

JOB ROLE – Optical Fibre Splicer

Sector – Telecom

(Qualification Pack Code: TEL/Q6400)



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Chapter 2. Data Communication

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Session Objectives

The students will be able to:

- Explain Data,
- Describe Types of electronic communication,
- Analyze Data communication,
- Explain Characteristics of data communication,
- Describe Components of data communication,
- Understand the Modes of data communication.

Introduction

Computer generates a lot of information through data processing. The information is not useful in itself. It has to be communicated to the people. This information, also known as, data (text, audio or video) must be delivered to the people at the right time. It is important to transmit the information from one location to another at a very fast speed. This process is known as data communication. The computing devices such as computer, tablet and mobile devices are used to send the digital data. Advances in communication technology, combined with rapidly evolving computer technology, have made enormous progress in this field

Data

Data refers to the raw facts that are collected and processed to deduce information, while information refers to processed raw data that enables us to take decisions. For example, when exam results are declared they contain data of all students. This data provides the relevant information that whether as a student passed or failed.

Data representation

Data can be represented in various forms such as.

- **Text:** It includes combination of alphabets in small case as well as upper case. It is stored as a pattern of bits.
- **Numbers:** They are a combination of digits from 0 to 9. It is stored as a pattern of bits.
- **Images:** In computers images are digitally stored in the form of pixel. Pixel is the smallest element of an image. A picture or image is a matrix of pixel elements. The size of an image depends upon the number of pixels (also called resolution). Commonly used image formats are jpg, png, bmp, etc.
- **Audio:** This data is in the form of sound which can be recorded and broadcasted. Audio data is continuous, not discrete.
- **Video:** It refers to broadcasting of data in form of picture or movie.

Types of electronic communication

Electronic communication is divided into two types.

(a) Data communication: The transfer of data between two points is called data communication.

(b) Telecommunication: When the transmission of data can take place from a long distance by means of towers, satellite or microwave system it is called telecommunication.

Data communication

To make communications possible using computers, there must be a signal translator called a modem. The modem, which is short for modulator or demodulator, first converts digital signals into analog and gain back to digital signals which enables information to move across the telephone line.

Using electricity, radio waves or light, information and data in the form of codes are transmitted through a physical medium such as wire, cable, or even the atmosphere.

In a computer network, computers, printers, scanners and cameras are connected. Computers can exchange and share information and resources. Using hardware and software, these interconnected computing devices can communicate with each other through defined rules of data communications.

Characteristics of data communication

The effectiveness of a data communication system depends on three fundamental characteristics.

Delivery

The data should be delivered to the correct destination and correct user.

Accuracy

The communication system should deliver the data accurately, without introducing any errors. The data may get corrupted during transmission affecting the accuracy of the delivered data.

