Commentary

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Meeting the Challenge of SMB Storage

Information is just as important to SMBs as is to larger enterprises. Moreover, while both have to manage the rapid growth of storage, SMBs must meet service level requirements without the storage skills specialization and budget dollars that large enterprise can afford. To do that, SMBs must have storage that is simple, scalable, cost effective, and well serviced. With its DS3000/DS4700 series of disk systems, IBM offers a reply to the challenge of SMB storage through programs (Express Advantage), software (IBM Remote Storage Manager), and hardware.

The Challenge of SMB Storage

Does the size of a business matter when dealing with storage? For a small to medium sized business (SMB) the answer is yes. SMBs have some of the same problems as larger enterprises, but must deal with those problems with a considerably different set of skills and economic constraints.

What's the same as larger enterprises is that both classes of business have mission critical applications and must meet the needs of continuing rapid storage growth. Overall volume growth may depend upon the size of the business, but annual percentage growth is independent of the size of the business.

In addition, information is just as important to smaller businesses as it is to larger businesses. For both, the day-to-day functioning of the businesses depends on stored information. What's different is that SMBs do not have the IT staff depth and specializa-

tion levels of larger enterprises nor do they enjoy large companies' deep pockets. From a staff perspective, the number of IT personnel roughly tends to be a small percentage of the total number of employees regardless of the business size. An SMB thus has to face the same range of storage tasks as a larger business, but with a much smaller IT staff. Many SMB IT staffs have the breadth to deal with a wide range of tasks, but must forgo the depth that would result from skill specialization.

On the money side, smaller businesses not only have proportionately fewer dollars to apply to storage and storage management software, but also cannot afford some value added functions and features that larger businesses find essential.

Therefore, in order for SMBs to meet essentially the same storage challenges as larger businesses but with less storage specialization skills and tighter money constraints, they need *simplicity* (i.e., the

lack of complexity), *scalability* (i.e., the flexibility to grow along different dimensions), *savings* (i.e., the ability to get more bang per buck than larger enterprises typically get), and *services* (i.e., the ability to ensure the necessary service levels.

The Need for Simplicity

Simplicity is required because most SMBs literally cannot deal with the complexity that larger enterprises are able to manage through storage specialists and by buying solutions. SMB IT personnel have to be jacks of all trades rather than specialists and so do not have the time to learn to deal with storage complexity. Moreover, SMBs cannot afford to buy their way out of problems such as too much third party support. On the other hand, SMBs cannot afford service-level impacts, such as due to human error, that would occur if the complexity is too much for them to handle. Therefore the storage solution itself has to be simple rather than complex.

The three dimensions of storage simplicity an SMB should look for are:

- *Ease of installation* — the out-of-box experience should be such that an SMB IT administrator can confidently perform the installation successfully.

- *Ease of learning* — IT administrators can learn Storage 101, but time-constraints leave them unable to afford advanced courses in storage. Learning the fundamentals should be easy enough and sufficient enough to perform most necessary storage-related tasks successfully.

- *Ease of day-to-day management* — Administrators cannot spend all their time on storage. However, they still need to avoid the errors and problems that could have a negative impact upon service levels. The storage solution must enable them to do their jobs in a timely manner.

The Need for Scalability

Scalability is necessary to meet the challenges of storage growth as well as to meet the changing demands for how data is used within a business.

Scalability is not only about the ability to simply add more capacity (although that is important). Scalability from an SMB perspective covers three dimensions:

- *Scale up* — this is really about being able to add more storage on demand without having to do a forklift upgrade. Can storage be added in a modular non-disruptive manner? This means that storage slots (and hence storage investment) need only be added when storage demand occurs. This requires the use of modular expansion units that plug into a base unit rather than large monolithic units that can only be replaced — not simply expanded.

- *Scale across* — although some SMBs may prefer to stick with direct-attached storage (DAS), the option to move to a storage area network (SAN) needs to be available. Moving to a SAN enables multiple servers to partition storage in the array. Typically, this means that the overall size of the storage pool may decrease as higher utilization rates are possible in a SAN as compared to all of the collective DAS space. This consolidation of storage saves money.

