Lecture # 1

CH. 1

Introduction

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Chapter’s Main Points

- Data communication: exchange of data between two devices via some form of transmission medium as a wire cable.
- Telecommunication = communication at distance (tele = far)

Effectiveness of data communication depends on:

1. Delivery: ضمان الوصول للهدف (المستقبل) الصحيح
2. Accuracy: ضمان وصول الداتا صحيحة وكشف وجود الخطأ والا تكون غير صالحة للاستعمال
3. Timeliness: ضمان الوصول بالوقت الصحيح وعدم حصول تأخير خاصصا في التطبيقات التي تكون حساسة للتأخير: نقل الصوت والفيديو مثلا

DC System components

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

- **Point-to-Point**
  Point-to-point connections provide a dedicated link between two devices. Each device can communicate only with those that are directly connected to it.

- **Multipoint Configuration**
  In multipoint networks many devices share a single link or communication medium.

**Categories of Networks**

- Local Area Network (LAN)
- Metropolitan Area Network (MAN)
- Wide Area Network (WAN)

**The categories are distinguished by:**

- Dimensions (physical separation & number of nodes)
- Ownership
- Physical architecture
Local Area Network (LAN)
- LANs mainly designed for computers to share resources such as printers.
- A LAN will generally use only a single type of transmission medium.
- Topologies: bus, star, & ring.
- Usually privately owned & operated

Metropolitan Area Network (MAN)
- Extend over an entire city (5 -50 Kms)
- Mainly used for interconnecting private LANs located at different areas to each other
- Normally owned and operated by someone else: an independent or government service provider

Wide Area Network (WAN)
- Extend over a large geographical area (entire country, continent or globe)
- Make use of public carrier transmission media such as Public switched data network (PSDN)/ (ISDN)
- WANs that are wholly operated by a single company sometimes referred as an enterprise network.

Protocol Definition
- A set of rules for communication, there is a need to be agreed on both sender and receiver

Protocol Elements
- Syntax: Structure or format of data
- Frame Format: Destination Add, Source Add, Data
- Semantics: Meaning and action (Does this Address belong to me?)
- Timing: When & How fast
5-6 What are the two types of line configuration, categorize the four basic topologies in terms of these line configuration?

a. Point-to-point: mesh, star, and ring.

b. Multipoint: bus.

9. For \( n \) devices in a network, what is the number of cable links required for a mesh, ring, bus, and star topology?

a. Mesh: \( n \) \((n-1)/2\)

b. Star: \( n \)

c. Ring: \( n \)

d. Bus: one backbone and \( n \) drop lines
11. What is an internet? What is the Internet?

An internet is an interconnection of networks. The Internet is the name of a specific World-wide network.

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**Exercises**

16. Assume six devices are arranged in a mesh topology. How many cables are needed? How many ports are needed for each device?

a. Cable links: \( n(n - 1) / 2 = (6 \times 5) / 2 = 15 \)

b. Number of ports: \( n - 1 = 5 \) ports needed per device.

17. For each of the following four networks, discuss the consequences if a connection fails.

a. Five devices arranged in a mesh topology

If one connection fails, the other connections will still be working.

b. Five devices arranged in a star topology (not counting the hub)

The other devices will still be able to send data through the hub; there will be no access to the device which has the failed connection to the hub.

c. Five devices arranged in a bus topology

All transmission stops if the failure is in the bus. If the drop-line fails, only the corresponding device cannot operate.

d. Five devices arranged in a ring topology

The failed connection may disable the whole network unless it is a dual ring or there is a by-pass mechanism.
19. In the ring topology, what happens if one of the stations is unplugged?

In a ring topology, unplugging one station interrupts the ring. However, most ring networks use a mechanism that bypasses the station; the ring can continue its operation.

![Ring Topology Diagram]

20. In the bus topology, what happens if one of the stations is unplugged?

In a bus topology, no station is in the path of the signal. Unplugging a station has no effect on the operation of the rest of the network.

![Bus Topology Diagram]

23. Performance is inversely related to delay. When you use the Internet, which of the following applications are more sensitive to delay?

a. Sending an e-mail

E-mail is not an interactive application. Even if it is delivered immediately, it may stay in the mail-box of the receiver for a while. It is not sensitive to delay.

b. Copying a file

We normally do not expect a file to be copied immediately. It is not very sensitive to delay.

c. Surfing the Internet

Surfing the Internet is the application very sensitive to delay. We except to get access to the site we are searching.
24. When a party makes a local telephone call to another party, is this a point-to-point or multipoint connection? Explain your answer.

In this case, the communication is only between a caller and the callee. A dedicated line is established between them. The connection is point-to-point.

**External Questions**

**Multiple Choices:**

1- Communication between a computer and a keyboard involves __________ transmission.

A) simplex.
B) half-duplex.
C) full-duplex.
D) automatic.

2- A television broadcast is an example of ______ transmission.

A) simplex.
B) half-duplex.
C) full-duplex.
D) Automatic.

3- A ______ connection provides a dedicated link between two devices.

A) point-to-point.
B) multipoint.
C) primary.
D) secondary.
4- In a ______ connection, more than two devices can share a single link
   A) point-to-point.
   b) multipoint.
   C) primary.
   D) secondary.

5- A ______ is a data communication system within a building, plant, or campus, or between nearby buildings.
   A) MAN.
   B) LAN.
   C) WAN.
   D) None of the above.

6- Devices may be arranged in a _____ topology.
   A) Mesh.
   B) Ring.
   C) Bus.
   D) All of the above.

7- A ________ is a set of rules that governs data communication.
   A) Forum.
   B) Protocol.
   C) Standard.
   D) None of the above.