

NETWORKS

DATA COMMUNICATION

Data communication can be defined as the group of technologies that enable computers to pass data electronically to one another. The concept of Data Communication evolved from sharing the computation power of a computer along with various resources available in a computer environment such as printers, hard- disks etc. Data Communication can be used to transfer the information within one building, one campus, one city, across cities, countries or continents. Wherever there is a physical constraint to connect two remote points, Data Communication has become a solution. The need for Data Communication has increased many times because of increased demand for exchange of information across the world.

NETWORK

A Network and Data Communication System that links terminals, microcomputers mini or mainframes so that these can operate independently but also share data and other resources.

In other words, a network is a way or means of transmitting or exchanging information from one or more sources. Simply, network means connecting two or more computers for sharing information and resources

NETWORK APPLICATIONS

A network can convert a group of isolated users into a coordinated multiuser system. Anyone who is having access to any network can easily and legally access or share any resources like data, peripherals or softwares with other users.

Networks thus, can help any organisation run more effectively, efficiently and economically.

The applications of networks are –

1. **Distributed Computer Systems** – The most important advantage of networks is that all computers are not necessarily placed at one particular location but can be located at different sites.
2. **Remote Data Entry** – Data entry can be done from any one of the computers connected to the network.
3. **Remote Data Inquiry** – From any one of the computers, the data can be accessed and viewed.
4. **Remote Job Entry** – the programs can be written or run from any computer connected to the network.
5. **Database Sharing** – Many users can access simultaneously a file without corrupting the data.
6. **Network Resource Sharing** – Network resources like printers, plotters, storage spaces etc. can be shared by the computers hooked to the network.
7. **Electronic-Mail (E-Mail)** – E-Mail system basically used for sending message electronically to individuals or group of individuals in an inter and intra office environment. Other applications based on it, include multimedia mail, database access, document sharing, fax routing etc.
8. **Subscriber Services** – Many subscribers can access a particular type of database provided by some agency on the payment of some fees.
9. **Banking Services** – Different branches of any bank located at different places, connected to each other through network provide instant transaction from any one of these branches.
10. **Telecommuting** – In the latest trend of running business, workers at home are linked to their company's computer and they are performing their jobs from their homes only.
11. **Advertising** – Advertising of your products and services can be done through any one of the popular network available.

TYPES OF NETWORKS

The entire computer network can be classified into following categories –

a) LOCAL AREA NETWORK (LAN)

A LAN is a data communication network, which connects many computers of workstations and permits exchange of data and information among themselves, within a localized area usually upto a radius of 2.5 kms, typically confined to a building, or a cluster of buildings within a campus.

b) METROPOLITAN AREA NETWORK (MAN)

A network that connects various locations including suburbs in a metropolitan city. The MAN is in between LAN and WAN.

c) WIDE AREA NETWORK (WAN)

A WAN is a network that links separate geographical locations. Generally a public system connecting different cities and towns mostly through telephone links or through satellite.

The main difference between a LAN and WAN is that, the LAN is under the complete control of the owner, whereas the WAN needs the involvement of another authority like the Telephone Company.

LANs are also able to handle very high data transfer rates at a low cost because of limited space covered.

LANs have a lower error rate than WANs.

LAN TOPOLOGY

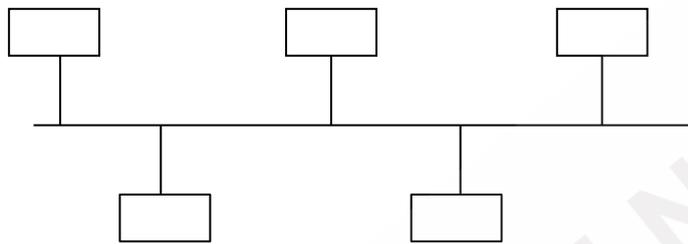
A network topology refers to the physical layout of the network in which all the devices are connected. Although there are several topographical designs are used in LAN but most of these are based on the following three types of

topologies

BUS Topology

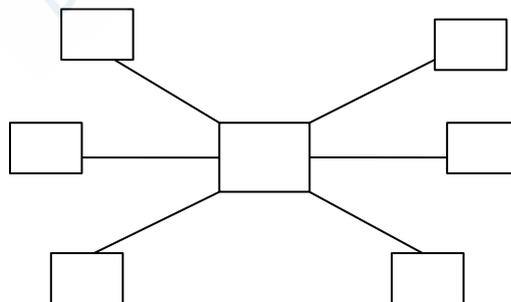
In this topology, all stations are connected to a single communication line, which is referred as a bus.

