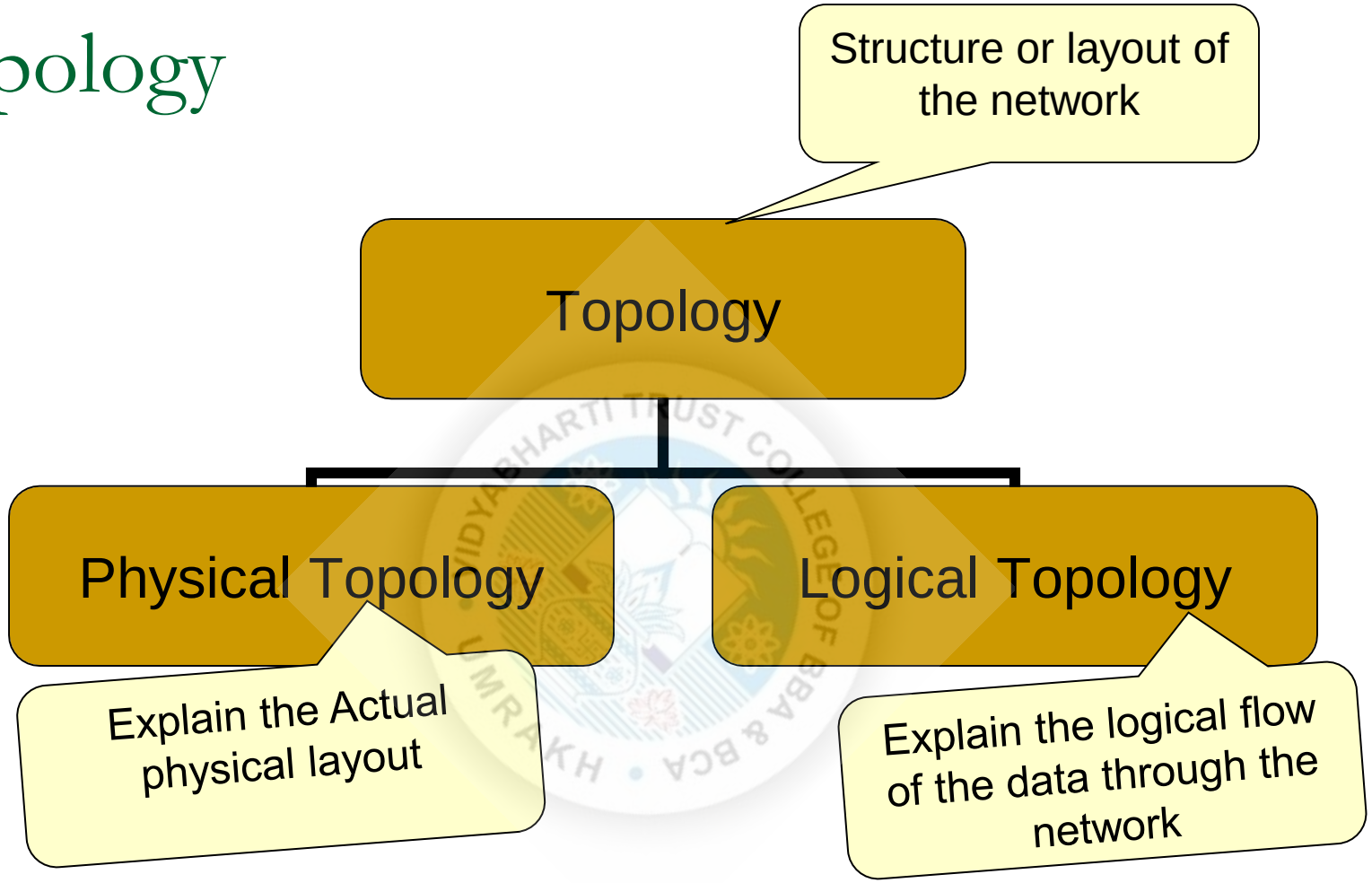
Topology

PROF. AMIT PATEL

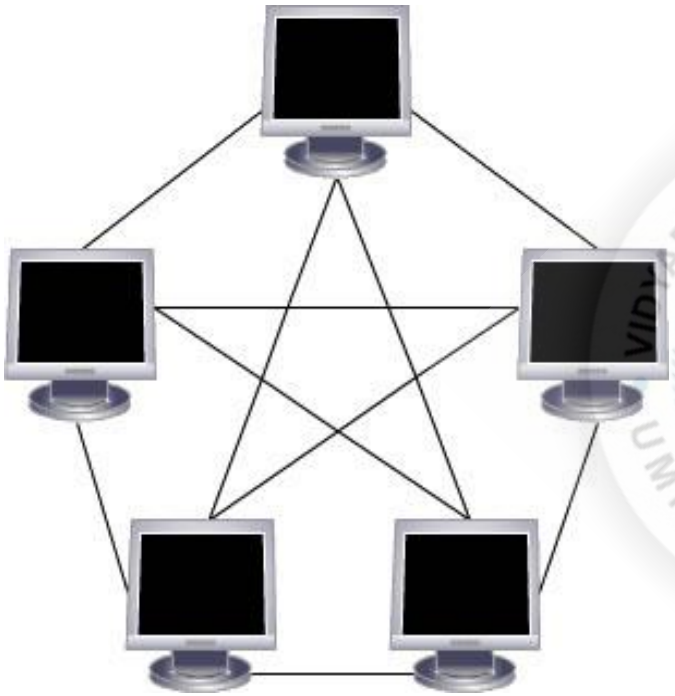
Topology


Structure or layout of the network
Topology
Physical Topology
Logical Topology
Explain the Actual physical layout
Explain the logical flow of the data through the network

List of Topology

- Mesh
- Bus
- Star
- Ring
- Tree
- Hybrid

Mesh Topology



- Every device has a dedicated point-to-point link to every other device.
- To find the number of physical link in a mesh network with n nodes, we need total n(n-1)/2 link.
- To support n(n-1)/2 link , every device need n-1 i/o port in single machine, and require total

