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COMPUTER NETWORK

What is a computer network?

A computer network is a group of two or more computers connected with each other for sharing resources and information. A simple computer network can be built only from two computers while a complex computer network can be built from several thousand computers.

Types of Computer Network

1.LAN (LOCAL AREA NETWORK)

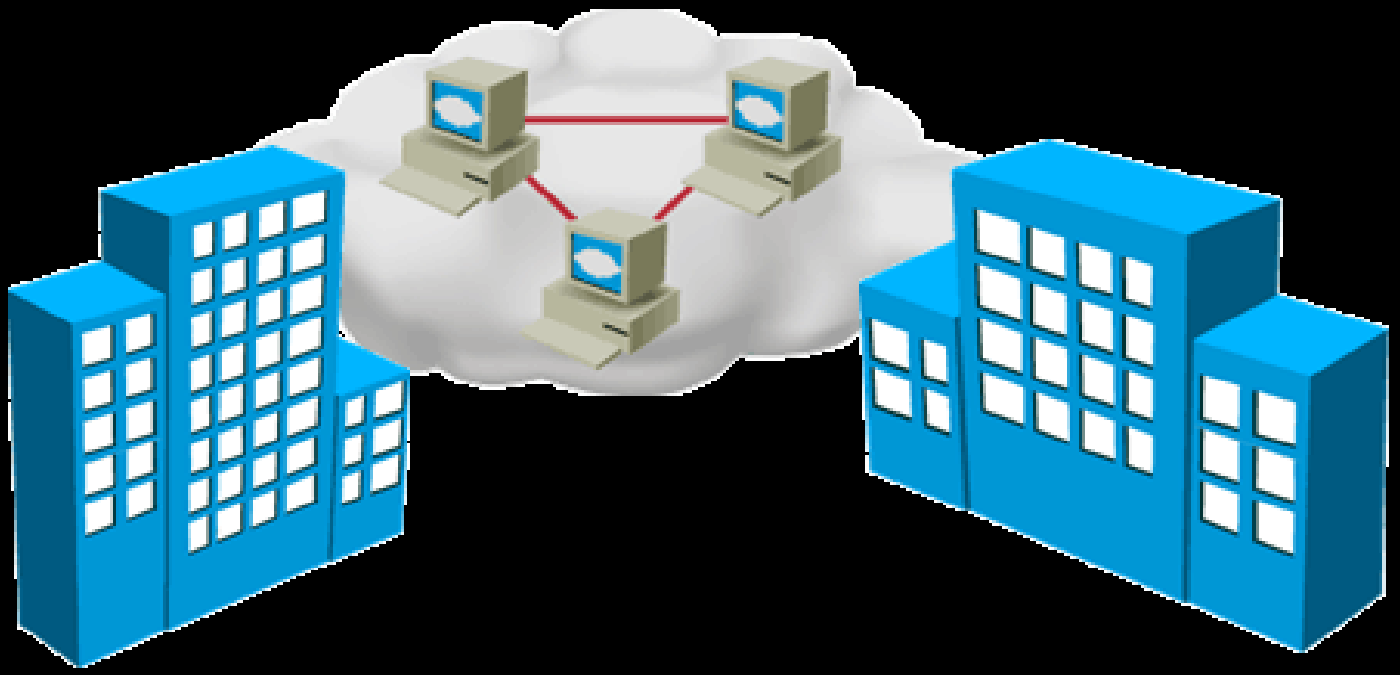
A LAN is a computer network which spans over a small geographical area such as home, building, office, etc. In LAN, computers are placed relatively close. Since computers are located within small distance, they do not need special devices and cables to connect with each other

1. Local area network is a group of computers connected with each other in a small places such as school, hospital, apartment etc.
2. LAN is secure because there is no outside connection with the local area network thus the data which is shared is safe on the local area network and can't be accessed outside.
3. LAN due to their small size are considerably faster, their speed can range anywhere from 100 to 100Mbps.
4. LANs are not limited to wire connection, there is a new evolution to the LANs that allows local area network to work on a wireless connection.

