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WHITE PAPER

***IP SAN or
Fibre Channel SAN?***

**A Benchmark Test Comparing Backups
of Microsoft Exchange® Server**

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INTRODUCTION

Microsoft Exchange Server is a commonly used mail server that is an integral part of many data centers. Choosing the proper storage environment for MS-Exchange Server can be a difficult decision because there are several available topologies for backing up to a data storage device. For this comparison, we will consider a Fibre Channel SAN and an IP SAN, using iSCSI, as viable network options for an MS-Exchange Server.

Fibre Channel SAN topology is the high-speed storage option at a top dollar price. And until recently, a Fibre Channel SAN was the only option for networked storage. But with the advent of iSCSI, companies now have another SAN topology, called an IP SAN, that is more cost-effective than Fibre Channel. Though an IP SAN offers slower throughput than a Fibre Channel SAN, dedicated IP SANs running iSCSI are positioned to be the practical and economical alternative for many storage environments.

So, which storage topology is optimal for an MS-Exchange Server environment?

Based purely on speed, one would expect the Fibre Channel SAN to out perform an IP SAN, but other factors must be considered. As with any environment, the storage device, the interface connection, the switches, and even the server, must all be accounted for in the system. Any one bottleneck can strangle the entire network, eliminating any benefit a high-performance network has to offer.

To help decide which topology is best for MS-Exchange Server and uncover any potential bottlenecks, Spectra Logic set out to compare the performance of a Fibre Channel and Gigabit Ethernet in the same environment. The intent of this benchmark comparison test was to discover the benefits and drawbacks of choosing a Fibre Channel SAN versus an IP SAN considering total cost and overall performance.

COST

The iSCSI protocol runs SCSI on a TCP/IP network. Widespread experience and familiarity with IP networks facilitate easy deployment of such technology. The total cost of switches, cabling and Host Bus Adapters (HBAs) is an important consideration. Common list prices of components, as of May 2003 illustrate the magnitude of cost differences for IP SAN and fibre SAN topologies:

Component	Fibre List Price of Tested	iSCSI Price of Tested	iSCSI Minimum Price
HBA	\$1000	\$400	\$400
Driver	(included with HBA)	Free for Linux, Windows, Novell, NetApp and HP-UX	Free for Linux, Windows, Novell, NetApp and HP-UX
Switch (per port)	\$1000	\$70-250	\$0
Network Interface Card (NIC)	N/A	\$50-100	\$0
TOTAL	\$2000	\$520-750	\$400
<i>Savings on IP SAN</i>		<i>63-74%</i>	<i>80%</i>

Overall, components for iSCSI are considerably less expensive than Fibre Channel components, especially considering the absolute minimum price range. Fibre Channel is the higher-performing technology, but it is expensive, more complex, and requires Fibre Channel expertise.

PERFORMANCE

The Environment

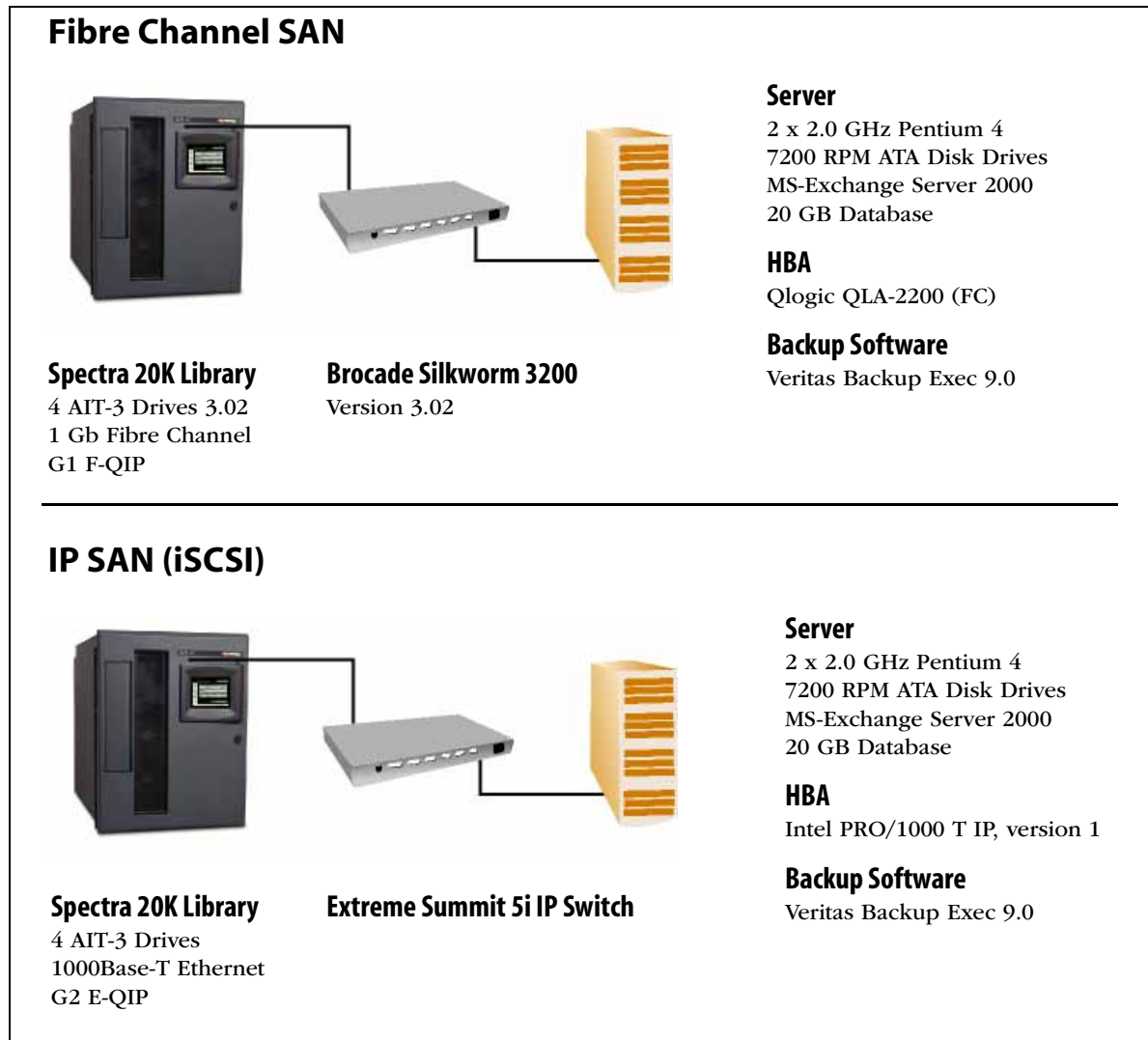
Microsoft's MS-Exchange Server is an extremely popular application for e-mail, workgroup scheduling and common office communications. It is used extensively in both large and small firms, and runs on a wide variety of hardware.