  n(n-1)/2 port

Advantage

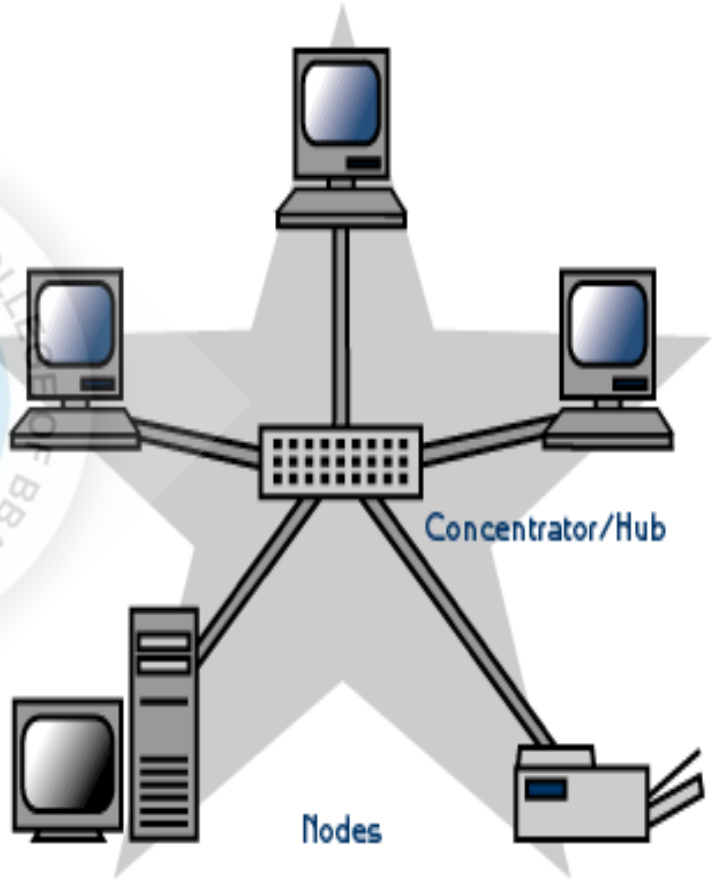
- Each connection can carry its own data load, so eliminating traffic problem.
- If one link become unusable, it doesn't impact the entire system.
- Provide more security because every message travel along dedicated line so only recipient sees it.
- Easy Fault Identification and isolation in small network.

Disadvantages.

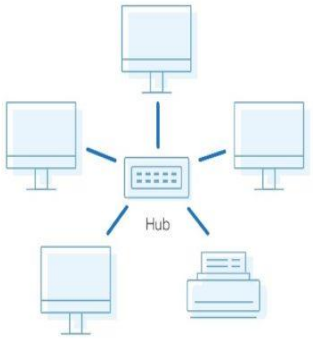
- Costly. Require more cable and i/o ports.
- Installation and reconnection are difficult.
- Limited to small network.

