



Continuous Assessment for Laboratory / Assignment sessions

Academic Year 2022-23

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Course: Computer Networks

Course Code: DJ19CEL405

Year: S.Y. B.Tech.

Sem: IV

Batch: III

Department: Computer Engineering

Performance Indicators (Any no. of Indicators) (Maximum 5 marks per indicator)	1	2	3	4	5	6	7	8	9	10	11	Σ	Avg	Avg	Avg	Σ	Avg
Course Outcome	1	1	2	2	4	3	4	4	5	4	6						
1. Knowledge (Factual/Conceptual/Procedural/ Metacognitive)																	
2. Describe (Factual/Conceptual/Procedural/ Metacognitive)																	
3. Demonstration (Factual/Conceptual/Procedural/ Metacognitive)																	
4. Strategy (Analyse & / or Evaluate) (Factual/Conceptual/ Procedural/Metacognitive)																	
5. Interpret/ Develop (Factual/Conceptual/ Procedural/Metacognitive)	-	-	-	-	-	-	-	-	-	-	-				-	-	
6. Attitude towards learning (receiving, attending, responding, valuing, organizing, characterization by value)																	
7. Non-verbal communication skills/ Behaviour or Behavioural skills (motor skills, hand-eye coordination, gross body movements, finely coordinated body movements speech behaviours)	-	-	-	-	-	-	-	-	-	-	-				-	-	
Total	<u>25</u>	<u>24</u>															
Signature of the faculty member	<u>S. Jadhav</u>																

Outstanding (5), Excellent (4), Good (3), Fair (2), Needs Improvement (1)

Laboratory marks Σ Avg. =	Assignment marks Σ Avg. =	Total Term-work (25) =
Laboratory Scaled to (15) =	Assignment Scaled to (10) =	Sign of the Student:

Signature of the Faculty member:
Name of the Faculty member:

Signature of Head of the Department
Date:

NAME: PRERNA SUNIL JADHAV

SAP ID: 60004220127

CLASS: S. Y. B.Tech (COMPUTER ENGINEERING)

COURSE : COMPUTER NETWORKS (DJ19CEL405)

DATE OF PERFORMANCE: 21 FEB 2023

DATE OF SUBMISSION: 22 FEB 2023

EXPERIMENT No.: 1

AIM: To study different networking devices and topologies.

Theory:

A) NETWORKING DEVICES:

1) Repeater:

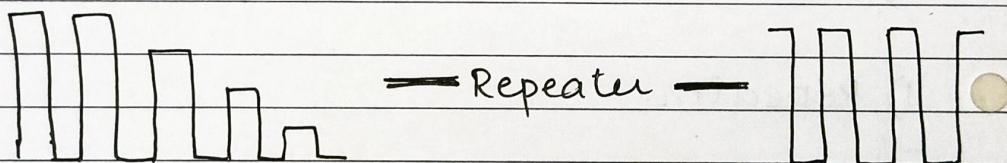
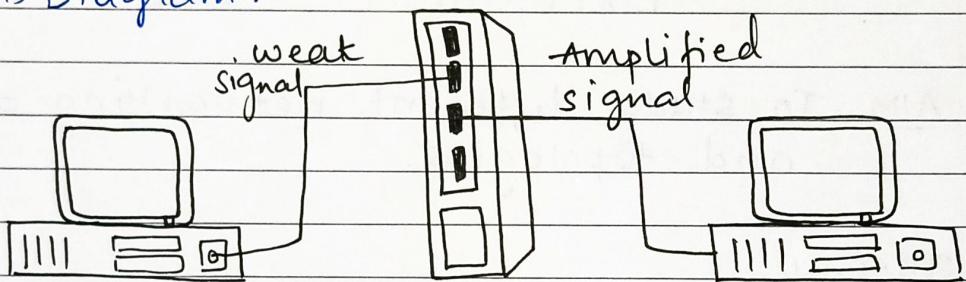
(i) Introduction

- A repeater is a network device that retransmits a received signal with more power and to an extended geographical or topological network boundary than what would be capable with the original signal.
- It is also known as a signal booster.
- The incoming data can be in optical, wireless

on electrical signals.

- It works at the physical layer of the OSI model
- Repeaters are two-point devices that are used for longer-distance data transmission without compromising data security or quality.
- When the incoming signals are attenuated it copies them bit by bit & retransmits them.

