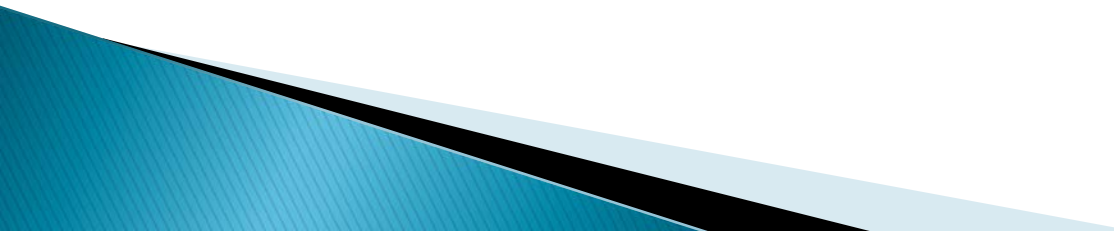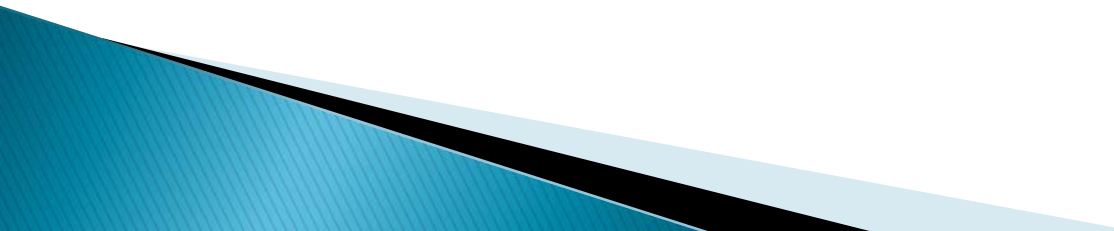# Lecture 2
Topology,Switching Technique

Introduction

- ✓ Physical and Logical Topologies
- ✓ Topologies
  - ✓ Bus
  - ✓ Ring
  - ✓ Star
  - ✓ Extended Star
  - ✓ Mesh
  - ✓ Hybrid

Physical vs. Logical Topology

➢ The actual layout of a network and its media is its Physical Topology

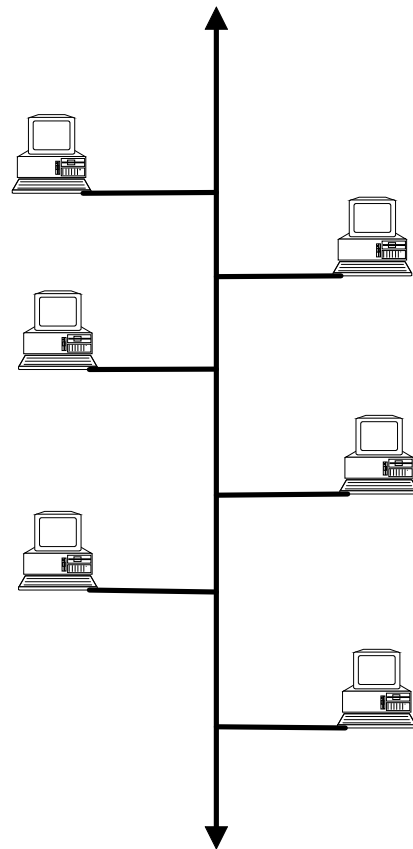➢ The way in which the data access the medium and transmits packets is the Logical Topology

Physical vs. Logical Topology (2)