Timeliness

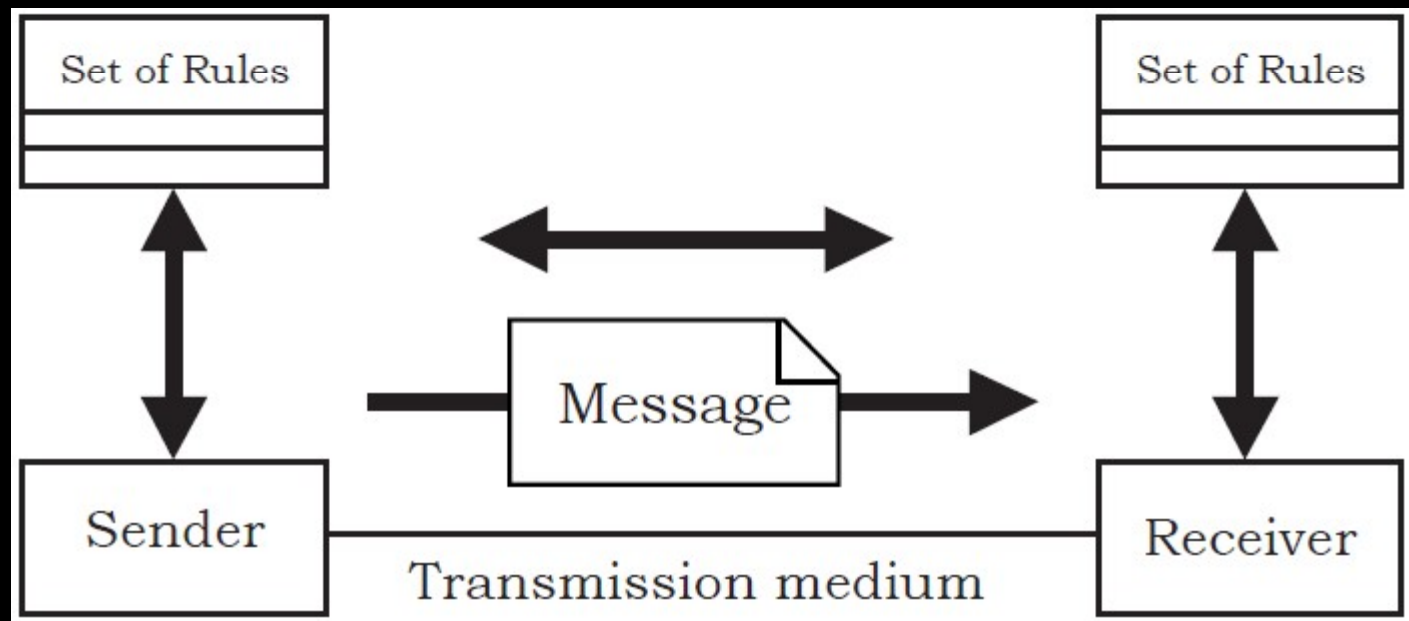
The system must deliver data in a timely manner. Data delivered late is useless. In the case of video, audio and voice data, timely delivery means delivering data, in the same order that they are produced, and without significant delay. This kind of delivery is called real-time transmission.

Components of data communication

The transmitter sends the message and the receiver receives the message. The medium is the channel over which the message is sent and the protocol is the set of rules that guides how the data is transmitted from encoding to decoding. The message is the data that is being communicated. Figure shows the basic components of communication system.

These are —

- (a) Transmitter
- (b) Receiver
- (c) Medium
- (d) Message
- (e) Protocol



Components of data communication

- **Sender or Transmitter:** The sender is the device that sends the message. It can be a computer, workstation, telephone handset, video camera, and so on.
- **Receiver:** The receiver is the device that receives the message. It can be a computer, workstation, telephone handset, television, and so on.
- **Transmission Medium:** The transmission medium is the physical path by which a message travels from sender to receiver.
- It can be wired or wireless and many subtypes in both. It consists of twisted pair wire, coaxial cable, Fibre-optic cable, laser or radio waves.
- **Message:** Message is the information to be communicated by the sender to the receiver.
- **Protocol:** A protocol is a set of rules that governs data communication. A Protocol is a necessity in data communications. Without a protocol, two devices may be connected but not communicating, just as a person speaking English cannot be understood by a person who speaks only Marathi.

Modes of data communication

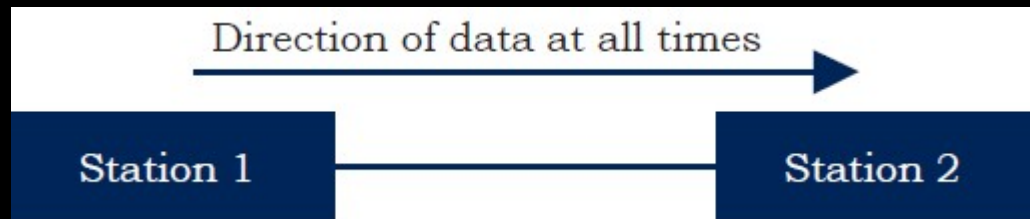
Two devices communicate with each other by sending and receiving data. There are three modes of data communication according to their way of communication.

- a) Simplex
- b) Half Duplex
- c) Full Duplex

Simplex

In simplex mode, communication is unidirectional shown in Fig. 2.2. Only one device sends the data while the other one only receives the data.

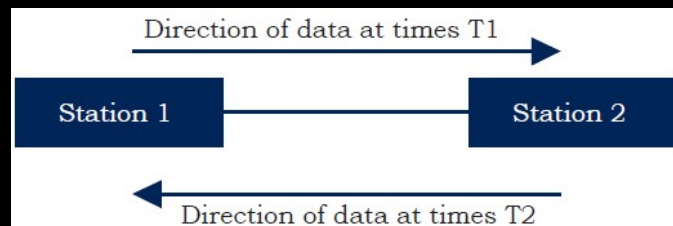
For example, while watching television (TV), we can receive the information from TV. It sends or transmits the information in unidirection to the audience.