(ii) Diagram:



(iii) Advantages:

- They provide signal strength
- They are cheap as well as easy to use
- They have no impact on the network's performance.
- They are capable of retransmitting data and boosting weak signals.

(iv) Disadvantages:

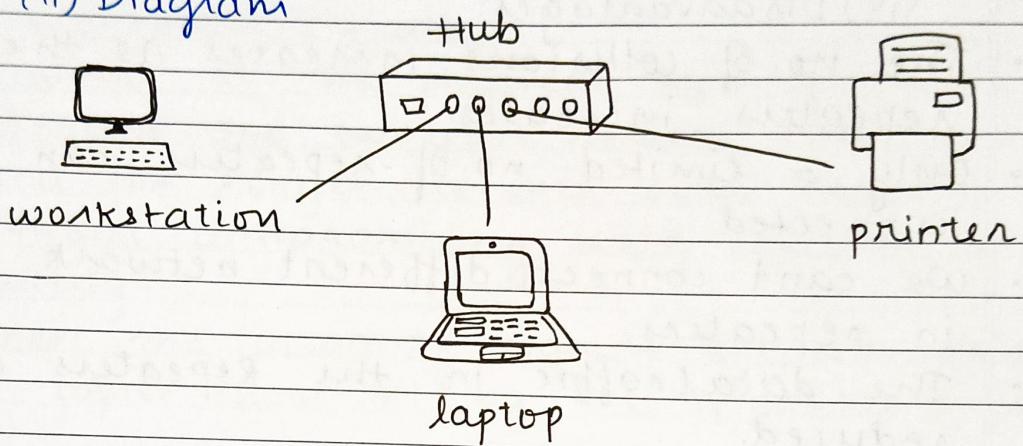
- The no. of collisions increases as the no. of repeaters increases.
- Only a limited no. of repeaters can be connected
- We can't connect different network architecture in repeaters
- The data traffic in the Repeaters cannot be reduced.

2) Hub:

(i) Introduction

- A hub sends data packets to all devices on a network, regardless of any MAC addresses contained in the data packet.
- The main purpose of a hub is to connect all present network devices together on a predefined internal network.
- Hub is not considered to be an intelligent one because it doesn't filter any data present or has no intelligence to assume as to where the data is actually supposed to be sent, & that's the reason because the only thing a hub knows is that when a device is actually connected to one of its port.

(ii) Diagram



(iii) Advantages

- Ability to connect to the network using various physical devices
- Cheaper compared to other devices
- Causes minimum delay
- Doesn't affect the network's performance

(iv) Disadvantages

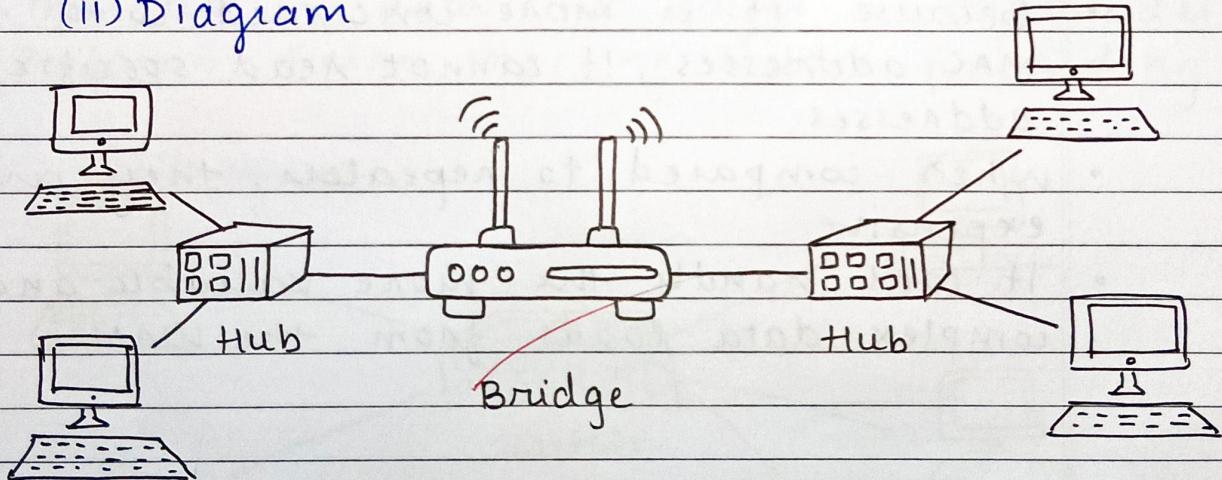
- Doesn't filter the data, hence wastage of bandwidth
- Makes the network insecure by sharing data to all devices present in the network
- Involves flooding of data.
- ~~cannot connect token ring.~~

