

CASE STUDIES ON THE
BUSINESS IMPACT AND
STRATEGIC VALUE OF
STORAGE AREA NETWORKS

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Introduction

The volume of data that companies process and store is exploding, along with the cost of managing that data. This unprecedented growth, coupled with companies' need to focus more on customer service than storage administration, requires organizations to thoroughly analyze their investments in data-storage infrastructures. Data storage is becoming such a vital strategic element of an enterprise's success that John T. McArthur, Vice President at IDC, recently commented, "Information is the lifeblood of the modern enterprise. Driven by advances in the storage and transmission of information, enterprises can make highly informed business decisions." Further evidence of this trend comes from a May 2001 Gartner Dataquest report that shows external storage growing at a 104 percent compound annual rate, to over 3.8 million terabytes in 2005. Seventy-two percent of that storage in 2005, according to Gartner, will be Storage Area Network (SAN)-attached.

SANs are gaining momentum as a data storage solution. Brocade Communications Systems, Inc., a leading manufacturer of switches and software for SANs, engaged KPMG Consulting to analyze and quantify the business benefits of SANs that some of its selected customers have realized.

Two of these—Intuit, Inc. and Federal Express Corporation—granted interviews, filled out questionnaires and shared technical documentation, enabling the KPMG Consulting professionals to compile significant data regarding their SAN deployments. The consultants also worked with Brocade to generate a financial model that analyzed the return on the companies' investments when compared with the direct-attached storage architecture that they had prior to the SAN¹.

The following are the key findings from the study of the two companies:

- SANs provide substantial business, financial, and operational benefits
- The major benefits of a SAN include:
 - Reduced capital expenditures
 - Increased IT staff efficiency
 - Higher system and application availability
 - Highly scalable, flexible storage architecture
 - Enhanced ability to efficiently exploit the full value of a company's information assets
- The financial return from implementing a SAN is significant
- Companies can use SANs to improve their competitive position

¹ These calculations are generated by a financial model prepared by KPMG Consulting and Brocade. For a full list and explanation of the assumptions and definitions under which this calculation was made, please consult *Methodology and General Financial Model for the Evaluation of a Storage Area Network*, Brocade, May 2001.

This Executive Summary provides a general overview of the study, the companies involved, and the results the companies achieved.

Purpose and Methodologies of Study

As data storage has become increasingly important, so, too, has choosing the correct storage solution. Storage alternatives in the marketplace today have both technical and financial components that must be fully understood before companies can make the appropriate choice for their needs. This understanding requires enhanced communication between technical personnel and business decision makers. While the technical staff might have a thorough knowledge of the optimal storage solution from a technical perspective, they must be able to articulate the business value in a way that a decision maker can understand.

Brocade engaged KPMG Consulting to gain a better idea of the business benefits realized by companies that have invested in SAN technology. Brocade's goal was to have an independent entity quantify, as completely as possible, the experiences, costs, and benefits of a Brocade Storage Area Network implementation. Among the information sought for the SAN implementation was the following:

- The company's decision-making factors in considering a SAN
- Key business problems to be addressed by a storage solution
- Costs of implementing a SAN
- Performance and effectiveness of pre- and post-SAN systems

KPMG Consulting focused on the selected customers' IT business units as a whole and, in much greater detail, on the SAN solutions implemented. The consultants gathered the data contained herein by disseminating questionnaires, conducting interviews of the IT management and staff, and reviewing numerous architectural diagrams and other technical documents.

Background of Study Participants

Intuit, Inc.

Intuit, Inc. is an industry-leading developer and marketer of consumer software applications that support personal finance, small-business accounting, and tax preparation. The company also creates Web-based investment applications and provides related services to better enable individuals and businesses to automate commonly performed financial tasks such as accounting and tax filings. Intuit is the author of such prolific Web-based and shrink-wrap software applications as Quicken and Quickbooks, and offers additional, fee-for-service functionality through its Web sites.

