

Lucent Technologies
Bell Labs Innovations

Storage Networking

Highlights

- Respondents' centralized storage capacity is expected to grow 37 percent within the next 12 months. Data-intensive back-office applications are the main driver of this growth.
- The percentage of centralized data in a storage network will jump from 26 percent to 43 percent by the end of 2002.
- Implementing or improving their organizations' storage network capabilities is important to eight out of ten respondents.
- Better management of storage devices and more efficient backup are benefits that more than 70 percent of respondents expect from storage networking.
- Satisfaction with SAN and NAS performance, reliability, and ease of resource management is very high, with at least 80 percent of respondents satisfied on each measure.
- Sixty percent of respondents identify process and people issues over technology as their biggest challenge to achieving storage networking goals. But justifying costs and benefits to upper management is most often a barrier to success.
- Switched-fabric and point-to-point SANs are most frequently implemented. FCP is the preferred protocol used by a wide margin.
- Technical support capabilities and ease of integration are the top criteria when evaluating a storage network solution.

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About Lucent Enterprise Professional Services

Lucent Enterprise Professional Services provides a full lifecycle of services and solutions that help clients plan, design, implement, and operate networks in today's rapidly changing and complex environment. We have a proven track record of more than 15,000 consulting engagements worldwide. We also sell VitalSoft software for monitoring and managing network and application performance.

Lucent Technologies is headquartered in Murray Hill, New Jersey, USA.
Visit the Lucent Services Web site at www.lucent.com/services

About Lucent Network Industry Surveys

Lucent Enterprise Professional Services conducts industry survey projects intended to provide IT managers with insight into key issues impacting the ability to develop and deploy network-centric business applications. Previous survey report topics include:

- ASP Network Infrastructure
- E-Business Network Architecture/Infrastructure
- Enterprise Operating Systems and Directory Services
- Management Intranets
- Network and Systems Management Total Cost of Ownership
- Network Challenges and Opportunities in Uncertain Times
- Network Convergence
- Network Operations Centers
- Network Professionals Job Satisfaction
- Network Quality of Service
- Network Security
- Performance Management and Engineering
- Remote and Mobile Network Access
- Remote Network Management
- Service Level Management
- Storage Networking
- Virtual Private Networks

To see the results of these surveys, go to the Lucent online Resource Library at **www.lucent.com/knowledge/resourcelib** and click on "Case Studies."

To participate in the latest Lucent network industry survey, visit our Web site at: **www.lucent.com/services.**

For more information regarding the network industry survey program, please contact:

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Introduction

The volume of data in enterprises is exploding, with no slowdown in sight. It is not uncommon for a large business to add 20, 50, or even 100 terabytes of data to its centralized storage in the course of a year.

Storage networks have been developed over the last few years to address this data explosion. These networks, if properly implemented, can provide many benefits, including better management of storage devices and data, improved disaster recovery capabilities, and lower costs. The key elements to achieving these goals, however, are selecting the appropriate type of storage network for each data application, and then designing a robust network architecture.

From October 15, 2001, through November 30, 2001, Lucent Enterprise Professional Services conducted a Web-based survey on storage networking, which was completed by 98 network professionals around the globe. The results of this survey yield valuable insights into the current and future storage networking strategies of today's enterprises. Moreover, these results identify the significant barriers and challenges network professionals face as they plan, design, and implement storage networks to enable their organizations to support their business strategies. These results should enable networking organizations to better understand how their operations compare with others in the industry and identify possible areas for improvement. Complete results for all Lucent industry surveys are available at: **www.lucent.com/knowledge/resourcelib**

For this survey, storage networking was defined as a network topology specifically designed to connect a storage device(s) to servers and workstations using network technologies. A storage-area network (SAN) consists of a communications infrastructure and management layer to ensure secure and robust data transfer. Network Attached Storage (NAS) consists of an engine that implements file services from one or more devices on which data is stored. Optical storage networking (OSN) uses fiber-optic technologies to create high-bandwidth storage networks.

The Bottom Line

Storage networking will play a significant role in IT strategy over the coming few years as the volume of data continues to expand rapidly in response to e-business and other computing initiatives. Network managers must thoroughly understand their enterprise's current and future strategy, and then translate this into storage needs in order to plan, design, and implement the appropriate storage network architecture(s).

Based on the results of this survey, these network managers should recognize that:

- Process and people are as important as technology in crafting a workable solution. Building a storage network is only a beginning; managing it efficiently and maintaining data integrity and accessibility will be the defining criteria of a successful storage strategy.
- Cost is going to be a significant barrier. Linking the benefits of a storage network to achievable and quantifiable business goals, such as revenue growth, will be critical in obtaining support from upper management for new storage networking initiatives.
- Choosing a storage network solution involves many technology choices as well as a deep understanding of networking. Enlisting partners with expertise and experience in these two arenas can help ensure success.

Storage Growth

Not all data is stored in a data center. Most PC users have megabytes, and sometimes gigabytes of data stored on their systems. But the data that runs most large businesses is typically stored on centralized servers, often in one or more data centers designed specifically to manage and protect that data. And this data is growing exponentially each year.

