

CHAPTER 4:5

NETWORK AND INTERNET

4.1 NETWORK - AND INTRODUCTION

A **Network** is a system of interconnected computers that can communicate with one another. Networks allow users to share peripheral devices (peripheral devices are nothing but input-output devices connected to the computer), program and data. A Network need not be only of interconnected computers but, even interconnected telephones or any communication device that can communicate with each other and share the existing resources.

Many computer networks are served by a host computer (or simply host) called Server. A “**Server**” is a computer shared by several users in a network. A “**Node**” is a device that is attached to a network. A node may be a microcomputer through which a user can communicate with the server and share the resources. A node may also be resources like storage device or any peripheral device.

There are also computer networks connected as **Peer - to - Peer**. The word **Peer** denotes - one who is equal in standing with another. This type of Network does not have any computer as Server or Node. Microcomputers in a peer-to-peer network communicated directly with one another without relying on a server.

4.1.1 Advantages of Networks

a) Sharing of peripheral devices: Laser Printers, Hard disk drives and Scanners are examples of peripheral devices. All these devices cannot be connected to each and every computer as they are very expensive. Hence, these devices can be shared by many users through a network.

b) Sharing of Programs and data: In many organizations, people use almost the same software and access the same data. If this software and data were made available for individual users

separately, then it is a wastage of memory. Hence, by sharing the software and data the usage of memory can be minimized, thereby minimizing the expense.

c) Better Communication: In the digital world, information can be transferred within a fraction of a second over long distances. And one of the greatest features of networks is Electronic Mail (E-Mail) system. Thus, a company can eliminate the delays encountered with standard postal services or with telephone tag, by using E-Mail services.

d) Security of information: Before networks became commonplace, an individual employee was storing information in his or her desktop computer which was not secured. But today, such data or information could be backed-up or duplicated on a network storage device, shared by others.

4.1.2 Types of Network

Based on the size, the Networks are classified into three types:

- (a) Local Area Networks (LAN)
- (b) Metropolitan Area Network (MAN)
- (c) Wide Area Network (WAN)

a) **Local Area Network** very popularly called as **LAN** and is a privately owned network that serves users within a single building as an office, or a group of buildings closes together as a college campus. LANs are distinguished from other kinds of networks by three characteristics

- i. Size
- ii. Transmission technology
- iii. Topology.

b) **Metropolitan Area Network**, very popularly called as **MAN** is a communication network covering a large geographic area when compared to LAN, like a city or suburb. A MAN can support both data and voice, and might even be related to the local cable television

network. Cellular phone systems are also those systems that come under this type of Network. A MAN is basically a bigger version of a LAN covering a group of nearby corporate offices in a city and might be either private or public.

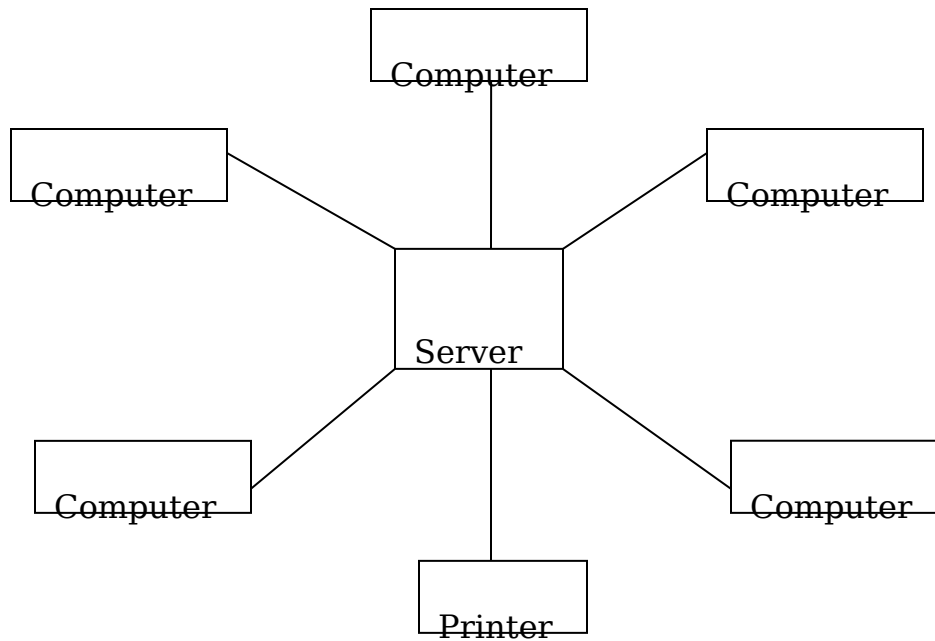
c) **Wide Area Network**, very popularly called **WAN** is a communication Network spanning a huge geographical area like a state, country or continent. It contains a collection of machines intended for running user (i.e., application) programs. The Internet links together hundreds of computer WANs.

