B.C.A. Science : Semester-III

INTRODUCTION TO COMPUTER NETWORK

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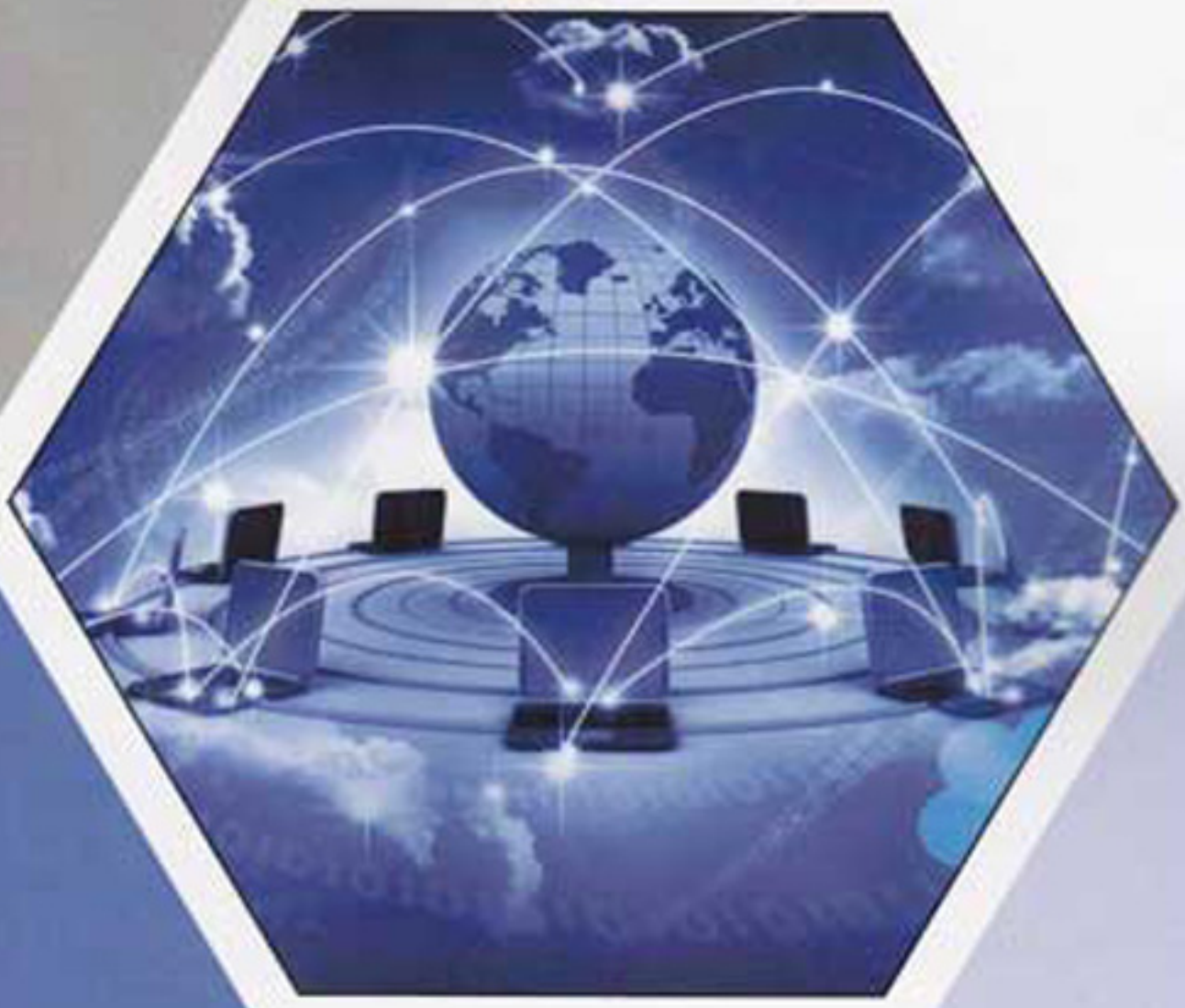

NIRALI PRAKASHAN
ADVANCEMENT OF KNOWLEDGE

Text Book Of

INTRODUCTION TO COMPUTER NETWORK

For

B.C.A. Science : Semester - III

As Per New Syllabus

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Preface ...

We take an opportunity to present this book entitled as **"Introduction to Computer Network"** to the students of **B.C.A. Science, Semester-III** as per the New Syllabus, June 2017-2018.