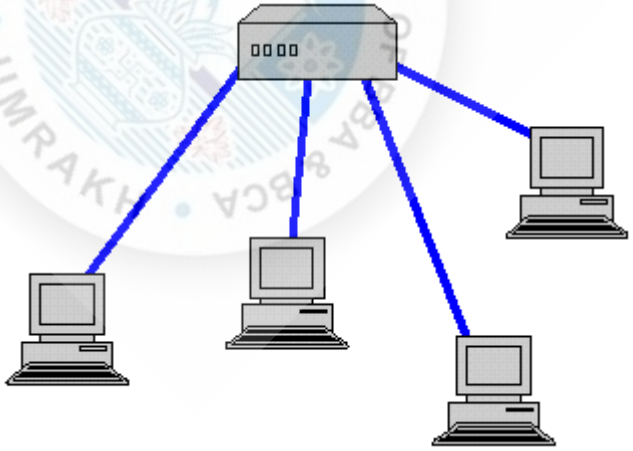
Star Topology

- Each device is connected to a central device called hub, switch or other connecting device through cable
- Don’t allow direct traffic
- Data passes through connecting device before reaching destination



Star Topology





Advantages – Disadvantage.

- Less expensive than Mesh
- Each device need only one link and i/o port.
- Easy to install and configure.
- Robustness : if one link fail, doesn't effect to whole network.
- Easy fault identification and isolation
- Dependent on central device if it is fail whole network is dead.
- More Expensive

BUS Topology (Daisy-Chained)

BUS

- It is multipoint topology.
- Daisy Chained Topology Because connected one right after the other.
- All devices are connected to a common cable called trunk.
- One long cable work as backbone to link all other device.
- Nodes are connected to bus cable by drop lines and cables.

Continue…

- Drop line is connection between device and main cable
- Tap is a connector that attached to the main cable to its metalic core.
- Limited number of tap used because the signal becomes weak while travelling through wire and loose their enery in form of heat.
- Maximum segment length of cable is 200 m
- Maximum of 30 devices per segment .

How it Works

- A signal from the source is broadcasted .
- It travels to all workstations connected to bus cable.
- only the intended recipient, whose MAC address or IP address matches, accepts it.
- If the MAC /IP address of machine doesn't match with the intended address, machine discards the signal.

Example

- Suppose that you want to send an instant message to your friend , who works across the office, asking whether he wants to come to watch movie with you. You click the Send button after typing your message
- The data stream that contains your message is sent to your NIC.
- Your NIC then sends a message across the shared wire that essentially says,
- “I have a message for computer.” The message passes by every NIC between your computer and friend’s computer until Friend’s computer recognizes that the message is meant for it and responds by accepting the data.

Advantages

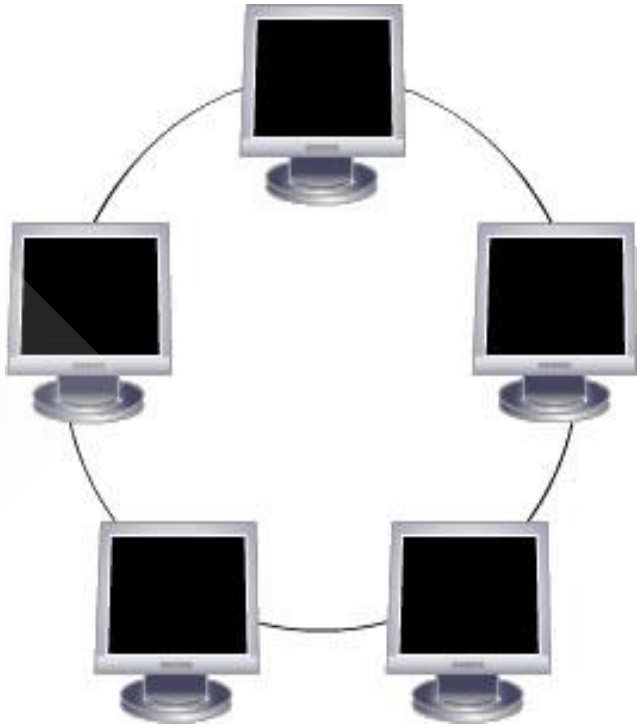
- Easy of installation because backbone cable laid along the most efficient path.
- Require Less cabling than star and mesh topology.