The Federal Express Corporation

Perhaps no company is more renowned for its IT system than Federal Express Corporation (FedEx), the world's largest express transportation company. FedEx business is principally comprised of leveraging its air routes and air/ground infrastructure to provide package and letter delivery within one or two business days, while allowing its customers to track the location of their packages almost instantaneously. This business model requires an extensive IT infrastructure and management of a tremendous amount of data.

SAN Definition and Description

A SAN is a networked storage infrastructure environment dedicated solely to storage for the purpose of providing a scalable, reliable IT infrastructure. SANs are generally comprised of two components, storage systems and a logically independent network. The storage system includes disk storage, tape libraries, and SAN-management software. The network includes adapters, wiring, and switches. Host Bus Adapters attach servers and peripherals to the wiring in the network, while switches provide the central connection point and routing capability—much like a LAN hub or switch.

The SAN industry was born of the proliferation and criticality of data. The storage industry's response to the dual problem of tremendous growth in data and the cost of managing that data leaped forward with the SAN, which offered the first open-standard opportunity to network and centralize storage. SANs can create increased system availability, greater accessibility to data due to greater connectivity, and a scalable, flexible architecture that efficiently meets future growth requirements.

The primary alternative to SAN-based storage is direct-attached storage, although many companies use consolidated enterprise storage to make sharing data easier. These solutions have limited value because they support a single operating system and are limited by the number of servers and connections they can simultaneously support.

SANs eliminate direct-attached storage's limitation on connectivity by utilizing a fabric switch, and have rapidly evolved to eliminate limitations on heterogeneous operating system support. SAN implementations can now support multiple operating systems and a variety of storage products, both disk and tape.

Summary of Principal Findings

The data that KPMG Consulting compiled revealed that the companies studied realized numerous benefits and were using them to gain competitive advantages. Moreover, these benefits also yielded compelling quantifiable financial return as measured by return on investment (ROI) and Payback Period. It is important to note that the ROI is the *annual* return generated from the investment in a SAN during the life of the SAN. The Payback Period is the number of months needed to recoup the costs of implementing a SAN and is a measure of how quickly these financial benefits are realized.

Table 1 provides a summary of the results from analyzing a number of SAN implementations at Intuit and Fed Ex. Table 2 provides a summary of the key drivers of these financial benefits. An ROI of 525 percent means that the SAN provided \$5.25 of benefit *annually* for every \$1 of investment required to implement and maintain the SAN. Measured over a three-year lifecycle, the SAN returned over \$15 for every \$1 invested. The Payback Period, 9 months or less for all projects, is an indication that these financial benefits were realized in a very short period of time.

Table 1

	High	Low
Annual ROI	525%	125%
Payback Period	2 Months	9 Months

ROI Driver	SAN Benefit	Examples from the Case Studies
Reduced Capital Expenditures	Storage consolidation allows better utilization of storage assets and “pay as you grow” scalability.	Prior to implementing a SAN, both companies purchased significant amounts of storage for headroom for growth—as much as half of their total storage in some cases. Intuit increased the utilization of its available storage by 50 percent (from 40 to 60 percent) with a SAN.
	Server consolidation drives better utilization of server assets.	Server consolidation enabled Federal Express to eliminate 50 percent of its servers and their associated costs (software, maintenance, and system administration) in its file-serving environment.
	Multi-vendor storage capability lowers storage costs.	Both companies highlighted this benefit and reported significant storage capital cost savings as a result of implementing a multi-vendor system, because they were able to purchase the right level of storage performance for each application system.
	High Availability systems are less expensive to implement.	FedEx eliminated 75 percent of its standby servers—and the costs of the associated software, maintenance, and system administration support—after implementing a SAN.
	Increased IT Staff Productivity	SANs enable centralized and consolidated management of their storage systems and tape libraries. SANs also significantly reduce the workload required to add additional storage.
Increased Enterprise Information and Systems Availability	SANs eliminate application downtime caused by backup and significantly reduce restore time.	Intuit reduced its backup time from 26 hours to three hours and is now able to keep its revenue-generating applications running while backup is performed.

