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Computer Network and Communication

2.1 INTRODUCTION

As we all know, the advances in Information technology revolutionized almost every aspect of our life. Education, industry, banking, researches and governance to name a few are based on information. Unlike earlier days of computers where computing was meant for either stand-alone PCs or Centralized mainframe situated within the limits and boundaries of the organization only. Present scenario is devoted to Internet where computing means sharing the information across the globe. Every piece of information generated at different stages of an activity may be shared at any location on earth. This is all because of the way we process the data. Now, we store data in a more compact form and maintain it through modern concepts and communicate it using latest techniques available all around. Gone are the days when somebody needed to carry unreliable and perishable floppy drives, magnetic tapes or such media to move data from one place to another place. Thanks to the latest communication techniques that now you can see your office files even while sitting miles away from your place. Your holiday photographs with your nearest relation at different end of the country, and lot more. So, in this lesson, you will learn the basics of computer network and communication revolution.

2.2 OBJECTIVES

After going through this lesson, you would be able to:

- define data communication systems
- identify different types of communication using Networks
- differentiate between different types of Network topologies
- explain different network devices
- explain different communication protocols

2.3 DATA COMMUNICATION

In every day-to-day activity, we generate some data. For example, suppose a student is appearing in examination. He/she generates answers for the questions given. An examiner examines them and awards the marks accordingly. A teacher may further use these marks for grading the students. All these steps of examination generate data in some sort, which represent a defined meaning. Other examples could be an Excel data file, a Word processor document, music on CD, etc.

Data and information from one computer system can be transmitted to other computer systems spread across a wide geographical areas. This is done by means of electrical signals. A signal may be defined as “*electric or electromagnetic encoding of data*”. Examples could be Telephonic conversation and digital data streams etc. These signals are of two types, namely, Analog signals & Digital signals. In Analog signal the transmission pattern is in continuous wave form. It varies over a continuous range with respect to sound, light and radio waves. On the other hand, a digital signal may assume only discrete set of values within a given range. Analog signal is measured in Volts and its frequency in Hertz (Hz). A digital signal is a sequence of voltage represented in binary form. Any form of signal may be transformed into the other form. For example, a music file stored in computer (digital) transformed into audible music (analog). Though, analog signals can be communicated via any media, these are more prone to data impairments such as noise and it is more difficult to separate such discrepancies from analog signals than from their digital counterparts.

2.4 COMMUNICATION TYPES

P-to-P Communication (Point to Point Communication): Peer to peer or point-to-point transmission is done in networks where a single communication channel is not shared by all nodes. But in this one, the communication channels are only shared between only two adjoining nodes like in the case of ring topology. To send the packet (data) between two nodes the packet is passed from the source node to its adjoining node. Upon receiving the packet the address part is checked and if the packet is not intended for that node then it is regenerated and passed to its adjoining node according to the routing algorithms which play an important role in point to point communication. The packet is passed on like this till it reaches the destination. This type of transmission is done over the Wide Area Network (WAN) and Metropolitan Area Network (MAN) .

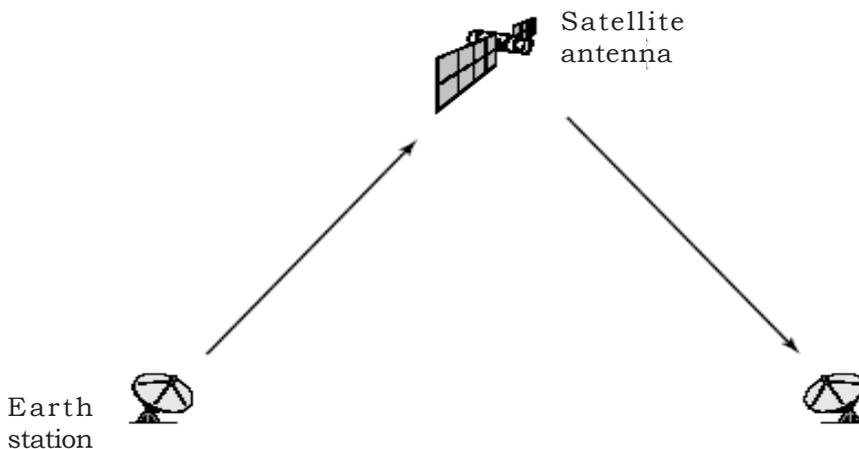


Fig. 2.1: Point to Point Communication

Broadcasting:

Broadcasting is a type of transmission technology in which the transmission of data from one node to another node is made. Broadcasting systems generally allow addressing a packet to all destinations by using a single code in the address fields. It is done on the broadcast network. A broadcast network have a single communication channel that is shared by all the other nodes, when the packet with this code is transmitted, it is received and processed by every machine on the network. An address field within the packet specifies for whom it is intended. A machine checks the address field if the packet is intended for itself

otherwise the packet will be discarded. This mode of operation is called Broadcasting. This sort of transmission is generally done on Local Area Network (LAN).