The book covers theory of An Introduction to Networks, Network Topologies and Types, Network Models, Overview of Transmission Media, Physical Layer, Data Link Layer and Network Layer.

A special words of thank to Shri. Dineshbhai Furia, Mr. Jignesh Furia for showing full faith in us to write this text book. We also thank to Mr. Amar Salunkhe and Mrs. Prachi Sawant of M/s Nirali Prakashan for their excellent co-operation.

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Although every care has been taken to check mistakes and misprints, any errors, omission and suggestions from teachers and students for the improvement of this text book shall be most welcome.

Authors

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1.3 Hardware and Software Resource Sharing

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CHAPTER 1

An Introduction to Networks, Network Topologies and Types

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Objectives...

- To understand Concepts of Computer Network and Data Communication
- To learn Applications of Computer Network
- To study Network Topologies and Types
- To study Types of Networks

1.1 INTRODUCTION

- Technologies related to data communication and networking may be the fastest growing in today's modern society.
- The most important technology has been the information gathering, its processing and distribution. To gather, process and distribute the information we requires computers.
- When we communicate, we share information. This sharing can be local or remote.
- Local communication can be face to face between individuals, while remote communication takes over distance. To transfer, share the information remotely or locally we need to interconnect the computers.
- The computers and communications have been merged together and their merger has had a profound effect on the manner in which computer systems are organized.
- Networking is linking of more than two different entities together to form a group or network to perform some specific task.

- The networking enhances the capacity of computer to share, exchange, preserve and protect information.
- Networking is decisive factor for the successful working of today's entire Information Systems (ISs). There are lots of networking examples around you, such as TV or Cable networks, Telephone networks, Railway networks, Cellular phone's networks, Post and Telegraph networks, etc. But most important networking example is Computer Networks, because it plays vital role in some forms in other networking examples.
- Communication is the basic process of information exchange. In electronic communication, information or messages in the form of electrical signals are propagated from one point to another by electronic means.
- Data communication refers to the exchange of data/information between two devices through some form of wired transmission medium (like coaxial cable, optic fiber cable etc.) or wireless transmission medium (like radio waves, micro waves, satellite communication and so on).
- In this chapter we are going to study all fundamental things about data communication, computer network, how networks operate, types of networks, what types of topologies available, etc.

1.2 DATA COMMUNICATION AND DATA REPRESENTATION

- Communication, whether between human beings or computer systems, involves transfer of information from a sender to a receiver.
- Data Communications are the exchange of data (information) between two devices using some transmission media such as cable wire or optic fiber.
- The effectiveness of data communication is depends on the following four factors/characteristics:
  1. **Delivery:** The data must reach to the correct destination (user or device).
  2. **Accuracy:** The data delivered by the system should be accurate.
  3. **Timeliness:** The data delivered by the system must be in timely manner. If it is delayed then data becomes useless. In real time system, the data such as audio or video should be deliver in the same order as they are produce.
  4. **Jitter:** Jitter means variation in the packet arrival time. It is uneven delay of audio or video packets. For example, if sender sends each packet after 20 ms, but at receiver some packets arrives at 20 ms and some are after 30 ms. So jitter is 10 ms for the delayed packets.

1.2.1 Components of Data Communication

- The Fig 1.1 shows the five components of data communication.

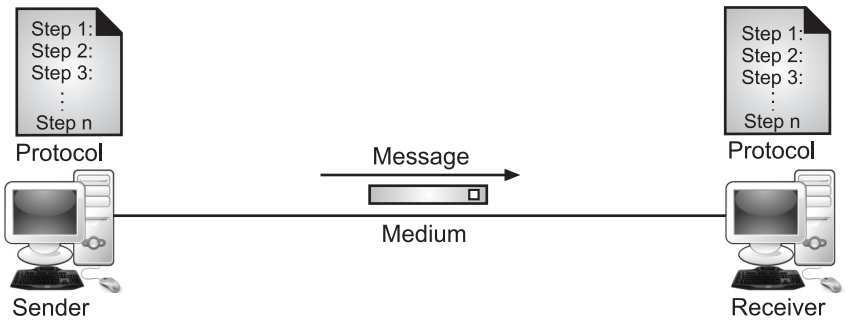


Fig. 1.1: Components of Data Communication System

- The five components data communication are explained below:
  1. **Sender:** It is the device that sends the data message. For examples, Computer, workstation, video camera, telephone etc.
  2. **Receiver:** It is the device that sends the data message. For examples, Computer, workstation, telephone, television etc.
  3. **Message:** It is the information includes text, numbers, pictures, audio and video to be communicated.
  4. **Transmission Media:** It is the physical path by which the message travels from sender to receiver. The transmission media includes twisted pair wire, coaxial cable, fiber optic cable, and radio waves.
  5. **Protocol:** It is a set of rules that governs data communication. Two devices may be connected but not communicated without protocol.