Table 2

The Study Participants Have Translated their SANs into Competitive Advantages

In addition to providing companies a lower cost structure for their IT organization, SANs are having an even larger impact on the overall business. FedEx and Intuit are using the availability, connectivity, and scalability features of their SANs to provide a competitive advantage for their businesses. Here are several examples:

- FedEx and Intuit both reported that they are now able to respond to users' requests for large amounts of storage in hours instead of weeks. This enables these companies to ***deliver on key business initiatives with unprecedented speed.***
- FedEx is ***bringing new products to market more quickly*** because the required changes to its billing systems, which are one of the most important aspects of any new FedEx product offering, are implemented and tested much faster and thoroughly with a SAN.
- Intuit's ability to keep its customer-facing Web systems up and running 24 x 7 is a major factor in ***customer retention and loyalty*** for this new and strategic channel.

For a full explanation of all of the benefits that were noted by the companies included in this study, please consult the following case studies.

INTUIT, INC.

Case Study Summary

Based on KPMG Consulting's interviews of several key IT professionals at Intuit, the industry-leading developer and marketer of consumer software applications that support personal finance, small-business accounting, and tax preparation, it is clear that Intuit has realized substantial gains in technical capabilities and financial efficiency as a result of its SAN deployment.

One of the primary improvements the IT staff discussed was system availability during backups. This benefit is critical to Intuit's business because of the company's reliance on its customers' ability to access its Web sites 24 x 7. As with most Internet-based transactions, each time the systems became unavailable, Intuit was essentially turning away customers. Today, not only has the company reduced its backup time from 26 hours in a direct-attached environment to just three hours with its current Brocade SAN architecture, but the system also remains available to customers during the entire backup procedure.

The second significant gain that Intuit realized was a result of consolidating storage systems and tape libraries. This aggregation enabled Intuit to not only increase the utilization of these assets but also to reduce the costs associated with managing these devices. Today, Intuit has centralized its previously distributed storage so it can now be managed by a smaller IT staff according to a single standard.

Centralization of storage also has allowed for large capital-expenditure savings. According to the Intuit employees who were interviewed, the company no longer needs to provision large amounts of headroom in multiple environments to avoid system downtime. As a result, Intuit no longer has to incur the capital expense for storage that it is not using.

The Intuit IT management that KPMG Consulting interviewed stated unequivocally that the switched SAN environment allowed the company to engage in business practices it otherwise would not have been able to. Peter Philp, senior systems manager, Technology Operations, summarized the company's experience with the switched environment in the following manner:

"The SAN allowed us to reduce management costs and capital expenditures while improving fault tolerance and overall flexibility of the infrastructure. In fact, we can potentially bring up data-storage capabilities of more than a full terabyte within an hour if a new project or business unit demands it. We could not find another storage solution that would enable our business to run as dynamically as the SAN does. The capabilities that we have derived from the SAN go to the core of our business—efficiently managing data to provide first-rate financial services for Intuit's customers."

The financial consequences of Intuit's SAN deployment reflect the technical benefits that the SAN achieved. Broken down into the three solutions that Intuit implemented, the company realized the estimated following returns on its investment in SAN technology¹:

Table 3

Solution	Annual ROI	Payback Period
Storage Consolidation	296%	4 months
Backup/Restore	123%	9 months
High Availability Systems	525%	2 months

The most significant drivers of these returns included:

- Additional revenue generated during backups that prior to the SAN required taking the system offline
- Lower IT management costs and increased productivity due to the centralization of Intuit's storage libraries
- Significantly shorter process time for adding and reconfiguring storage
- Reduced capital spending through shared storage

The following study, prepared by KPMG Consulting, Inc. on behalf of Brocade, provides an in-depth discussion regarding these gains and Intuit's experiences with its SAN.

