

**PATUAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY**

Course Code: **CCE- 211**

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Level- 2 , Semester- 1

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Assignment No: 01

Date of Submission: 01-04-2024

**Q1-1.  
Identify the five components of a data communications  
system.**

Answer:

A data communications system has FIVE components. These are all:

1. Message(data): The message is the information or data to be communicated. Example: Text, Pictures, Audio, Video etc.
2. Sender (Transmitter): The sender is the device that sends the transmitting data message. Example: A computer, a telephone handset etc.
3. Receiver: The receiver is the device that receives the transmitted data message. Example: A computer, a telephone handset, television etc.
4. Transmission medium (Channel): It’s the physical or local pathway by which the message or data travels from sender to receiver. Example: wire, cables, fiber optics, satellites etc.
5. Protocol: It’s means set of rules and conventions that govern the communication. They define how data is formatted, transmitted, receiver and interpreted. Example: TCP/ IP for internet communication and HTTP for web browsing.

**Q1-2.  
What are the three criteria necessary for an effective and  
efficient network?**

Answer:

A network is the interconnection of a set of devices capable of communication.

There are three important criteria for an effective and efficient network.

1. Performance: Network performance refers to the speed and responsiveness of data transmission.
2. Reliability: A reliable network ensures that data is transmitted accurately and consistently, network reliability is measured by the frequency of failure, the time it takes a link to recover from a failure.
3. Security: It means protecting data from unauthorized access, damage and breaches and data losses.

**Q1-3.  
What are the advantages of a multipoint connection over a  
point-to-point connection?**

Answer:

Multipoint connections offer several advantages over point-to-point connections.

Advantages:

1. Cost-Effectiveness: It can be more cost-effective than establishing individual point to point connections.
2. Resource Sharing: Devices can share the same communication medium.
3. Simplified Infrastructure: It’s reduced the complexity of the overall network architecture.
4. Collaboration and Communication: Multipoint connections facilitate collaboration and communication which can enhance productivity and share skills, teamwork

**Q1-4.  
What are the two types of line configuration?**

Answer:

There are two types of line configuration.

1. Point-to-Point: It provides a dedicated link between two devices.
2. Multipoint/ Multidrop: A multipoint connection is one in which more than two devices share a single link.

**Q1-5.  
Categorize the four basic topologies in terms of line  
configuration.**

Answer:

Bus Topology: Line configuration - Linear (Multipoint)

Star Topology: Line configuration – Centralized (Multipoint)

Ring Topology: Line configuration – Circular or Closed-loop (Point to point)

Mesh Topology: Line configuration – Partial (Point to point)

**Q1-6.  
What is the difference between half-duplex and full-duplex  
transmission modes?**

Answer:

Half-duplex: In half-duplex mode, data transmission can occur in both directions, but not simultaneously.

Full-duplex: In full-duplex mode, data transmission can occur simultaneously in both directions.

**Q1-7.  
Name the four basic network topologies, and cite an  
advantage of each type.**

Answer:

Mesh Topology:

Advantage:

Dedicated links

Robustness

Privacy

Easy to identify fault.

Star Topology:

Advantage:

One I/O port per device

Little cabling

Easy to install

Robustness

Easy to identify fault

Bus Topology:

Advantage:

Little cabling

Easy to install

Ring Topology:

Advantage:

Easy to install

Easy to identify fault.

**Q1-8.  
For n devices in a network, what is the number of cables  
links required for a mesh, ring, bus, and star topology?**

Answer:

Mesh Topology: n(n-1)/2 cables of links

Ring Topology: n

Bus Topology: n-1

Star Topology: n

**Q1-9.  
What are some of the factors that determine whether a  
communications system is a LAN or WAN?**

Answer:

There are some of the factors that determine whether a communications system is a LAN or WAN.

Geographical scope, Topology, Ownership, Data transfer rates and associated costs.

**Q1-10.  
What is an internet? What is the Internet?**

Answer:

An internet (lowercase “i”): It refers to a network that connects multiple smaller networks. Example: LANs, WANs.

The Internet (uppercase “I”): It refers to the global network. Example: TCP/IP, IoT devices.