On a bus network, there is no central controller and all stations share the same medium. A break in the bus can be difficult to locate and these can be expanded easily by simple lengthening the bus wire.



STAR Topology

This Topology, a number of stations are connected directly to a central station or controller. The central controller manages and controls all communications between stations on the network. A station passes the information to the central controller and then the central controller passes the information to the destination station. Each node has a Point-to-Point link with a central controller.

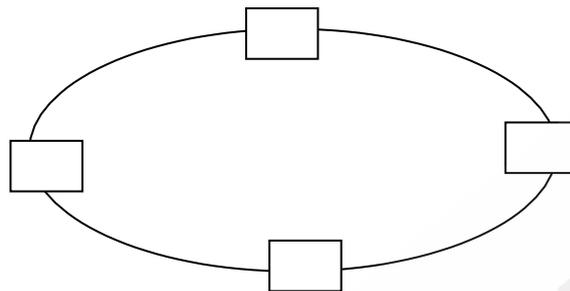


RING Topology

In this network topology, each station attached to an adjacent station using

Point-to- Point links forming a physical ring. The information travels in one direction and each station regenerates and then re-transmits the information on the ring.

Failure of a station in a ring disrupts the ring because the information is not regenerated. Expansion and deletion of the station from the ring is very difficult.



NETWORK CONFIGURATION

A network is made up of hardware as well as software components specialized in nature to perform several functions of network.

HARDWARE

The basic hardware components of network are:

SERVER: A server is an important component of a dedicated server network that controls one or more resources. The server runs the network operating system and offers network services to users at their individual workstations.

Three types of servers used in LANs are:-

- File Server
- Printer Server
- Modem Server

The File server is used to share storage spaces for files, Printer server is used to handle printing works of all workstations and Modem Server is used to share modem by all connected workstations.

WORKSTATIONS

When a computer is connected to a network, it becomes a node on the network and is called a workstation or client. These nodes may be of 3 types:-

Dumb – these nodes can only receive and send data.

Smart – these nodes can receive, send data and edit data as well

Intelligent – these nodes can receive, send, edit data and can run programs independently.

NETWORK INTERFACE CARDS

Each computer attached to a network requires a network interface card that supports a specific networking scheme such as Ethernet, ArcNet or TokenRing. The network cable is attached to the network interface card. It contains the rules and logic to access the LAN.

TRANSMISSION CHANNEL

- a) **Twisted Pair Cable:** As the name suggests, it is a coiled wire consisting of two insulated copper wires, twisted on each other. This type of wire is easiest one to lay and used for short and medium range network. Advantage of this cable is that of its noise immunity and low transmission rate.
- b) **Coaxial Cable:** This type of cable is made up of one or more small cables in a protective covering. Advantages of using this type of cable are that these are immune to electrical noise and capable of high data transfer rate. These are used for long distance range.
- c) **Fiber Optic Cable:** This cable uses light impulses that travel through clear, flexible tubing half the size of human hair. These cables are reliable for high data transfer rate over a longer distance.

- d) **Telephone Cable:** Data transmission through telephone cables is in analog form to convert digital form (on-off electronic pulse) of data into analog form (electric wave) or vice versa, a special hardware MODEM (modulation- demodulation) is used.

ETHERNET

Ethernet is a protocol that controls the way data is transmitted over a local area network (LAN). It uses wires (meaning it is not a wireless technology).