Company and Business Unit Background

Intuit, Inc. is an industry-leading developer and marketer of consumer software applications that support personal finance, small-business accounting, and tax preparation. The company also creates Web-based investment applications and provides related services to better enable individuals and businesses to automate commonly performed financial tasks such as accounting and tax filings. Intuit is the author of such prolific Web-based and shrink-wrap software applications as Quicken®, QuickBooks®, QuickBooks for the Web, TurboTax®, TurboTax for the Web™, and QuickBase®. Intuit also offers additional, fee-for-service functionality via its Web sites.

Last year, the company performed the electronic filing of federal income tax returns on behalf of 25 percent of the approximately 120 million tax-paying people and entities in the United States. Intuit customers have on-demand access to all of their previously filed data along with a myriad of forms and records that reside in Intuit databases. The growth associated with this business creates a huge demand for storage capacity—up to 500 percent annually in some cases and generally 75 to 100 percent per year. Intuit relies heavily on its Internet facilities to provide revenue from its applications and enhance its shrink-wrap products.

Obviously, this business model requires an extensive IT infrastructure—including extremely high levels of scalability, flexibility, security and availability—and management of a tremendous amount of data. At Intuit, the company's Storage Team, part of the Technology Operations organization, investigated, purchased and implemented the SAN. These individuals are tasked with building and maintaining the entire IT

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storage infrastructure for the company's internal functions and the technology necessary to deliver the outward facing applications. The consultants discussed the company's data systems challenges with the following Intuit personnel:

- Lance Bell, Group Manager, Internet Systems, Technology Operations
- Richard Marino, Group Manager, Storage and Corporate Systems, Technology Operations
- Peter Philp, Senior Systems Manager, Storage Team, Technology Operations
- Eric Ihde, Systems Manager, Storage Team, Technology Operations

The information they supplied helped generate both the foundation for this study and an ROI financial model.

The Pre-SAN Infrastructure—Spring and Summer 1998

Intuit's pre-SAN storage infrastructure in 1998 consisted of direct-attached storage supplied by several leading storage vendors with major applications running on over 1000 servers. The IT staff identified some problems and limitations with this configuration. Initially, the system was slow to back up customer data and performing backup required taking the applications out of service. A significant percentage of Intuit's business is conducted on its Internet site which means that any system downtime results in lost revenue.

An excellent illustration of the consequences of Intuit's backup situation occurred on April 13th, 1998. According to the IT staff, a large portion of Intuit's services are provided in the weeks just prior to the April 15th tax-return filing deadline. In the beginning of April 1998, Intuit's management decided to postpone backups until after April 15th to ensure maximum system availability for its customers; however, on April 13th, management reconsidered and decided to perform a backup of the filings to ensure the protection of customer tax data. Although the company was able to do a successful backup, its systems were down for 26 hours during an important time period. As a result, the company experienced significant customer complaint and churn issues: "We really cannot put a price tag on what that period of time cost us," noted Richard Marino, group manager, Storage and Corporate Systems, Technology Operations.

But backup was not the only issue facing the IT staff at Intuit. There was also the issue of storage consolidation and the company's difficulty in efficiently managing its storage. "Attached storage was simply not working for us. There were too many limitations to SCSI technology to say nothing of the expense and downtime associated with adding more storage. With the level of data growth that our corporate strategy necessarily involved, attached storage was no longer a viable option," recalled Peter Philp, senior systems manager, Technology Operations.

"Why did we go to a SAN? Four reasons—costs, costs, costs and costs—we needed to control them!"

Richard Marino
Group IT Manager

“Since we implemented the SAN, we have a very centralized system. Further, our fault tolerance has improved so much so that we stayed available throughout the entire tax season this year without even putting a strain on our existing IT staff.”