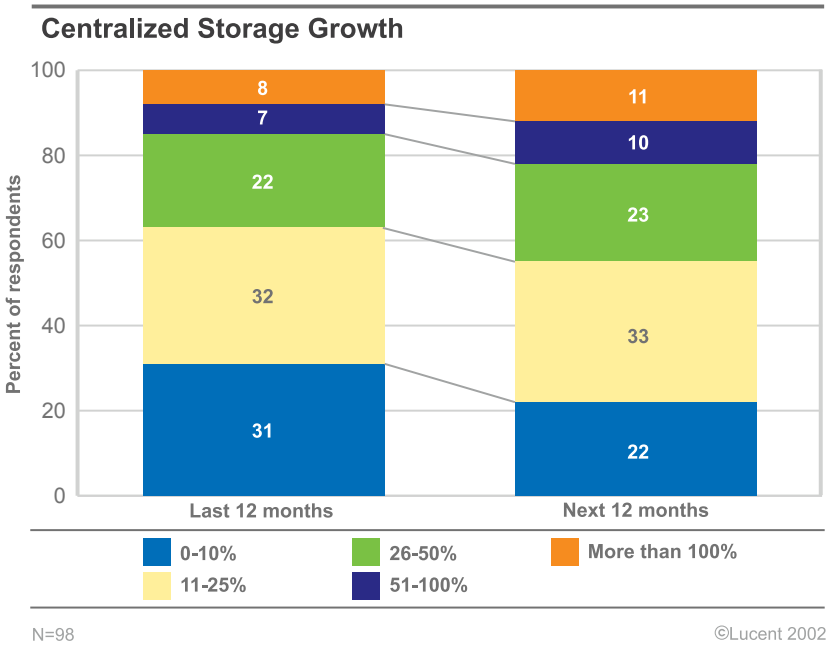
Over the last 12 months, one-third of respondents' centralized storage capacity has grown more than 25 percent. Another third of respondents' organizations have experienced between 11 and 25 percent growth of their centralized storage capacity.

In the coming year, the story is even more dramatic: 44 percent of respondents' centralized storage capacity will grow more than 25 percent. Looking at it another way, last year the average growth was 31 percent; this year that figure will increase to 37 percent.

The reasons for this rapid expansion in storage capacity are many and varied. However, the primary driver of storage growth for nine out of ten respondents falls into one of three categories.

By far, data-intensive back-office applications are most often the main culprit behind the data storage explosion. Forty percent of respondents identified this as the major driver over the last year, and 45 percent say it will be the major driver in the year ahead.

Internet and e-business applications were the major driver of storage growth last year for one-quarter of respondents, a figure that will increase slightly in the next year. New front-office applications is the third category responsible for storage growth, at a rate just slightly behind Internet and e-business applications.



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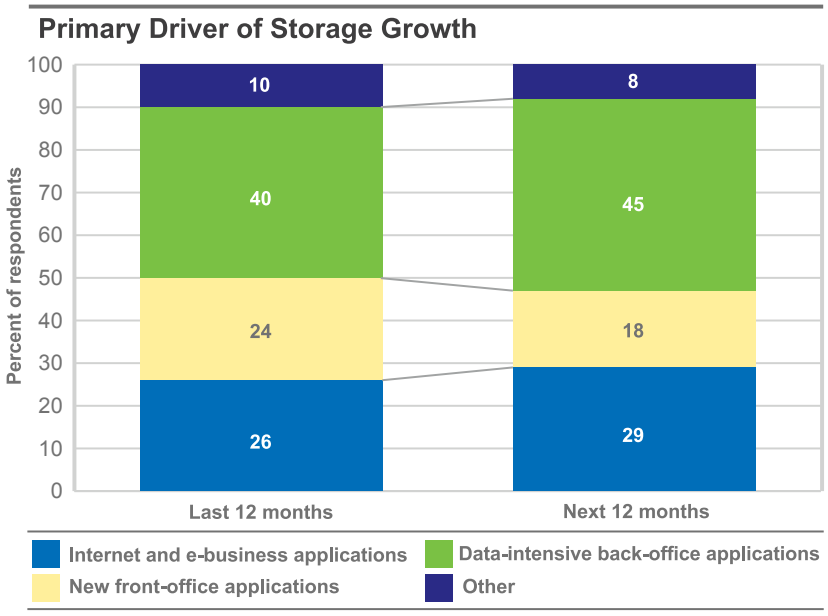

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Over the last few years, two-thirds of respondents have turned to some type of storage network to help them manage the high demand for storage. By the end 2002, 80 percent will be employing this developing technology.

In 2000, respondents stored an average of 26 percent of their centralized data in a storage network. By the end of 2002, that figure will jump to 43 percent.