4.1.3 Network Topology

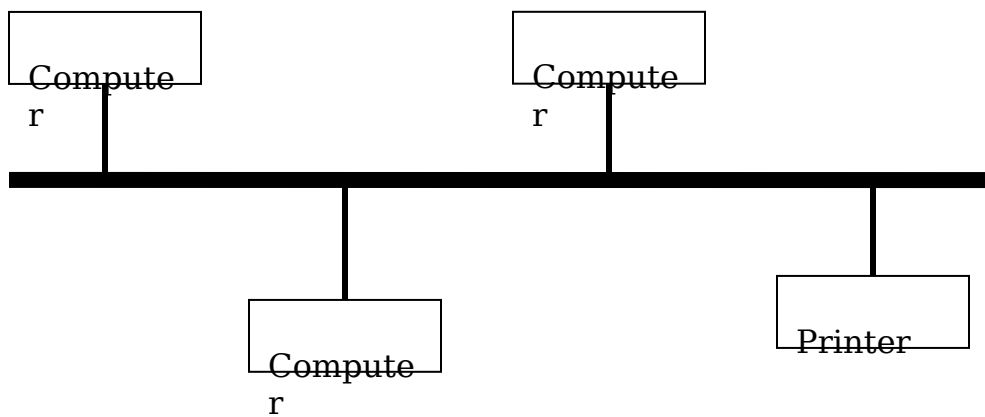
Networks can be laid out in different ways. The Physical layout or shape of a Network is called Topology. The different network topologies are:

- (a) Star topology
- (b) Bus topology
- (c) Ring topology

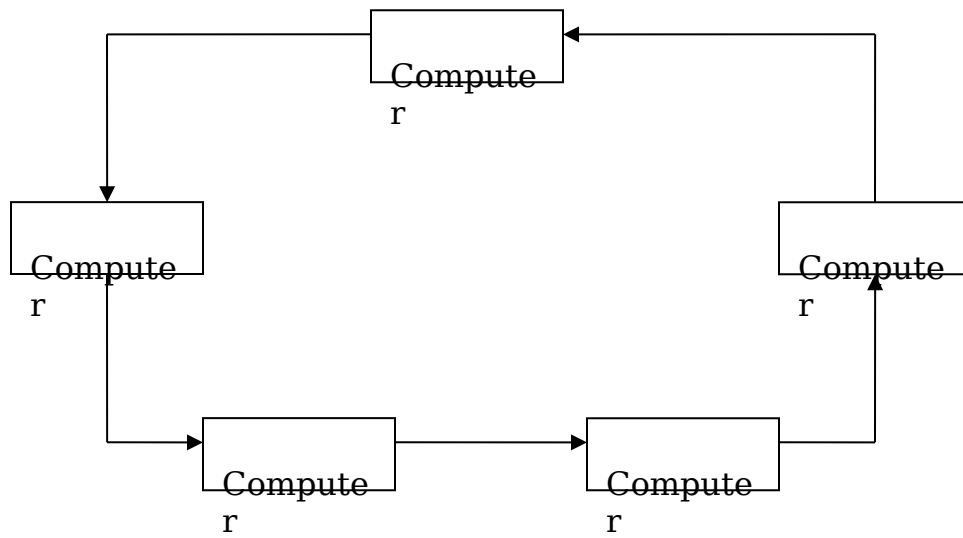
a) **Star topology** is one in which all microcomputers and other communication devices (nodes) are connected to a central hub, such as a Server or a Host computer via cables. This creates a fault-tolerant system, that is able to survive if one or two of the workstations develops a bad link. But just like any system, a topology is only as strong as its weakest link. If the central hub or server malfunctions, the entire network fails. The advantage of a star topology is that, if a connection fails, the rest of the devices on the network will continue to operate. The disadvantage of a star topology is that the information is centralized.



b) The **Bus topology** is the simplest of the network configurations. The development of computer system architecture gives rise to the concept of a bus or highway approach to information transfer. It requires less cable than any other topology. In a Bus topology, all microcomputers and devices are connected through a common channel using co-axial cables. This layout forces every signal to be equally available to every device; thus, high traffic use will cause the network to slow. In this topology, if any connection to the node fails the entire network fails.



c) **Ring topology** is the one in which all microcomputers and other communication devices are connected in a continuous loop. Electronic messages are passed around the ring in one direction, with each node serving as the repeater, until they reach the right destination. Since all messages are flowing in only one direction; failure of a single node can compromise the entire network.