- Your choice of Logical Topology will affect the Physical Topology – and vice versa
- Design carefully – it may be difficult to change part way through the installation
- Your choice will determine cable installation, network devices, network connections, protocols
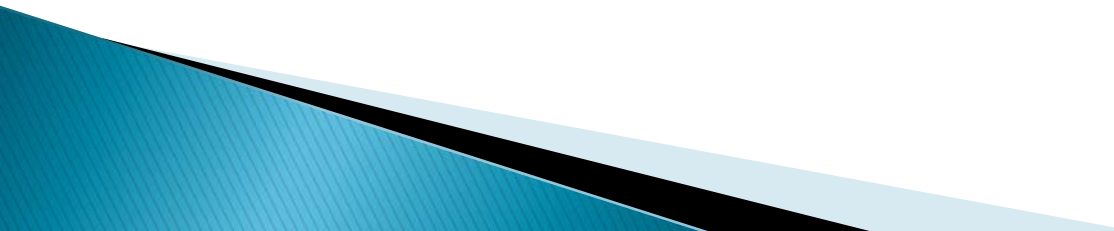
Factors

- Cost
- Scalability
- Bandwidth Capacity
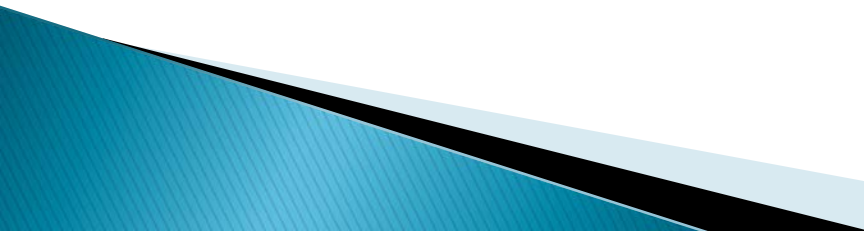- Ease of Installation
- Ease of fault finding and maintenance

Bus Topology

Bus Topology (2)

- Network maintained by a single cable
- Cable segment must end with a terminator
- Uses thin coaxial cable (backbones will be thick coaxial cable)
- Extra stations can be added

Bus Topology (3)

- Standard is IEEE 802.3
- Thin Ethernet (10Base2) has a maximum segment length of 200m
- Max no. of connections is 30 devices
- Four repeaters may be used to a total cable length of 1000m
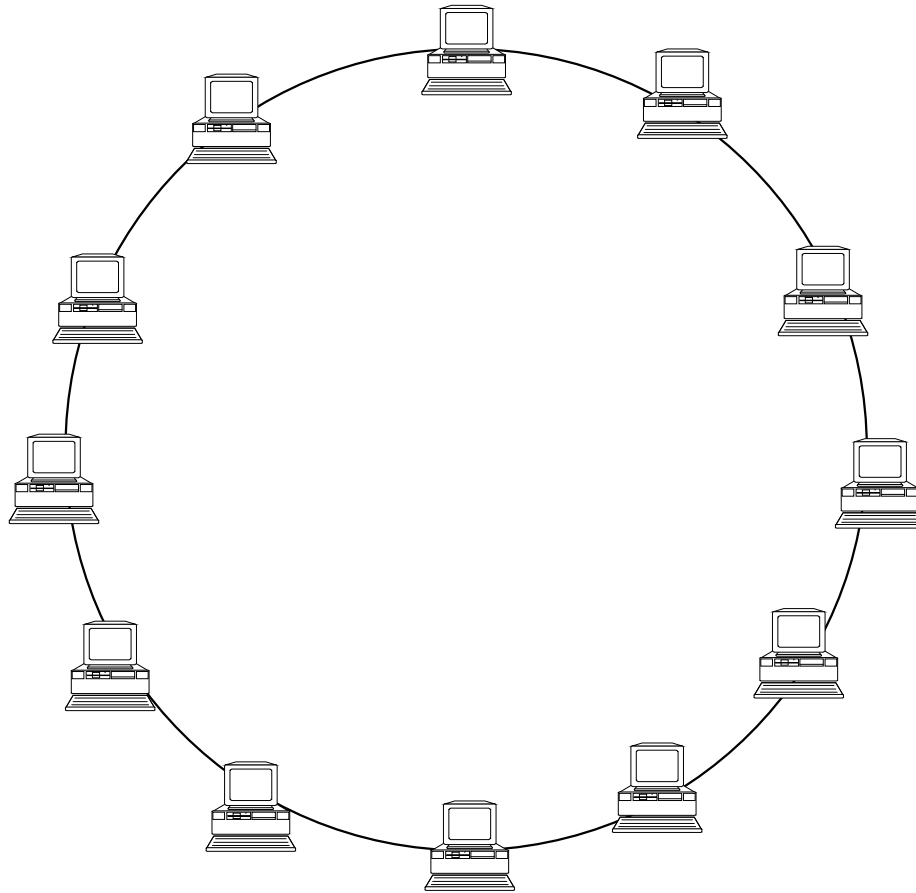- Max no. of nodes is 150