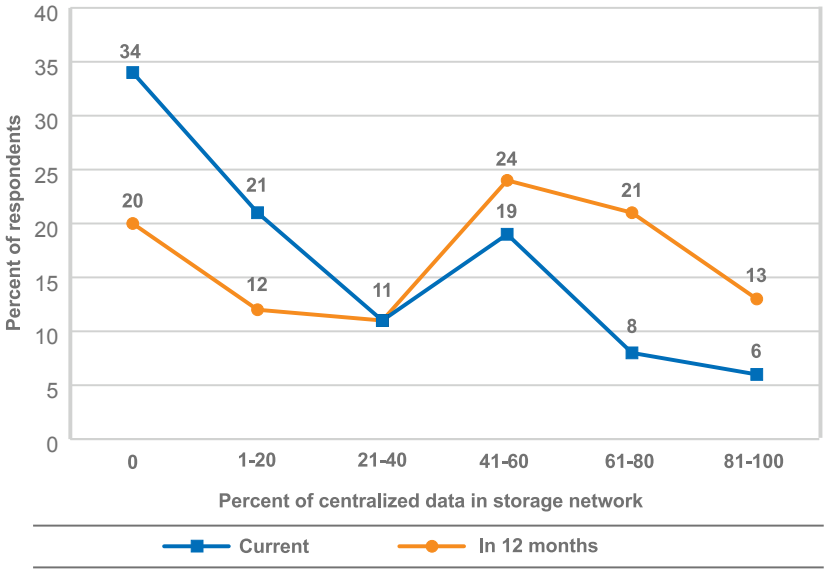
Nearly half of respondents have already implemented some form of storage network, or are using a storage service provider (SSP), and within six months, nearly two-thirds will have done so.

Storage-area networks (SANs) have been implemented the most often, and will be most often implemented in the coming 12 months. By the end of 2002, two-thirds of respondents expect to have implemented this type of storage network.

The second most popular storage network is network-attached storage (NAS), which has been implemented by 21 percent of respondents. However, in the coming year, more respondents will implement a SAN/NAS hybrid storage network than a NAS.

Optical storage networks (OSNs) and SSPs are implemented infrequently, a situation that will not change dramatically in the coming year.

Centralized Data in Storage Networks



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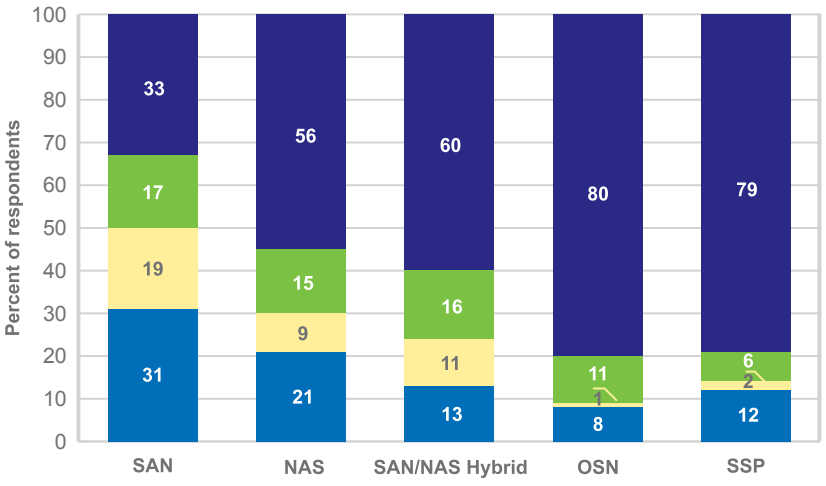
Status of Storage Networking Efforts



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Benefits and Barriers

The overwhelming majority of respondents recognize the importance of implementing or improving their organizations' storage networking capabilities. In fact, more than one-third of respondents characterize this goal as "very important," and another 42 percent say it is "somewhat important."

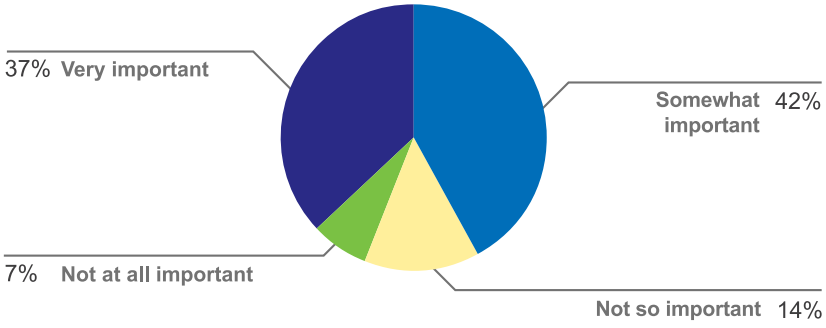
The benefits that respondents expect from their efforts to implement or improve their storage networking capabilities are numerous. Four benefits, however, jump to the top of the chart: better management of storage devices, more efficient backup, better disaster recovery capabilities, and better security. All four of these are seen as benefits by two-thirds or more of respondents.

Narrowed down to the single primary benefit from storage networking, only one stands out from the others: better management of storage devices, which was identified by one out of five respondents. Otherwise, opinion was mixed on which is the primary benefit.

Attaining these benefits, primary or secondary, is not necessarily a simple task. Although the right technology is critical to any solution, other components may be just as challenging. In fact, respondents were almost evenly split on whether their top challenge to evaluating, implementing, or enhancing their storage networking strategies is technology-, people-, or process-related.