Modes of data communication

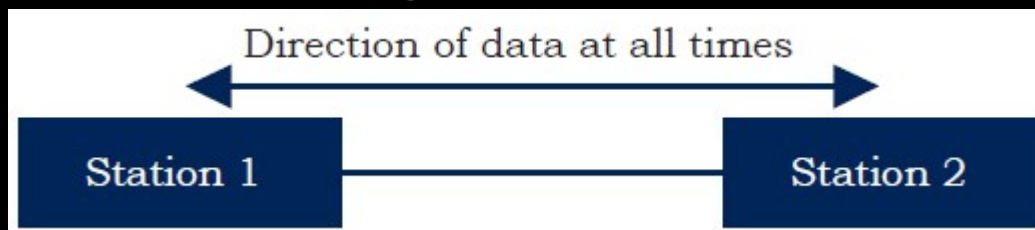
Half duplex

In half duplex both the stations can transmit as well as receive but not at the same time as shown in Figure. When one device is sending the other can only receive and vice-versa. Walkie-talkie is an example of a half duplex device. It has a “push-to-talk” button which is used to turn on the transmitter and turn off the receiver. It can either transmit or receive the information at a time. An advantage of half duplex is that the single track is cheaper than the double tracks.



Full duplex

A full duplex communication mode is able to transmit data in both directions at the same time as shown in Figure.



Data and signals

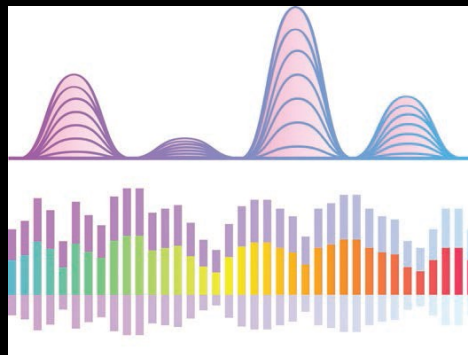
The information stored in computer systems and transferred over a computer network can be divided into two categories: data and signals. Data are entities that convey meaning within a computer or computer system.

To transfer this data from one point to another, either by using a physical wire or by using radio waves, it has to be converted into a signal. Signals are the electric or electromagnetic encoding of data. Signals are used to transmit data.

Types of data

There are basically two types of data – analog and digital, used in data communication shown in Figure.

- **Analog data** — The data which is represented in physical properties and can be expressed as any value along a continuous scale is called analog data. The sound made by a human voice and analogue clock are the simple examples of analog data.
- **Digital data** — Discrete and discontinuous representations of information are called digital data. Most electronic devices such as digital clock, calculators, computers, cameras and mobile phones store and process data in form of numbers which is called digital data. These numbers are in form of binary number meaning 0 and 1, represent the switches for power on or off. For example, when we store the audio data in form of ones and zeroes, the audio devices such as CD Players, read these ones and zeroes and translate them into actual signals.



Signals

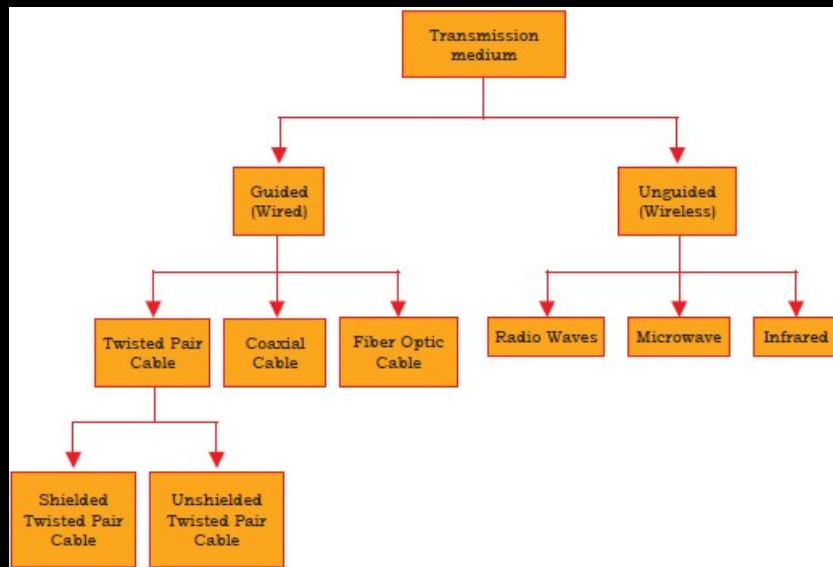
In data communication, signals are used to send the data from one location to another. Signals are electromagnetic or light rays which carry the data. The simplest form of signal is a direct current (DC) that is switched on and off.

