

Preface

This book expands and updates the content of my earlier book *Designing Storage Area Networks: A Practical Reference for Implementing Fibre Channel SANs*, published in the winter of 1999. At a thin 202 pages, that book was the first to provide a brief overview of storage area network (SAN) technology and was widely adopted as an introductory and training text for both vendors and customers. Because of the rapid growth and technical development within the storage industry over the past three years, however, new functionality and technology initiatives are already transforming the SAN landscape. Advances in Fibre Channel performance and switch technology, the introduction of SANs based on Transmission Control Protocol/Internet Protocol (TCP/IP) and Gigabit Ethernet, and the emergence of storage virtualization have given customers more options for addressing their data storage needs. Although some of these technical initiatives are presented in my second book, *IP SANs: A Guide to iSCSI, iFCP, and FCIP Protocols for Storage Area Networks*, this text focuses on the practical considerations implementers should think about in designing SAN solutions with today's diverse technologies.

Storage area networks are now recognized as the preferred solution for fulfilling a wide range of critical data storage needs for institutions and enterprises. The success of SANs in establishing real end-user value is affirmed by the adoption of the technology by all major solution providers as their flagship server and storage offerings. IBM, Hewlett-Packard, Sun, Dell, and others now provide certified SAN configurations for performance, high availability, and backup of storage data, and storage vendors such as EMC, Hitachi Data Systems, XIOtech, and others offer SAN interfaces on their premier products. Although the current market penetration of SAN-based solutions is only 20 percent of the total storage market, SANs are expected to capture the majority of the market within a few years.

The emergence of storage networking represents the fusion of two distinct technologies, each with its own priorities, vocabulary, and culture. For 20 years, the glacial pace of storage development gradually resulted in smaller, higher-capacity disks and faster channel performance, but this evolutionary inertia was always bounded by a rigid master/slave relationship between hosts and storage. By contrast, the rapid and more volatile development of networking technology has overturned previous architectures and relationships and, as demonstrated by the Internet, has delivered a global capability with innovative and enriched feature sets. Combining the more conservative outlook of storage with the more dynamic worldview of networking has resulted in a collision of cultures that has actually benefited both disciplines. Data storage has been transformed from the frumpy wallflower of data communications into a stellar attraction for investors, vendors, and technologists. Networking has gained an endless supply of high-volume data that further extends and justifies its presence throughout the enterprise. It has also gained new opportunities to create storage-specific interfaces and functionality.

This synthesis of storage and networking into a new technology has presented both challenges and opportunities for customers and vendors. Storage administrators and managers must now be conversant in networking concepts and consequences such as addressing, routing, and network convergence, and network architects and administrators must learn the mysteries of LUNs, JBODs, and RAID levels. This book is therefore written for a broad audience of IT managers, administrators, consultants, and technical staff whose responsibilities may span both storage and

networking implementations. In addition, storage networking has generated new concepts and issues previously undefined by either storage or networking. The unexpected consequences of positioning storage in an open, networked environment are also examined in the text, and particularly in the applications studies.

Although storage networking is an enabling technology for dealing with the massive growth of storage data, it is often criticized for presenting persistent interoperability and management issues. Some of the problems associated with SANs are simply the byproduct of a new technology struggling to break new ground. Other problems are, unfortunately, vendor-induced in an effort to retain market share. Overcoming interoperability issues and management complexity is a prerequisite for wider-scale adoption of SAN technology, and several industry initiatives are now attempting to address the remaining obstacles. Although it may take several years for some of these efforts to bear fruit, this book discusses them to indicate where help is on the way.

In the first edition of *Designing Storage Area Networks*, the underlying infrastructure, or plumbing, for SANs was exclusively Fibre Channel. As the first successful gigabit serial transport, Fibre Channel pioneered the signaling and data-encoding mechanisms later adopted by Gigabit Ethernet. Had Gigabit Ethernet appeared first, it might have preempted Fibre Channel as a storage network transport. Although Ethernet has on its side the massive momentum of market presence in the rest of the data communications space, its tardy arrival in storage networking now puts it in conflict with the flourishing Fibre Channel. Although this contention has generated ongoing religious disputes among vendors, both Fibre Channel and Ethernet are, after all, simply plumbing. This book provides technical detail on both Fibre Channel and Ethernet-based SAN technologies, in the expectation that customers will make their own decisions on which transport best meets their needs. The vast majority of vendors selling SAN solutions are planning to provide both Fibre Channel and IP-based products to accommodate their customers' requirements.

The people who have direct responsibility for designing and implementing SANs have a desperate need for more detailed information on product capabilities and interoperability, information such as which version of a particular backup application works with a specific database or level of operating system. Given the lead time required for hard-copy publishing, it is impossible to capture this very useful but granular information. By the time such a text hit the stands, it would be outdated and of little value. The Storage Networking Industry Association (SNIA) is currently establishing end-user organizations that maintain online databases of customer issues and solutions. I urge any reader seeking more detailed information on SAN solutions to become involved in this SNIA-led effort and to help build the practical resources that will benefit the user community at large.

Designing a storage network requires, first of all, answering a basic question: What is the application? Customers do not, after all, spend millions of dollars on storage arrays, tape subsystems, switches, servers, and cabling for the sake of the technology itself. Applications are fostering SAN deployment, and applications are as varied as the core requirements of diverse institutions and enterprises. Although vendors may package canned solutions to fulfill common needs such as storage consolidation or tape backup, the SAN architect should avoid being driven by vendors, instead driving the vendors to solve their specific application requirements. This text attempts to define the most common applications that are more efficiently served by SAN

technology, but these examples only begin to address a much broader spectrum of real-world applications that storage networking may benefit.