SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

19CSB302-COMPUTER NETWORKS

UNIT-1 FUNDAMENTALS AND PHYSICAL LAYER

Topology

Network Topology designates to a computer network's physical or **logical arrangement of devices, nodes, and links.**

The networking process involves connecting devices and enabling them to communicate.

Topology in computer network plays a crucial role in determining the **performance, reliability, and scalability of the network.**

Types of Topology

- Bus Topology
- Ring Topology
- Star Topology
- Mesh Topology
- Hybrid Topology

Bus Topology

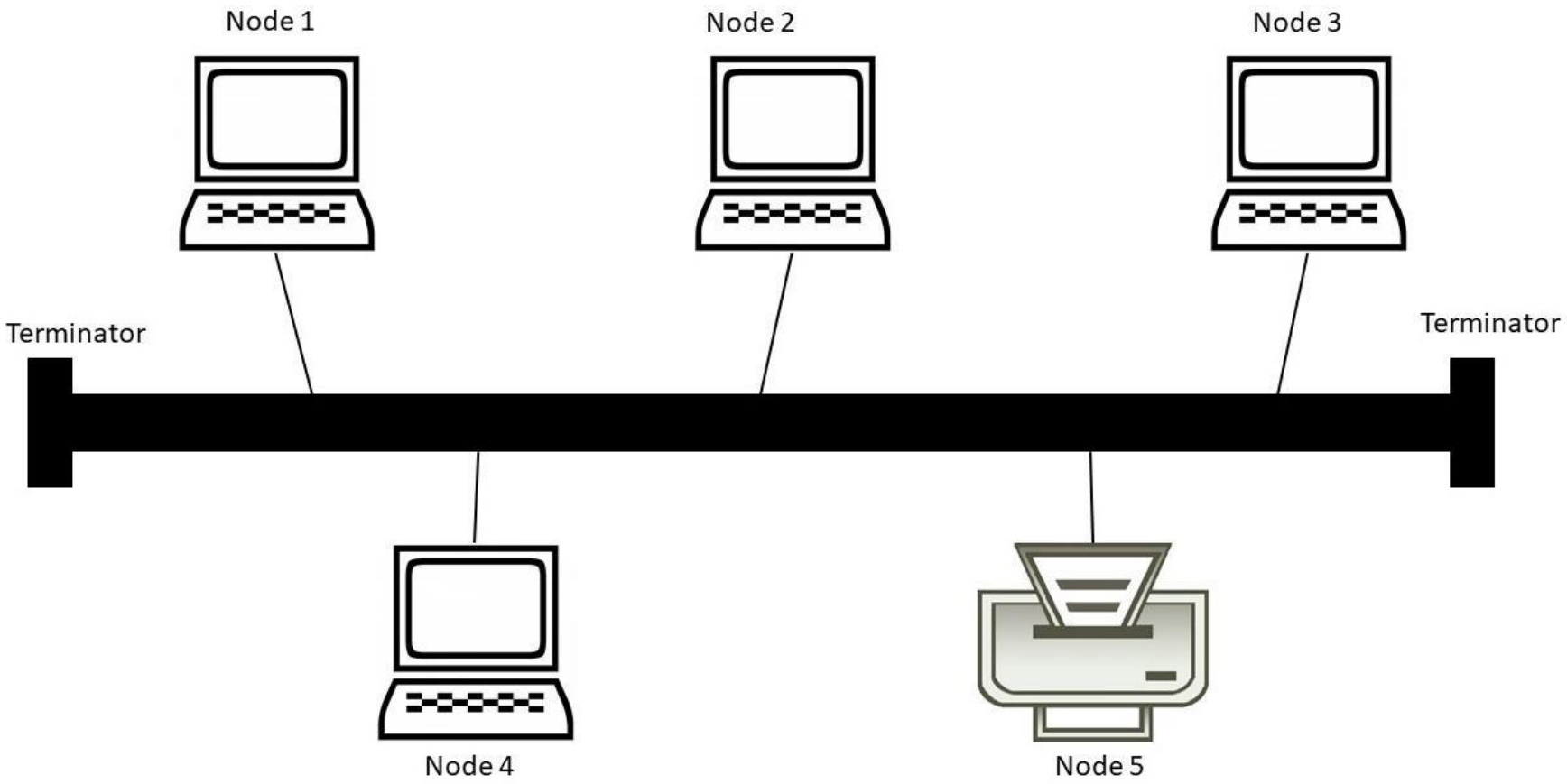
- The bus topology connects each device on the network to a common main cable, creating a single communication path for all nodes
- One point transmits data along a single route to another point.