Disadvantage

- Difficult reconnection and fault isolation.
- Difficult to add new device.
- Break in a cable stop all transmission.
- Limited cable length and number of station.
- Maintenance cost may be higher.
- Performance degrade as addition computer are added.
- Does not cope with heavy traffic rate.

Ring Topology

- Each device connect to exactly two other nodes.
- Single continuous path for signal through each node.
- All devices have equal access to media.
- Ring networks operate like bus networks with the exception of a terminating computer.
- In this configuration, the computers in the ring link to a main communication cable.



Continue…

- The network receives information via a "token" containing information requested by one or more computers on the network.
- The token passes around the ring until the requesting computer(s) have received the data.
- The token uses a packet of information that serves as an address for the computer that requested the information.
- The computer then "empties" the token, which continues to travel the ring until another computer requests information to be put into the token.

Advantage

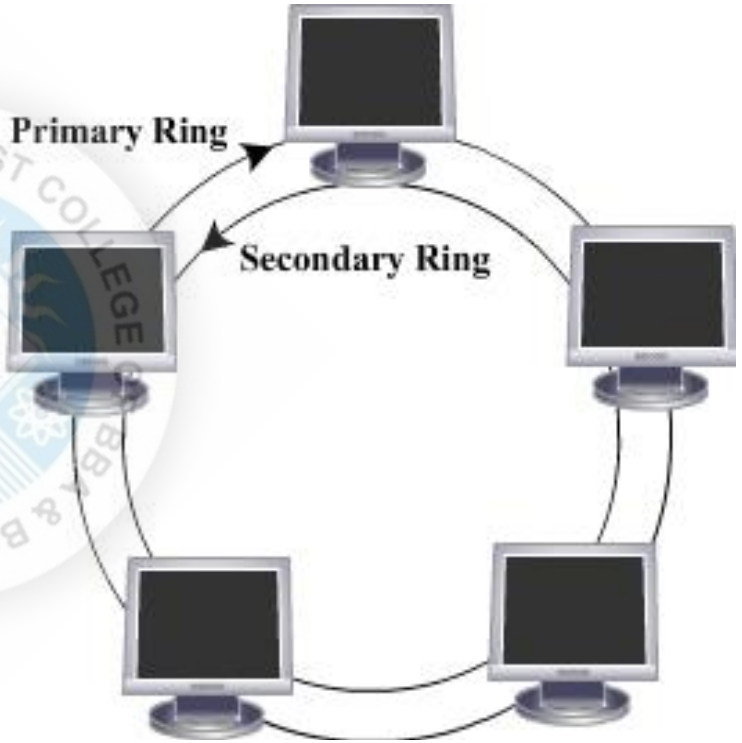
- Easy to install and reconfigure. Because each device is linked to only its immediate neighbours
- Fault isolation is simplified.
- Perform better than bus topology under heavy traffic load.
- Does not require central device.

Disadvantages.

- Unidirectional traffic.
- Break in a cable disable whole network.
- Bandwidth is shared on all link.
- Moving, adding and changing the devices can affect the network.

