CATEGORIES OF N/W

SUBJECT:DATA COMMUNICATION & OPTICAL FIBERS

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CATEGORIES OF NETWORKS

Today when we speak of networks, we are generally referring to two primary categories:

local-area networks and wide-area networks. The category into which a network falls is determined by its size. A LAN normally covers an area less than 2 mi; a WAN can be worldwide. Networks of a size in between are normally referred to as metropolitan area networks and span tens of miles.

LOCAL AREA NETWORK

- A local area network (LAN) is usually privately owned and links the devices in a single office, building, or campus .
- Depending on the needs of an organization and the type of technology used, a LAN can be as simple as two PCs and a printer in someone's home office; or it can extend throughout a company and include audio and video peripherals. Currently, LAN size is limited to a few kilometers

LANs are designed to allow resources to be shared between personal computers or workstations.

The resources to be shared can include hardware (e.g., a printer), software(e.g., an application program), or data.

A common example of a LAN, found in many business environments, links a workgroup of task-related computers, for example, engineering workstations or accounting PCs. One of the computers may be given a large capacity disk drive and may become a server to clients.

Software can be stored on this central server and used as needed by the whole group.

In this example, the size of the LAN may be determined by licensing restrictions on the number of users per copy of software,or by restrictions on the number of users licensed to access the operating system.

In addition to size, LANs are distinguished from other types of networks by their transmission media and topology. In general, a given LAN will use only one type of transmission medium.

The most common LAN topologies are bus, ring, and star.

Early LANs had data rates in the 4 to 16 megabits per second (Mbps) range.

Today, however, speeds are normally 100 or 1000 Mbps

WIDE AREA NETWORK

A wide area network (WAN) provides long-distance transmission of data, image, audio, and video information over large geographic areas that may comprise a country, a continent, or even the whole world.

A WAN can be as complex as the backbones that connect the Internet or as simple as a dial-up line that connects a home computer to the Internet.

We normally refer to the first as a switched WAN and to the second as a point-to-point WAN

The switched WAN connects the end systems, which usually comprise a router (internetworking connecting device) that connects to another LAN or WAN.

The point-to-point WAN is normally a line leased from a telephone or cable TV provider that connects a home computer or a small LAN to an Internet service provider (lSP).

This type of WAN is often used to provide Internet access.

An early example of a switched WAN is X.25, a network designed to provide connectivity between end users.

X.25 is being gradually replaced by a high-speed, more efficient network called Frame Relay.

A good example of a switched WAN is the asynchronous transfer mode (ATM) network, which is a network with fixed-size data unit packets called cells.

Another example of WANs is the wireless WAN that is becoming more and more popular.

METROPOLITAN AREA NETWORKS

- A metropolitan area network (MAN) is a network with a size between a LAN and a WAN.
- It normally covers the area inside a town or a city.
- It is designed for customers who need a high speed connectivity, normally to the Internet, and have endpoints spread over a city or part of city.
- A good example of a MAN is the part of the telephone company network that can provide a high-speed DSL line to the customer.
- Another example is the cable TV network that originally was designed for cable TV, but today can also be used for high-speed data connection to the Internet

INTERCONNECTION OF NETWORKS: INTERNETWORK

Today, it is very rare to see a LAN, a MAN, or a LAN in isolation; they are connected to one another.

When two or more networks are connected, they become an internetwork, or internet.

EXAMPLE

Assume that an organization has two offices, one on the east coast and the other on the west coast. The established office on the west coast has a bus topology LAN; the newly opened office on the east coast has a star topology LAN. The president of the company lives somewhere in the middle and needs to have control over the companyfrom her horne.

To create a backbone WAN for connecting these three entities (two LANs and the president's computer), a switched WAN (operated by a service provider such as a telecom company) has been leased. To connect the LANs to this switched WAN, however, three point-to-point WANs are required. These point-to-point WANs can be a high-speed DSL line offered by a telephone company or a cable modern line offered by a cable TV provider

PROTOCOLS AND STANDARDS

- Protocols
- In computer networks, communication occurs between entities in different systems.
- An entity is anything capable of sending or receiving information. However, two entities cannot simply send bit streams to each other and expect to be understood.
- For communication to occur, the entities must agree on a protocol.
- A protocol is a set of rules that govern data communications.
- A protocol defines what is communicated, how it is communicated, and when it is communicated.
- The key elements of a protocol are syntax, semantics, and timing.

SYNTAX

- The term *syntax refers to the structure or format of the data, meaning the* order in which they are presented.
- For example, a simple protocol might expect the first 8 bits of data to be the address of the sender, the second 8 bits to be the address of the receiver, and the rest of the stream to be the message itself.

SEMANTICS

The word *semantics refers to the meaning of each section of bits*.

How is a particular pattern to be interpreted, and what action is to be taken based on that interpretation

TIMING

- The term *timing refers to two characteristics*:
- *when data should be sent* and how fast they can be sent.
- For example, if a sender produces data at 100 Mbps but the receiver can process data at only 1 Mbps, the transmission will overload the receiver and some data will be lost.

STANDARDS

- Standards are essential in creating and maintaining an open and competitive market for equipment manufacturers and in guaranteeing national and international interoperability of data and telecommunications technology and processes.
- Standards provide guidelines to manufacturers, vendors, government agencies, and other service providers to ensure the kind of interconnectivity necessary in today's marketplace and in international communications.

Data communication standards fall into two categories: *de facto (meaning* "by fact" or "by convention") and *de jure (meaning "by law" or "by regulation").*

- De facto

Standards that have not been approved by an organized body but have been adopted as standards through widespread use are de facto standards.

De facto standards are often established originally by manufacturers who seek to define the functionality of a new product or technology.

- De jure.

Those standards that have been legislated by an officially recognized body are de jure standards.