جامعة الحمدانية

كلية التربية

قسم علوم الحاسوب

Data Communications and Networking

المرحلة الرابعة

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References and Required Text Book

Required Text Book:

"***TCP/IP Protocol Suite***", Behrouz A. Forouzan, McGrawHill,Third edition 2007.

"***Data Communications and Networking***" by Behrouz A. Forouzan, McGrawHill, Fourth Edition , 2006.

Other references

"*CCNA 1 and 2 companion guide*", **Cisco networking academy, Cisco press, 2003**

Introduction to data communication

- Data communications and networking are changing the way we do business and the way we live. Business decisions have to be made ever more quickly, and the decision makers require immediate access to accurate information.
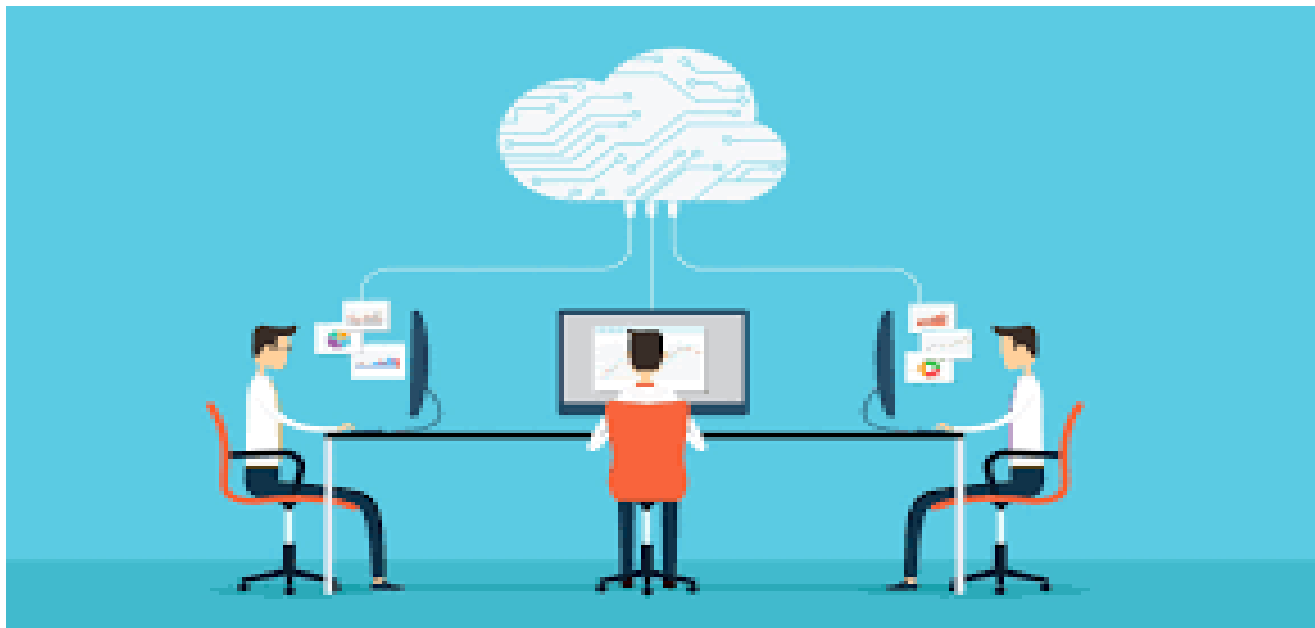
Introduction to data communication

- The development of the personal computer brought about tremendous changes for business, industry, science, and education. A similar revolution is occurring in data communications and networking. Technological advances are making it possible for communications links to carry more and faster signals.

- Research in data communications and networking has resulted in new technologies. One goal is to be able to exchange data such as text, audio, and video from all points in the world. We want to access the Internet to download and upload information quickly and accurately and at any time.

Data Communication

When we communicate, we are sharing information. This sharing can be local or remote. Between individuals, local communication usually occurs face to face, while remote communication takes place over distance.

