



LAN TOPOLOGIES

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Introduction

- **Topology ? → to reduce complexity of CN maintain**
- Network topology is the arrangement of the various elements of computers.
- Network topology two types
- 1. **Physical topology**
- 2. **Logical topology**
- Physical topology → placement of the network's various components(cables, computer etc.)
- logical topology → how data flows within a network
- two n/w can be same topology irrespective of physical distance, transmission rates, signal used.



Network topology

- The physical topology of a network is determined
 - by the capabilities of the network access devices and media,
 - the level of control or fault tolerance desired,
 - and the cost of cabling or telecommunications circuits.
- The logical topology of network
 - the way that the signals act on the network media
 - the way that the signals act on the network media
 - without regard to the physical interconnection of the devices
- network's logical topology not necessarily same as physical topology.
- so logical topologies are determined by network protocols. → closed to MAC methods and protocols

Physical network topology

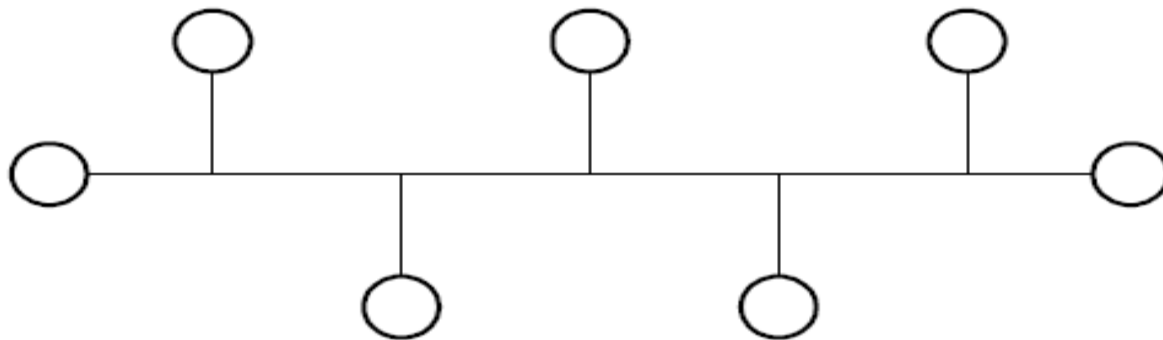
- some of the network topologies are
 - point – to – point
 - star
 - Bus
 - Ring
 - Mesh
 - Tree
 - Hybrid

Point to point topology

- simplest topology
- it has permanent link between two end points.
- two types → based on link
 - switched point – to – point topology
 - easiest to understand
 - uses permanent and dedicated channel
 - permanent point – to – point topology
 - uses circuit switching / packet switching
 - channel can be assigned dynamically,
 - drops when there is no need.

bus topology

- all devices are connected single linear cable called **trunk**.
- Data sent to all computer on shared communication channel.
- it uses passive interfaces to communicated channel.
- it is also called passive bus topology.
- good for temporary and small networks.
- signal transfer in both the directions.
- more collisions



bus topology

Advantages

- simple, easy to use and understand
- inexpensive, less number of cables are needed.
- easy to extend by using repeaters etc.