3) Bridge:

(i) Introduction

- A bridge is a network device that connects two or more LANs (local area network) to form a larger LAN.
- Network bridging refers to the process of aggregating networks.
- A bridge connects various components, making them appear to be part of a single network.
- In the OSI model, a bridge operates at level 2 on the data link layer.
- This is primarily to inspect incoming traffic and determine whether it should be filtered or forwarded.

(ii) Diagram



(iii) Advantages

- It serves as a network extender by acting as a repeater.
- Subdividing network traffic into network communication can reduce network traffic on a segment.
- Collisions can be reduced
- It reduces Bandwidth wastage, as fewer network nodes share a collision domain, bridges increase the available bandwidth to individual nodes.

(iv) Disadvantages

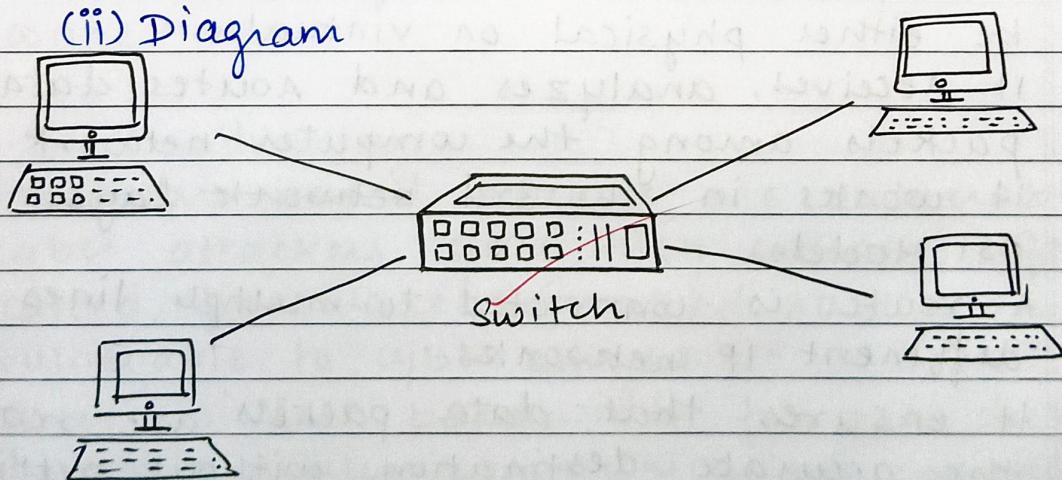
- It cannot assist in the construction of the network between the various network architectures.
- Because it is more concerned with the MAC addresses, it cannot read specific IP addresses.
- When compared to repeaters, they are expensive.
- It can't handle the more variable and complex data loads from the WAN.

4) Switch:

(i) Introduction

- It is used to segment the networks into different subnetworks called subnets or LAN segment.
- It is responsible for filtering and forwarding the packets between LAN segments based on MAC address.
- When a switch receives data, it determines the destination and sends it directly to that device. It doesn't broadcast the packets to all computers as hub does, which means bandwidth is not shared & make network more efficient. That is why, switches are more intelligent and preferred than a hub.
- Operates in data link layer in OSI Model
- Performs Error checking before forwarding it.

(ii) Diagram



(iii) Advantages

- Prevents traffic overloading in a network by segmenting the network into smaller subnt
- Increase the bandwidth of the network.
- Less frame collision as switch creates the collision domain for each connection.

