



What's Hot and New in iSeries Storage?



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By Nancy Roper

Introduction

Rub the magic lamp a little harder, because the genie inside has been granting lots of wishes for iSeries customers in the storage arena in the past year, and will continue to do so in the months and years to come. It all started with the announcement of LTO tape technology in the fall of 2000, and has continued with the addition of SAN and fibre channel technology in recent months. These technologies, combined with the new iSeries processors, are letting customers backup their systems at lightning speeds, with distance and connectivity options that they've been dreaming about for years. The fibre technologies have also made iSeries attachment to external storage subsystems a viable option for enterprise customers who are looking to consolidate their storage.

So what is all this hype about storage, and how do you use it to your advantage, you ask? Well, read on! This article will talk about the iSeries' entrance into the fibre channel world. It will describe the new LTO and fibre-tape options available, explain the main V5R1 BRMS enhancements, and introduce you to external disk storage and the benefits it can provide.

The iSeries enters the SAN world!

When V5R1 was announced, the iSeries formally entered the Storage Area Network (SAN) world. New fibre adapter cards for the 270 and 8xx processors were announced that will attach fibre channel tape (adapter card feature code #2765) and external disk (adapter card feature code #2766).

So what is a Storage Area Network, you ask? Well, let's look at what we've had in the past, then compare it to a SAN:

In the past, disk and tape were direct-attached to the AS/400 and iSeries via SCSI cables that could be at most 25m long. Each server "owned" its own storage. For example, disk drives were right inside the servers and not shared between systems.

Tape drives were dedicated to one system, or sometimes shared between two systems. Transmissions ran at SCSI speeds.



Figure 1

By comparison, in a SAN environment, the SCSI cables are replaced by a high speed, interconnected storage network, typically running across fibre channel cables, with hubs and switches and other SAN devices mixed in for connectivity and redundancy. This network can provide any to any connectivity among the servers and the storage devices. Distances of 10 km can be achieved easily. Performance today is up to 100 MB/sec, with 200 MB/sec devices beginning to come to market, and 400 MB/sec devices on the horizon. A SAN can be as simple as a single orange

fibre cable running between an iSeries and a fibre tape drive, or it can be as complex as a multi-platform, enterprise wide network, complete with monitoring tools, etc.

So what does this mean to you?

Improved Connectivity: Have you ever been frustrated that you had to buy an extra tape drive, not because your existing drive was overloaded, but because it only had 2 ports and you had 3 systems? Or have you ever wanted to run a save, and found you had lots of idle drives in your tape library, but none of them was attached to the system that needed the backup? With fibre channel, these issues go away. You can use switches and hubs to attach multiple hosts to multiple drives to give great flexibility in your operations.

Improved Distance: Did you ever consider doing remote backups, whereby your CPU was in one building, and your tape drive was in another, thus saving the need to send your tapes offsite? Or did you ever want to lock your CPUs in your computer room, but put the drives out closer to your operators?



Figure 2. XChange Xcellence Award

With fibre channel, options like these become available, because you can separate your host and your storage by 10 km with ease.

Improved Performance: Have you been wondering how you can squeeze your backup into the tiny save window left after the demands of global operations and e-business? Well, SAN and fibre channel answer this challenge too. The high speed of fibre channel, combined with the new HSL bus connections on 270 and 8xx iSeries CPUs, will make your backups fly. This high speed connection will also make external disk viable in an iSeries environment.

In order to start using fibre channel and SAN on your iSeries, you will need to be on the latest hardware models (270 or 8xx), and the latest version of the operating system (V5R1), along with the new fibre attachment cards. Initially, the iSeries will use a fibre-channel arbitrated loop topology for storage area networks, with fabric-mode being added in future releases. Initially, the SAN devices that will be supported on iSeries to connect multiple hosts to the storage are the 3534 IBM TotalStorage SAN Managed Hub and the 2109 IBM TotalStorage SAN Switch.

For further information on iSeries SAN, please refer to the redbook entitled "iSeries in Storage Area Networks" (SG24-6220) at www.redbooks.ibm.com.

LTO Tape

A new tape technology has taken the market by storm in recent months. It is called "Linear Tape Open" (LTO) and is very well suited to the iSeries marketplace. Three tape vendors, IBM, HP, and Seagate worked together to describe the specification for LTO. Their goal was to create a product to replace the aging and proprietary 8mm and DLT products that are in common use on iSeries, xSeries, and Unix servers. In their specification, the team demanded that the initial LTO drives be high speed (at least 10-20 MB/s before compression), high capacity (at least 100 GB per tape before compression), reliable, economical, and open. They then drafted a four generation technology roadmap that shows the LTO drives doubling in speed and capacity every 18-24 months. The result of the team's work was a drive that competes with the high-end drives on performance and function, but is priced in the same neighbourhood as the low-end drives. It excels at the streaming tape operations that are typical on the iSeries platform.