The wires used for a LAN are mostly those headed by an RJ-45 jack, which is similar to the jack plugged into your telephone set, but twice as big. Some Ethernet networks use coaxial cables, but that's rarer, and present in rather large LANs, which span over areas between buildings. If you want to see what a coaxial cable is like, look at the thick cable that links your TV antenna to your TV set.

Ethernet is by far the most popular LAN protocol used today. It is so popular that if you buy a network card to install on your machine, you will get an Ethernet card, unless you ask for something different, if of course that different protocol is available.

ARCNET

Short for Attached Resource Computer network, ARCnet is one of the oldest, simplest, and least expensive types of local-area network. ARCnet was introduced by Datapoint Corporation in 1977. It uses a token-ring architecture, supports, data rates of 2.5 Mbps and connects up to 255 computers. A special advantage of ARCnet is that it permits various types of transmission media – twisted-pair wire, coaxial cable, and fiber optic cable – to be mixed on the same network.

A new specification, called ARCnet Plus, will support data rates of 20 Mbps.

HUBS

A common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets.

A passive hub serves simply as a conduit for the data, enabling it to go from one device (or segment) to another. So-called intelligent hubs include additional features that enables an administrator to monitor the traffic passing through the hub and to configure each port in the hub. Intelligent hubs are also called manageable hubs.

A third type of hub, called a switching hub, actually reads the destination address of each packet and then forwards the packet to the correct port.

What do you mean by Network protocol

In networking the communication language used by the computer device is called network protocol. Protocols serve as a language of communication among network devices. Network protocols like HTTP, TCP/IP and SMTP provide a foundation that much of the internet is built on. A network protocol defines rules and conventions for communication between the network devices. Protocols for computer networking generally use packet switching techniques to send the receive messages in the form of packets.

Network protocols include mechanisms for devices to identify and make connections with each other, as well as formatting rules that specify how data is packaged into messages sent and received some protocols also support message acknowledgements and data compression designed for reliable and or high- performance network communications.

What is TCP/IP

Transmission control protocol (TCP) and Internet Protocol (IP) are two distinct network protocols technically speaking. TCP/IP are so commonly used together, and has become standard terminology to refer to either or both protocols. It provides connection-oriented communication between network devices. It is commonly used both on internet and in home computer networks.

What is a Hub

This is a hardware device that is used to network multiple computers together. It is a central connection for all the computers in a network, which is usually Ethernet- based. Information sent to the hub can flow to any other computer on the network. If you need to connect more than two computers together, a hub will allow you to do so. Hub is a common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. If you only need to network two computers together, a simple crossover Ethernet cable will do the trick.

An **Ethernet hub, active hub, network hub, repeater hub or hub** is a device for connecting multiple twisted pair or fiber optic Ethernet devices together and making them act as a single network segment.

General Characteristics of Hubs

A hub is a small rectangular box, often made of plastic that receives its power from an ordinary wall outlet. A hub joins multiple computers (or other network devices) together to form a single network segment. On this network segment, all computers can communicate directly with each other. Ethernet hubs are by far the most common type, but hubs for other types of networks such as USB also exist. A hub includes a series of ports that each accept a network cable. Small hubs network four computers. They contain four or sometimes five ports, the fifth port being reserved for “uplink” connections to another hub or similar device. Larger hubs

contain eight, 12, 16 and even 24 ports.

Different types of hubs exist:

- **Passive** - do not amplify the electrical signal of incoming packets before broadcasting them out to the network.
- **Active** – do perform this amplification, as does a different type of dedicated network device called a repeater.
- **Intelligent/manageable hub** – features that enables an administrator to monitor the traffic passing through the hub and to configure each port in the hub
- **Switching hub** – reads the destination address of each packet and forward it to correct port.

What is NETWARE

NetWare, made by Novell, is a widely-installed network server operating system. Initially very successful in installing its products in large and small office local area networks (LANs), Novell redesigned (or at least refeatured) NetWare to work successfully as part of larger and heterogeneous networks, including the Internet. A early – and primary competitor was the Microsoft Windows NT operating system.