

Computer Network

Assignment - I

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Q.1) What is Network & Internet? Explain both terms in detail.

Ans: Network is an interconnected collection of autonomous computers.

- When two or more computers are joined together so that they are capable of exchanging information, they form a network.

- The need for networking are:

- Resource sharing :- Through a network, data, s/w and h/w resources can be shared irrespective of the physical location of the resources and the users.
- Reliability :- A file can have its copies on two or more computers of the network.

• Reduced cost :- Sharing resources reduces the cost

• Fast communication :- Information can be exchanged at a very fast speed.

=> Internet is worldwide network of computer networks.

- Most computers are not connected directly to the Internet.

- They are connected to smaller networks.

- Which are connected through gateways to the Internet backbone.

Q.2] Explain switching techniques in detail.

Ans These are three types of switching techniques :

1) Circuit Switching

- Physical connection between the two computers is established and then data is transmitted from source to destination computer.
- When a computer places a telephone call, the switching equipment within the telephone system seeks out a physical copper path from sender's to receiver's telephone.
- It sets up end-to-end connection between computers before any data can be sent.

2) Message Switching

- The source computer sends the data to the switching office first which stores the data in its buffer.
- It then looks for a free link to another switching office and then send the data to the office.
- Process is continued till the data is delivered to the destination computer.
- It is also known as store and forward technique.

3) Packet Switching

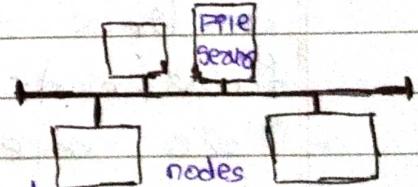
- There is a tight upper limit on the block size. In message switching there was no upper limit.
- A fixed size of packet is specified.
- All the packets are stored in main memory in switching office. In message switching packets are stored on disk.
- This increases the performance as access time is reduced.

Q.3] Draw and describe all Network topologies in detail.

Ans The pattern of interconnection of nodes in a network is called the topology.

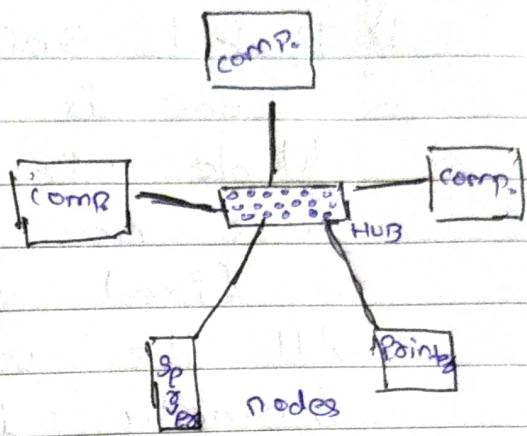
• Bus Topology

- A linear bus topology consists of a main run of cable with a terminator at each end.
- All nodes (file servers, workstation & peripherals) are connected to the linear cable.
- Advantages : Easy to connect a comp. or peripheral to a linear bus and requires less cable length than a star topology.
- Disadvantages : Entire network shuts down if there is a break in the main cable. Difficult to identify the problem if the entire network shuts down.