Bus Topology (5)

Advantages

- Inexpensive to install
- Easy to add stations
- Use less cable than other topologies
- Works well for small networks

Disadvantages

- No longer recommended
- Backbone breaks, whole network down
- Limited no of devices can be attached
- Difficult to isolate problems
- Sharing same cable slows response rates

Ring Topology

Ring Topology (2)

- No beginning or end
- All devices of equality of access to media
- Single ring – data travels in one direction only
- Each device has to wait its turn to transmit
- Most common type is Token Ring (IEEE 802.5)
- A token contains the data, reaches the destination, data extracted, acknowledgement of receipt sent back to transmitting device, removed, empty token passed on for another device to use
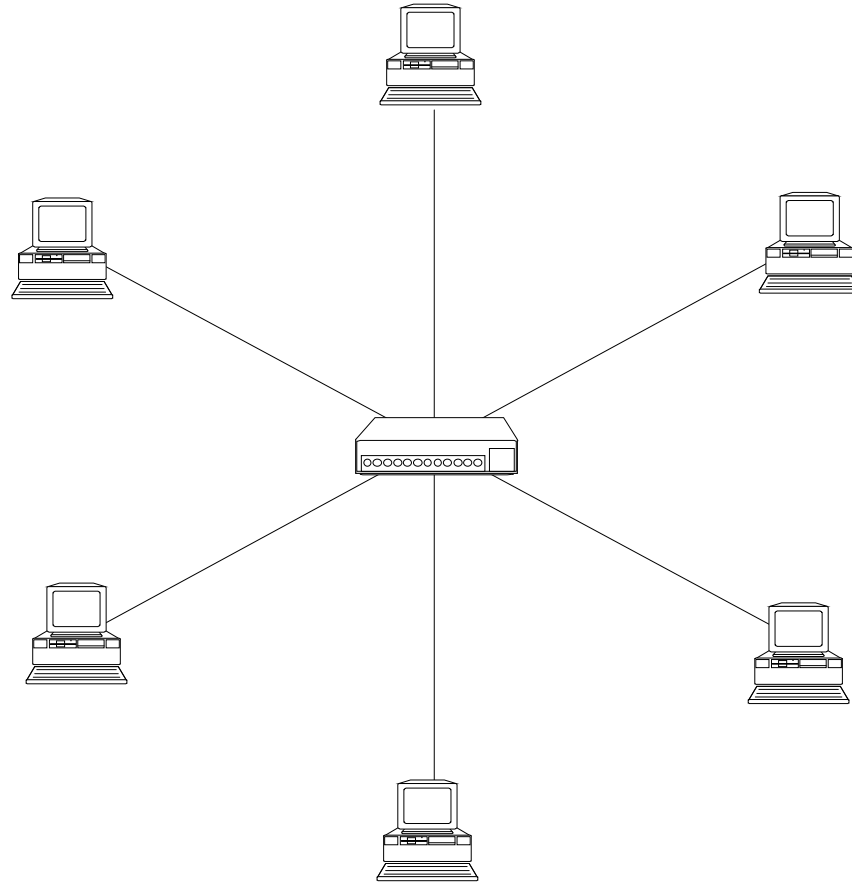
Ring Topology (3)