IBM was first to market with an LTO product set, and very quickly won the "XChange Xcellence Award" award for "Best New Product – Hardware Division" (Figures 1 & 2) at CMP's Solution Provider Xchange show in New Orleans in April 2001. IBM's product line includes the following devices:



Figure 3

The 3580 (Figure 3) is a single drive, single cartridge device that is so small and light you can carry it in one hand. It attaches to a single host. In a typical iSeries environment (3:1 compression), this drive can save 300 GB of data unattended. For many systems, this means that the entire system save would fit on a single tape. This drive is available in SCSI models only.



Figure 4

The 3581 (Figure 4) is a single drive device that can hold up to 7 cartridges for a total of 2.1 TB of unattended storage in a typical iSeries environment (3:1 compression). It attaches to a single host. This drive can be used in sequential mode where the tapes are used one by one in order. Alternatively, it can be switched into random-mode to behave like a mini tape library, whereby the tapes can be accessed in any order, and tapes can be remounted without operator intervention. There is an optional barcode reader that is beneficial when running in random mode: it uses one of the cartridge slots. This drive is available in SCSI models only.



Figure 5

The 3583 (Figure 5) is a small tape library that can hold from 18 to 72 cartridges. In an iSeries environment, the SCSI model can attach to a single host and can have one drive. The fibre model has 2 fibre ports and can have from 1-6 drives. Two iSeries hosts can be attached directly via the fibre ports, or multiple iSeries hosts can be attached via hubs and switches. In each case, all hosts can access all drives.



Figure 6

The 3584 (Figure 6) is an enterprise-sized tape library that can hold from 141 to 2481 cartridges. It is similar in appearance to a 3494. Each frame can hold up to 12 drives,

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and a library can have from 1-6 frames. A mixture of SCSI and fibre drives can be placed in a single 3584. SCSI drives can each attach to a single host. Fibre drives can each direct-attach to a single host, or they can attach to multiple hosts via hubs or switches. DLT drives can also be put in a 3584 for use with other host platforms, but DLT is not supported on the AS/400 or iSeries.



Figure 7

A key feature of the 3584 is the ability to partition it into multiple independent libraries. This can be done using barcode stickers on the inside of the library to carve off tape drives and entire columns of media. Alternatively it can be done via the front panel of the library to carve off mini-libraries as small as a single cartridge and a single drive, or as large as the entire 3584. Library partitions are ideal for separating the activity of different host platforms, or different operating entities of the business.

Customer feedback on LTO has been excellent. Businesses are now able to start up operations much earlier in the morning with their night-time saves running so much more quickly. Keeping track of the tapes is much easier for the operators now that there are just a fraction as many tapes to manage: for example, a single LTO tape holds the same amount of data as 125 tapes from the older 3490E family. Offsite storage costs are down since the system save fits on just a handful of tapes.

For more information on LTO tape technology, please visit the following website: <http://www.storage.ibm.com/hardsoft/tape/lto/index.html>

Fibre 3590E Tape

IBM's premier tape technology is the 3590E tape family. 3590E drives match the LTO drives on streaming backup performance, but they also excel on

small file saves and start/stop work such as auto-recall applications and TSM restores. 3590E is the industrial strength tape drive intended for high-end and mission critical environments.

Over the summer, fibre models of the 3590E tape drive became available for the iSeries. Customers buying new 3590E's, or customers upgrading from B-model 3590's will find it more economical to move directly to the fibre 3590E's, rather than doing a two-step upgrade via the SCSI 3590E. However, in order to go directly to the fibre drives, customers will need to coordinate their tape acquisitions with their 270/8xx and V5R1 upgrades that are required to support fibre.

Note that customers on the newest iSeries processors (270 and 8xx) will see the largest performance improvement when they migrate to the high-speed LTO and 3590E tape drives, due to the HSL bus connection and the new high speed SCSI and fibre tape adapters on these processors. Customers on older 170, 6xx and 7xx processors will see a smaller performance increase initially, because they will be bottlenecked on the older bus and IOP technologies. Once these customers upgrade to the newer buses and adapter cards on 270 and 8xx, their saves and restores will be able to run closer to rated speeds. Performance figures for various tape drives can be found in the Performance Capabilities Reference at <http://www-1.ibm.com/servers/eserver/iseseries/perfmgmt/resource.htm>.

Backup, Recovery, and Media Services

Backup, Recovery, and Media Services (BRMS) is IBM's strategic tape management software for the AS/400 and iSeries. It tracks your saves, automates your recoveries, manages your tape libraries, and provides hierarchical storage management.

At V5R1, BRMS had significant enhancements. A key addition was the GUI interface (Figures 7, 8, 9) that was implemented as part of Operations Navigator. Wizards now step you through a series of questions, complete with explanations, to help you set up your backups, etc.