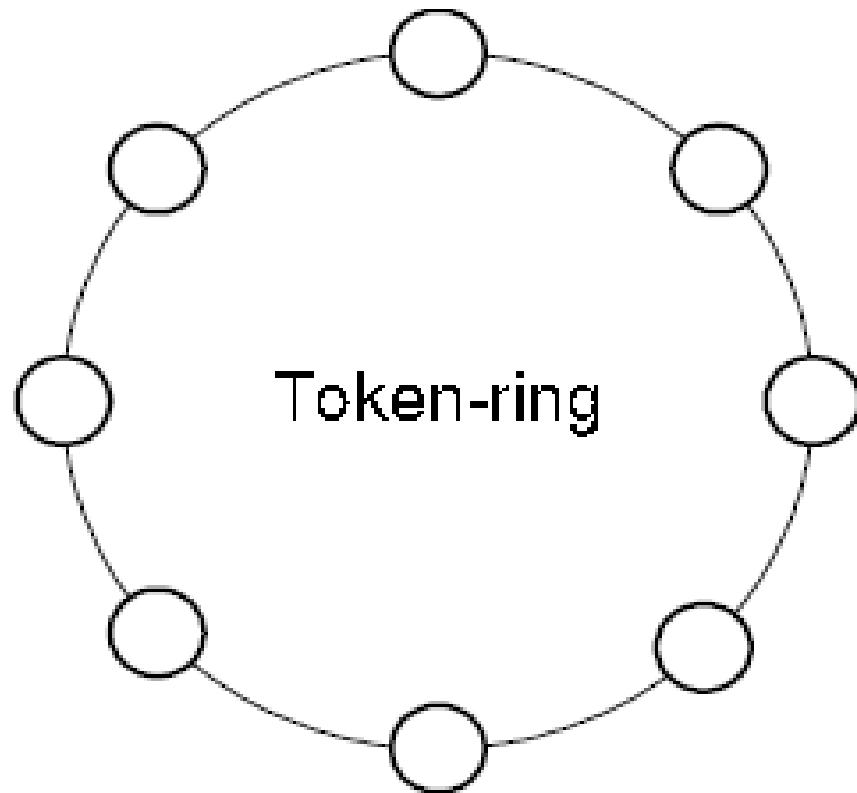
Disadvantages

- many devices → more traffic → slow
- complex to troubleshoot.
- Cable length is limited.
- Unmanageable if network is large.

ring topology

- In a ring network, every device has exactly two neighbors for communication purposes.
- All messages travel through a ring in the **same direction**.
- No beginning and end points.
- All devices of equality of access to media.
- Each device has to wait its turn to transmit.
- A token, or small data packet, is continuously passed around the network.
- When a device needs to transmit, it reserves the token for the next trip around, then attaches its data packet to it.
- token contains the data, reaches the destination,
- data should extracted, acknowledgement sent back
- empty token passed on for another device to use.
- Most common type is Token Ring (IEEE 802.5)

ring topology





ring topology

Advantages

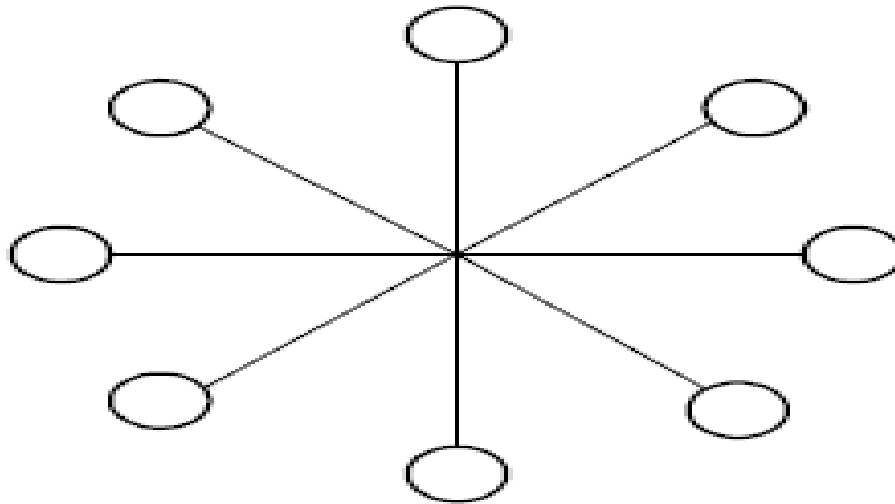
- simple, easy to use
- inexpensive, handles high volume of traffic.
- easier to manage than bus topology.

Disadvantages

- many devices → more traffic → slow
- any changes in movement of single node will cause complex problems.
- if any one for node fails, entire networks collapse.
- more delay. (for acquiring token to transmit data)

star topology

- In a star network, devices are connected by cable segment to a centralized device (hub).
- signals or data are transferred through centralized device only.
- The star topology reduces the chance of network failure by connecting all of the systems to a central node.