(iv) Disadvantages

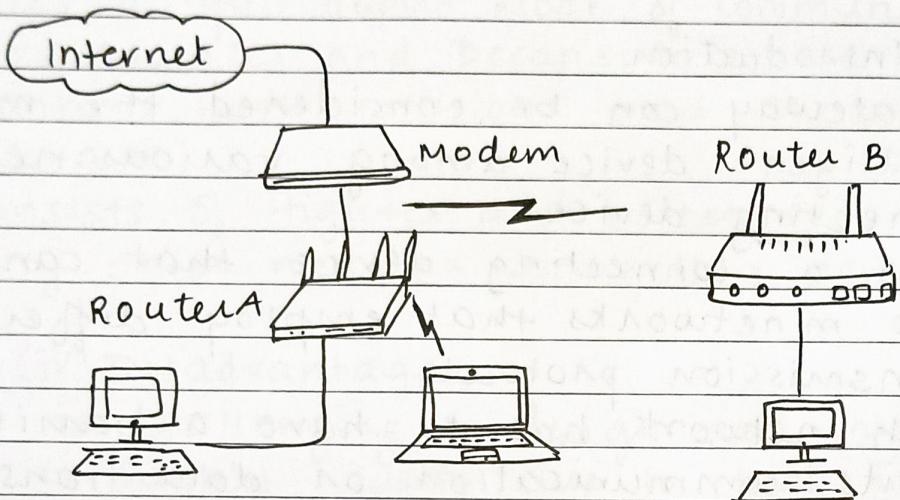
- They are more expensive than network bridges
- Network connectivity issues on network switches are difficult to trace.
- They do not work very well when used as a diversion to limit broadcasts.

5) Router:

(i) Introduction

- A router is a networking device that can be either physical or virtual
- It receives, analyzes and routes data packets among the computer network & devices.
- It works in the 3rd network layer of OSI Model.
- A router is connected to multiple lines from different IP networks.
- It ensures that data packets are reaching the accurate destination without getting lost.

(ii) Diagram



(iii) Advantages

- Determines the most efficient path between source and destination using dynamic routing algorithms such as OSPF, BGP, RIP etc.
- Provides connection among different network architecture
- Connects multiple users to a single network connection.

(iv) Disadvantages

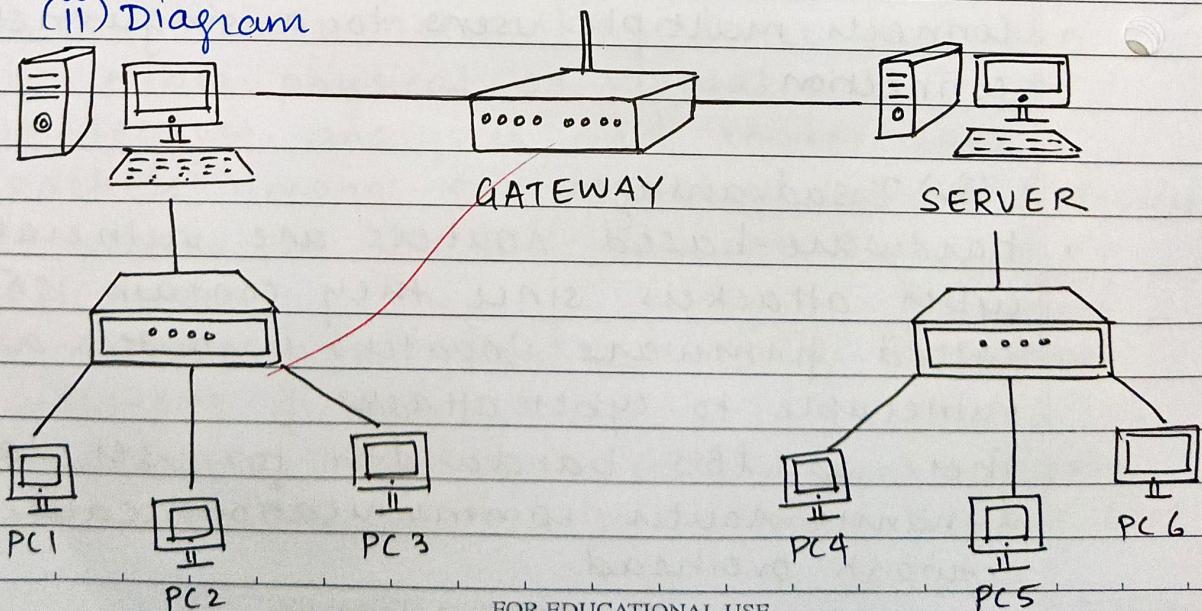
- Hardware-based routers are vulnerable to cyber attackers since they contain software called ~~firmware~~. Unpatched routers are quite vulnerable to cyber attacks.
- There is less bandwidth for user data since dynamic router communications cause additional network overhead.