In the early stages of a new technology, a majority of network professionals typically view technology issues as the top challenge to achieving their networking goals. As a technology starts to mature, however, the focus begins to shift toward process issues

Importance of Improving Storage Networking Capabilities within 12 Months



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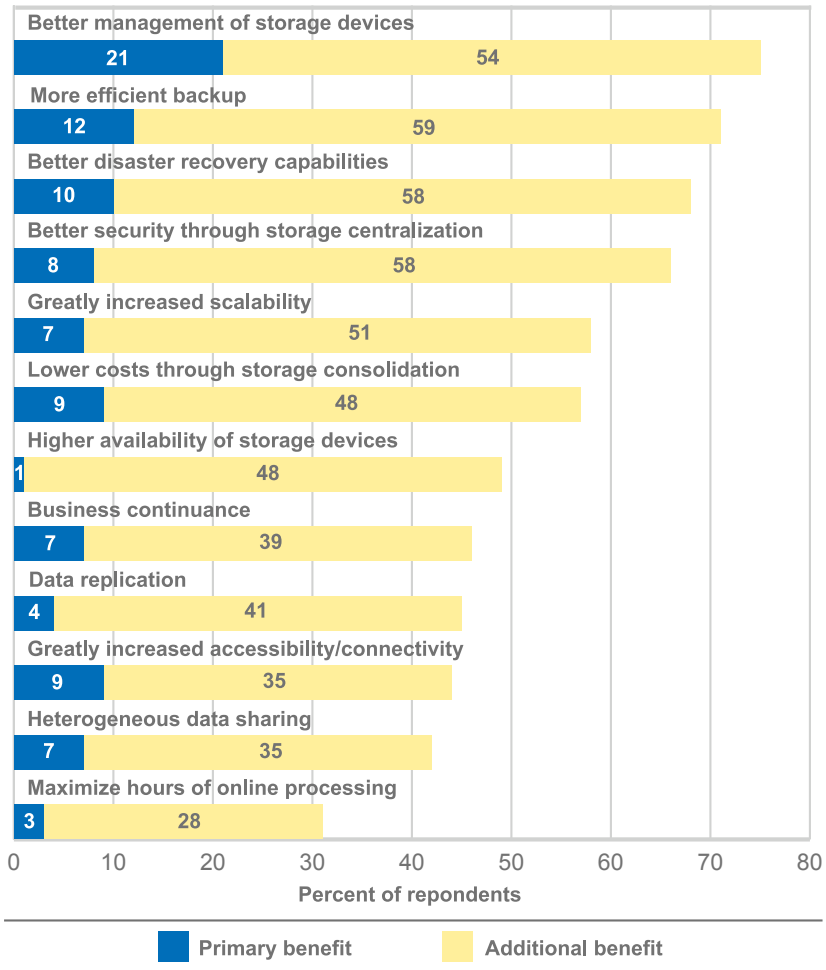
Benefits of Storage Networking



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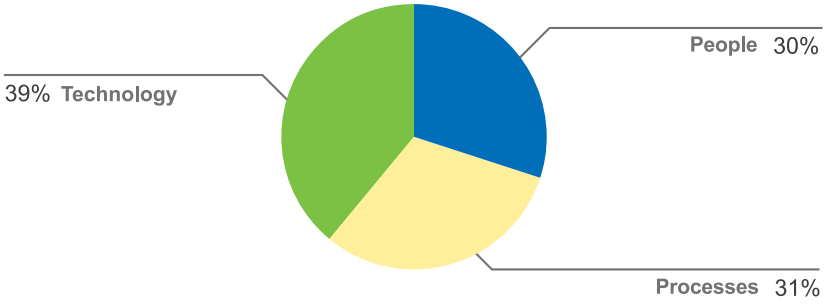
(e.g., troubleshooting, problem escalation, and capacity planning) and people issues (e.g., training, recruiting, and workflow). The even distribution of challenges in this survey is a clear indication that storage networking, although not yet ubiquitous, is well beyond the early adopter stage.

Reflecting the fact that technology is not the only challenge, a majority of respondents say that justifying costs/benefits to upper management is a significant barrier to implementing or improving their storage networking strategies. Along the same line, 46 percent of respondents believe that the cost of storage networking products and/or services is a significant barrier to their efforts. This should be an unambiguous indication to storage networking vendors that reducing the cost of their products or services will be critical in growing the market over the coming year.

Technology is still seen as a barrier for many respondents. For 46 percent, determining networked storage requirements is problematical. Thirty-nine percent of respondents are having difficulty implementing or integrating storage products from multiple vendors. However, only 17 percent think that current products can't meet their requirements, and only one out of five think that the standards are still too immature to be successful in their storage networking efforts.