4.2 INTERNET

Internet or simply “the Net” is an international network connecting more than 140,000 smaller networks in more than 170 countries. These networks are formed by educational, commercial, nonprofit, government and military organizations. On a given day 163 million computers in 200 countries get connected to the Internet.

4.2.1 What is Internet?

The term Inter Net has been coined from two terms, Interconnection and Network.

A Network is simply a group of computers that are connected together for sharing information and resources. Several such networks have been joined together across the globe to form what is called the Internet? Thus, the Internet is nothing but a network of networks.

There is no single, generally agreed-upon answer to the question because the Internet is different for each of us:

- # It is a set of computers talking over fiber optics, phone lines, satellite links, and other media.
- # It is a place where you can talk to your friends and family around the world.
- # It is a place to get cool game demos.
- # It is an ocean of resources waiting to be mined.
- # It is a place to do research for your thesis or a business presentation.
- # It is an unlimited commercial opportunity.
- # It is a worldwide support group for any problem or need.
- # It is a gold mine of professionals in all fields sharing information about their work.
- # It is hundreds of libraries and archives that are open to your fingertips.
- # It is the ultimate time-waster.
- # It is the technology of the future that will help make our lives, and those of our children, brighter.

4.2.2 History of Internet

- ✓ In 1969, the U.S. Defense department built the Internet under the name ARPAnet (ARPA – Advanced Research Project Agency) to serve two purposes.
 - The first was to share research among military, industry and university sources.
 - The second was to provide a system for establishing communication among military units in the event of a nuclear attack.
- ✓ Soon after, other private networks came up following the design of ARPAnet.
- ✓ In 1998 the NSF (National Science Foundation) created NSFnet a network with FIVE supercomputers as a help to establish effective communication amongst universities.
- ✓ Although the Internet was originally meant for research purposes, it has now changed drastically and is mainly used for commercial purposes.
- ✓ Although there are organizations that help to manage different parts of the network, there is no single body that owns the Internet.

4.2.3 Who Owns Internet?

No single entity owns the Internet. Any single person, service, corporation, university, or government does not fund it. Every person who makes a connection, every group who's Local Area Network (LAN) becomes connected, owns a slice of the Internet. Because we have grown used to the model of centralized, cooperative utilities, such as the phone companies and the electric companies, we can comfortably compare the Internet to a utility.

The owner of the connected equipment, therefore “owns” a piece of the Internet. The telephone companies “own” the pieces that carry the packets (blocks of information). The service providers “own” the

packet routing equipment. So, while no one person or entity owns the Internet, all who use it or supply materials for it plays a part in its existence.

4.2.4 Protocols

Protocols are the rules that the networks all use to understand each other. The various protocols are sets of technical specifications that let computers exchange information, no matter what kind of computers they are, or what kind of technology hooks them together. Ventures of software and hardware want their products to be useful on the Internet, and so they make sure those products understand the Internet protocols and operate within them. The term interoperability has been coined to describe the ability of a disparate type of hardware and software to work together under a common set of rules. Interoperability is a hot market commodity today, and so you'll see the term in the advertising and product reviews for all kinds of computer products. These connected networks usually use the **TCP/IP (Transmission Control Protocol/Internet Protocol)** communications suite. TCP/IP and the various protocols that are used on the Internet are important underlying concepts for the Net.

4.2.4 Applications of Internet

As rightly mentioned earlier the Internet was originally meant for research purposes, and now it has drastically changed for commercial purposes. Due to this drastic change, the applications of the Internet are increasing day by day. The following are the few applications of the Internet.

a) Accessing and obtaining Information.

The faster-growing part of the Internet is the World Wide Web (WWW). The World Wide Web or simply the Web consists of an

interconnected system of sites called Websites. To access a website, web browser software like Microsoft's Internet Explorer or Netscape Navigator has to be used. It is very difficult to conceive how much information is available on the web. Any information can be obtained from the web, say for example, about travel agents, financial investment groups, restaurant guides, mail-order shopping sites,..... etc. Online versions of newspapers and magazines are also available. How to search and find such information?

By using Web search engines information of interest can be obtained. Search engines are nothing but tools to search and find information from the web. These search engines are a software called "Spiders" to crawl around the Web for searching for information. Examples of some popular search engines are

- ✓ Alta vista
- ✓ Info seek
- ✓ Yahoo
- ✓ Google

b) Communication

The World Wide Web is getting all the headlines, but for many people, the main attraction of the Internet is the Electronic Mail or E-Mail – the fastest way of sending messages from one user to another. It hardly takes a few fractions of a second to transfer a message. There are several websites offering this service. For example,

Gmail.com
yahoo.com
hotmail.com
rediffmail.com
freemail.com

c) Marketing and Business on the Web

Many people are now putting their business online. To do this, one needs to develop a website with online order forms. This concept is developing very fast day by day. Of course, it costs money to make more money.