BRMS now also offers parallel *ALLUSR saves whereby a single backup job can automatically split your backup across multiple drives. This enhancement fits nicely with the new high-speed bus on the iSeries that makes it possible to run many more tape drives simultaneously on a system.

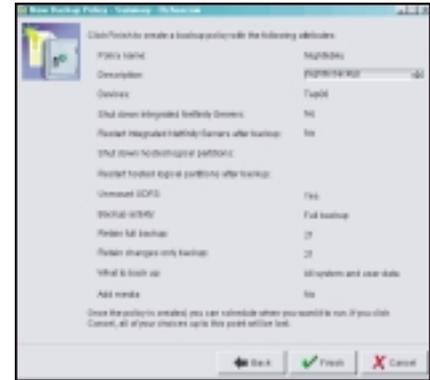


Figure 8

The BRMS Recovery Report that steps you through the recovery of your system has been enhanced to make it even more user-friendly than in the past. Some steps have been reworded, others have been broken into multiple smaller steps to make it more readable, and fields have been added to record the timing of each step, making it easier to monitor the recovery.

With V5R1 and the appropriate PTFs, BRMS networks can now run across TCP/IP connections.

Recall also that BRMS now offers an online backup of Domino and Quickplace servers. Your users can use their databases around the clock with no need to quiesce for the save. BRMS and Lotus work together in the background to create transaction logs during the save and capture them along with the data in

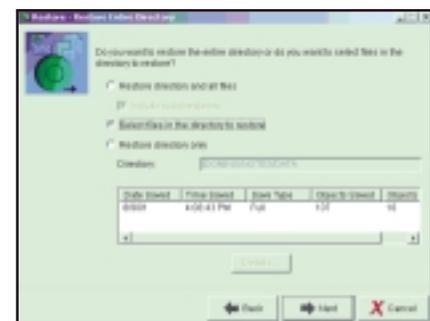


Figure 9

order to provide a committed save, without any interruption to the user. For more information on the BRMS product and the above functions, please visit the following website: <http://www-1.ibm.com/servers/eserver/series/service/brms/>

External Disk Subsystems

Centralized disk storage such as IBM's Enterprise Storage Server (also known as "Shark" or "ESS") has become tremendously popular on many platforms in recent years because of the management benefit that it offers in these environments. The centralized storage subsystems allow all disk storage in an enterprise to be placed in a series of cabinets (Figure 10) and managed via a central GUI interface. As data requirements change, disks can be reformatted and used on a different system or platform. Scatter-loading of data across multiple disks in these storage units improves system performance on many of the host platforms. Large read and write caches also boost performance. RAID protection is implemented within the



Figure 10. IBM ESS (Shark)

storage subsystem, thus offloading any overhead from the host. Hot spare disks are included and are rebuilt automatically following a disk failure. The storage subsystem features duplicate power, cooling, disk paths, etc. to maximize availability. Failures are reported within the organization via pager, email, and SNMP notifications, and they are reported to support via a call-home feature.

Centralized storage systems also provide "Copy Services" functions that offer interesting possibilities on many platforms. "Flashcopy" makes an instantaneous copy of disks that can be used for testing, data warehousing, or backup, etc. "Peer to Peer Remote Copy (PPRC)" provides an ongoing bit-by-bit copy of the disk to a remote site for use in disaster recovery.

Many of the functions provided by external disk subsystems are already available as part of OS/400's integrated storage management architecture and via our high availability software partners. However, iSeries users may find the centralization of storage, the hot spare capability, the redundant hardware, and the ability to move storage between platforms attractive. In the past, external storage subsystems only attached to the AS/400 via the older 6501 SCSI adapter card. However, with the V5R1 announcement, IBM's ESS can now attach to the iSeries via the #2766 fibre adapter card, and as a result, external storage is now viable from a performance standpoint. Recall that a 270 or 8xx CPU and V5R1 are prerequisites for the fibre cards on the iSeries.

Detailed information regarding the use of the Enterprise Storage Server on the iSeries can be found in the redbook entitled "iSeries in Storage Area Networks" (SG24-6220) at www.redbooks.ibm.com.

Conclusion

As you can see, iSeries storage, has moved forward dramatically in the past year, with the introduction of SAN, LTO, and fibre 3590E. Ongoing enhancements continue to make the BRMS product a shining star, and the addition of fibre attachment for the ESS makes it viable for the iSeries to participate in storage consolidation projects.

Watch for continued enhancements in the iSeries storage area, as we continue to grow our presence in the SAN world, and gradually march through new generations of tape technology. Also watch for continued investment in BRMS and ESS connectivity and function in the years to come. TUG

Nancy Roper has worked for IBM for 11 years, where she now specializes in iSeries attachment to the various storage products. Nancy is one of the authors of the recent redbook that describes the iSeries participation in a SAN environment. She will be speaking on IBM storage solutions at TUG's next Meeting of Members on November 21, 2001. She can be contacted at nroper@ca.ibm.com.

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