The term *telecommunication*, which includes telephony, telegraphy, and television, means communication at a distance (*tele* is Greek for "far").

Data communications are the exchange of data between two devices via some form of transmission medium such as a wire cable.

Data communications system depends on four fundamental characteristics:

1. Delivery: The system must deliver data to the correct destination.

2. Accuracy: The system must deliver the data in perfection way.

3. Timeliness: The system must deliver data in a timely manner. Data delivered late are useless. In the case of video and audio, This kind of delivery is called *real-time* **transmission**.

4. Jitter: Jitter refers to the variation in the packet arrival time (uneven delay). or A phenomenon in real-time traffic caused by gaps between consecutive packets at the receiver. (International Call).

Components

A data communications system has five components:
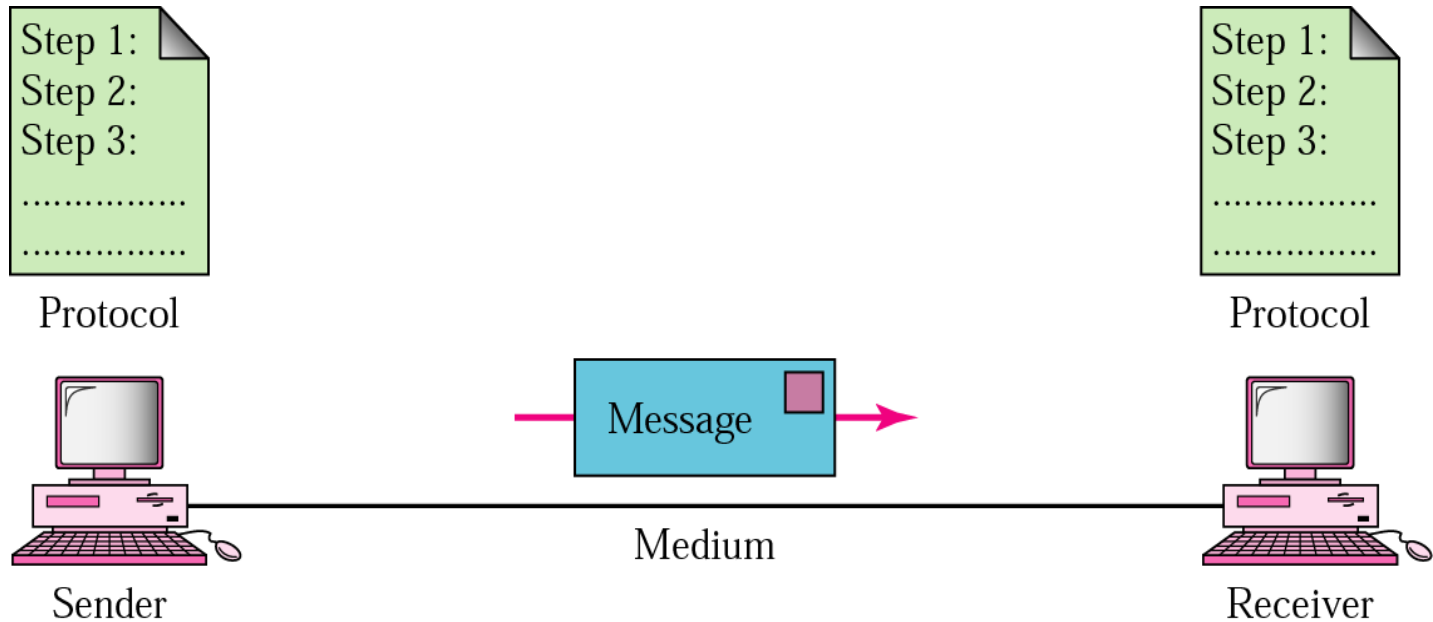
1. Message: The message is the information (data) to be communicated. Popular forms of information include text, numbers, pictures, audio, and video.

2. Sender: The sender is the device that sends the data message. It can be a computer, workstation, telephone handset, video camera, and so on.

3. Receiver: The receiver is the device that receives the message. It can be a computer, workstation, telephone handset, television, and so on.