1.2.2 Data Representation

- Data is collection of raw facts which is processed to deduce information. There may be different forms in which data may be represented.
- Today the information comes in different forms such as text, numbers, images, audio and video as explained below:
  1. **Text:** Text in data communications, represented as a bit pattern, a sequence of bits i.e., 0's and 1's. Each set of bit pattern is called a code and the process of representing symbols is called coding. Coding system can be Unicode or ASCII. Text includes combinations of alphabets in smallcase as well as uppercase.
  2. **Numbers:** It is also bit pattern, but not in ASCII. Numbers are directly converted onto binary numbers to simplify mathematical operations. Numbers include combination of digits from 0 to 9.

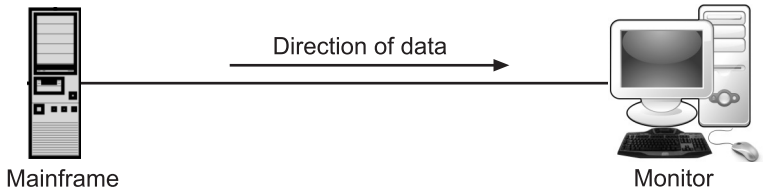
3. **Images:** Images are also represented by bit patterns. An image is composed of matrix of pixels. The black and white image requires only 1 bit (0's and 1's) for one pixel. The gray image requires 8 bits for one pixel and color (RGB) image requires 24 bits for one pixel.
4. **Audio:** It refers to the recording or broadcasting of sound and music. It is continuous signal.
5. **Video:** It refers to the recording or broadcasting of picture or movie.

1.3 INFORMATION EXCHANGE, SHARING, PRESERVING AND PROTECTING

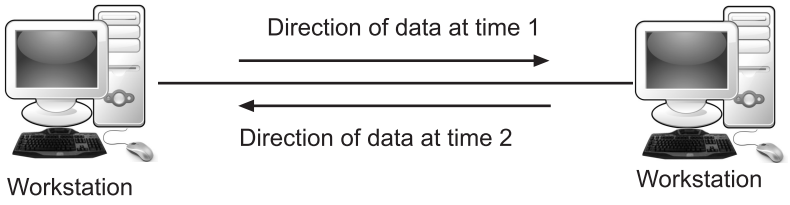
- Following sub sections gives the explanation of information exchange, sharing information, preserving and protecting information in data communication.

1.3.1 Information Exchange

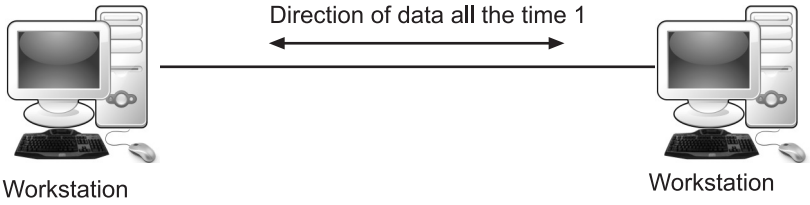
- Data communication is a process of exchanging data or information between two devices over a transmission medium.
- A network is nothing more than two or more computers connected by a cable or by a wireless radio connection so that they can exchange information (data).
- Information exchange process involves a communication system which is made up of hardware and software.
  1. The **hardware part** involves the sender and receiver communication devices and the intermediate devices through which the data/information passes.
  2. The **software part (protocol)** involves certain rules which specify what is to be communicated, how it is to be communicated and when.
- In data communication the exchange of information take place through transmission modes which defines the direction of the flow of information between two communication devices i.e., it tells the direction of signal flow between the two devices.
- Data communication between two devices occurs due to exchanging of data in simplex, half duplex and full duplex transmission modes as shown in Fig. 1.2.



