The Holy Grail Of Network Storage Management

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 2001).

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 FibreCenter34008/D, host bus adapters, the ATTO Diamond array, Compaq 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 (Riabov 2004).

This chapter describes fundamentals of storage area networks (SANs), their architectural elements (interfaces, interconnects, and fabrics), technologies (fibre-channel-arbitrated loop transport protocol, Brocade'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 archi-tecture), 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

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