- *Tiered storage* — adding a SATA layer of disk to an existing SAS layer may not seem like scaling but really is. SAS drives should be used for I/O intensive tasks. In contrast, non-high-performance-requiring fixed content data can be moved to higher capacity SATA drives which have roughly the same cost and environmental characteristics as SAS drives but a better cost and wattage relative to the amount of capacity available. SATA drives can store more data (allowing companies to scale up), but are also less expensive and "greener" than high performance SAS drives.

The Need for Savings

Savings are necessary because of the traditional recognition that with SMBs money seems tighter and dollars have to go further than with larger organizations.

There are three key dimensions to savings that have to be taken into account:

- *People* — the key metric for measuring the efficiency of storage to the cost of managing that storage is the people cost (measured in headcount dollars) to storage capacity ratio (i.e., $/TB). Improving that ratio means cutting the cost per unit of storage. Overall, the goal should be to keep people costs constant or growing more slowly than increases in storage.

- *Operational costs* — businesses should look for less labor-intensive storage (see people), but also look for storage that can provide greater efficiency (such as tiered storage for ongoing power and cooling "green" savings).

- *Capital costs* — businesses should look for packaged deals and for storage (such as tiered storage) that gives a bigger bang for the buck.

The Need for Service

Service is necessary because SMB organizations need high availability for their applications — especially their mission-critical ones — just as do larger organizations. However, they simply cannot afford to pay a premium for services that have marginal value-add, at best.

There are a couple of dimensions of service that businesses should look into:

- *Warranty and non-warranty service* — things break so a break and fix service is necessary, but businesses should be able to select from a range of break-fix options. Since a business may be located anywhere, global support is essential.

- *Proactive service support* — yes, things break and have to be fixed. However, the proverbial ounce of prevention through proactive service support is better for most businesses. A storage ecosystem is more than just the array itself so ensuring that all the products that compose that ecosystem work together prevents service calls from occurring in the first place. Providing early detection of potential (or actual) problems (through the use of remote support) so that action can be taken earlier and easier to prevent service-impacting events can be very valuable.

IBM Rises to Meet the Challenge of SMB Storage

Considering these requirements for SMB storage, are there any solutions that can actually meet those requirements?

The answer is yes. For traditional DAS/SAN disk storage, IBM offers the DS3000 Series and the DS4700 Express. For users who want networked-attached storage (NAS) capability (and may also want to work in traditional block storage along with it), IBM offers the N3000 Express series. And a data storage solution is not complete without a tape option. IBM offers SMB-focused linear tape open (LTO) tape technology, including libraries, tape drives, and cartridges.

To top it off, IBM offers a comprehensive portfolio of SAN switches to bring together servers, storage, and tape in what IBM views as a cost-effective, highly-reliable way for the SMB (as well as enterprise) marketplace. As a result, IBM provides flexible, scalable, and open standards-based business-class storage networking solutions that fit within its on demand world initiative.

IBM's DS3000 Series/DS4700 Express Meets the Challenge of SMB Disk Storage

The IBM DS3000 Series of disk arrays as well as the DS4700 Express arrays in conjunction with associated products are a good illustration of what can be done to meet the SMB storage challenge.

DS3000 Series Overview

All IBM DS3000 series models feature a 2U high enclosure that supports up to 12 SAS and/or SATA drives

intermixed (albeit in separate RAID groups). Online capacity can be up to 48 drives total using up to three EXP3000 expansion enclosures. The products feature dual-active RAID controllers with mirrored, battery-backed cache as well as redundant, hot-swappable components. Management is accomplished through the DS3000 Storage Manager Software. Additional capabilities include support for up to 16 storage partitions and for point-in-time snapshot capabilities called FlashCopy and a logical volume copy called VolumeCopy.

