

# Storage Area Network Fundamentals

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## INTRODUCTION

The volume and value of enterprise data have been growing faster than the speed at which traditional backup utilities' effectiveness has been increasing. Enterprises have become more dependent on their online systems and cannot ensure the availability of these data by relying only on traditional, network-bottlenecked, server-attached storage systems. Solutions to this problem have been offered by storage area network (SAN) technology, which provides enterprises with serverless zero-time-windows backup. In this new backup approach, backed-up data are removed to a secondary remote storage device, and the enterprise server becomes off-loaded, permitting high-performance continuous access to both applications and data. The objective of a SAN is to allow multiple servers access to a pool of data storage in which any server can potentially access any storage unit. In this environment, management plays a large role in providing security guarantees (with authorization to access particular storage devices) and sequencing or serialization guarantees (with authorization to access a particular device at certain time-point) (Server Clusters 2003).

A SAN fabric is usually based on fibre-channel technology that allows up to 10-km long-distance connections. This feature has a significant advantage in a campus environment, where reliable backup resources can be shared among several divisions. For example, fibre-channel SANs for a health care enterprise allow 24/7 continuous operation, patient record backup, and medical image archiving (Farley 2003).

The SAN becomes a key element of the enterprise environment in which data availability, serviceability, and

reliability are critical for a company's business. Many enterprise solutions (e.g., ATTO FibreBridge products, rack mount solutions, ATTO FibreCenter3400R/D, host bus adapters, the ATTO Diamond array, Compug Storage Works products, EMC Connectrix solutions, LSI Logic E4600 Storage System) are available today. They can be effectively used in multiple platform storage-infrastructure solutions for data-intensive applications such as e-commerce, online transaction processing, electronic vaulting, data warehousing, data mining, Internet/Intranet browsing, multimedia audio/video editing, high-definition television (HDTV) streaming, and enterprise database management applications (Rjabov 2004).

This chapter describes fundamentals of storage area networks (SANs), their architectural elements (interfaces, interconnects, and fabrics), technologies (fibre-channel, arbitrated loop transport protocol, Beocade's configurations, InfiniBand switched-fabric architecture, Crossroad systems with a storage router, virtual interface architecture, direct access file system, Internet protocol (IP) storage technologies, SANs over IP, fibre channel over IP, Internet fibre-channel protocol, Internet SCSI, storage over IP, fabric shortest path first protocol, storage resource management, and adaptive network storage architecture), solutions, standards, associations, initiatives, forums, coalitions, vendors, and service providers.

## SAN OVERVIEW

### What Is a SAN?

A SAN (storage area network) is a networked high-speed infrastructure (subnetwork) that establishes direct access

# Fundamentals Of Storage Area Networks

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## **Fundamentals Of Storage Area Networks:**

*Storage Area Network Fundamentals* Meeta Gupta, 2002 *Storage Area Network Fundamentals* looks at the various areas and technologies associated with SANs the available SAN technology its limitations expenditures and ways to minimize them and the forthcoming technology so that organizations can deploy real operational storage in data centers without further delay Designed as an introduction to SANs *Storage Area Network Fundamentals* develops an understanding of SAN basics and how to plan implement and manage a storage area network The book covers the different topologies protocols and products required to implement and manage efficient SANs as well as questions to test the knowledge imparted to the reader

**Fundamentals of Storage Area Networks** Terry William Ogletree, 2003 This text explores the growing need for storage area networks SANs in enterprise level networks It details the basics of storage area networks and then moves on to provide detailed coverage of the fibre channel architecture arbitrated loop technology and fabric switching technology **Storage**