4. Transmission medium: The transmission medium is the physical path by which a message travels from sender to receiver. Like twisted-pair wire, coaxial cable, fiber-optic cable, and radio waves.

5. Protocol: A protocol is a set of rules that govern data communications. It represents an agreement between the communicating devices. Without a protocol, two devices may be connected but not communicating, just as a person speaking French cannot be understood by a person who speaks only Japanese.

Data Representation

Information today comes in different forms such as text, numbers, images, audio, and video.

1. Text: it is represented as a bit pattern, a sequence of bits (0 or 1). For example: which uses 32 bits to represent a symbol or character.

2. Numbers: the number is directly converted to a binary number to simplify mathematical operations.

3. Images: an image is composed of a matrix of pixels (picture elements), where each pixel is a small dot. The size of the pixel depends on the *resolution*. After an image is divided into pixels, each pixel is assigned a bit pattern.

4. Audio: It is continuous, not discrete. Even when we use a microphone to change voice or music to an electric signal.

5. Video: It can either be produced as a continuous entity (e.g., by a TV camera), or it can be a combination of images, each a discrete entity, arranged to convey the idea of motion.

Transmission Mode

Communication between two devices can be simplex, half-duplex, and full-duplex

Simplex

The communication is unidirectional, as on a one-way street. Only one of the two devices on a link can transmit; the other can only receive. Such as keyboards and monitors.
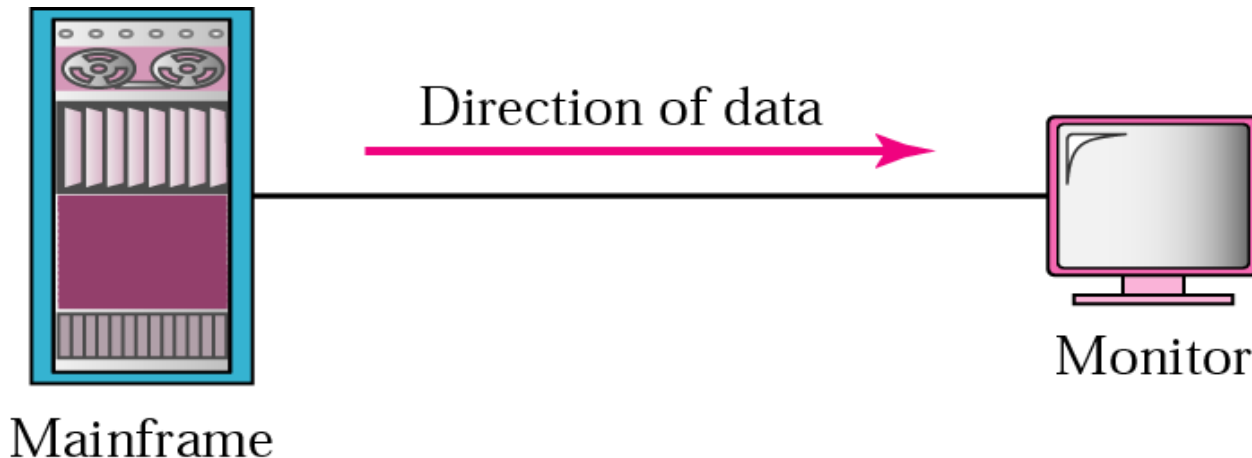
Half-Duplex