Biggest Challenge to Achieving Storage Networking Strategy



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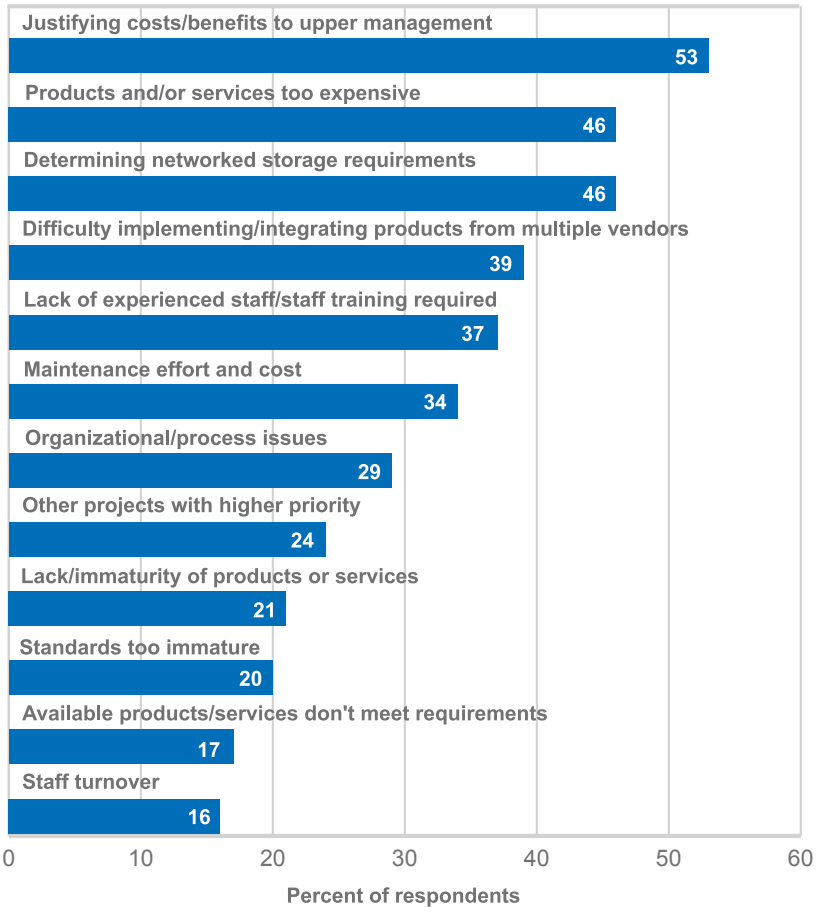
Significant Barriers to Implementing or Improving Storage Networking Strategy



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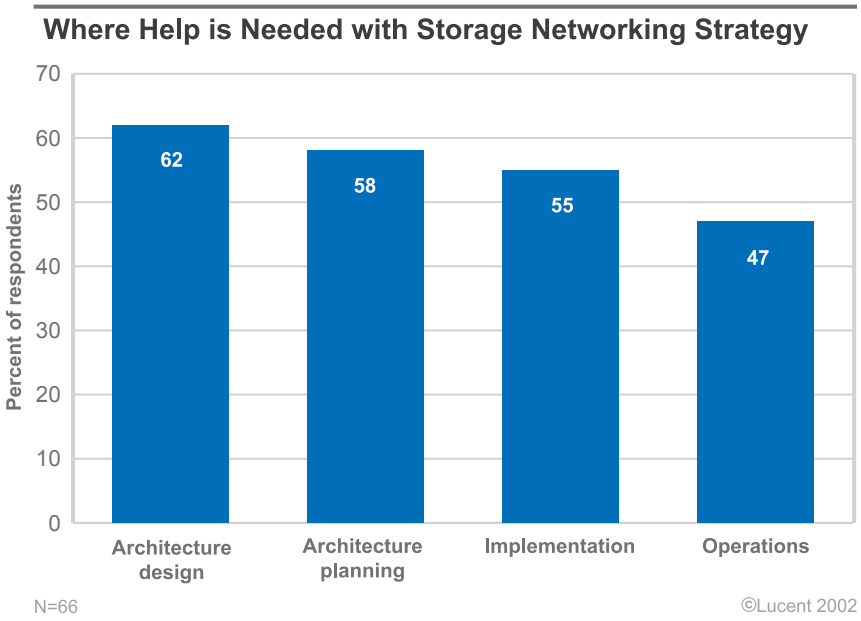
Reflecting the large percentage of respondents who are struggling with multiple barriers, a large majority (two-thirds) need assistance in one or more stages of the network lifecycle. Of those that need some assistance, 62 percent are looking for help with their storage networking architecture design, which includes vendor selection. Another 58 percent need help with architecture planning, while 55 percent can use help with implementation of their storage network. Less than half of respondents need operational support.



Making Choices

A SAN is the most popular type of storage network, both implemented today and to be implemented in the coming six months. Within this category, however, there are several architecture options.