6) Gateway

(i) Introduction

- A Gateway can be considered the most intelligent device among various network connecting devices.
- It is a connecting device that can connect two networks that employ different transmission protocols.
- Each network has to have a barrier that limits communication or data transmission to only connected devices. As a result, a gateway is required if a network needs to interact with network devices beyond its boundary.
- It is located at the network's edge & administers all traffic or data directed in/out

(ii) Diagram



(iii) Advantages

- Uses a full duplex mode of communication
- Encapsulates and Decapsulates the packets.
- controls both collisions and the broadcast domain
- Consists of tighter and better security than any other network connection device.

(iv) Disadvantages

- It is challenging to design and implement.
- It is highly costly due to high implementation cost.
- A particular system administration setup is required.

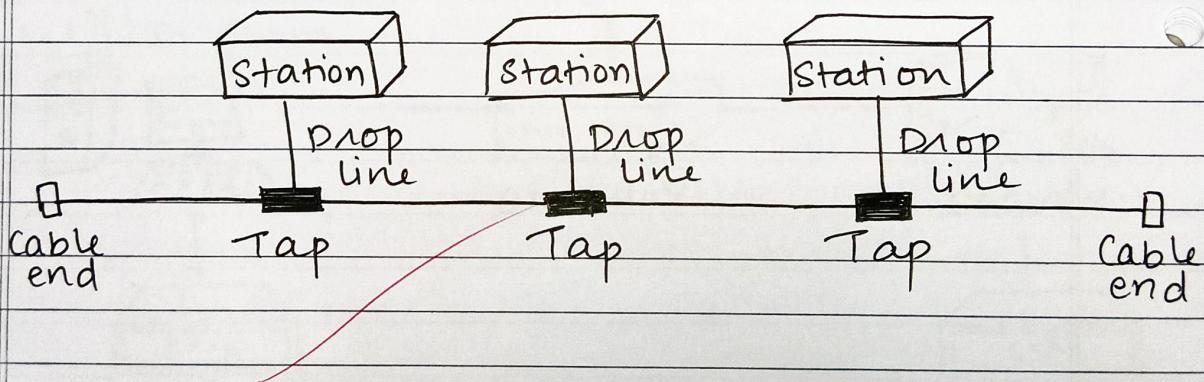
B) NETWORKING TOPOLOGY:

i) Bus:

(i) Introduction

- The bus topology is designed in such a way that all the stations are connected through a single cable known as 'backbone cable'.
- Each node is either connected to the backbone cable by the 'drop line' or directly connected to the backbone cable.
- When a node wants to send a message over network, it puts a message over network.
- All stations available will be received the message whether its addressed or not.

(ii) Diagram



(iii) Advantages

- It's easy to install
- Because of backbone, less cable is required.
- No. of I/O ports required is less.
Also the hardware is reduced.
- Backbone can be extended by using repeaters.
- Cost is low as well.

(iv) Disadvantages:

- Heavy traffic can slow a bus considerably.
- Difficult for reconnection, fault isolation or troubleshooting.
- Difficult to add new node / device.
- Failure of backbone affects failure of all devices on network.

