# Open Systems Storage: Case Studies in Storage Management

To effectively manage the growth in data storage capacity and increased customer demands, storage managers must develop systematic strategies and invest in software tools and technologies.

Consider the challenges facing Gene Willis, the manager of performance and storage systems for the Jacksonville, Fla.-based CSX, a large railroad and integrated transportation system. Willis is responsible for storage, performance and resource allocation for the company's mainframe and distributed computing systems. In particular, he works with the operation group to configure DASD storage resources.

"In the transportation environment our users want access to more historical data on which to base their decisions," Willis said. The data includes information on rail shipping, ocean vessels, barges, and intermodal shipping activities. "They want to know what cars they have at their disposal, and what kinds of goods are being shipped via which form of transportation," he said. Not only are railroads and other forms of transportation running at full capacity, customers increasingly rely on just-in-time (JIT) inventory. A cost-efficient approach pioneered by the Japanese, JIT demands that goods arrive exactly when expected. Delays can shut down entire operations.

Another challenge facing Willis is that CSX's mission-critical applications, including its customer order processing system and its Dynamic Car Planning System are now run on open systems platforms. In many cases, for time-critical dock-to-dock shipping information, the mainframes operate as large servers and data repositories for open systems applications.

In short, Gene Willis' customers want more data, faster, from a wider variety of computer platforms. He must ensure that data is available 24 hours a day, seven days a week. However, he must also ensure that the necessary resources are available for applications developers who do not always factor storage demands into their development processes. In addition to these requirements, Willis is under a mandate from his management to work as efficiently as possible since CSX, like any company, does not have an unlimited budget for storage.

## KEEPING PACE

Despite the explosion in sheer quantity of data stored, technical and data center staffs, such as those at CSX, find it hard to keep pace. "The days of having an individual per X gigabyte of data are gone," Willis said. And he is not alone. Managers responsible for enterprise storage everywhere are facing the same pressures. For example, Tom Couvreur is the technical services manager at the Chemical Abstracts Service in Columbus Ohio, a company that offers an extensive online information service. When his team first started looking at how to integrate open systems and mainframe storage, the company had 20 UNIX servers. The company now has 200 UNIX servers, 14TB of data, and its DASD storage is growing at 20 to 30 percent annually (2.8TB to 4.2TB). When the team first started to look at real-time back up for mission-critical information, the target was

to handle 10GB of data. Today, the target for real-time backup is 300GB. Faced with those kinds of growth rates and increased customer demands, enterprise system storage managers can no longer fall back on the strategy of simply adding more storage capacity — an approach that has been widely used, particularly in the open systems environment over the past decade. Instead, they must work to develop systematic storage strategies and invest in software tools and technologies that will allow them to manage storage more efficiently.

## DEVELOPING STORAGE MANAGEMENT SOLUTIONS FOR OPEN SYSTEMS

In enterprises ranging from software development to transportation, from consumer utilities to retail, executives responsible for storage management confront several key issues in developing storage management strategies. First, storage management issues in the MVS environment are radically different than the issues in the open systems arena. Not only is the technology different, the user communities have different cultures and different approaches to storage management. To develop an effective storage management strategy, the differences in those cultures have to be bridged. More-over, since separate communities have evolved around the different computing platforms found in the enterprise, it should be no surprise that the software tools available for storage management are different in each community.

BY ELLIOT KING

Another key issue is that storage management professionals have to find ways to manage more data with fewer people. For example, Jim Hill, manager of the MVS storage management group at Bell South in Birminham, Ala., is responsible for installing and supporting mainframe storage for six geographic locations. In total, he is currently responsible for more than 45TB of data and more than 100 tape libraries. "Our biggest problem is growth and the lack of head count to manage the growth," Hill said.

To respond to this problem, Hill installed Hierarchical Storage Management (HSM) and Systems-Managed Storage (SMS) in 1989. HSM is a software-driven method for managing different types of storage media. The objective is to store data on the media that best suits its requirements for performance and availability. HSM products assign datasets into logical groupings that share common usage patterns, expected life spans, and backup requirements. Most products also include backup and recovery functions.

Hill's second solution, SMS, automates many storage management tasks that were previously performed manually and is generally applied to dataset allocation. Using SMS, the storage administrator establishes a policy that defines a volume pooling structure made of storage groups. The administrator can then write automatic class selection (ACS) routines that define which datasets can be allocated where and how hardware resources should be utilized. "We became interested in SMS because of the potential to improve utilization," said Hill. "Before we went to SMS, we were 40 percent utilized. Now we are 70 percent utilized."

The drive to automate storage management in the mainframe environment is widely evident, although its implementation is not as universal as might be expected. "There are plenty of people who are behind the curve," said Paul Mason, vice president of infrastructure software research for International Data Corporation, (IDC). "SMS does not have 100 percent implementation." Part of the problem in the recent past has been that in their zeal to move to open systems, some companies have shortchanged their investments in mainframe technology. That is changing as senior management recognizes the integral part mainframe technology will continue to play in their information management infrastructure. Moreover, smaller companies that already have effective disk pooling strategies in place via vendor products do not have as much incentive to implement SMS since it does not provide an immediate benefit.

To facilitate the use of SMS and HSM, many companies have opted for sophisticated software tools offered by such companies as DTS Software, Sterling Software, and Boole & Babbage, among others. For example, Compuware, a large computer software publisher, uses several Boole & Babbage products, including SG-Control, which provides for dynamic space allocation management using logical groups of datasets. In addition to automating many storage management functions, tools such as these allow the administrators to get a true picture of DASD allocation and utilization, and to better manage their systems. Vendors such as DTS Software and Sterling Software provide similar tools for allocation management and space abend prevention.