**Area Networks For Dummies** Christopher Poelker, Alex Nikitin, 2009-01-09 If you've been charged with setting up storage area networks for your company learning how SANs work and managing data storage problems might seem challenging *Storage Area Networks For Dummies* 2nd Edition comes to the rescue with just what you need to know Whether you already a bit SAN savvy or you're a complete novice here's the scoop on how SANs save money how to implement new technologies like data de duplication iScsi and Fibre Channel over Ethernet how to develop SANs that will aid your company's disaster recovery plan and much more For example you can Understand what SANs are whether you need one and what you need to build one Learn to use loops switches and fabric and design your SAN for peak performance Create a disaster recovery plan with the appropriate guidelines remote site and data copy techniques Discover how to connect or extend SANs and how compression can reduce costs Compare tape and disk backups and network vs SAN backup to choose the solution you need Find out how data de duplication makes sense for backup replication and retention Follow great troubleshooting tips to help you find and fix a problem Benefit from a glossary of all those pesky acronyms From the basics for beginners to advanced features like snapshot copies storage virtualization and heading off problems before they happen here's what you need to do the job with confidence **Storage Area Network Essentials** Richard Barker, Paul Massiglia, 2002-10-23 The inside scoop

on a leading edge data storage technology The rapid growth of e commerce and the need to have all kinds of applications operating at top speed at the same time all on a 24/7 basis while connected to the Internet is overwhelming traditional data storage methods The solution *Storage Area Networks* SANs the data communications technology that's expected to revolutionize distributed computing Written by top technology experts at VERITAS Software Global Corporation this book takes readers through all facets of storage networking explaining how a SAN can help consolidate conventional server storage onto networks how it makes applications highly available no matter how much data is being stored and how this in turn makes data access and management faster and easier System and network managers considering storage networking

for their enterprises as well as application developers and IT staff will find invaluable advice on the design and deployment of the technology and how it works Detailed up to date coverage includes The evolution of the technology and what is expected from SANs Killer applications for SANs Full coverage of storage networking and what it means for the enterprise s information processing architecture Individual chapters devoted to the storage network and software components of storage networking Issues for implementation and adoption      **Architecting Storage Area Networks** Pasquale De

Marco,2025-05-16 In the ever evolving landscape of data storage where businesses grapple with explosive data growth and the demand for instant access to information Storage Area Networks SANs have emerged as a cornerstone of modern IT infrastructures This comprehensive guide to SANs empowers readers with the knowledge and expertise to harness the full potential of this transformative technology Delve into the intricacies of SAN architecture exploring its components protocols and applications and gain a deep understanding of how SANs operate Discover the various storage devices and technologies employed in SANs from traditional hard disk drives to cutting edge flash storage solutions and learn how to select the right storage solution for your specific needs Master the art of data protection and security in SAN environments ensuring the integrity and availability of your valuable data Implement robust backup and recovery strategies leverage replication and snapshots for data protection and employ encryption and access control measures to safeguard your data from unauthorized access Explore the profound impact of virtualization on SANs unlocking new possibilities for resource optimization and flexibility Learn how to leverage SANs to support virtualized environments including virtual machines virtual SANs and hyperconverged infrastructure and discover best practices for managing virtualized storage environments Stay abreast of the latest trends and innovations in SAN technology including software defined storage flash storage and the integration of cloud storage Prepare for the future of data storage with insights into emerging technologies and best practices ensuring that your SAN infrastructure remains agile and adaptable in the face of evolving business demands With its in depth coverage and practical guidance this book is an indispensable resource for IT professionals system administrators and architects seeking to design implement and manage SAN solutions that meet the evolving demands of modern businesses Embrace the power of SANs and unlock new horizons of data storage efficiency scalability and performance If you like this book write a review on google books      *MPLS and VPN Architectures* Ivan Pepelnjak,Jim Guichard,2002 This revised version of the bestselling first edition provides a self study complement to the Cisco CCIP training course implementing Cisco MPLS Extensive case studies guide readers through the design and deployment of real world MPLS VPN networks MPLS and VPN Architectures

[Storage Networks Explained](#) Ulf Troppens,Rainer Erkens,Wolfgang Müller,2004-09-15 Storage Networks Explained has much to recommend it a rarity in the literature of digital data storage a complete exposition of both the base subject matter and its applications which at the same time offers a level of readability making it suitable as an introduction to the subject Storage Networks Explained is also flexible It can be read cover to cover browsed or used as a reference I recommend

