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Introduction to Networking

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CHAP:1- INTRODUCTION TO NETWORKING

Q1: What is a network?

Ans: A network is a set of devices (**often referred to as nodes**) connected by communication links. A node can be a computer, printer, or any other device capable of sending and/or receiving data generated by other nodes on the network.

Q2: What is the definition of a computer network?

Ans: A computer network is a group of computer systems that are linked together through communication channels to facilitate communication and resource-sharing among a wide range of users.

Q3:. What are the uses of Computer Network?

Ans:

Uses of Computer Networks:

- Users can share resources and communicate.
- File sharing.
- Hardware sharing (Printers, CD-ROM drives and hard drive).
- Program sharing.
- Multiplayer gaming.

Q4: What are the components of a computer network?

Ans: a) Servers

b) Clients,

c) Transmission Media,

d) Shared data,

e) Shared printers and other peripherals,

f) Network Interface Card,

g) Network Operating System,

h) Hub,

i) Switch,

j) Router,

k) LAN Cable.

Q5: Discuss the definitions of

a) Hub **b) Repeater**

c) Switch **d) Bridges**

e) Routers **f) Gateway**

g) Modem

(These are the network devices).

Ans:

a) Hub: A hub works in the physical layer of the OSI model. It is basically a non-intelligent device, and has no decision making capability. What a hub basically does is take the input data from one of the ports and broadcast the information to all the other ports connected to the network.

b) **Repeater:** A repeater is an electronic device that receives a signal, regenerates it and retransmits at a higher level or with a higher power. A repeater also works in the Physical layer. The repeaters are used in places where amplification of input signals is necessary. Repeaters are used within a network to extend the length of communication.

c) **Switch:** A switch is an intelligent device that works in the data link layer. The term intelligence refers to the decision making capacity of the switch. Switches operate at both the physical layer and the data link layer. Since it works in the data link layer, it has knowledge of the MAC addresses of the ports in the network.

d) **Bridges:** Bridges are used to connect similar network segments that are using similar communication standards. A bridge filters the data traffic at a network boundary. Bridges operate at both the physical layer and the MAC sublayer of the Data link layer.

Bridges inspect incoming traffic and decide whether to forward or discard it.

e) **Routers:** Routers are networking devices used to extend or segment networks by forwarding packets from one logical network to another. Routers are most often used in large internetworks that use the TCP/IP protocol suite connecting TCP/IP hosts and local area networks (LANs) to the internet using dedicated leased lines. Routers work at the network layer to move packets between networks using their logical addresses i.e the IP addresses of the destination hosts on the network.

f) **Gateway:** A gateway is an internetworking device used to connect networks that use different networking protocols. A gateway is necessary when there are different technologies implemented by the different LAN's which are to be connected together.

g) **Modem:** The device that converts digital signals into analog signals and analog signals to digital signals is called modem. The word modem stands for modulation and demodulation. The process of converting digital signals to analog signals is called modulation. The process of converting analog signals to digital signals is called demodulation. Modem are used with computers to transfer data from one computer to another computer through telephonic lines.

Q6: What is network topology? What network topologies are there in a computer network?

Ans: Network topology refers to the layout of a network and how different nodes in a network are connected to each other and how they communicate.

Following are the five most common network topologies:

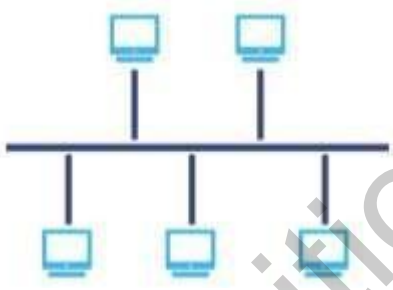
- Bus topology,
- Ring topology,
- Star topology,
- Mesh topology,
- Tree topology.