There are three models: The DS3200 provides for direct-attached storage using 3-Gbps SAS connection to a host. It is a solution for IBM's System X servers, and can serve as the first external storage for an internal DAS user or as a "shared DAS" solution for 2-node clusters. The DS3300 is an IP-SAN attach configuration that features a 1-Gbs iSCSI connection to an IP switch. It is a solution for IBM's System x servers, BladeCenter servers (including Power blades running Linux). An SMB can use a DS3300 to transition from DAS to networked storage.

The DS3400 is a direct or FC SAN-attached configuration supporting 4-Gbps FC. IT is a solution for IBM's System x servers, System p servers (running AIX or Linux), and BladeCenter servers including Power blades running AIX or Linux. A DS3400 can serve as low-cost additional storage for an existing SAN or as the foundation for transitioning from DAS to a SAN. Relatively speaking the DS3300 is the most affordable of these offerings, but provides less performance than the DS3400 which trades a measure of affordability for higher performance. The DS3200 stands

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in the middle for both performance and affordability.

DS4700 Express Overview

The DS4700 offers a little more oomph (relative to the DS3000 series) in terms of platform support, connectivity, performance, and scalability in Fibre Channel environments.

The DS4700 Express supports a wide range of open systems platforms, including System p, System x, NetWare, Linux, and UNIX. Eight host channels with dual controllers send a strong connectivity message. Performance is up to 1550 MBps bandwidth accompanied by 4Gbps capable Fibre Channel connections for high throughput applications. Scalability-wise the DS4700 Express can support up to 112 disk drives with the attachment of six DS4000 EXP810 expansion units. So shops that require that require that extra oomph on one or more dimensions get it with the DS4700 Express.

Meeting the Challenge of Simplicity

Both the DS3000 and DS4000 use a Storage Manager that is derived from the same code base. The Storage Manager helps with the ease-of-day-to-day management simplicity. Since Storage Manager provides the administrator's action-driven window to the storage world, having a user interface that is both intuitive and simple is essential. As an example, the tool provides a portal-view landing page that is an at-a-glance summary page. In addition, IBM adds some nice touches such as a Recovery Guru, e-mail diagnostic alerts, and an initial setup tasks dialog box.

Both offer FlashCopy, a point-in-time copy capability for file restoration and aid in backups, and VolumeCopy, a feature that fully replicates one logical volume to another within an array. The DS4700 also offers Dynamic Volume Expansion for resizing logical volumes without user disruption and Enhanced Remote Mirroring to mirror data to a remote site for data protection purposes.

The DS3000 also has some simplicity features that DS4700 Express shops do not require. The DS3000 series attacks the ease-of-management dimension of simplicity through the use of an Express Kit and a Quick Install Guide, an illustrated guided check list that is simply a folded large sheet of sturdy paper printed on both sides. Yes, an administrator may have to check other documentation (such as when installing a host bus adapter (HBA), but the directions are clear enough that an administrator should be able to follow the Guide easily enough.

Concerning ease-of-learning simplicity, IBM provides an educational CD that an administrator can use to learn the basics of installation, problem identification, and storage expansion. The CD uses the Macromedia Flash Player. The learning CD is highly graphical, interactive, straight-forward, well-designed, thorough, and very-well written. Quite frankly the administrator can learn in private answers to questions that he/she would hesitate to ask in public. And, in so doing, the process of installation and management should go more smoothly.

Meeting the Challenge of Scalability

The DS3000 and the DS4700 Express help meet the dimension of scalability by having the ability to add expansion enclosures. With the DS3000 line one to

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three expansion enclosures can be added and with the DS4700 Express one to six expansion enclosures can be added. That provides the flexibility of growth when needed without having to take on the impossible task of storage prognostication to determine exactly when additional storage must be made available.

SAS and SATA can be intermixed within the same DS3000 disk system and FC and SATA drives can be intermixed within the same DS4700 Express disk system. Since SATA drives have larger capacity than their high performance counterparts (i.e., SAS or FC drives) the overall maximum capacity of the disk system (including expansion enclosures) is increased.

