SANity Check

Preparing For a Storage Area Network

Tivoli

The concept of connecting a company's heterogeneous storage resources as part of a storage area network (SAN) is not a new one. It has been discussed for at least ten years, if only in theoretical terms. However, the development of information as a business tool and competitive weapon, allied to the explosive growth of e-commerce and Internet-based applications, has provided the impetus for SAN development and implementation.

In some ways, the development of the SAN in IT environments was inevitable and has occurred with other new innovations in the past. The most striking comparison is that of information to fiscal capital. Capital, or money, only becomes truly valuable when it is working and in circulation. If it sits in a bank vault or a box under the bed it cannot work and create a return on investment. Similarly, if information is allowed to flow effortlessly around a company, it becomes infinitely more valuable and can create more fiscal and intellectual capital and so increase corporate worth.

The current and future value of stored information may be judged by the fact that more than 50 percent of all capital investment in the world in the year 2000 will be in IT, and the proportion will increase in the coming years. Of the capital expenditure on IT, the Yankee Group, a Boston-based consultancy, estimates that 75 cents of every dollar will be spent on storage in all its forms.

SAN benefits include:
- Better access to information
- Expanded business continuance capabilities
- Maximized hardware utilization
- Improved business decisions
- Upgraded disaster recovery capabilities
  Improved relationships with suppliers, business partners, and customers
- Freedom from vendor dependence
- Greater ability to implement the newer information manipulation techniques, such as data warehousing, data mining, and customer retention systems

On the other side of the balance are factors that include:
- Increased costs
- Greater complexity
- Information security concerns
- Connectivity issues over long distances

Any organization—private company, publicly owned corporation, or government body—should assess whether it needs a SAN and, if so, how complex and widespread it should be. Once that decision is made, the process of preparing for and building a SAN can begin.

Making the Decision For a SAN

This sounds like a trick question but it is serious. For smaller organizations the answer will probably be no, at least in the short term, as the cost of implementation will outweigh the benefits for companies that may already have homogeneous IT systems and a limited number of locations. For large enterprises, the answer is almost certainly yes, because their information resources are spread over many locations around the world and in a variety of different storage environments from different vendors supplying everything from mainframes to laptops. Because of the information access they give, the return on investment in SANs and SAN technology is too significant to ignore.

As usual, the challenge will be for those organizations and companies that do not fall into the two previously defined categories. Key questions for SAN planners to answer are:

- What are the short-, medium-, and long-term business objectives of my organization?
- What is its predicted corporate growth, and in which business and geographical areas?
- What applications are in place that will give additional business benefits from creating a SAN?
- How is my company deploying current server and storage resources?
- How many locations would be part of a SAN and what are the current storage and connection parameters for remote locations?
- What is the inventory of storage and server devices?
- What are the current server and storage purchase plans?
- What is the current storage position and strategy?
- What internal personnel resources can be used to implement a SAN strategy?

Accurate answers to these questions provide the basis for a SAN implementation decision. If your organization has only one or two locations, homogeneous technology, and is in a passive growth and investment mode, a SAN is probably not in its immediate future. A fast-growing company with multiple sites and diverse systems and storage resources, in a rapidly expanding business environment that involves significant customer interaction and management, had better be looking seriously at SAN implementation to maintain its business advantage.

A final decision must also be made on the philosophy of the SAN to be installed and it is one that requires considerable thought. Will it be a company-wide, monolithic network that links all locations, or will the better option be a series of SANs, by region or business unit, linked into a super-SAN?

There are many companies offering SAN hardware and services to potential users. Most, if not all, have legitimate contributions to make. Anyone assessing SAN strategy needs to look at as many options as possible. However, this paper

discusses experience with SAN solutions, services, and products available only from IBM and Tivoli® and shows how they can aid in assessing an organization's SAN position and requirements.

IBM and Tivoli have Web sites that can help potential SAN implementers with the decision making process. You can find these sites at: storage.ibm.com/ibmsan and tivoli.com/support.