Q7:.Discuss the definitions of:

a) Bus topology **b) Ring topology** **c) Star topology**

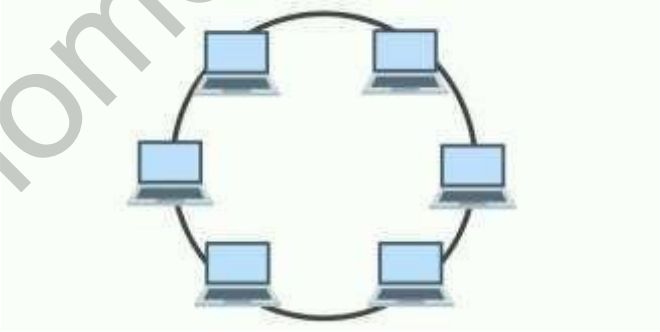
d) Mesh topology **e) Tree topology**

Ans: a) Bus topology: In this topology, all the nodes are connected to a single cable (called bus), by the help of interface connectors. This central cable is the backbone of the network and is known as Bus. Bus networks are relatively used for small networks. It is good for LAN.



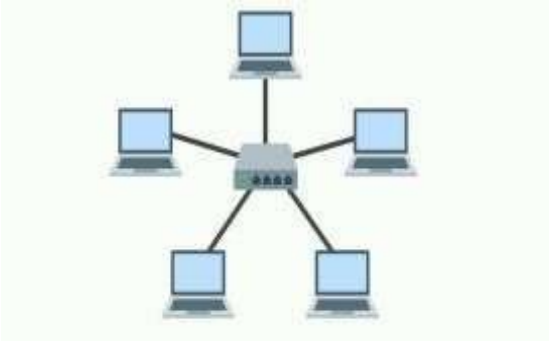
(Fig 1.1: Bus topology)

b) **Ring topology:** In a ring topology, all the nodes are connected in a closed loop. Message travels around the ring, with each node reading those messages addressed to it.



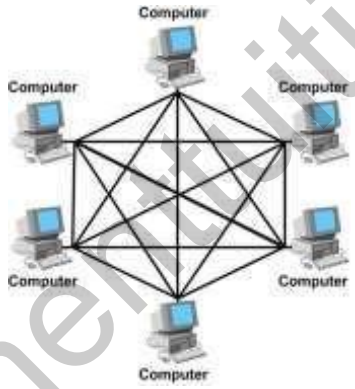
(Fig 1.2:Ring topology)

c) **Star topology:** In a star network devices are connected to a central computer, called a hub. Nodes communicate across the network by passing data through the hub.



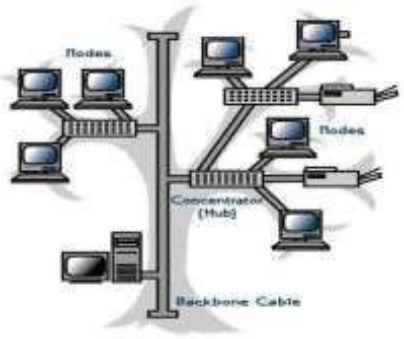
(Fig 1.3:Star topology)

d) **Mesh topology:** In a mesh topology, every device has a dedicated point-to-point link to every other device in the network. The term dedicated means that the link carries traffic only between the two devices it connects.



(Fig 1.4:Mesh topology)

e) **Tree topology:** This is a hybrid topology that combines characteristics of linear bus and star topologies. In a tree network, groups of star-configured networks are connected to a linear bus backbone cable.



(Fig 1.5:Tree topology)

Q8: Which topology is used by the Ethernet systems?

Ans: Bus topology.

Q9: What are the basic differences between connection oriented and connectionless service?

Ans: If connectionless service is offered, packets are inserted into the network individually and routed independently. No advanced setup is needed. In this context, the packets are frequently called datagrams and the network is called a **Datagram network.**

If a connection-oriented service is used, a path from the source router all the way to the destination router must be established before any data packets can be sent. This connection is called VC (Virtual circuit) and the network is called **Virtual-circuit network.**

After the end of the transmission, the connection is released, which in turn removes the virtual circuit.