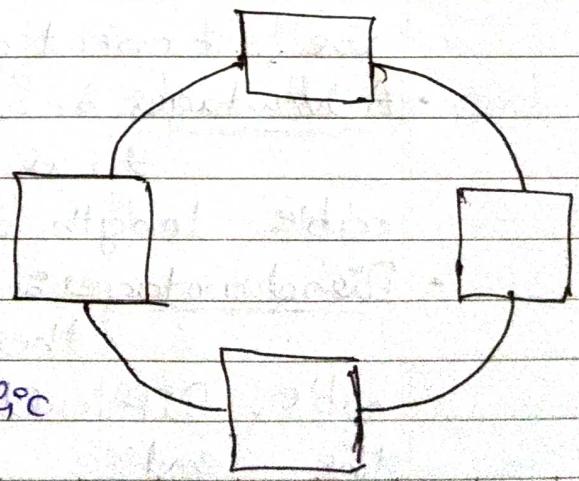
o STAR Topology

- A star topology is designed with each node (file server, workstation) connected directly to a central network hub or concentrator.
- Data on a star network passes through the hub or concentrator before continuing to its destination.
- The hub or concentrator manages and controls all functions of the network. It also acts as a repeater for the data flow.
- Advantages:- Easy to install and wire.
- No disruptions to the network when connecting or removing devices.
- Easy to detect faults and to remove parts.
- Disadvantages:- Requires more cable length than a linear topology. If the hub or concentrator fails, nodes attached are disabled.
- More expensive than linear bus topologies because of the cost of the concentrators.



o Ring Topology

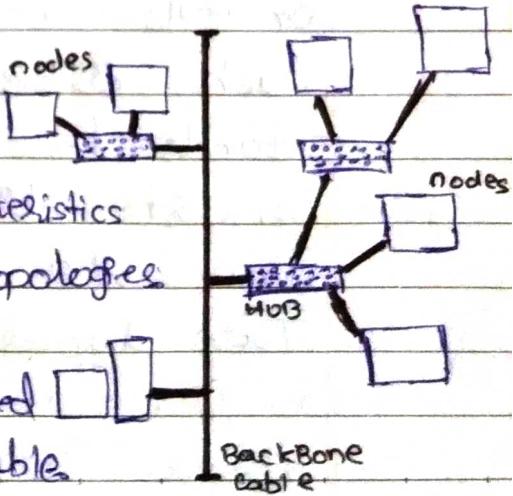
- Ring Network, a local area network formed in a ring (closed loop) topology that uses token passing as a means of regulating traffic on the line.



- On a token ring network, a token governing the right to transmit is passed from one station to the next in a physical circle.
- If a station has information to transmit, it "seizes" the token, marks it as being in use, and inserts the information.
- The "busy" token, plus message, is then passed around the circle copied when it arrives at its destination, and eventually returned to the sender.
- The sender removes the attached message and then passes the freed token to the next station in line.
- Advantages: Short cable length as compared to star, and no wiring closet space required.
- Suitable for optical fibres: high speed & traffic travels in one direction.
- Disadvantages: Node failure causes network failure. It is difficult to diagnose faults. Network reconfiguration is difficult. It is not possible to shut down a small section of the ring.

○ Tree Topology:

- A tree topology combines characteristics of linear bus and a star topologies.
- It consists of groups of star-configured workstations connected to a linear backbone cable.



- Tree topologies allow for the expansion of an existing network, and enable schools to configure a network to meet their needs.
- Advantages: point-to-point wiring for individual segments.
- Supported by several hardware and software vendors.
- Disadvantages: Overall length of each segment is limited by the type of cabling used.
- If the backbone line breaks, the entire segment goes down.
- More difficult to configure and wire than other topologies.

Q.5] Explain all network devices which is used in network in detail.

Ans: All network devices which is used are given below:

o Modem

- Modems are most frequently used to enable computers to communicate with each other across telephone lines.
- Stands for modulation - demodulation.
- Converts digital signal to analog signal and vice versa.
- Two types - Internal and External.

- o RJ 45 connectors:

- Registered Jack 45 is an 8-wire connector which is commonly used to connect computers on LAN.
- Looks like RJ-11 telephone connectors.

- o Ethernet cables:

- Ethernet, is a LAN architecture developed by the Xerox corporation in 1976, originally for linking minicomputers at the Palo Alto Research Center.
- Computers that use Ethernet architecture have to install ethernet card.
- Now computers are coming fitted with ethernet card.

- o Hubs:

- A common connection point for devices in a network.
- Hubs are commonly used to connect segments of a LAN.
- A hub contains multiple ports.
- A passive hub serves simply as a conduit for the data, enabling it to go from one device (or segment) to another.
- Support 8, 12 or 24 RJ-45 ports
- Used in star or ring topology.

- o Switches:

- A switch (switching hub) in the context of networking refers to a device which

filters and forward data packets across a network.