Data transmission: When a device wants to transmit data, it sends data over the backbone cable.

Data reception: Each device on the network actively checks the data to determine if it intends for it.

The device accepts the data if it’s intended for it. Otherwise, it ignores the data.

Acknowledgment: The device sends a confirmation or acknowledgment back to the sender to indicate that it has received the data.


Node 1
Node 2
Node 3
Terminator
Terminator
Node 4
Node 5

Advantages of Bus Topology

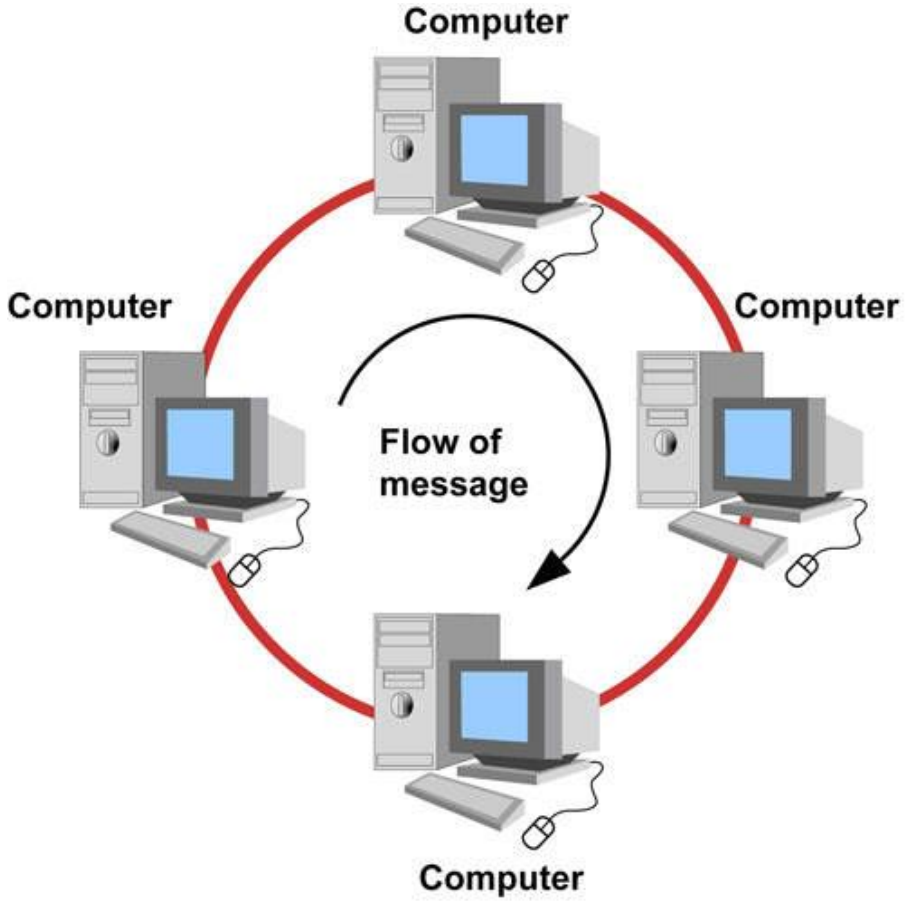
- Bus topology is easy to set up and does not require a lot of cables.
- It is suitable for small networks with a low number of devices.
- It is cost-effective as it requires less cabling and hardware.
- Failure of a **single device** does not affect the rest of the network.

