

💡 What is Network Topology?

Network topology refers to the **physical or logical layout** of a network. It shows how devices (nodes like computers, switches, routers) are **connected and communicate** with each other.

There are two types:

1. **Physical topology** – Actual layout of cables and devices
2. **Logical topology** – How data flows in the network

🔗 Types of Network Topologies

1. Bus Topology

🔧 **Structure:** All devices are connected to a **single central cable (the bus)**

🌐 **Communication:** Data travels in both directions but only one device can send at a time

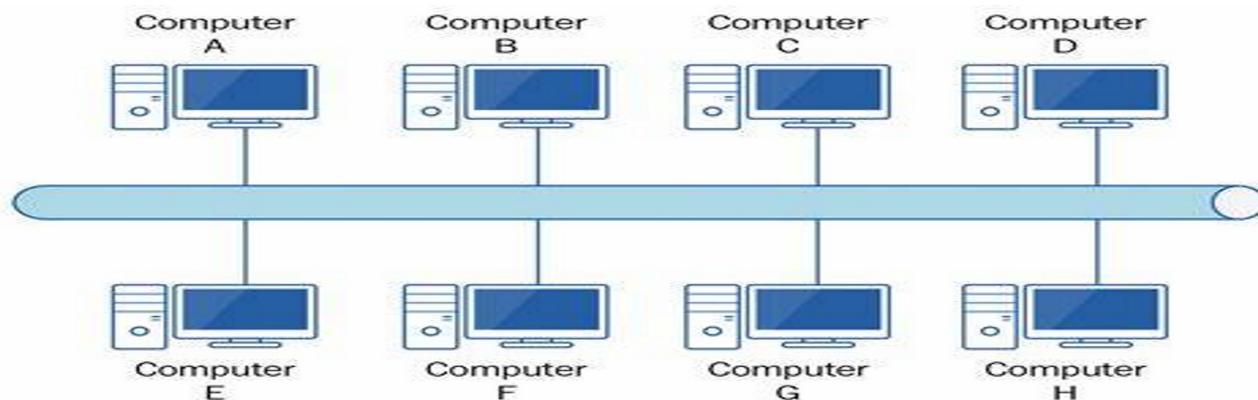
✓ Advantages:

- Easy to install
- Requires less cable

✗ Disadvantages:

- If the main cable fails, the whole network goes down
- Difficult to troubleshoot
- Slow when traffic is high

🔧 **Example:** Small temporary networks, early Ethernet systems



2. Star Topology

Structure: All devices are connected to a central device (hub or switch)

Communication: Data goes from sender → central device → receiver

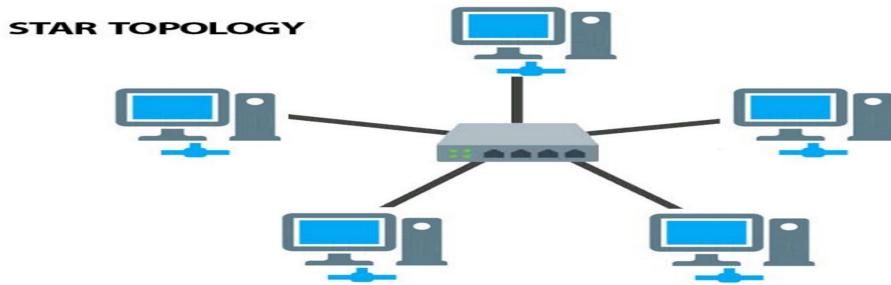
Advantages:

- Easy to add or remove devices
- Failure of one device doesn't affect others

Disadvantages:

- If central hub/switch fails, entire network fails
- Requires more cable

Example: Most home and office LANs



3. Ring Topology

Structure: Devices are connected in a circular loop

Communication: Data travels in one direction (or both in dual ring), device by device