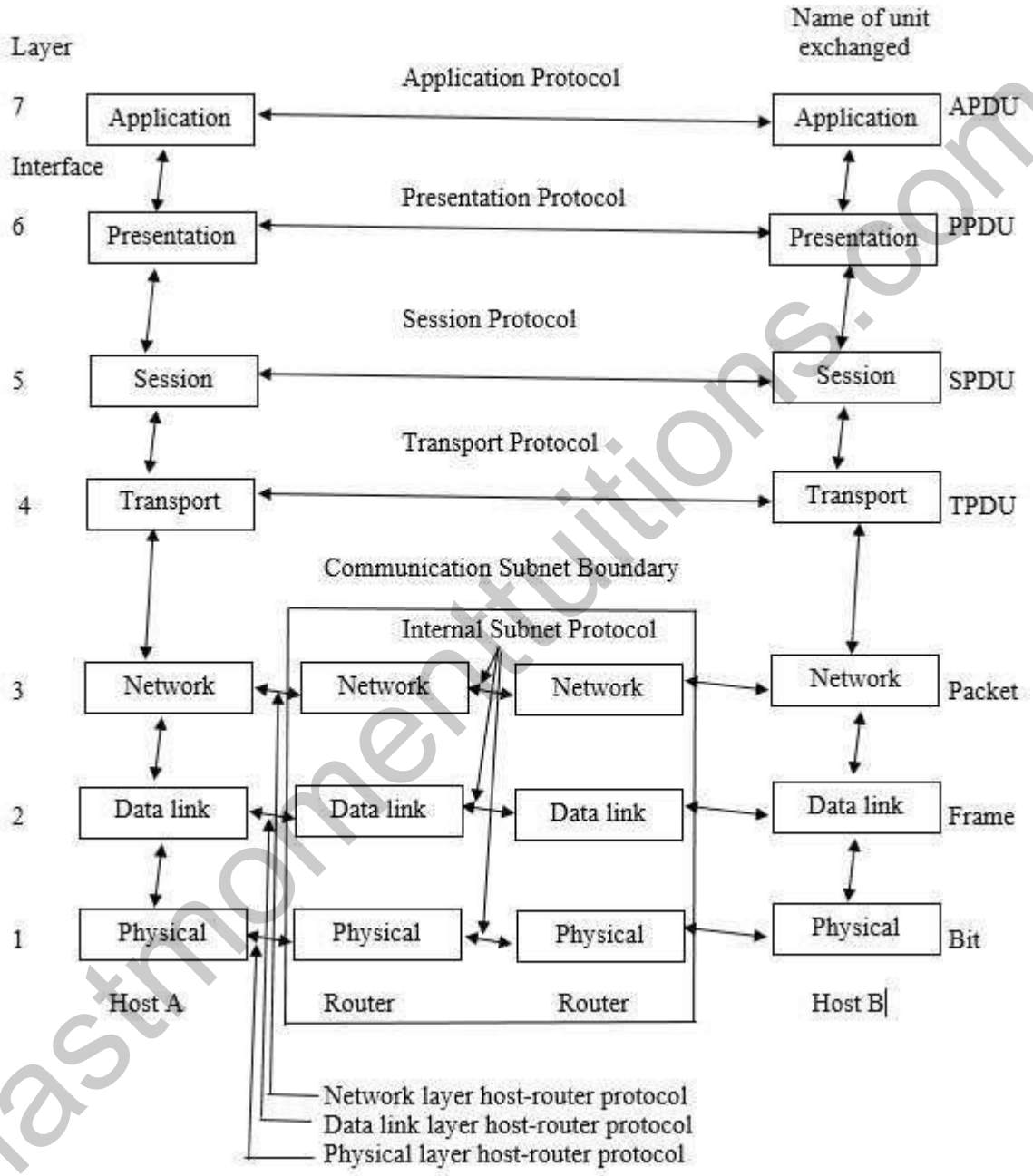
Q10: Compare Virtual-circuit and Datagram networks.