(v) Applications

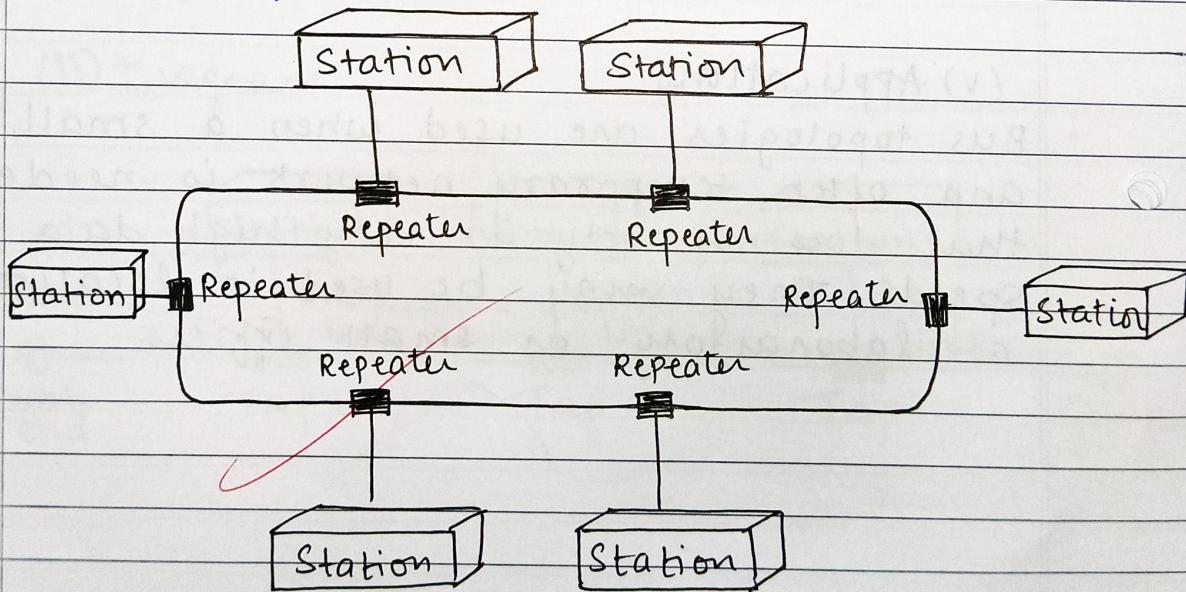
- Bus topologies are used when a small, cheap and often temporary network is needed that does not rely on very high data transfer speeds. They may be used in locations such as laboratory or small offices.

2) Ring:

(i) Introduction

- It is a topology in which each computer is linked to another on both the sides.
- The last computer is linked to first, forming a ring.
- This topology enables each computer to have exactly 2 neighbours.
- The most common access method of the ring topology is token passing.
- Token is a frame that circulates around the network.

(ii) Diagram



(iii) Advantages

- A ring topology is relatively easy to install and reconfigure.
- Link failure can be easily found as each device is connected to its immediate neighbors only.
- Because every node is given equal access to the token no one node can monopolize the network.

(iv) Disadvantages

- Maximum ring length and the number of devices is limited.
- Failure of one node on the ring can affect the entire network.
- Adding or Removing node disrupts the network.

(v) Applications

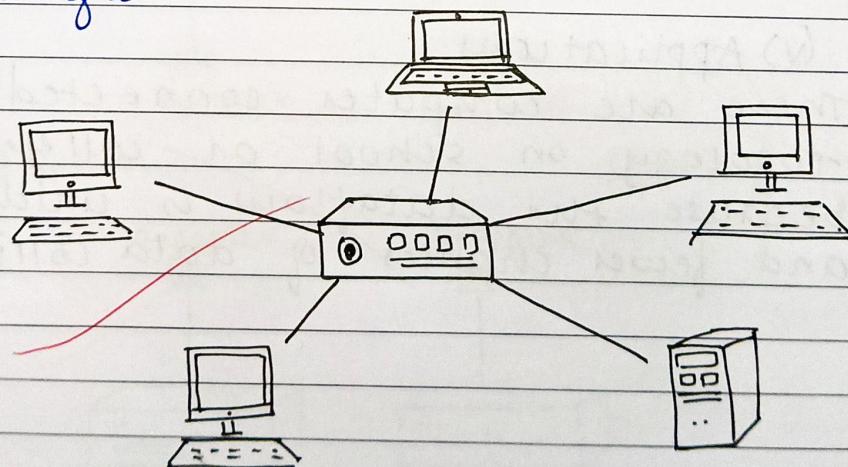
- There are computers connected in ring topology on school or college campuses because the dataflow is unidirectional and fewer chances of data collision.

3) Star:

(i) Introduction

- Star topology is an arrangement of the network in which every node is connected to the central hub, switch or a central computer.
- The central computer is known as a server. The peripherals devices attached to it are known as clients.
- Coaxial cable or RJ-45 cables are used to connect the computers.
- Hubs or switches are mainly used as connection devices in a physical star topology.
- Star topology is the most popular one.

(ii) Diagram:



(iii) Advantages

- Each device needs only one link and one I/O port, which makes stars topology less expensive
- easy to install and easy to configure
- Robust topology. If any link fails it doesn't affect entire network.
- Easy fault identification and isolation
- It is easy to modify and add new nodes to star network without disturbing the rest of the network.

(iv) Disadvantages:

- If central hub fails the entire network fails to operate.
- Each device requires its own cable segment
- In hierarchical network, installation and configuration is difficult.