Advantages
- Data packets travel at great speed
- No collisions
- Easier to fault find
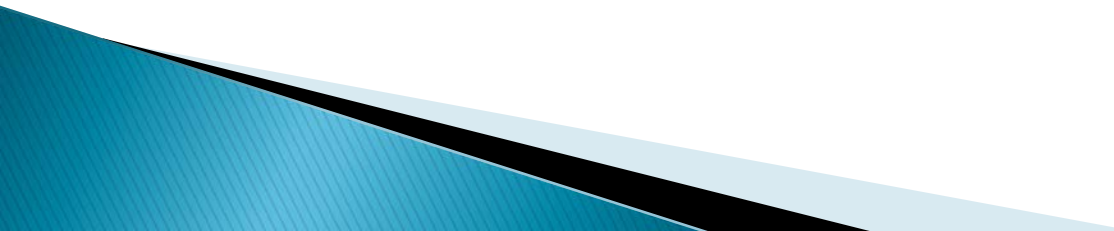- No terminators required

Disadvantages
- Requires more cable than a bus
- A break in the ring will bring it down
- Not as common as the bus – less devices available

Star Topology

Star Topology (2)

- Like the spokes of a wheel
- Centre point is a Hub
- Segments meet at the Hub
- Each device needs its own cable to the Hub
- major type of topology
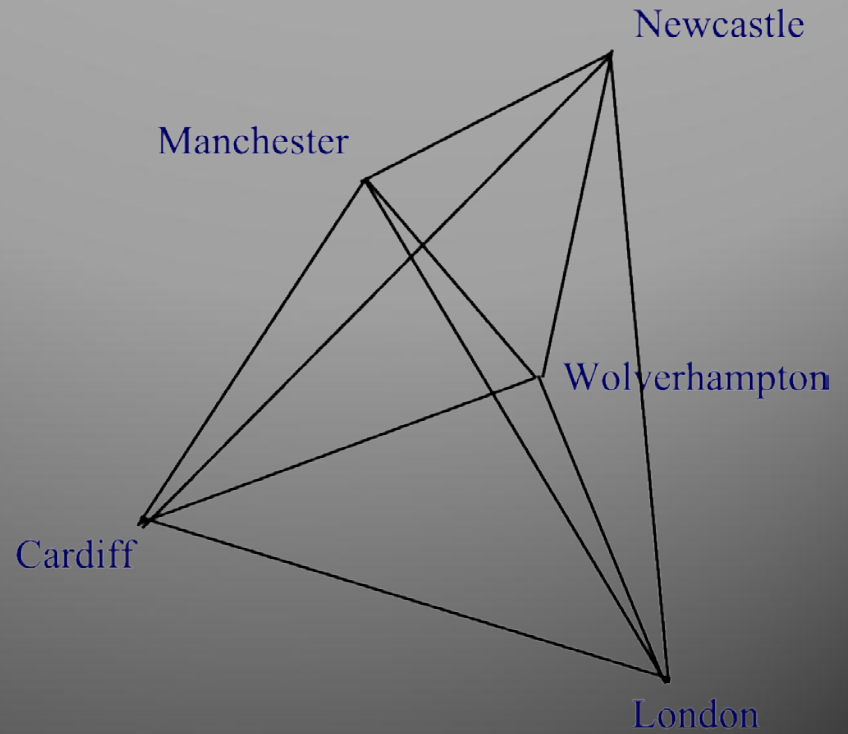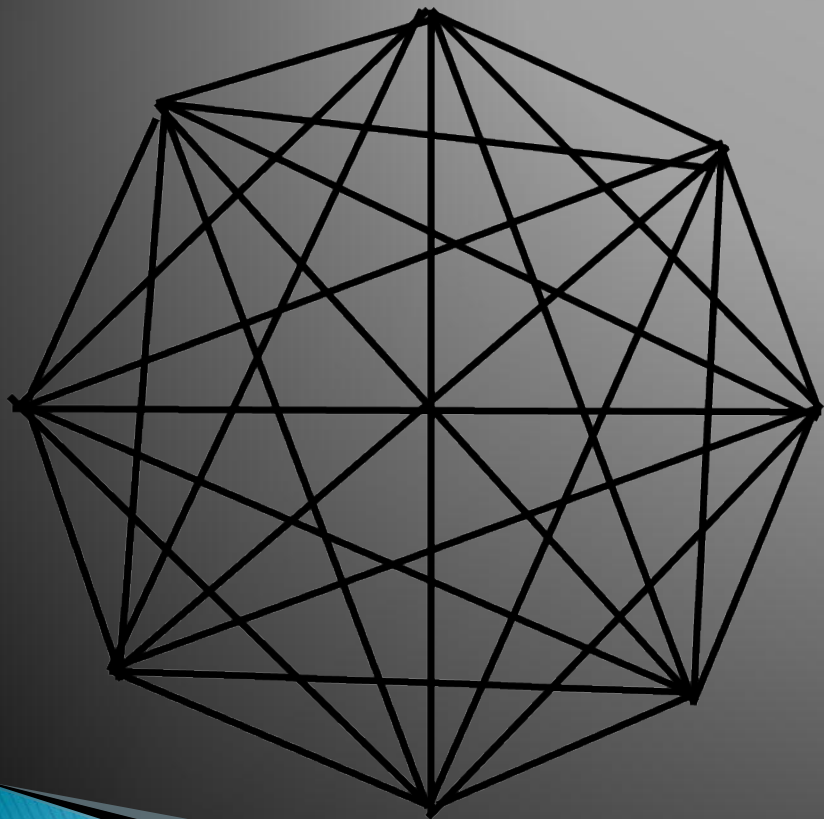- Easy to maintain and expand