2. MAN (Metropolitan Area Network)

MAN network covers larger area by connections LANs to a larger network of computers. In Metropolitan area network various Local area networks are connected with each other through telephone lines. The size of the Metropolitan area network is larger than LANs and smaller than WANs(wide area networks), a MANs covers the larger area of a city or town.

A MAN is a computer network which connects two or more LAN networks within same city. When due to distance connecting two LANs is not possible, MAN network is used. It is larger than LAN but smaller than WAN. It deploys special devices and cables to connect the LANs.



3.WAN(Wide area network)

Wide area network provides long distance transmission of data. The size of the WAN is larger than LAN and MAN. A WAN can cover country, continent or even a whole world. Internet connection is an example of WAN. Other examples of WAN are mobile broadband connections such as 3G, 4G etc.

WAN is a computer network which spans over a large geographical area such as state, region, country etc. WANs are typically used to connect two or more LANs or MANs which are located relatively very far from each other. To provide connectivity, this network uses special devices, cables and technologies

Advantages of WAN:

Centralized infrastructure: One of the main advantage of WAN is the that we do not need to maintain the backup and store data on local system as everything is stored online on a data centre, from where we can access the data through WAN.

Privacy: We can setup the WAN in such a way that it encrypts the data that we share online that way the data is secure and minimises the risk of unauthorized access.

Increased Bandwidth: With the WAN we get to choose the bandwidth based on the need, a large organization can have larger bandwidth that can carry large amount of data faster and efficiently.

Area: A WAN can cover a large area or even a whole world though internet connection thus we can connect with the person in another country through WAN which is not possible is other type of computer networks.

Disadvantages of WAN:

Antivirus: Since our systems are connected with the large amount of systems, there is possibility that we may unknowingly download the virus that can affect our system and become threat to our privacy and may lead to data loss.

Expensive: Cost of installation is very high.

Issue resolution: Issue resolution takes time as the WAN covers large area, it is really difficult to pin point the exact location where the issues raised and causing the problem.

4. PAN (Pearson Area Network)

Same as LAN network, but it is limited to a specific person or location such as home network. This network is usually setup for sharing resources such as internet and printer within personal computers

5. CAN (Campus Area Network)

Same as MAN network, but it is limited to a university or an academy. This network is usually setup for educational activities such as classroom updates, practices labs, emails, exams, notifications, polls, etc.


UNIVERSITY

6.GAN (Global Area Networks)

Same as WAN network, but it covers unlimited geographical area. For example a company has an office in Delhi and another one Washington D.C., connecting these two offices will be considered as a GAN network. In other words, GAN is a computer network which connects two or more WANs. This network is increasingly gaining popularity as many companies are expending their working area beyond their native countries.

Computer Network Topology

Geometric representation of how the computers are connected to each other is known as topology. There are five types of topology – Mesh, Star, Bus, Ring and Hybrid.

