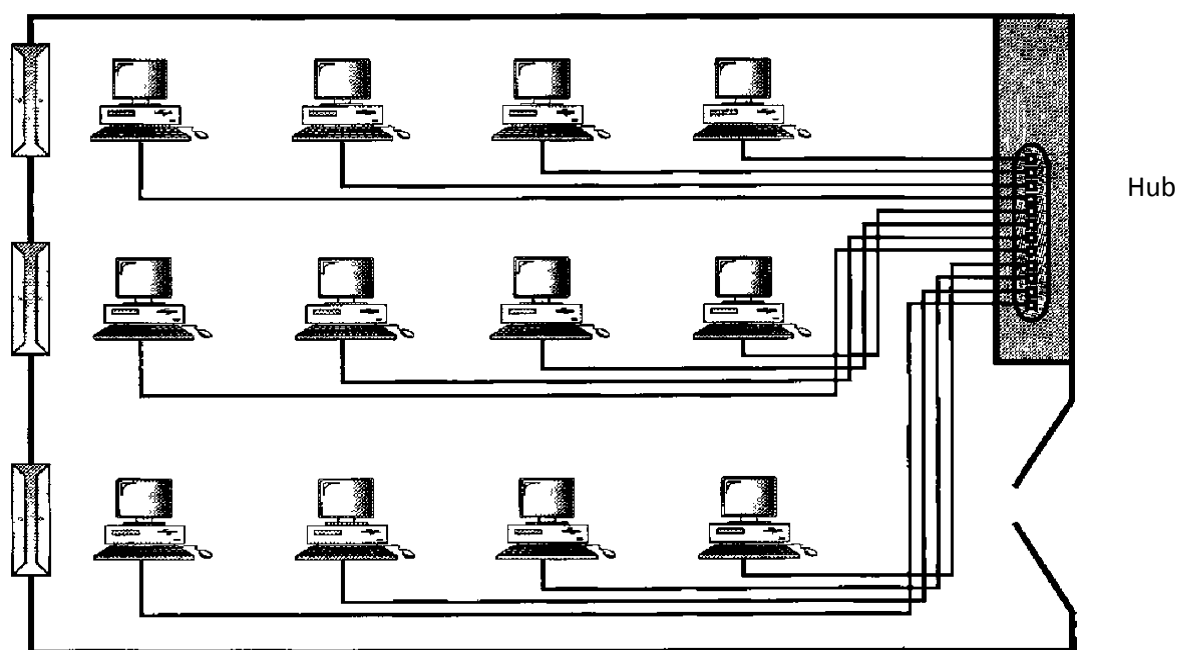


Categories Of Networks:-

Today when we speak of networks, we are generally referring to three primary categories: **local-area networks**, **metropolitan area networks** and **wide-area networks**. The category into which a network falls is determined by its size.

1- Local Area Networks (LAN):-

A local area network (LAN) is usually privately owned and links the devices in a single office, building, or campus (see Figure). 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.



- Ethernet, for example, is a bus – based broadcast network with decentralized control. Computers on Ethernet can transmit wherever they want to, if two or more packets collide, each computer just waits a random time and tries again later. 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.

2- Metropolitan Area Networks (MAN) :-

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.

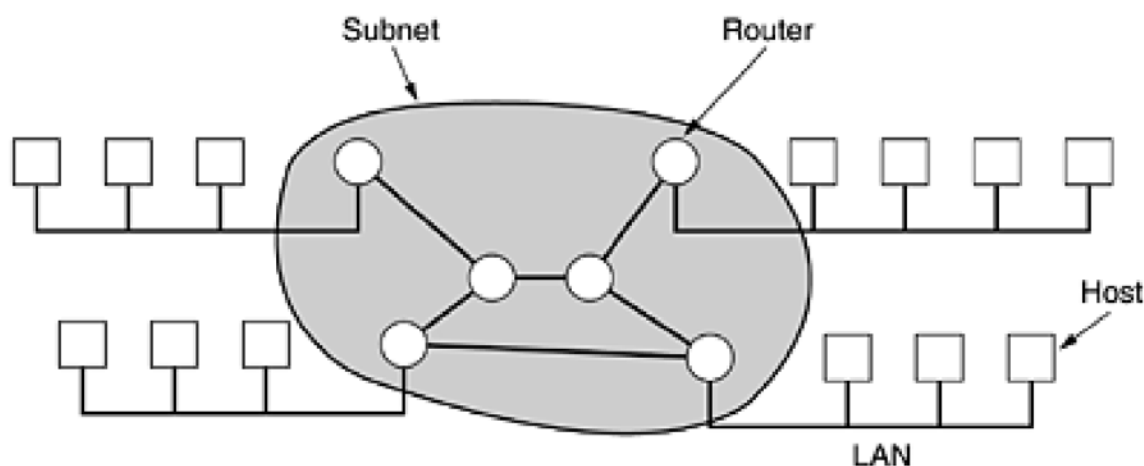
3- Wide Area Networks (WAN) :-

- WAN spans a large geographical (country or continent).
- It contains a collections of machines intended for running user programs (this machine traditionally called Host).
- Hosts are connected by a communication subnet.
- The hosts are owned by the customers, whereas the communication subnet is typically owned and operated by a telephone company or internet service provider.
- The job of the subnet is to carry messages from host to host.
- The subnet Consists of distinct components:-

a) Transmission lines:- moves bits between machines (copper wire, optical fiber, or radio link).

b) Switching elements:- are specialized computers that connect three or more transmission lines. When data arrive on an incoming line, the switching elements must choose an outgoing line on which to forward them. The name Router is used for switching element.