For the benchmark test, a 20GB database was created to represent four separate mailboxes. The host was an Intel® Pentium® 4 dual-processor (2 x 2.0GHz) server with four 7200 RPM ATA disk drives.

The database was backed up to a Spectra Logic Spectra 20K tape library. Four Sony AIT-3 tape drives were used and both tests were run to a single drive, two drives, three drives, and all four drives to see how each configuration would scale and to reveal any bottlenecks.

Component	Fibre Channel	iSCSI
Server	2 x 2.0 GHz Pentium 4, 7200 RPM ATA Disk Drives	2 x 2.0 GHz Pentium 4, 7200 RPM ATA Disk Drives
RDBMS	MS-Exchange Server 2000	MS-Exchange Server 2000
DB Size	20 GB	20 GB
Switch	Brocade Silkworm 3200, version 3.02	Extreme Summit 5i IP Switch
Host Bus Adapter	Qlogic QLA-2200 (FC)	Intel PRO/1000 T IP (iSCSI), version 1
Backup Software	Veritas Backup Exec, version 9.0	Veritas Backup Exec, version 9.0
Backup Hardware	Spectra 20K, 4 AIT-3 tape drives (1 Gb Fibre Channel, using a G1 F-QIP)	Spectra 20K, 4 AIT-3 tape drives (1000Base-T Ethernet, using a G2 E-QIP)

The same server, data, library and tape drives were used for both storage network configurations. Only the network and host connectivity was changed. The following configurations were tested:



The Hypothesis

The benchmark test was performed to compare the throughput performance between Fibre Channel and iSCSI while backing up a 20GB MS-Exchange Sever database. The more costly SAN Fibre Channel connectivity was expected to significantly outperform iSCSI over Gigabit Ethernet.

The Performance Data

The complete test results show an unexpectedly small throughput performance differential between the two network configurations:

Backup	Fibre Channel	iSCSI
Single stream	19.32 MB/Sec	21.14 MB/Sec
Two stream	32.06 MB/Sec	24.82 MB/Sec
Three stream	35.24 MB/Sec	33.72 MB/Sec
Four Stream	35.35 MB/Sec	32.72 MB/Sec

While the Fibre Channel did produce slightly higher throughput speed, iSCSI provided very competitive results. The test concluded that the high-speed throughput of a Fibre Channel SAN was limited by a significant performance bottleneck within the system. A significantly faster server might produce a wider differential, but similar MS-Exchange Server environments will probably see similar results.

SUMMARY

Fibre Channel offers impressive throughput and where performance is imperative, a Fibre Channel SAN is an excellent choice. However, IP SAN equipment is less expensive; the topology is more familiar to data center staff, and it is conducive to running other applications over the network.

Given the equal performance with an expected 63-74 percent cost advantage, an IP SAN using iSCSI should quickly become the backup consolidation network of choice for MS-Exchange Server. In fact, iSCSI should be considered when choosing any storage environment, especially ones with performance constraints similar to the those of mail servers.

Users upgrading from typical DAS environment should consider an IP SAN as a familiar and practical alternative to a Fibre Channel SAN. As this benchmark comparison illustrates, any backup is only as fast as its slowest link. A database, backplane, disk, or server might not be able to achieve the faster throughputs that justify a high-performance Fibre Channel SAN.

Spectra Logic manufactures, sells, and supports both native Fibre Channel and Gigabit Ethernet tape libraries. Each has its advantages. But an IP SAN will provide solid performance in many environments, free backup traffic from the LAN, and allow other IP traffic if needed—at a cost-effective deployment price.

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