star topology

Advantages

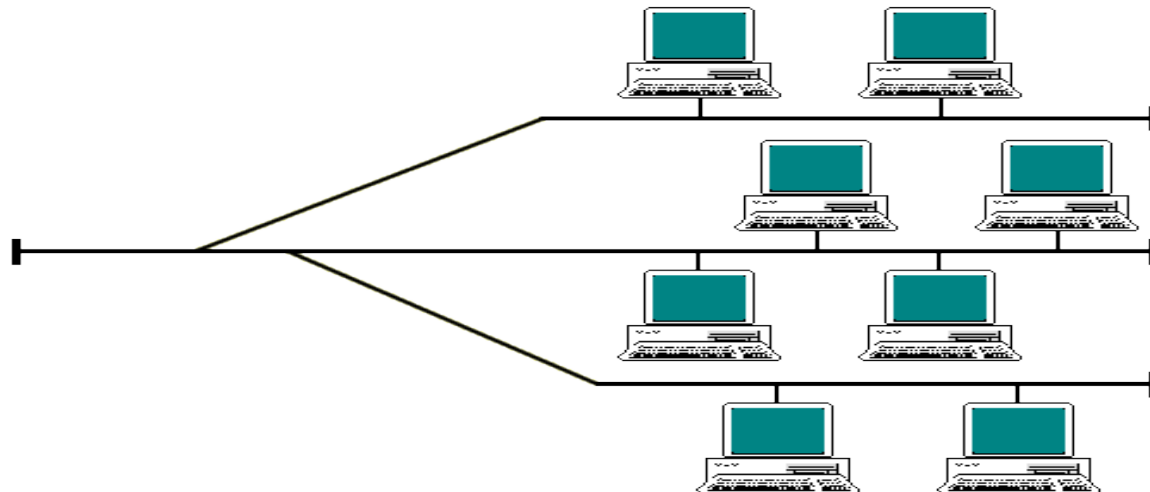
- Easy to manage and locate problems
- Easier to expand than a bus or ring topology.
- Easy to install and wire and high fault tolerance.
- Easy to detect faults and to remove parts.

Disadvantages

- Requires more cable length than a linear topology.
- If the hub or concentrator fails, nodes attached are disabled.
- More expensive because of the cost of the central devices.

tree topology

- it comes under hierarchical topology.
- it can be viewed as collection of star topologies in hierarchy.
- This tree has individual peripheral nodes
 - required to transmit to and receive from one other only.
 - not as repeaters or regenerators.
- For easier troubleshooting and control, it uses distinct hierarchy on links and nodes.
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tree topology

Advantages

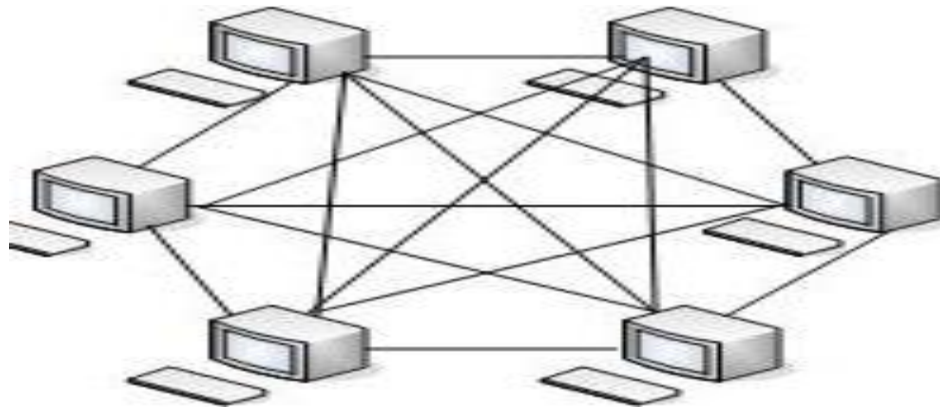
- Point-to-point wiring for individual segments.
- Supported by several hardware and software vendors.
- All the computers have access to the larger and their immediate networks.

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.

mesh topology

- in this topology, each node is connected to every other node in the network.
- Implementing the mesh topology is expensive and difficult.
- automatically configured to reach the destination by taking the shortest route.
- each node may send message to destination through multiple paths. $(n*(n-1)/2)$





mesh topology

Advantage

- No traffic problem as there are dedicated links.
- It has multiple links, so if one route is blocked then other routes can be used for data communication.
- Points to point links make fault identification easy.

Disadvantage

- There is mesh of wiring which can be difficult to manage.
- Installation is complex as each node is connected to every node.
- Cabling cost is high.

hybrid topology

- A combination of any two or more network topologies.
- A hybrid topology always accrues when two different basic network topologies are connected.
- it is flexible and reliable
- expensive (**disadvantage**)