Ans:

Issue	Datagram networks	Virtual-circuit network
Circuit setup	Not needed	Required
Addressing	Each packet contains the full source and destination address	Each packet contains a short VC number
State information	Routers do not hold state information about connections	Each VC requires router table space per connection
Routing	Each packet is routed independently	Route chosen when VC is set up;all packets follow it
Effect of router failures	None, except for packets lost during the crash	All VCs that passed through the failed router are terminated
Quality of service	Difficult	Easy if enough resources can be allocated for each VC
Congestion control	Difficult	Easy if enough resources can be allocated in advance for each VC

Q11: Discuss the OSI reference model.

Ans:



(Fig 1.7:The OSI reference model)

Q12: Explain the key functions of all the layers of the OSI model.

Ans: **i) Physical Layer:**

a) The physical layer of the OSI model defines the electrical and mechanical specifications used in networking including transmission distances, the various types of media available and electrical issues.

b) This layer is concerned with transmitting raw bits over a communication channel.

ii) **The Data Link Layer**:

a) The main task of the data link layer is to transform the raw input data into data frames and transmit the frames sequentially.

b) It takes care of the flow control i.e a fast transmitter should not drown a slow receiver of data.

c) This layer also controls the access to the shared channel.

iii) The Network Layer:

a) The main task of the network layer is to determine how packets are routed from source to destination.

iv) The Transport Layer:

a) The basic function of the transport layer is to accept data from above it, split it up into smaller units, pass these to the network layer, and ensure that all the pieces arrive correctly at the other end.

b) Error recovery is done in the layer.

v) The Session Layer:

a) The session layer allows users on different machines to establish sessions between them.

b) Session layer, establishes ,manages and terminates sessions between applications.

vi) Presentation Layer:

a) The presentation layer is concerned with the syntax and semantics of the information transmitted.

b) The presentation layer manages these data structures and allows higher-level

data structures to be defined and exchanged through the network with a standard encoding format.

vi) The Application Layer:

c) Application layer defines the communications services used by the user's applications to transmit data over the network.

d) This layer defines application protocols such as **FTP, Email clients, Web browsers, Telnet** etc.

Q13: Compare TCP/IP and OSI model.

Ans:a) TCP/IP has 4 layers whereas the OSI model has 7 layers.

b) TCP/IP model is based on standard protocols around which the Internet has developed. It is a communication protocol, which allows connection of hosts over a network whereas OSI is a generic, protocol independent standard, acting as a communication gateway between the network and the end user.

c) In the TCP/IP model the transport layer does not guarantee delivery of packets. Still the TCP/IP model is more reliable, on the other hand, In OSI model the transport layer guarantees the delivery of packets.

d) In the TCP/IP, transport Layer is both Connection Oriented and Connection less Whereas In the OSI, transport Layer is Connection Oriented.

e) In the TCP/IP, network Layer is Connection less, on the other hand, In OSI, Network Layer is both Connection Oriented and Connection less.

Q14: Discuss TCP/IP model.

Ans: The TCP/IP protocol suite consists of four layers: host-to-network (or link layer),internet layer, transport layer and application layer.

The Link Layer: This layer specifies details of how data is physically sent through the

network, including how bits are electrically signaled by hardware devices that interface directly with a network medium, such as coaxial cable, optical fiber, or twisted-pair copper wire. This layer acts as an interface between hosts and transmission links.

The Internet Layer: This layer packages data into different independent IP datagrams, which contain source and destination address information that is used to forward the datagrams between hosts and across networks. They may even arrive in a completely different order in the destination than how they were sent from the host,in which case it is the job of higher layers to rearrange them, if in-order delivery is desired. This internet layer defines an official packet format protocol called IP(Internet Protocol),and a companion protocol called ICMP(Internet Control Message Protocol)that helps it function.

The Transport Layer: The layer above the internet layer in the TCP/IP model is usually called the transport layer. It is designed to allow entities on the source and destination hosts to carry on a conversion. Two end-to-end transport protocols have been defined here.

The Application Layer: Application layer defines the communications services used by the user's applications to transmit data over the network.
