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A Study on Merits and Demerits of SAN Protocols

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***Abstract*—** This paper focuses on SAN protocols and their various topologies, protocol layers, addresses. This article gives the description of rules and regulation of SAN that work in networks of storage. This study paper deals with the study of SAN and DAS, how they work in the open industrial network. This paper surveys on protocols and their working in storage. DAS have SATA, SCSI and SAN have uses FC, FCOE protocols.

Keywords- Fibre Channels,Fibre Channel over Ethernet, Network File System, Internet Small Computer System Interface, Serial AT Attachment

I. INTRODUCTION

In this recent year, IT infrastructure changes rapidly. In the world of changing environment storage of data is necessary and compulsory. So we require protocols to store the data and use efficient data networks. These papers remove misconception and misunderstand of SAN system that SCSI and ATA are same technology. The two class of protocols which have different aims and ambitions. These protocols have different features and characteristics. [1][2]

A. SAN (storage area network)

- It is a network that connects storage devices to multiple servers.
- It provides block level data storage.
- It has its own network storage devices.

B. DAS (Direct attached storage)

- It is a technology that connects to one computer (host machine)
- It is not accessible to other computers.
- Ex –internal hard drive in a laptop

II. LITERATURE REVIEW

A. ATA

It is Advanced Technology Attachment. It is disc drive network that helps controller to drive.

- Types:

1. ATA: also called as IDE. It supports 1 or 2 hard disks a 16-bit interface
2. ATA-2: Support faster PIO modes and DMA modes
3. ATA-3: Minor revision to ATA-2

B. SATA

It is Serial AT attachment that connects hard drives a computer system. It supports at the host swapping. It has advanced host controller interface service. It also used in windows drivers who have a logo of SATA have IDE simulation mode. Windows, Mac OS X, Linux all have AHCI mode which allowed access to SATA's advanced features.

The SATA has shared and parallel disc when HDD have installed. The communication between adapters and devices take place with high serial cable. Its specification gets derived from SATA-IO. It has seven signal pair conductors. It has the maximum cable length of 39.37 inches. SATA cables are easier to manage and have less cost than PATA cables. SATA connectors have designed for easy connectors for such features like Hot Docking. SATA includes CRC (cyclic redundancy check) which checks single as well double digit errors.[3][4][5]

When an error is detected, then they retry of ending failed packet tack place. It is being done by whose packet size is up to 8KB. It consists of a bidirectional signal. Its transmission rate is 1.5GBPS to 3.0GBPS. It also supports external command of ATA. The processing of signal has performed at the voltage 500mV. It gets kept into low power modes for recovering back to normal operations. Drives and ports signal are being used to host for any event notification. It has a full support of Native Command Queuing (NCQ) to support commands and protocols. They can expand the number of ports for various operations like attaching and accessing. The same port can allow two hosts for implementing fail operations. It is a technology which has a dual simplex mode in which data is transfer into both directions. SATA processing has based on the transmission of data, and another is feedback of data.[6][7][9]

C. FC

It is a technology used for transmitting the data between devices .it transfer rate is 4GBPS and 10GBPS which are especially for connecting computers servers to shared storage devices and controllers and drives. It is three times faster than SCSI. If the medium is using the optical fiber, then it is being used up to 10 km. Shorter distances are also using coaxial cable and twisted pair cable. Large critical environments are using it. It is being designed to improve the speed of workstation, mainframe computers, peripheral devices, etc. It is not expensive by providing speed, reliability, connection at very low cost. Here we observe point to point connection which connects both channel and network data communication. They can handle a large number of tasks. It supports services which used to transport level services such IP and SCSI. These protocols lead to connectionless services, and this leads to high-speed data transferring. The data is transfer in the form of packets with the help of a shared medium. It maintains speed and less flexibility overhead of a channel. It has various features like circuit and packet switching, full duplex which supports both optical and fiber technology

D. ISCSI

It is the internet a small computer system interface. It transfers TCP/IP packet by a smaller computer system. It is a transport layer protocol which gets used by sending of packets an end to end over LAN network.

