

Investigates how the problem of connecting multiple devices into a Network is addressed

6.5 Learning Outcomes:

Connecting two devices using Modems

- Demonstrate the simplicity of a Bus
- Draws diagrams of different topologies
- Describes the use of Hubs and Switches to simplify the wiring of a network and Compares/ contrasts their functionalities

All-to-all connections are impractical

A solution: Bus Topology

- Simple
- Problem: Controlling access to the bus (media)

Other topologies

- Star
- Ring
- Mesh

Simplifying wiring

- Hubs
- Switches

Network Topologies

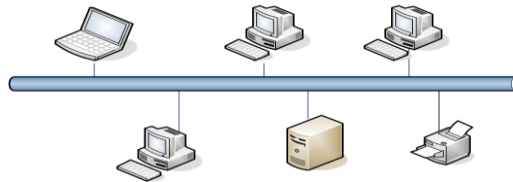
- Network Topology refers to the layout of a network and how different nodes in a network are connected to each other and how they communicate.
- Topologies are either physical (the physical layout of devices on a network) or logical (the way that the signals act on the network media, or the way that the data passes through the network from one device to the next).
- The shape of the cabling layout used to link devices is called the physical topology of the network. This refers to the layout of cabling, the locations of nodes, and the interconnections between the nodes and the cabling.
- 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 associated with cabling or telecommunications circuits.
- Common topologies:
 - Bus, ring, star, mesh and wireless

Bus topology

- Uses a trunk or backbone to which all of the computers on the network connect.
- Systems connect to this backbone using T connectors or taps.
- Coaxial cablings (10Base-2, 10Base5) were popular options years ago.
- A bus topology consists of a main run of cable with terminators at each end. All nodes (file server, workstations, and peripherals) are connected to the linear cable.
- Access to the shared common communication medium by nodes is a problem when multiple nodes try to access the medium at the same time.

vantages	Disadvantages
Cheap and easy to implement	Network disruption when computers are added or
Require less cable	A break in the cable will prevent all systems
Does not use any specialized network	Difficult to troubleshoot.

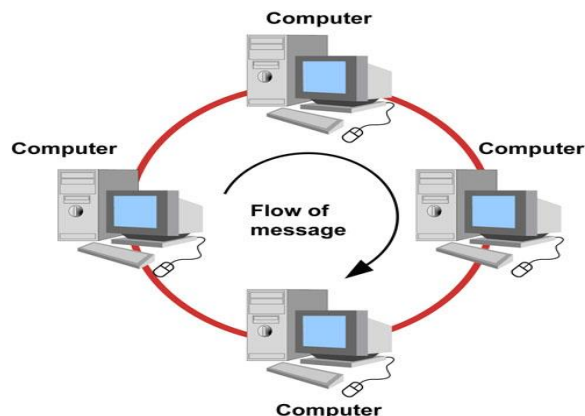
BUS Topology



Ring Topology

- Logical ring
- Meaning that data travels in circular fashion from one computer to another on the network.
- Typically FDDI, SONET or Token Ring technology are used to implement a ring network
- Ring networks are most commonly wired in a star configuration
 - Token Ring has multi-station access unit, equivalent to hub or switch. MSAU performs the token circulation internally.
- **Ring Topology:** in a ring topology each station is directly connected only to two of its neighbors. Messages sent between two stations pass through all of the stations in between (clockwise or counterclockwise).

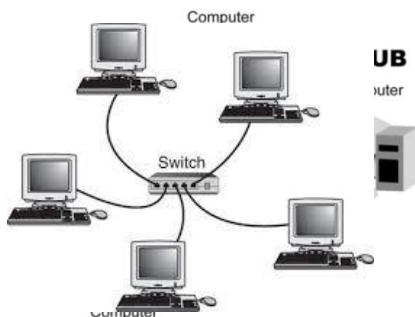
Advantages	Disadvantages
Cable faults are easily located, making	Expansion to the network can cause
Ring networks are moderately easy to	A single break in the cable can disrupt the



Star Topology

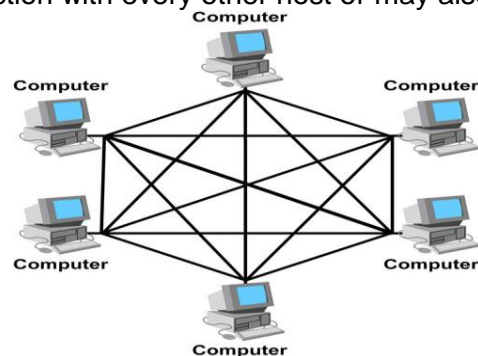
- **Star Topology:** A star topology is designed with each node is (file server, workstations, and peripherals) connected directly to a central network hub or switch.
- All computers/devices connect to a central device called hub or switch.
 - Each device requires a single cable
- Point-to-point connection between the device and hub.
 - Most widely implemented
 - Hub is the single point of failure

Advantages	Disadvantages
Easily expanded without disruption to the network	Requires more cable
Cable failure affects only a single user	A central connecting device allows for a single point of failure
Easy to troubleshoot and isolate problems	More difficult to implement



Mesh Topology

- **Mesh Topology:** In this type of topology, a host is connected to one or multiple hosts. This topology has hosts in point-to-point connection with every other host or may also have hosts which are in point-to-point connection with few hosts only.
 - Each computer connects to every other.
 - High level of redundancy.
 - Rarely used.
 - Wiring is very complicated
 - Cabling cost is high
 - Troubleshooting a failed cable is tricky



- A variation hybrid mesh – create point to point connection between specific network devices, often seen in WAN implementation.

Advantages	Disadvantages
Provides redundant paths between devices	Requires more cable than the other LAN topologies
The network can be expanded without disruption to current uses	Complicated implementation

Switches and hubs:

Hubs and switches are common network devices that function as a common connection point for network devices that make up a network

➤ **Hubs**

- A **hub** is the most basic networking device that connects multiple computers or other network devices together.
- Unlike a network switch or router, a network hub has no routing tables or intelligence on where to send information and broadcasts all network data across each connection.
- Most hubs can detect basic network errors such as collisions, but having all information broadcast to multiple ports can be a security risk and cause bottlenecks.
- In the past network hubs were popular because they were much cheaper than a switch and router, but today most switches do not cost much more than a hub and are a much better solution for any network.
- A hub refers to a hardware device that enables multiple devices or connections to be connected to a computer.
- A hub receives data in one of its incoming connections and then shall forward the data to all of its outgoing connection.



➤ Switches

- A piece of a physical circuitry component that governs signal flow.
- Having a switch or toggle switch allows a connection to be opened or closed.
- A switch receives data in one of its incoming connections and forwards the data only
- On the outgoing connection which connects to the destination device.
- When opened the switch allows a signal or power to flow through the connection.
- When closed the switch stops the flow and breaks the circuit connection.
- On a network, a switch is a hardware device that filters and forwards packets through the network, but often not capable of much more.
- **In this way a switch is a more intelligent device than a hub.**