Star Topology (3)

Advantages
- Easy to add devices as the network expands
- One cable failure does not bring down the entire network.
- Hub provides centralised management
- Easy to find device and cable problems
- Can be upgraded to faster speeds
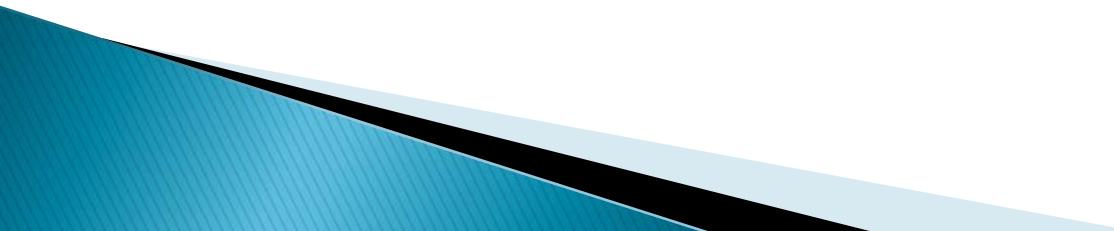- Lots of support as it is the most used

Disadvantages
- A star network requires more cable than a ring or bus network
- Failure of the central hub can bring down the entire network
- Costs are higher (installation and equipment) than for most bus networks

Mesh Topology (Web)

Mesh Topology (2)