Disadvantages of Bus Topology

- A cable break in the backbone cable can cause the entire network to fail.
- As the number of devices increases, the network performance can slow down.
- It is challenging to identify and troubleshoot problems in the network.
- It has limited scalability, as adding new devices to the network is challenging.

Ring Topology

- The devices are interconnected in a ring-like pattern.
- Each device is linked to two other devices, one on either side, forming a continuous ring or loop
- Data is transmitted in one direction around the circle, with each device on the network reading and passing on the data until it reaches its destination
- The token-passing mechanism controls access to them and only the device with the token can transmit data onto the network.


Computer
Computer
Computer
Flow of message
Computer

Advantages of Ring Topology

Scalability: A ring topology can easily scale up or down by removing or adding devices from the loop.

This makes it a flexible option for networks that need to grow or shrink over time.

Balanced Network Traffic: In a ring topology, each device has an equal opportunity to transmit data, which helps to balance network traffic.

Disadvantages of Ring Topology

- The failure of a single device can disrupt the entire network.
- When a failure occurs in a ring topology, it can be challenging to locate the source of the problem making it difficult to trouble shoot

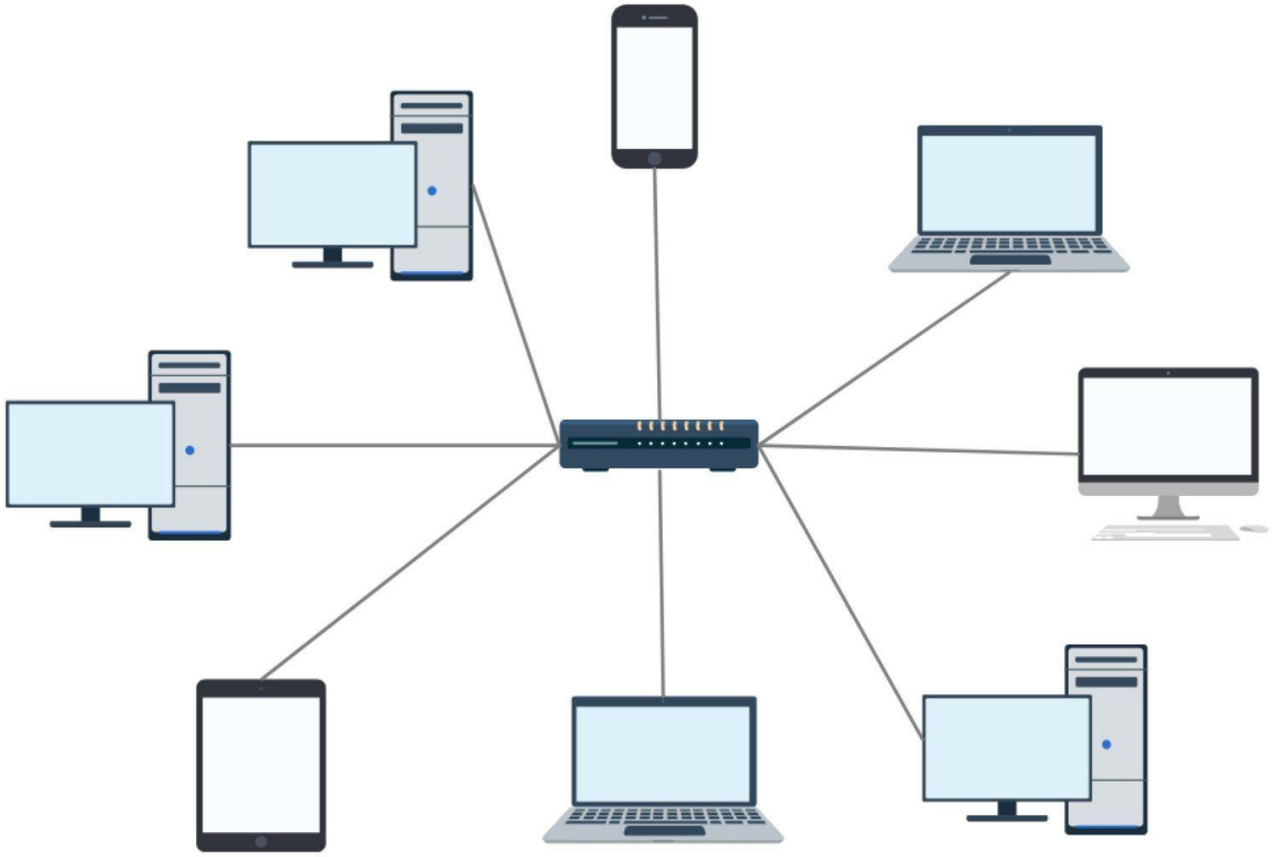
Star Topology

Devices transmit data through the central hub, which then distributes the data to all devices connected.

All traffic must pass through the hub or switch

When a device on the network wants to send data to another device, it first sends the data to the central hub or switches.

The hub or switch receives the data and determines which device on the network is the intended receiver then forwards the data.



Advantages of Star Topology

Easy to install and manage: Easy to add or remove devices without disrupting the network

High reliability: Failure in one device will not impact the rest of the network.

Easy to troubleshoot: Each device connects to the central hub, it is easy to identify and isolate network problems.

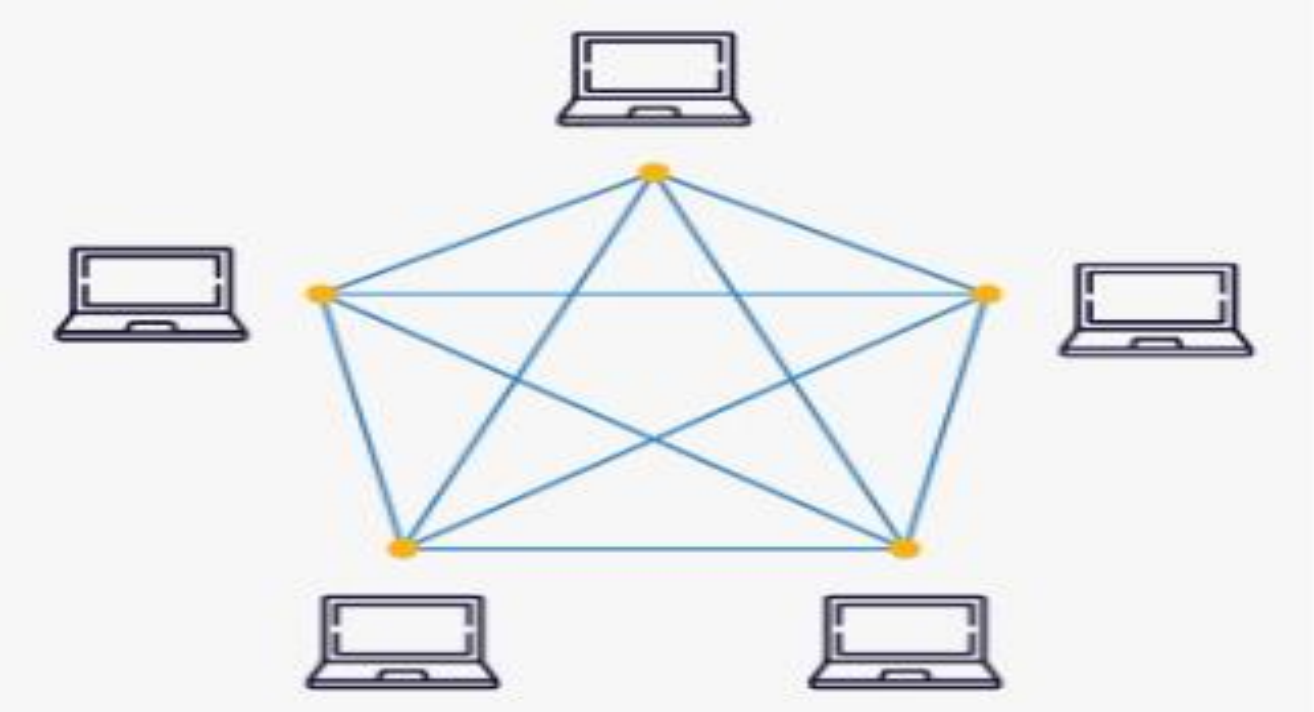
Scalable: Adding new devices to the network is easy

