Local Area Network

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HISTORY

Personal Computer LANS. A common LAN configuration is one that supports personal computers. Due to its low cost, individuals procure PCs for departmental applications.LANs for the support of personal computers and work stations have become nearly universal in organizations of all sizes.The key requirement is low cost.In particular, the cost of attachment to the network must be significantly less than the cost of the attached devices.

Backend Networks and Storage Area Networks. These are used to interconnect large systems such as mainframes, supercomputers, and mass storage devices. The key requirement is bulk data transfer among a limited number devices in a small area. Typical characteristics include High Data Rate, High- speed interface, Distributed access, Limited distance, Limited number of devices. A concept related to that of backend network is the storage area network (SAN). A SAN is a separate network to handle storage needs. The SAN detaches storage task from specific servers and creates a shared storage facility across a high-speed network. Here, no server sits between the storage devices and servers are linked directly to the network. The SAN arrangement improves client-to-storage access efficiency, as well as direct storage-to- storage communications for backup and replication functions.

TOPOLOGY

This term refers to the way in which the machines attached to the network are interconnected.

Bus Topology.

All stations attach, through appropriate hardware interfacing known as tap, directly to a linear transmission medium, or bus. A transmission from any station propagates the length of the medium in both the direction and can be received by all other stations. At each end of the bus is a **termina**-



Figure 1: The use of Storage Area Networks



Figure 2: Bus Topology





tor.

Tree Topology.

It is generalization of bus topology. The transmission medium is a branching cable with no closed loops. The tree layout begins at a point known as **headened.** One or more cables can start at the headened which can further branch.

In the above two topologies there are certain problems.

1) Due to broadcasting, there should be an addressing mechanism indicating for whom the transmission is intended.

2) The signals will overlap if two station on the same bus attempt to transmit at the same time.

These problems are sorted out by use frames. Each frame consists of a portion of the data that a station wishes to transmit and a header that contains the control information, where each station on the bus is assigned a unique address. Also, the station tales turns sending frames in some cooperative fashion. This involves putting additional control information into the frame header, thus, solving the second problem.





Ring Topology.

The network consists of set of repeaters joined by point to point links in a closed loop. The repeaters receives the data from one link and transmit them bit by bit on the other link. The links are unidirectional. A frame is discarded by the source station, if it reaches there while circulating. Because multiple stations share the ring, medium access control is needed to determine at what time each station may insert frames.

Star Topology.

Each station is directly connected to a common central node. Typically, each station attaches to a central node two point-to-point links, one for transmission and one for reception. if the central node operates in a broadcast fashion it is logically a bus and the central node is referred as hub. Another approach is for the central node to act as a frame switching device wherein an incoming frame is buffered an retransmitted to the destination station.

CHOICE OF TRANSMISSION MEDIUM

There are number of factors other than Topology which determine this:

1) Capacity: to support the expected network traffic.



Figure 5: Star Topology

- 2) Reliability: to meet the requirements for availability.
- 3) Types of data supported: tailored to the application.

4) Environmental scope: to provide service over the range of environments required.

LAN PROTOCOL ARCHITECTURE

Consider figure no.6. The lowest layer corresponds to physical layer of the OSI model and functions as:

1). Encoding/decoding of signals.

2). Preamble generation/removal (for synchronization)

3). Bit transmission/reception

Above this, Logical Link Control layer (LLC) and Medium Access Control MAC corresponds to Data Link layer of OSI model.

Function of LLC layer is to provide an interface to higher layers and perform flow and error control. MAC layer performs:

1). On transmission, assemble data into a frame with address and errordetection.

2). On reception, disassemble frame, and perform address recognition and error detection.

3). Govern access to the LAN transmission medium.

MEDIUM ACCESS CONTROL

This is a mean of controlling access to the transmission medium to provide



for an orderly and efficient use of the network's transmission capacity. The key parameter in any MAC technique is where and how. 'Where' refers to whether control is exercised in a centralized or distributed fashion. 'how' is constrained by the topology and is tradeoff among competing factors, including cost, performance, and complexity. We can categorize access control techniques as being either synchronous or synchronous. With, synchronous a specific capacity is dedicated to a connection. The asynchronous approach can be further divided into three categories: round robin, reservation, contention.

Round Robin:

Each station in turn is given the opportunity to transmit during which the station may decline. The station, when it is finished relinquishes is turn, and the right to transmit passes to the next station. It is efficient when there are many stations to transmit over a extended period of time. If the stations are few, there is a considerable overhead in passing turns. Problem persists if most of them are idle.

Reservation:

Suited for stream traffic. Time on the medium is divided into slots. A station reserves future slots if it is wishing to transmit for an extended or even for

indefinite period.

Contention:

Appropriate for bursty traffic. No control is exercised to determine whose turn it is. They are easy to implement and efficient up to moderate loads but collapses under heavy load.

MAC FRAME FORMAT

Following are the fields:

MAC Control: contains control information such as priority level needed for functioning of the MAC protocol.

Destination MAC Address

Source MAC address

LLC: The LLC data from the next higher level.

CRC

BRIDGES It is a device that provides a mean to interconnect two similar LANs. there are several reasons for the use of multiple LANs connected by bridges:

Functional Security Critical Mass Geography