Peter Philp,
Senior Systems Manager

In addition, the IT staff discussed other characteristics they desired in a storage solution but weren't getting in a direct-attached solution. These included:

- Centralized storage
- Data redundancy
- Standard configurations
- Resource sharing
- Backup management

Marino described the staff's priorities much more succinctly: “Why did we go to a SAN? Four reasons—costs, costs, costs and costs—we needed to improve control of them!”

Intuit faced a potentially severe data and application availability issue before the SAN deployments. This, coupled with the need to accommodate exploding storage capacity and the capital expenditures of purchasing storage that often goes unused for several months, caused the IT staff at Intuit to begin looking for alternative storage solutions. Marino told KPMG Consulting that the investigation didn't take long before they decided to turn to a fabric-based SAN technology.

The Post-SAN Environment—Significant Improvements in Storage Consolidation, Backup and Restore, and Disaster Tolerance

Approximately two years ago, Intuit deployed its first fabric-based SAN. At the time of the decision-making process, Philp commented that Intuit “chose Brocade switches for [our] SAN because the Brocade market presence created a ‘de facto’ standard.”

The deployment of the SAN enabled Intuit to conduct backups much more quickly and with greatly improved overall application availability. Philp told KPMG that, “the fabric switches increased storage reliability and performance and, most importantly, minimized downtime associated with our backups.” Marino also noted that, “backup and restore became much more efficient, quicker and easier to manage. The net result was much higher availability, less disruptive infrastructure upgrades and much higher levels of data integrity.”

Backup

Prior to the SAN deployment, Intuit experienced long backups with even longer restore times. Currently, backups conducted each day take only about three hours each. Significantly, Intuit's system remains available during this time now that the bandwidth of its non-storage network is completely free of this process. Marino noted further that, “We simply couldn't have done all of this without a SAN. We can do our backups in the middle of the day, while providing maximum service to our customers. There is no question that this infrastructure has given us a competitive advantage.”

Providing further evidence of the staff's increased efficiency is Marino's comment that the SAN deployment enabled Intuit to significantly reduce the IT personnel required for nightly backups.

Storage Consolidation

The staff also mentioned that Intuit is working more efficiently due to the SAN's ability to deliver centralized storage. Philp discussed the cost savings the company has realized as a result of the SAN infrastructure, “The system now performs at a much

higher level even though we are saving significantly in two areas: first, we have much lower staff costs when measured on a per-gigabyte basis, and secondly, we have delayed the capital expenditure associated with buying more storage hardware and additional software.” Philp attributes the latter benefit to the SAN enabling better storage management—Intuit can make much more efficient use of the storage capacities that it currently has. “This saves time and money and makes the lives of our system administrators much easier,” he noted.

Ihde estimated that prior to the SAN implementation their storage hardware was underutilized due to the challenges of decentralized data. Now with the SAN, storage utilization is significantly improved by as much as 50 to 80 percent. According to Ihde: “These are real dollars that we are saving this company, so the competitive advantages arise from both the cost savings and the better availability of the data. Before we had to either turn away customers or let the system limitations affect their experience. Now, we no longer have that problem. If the name of the game is to increase earnings, the SAN is helping us do that.”

The IT staff now offers storage-on-demand for its business units, something they could not do prior to deploying a SAN. “Although we would much rather have notice of storage requirements, we can now often meet demands for hundreds of gigabytes within an hour of receiving notice of a new project. When given more time, we have handled pretty much everything that has been thrown at us so far,” said Philp.

The IT team at Intuit also sees a brighter future as it continues to find additional ways to leverage its SAN. It anticipates offering storage billback functionality to business units for initiatives to provide senior management with more accurate investment return information. This should allow company executives to make more informed business decisions going forward. Lastly, new applications that are developed by Intuit engineers will find improved system support as a result of the SAN.