In half-duplex mode, each station can both transmit and receive, but not at the same time. Such as traffic allowed in both directions.
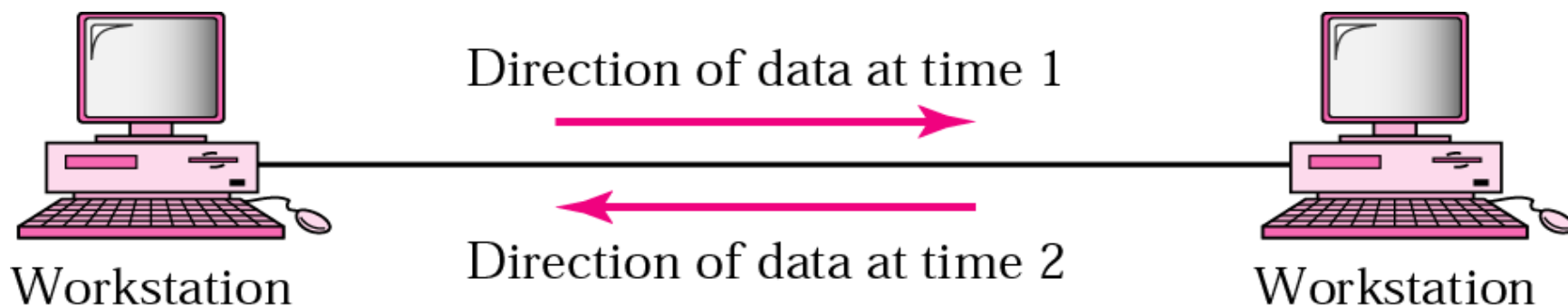
Full-Duplex

Both stations can transmit and receive simultaneously. One common example of full-duplex communication is the telephone network. When two people are communicating by a telephone line, both can talk and listen at the same time.
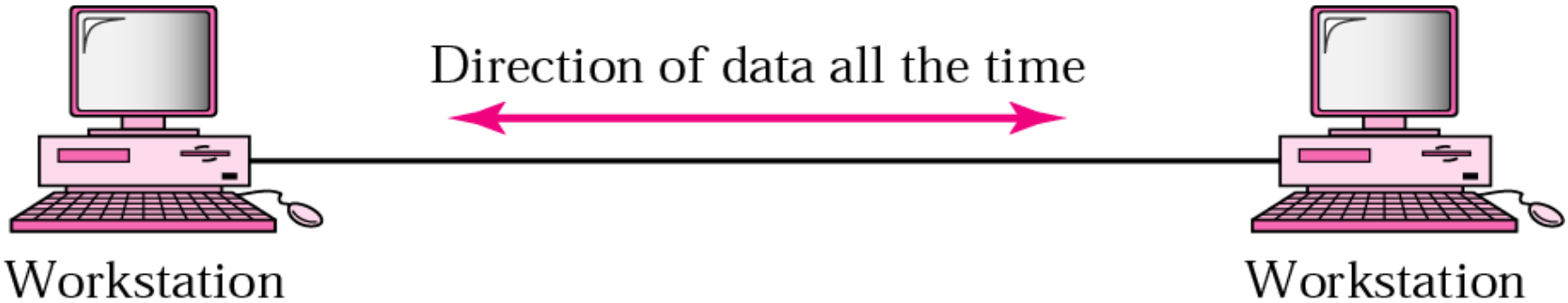
Networks

A network is a set of devices (often referred to as *nodes)* connected by communication links.

Distributed Processing

Most networks use distributed processing, in which a task is divided among multiple computers.

Network Criteria

The most important of these are performance, reliability, and security.

Performance:

Performance can be measured in many ways, including transit time and response time. Transit time is the amount of time required for a message to travel from one device to another. Response time is the elapsed time between an inquiry and a response.

The performance of a network depends on a number
of factors including:
1. The number of users.
2. The type of transmission medium.
3. The capabilities of the connected hardware.
4. The efficiency of the software.

Reliability

In addition to accuracy of delivery, network reliability is measured
by the frequency of failure, the time it takes a link to recover from a
failure.

Security
Network security issues include protecting data from unauthorized
access, protecting data from damage and development.

SUMMARY

1. Data communications are the transfer of data from one device to another via some form of transmission medium.

2. A data communications system must transmit data to the correct destination in an accurate and timely manner.

3. The five components that make up a data communications system are the message, sender, receiver, medium, and protocol.

4. Text, numbers, images, audio, and video are different forms of information.

5. Data flow between two devices can occur in one of three ways: simplex, half-duplex, or full-duplex.

6. A network is a set of communication devices connected by media links.