(v) Applications :

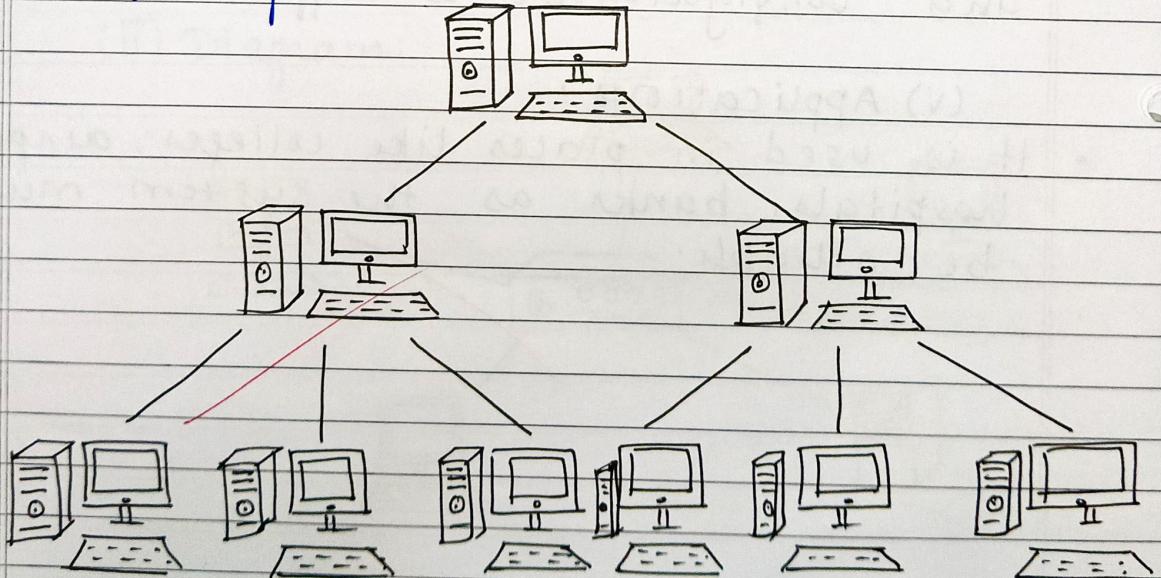
- It is used in places like colleges, airports, hospitals, banks as the system must be reliable.

4) Tree

(i) Introduction

- Tree topology are also known as hierarchical topology, as root node connects all other nodes to form a hierarchy.
- This topology is known as 'Star-Bus' topology because it combines several star topologies into a single bus.
- Data flows from top to bottom in this network topology, from the central hub to the secondary hub and then to the devices, or from bottom to top, from devices to the secondary hub, which then connects to the central hub.

(ii) Diagram



(iii) Advantages

- Support for broadband transmission, i.e., signals are sent over long distances without being attenuated.
- It is expandable i.e., we can add new devices to the existing network.
- Error detection and correction are very easy in a tree topology.
- The breakdown in one station doesn't affect the entire network.

(iv) Disadvantages:

- If any fault occurs in the node, then it becomes difficult to troubleshoot the problem.
- Devices required for broadband transmission are very costly.
- A tree topology mainly relies on main bus cable & failure in it will damage the overall network.

(v) Applications

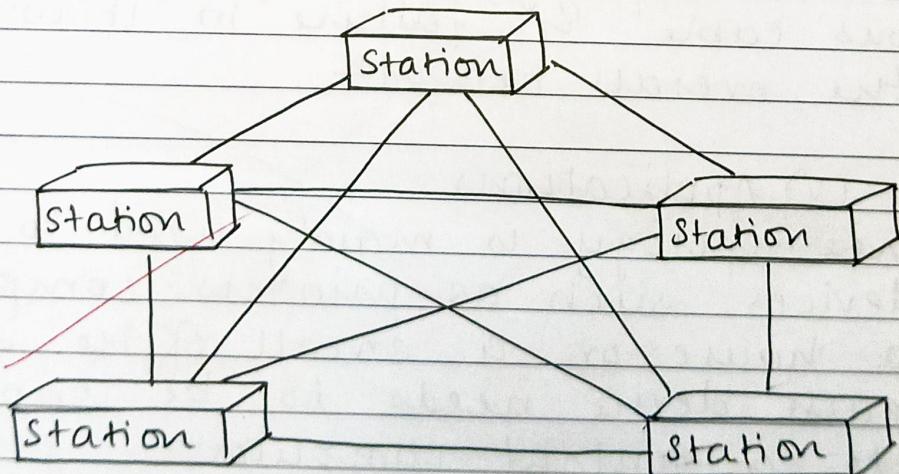
- Tree topology is mainly used to connect devices such as printers, computers in a house or a small office where each device needs to be connected to a central computer.