Planning and Designing a SAN

Once a decision is made to implement a SAN, the hard work starts. Although the Y2K issue must have seemed overblown to many people outside the IT community, some real advantages to the industry and its customers have resulted. Two of these advantages relating to the decision to implement a SAN are:

- Every CIO should now have a complete and relatively up-to-date inventory of all the hardware and software that exists in the company.
- Most old and outdated hardware and software have been replaced.

Armed with the information gathered in the decision making process and generated by the Y2K system audit, it is now time to call in some external specialist to help. Unless, that is, you have an IT organization which is technically adept, and which has the time available to complete the planning and design of your SAN in-house. There are many sources for different levels of assistance in this vital task, including the well-known system integrators, server and storage manufacturers, and

specialist SAN vendors. The services mentioned here are from IBM Global Services and Tivoli, but you should consider other options. Choose your SAN implementation partners for their ability to integrate a variety of technologies and applications together with the resources and intellectual capital to complete this complex task.

At the planning stage, the key is first to update the most recent audit of all your server and storage resources throughout the organization and to examine and define the tactical plans and requirements for your soon-to-be implemented SAN. The following schedule of activities is drawn from Tivoli and IBM planning recommendations but is applicable to all vendor hardware and software configurations.

Technical Audit

IBM and Tivoli specialists can either carry out a complete audit of the disk and tape resources, channel and communication hardware, software, and utilities you have installed and assess its suitability and capability in a SAN environment, or they can do the review based on your existing audit.

Planning

This is the stage at which the future shape of the SAN is decided. Key areas for consideration are, first, to define the operational planning parameters for:

- Network availability
- Disaster recovery planning and fault detection plans, including failure isolation
- Data migration

- Storage network availability and recovery processes
- Dynamic reallocation of resources on the network

Network Design

With the organization's business goals as the critical factor, design a solution that includes:
- System interoperability
- Storage capacity
- Performance
- Database architecture
- Operating and storage system software
- Database administration, including error recovery, backup and restore, and redundancy
- Connectivity and network protocols including cabling design
- Standards
- Scalability

Implementation

Until now, the SAN development process has been in the nonphysical stage with all the work being done on planning, presentation, and design. With most of that work completed, it is time to turn designs into physical reality in the following stages:
- Implementation commences with environmental and physical requirements including as necessary, but not limited to, installation of additional power supplies; extra heating, cooling, and ventilation requirements; and building changes
- Full power test of all newly installed power supply and uninterruptible power systems
- Additional wiring and cabling infrastructure installation, according to the cabling plan developed in the network design stage
- Installation and testing and parallel running of the hardware, software, and database systems
- Migration of data to new infrastructure
- Run new production systems
- Monitor systems and service levels

It will be obvious to anyone reading this paper, planning, designing, and implementing a SAN is not a task to be undertaken lightly or without assistance. IT departments in even the largest of corporations and government departments are today staffed in a lean and economic way. It is unlikely that a sufficient array of skills and capabilities will be available without looking to outside resources. Table 1 provides a checklist for the critical functions listed.

Additionally, a SAN implementation will, by design, affect every facet of a company's IT activities. Testing and development will not always be possible using only in-house systems. So where do you find the resources to speed the implementation of a SAN strategy?

Getting Help

The very nature of a SAN makes the prospect of creating and implementing it daunting. Finding the help that is needed by most organizations may seem almost as difficult. For example, entering storage area networking into a search engine, such as Lycos, produces 12,362 Web sites and 358 news articles that provide a match, and Lycos is one of

the more discriminating sites. Infoseek produced 25,850 matches. Just counting the companies mentioned in the first ten pages of one query response showed 103 companies that offered SAN expertise, and there were another 1,200 pages to go.So how do you decide where to go for help in the critical areas of planning, design, and implementation, and where can you test your configuration without influencing your production environment?