(a) Simplex



(b) Half-duplex



(c) Full-duplex

Fig 1.2: Data Flow in Data Transmission (Information Exchange)

1. **Simplex:** A type of information exchange strategy between two communication devices whereby information (data) can be passed only in one direction. In short, simplex mode data transmission is unidirectional (one way). For example, communication between a computer and a keyboard involves simplex data transmission.
2. **Half-duplex:** A type of information exchange strategy between two communicating devices whereby information (data) can be exchanged in both directions alternatively. Means each station can both transmit and receive, but not at the same time. It is also known as two-way alternate. For example, a walkie-talkie operates in half-duplex mode. It can only send or receive a transmission at any given time.
3. **Full-duplex:** A type of information exchange strategy between two communicating devices whereby information (data) can be exchanged in both directions simultaneously. It is also known as two-way simultaneous. For example, mobile phones operate in full-duplex mode when two persons talk on mobile phone, both can listen and speak simultaneously.

1.3.2 Sharing of Data

- A computer network is a collection or set of computing devices connected to one another to establish communication and also share available resources.

- Computer networks are all about sharing. Specifically, networks are about sharing three things i.e., data (files), resources and programs as explained below:
  1. **Sharing Data (File):** Computer networks enable user to share data/information with other computers on the network. In networking, file sharing refers to copying files/data from one computer to another using a live network connections. Depending on how user set up his/her network, he/she can share data or files with his/her network friends in several different ways like he/she can send a file from his/her computer directly to a friend's computer via computer network like LAN. Fig. 1.3 shows file sharing using file server.

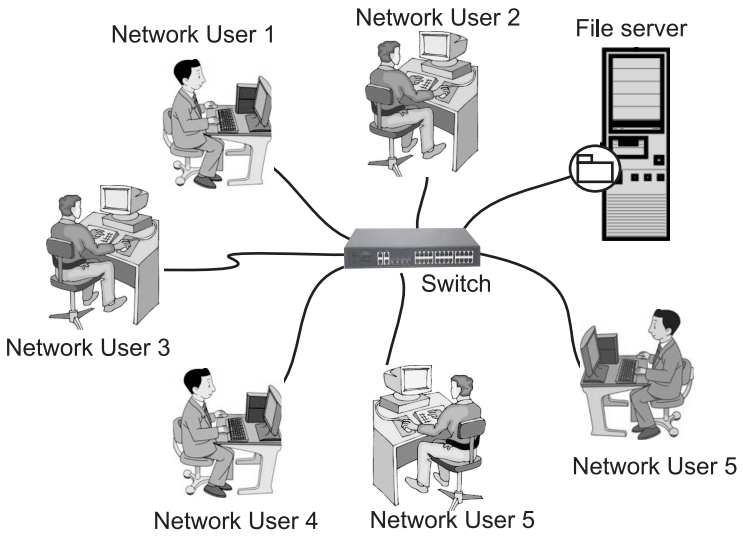
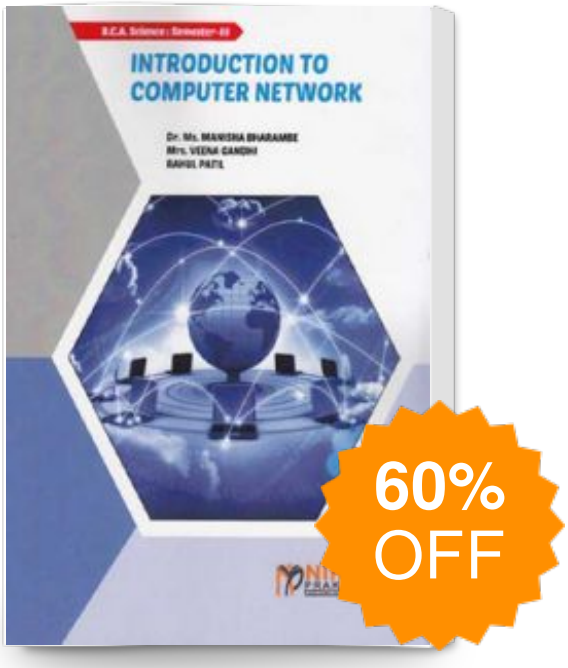


Fig. 1.3: File Sharing using File Server

  2. **Sharing Resources:** User can set up certain computer resources such as hard drives or printers so that all computers on the network can access them. For example, the laser printer attached to a computer in Fig. 1.4 is a shared resource, which means that anyone on the network can use it.
  3. **Sharing Programs/Applications:** Rather than keep separate copies of programs/ applications on each user's computer, putting programs/applications on a drive that everyone shares is sometimes best. For example, if ten computer users all use a particular program, one can purchase and install ten copies of the program, one for each computer. Or one can purchase a ten-user license for the program and then install just one copy of the program on a shared drive. Each of the ten users can then access the program from the shared hard drive.

Introduction To Computer Network



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