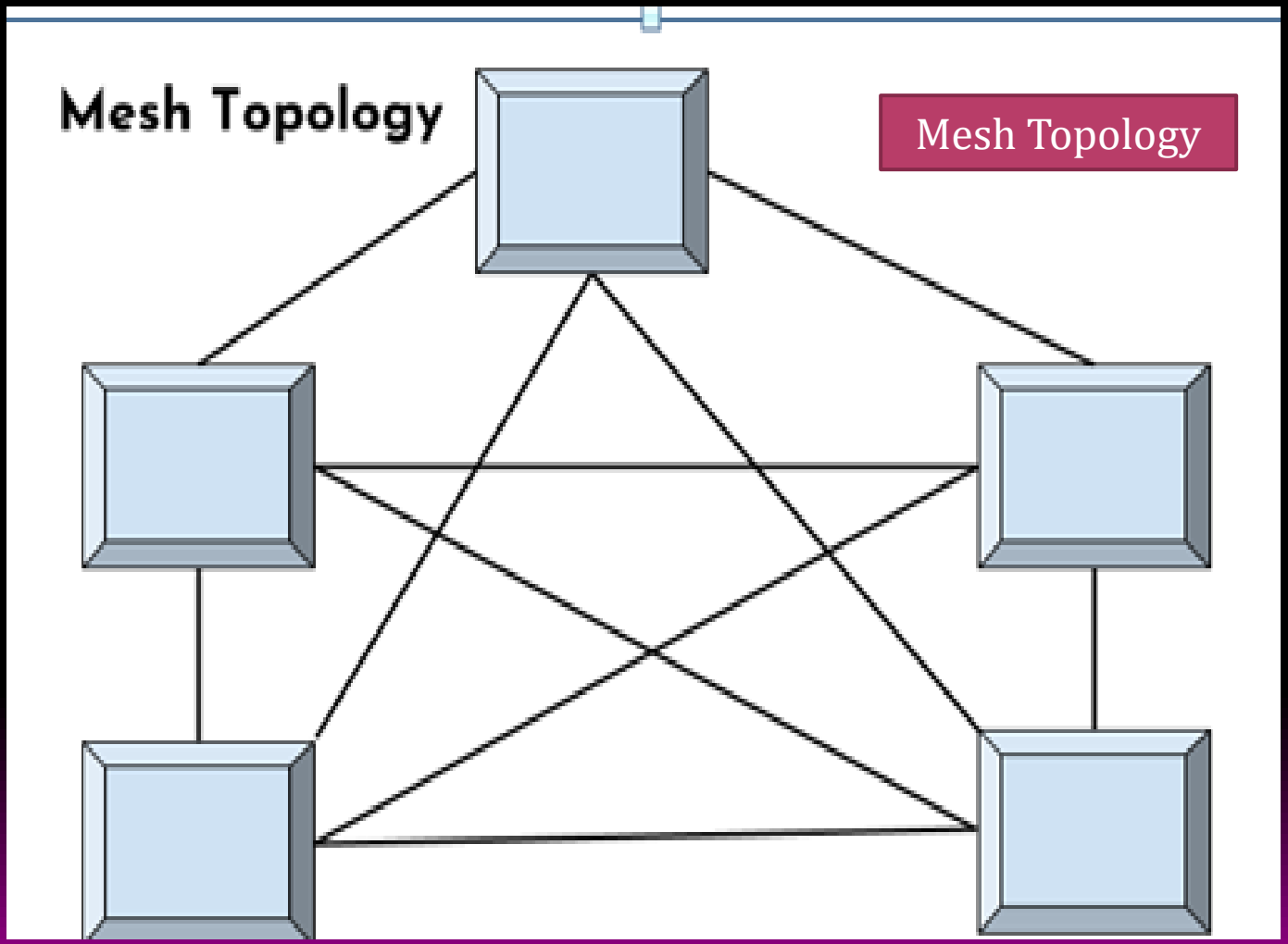
Types of Topology

1. *Mesh Topology*
2. *Star Topology*
3. *Bus Topology*
4. *Ring Topology*
5. *Hybrid Topology*

Mesh Topology

- *In mesh topology each device is connected to every other device on the network through a dedicated point-to-point link. When we say dedicated it means that the link only carries data for the two connected devices only. Lets say we have n devices in the network then each device must be connected with (n-1) devices of the network. Number of links in a mesh topology of n devices would be n(n-1)/2.*