Classification of signals Signals can be classified as

- (i) Electrical Signal**
- (ii) Optical Signal**
- (iii) Electromagnetic Signal**

Transmission media

Transmission media is a means by which a communication signal is carried from one system to another as shown in Fig. 2.6. Transmission or communication media can be divided into two categories — physical or conducted media, such as wires, and radiated or wireless media, which use radio waves. Conducted media include twisted pair wire, coaxial cable, and fibre optic cable. In wireless transmission, different types of electromagnetic waves, such as radio waves, are used to transmit signals.



Guided (bounded or wired) media

Guided transmission media uses a cabling system that guides the data signals along a specific path. Guided media is also known as bounded or wired media.

Depending on the type of transmission medium used the bounded media can be further classified into three types —

- (i) Twisted pair cable
- (ii) Coaxial cable (in the form of electric signals)
- (iii) Fibre optic cable (in the form of light)

Twisted Pair (TP)

Twisted pair is least expensive and most widely used for telecommunication. It consists of two insulated copper wires arranged in a regular spiral pattern.

Guided (bounded or wired) media

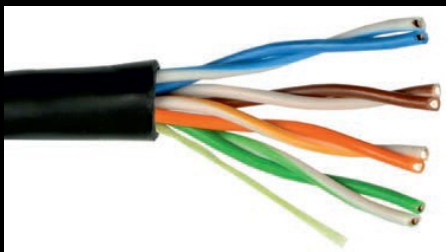
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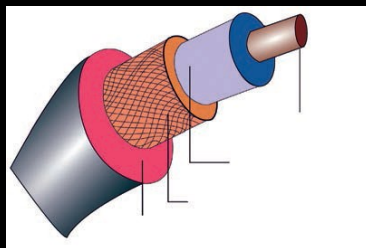
Twisted pair is least expensive and most widely used for telecommunication. It consists of two insulated copper wires arranged in a regular spiral pattern.



Guided (bounded or wired) media

Coaxial cable

It is made up of two conductors that share a common axis. It consists of a hollow outer cylindrical conductor that surrounds a single inner wire conductor.



Optical Fibre Cable (OFC)

OFC is a light pipe which is used to carry a light beam from one place to another. Light is an electromagnetic signal and can be modulated by information



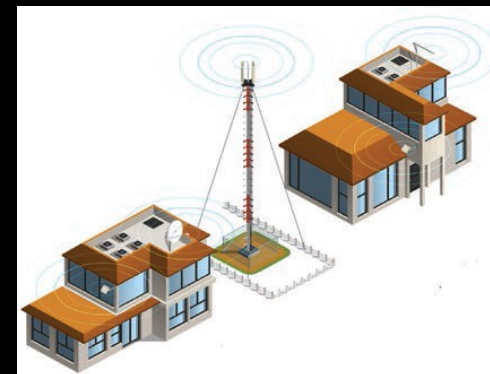
Unguided (unbounded or wireless) media

Depending on the method of transmission the unbounded media can be further classified into three types:

Radio links

Microwave links

Infrared light transmission



Radio links: Radio waves have frequencies between 10 kilohertz (kHz) and 1 gigahertz (GHz).

Microwave links: It is a communication system which uses a beam of radio waves in the microwave frequency range above 100MHz to transmit information between two fixed locations on the earth. It consists of a pair of antennas spaced some kilometers apart and is used to send information.



Infrared light wave transmission: Infrared light waves are widely used for short range communication. The remote control used in TV, VCR and stereos all use infrared Communication



Summary

In this session, you have learnt about data communication and its components.

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