The scale across dimension is addressed through storage partitioning, which allows multiple servers to address the same pool of disk system storage. That is important for storage consolidation, which means more cost efficient utilization of storage. It also enhances ease-of-management through a one window to the world central focus that is superior to fragmented processes resulting from managing storage on each individual server.

The tiered storage dimension of scalability is met through the SAS or FC (as appropriate)-SATA intermix capability with all the benefits that have been previously discussed.

Meeting the Challenge of Savings
IBM recognizes the budgetary challenges that SMB businesses face in people, operating costs, and capital dimensions. Consequently, the

company has put together a subset of its SMB storage solutions designated as Express Advantage offerings. These solutions combine hardware, software, services, and financing solutions, and are designed, developed, and priced specifically for SMBs.

In addition, since IBM recognizes that many SMBs buy storage-related solutions through the channel, IBM has put together an Express Seller program that it views as readily available and aggressively-priced solutions that the channel can sell autonomously.

Meeting the Challenge of Service
IBM provides a variety of standard maintenance programs for warranty and non-warranty service. For example, IBM offers a three year warranty on parts and labor. If a business depreciates storage on a three year schedule and replaces at that time, then storage can always be under warranty. Key is the fact that IBM is a global company and has a long well-regarded tradition of providing quality global service.

That leads to the real power of IBM in being able to provide proactive service support.

One way that IBM does this is through its System Storage Proven program. This gives a SMB the assurance of interoperability as well as access to a broader range of solutions. That is especially important since SMBs often work with IBM's channel partners.

One notable way that IBM provides proactive support is through the use of the IBM Remote Storage Manager for Storage (RSM). RSM works with IBM Storage Manager to detect events by sending logs and status information along with alert information to IBM for

analysis. IBM service can also dial in to obtain additional information and logs to aid in the problem determination process. All this leads to faster problem resolution.

Note that there is no charge for this service although there is a charge for the hardware required to run the software at the local site. As a result, IBM is able to provide a sophisticated level of storage expertise that SMBs cannot afford themselves. IBM can efficiently leverage its skilled people across many accounts as problems at any one SMB should account for only a tiny amount of the support needed. As a result, a small business can get sophisticated storage service with only a small upfront cost.

The N3000 Express Series Meets SMB Storage Needs for NAS Plus

The DS3000/DS4700 products meet the needs of SMBs for traditional block-based storage and so a strongly block-based focused SMB IT department would turn to those products. But what about IT shops that have a strong NAS requirement for managing files? For that, IBM offers the N3000 Express series of modular disk storage systems.

Naturally, an all NAS shop could use this series of products. But even strongly-oriented NAS shops tend to have block-level application requirements in addition to their file-level data access requirements. And the N3000 Express series can handle both block-level and file-level data access in a unified architecture. That single, integrated architecture that supports concurrent block I/O and file serving over Ethernet and Fibre Channel SAN infrastructures dissolves that supp

posed argument about either NAS or SAN with the answer "both."

That versatility is very welcome, but from a NAS perspective, SMBs know that the NAS capabilities are built upon the robust, powerful, and very well proven Data ONTAP technology. So SMB NAS requirements are well taken care of right off the top.

N3000 Express Series Overview

The N3000 Express series is composed of two products — the N3300 Express and the N3600 Express. They share a lot in common. They use the same unified storage architecture and can run the same software and management tools.

The N3000 Express is very versatile in that it supports CIFS, NFS, iSCSI, and FC; this have-it-your-way multi-protocol capability means that SMBs can not only meet current needs, but also be sure that they can support future requirements if needed.

N3000 Express series offers SMBs a strong software suite that was originally designed for enterprise-class requirements, but SMBs can pick and choose the combination of software that best meets their needs for such purposes as simple replication, disaster recovery, or on-the-fly provisioning.

The N3300 Express has 12 internal SAS or SATA drive bays in a 2U high enclosure, but can accommodate up to four expansion units for up to 68 disk drives total. Its bigger brother, the N3600 Express has 20 drive bays in 4U and can accommodate up to 104 if the maximum number of six disk expansion units are used.