Mesh Topology



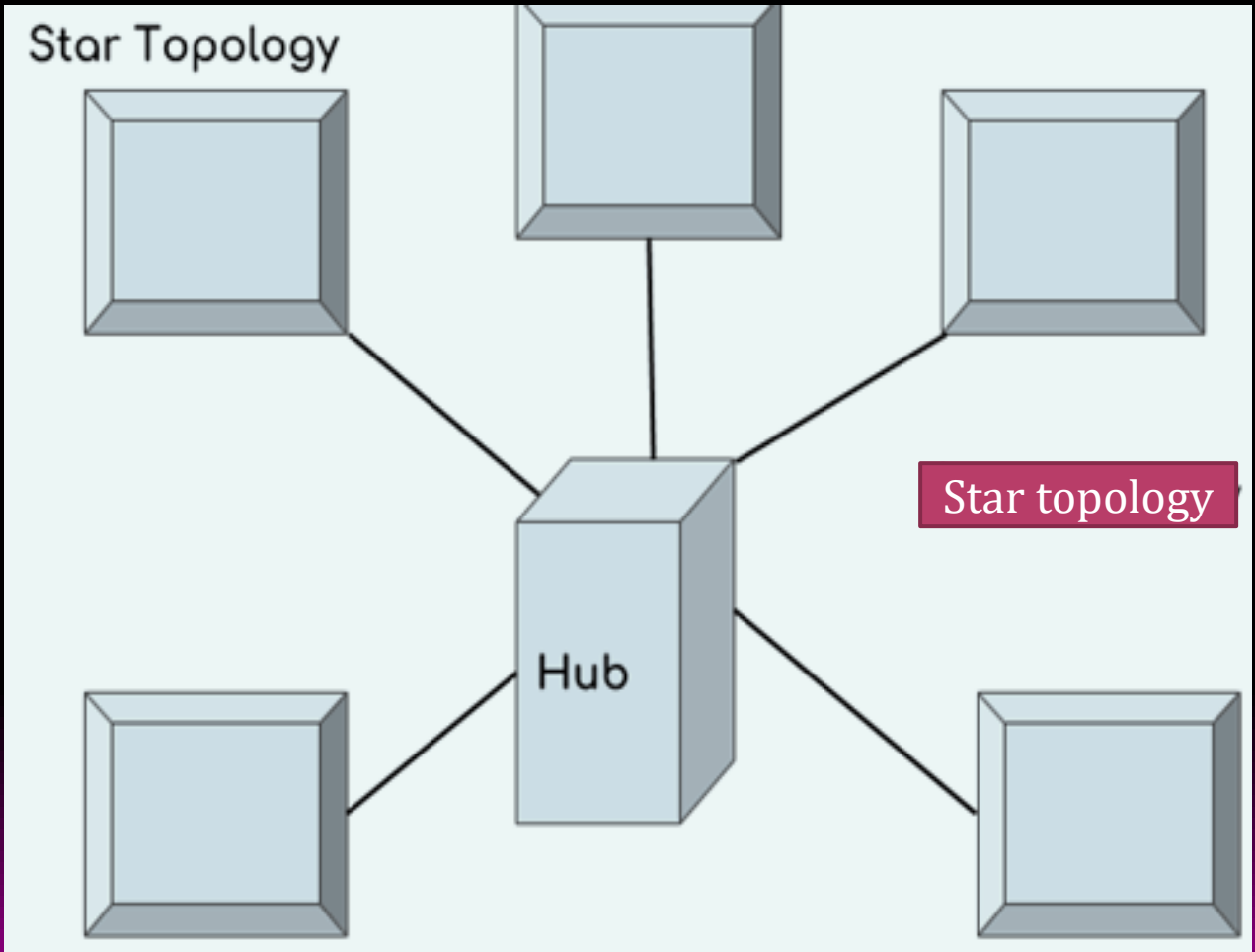
Advantages and Disadvantages of Mesh topology

- *1. No data traffic issues as there is a dedicated link between two devices which means the link is only available for those two devices.*
  2. Mesh topology is reliable and robust as failure of one link doesn't affect other links and the communication between other devices on the network.
  3. Mesh topology is secure because there is a point to point link thus unauthorized access is not possible.
  4. Fault detection is easy.

- ***Disadvantages of Mesh topology***
- *1. Amount of wires required to connected each system is tedious and headache.*
  2. Since each device needs to be connected with other devices, number of I/O ports required must be huge.
  3. Scalability issues because a device cannot be connected with large number of devices with a dedicated point to point link.

