

# A Case Study on Different SAN Technologies

## – FC SAN and IP SAN

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**Abstract—** The need of choosing the proper storage environment is increasing rapidly because to backup a storage device there are several topologies present. This paper provides a brief description of storage networking and the needs of storage networking. The storage area network technology has two types: Internet Protocol SAN (IP SAN) and Fibre Channel SAN (FC SAN). The case study is on comparing the two technologies with respect to cost and performance.

**Index Terms—** Fibre Channel SAN (FC SAN), Internet Protocol SAN (IP SAN), Internet Small Computer System Interface (iSCSI), Storage Area Network (SAN), Small Computer System Interface (SCSI).

### I. INTRODUCTION

A Storage Area Network (SAN) consists of a network that is present between the storage devices and servers. Multiple servers is allowed by SAN in order to access any storage device so that it is helpful in increasing fault tolerance [6]. A block of storage is not taken down whenever a particular server goes down.

A SAN has communication infrastructure in order to provide management layer and physical connections so that connections can be organized, storage elements, and computer systems to provide secured and robust data transfer [1]. Some of the benefits of a SAN are High bandwidth, SCSI extension, Resource Consolidation, Scalability, Secure Access.

Now-a-days storage is the main concern in many scenarios, so choosing the proper storage environment may be a difficult decision because to backup a storage device there are several topologies present. A Fibre Channel SAN

and an IP SAN is considered for comparison [11]. High speed option is provided by the Fibre channel SAN which is a top dollar price and it was the only option for networked storage till now. With the introduction of iSCSI, now the companies have another SAN topology and it is more cost effective than Fibre channel is known as IP SAN which has slower throughput when compared to Fibre channel, devoted IP SANs running iSCSI are situated to be the viable and prudent option for some stockpiling situations.

### II. LITERATURE SURVEY

#### A. Fibre Channel SAN

Fiber Channel (FC) is a rapid serial interface for interfacing PCs and capacity frameworks. Fiber Channel is the transcendent innovation for executing SANs today on the grounds that it does the best employment at meeting the necessities of today's applications. FC is quick, at present it backings pace of up to 1Gbps with 2, 4 & 10Gbps in progress. FC, being a system structural engineering, permits stockpiling gadgets to be gotten to by all servers on the SAN consequently enhancing reliability [12]. It underpins a few distinct topologies. The topologies have changing levels of expense to abilities tradeoffs, consequently permitting companies to begin with a little, solid setup and scale up as required. It additionally backings separations up to 10mi through fiber optic link. This backings the capacity of off-site information stockpiling for catastrophe recuperation and high velocity neighborhood between structures on a grounds or in the region. Fiber Channel is a demonstrated and handled innovation with numerous organizations fabricating FC segments for SANs [10].

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*Merits*

- Flexible, Scalable relative to Topologies, Speed, Performance, Distance, Node connectivity and cost.
- Communication and Data Overhead which includes Framing, Data Communication, Latency, Efficiency, Routing Control, and Access Control.
- Redundancy, Availability, and Failover.
- Applicability in SAN with large IT User Base.

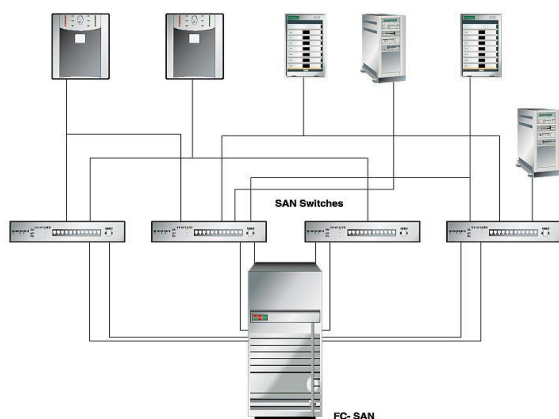
*Limitations*

Fiber Channel SAN topology is the high velocity stockpiling. Its expense is its major impediment. Fiber Channel SANs have dependably been restrictively costly, both from a base and a bolster viewpoint. This has constrained the sending of FC SANs just to huge ventures.

To receive FC SANs, another system base must be introduced. Fiber Channel obliges a different fiber-optic system for the SAN to run. Pipes and putting in new Fiber Channel channels may end up being excessively unwieldy. FC SANs likewise oblige executives to take in another arrangement of system administration aptitudes. Talented work and the expense of preparing are likewise contemplations before sending FC SANs.

Fiber Channel was intended to work in secure situations and consequently its security foundation is not also characterized.

Fiber Channel was not intended to be a WAN convention and is not versatile concerning separation. It is restricted to only 50 miles, which is an inborn limit of optic fiber. Subsequently SANs are geologically limited. At long last, the interoperability record of Fiber Channel gadgets from diverse sellers has been a reason for concern. Every one of these restrictions of FC SANs urge us to carefully inspect alternate alternatives, essentially Internet Protocol SAN.