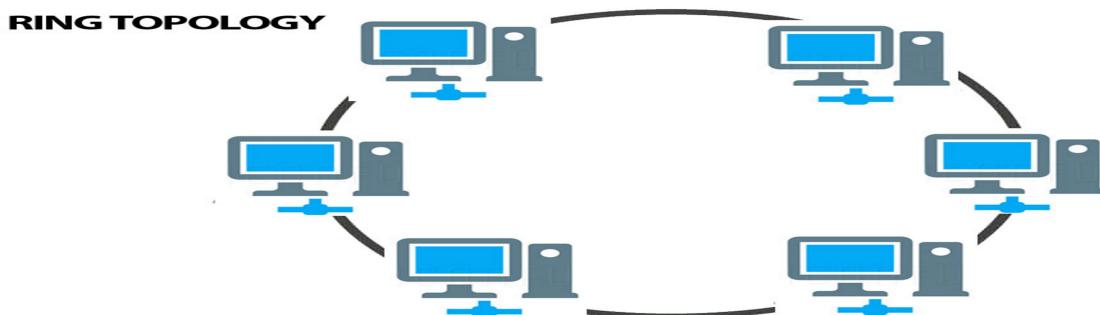
Advantages:

- Predictable performance
- Each device gets equal access

Disadvantages:

- One device failure can disrupt entire network (unless dual ring)
- Troubleshooting is hard

Example: Old fiber networks, some MANs



4. Mesh Topology

 **Structure:** Every device is **connected to every other device**

 **Communication:** Multiple paths for data to travel

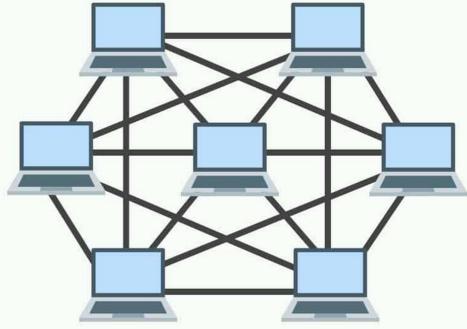
 **Advantages:**

- Very reliable and fault-tolerant
- High redundancy

 **Disadvantages:**

- Very expensive and complex
- Needs a lot of cabling

 **Example:** Military networks, critical backbone systems



Full Mesh Topology

5. Tree Topology (Hierarchical)

 **Structure:** Combination of **star** and **bus** topology

- Central root node connected to branch nodes (which may be stars)

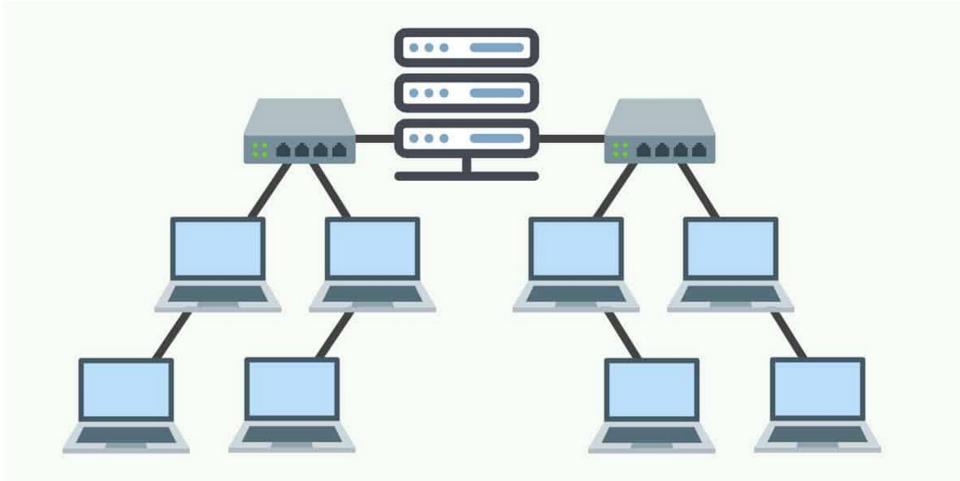
 **Advantages:**

- Scalable
- Easy to manage and troubleshoot

 **Disadvantages:**

- If root node fails, large portion of network may fail

 **Example:** Large enterprise networks



6. Hybrid Topology

Structure: Combination of two or more topologies

E.g., a star-bus or star-ring mix

Advantages:

- Flexible
- Can be designed to meet specific needs

Disadvantages:

- Expensive
- Difficult to design and maintain

Example: Real-world large networks (schools, ISPs, companies)