4.3. HARDWARE REQUIREMENTS FOR NETWORKS

In most (Wide Area) Networks, the subnet consists of two distinct components:

- Transmission lines
- Routing Elements

Transmission lines (also called circuits, channels, or trunks) move bits between machines.

The **(Routing Elements) Switching Elements** are specialized computers used to connect two or more transmission lines. When data arrive on an incoming line, the switching element must choose an outgoing line to forward them on. Unfortunately, there is no interchangeable, especially when discussing hardware on a client/server network. You may notice that the term client can also refer to software or applications.

Network medium

Network medium is the general term used to describe all of the cabling and other materials that can be used to connect a network. The most common network medium is cabling. Dozens of cable types are available, but only four are in widespread use:

- ◆ Coaxial Cables
- ◆ Fiber-Optic
- ◆ STP (Shielded Twisted-Pair)
- ◆ UTP (Unshielded Twisted-Pair)

But networks are not limited to physical cabling; many wireless media are used as well. These include Infrared and Laser devices, radio and cellular connections, microwave antennas, and digital

satellites. These media may increase the range of a network, and are often much more expensive than their physical counterparts, and are susceptible to more types of interference.

Network Interface Card (NIC)

- A NIC is the expansion card that is added to a computer to enable it to communicate on a network. The NIC translates the signals from the network into a form the computer can understand and vice versa for outgoing data.
- The NIC connects a computer with the network medium. A NIC can be a standard expansion card, a PCMCIA card, or even an external device connected through a communications port (such as a serial or parallel port).
- NIC usually have a memory buffer where information is temporarily stored and is transmitted to or from the network. This buffer enables the NIC to handle information bursting and chunking without bogging down the attached computer.

Modem

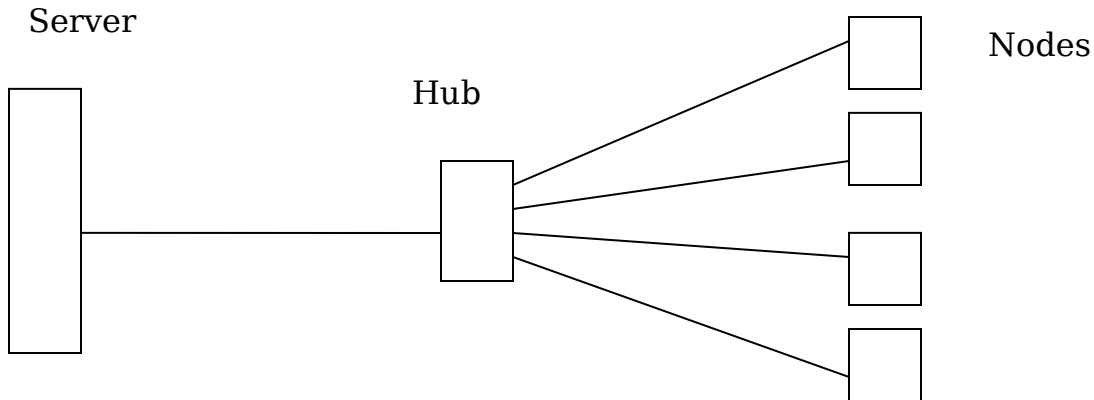
Modems are the devices used to communicate data over telephone lines. Modems get their name from their function, Modulation-Demodulation. This function is the translation of digital computer data into a signal that can be transmitted over a phone line and vice versa. Similar to a NIC, modems enable computers to communicate over the connection medium of the telephone system. Networks can be created using modems instead of NICs, but, more often, they are used to provide temporary connections for remote users.

Hubs

Hubs are also called as concentrators. They are network devices that are used to connect multiple network connections into more manageable configurations. The benefits of the hub include the following:

- ◆ Simplification of cabling

- ◆ Increased reliability
- ◆ Troubleshooting is simplified for communication problems.



Hubs can either be simply cable connecting devices or intelligent hubs. Intelligent hubs can perform additional tasks, such as fault tolerance, remote management, and re-broadcasting. The term repeater refers to an intelligent hub that can re-send or repeat garbled data.

Bridges, Routers, and Gateways

Bridges, routers, and gateways are devices that enable one network to communicate or connect with another network. These specialized devices are required to link networks that use different connection media, NOS, or platforms. They are also used to link networks located at different locations, whether in the same building, city, country, or planet.