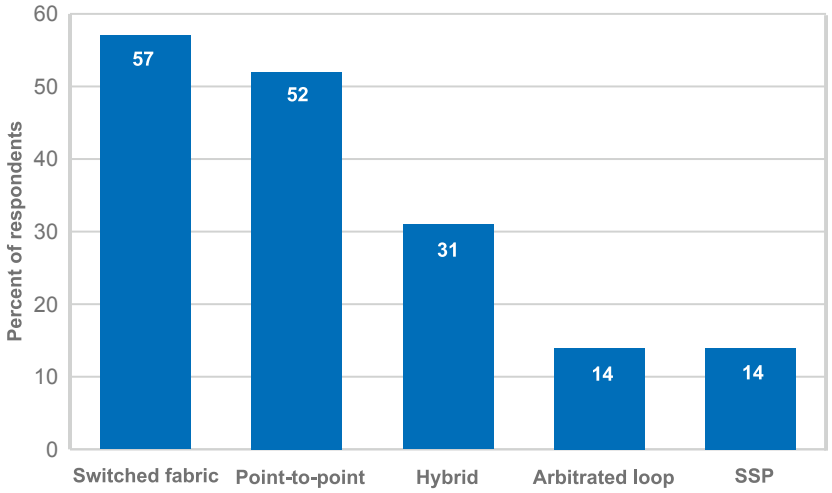
Most often chosen for implementation is a switched-fabric topology, where large numbers of servers and storage systems are connected using fiber-optic switches. Fifty-seven percent of respondents have chosen this SAN type. But nearly as many respondents have or are going with a point-to-point topology, which allows simple bi-directional communication between two nodes.

An arbitrated loop SAN - a ring topology where each node passes data to adjacent nodes - is the choice of only 14 percent of respondents, most likely because of increased complexity of this architecture compared to a point-to-point or switched-fabric topology. Thirty-one percent of respondents, however, have chosen a hybrid SAN that mixes two or more of these topologies, and thus also increases complexity.

We asked respondents who have already implemented a SAN, or plan to implement a SAN within six months, which protocols they will use. By a margin of two to one, Fiber Channel Protocol (FCP) was preferred over any other protocol, being implemented by 56 percent of respondents.

Other protocols, such as iSCSI and FCIP tunneling, are also being implemented, but much less often than FCP.

Types of SANs Currently Implemented or Being Implemented within Six Months



Note: Includes only respondents who have already implemented a SAN or plan to do so within six months.

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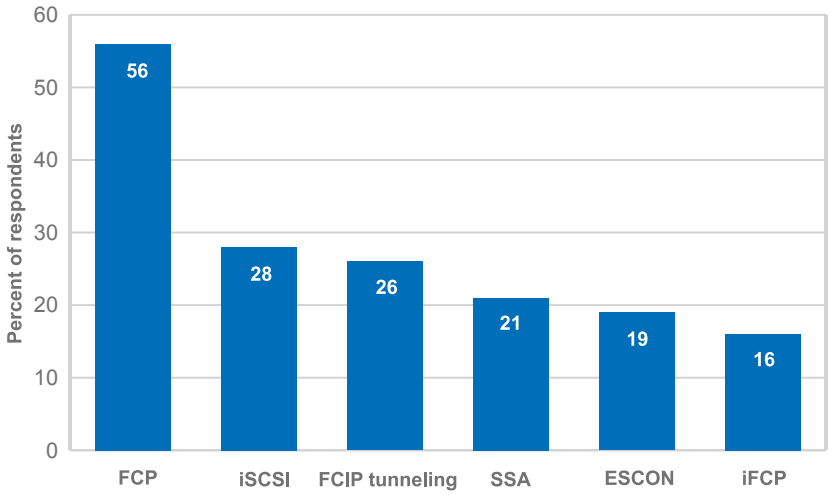
Protocol Used/to be Used for SAN Implementation



Note: Includes only respondents who have already implemented a SAN or plan to do so within six months.

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We then asked respondents who have already implemented a SAN, NAS, or SAN/NAS hybrid how satisfied they are with six aspects of its operation. The great majority (84 percent) of respondents are very or somewhat satisfied with its performance, and nearly as many (80 percent) feel the same way about its reliability. These are very encouraging results for a technology that is still developing.

The top benefit expected from storage networking is better management of storage devices. More than 80 percent of respondents say that they are satisfied with the ease of resource manageability, although only 24 percent are very satisfied.

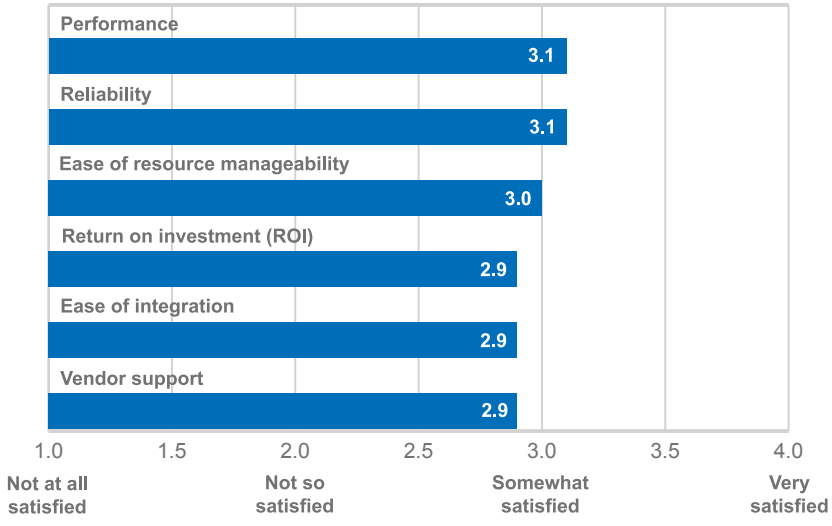
Surprisingly, most respondents (78 percent) are satisfied with their SAN, NAS, or hybrid's return on investment, despite the fact that the cost of products and/or services was considered a hurdle by nearly half of all respondents. For this sub-group, however, less than 40 percent share that view. Those who have not implemented a SAN, NAS, or hybrid may not fully realize its value.