Dual Ring Topology

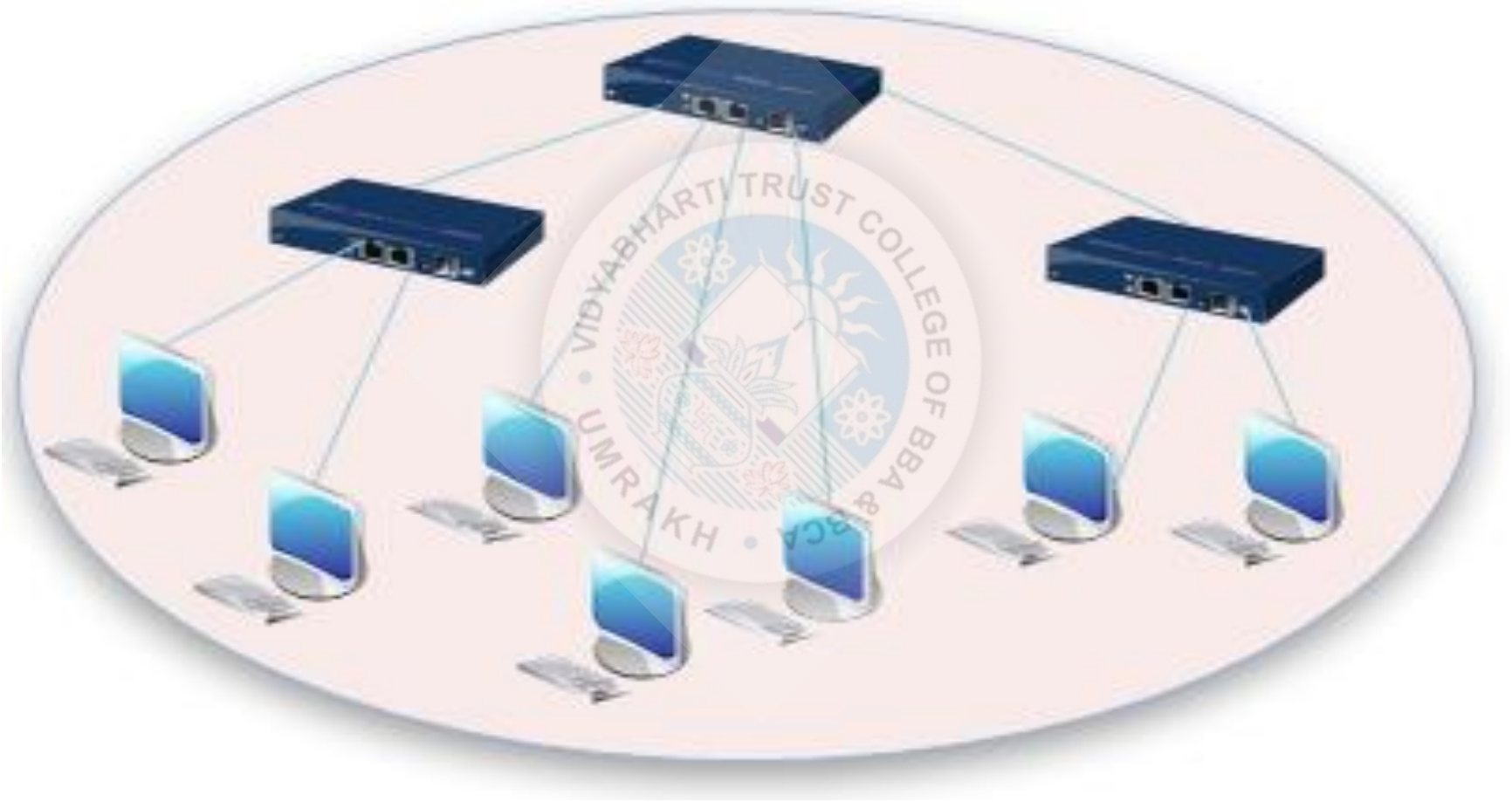
- Consists of two independent primary and secondary rings
- Secondary ring is redundant, used only when primary stops functioning



Tree Topology

- Also known as Hierarchical Topology.
- Tree topologies integrate multiple star topologies together onto a bus.
- The type of **Topology** in which **a central 'root' node, the top level of the hierarchy, is connected** to one or more other nodes that are one level lower in the hierarchy i.e., the second level, with a point-to-point link .
- While each of the second level nodes will also have one or more other nodes that are one level lower in the hierarchy, i.e., the third level,

Tree Topology



Tree Topology

- Top level central 'root' node being the only node that has no other node above it in the hierarchy.
- In its simplest form, only hub devices connect directly to the tree bus, and each hub functions as the "root" of a tree of devices.
- This bus/star hybrid approach supports future expandability of the network much better than a bus (limited in the number of devices due to the broadcast traffic it generates) or a star (limited by the number of hub connection points) alone.
- This topology divides the network in to multiple levels/layers of network.