Table 1: How the N3000 Express Series Meets the SMB Storage Challenges

Challenge	Answer
Simplicity	Standardization using the series takes advantage of existing IT skills and reduces complexity.
Scalability	Modularization means starting with current needs and then adding expansion units as needed.
Savings	Ability to drive down costs for storage, such as the use of thin provisioning
Service	The breadth of service applies here as well as for just block-based storage.

Source: Mesabi Group June 2008

IBM LTO Technology Meets SMB Tape Storage Needs

The long-term expected demise of tape technology has been greatly exaggerated. Tape technology is likely to stay for the foreseeable future. For data protection purposes, such as disaster recovery, extra copies of data must be stored. Although disk may be used for the main recovery copy, storing additional copies on tape versus disk is typically more cost effective even when overall storage infrastructure costs are taken into account. Moreover, tape is more energy efficient (as a tape cartridge not in active use in a tape drive consumes no energy).

Over the past few years linear tape open (LTO) tape technology has dominated as an open technology to displace a number of proprietary tape formats. IBM has played a leadership role in this as one of the three prime movers in the LTO Program, which specifies the roadmap and standards for LTO technology.

IBM participates in all three areas of LTO technology — the automation part with tape libraries, the read/write mechanism part with tape drives, and the actual storage on tape media part with cartridges. So it should come as no surprise that IBM has a solution that applies to SMBs.

LTO Half-Height Overview

IBM offers the TS2240 Tape Drive Express model. This tape drive uses IBM Ultrium 4 (a.k.a. LTO 4) technology that offers a 120 MB/sec performance native data transfer rate and 800 GB capacity native. (A reasonable 2:1 compression ratio doubles those numbers.) The TS2240 is a half-height (HH) drive as opposed to traditional full-height (FH) tape drives. Half-height drives are an advantage to SMBs as they save space.

Although some performance metrics such as average rewind time are less than FH drives, those metrics probably don't matter to an SMB (because of a less demanding workload) and functionality — which does matter — is not sacrificed with HH drives. That functionality includes the necessary continued media support for prior LTO generations and solid managed encryption capabilities that are becoming a necessity for businesses of all sizes.

IBM supports the TS2240 tape drive with two rack-mounted tape library models — the TS3100 and TS3200 Tape Library Express models. The TS3100 can handle up to two HH tape drives with 24 data cartridges for a capacity of 19.2 TB native (double with compression). The TS3200

Commentary

can handle up to four HH tape drives with 48 data cartridges for a capacity of 38.4 TB (double with compression). HH LTO Gen 3 and HH LTO Gen 4 tape drives can be mixed in the same library.

Table 2: How IBM LTO Tape Technology Meets the SMB Storage Challenges

Challenge	Answer
Simplicity	Barcode reader and remote management
Scalability	LTO 4 packs a lot in a small package; scaling comes about by doubling capacity each generation
Savings	Where tape can effectively be employed, the cost is less than hard disks.
Service	The breadth of service applies here as well as for disk storage.

Source: Mesabi Group June 2008

Conclusion

How can storage provide the necessary service-levels that business information requires? How can the ever expanding growth of storage be managed properly? These challenges are common to both SMBs and large enterprises.

Yet SMBs face constraints in meeting those challenges. They cannot afford

the levels of IT staff storage specialization nor the expenses that larger enterprises can afford.

To meet the overall storage challenge, SMBs need more from their storage for less. They need simplicity as they cannot afford the skills to handle complexity. They need scalability so that they have the flexibility to pay as they grow. They need affordable storage with necessary functionalities and features. They need support services so they can meet service-level requirements.

IBM offers a solution to this challenge with a number of choices — DS3000 series and DS4700 for traditional block-based storage, the N3000 series for disk storage where there is a strong NAS need, and LTO-4 tape technology to fill out the necessary tape requirements. SMBs can easily choose the products that best match their need for simplicity, scaling, savings, and service.

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