When all is said and done, the selection of the right storage network solution to fit an enterprise's particular needs is the most important part of the process. Excellence in implementation and operations cannot compensate for mistakes in planning and designing a storage network solution.

When respondents are evaluating a storage network solution, the most important criteria for them are the technical support capabilities of the vendor and the ease of integration, both considered important by 95 percent of respondents.

Cost is also a major consideration given that cost justifying the solution to upper management is a significant barrier to a majority of respondents. In fact, more than 80 percent of respondents consider each of the criteria to be important, with the exception of the vendor having market leadership. And even on that measurement, 63 percent of respondents think it is important in their evaluation process.

Satisfaction with SAN, NAS or Hybrid Storage Network Characteristics



Note: Includes only respondents who have already implemented a SAN, NAS, or SAN/NAS hybrid.

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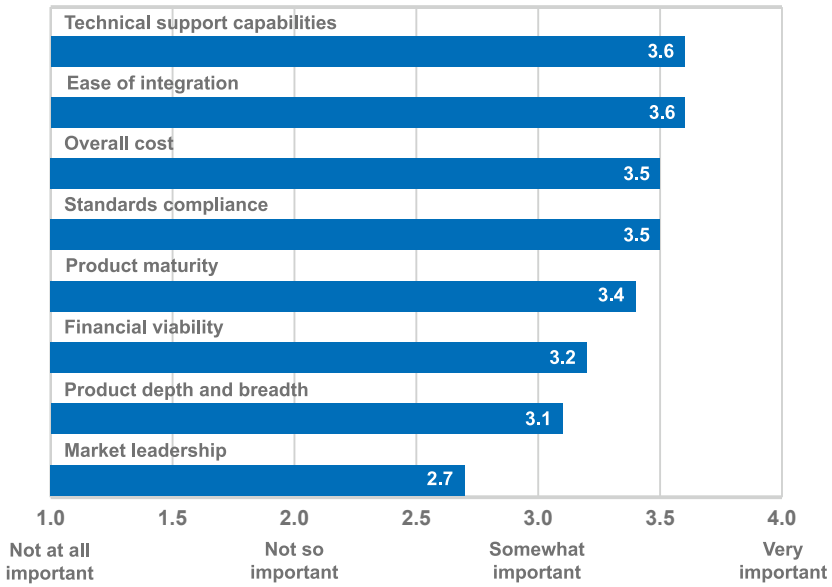
Importance When Evaluating Storage Network Solution



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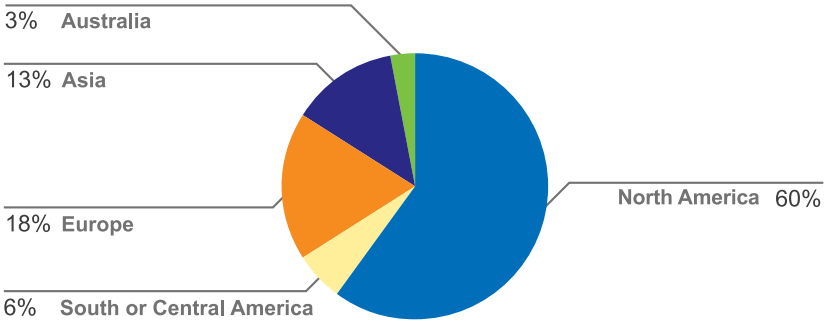
Respondent Demographics

Sixty percent of respondents are located in North America, followed by Europe (18 percent) and Asia (13 percent). South and Central America (6 percent) and Australia (3 percent) account for the remaining respondents.

Survey respondents represent a fairly broad cross section of industries, led strongly by telecommunications/ computer services providers, which represent nearly one-third of respondents (31 percent). Other well-represented industries include government/education/nonprofit organizations (19 percent), financial services/insurance/legal firms (11 percent), and manufacturing/ pharmaceuticals (7 percent).