Disadvantages of Star Topology

- If the hub or switch fails, the entire network can be affected.
- A star topology requires more cabling and equipment than other network topologies which makes it more expensive to install and maintain.

Mesh Topology

- Every device has a dedicated **point to point** link to every other device
- There are multiple paths for data to travel between any two devices on the network providing fault tolerance in case of a network failure.
- n*(n-1)/2 is used to calculate the number of physical connections in a mesh topology



Advantages of Mesh Topology :

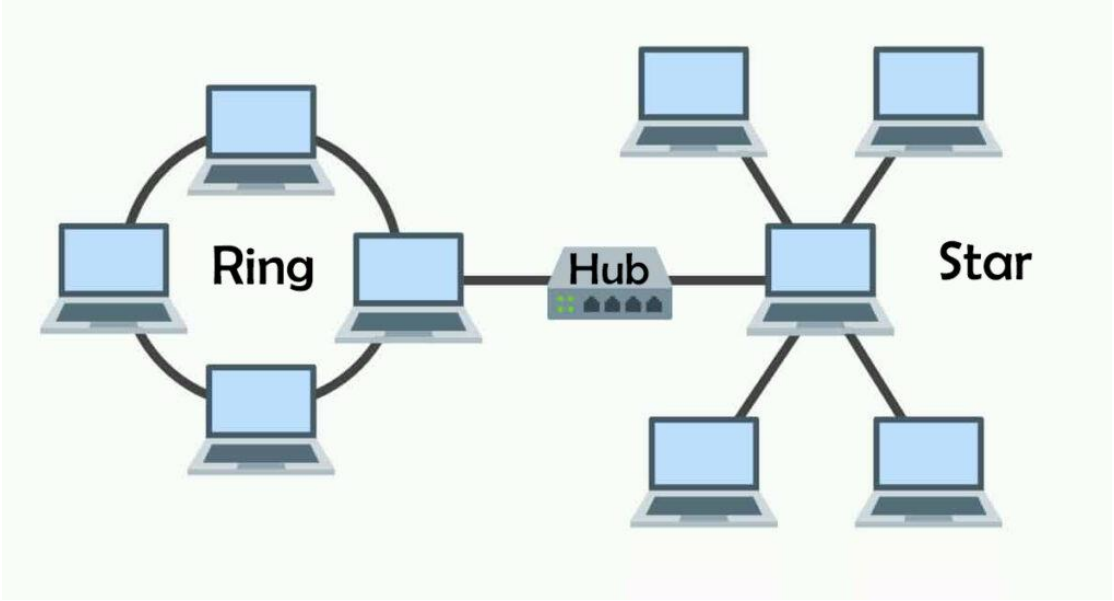
- Failure during a single device won’t break the network.
- This topology provides multiple paths to succeed in the destination and tons of redundancy.
- Data transmission is more consistent because failure doesn’t disrupt its processes.
- A mesh doesn’t have a centralized authority.

Disadvantages of Mesh Topology :

- Installation is difficult in the mesh.
- The cost to implement mesh is high
- Power requirement is higher as all the nodes will need to remain active all the time and share the load.

Hybrid Topology

- A hybrid topology is a type of network topology that uses two or more different network topologies. These topologies can include a mix of bus topology, mesh topology, ring topology and star topology.



Advantages

- It is effective and flexible.
- Troubleshooting is easy.
- Error detecting is reliable.
- It is scalable because the size can be increased easily.

Disadvantages

- Designing is difficult or complex.
- It is costly.