Storage Networks Explained as an essential component of any active information technology library Paul Massiglia Technical Director VERITAS Software Corporation Storage networks will become a basic technology like databases or local area networks According to market research 70% of external storage devices will be connected via storage networks in 2003 The authors have hands on experience of network storage hardware and software they teach customers about concrete network storage products they understand the concepts behind storage networks and show customers how storage networks address their business needs Storage networks provide shared access to stored data from multiple computers and servers thus increasing storage efficiency and availability They permit information management functions such as backup and recovery data mirroring disaster recovery and data migration to be performed quickly and efficiently with a minimum of system overhead This book explains how to use storage networks to fix malfunctioning business processes covering the technologies as well as applications A hot topic that will become increasingly important in the coming years One of the first books to focus on using rather than building storage networks and how to solve problems Looking beyond technology and showing the true benefits of storage networks Covers fibre channel SAN Network Attached Storage iSCSI and InfiniBand technologies Contains several case studies e g the example of a travel portal protecting a critical database Endorsed by the Storage Networking Industry Association Written by very experienced professionals who tailored the book specifically to meet customer needs including support with supplementary material on Troppens website and Preface written by Tony Clark Provides basic application information key for systems administrators database administrators and managers who need to know about the networking aspects of their systems As well as systems architects network managers information management directors and decision makers This book also supports applications for graduate students and other relevant courses in the field Awarded Best System Administration Book 2005 by the Linux Journal

*SANs Demystified* Denise Colon, 2002-10-19 Get up to speed quickly on storage area networks SANs in the real world What they are what they do how to get one Essentials on backup recovery disaster avoidance NO HYPE SANs With plain words but impressive authority storage area network SAN consultant Denise Colon explains how SANs use fibre channel to store vast amounts of data move it at lightning speed scale to meet accelerating growth and offer unprecedented reliability Her SANs Demystified then gives you the tools to build configure and manage your own SAN without mishaps YOU MUST READ THIS BOOK IF People look to you for answers on networks systems administration or data management How a SAN fits with your system practically and technically is need to know info Evaluating implementing configuring or managing SANs may be in your future You want a solutions kit for SAN issues from buildout to backup Impartial comparisons of off the shelf SANs could save your company money Right answers on recovery and disaster avoidance are more than a pass fail issue to you You need to be knowledgeable on the next steps for networks Your job involves network training security administration management assessment implementation or configuration Your business is growing globally or you want it to Faster than a speeding bullet

capable of storing and moving massive quantities of data reliable and scalable SANs are in the future of many networks and this is the book that brings the future home      **Storage Area Network Essentials** Richard Barker,Paul Massiglia,2011-02-11      **Storage Area Networks For Dummies** Christopher Poelker,Alex Nikitin,2003-03-07 In case you weren't sure a storage area network or SAN is a collection of computers and storage devices connected over a high speed optical network and dedicated to the task of storing and protecting data SANs solve many of the data storage and management problems that have long bedeviled enterprise networks and they save companies who use them a bundle Which is why SAN administration is one of the highest paid jobs in IT today Add storage area networking to your resume and your phone will ring off the hook with calls by head hunters promising of six figure salaries Bored with in your current IT job and looking for a change of pace and bigger bucks Then Storage Area Networks For Dummies is for you Have you been tasked with designing implementing or troubleshooting your company's SAN and need to play catch up in a hurry Look no further In no time this book gets you on track with the know how and confidence you need to Choose the right hardware for the job Design state of the art SANs Implement a SAN and get it running like a well oiled machine Configure manage and troubleshoot SANs Seamlessly integrate two or more SANs Become a SAN sage and give your career a major boost From the ABCs of SANs to making the most of advanced SAN features Storage Area Networks For Dummies covers all the bases in plain English and with loads of real life examples Key topics covered include What are SANs how they work and who needs them SAN protocols components and common problems Designing and building a SAN SANs and disaster recovery Networking SANs Understanding choosing and using SAN backup solutions Making the most of Point in Time technology Outsourcing SANs Managing and troubleshooting SANs The solution to so many enterprise data storage problems SANs equal heightened efficiency and productivity for organizations and greater prosperity for those who build and manage them Let Storage Area Networks For Dummies help you get in on the ground floor of one of today's hottest IT growth areas

