



# A SAN With No Switches Or Hubs?

▲ The Division of Engineering and Applied Sciences at Harvard University was not ready for a disk-based SAN (storage area network). So VAR Cambridge Computer Services, Inc. built them a backup SAN using just a storage router, software, and a tape library.

by Ed Miseta

The Division of Engineering and Applied Sciences (DEAS) at Harvard University (Boston) has been a customer of storage VAR Cambridge Computer Services, Inc. (Boston) for about 10 years. It is also one of Cambridge's most challenging accounts. "Harvard is a challenge because they have just about every platform you can imagine," says Jacob Farmer, CTO of Cambridge. "They also work those platforms very hard, employing them for testing, scientific data collection, directory hosting, and more. These are intense users that like to keep their computing options open and have cutting-edge solutions. They require a very flexible computing environment."

Adding to the complexity of the environment were the many types of storage hardware in use. Harvard had high-availability clusters, Network Appliance filers, a Sun T3 storage array, and a variety of host computers. "They were building their network and storage systems in a very erratic pattern," says Farmer. "They needed a flexible storage management platform that would grow with their needs."

## SAN And LAN – The Right Combination For Backup

Farmer decided early on that Harvard would need a storage area network (SAN) with central disk storage. Unfortunately, the school was not yet ready to commit to that type of system or expense. Funding would come from many different sources at many different times of the year, and equipment was purchased based only on what was needed at the time. "It's a very complicated environment," adds Farmer. "Funding is decentralized, the needs of the researchers are decentralized, so the only thing we felt they could centralize is the backup system."

Farmer knew this customer needed SAN technology to back up its data. But because there were so many machines to back up, using a SAN would have been cost prohibitive. Farmer solved this problem by designing a system that is a hybrid of a SAN and a LAN backup system. "A lot of people think of SAN as strictly a disk technology [a way to centralize disk storage], but I would argue that backup is the real killer application for SANs," says Farmer.

The Cambridge solution incorporated a TLS412180 tape library from Qualstar (Simi Valley, CA) with an external storage router. The router has six Fibre Channel ports as well as four SCSI (small computer system interface) ports. This enabled Cambridge to connect six Fibre Channel host com-



Jacob Farmer, CTO of integrator Cambridge Computer Services, Inc., was able to create a switchless backup SAN for the Division of Engineering and Applied Sciences at Harvard University. His solution consisted of software, a SAN router, and a tape library from Qualstar.

puters directly to the router, in effect making the SAN router the entire SAN. "Since there was only a handful of computers that had to be connected to the backup SAN, we were able to do it all through the router without needing Fibre Channel switches," says Farmer. "Harvard did not have the budget for the switches [which cost approximately \$15,000 each] nor were they ready to go down that road. When Harvard is ready to buy a SAN, they can purchase Fibre Channel switches, plug all of their computers into the switches, and then plug the SAN router into the switches and grow this system to the next level."

## AIT Is The Right Choice For Variable Rate Data Streams

The Qualstar library was also an integral part of the system. The library uses AIT (advanced intelligent tape) technology and holds 180 tapes (18 TB of uncompressed capacity). However, the library can grow to double that capacity. The Qualstar product was selected because of its capacity and expandability, but also because of its AIT tape drives, which are particularly well suited for unpredictable data rates (i.e. whether the data is moving slowly or very fast).

Data rates are determined by the applications and the network infrastructure that will carry the data. The throughput in a backup system is also subject to a wide range of bottlenecks. The bottlenecks will interact with each other to create new bottlenecks, and in complex environments it is



## INSTALLATION REVIEW TAPE

almost impossible to predict the throughput of the backup system. But Farmer points out that the biggest bottleneck of all occurs when tape drives can't handle variable rates of data. In that situation, the drives go through a start, stop, rewind, and reposition pattern that kills performance.

"With SDLT [super digital linear tape] and LTO [linear tape-open], the tapes stream at more or less a fixed speed," he says. "If the buffer on the drive empties [i.e. the data flow

stops], the drive has to stop and wait for more data. But normally the drive is going too fast to stop quickly, so it overshoots and has to rewind and reposition before it can start up again. In complex environments, that translates to really poor performance. AIT is effectively a variable rate tape drive. Its buffer is able to adequately compensate for the reposition time of the media."

Another challenge for Cambridge was that Harvard had only a small amount of space in its data center available for new hardware. The Qualstar library fits in 5 square feet of floor space. "We are able to get 18 TB of storage capacity into a very small amount of space," says Farmer. "The customer also had other Qualstar tape libraries in the past and never had a service call. They felt it was a reliable solution."

Software from LEGATO Systems (Mountain View, CA) completed the solution. "LEGATO NetWorker is a modular software solution that allows the customer to scale incrementally," says Farmer. "When Harvard is ready to add a new backup client to the system, if it is a small client they add it to the LAN, and if it is a larger client they can add it to the SAN. In either case, it is a simple license from LEGATO that adds on incrementally."

### Customers Need SAN For Backup

Farmer believes SAN-based backup is inevitable due to the continuing growth of data. "Disk storage is growing at a faster rate than the infrastructure for running backups," he states. "Tape technology would have to double in speed and capacity every time the disks double in capacity, and that is not happening. The computer technology for delivering data to the tape drive would have to double as well, and that is also not happening. You can't buy your way out of backup problems. You have to design your way out of them. VARs need to learn SAN-based backup and start offering these solutions to their customers." □

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**ESS** ENTERPRISE  
Storage Solutions

3835R East Thousand Oaks BLVD. #315  
Westlake Village, CA 91365  
Tel 877.230.2837 / Fax 805.435.2500 / [www.ess-direct.com](http://www.ess-direct.com)

For More Info. On Qualstar  
Go To [www.qualstar.com](http://www.qualstar.com)