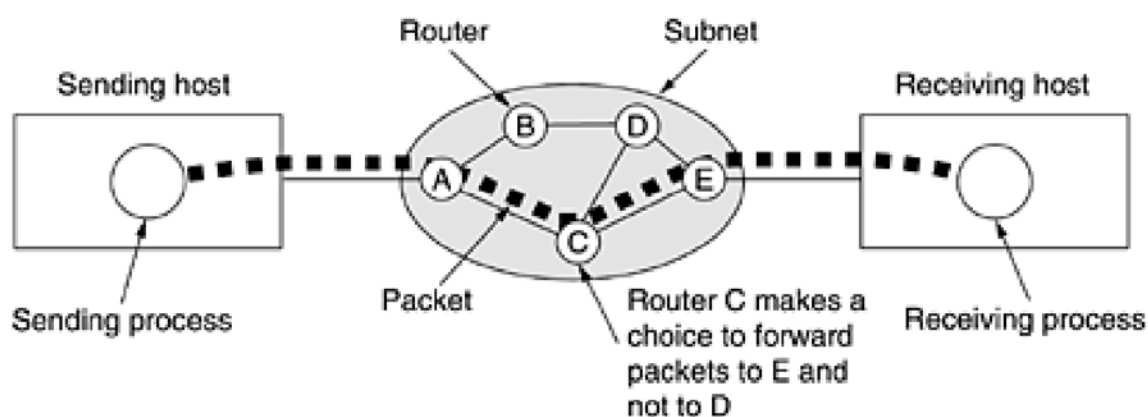
- The collection of communication lines and routers (but not the host) from the subnet.



Relation between hosts on LANs and the subnet.

- In most WANs, the network contains numerous transmission lines, each one connecting a pair of routers. If two Routers that don't share a transmission line wish to communicate, they must do this indirectly, via other routers. When a packet is sent from one router to another via one or more intermediate routers the packet is received at each intermediate router in its entirety, stored there until the required output line is free, and then forwarded. A subnet organized according to this principle is called Store – and – forward or Packet switched subnet . 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.

The principle of a packet-switched WAN is so important, when a process on some host has a message to be sent to a process on some other host, the sending host first cuts the message into packets, each one bearing its number in the sequence. These packets are then injected into the network one at a time in quick succession. The packets are transported individually over the network and deposited at the receiving host, where they are reassembled into the original message and delivered to the receiving process. A stream of packets resulting from some initial message is illustrated in figure below.



A stream of packets from sender to receiver.

In this figure, all the packets follow the route ACE, rather than ABDE or ACDE. In some networks all packets from a given message must follow the same route; in others each packet is routed separately. Of course, if ACE is the best route, all packets may be sent along it, even if each packet is individually routed.

Routing decisions are made locally. When a packet arrives at router A, it is up to A to decide if this packet should be sent on the line to B or the line to C. How A makes that decision is called the routing algorithm. Many of them exist.

A second type of WAN can be as simple as a dial-up line that connects a home computer to the Internet. We normally refer to this type a point-to-point 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 (ISP). This type of WAN is often used to provide Internet access.

4- Wireless Networks:-

Wireless N.Ws can be divided into 3 main categories:-

A- **System Interconnection**:- is all about interconnecting the components of a computer using short – range radio. A short – range wireless network called Bluetooth used to connect components to computers without wires. In the simplest form, system interconnection networks use the master – slave paradigm. The system unit is normally the master, talking to the mouse, keyboard etc. as slave. The master tells the slaves what addresses to use, when they can broadcast, how long they can transmit, what frequencies they can use and so on.

B- **Wireless LANs** :- These are systems in which every computers has a radio modem and antenna with which it can communicate with other system. Wireless

LANs are becoming increasingly common in small offices and homes where installing Ethernet is considered too much trouble.

- C- **Wireless WANs** :- The radio network used for cellular telephone is an example of a low – bandwidth wireless system. This system has already gone through three generations. The first was analog and for voice only. The second was digital and for voice only. The third is digital and is for both voice and data. In a certain sense, cellular wireless network are like wireless LANs except that the distances involved are much greater and the bit rates much slower. Wireless LANs can operate at rates up to about 50 mbps over distances of ten meters. Cellular systems operate below 1 mbps over distances measured in kms.

5- Home Networks:-

Home networks are on the Horizon. The fundamental idea is that in the future most home will be setup for networking. Every device in the home will be capable of communicating with every other device and all of them will be accessible over the Internet.

6- Interconnection of Networks: Internetwork :-

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

As an 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 company from her home. 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 modem line offered by a cable TV provider as shown in Figure below.