Respondents' Locations



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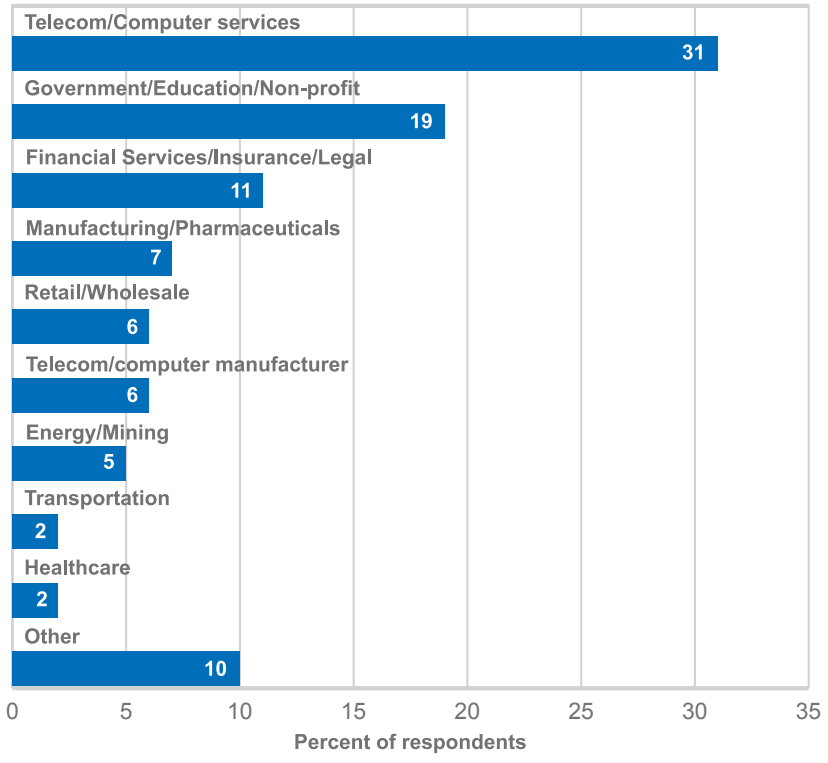
Respondents' Industries



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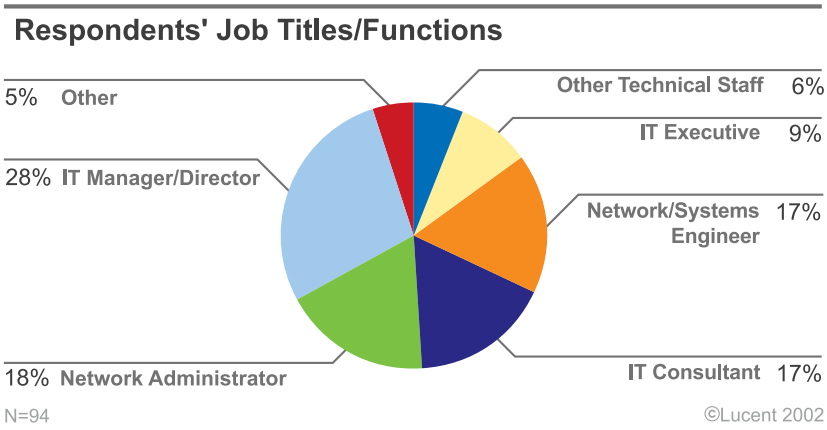
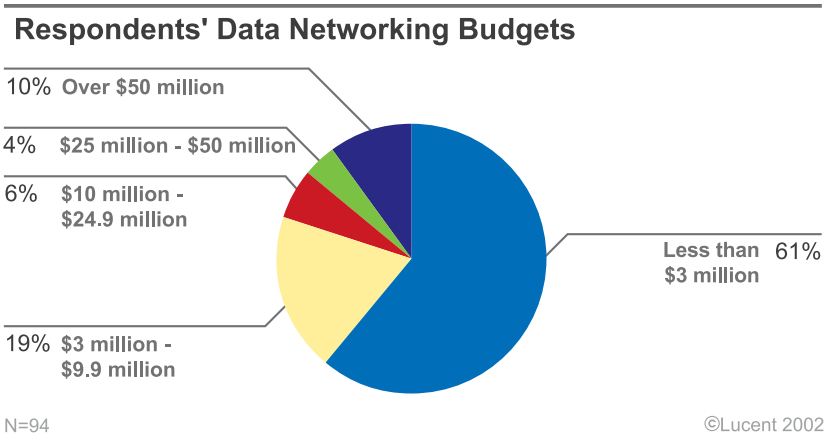
The highest percentage job title/function category is IT manager/director (28 percent), followed by network administrator (18 percent), IT consultant (17 percent), and network/systems engineer (17 percent).

At the high end, 14 percent of respondents' companies budget in excess of $25 million annually for data networking. The majority of respondents' companies work with budgets of under $3 million.





Respondent Comments

- *In so far as we a just entering -e-commerce, we lack adequately trained staff. Nor are there any adequately trained professionals to assist in our efforts. It is very difficult to find anybody in the area that knows what they are talking about especially when it comes to e-commerce and the network needs!*
- *SAN is still hard to integrate multiplatforms and achieve serverless function.*

Methodology

This survey was conducted over the World Wide Web from October 15, 2001 to November 30, 2001 at: **http://www.lucent.com/contact/current_survey.html**

All Web survey responses were automatically collected into a survey tool. Any questions skipped or incorrectly answered by survey respondents were not included in the tabulations. Not-applicable responses were also not included in the tabulations. Each chart includes the number of valid responses for that particular question (e.g., N=100 indicates 100 responses). Percentages shown in charts may not equal 100 percent due to rounding.

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