"First, I can get a good inventory, " said Larry Robertson, a technical specialist at Compuware, "and then I can get some accountability about who owns data." Using Boole & Babbage space management tools, all the datasets have owners and a logical budget. Consequently, these owners have some incentive to manage their storage needs.

Often, events outside the data center trigger the move to SMS and automated storage management in the mainframe arena. For example, when Citizens Utilities decided to consolidate operations in New Orleans, it moved to SMS. "Before that we did everything manually," said Robert Brazeil, a senior systems programmer. "But we had to automate storage management. We just didn't have the programmers to do it otherwise." Like Compuware, Citizens opted for a suite of Boole & Babbage tools including EasyPOOL, which allows users to prepare for the DFSMS approach to storage management through defining standards, identifying violators, and extending pooling to non-DASD devices. Citizens also selected another product, StopX37/II, which eliminates abends more efficiently than either DFSMS or implementing changes in the JCL.

For the most part, storage management professionals are satisfied with the tools they have to manage mainframe storage. Using storage management software, storage administrators can get good views of their systems and automate a wide range of storage functions. Of course, some problems still need to be adequately addressed.

## EXPLORING THE OPEN SYSTEMS WORLD

The situation could not be more radically different in the open systems environment. In the mainframe storage environment administrators can apply tools to well established storage discipline, whereas the open systems world is still wild and woolly. "It is out of control," said CSX's Gene Willis.



Faced with those kinds of growth rates and increased customer demands, enterprise system storage managers can no longer fall back on the strategy of simply adding more storage capacity — an approach that has been widely used, particularly in the open systems environment over the past decade.
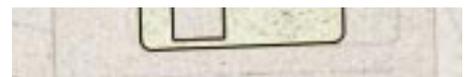
The problem is three-fold: the sheer growth of storage capacity, the traditional method for adding storage capacity and the culture of the open systems environment. "The biggest challenge in open systems is rapid growth," Paul Mason said. Over the past two years it has become commonplace for a Windows NT server to have a gigabyte of associated storage and a UNIX server to have a terabyte of data storage. Moreover, because the initial cost of storage has fallen, when facing capacity limitations, many administrators have routinely opted simply to add more storage rather than to better manage their existing resources. "It is as if you have a garage that you have filled up with junk," Mason said. "If it only costs $200 to build another garage, you may choose to do that rather than spend a weekend sorting through and organizing what you have."

But the problems run deeper than that. In the open systems environment, applications developers often don't focus on the storage implications of the applications they develop. The only role for technical services personnel has been to ensure the storage needs for the applications were met. There have been no systematic methods in place for accountability.

*In the interim, through the use of software tools and management disciplines, storage management and technical services personnel hope to improve their resource allocation and performance in the open systems environment and better integrate open systems management storage with mainframe storage.*
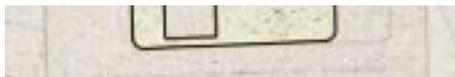
The almost ad hoc adding of capacity in the open systems environment is starting to change, however. A systems administrator for a retail operation reports that in his shop the group manager for enterprise storage now controls storage allocations. In another large center, when developers request additional storage, the company performs a total cost analysis for the storage that is reviewed and approved by a vice president. The total cost analysis includes items such as maintenance, storage management, backup and labor, and is calculated on a cost per kilobyte basis. Doing that kind of analysis, "takes us out of the middle of it," one administrator noted.

## RE-CENTRALIZING STORAGE MANAGEMENT

Also, as open systems become more essential to company operations, many companies are trying to re-centralize their storage management operations. One approach for companies with heterogeneous computing platforms is to use ADSM from IBM to manage backup and restore operations. "ADSM provides one place to manage the resources of different platforms," noted Mason, "and is an attractive solution for environments in which centralized control is valued, such as banking and financials."

But as Chemical Abstract Services' Tom Couvreur noted, ADSM, or other backup and recovery management tools are not a complete answer for many environments. It can be helpful to supplement these tools with storage management products that allow systems administrators to view utilization across platforms and to automate the problem resolution. Reporting and viewing software can report on ADSM actions and status as well as look at backup failures and issue alerts if critical ADSM events fail to occur.

While other products provide numerous functions, the Boole & Babbage suite is the only solution to offer a view of all platforms on a single console and the ability to scale appropriately. This solution utilizes the newer client/server architecture, which generates less traffic across the network by using intelligent agents. An intelligent agent (or client) sends information only when certain conditions or thresholds are met. Older client/server architecture uses passive agents that send information when requested, thus requiring a request and a response, and twice the network resources and additional CPU resources as the newer architecture.

Consolidating storage on a multi-gigabyte RAID device is another approach some administrators are using to better manage storage in the open systems environment. For example, a food manufacturer replaced storage on 12 NetWare servers, four NT servers, and eight AIX-based RS/6000 servers with a single EMC storage subsystem. Before the move, each server required its own tape backup subsystem. Since backups were conducted over the network, each one would have to be restarted every time the network went down. The new approach required only a single restore.

Having a centralized method to visualize storage resource utilization is an important step in gaining control over the open systems environment. Centralization is also key to being able to apply the same management and control techniques regularly applied in the mainframe environment. In the long run, storage management professionals would like to see several new pieces of technology emerge. The ultimate goal, one administrator suggested, would be to have platform-independent storage management software as well as platform-independent DASD storage.

In the interim, through the use of software tools and management disciplines, storage management and technical services personnel hope to improve their resource allocation and performance in the open systems environment and better integrate open systems management storage with mainframe storage. It is a battle but one in which progress is being made. "We are getting our hands around it," said Bell South's Jim Hill. **ts**

---

*Elliot King is a free-lance technical writer based in Baltimore, Md.*

*©1998 Technical Enterprises, Inc. For reprints of this document contact sales@naspa.net.*