**Designing Storage Area Networks** Tom Clark,2003 This is a complete revision of Clark's bestseller Designing Storage Area Networks The new book provides guidelines for implementing SANs to solve existing networking problems in large scale corporate networks      *STORAGE NETWORKS EXPLAINED: BASIC AND APPLICATIONS OF FIBRE CHANNEL SAN, NAS, ISCSI AND INFINIBAND* Ulf Troppen,Rainer Erkens,Wolfgang Muller,2008-09 Market\_Desc The book provides basic application information key for systems administrators database administrators and managers who need to know about the networking aspects of their systems As well as systems architects network managers information management directors and decision makers This book also supports applications for graduate students and other relevant courses in the field Special Features Hot topic that will become increasingly important in the coming years First book to focus on using rather than building storage networks and how to solve problems Looking beyond technology and showing the With CD benefits of storage networks Covers fibre channel SAN Network Attached Storage iSCSI and InfiniBand technologies Contains several

case studies e g the example of a travel portal protecting a critical database Endorsed by the Storage Networking Industry Association Written by very experienced professionals who tailored the book specifically to meet customer needs About The Book The authors have hands on experience of network storage hardware and software they teach customers about concrete network storage products they understand the concepts behind storage networks and show customers how storage networks address their business needs They know which questions their readers will ask and what they need to know to do their day to day job as efficiently as possible both those with no SAN experience and those with SAN experience

**The Handbook of Computer Networks, Distributed Networks, Network Planning, Control, Management, and New Trends and Applications** Hossein Bidgoli, 2008 The Handbook of Computer Networks is the third set of reference books from leading author and Professor of Management Information Systems at California State University Bakersfield Hossein Bidgoli The Handbook of Computer Networks is designed to arm researchers practitioners students and managers with in depth understanding of this important and fast growing field in its broadest scope and in an applied and functional framework Each volume incorporates state of the art core information and networking topics practical applications and coverage of the emerging issues in the computer networking and data communications fields

Principles of Computer Security, Fourth Edition Wm. Arthur Conklin, Greg White, Chuck Cothren, Roger L. Davis, Dwayne Williams, 2016-01-01 Written by leading information security educators this fully revised full color computer security textbook covers CompTIA's fastest growing credential CompTIA Security Principles of Computer Security Fourth Edition is a student tested introductory computer security textbook that provides comprehensive coverage of computer and network security fundamentals in an engaging and dynamic full color design In addition to teaching key computer security concepts the textbook also fully prepares you for CompTIA Security exam SY0 401 with 100% coverage of all exam objectives Each chapter begins with a list of topics to be covered and features sidebar exam and tech tips a chapter summary and an end of chapter assessment section that includes key term multiple choice and essay quizzes as well as lab projects Electronic content includes CompTIA Security practice exam questions and a PDF copy of the book Key features CompTIA Approved Quality Content CAQC Electronic content features two simulated practice exams in the Total Tester exam engine and a PDF eBook Supplemented by Principles of Computer Security Lab Manual Fourth Edition available separately White and Conklin are two of the most well respected computer security educators in higher education Instructor resource materials for adopting instructors include Instructor Manual PowerPoint slides featuring artwork from the book and a test bank of questions for use as quizzes or exams Answers to the end of chapter sections are not included in the book and are only available to adopting instructors Learn how to Ensure operational organizational and physical security Use cryptography and public key infrastructures PKIs Secure remote access wireless networks and virtual private networks VPNs Authenticate users and lock down mobile devices Harden network devices operating systems and applications Prevent network attacks such as denial of service spoofing hijacking and