5) Mesh

(i) Introduction

- Mesh topology is an arrangement of the network in which computers are interconnected with each other through various redundant connections.
- There are multiple path from one computer to another computer.
- It can be formed by this formula:-
Number of cables = $(n * (n-1)) / 2$,
where n is the no. of nodes that represents the network.
- This indicates that each node must have $(n-1)$ I/O ports.

(ii) Diagram



(iii) Advantages

- No traffic because of dedicated link
- Robust because if one link fails, it does not affect the entire network.
- Privacy and security of data is achieved due to dedicated link.
- Fault identification is easy.

(iv) Disadvantages

- Difficulty of installation and reconfiguration as every node is connected to every other node.
- Costly because of maintaining redundant links.
- The amount of cabling required is large

(v) Applications

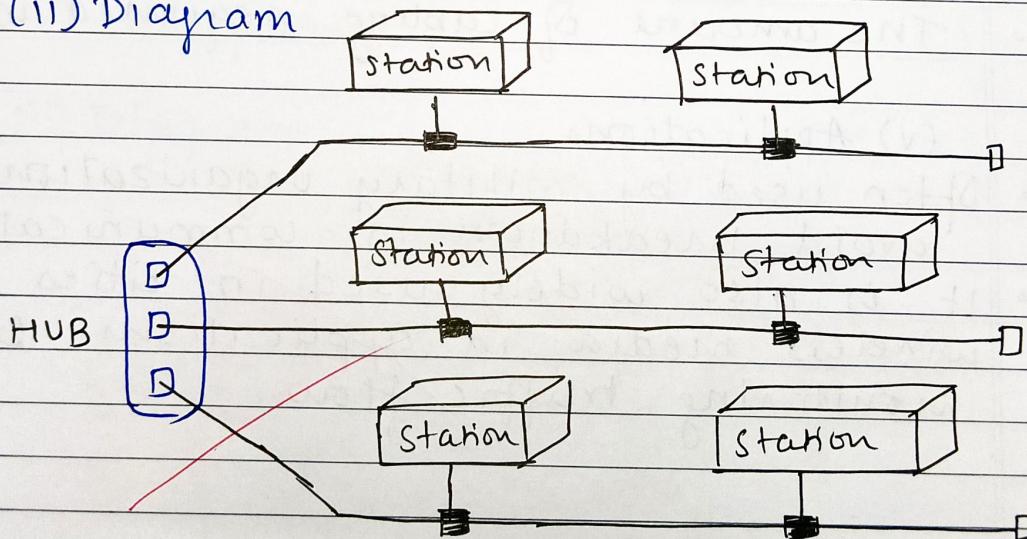
- Often used by military organization to avoid breakdown in communication
- It is also widely used in cities using wireless media in applications like monitoring traffic flow.

6) Hybrid

(i) Introduction

- When two or more different topologies are combined together is termed as hybrid topology and if similar topologies are connected with each other it will not result in hybrid topology.
- For example, if there exist a ring topology in one branch of HDFC bank and bus topology in another branch of HDFC bank, connecting these two topologies will result in hybrid topology.

(ii) Diagram



(iii) Advantages

- Reliable: Fault in one part, won't affect functioning of entire network.
- Scalable: Add new elements without affecting the functionality of existing system.
- Flexible: It can be designed according to the requirements.
- Effective: The strength is maximized & the weakness of the network is minimized.

(iv) Disadvantages:

- Complex Design: It is very difficult to design the architecture of this network.
- Costly Hub: Hub used in this topology are expensive than the usual hub.
- Costly Infrastructure: As it require a lot of cabling, network devices etc.

(v) Applications

- Some of the major applications of the hybrid topology are -
 - financial and banking sector
 - automated industry
 - multi national companies
 - research organizations
 - educational institutes etc.

CONCLUSION:

Different types of networking devices and topologies are studied.

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