Conclusion

Based on KPMG Consulting’s research, it is clear that Intuit experienced significant productivity and technical capability gains as a result of its SAN deployment. At the highest level, Intuit’s system and data availability greatly increased. Both internal business units in search of critical customer data and potential customers in search of product information/transactions can now access desired applications 24 x 7, even during backup scenarios. The company can also quickly and cost effectively add and reconfigure storage capabilities. Ultimately, Intuit has achieved a strategic advantage by increasing the satisfaction of its internal and external constituencies through greater technical capability and a lower IT cost structure.

KPMG Consulting and Brocade would like to thank Intuit and the following individuals for participating in our research project to document the business value of today’s Storage Area Networks: Lance Bell, Group Manager, Internet Systems, Technology Operations; Richard Marino, Group Manager, Storage and Corporate Systems, Technology Operations; Peter Philp, Senior Systems Manager, Storage Team, Technology Operations; Eric Ihde, Systems Manager, Storage Team, Technology Operations.

FEDERAL EXPRESS CORPORATION

Case Study Summary

Another of the selected customers that KPMG Consulting studied was the Federal Express Corporation, one of the largest express delivery and logistics service providers in the world. According to the members of the FedEx product development business unit, the pre-SAN environment at the FedEx testing site was direct-attached storage. However, according to Darryl Rochester, FedEx IT Manager, this infrastructure was not sufficiently flexible to allow for the frequent storage and server configuration changes the staff must do to test functionality enhancements in the company's billing software. "There are times when we have to completely switch environments from one billing application to another. With direct-attached storage, there was no way to do this quickly or efficiently," noted Rochester. The direct-attached architecture also did not have the capacity to perform testing with large production databases in a cost efficient manner.

"The long-range effect of the SAN is the competitive advantage that FedEx gets because of the reduced cycle time that it takes the company to offer new products to its customers."

Darryl Rochester,
IT Manager

The direct-attached environment was also not scalable enough to support the company's anticipated data growth nor did it provide the company with the connectivity it needed to conserve valuable real estate in their data center. According to Rochester, his staff was constantly working to add or reallocate storage and these processes required significant company and staff time and resources. Further, the pre-SAN environment provided the company with no ability to fail over to an alternate data center.

Rochester noted that the problems that his staff encountered prior to the implementation of the SAN had very real affects on FedEx business—they increased the cycle time new FedEx products would take to make their way into production. Any delay caused in testing, "...caused our customers, the company developers and testers to miss deliverables for releases for production. These engineers often worked overtime hours to catch up because they were unable to do any work whatsoever during unscheduled system downtime," commented Rochester. The lifestyle and morale of the IT staff was also affected. The KPMG Consulting professionals heard comments describing the direct-attached environment as "a nightmare."

Today, as a result of the SAN, FedEx can change testing environments and increase the sizes of its databases almost immediately, according to Rochester. They have reduced the workload of their IT staff so much so that they are performing the same work that they were prior to the deployment of the SAN with one-third less staff. They have also decreased the number of file servers in their systems by 50 percent in such a seamless fashion that the 600 developers that the servers support were completely unaware of the transition. Remarkably, this entire transition was done in a total of 36 hours spread over three months and resulted in no system downtime. The additional connectivity available in a SAN environment has allowed FedEx to conserve real estate in their data center due to a reduction in the number of servers and storage arrays. Rochester also noted that they have reduced their number of

High Availability (HA) servers by 75 percent. The effects of these improvements have resulted in the following:

- Increased productivity and efficiency due to the greatly reduced configuration change window
- Faster testing cycle times that allow new products or enhancements to get to the customer quicker
- Lower IT management costs due to a consolidated storage and server environment
- Reduced capital spending as a result of better utilization of existing storage and servers
- Reduced real estate needs in the data center

The professionals from KPMG Consulting found that FedEx also realized significant financial results from their implementation of a switch-oriented SAN environment. The calculations revealed an annual ROI of 297 percent from the Storage Consolidation and payback of the investment in just four months after FedEx made the investment¹.