password guessing Combat viruses worms Trojan horses and rootkits Manage e mail instant messaging and web security Explore secure software development requirements Implement disaster recovery and business continuity measures Handle computer forensics and incident response Understand legal ethical and privacy issues      **Storage Area Networks** Ralph H. Thornburgh, Barry Schoenborn, 2001 Evaluating planning and migrating to SAN storage architectures SAN concepts components and applications in depth Management backup disaster recovery and day to day administration Includes an overview of Fibre Channel the SAN enabler The complete guide to SAN technology for every implementer and manager Every month enterprises require more information delivered faster with greater reliability and traditional data storage methods no longer suffice Enter the Storage Area Network SAN which can store enormous amounts of data serve it at lightning speed scale to meet accelerating growth and deliver unprecedented reliability Now there s a complete guide to SAN technology for every IT professional and decision maker Storage Area Networks covers it all key concepts components applications implementation examples management and much more Coverage includes What SANs are what they can do and how they overcome the critical limitations of earlier data storage systems Evolving to SANs best practices for building SANs from your legacy storage topologies An overview of Fibre Channel the key enabling technology for SANs SAN configuration device and connectivity options in depth Well managed SANs day to day administration backup restore and disaster recovery A detailed review of Hewlett Packard s market leading SAN product line Fibre Channel chips host bus adapters hubs arrays tape libraries bridges switches and more Storage Area Networks also previews the future of SAN technology policy based SANs emerging applications and more Whether you re considering a SAN for the first time or you want a comprehensive management reference for the SAN you ve already invested in this book offers the insights techniques and guidance you need right now      **Storage Networks Explained** Ulf Troppens, Rainer Erkens, Wolfgang Muller-Friedt, Rainer Wolafka, Nils Haustein, 2011-08-24 All you need to know about Storage Area Networks The amount of data of an average company doubles every year Thus companies who own 1TB of data today will own 32TB in five years Storage networks help to tame such data quantities and to manage this data growth efficiently Since stored data and information are the biggest asset of any company anyone who is involved in the planning or the operation of IT systems requires a basic knowledge of the principle and the use of storage networks Storage Networks Explained covers the fundamentals techniques and functions of storage networks such as disk subsystems Fibre Channel SAN Internet SCSI iSCSI Fibre Channel over Ethernet FCoE Network Attached Storage NAS file systems and storage virtualization Furthermore the authors describe the use of these techniques and how they are designed to achieve high availability flexibility and scalability of data and applications Additional attention is given to network backup and the management of storage networks Written by leading experts in the field this book on storage area networks is updated and fully revised Key features Presents the basic concepts of storage networks such as I O techniques disk subsystems virtualization NAS and SAN file systems Covers the design of storage networks which provide flexible highly



available and scaleable IT systems Explains the use of storage networks for data sharing data protection and digital archiving Discusses management of storage networks using SNMP SMI S and IEEE 1244 This book provides system administrators and system architects as well as students and decision makers with the tools needed for optimal selection and cost effective use of storage networks The Linux Journal awarded the first edition with the Editor s Choice Award 2005 in the category System Administration Book     **IBM Systems Journal** International Business Machines Corporation,2003     Novell's Guide to Storage Area Networks and Novell Cluster Services Stephen C. Payne,Robert Wipfel,2001-11-29 This is the first comprehensive book to cover Novell s hot new clustering and storage area network solutions a security collaboration and 100% high availability must for any business The book is a modular comprehensive look at the design of SAN s and clusters Also included are solutions supported by NCS NCS and SAN features functions implementation and troubleshooting and configuration within the SAN and cluster The authors have taken a unique modular approach in the book so in cases where perhaps SAN s are being implemented in a mixed NetWare and Microsoft Windows 2000 operating system environment to share an Oracle database     **Networking Basics** Mark D. Ciampa,2003 From hubs and routers to servers and cables Networking BASICS 2nd Edition provides a step by step introduction to the field of computer networking Beginners will become comfortable with the concepts and vocabulary of computer networking and will gain hands on experience in basic networking technology     **Essentials of Management Information Systems** Kenneth C. Laudon,Jane Price Laudon,2003 Appropriate for both undergraduate and MBA students this textbook examines the role of information systems in business and management The authors describe the organizational and technical foundations of information systems decision support systems and the process of redesigning an organization The fifth edition is reorganized to focus on the use of the internet to digitally enable business processes Annotation copyrighted by Book News Inc Portland OR

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