*Fig: FC-SAN Architecture*

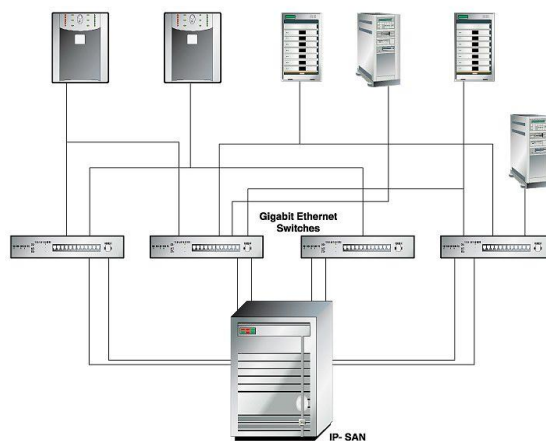
**B. INTERNET PROTOCOL SAN**

IP capacity is a general term for a few ways to deal with utilizing the Internet Protocol (IP) in a stockpiling range system (SAN) generally over Gigabit Ethernet. IP capacity is a distinct option for the Fiber Channel system of the conventional SAN [5]. Advocates of IP-based stockpiling claim that it offers various advantages over the Fiber Channel elective, and will advance the far reaching appropriation of SANs that was anticipated when they were initially presented.

Long separation systems administration is institutionalizing on the Internet Protocol (IP) because of its intrinsic steering capacities and its industry acknowledgement. Advances in Ethernet innovation, alongside the craving to rearrange preparing, equipment and backing, have made IP SANs conceivable.

The genuine offering point is having the capacity to reuse existing, effectively comprehended TCP/IP foundation to fabricate SANs. With the advances in QOS (Quality of Service) and security, the chance to impart stockpiling to the current base speaks to a noteworthy expense reserve funds in equipment, preparing and usage [5].

The topic of IP SANs is to get everything on a solitary sort of system stage. This does not so much imply that stockpiling activity will be streaming on the same system as the general information movement. From an execution viewpoint, a venture SAN exists as a different element from the general information system.



*IP-SAN Architecture*

*Fig:*

*Merits*

There are numerous motivations to pick IP SANs over its contending innovations. The key component which makes IP SANs an appealing recommendation is the expense. The expense reserve funds happen in a few ways: Common innovations between your general information and SAN systems diminish preparing and staff obtaining expenses, and the expansive introduced base of Ethernet drives the aggregate expense of proprietorship (TCO) down. This hinders the requirement for lavish Fiber Channel foundation. IP SANs can ordinarily be conveyed for around 20 percent of the expense of a fiber channel arrangement.

Riding the IP wave of innovation advancement and improvements like the presentation of 10 Gigabit Ethernet, IP SANs have accomplished an alternate skyline and a level of reasonableness and acknowledgement.

The propelled adaptability of IP SANs is demonstrated by the Internet and the Internet. IP systems convey unhindered topologies that can scale to expansive populaces.

Since there are no limits on separation with an IP foundation, it is simpler to actualize debacle tolerant arrangements. IP is by and large progressively seen as capacity interconnects for long term information replication applications due to its more noteworthy separation abilities contrasted with Fiber Channel.

While Fiber Channel host-transport connectors (HBA) must be associated specifically to the SAN switch. An IP HBA can associate with a stockpiling switch anyplace on the Gigabit Ethernet SAN. This gives more adaptability with regards to building a complex SAN.

Characteristic multi-way and failover innovation in iSCSI makes the arrangement profoundly accessible with no single purpose of disappointment.

While FC SANs are suited for just server farms, IP SANs are broadly relevant for essential stockpiling, server merging, fiasco recuperation, and circle to-plate reinforcement applications.

COMPARISION OF FIBRE CHANNEL SAN AND IP SAN:

1) COST

The iSCSI protocol runs SCSI on a TCP/IP network[10]. 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, illustrate the magnitude of cost differences for IP SAN and fibre SAN topologies:

Component	Fibre List Price of Tested	IP SAN Price of Tested
HBA	\$1000	\$400
Driver	(included with HBA)	Free for Linux, Windows, Novell, NetApp and HP-UX
Switch (per port)	\$1000	\$70-250
Network Interface Card (NIC)	N/A	\$50-100
TOTAL	\$2000	\$520-750

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.

2) PERFORMANCE

*The Environment*

[2]Microsoft's MS-Exchange Server is a to a great degree prominent application for email, workgroup planning and basic office correspondences. It is utilized broadly as a part of both substantial and little firms, and keeps running on a wide assortment of equipment [11]. 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	IP-SAN
Server	2 x 2.0 GHz Pentium 4,	2 x 2.0 GHz Pentium 4, 7200

	7200 RPM ATA Disk Drives	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 (HBA)	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)

### III. CONCLUSION

Storage networks are a natural extension of IP networks. Therefore, IP-based storage networks are inevitable and will come at the expense of other technologies, such as Fibre Channel.

An IP SAN can provide all the benefits of a higher-cost FC SAN: infinite scalability of storage for a server or group of servers; capacity consolidation across storage devices on the subnet; aggregation of storage allowing higher utilization; offloading of storage traffic from the main LAN; local or remote disaster recovery; disk-to-disk backup, snapshots, and failover. FC SANs offer better performance but this performance comes at a very high cost. IP SANs offer slightly less performance at a comparatively low cost. Considering tradeoffs between cost and performance, IP SAN are gaining more popularity.

However, IP SANs can achieve the benefits without the cost, infrastructure hassle, and distance limitations of a Fibre Channel SAN. Fibre Channel SAN will eventually be replaced by IP SANs it was only a matter of time.

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