Solution	Annual ROI	Payback Period
Storage Consolidation	297%	4 months

Table 4

This figure was primarily driven by the substantial increases in staff productivity and storage equipment redeployment. The manner in which the SAN solution permitted these savings are discussed in detail below.

Most importantly, the product testing unit is able to, “serve our customers, the 600 developers and testers, better and faster with greater reliability than we ever could prior to implementing the SAN. Productivity among our customers and the billing systems people has also been improved as a result,” Rochester told the consultants. Rochester summarized what he felt was the success of the SAN implementation when he commented that, “the long range effect of the SAN is the competitive advantage that FedEx gets because of the reduced cycle time that it takes the company to offer new products to its customers.”

The following study provides an in-depth discussion regarding these gains and their experiences with the SAN.

Company Background

Perhaps no company is more renowned for its IT system than FedEx, the world’s largest express transportation company. FedEx’s business is principally comprised of leveraging its air routes and air/ground infrastructure to provide package and letter delivery within one to two business days while allowing its customers to track the location of their packages almost instantaneously. Obviously, this business model requires an extensive IT infrastructure and management of a tremendous amount of data.

The group who implemented the SAN at FedEx was the product development business unit. This unit creates a mirror-image of the company’s IT production

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application infrastructure so that FedEx can simulate a high volume of transactions to test how system changes react prior to the enhancement entering the production environment. With this system, the IT staff can evaluate proposed changes to its production environment without compromising the service levels they offer to their customers. An effective test environment that allows for seamless production enhancements can be a significant competitive advantage for companies because it will enable seamless application upgrades and enhancements to the production system.

The consultants discussed the problems that FedEx was having with Darryl Rochester, IT Manager, and Vijay Banga, one of Rochester's System Engineers Consultants. The information that they supplied helped generate both the foundation for this study and an ROI financial model.

A Description of the Pre-SAN State

One of the major problems associated with direct-attached storage that FedEx encountered was the lack of manageability that it allowed in their test environment. Because the unit's job is to test the FedEx billing applications and each of its components, they needed to evaluate different combinations of application modules both in performance and volume testing. However, with direct-attached storage, the staff was forced to completely reconfigure each of their test servers every time they wanted to check a different billing component combination. This led to significant system downtime during the reconfiguration periods. Because downtime meant that their customers, 600 highly trained software engineers and testers, couldn't work, system downtime created significant costs and inefficiencies. Further, the direct-attached connection limitations did not allow them to test their entire billing application at once.

Rochester also told the consultants that it became very clear that the direct-attached infrastructure was not delivering the flexibility that FedEx needed to efficiently manage their data. Rochester felt that, to deliver the level of service required by the production group, they needed the ability to combine or change servers constantly all while maintaining a high level of system availability. The data needs of FedEx were growing so rapidly that they were outpacing the physical constraints associated with a SCSI-based, direct-attached architecture and its limited number of connections. They needed an infrastructure that would allow the company to grow quickly without requiring a tremendous outflow of resources every time more storage was to be added.

This direct-attached system and its limitations with respect to flexibility, storage manageability and scalability caused the unit's customers, who are software developers and testers, to miss deliverables for releases of system enhancements. Rochester noted that this would happen frequently prior to the SAN deployment: "When this occurs, the developers and testers are forced to work significant overtime to catch up on their work. While the system is down or undergoing storage increases, these same engineers have nothing to do."

One of the other major problems that the group was encountering was the inability to use a multi-vendor strategy because of the limited connectivity, Rochester told the consultants. They wanted the ability to obtain the pricing advantages of using multiple storage vendors but felt that they couldn't achieve a heterogeneous environment with the lack of connectivity that a direct-attached architecture offered.

The Post-SAN Environment

FedEx implemented the SAN primarily to provide the unit with the flexibility, scalability, manageability and connectivity that it needed. Since deploying the SAN, Rochester explained that FedEx has experienced pronounced benefits and addressed each of the group's former problems. They have secured lower costs while making significant improvements in their technical functionality, which has enabled his group to deliver better service levels to his customers while saving significant costs.