Tree Topology

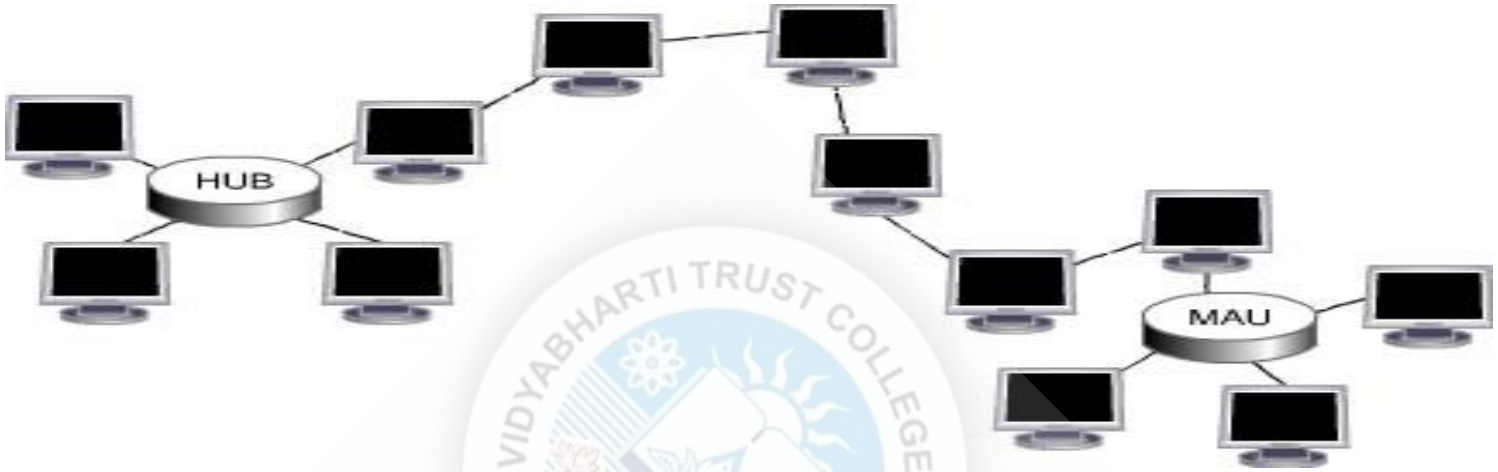
Advantages of a Tree Topology

- Point-to-point wiring for individual segments.
- Supported by several hardware and software venders.

Disadvantages of a Tree Topology

- 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.

Hybrid Topology



- Combines two or more different physical topologies
- Commonly Star-Bus or Star-Ring .

Hybrid Topology

- Advantages:
  - Used for creating larger networks
  - Handles large volume of traffic
  - Fault detection is easy
- Disadvantages:
  - Installation and configuration is difficult
  - More expensive than other topologies
  - More cabling is required

Logical Topology

- The logical topology defines how the data should transfer from one device to the next without regard to the physical interconnection of the devices.
- Also known as “Signal Topology”
- This topology is limited to ‘network protocols’ & define or describe how data is moved across the network.
- Each network also has a *logical topology* that may or may not be the same as its *physical topology*.

Logical Topology

- Two of the most common logical topologies are:

Bus topology:

- Ethernet uses the logical bus topology to transfer data.
- Under a bus topology a node broadcasts the data to the entire network.
- All other nodes on the network hear the data and check if the data is intended for them.

Logical Topology

Ring topology:

- In this topology, only one node can be allowed to transfer the data in a network at a given time.
- This mechanism is achieved by token (the node having token only can transmit the data in a network) and hence the collision can be avoided in a network.

Physical Topology

- The way that the workstations are connected to the network through the actual cables that transmit data (the physical structure of the network) is called the physical topology.
- The method employed to connect the physical devices on the network with the cables, and the type of cabling used, all constitute the physical topology.

Physical Topology

Types of physical topologies include:

- Star Topology: A topology with a single access point or a switch at the center of the topology; all the other nodes are connected directly to this point.
- Tree (Extended Star) Topology: A combination of both the star and the linear bus topologies. This topology has multiple access points connected to the linear bus, while the nodes are connected to their respective access points.

Case Study 1

VTCBBC has built an New Common ADMIN department for Campus in such a way that each device is connected to one another in this department. This department consists of seven officer for seven department. It is required that officer should handle only their specific department since the information is confidential. Like BCA Admin officer handle only BCA department Administration. But in the existing topology the data is not secured. So, the network administrator, wants to switch over to other topology.

Factor Consider For Selecting Topology

- Budget
- Number of User
- Reliability
- Scalability
- Bandwidth capacity
- Ease of installation
- Ease of troubleshooting

Problem

Design a new type of network for this department.

Suggested Solution

The current topology implemented by the VTCBB is mesh in which information is shared between different devices. To obtain security of data star network seems to be the best choice. It also provides ease of troubleshooting, centralized management and ease of reconfiguration.