Star Topology

- *In star topology each device in the network is connected to a central device called hub. Unlike Mesh topology, star topology doesn't allow direct communication between devices, a device must have to communicate through hub. If one device wants to send data to other device, it has to first send the data to hub and then the hub transmit that data to the designated device.*

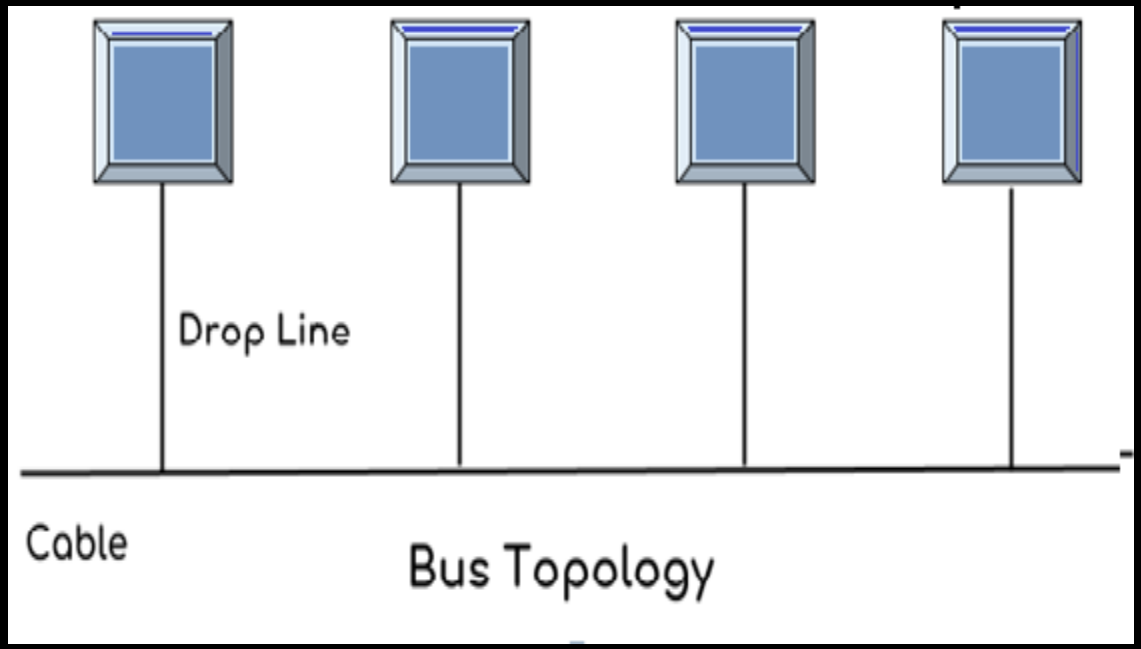

Star Topology
Hub
Star topology

Advantages and Disadvantages of star topology

- 1. Less expensive because each device only need one I/O port and needs to be connected with hub with one link.
  2. Easier to install
  3. Less amount of cables required because each device needs to be connected with the hub only.
  4. Robust, if one link fails, other links will work just fine.
  5. Easy fault detection because the link can be easily identified.
- **Disadvantages of Star topology**
- 1. If hub goes down everything goes down, none of the devices can work without hub.
  2. Hub requires more resources and regular maintenance because it is the central system of star topology.

Bus Topology

- *In bus topology there is a main cable and all the devices are connected to this main cable through drop lines. There is a device called tap that connects the drop line to the main cable. Since all the data is transmitted over the main cable, there is a limit of drop lines and the distance a main cable can have.*