**Q1-11.  
Why are protocols needed?**

Answer:

Protocols are needed for several reasons in the context of computer networks and communication systems:

1. Standardization: set of rules, formats.
2. Facilitating Communication: How data is formatted, transmitted, routed and received.
3. Error Detection and Correction: To ensure data integrity during transmission.
4. Security: encryption, authentication.

**Q1-12.  
In a LAN with a link-layer switch (Figure 1.8b), host 1  
wants to send a message to host 3. Because communication  
is through the link-layer switch, does the switch need to  
have an address? Explain.**

Answer:

In a LAN with a link-layer switch, the switch does not need to have an address like hosts. Because it operates at the data link layer, forwards frames based on MAC addresses, and performs transparent switching without modifying the frames.

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**Q1-13.  
How many point-to-point WANs are needed to connect n  
LANs if each LAN should be able to directly communicate  
with any other LAN?**

Answer:

The number of point-to-point WAN connections needed to connect n LANs in a full mesh topology is n(n-1)/2.

**Q1-14.  
When a resident uses a dial-up or DLS service to connect to  
the Internet, what is the role of the telephone company?**

Answer:

The telephone company serves as the infrastructure provider and facilitator of connectivity for subscribers using dial-up or DSL services to access the Internet.  
  
**Q-15 If there is a single path between the source host and the  
destination host, do we need a router between the two  
hosts?**  
Answer:

No, if there is a single path between the source host and the destination host within the same network segment, a router is not strictly necessary for communication between them.

**P1-1.  
What is the maximum number of characters or symbols that  
can be represented by Unicode?**

Answer:

By considering, last update in January 2022 Unicode supports over 143,000 characters, covering various scripts, symbols and emoji.

**P1-2.  
A color image uses 16 bits to represent a pixel. What is the  
maximum number of different colors that can be  
represented?**

Answer:

Maximum number of colors = 2^(number of bits per color component)

The maximum number of different colors that can be represented in a color image using 16 bits per pixel is 65,536.

**P1-3.  
Assume six devices are arranged in a mesh topology. How  
many cables are needed? How many ports are needed for  
each device?**

Answer:

Total number of cables: 6\*(6-1)/2 = 15

Number of ports per device = (6-1)\*2 = 10

**P1-4.  
For each of the following four networks, discuss the  
consequences if a connection fails.**  
   
a. Five devices arranged in a mesh topology  
b. Five devices arranged in a star topology (not counting the  
hub)  
c. Five devices arranged in a bus topology  
d. Five devices arranged in a ring topology

Answer:

a. Mesh Topology: Communication between the specific pair of devices with the failed connection may be affected, but other connections remain unaffected due to multiple paths.

b. Star Topology: Communication between the device with the failed connection and all other devices is disrupted, but other devices remain unaffected.

c. Bus Topology: Communication for devices downstream of the failure is disrupted, while devices upstream may still function.

d. Ring Topology: Communication for all devices downstream of the failed connection is disrupted, isolating them until the issue is resolved.

**P1-5.  
In the ring topology in Figure 1.7, what happens if one of the  
stations is unplugged?**

Answer:

If one station is unplugged in a ring topology, communication is disrupted for all stations downstream of the unplugged station, isolating them from the network until the issue is resolved.

**P1-6.  
In the bus topology in Figure 1.6, what happens if one of the  
stations is unplugged?**

Answer:

If one station is unplugged in a bus topology, only that station and devices downstream lose connectivity, while the rest of the network remains unaffected.

**P1-7.  
When a party makes a local telephone call to another party,  
is this a point-to-point or multipoint connection? Explain  
your answer.**

Answer:

This connection is point-to-point. Because, communication occurs between two specific endpoints (the caller and the receiver).

**P1-8.  
Compare the telephone network and the Internet. What are  
the similarities? What are the differences?**

Answer:

Similarities:

1. Both facilitate global communication.
2. Support various communication services.
3. Rely on specific protocols for communication.

Differences:

1. Telephone network primarily for voice, Internet for diverse communication.
2. Telephone: circuit-switched; Internet: packet-switched.
3. Telephone: hierarchical infrastructure; Internet: decentralized.
4. Telephone: traditional billing; Internet: diverse pricing models.
5. Telephone: evolved from analog; Internet: rapid evolution.