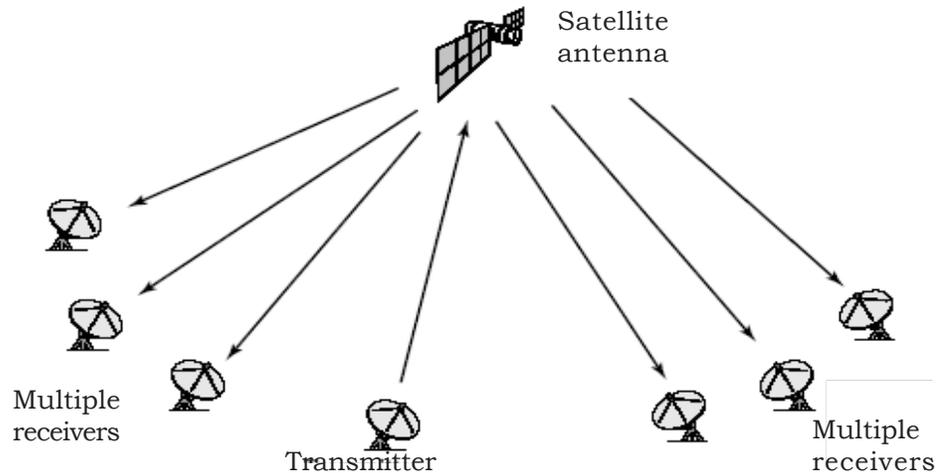


Fig. 2.2: Broadcast Communication

Some broadcast systems support transmission to a subset of the machine, which is known as multicasting when a packet is sent to a certain group; it is delivered to all machines subscribing to that group.

2.5 NETWORK TOPOLOGY

In the context of communication network the term topology refers to the way the computers or workstations in the network are linked together. According to the physical arrangement of workstations and nature of work, there are four major types of network topology. These are *bus topology*, *ring topology*, *star topology*, and *mesh topology*.

Bus topology: This network topology connects networking components along a single cable or uses a series of cable segments that are connected linearly. A network that uses a bus topology is referred to as a “bus network.” Bus topology is used for:

- Small workgroup Local Area Networks (LANs) whose computers are connected using a thin-net cable
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- Trunk cables connecting hubs or switches of departmental LANs to form a larger LAN
- Back-boning, by joining switches and routers to form campus-wide networks

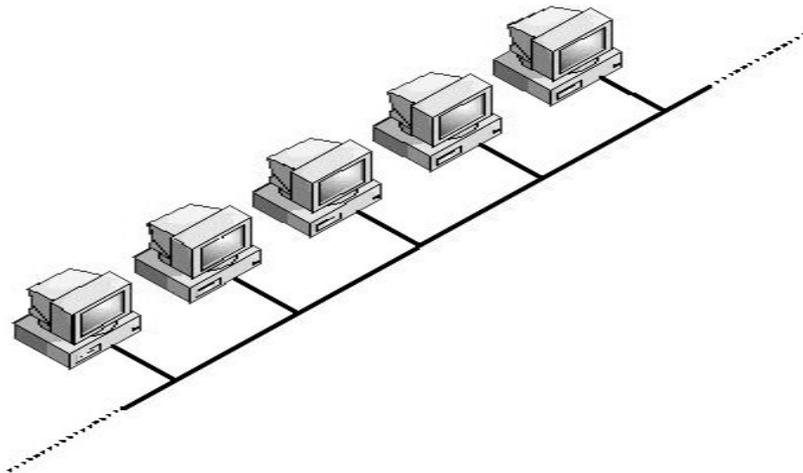


Fig. 2.3: Bus topology

Bus topology is the cheapest way of connecting computers to form a workgroup or departmental LAN, but it has the disadvantage that a single loose connection or cable break can bring down the entire LAN.

Ring topology: This is a network topology in which network stations are connected along a single path whose ends are joined to form a circle. The circle might be logical only. The physical arrangements of the cabling might be star like, with a hub or concentrator at the center. A ring network is based on a ring topology.

The ring topology is commonly used in the following kinds of networks:

- **Token ring networks:** The ring of a token ring network is concentrated inside a device called a *Multistation Access Unit (MAU)*.
- **Fiber Distributed Data Interface (FDDI) networks:** The ring in this case is both a physical and logical ring and usually runs around a campus or collection of buildings to