- Unlike a standard hub which simply replicates what it receives on one port onto all the other ports, a switching hub keeps a record of the MAC address of the devices attached to it.
- When the switch receives a data packet, it forwards the packet directly to the recipient device by looking up the MAC address.

o Repeater:

- A repeater is an electronic device that receives a weak or low-level signal and retransmits it at a higher level or higher power, so that the signal can cover longer distances without degradation.

o Bridge:

- In telecommunication networks, a bridge is a product that connects a local area network (LAN) to another local area network that uses the same protocol (for example, ethernet or Token Ring).

o Routers:

- Router is a specialized network device used to interconnect different types of computer network that uses different protocol. E.g. ethernet to a mainframe.

- Gateway

- Gateway is a device that connects dissimilar networks.
- Establishes intelligent connection between a local network and external networks with completely different structures.
- Gateway is the ISP that connects the user to the internet.

Q.S] Describe OSI reference model in detail.

Ans • The open system Interconnection Reference Model, the OSI model was developed by the ISO (International standards Organization) and released in 1984.

- The OSI model, as it is called for short, defines the rules, mechanisms, formats, and protocols used to guide how data flows from one device to another.

- Physical Layers

- This layer of the OSI model defines the electrical & mechanical specifications used in networking, including transmission distances, the various types of media available, and electrical issues.

- Data Link Layers

- Physical addressing, Network topology, Error notification, Access to the physical medium, Flow control.

- Network Layer

- Message addressing, Path determination b/w source and destination nodes on diff' networks.
- Routing messages between networks.
- Controlling congestion on the subnet.
- Translating logical address into physical addresses.

- Transport Layer

- Segment and reassemble upper-layer application.
- Transport segments from one host to another host.
- Establish and manage end-to-end operations.
- Error recovery.

- Session Layer

- A session is a series of related connection-oriented transmissions between network nodes.
- Session layers establishes, manages and terminates sessions between applications.
- The session layer provides a name space that is used to tie together the potentially different transport streams that are part of a single application.
- Session layer is its sole in deciding whether a communications session uses a simplex, half-duplex, or full-duplex transmission mode.

- Presentation layers

- Data encryption, data compression, data formatting, data conversion.

- Application layers

- This layer defines the communication services used by the user applications to transmit data over the network.
- FTP, Email clients, web browser, Telnet,
- SNMP (Simple Network Management Protocol).
- BBS (Bulletin board system) servers
- EDI (Electronic Data Interchange) and other transaction services.

Q.6] Describe TCP/IP model in detail.

Ans TCP/IP model was designed and developed by Department of Defense (DoD) in 1960s and is based on standard protocols.

It stands for Transmission Control protocol/Internet Protocol. The TCP/IP model is a concise version of the OSI model. It contains four layers, unlike seven layers in the OSI model.

The layers are:

1) Network Access Layer-

⇒ This layer corresponds to the combination of Data Link layer and physical layer of the OSI model. It looks out for

hardware addressing and the protocols present in this layer allows for the physical transmission of data.

2) Internet Layer-

- This layer parallels the functions of OSI's network layer. It defines the protocols which are responsible for logical transmission of data over the entire network.

The main protocols residing at this layer are:

- IP (Internet Protocol)
- ICMP (Internet Control Message Protocol)
- ARP (Address Resolution Protocol).

3) Host-to-Host Layer:

- This layer is analogous to the transport layer of the OSI model. It is responsible for end-to-end communication and error-free delivery of data.

It shields the upper-layer applications from the complexities of data.

The two main protocols present in this layer are:

- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)

4) Application Layer:

- This layer performs the functions of top three layers of the OSI model:

Application, Presentation and Session layers.
It is responsible for node-to-node communication and controls user-interface specification.
Some of the protocols present in the layers are: HTTP, HTTPS, FTP, TFTP, Telnet, SSH, SMTP, SNMP, NTP, DNS, DHCP, NFS, X-Window, LPD.

Have a look at protocols in Application layers for some information about these protocols.