Storage Consolidation and Manageability

Once the SAN was deployed, FedEx was able to easily consolidate their storage devices. Rochester noted that this capability of the SAN allowed them to address their primary concern: they could now quickly and easily recreate the test environments because they could reconfigure their storage without taking their servers down. As discussed above, the testing group was constantly asked to run various components of FedEx's billing application both for performance and volume results. Unlike in the direct-attached environment, having the SAN architecture in place obviated the need to spend time reconfiguring all of their servers every time a different environment was necessary. For the first time, they were also able to run their entire billing application because the SAN allowed them to add storage efficiently. All of these improvements resulted in substantial cost and time savings for his group.

FedEx also realized significant cost savings from the manageability and scalability that the SAN architecture offered over SCSI cable. "One of the first things we did after deploying the switched SAN was combine all of our testing environments with our development environment. This saved us the costs of duplicating management and hardware needs," Rochester told the consultants. The SAN also produced some very real technical advantages: "We have added servers and storage arrays without encountering any problems. We have merged storage arrays from different vendors on the same SAN, which has allowed us to add other projects into our environment without our customers knowing or feeling the major pains that they definitely would have felt in lost productivity prior to the SAN."

FedEx is also enjoying significant cost savings resulting from utilizing several different storage vendors. With the ability to run a more heterogeneous environment in the SAN, they are no longer as bound to a single storage provider and can use that ability to gain much more advantageous pricing.

Following the implementation of the SAN, Rochester's staff noticed immediately that they could instantly increase the sizes of their databases without hitting any limits: "SANs gave us the ability to increase the number of connections to the storage arrays," noted Vijay Banga, one of Rochester's System Engineers. According to Banga, the deployment accomplished its goals: "At this point, we can respond to our customers' requests for additional storage in a timely fashion."

Server Consolidation

As a result of the successes that Rochester and his staff realized from the SAN implementation, they decided to attack the problem of server consolidation by adding development file share servers to the SAN. They reduced the number of NFS servers by 50 percent in a transparent implementation in which the users, who consisted of 600 developers, were never aware of the infrastructure changes.

"We've merged storage arrays from different vendors on the same SAN, which has allowed us to add other projects into our environment without our customers knowing or feeling the major pains that they definitely would have felt in lost productivity prior to the SAN."

Darryl Rochester,
IT Manager

The deployment was completed in just 36 hours over three months. The NFS server reduction saved significant capital outlays and the costs associated with the IT staff to manage twice the hardware.

High Availability

FedEx also implemented a SAN to reduce the costs for its HA systems. In a direct-attached environment, implementing an HA system requires one standby server for every production server. The connectivity provided by a SAN enables customers to implement an HA system with one standby server for a number of production servers. In FedEx's case, the SAN enabled FedEx to eliminate 75 percent of their standby servers along with the associated software license and maintenance costs for each server. They also realized management savings since there are now fewer servers to manage.

Conclusion

According to Rochester, not only has the SAN produced substantial cost savings and increased efficiency, it has greatly reduced delays in the time it takes to test enhancements in full scale production testing. This ability has a real influence on how quickly FedEx can get new products and enhancements to existing products to the customer. Reducing cycle time in a business as competitive as package delivery can provide a company with long-lasting competitive advantages and greater earnings to its shareholders. "Any delay that we experience will be felt throughout the entire company because that is a delay in when these applications will be ready for implementation throughout the rest of the company," noted Rochester. Rochester also provided the consultants with an excellent summary of their SAN experience and his vision into the future of this architecture: "In the last two years, SANs have become a very hot technology in the company and I would guess outside the company as well. At FedEx, everyone in IT is looking for open solutions using SANs."

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If you have questions on how networking your storage can benefit your company, contact info@brocade.com or visit our website at <http://www.brocade.com>.