Drop Line
Cable
Bus Topology

Advantages of bus topology

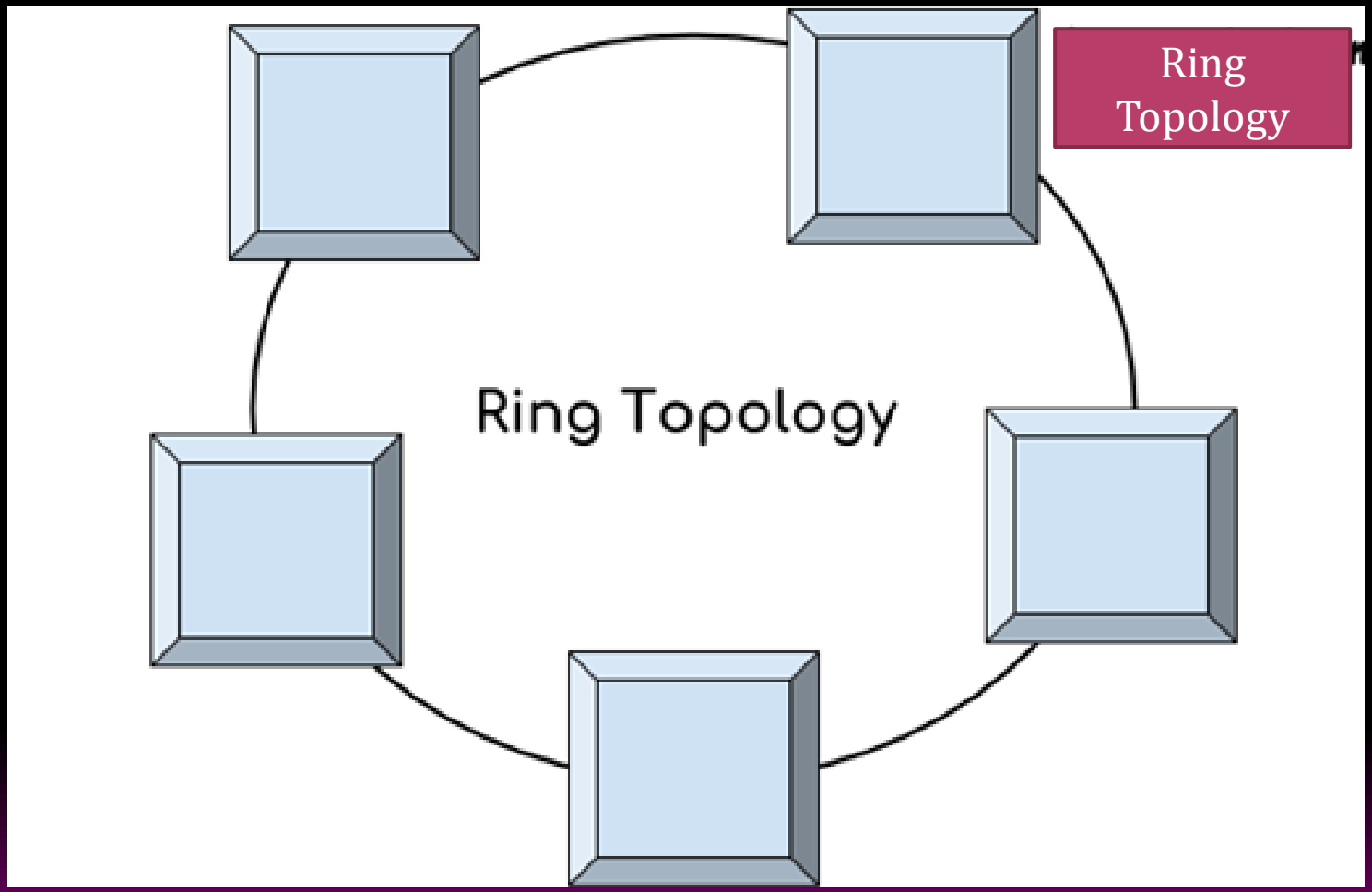
1. Easy installation, each cable needs to be connected with backbone cable.
2. Less cables required than Mesh and star topology

Disadvantages of bus topology

1. Difficultly in fault detection.
2. Not scalable as there is a limit of how many nodes you can connect with backbone cable.

Ring Topology

In ring topology each device is connected with the two devices on either side of it. There are two dedicated point to point links a device has with the devices on the either side of it. This structure forms a ring thus it is known as ring topology. If a device wants to send data to another device then it sends the data in one direction, each device in ring topology has a repeater, if the received data is intended for other device then repeater forwards this data until the intended device receives it.