The SCSI commands get employed by IP network that transfers data over an intranet and to manage storage over long distances. It can enable location-independent storage and retrieval. The protocols allow sending commands to storage devices on remote servers. It presents block rather than the accessing blocks. The accessing blocks get done for networking I/O operations. The encapsulation is process being done by remote accessing blocks. It may be the dependent or independent initiator and target. It provides universal access to LAN and MAN for network storage. It helps in IPWAN and existing architectures. It is a protocol which is helpful for I/O devices and storage devices.

- Types:

1. Initiators:

It starts the communication. It sends request commands.

2. Targets:

It responds the request command.

E. FCOE

It is Fiber Channel over Ethernet. It is a technology that has FC frames which allow 10GB Ethernet networks. It maps directly to fiber channel which is being used by Ethernet forwarding process. It replaces the protocols FC0 and FC1 with having native FC constructs. Data center used Ethernet networks and FC channels for storage.it operate over protocol stack rather than in TCP and IP. It follows the priority- based flow control mechanism to reduce frame loss. In FCOE, fiber channels act differently at protocol level by operating over Ethernet above the protocol stack. It has three extensions phases. The wrapping of fiber frames to Ethernet frames to extend the Ethernet protocol to map the fiber channels port id to Ethernet mac address. With the help of converging network adapters, computers can connect to FCOE. Network is doing the wrapping of FCOE in software

F. NFS

It is network file system. It can be work in a group if one fails then other will work. IT uses TCP which resends lose packets.

It presents a file over a network. It local data is available to host and is access through metadata. It has a standard system which gets accessed through the adapter. It also requires a trusted host which have hardware coverage and network coverage. It can run over 1GB or 10GB. It also supports UDP but needs some external help. It supports jumbo frames for network traffic which can improve performance features in certain situations. There is no load balancing on it because of a single session. Aggregate bandwidth gets achieved by configuring multiple paths. Accessing is gets done via data stores. It varies array to array full copy array allocated space. It has the maximum support of data store. It size is maximum 64TB, but it must have NAS support.it has maximum no of 256 devices. It supports DRS control over the file system. It requires IP for configuring. The host granted to access the data stores appear immediately.

In this, no additional hardware is being required and can be used in equipment and network components. Sun Microsystem developed it in 1984. It allows a user to access a file system over a computer network. It is also a client-server process which uses RFC to send request between client and server. It is designed to be independent on any OS, computer systems or network. This protocol helps to give remote access function to the restricted user. It performs operating system function like level route directory. It provides procedurally oriented service to remote services. It gets used as transport protocol. The NFS protocol gets written in RFC description language. The NFS protocol gets designed as a stateless server which means no servers maintains the contract.[17]

III. STUDY FINDINGS

A. Merits

The protocols are accessible for configuration such as LUN are present for data stores or RDM. It is support of DRS. No additional hardware is necessary. It can use existing equipment and component. The administrator either network skills can troubleshoot with web tools such as wire shark. They are inexpensive to implement. It gets used for data center bridging. Even if the frame gets lost, they can work. They are useful in enabling different traffic class to run on the same network. They can support of I/O controls. It allows handshaking authentication, so senders and receiver trust each other. VLAN is being used for isolate the traffic. Zoning gets used for isolation between hosts and FCOE.

B. Demerits

There is a lack of binding with ISCSI. There are security issues in because of the absence of encryption.it can cause additional overhead. Because of TCP latency will also be present. Because of single session configure process. FC runs on 8GB which slower than other networks. There is no virtual MSCS support.

FC requires a switch, array and storage devices. It requires additional management overhead. It does not use IP routing. It requires a dedicated host for multipath. It follows around robin scheduling. It has better load performance load when multiple paths are accessed. NFS version 3 does not have multipath and security features. NFS also causes CPU overhead

IV. CONCLUSION AND FUTURE SCOPE

This paper provides information on SAN protocols and how they work. They can achieve millions of I/O operations. Storage performance depends on the workload. Storage protocols also rely on the transaction. The amount of data supports relatively small transfer process. It firms must view the cost of storage when deals with large data set. Storage systems using SATA systems will increase their marketplace.

Growing customer demand may affect the performance of the storage. With an increase of powerful servers, the requirement of storage will rise. In future for faster accessing customers may demand more flexibility in protocols.

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