Typical sources of support include:
- Hardware vendors
- Software vendors
- System integrators
- Niche market experts, such as disaster recovery specialists, and database providers

All of these specialists may already be doing business with your organization and will have a good knowledge of your installations and the part their products play in your IT strategy. They also know something about your business and what your goals are and they definitely belong in your SAN process. However, none of the leading players in each category is likely to have the breadth of knowledge and experience needed to manage a project of the size and nature of a heterogeneous, multivendor, multinational SAN implementation for a large enterprise. It must also be remembered that many experts are saying that the first implementa-tion of a fully configured SAN will not be completed until the Fourth Quarter of 2000, simply because not all the technology will be in place until then.

Your organization should look for the following capabilities in a SAN implementation partner:
- Broad market knowledge that results from having trading partnerships with multiple vendors. The Team Tivoli program is one example of this with its more than 150 Tivoli Ready™ solutions that enable customers to choose from a wide array of SAN-tested products. There are similar programs from other companies that can also be examined.
- Vendor-neutral policies that allow for completely open SAN deployments from the mainframe to the desktop
- Education and training capabilities that will enable maximum return from your in-house staff
- Cross-discipline expertise that marries storage, server, network, and application capabilities Business expertise that matches the IT strengths of a SAN trading partner.

SAN implementation will have a far-reaching influence on an organization's business prospects, so IT wisdom alone is not enough to ensure busi-ness success. Table 2 shows a short checklist for SAN implementation partner selection.

The final, but possibly most important, consideration should be whether your SAN implementation partner has access to a testing environment that will allow you to try out the components of your SAN without degrading your production systems.

The IBM Global Services Testing Centers in the U.S. and Germany are examples of what is available to customers. Designed to help IT departments meet the challenges of creating enterprise storage area networks, these Centers have more than 6,000 MIPS of processing power on IBM mainframes, open systems-based processors and desktop systems, networking devices, and storage. What makes the facilities in Gaithersburg or Mainz truly effective is that both centers also have a very wide range of non-IBM hardware and software which allows customers to create almost any configuration of products and to emulate their individual, unique corporate environments.

Judicious use of a facility, such as that at Gaithersburg or Mainz, helps SAN developers get performance analysis assistance for a proposed SAN installation and can help users decide which currently installed technology should have a place in a SAN. At the preimplementation stage, designers can establish which hardware and software is interoperable and if any additional hardware and software is required. The proposed new systems can be tested against a workload to see if they are robust enough for production testing and if parallel running of production applications eventually can be carried out.

Going Live With a SAN
The final test is the switchover to a live SAN environment. Unlike almost all significant technology improvements in recent years, SAN switchover is likely to require some sort of system closedown. While not completely certain at this time, enterprises should include the possibility in any planning.

Risks in implementing a SAN do exist. However, the risks can be mitigated by choosing a good SAN implementation partner and by selecting the right mix of existing and new hardware and software. The result can be better profits and a higher return on your organization's investment in IT.

Table 1. Checklist For SAN Planning, Network Design, and Implementation

Task Technical Audit	Date started	Date completed	Comments
Planning 1. Network availability 2. Disaster recovery and fault detection plans 3. Data migration 4. Network availability and recovery processes			
Network Design 1. System interoperability 2. Storage capacity 3. Performance Database architecture 4. Operating and storage system software 5. Database administration 6. Connectivity and network protocols 7. Standards 8. Scalability			
Implementation 1. Environmental and physical requirements 2. Full power test of all newly installed power supply and uninterruptable power systems 3. Additional wiring and cabling infrastructure installation 4. Installation and testing and parallel running 5. Migration of data to new infrastructure 6. Run new production systems 7. Monitor systems and service levels			

Table 2. Checklist For SAN Implementation Partner Selection

Implementation Partner Criteria	Yes (names of possible partners)	No (reasons for rejection)
Broad market knowledge that results from having partnerships with multiple vendors		
Vendor-neutral policies that allow for completely open SAN deployments		
Education and training capabilities for preparing in-house staff to manage SAN		
Cross-discipline expertise that marries storage, server, network, and application capabilities		
Business expertise that matches the IT strengths of prospective SAN partners		

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