Ring Topology
Ring Topology

Advantages of Ring Topology

1. Easy to install.

2. Managing is easier as to add or remove a device from the topology only two links are required to be changed.

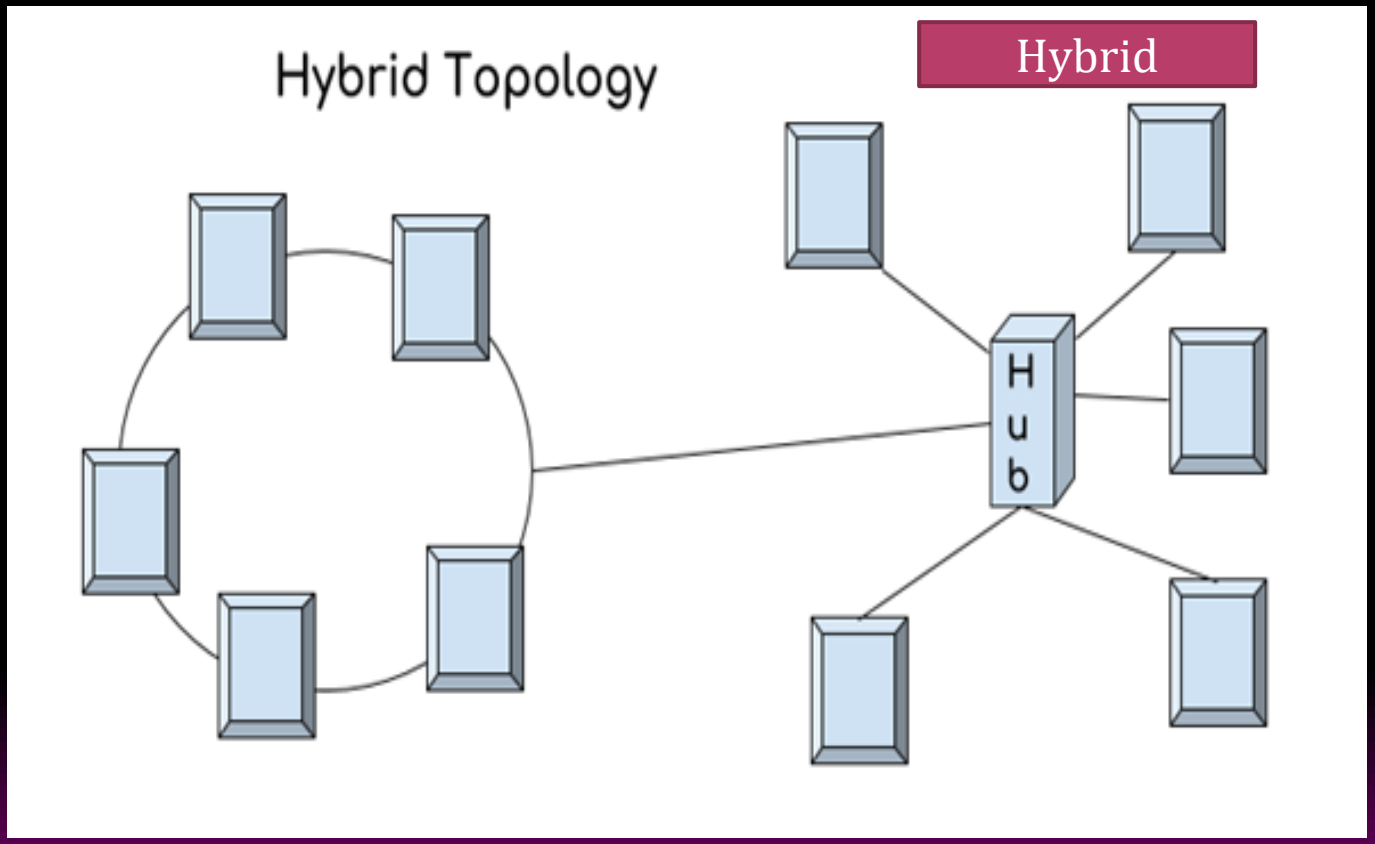
Disadvantages of Ring Topology

1. A link failure can fail the entire network as the signal will not travel forward due to failure.

2. Data traffic issues, since all the data is circulating in a ring.

Hybrid topology

A combination of two or more topology is known as hybrid topology. For example a combination of star and mesh topology is known as hybrid topology.


Hybrid Topology
Hybrid
H
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Advantages of Hybrid topology

1. We can choose the topology based on the requirement for example, scalability is our concern then we can use star topology instead of bus technology.

2. Scalable as we can further connect other computer networks with the existing networks with different topologies.

Disadvantages of Hybrid topology

Fault detection is difficult.

2. Installation is difficult.

3. Design is complex so maintenance is high thus expensive.

Reference

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Thank You