- Not common on LANs
- Most often used in WANs to interconnect LANS
- Each node is connected to every other node
- Allows communication to continue in the event of a break in any one connection
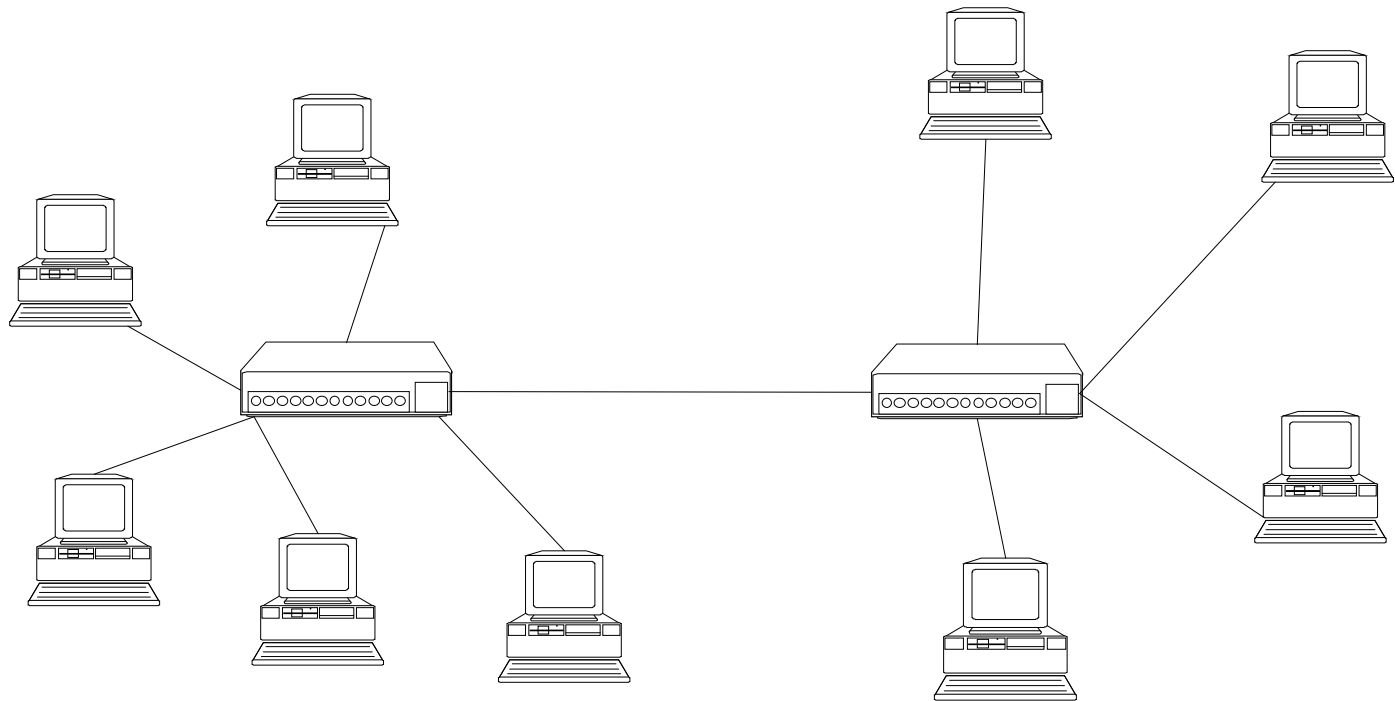- It is "Fault Tolerant"

Mesh Topology (3)
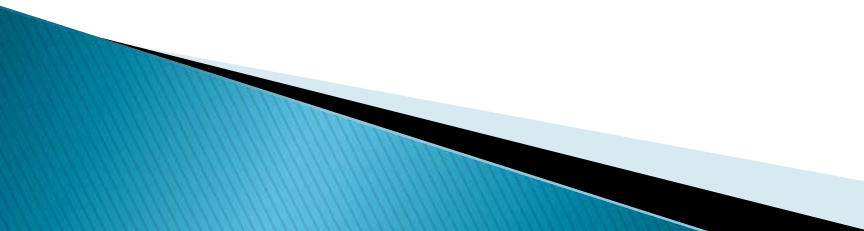
Advantages
- Improves Fault Tolerance

Disadvantages
- Expensive
- Difficult to install
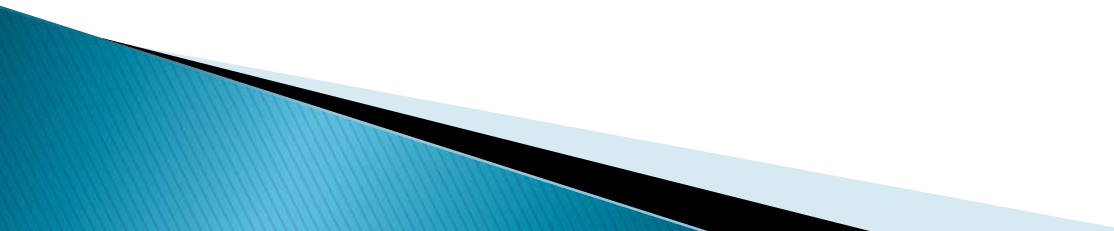- Difficult to manage
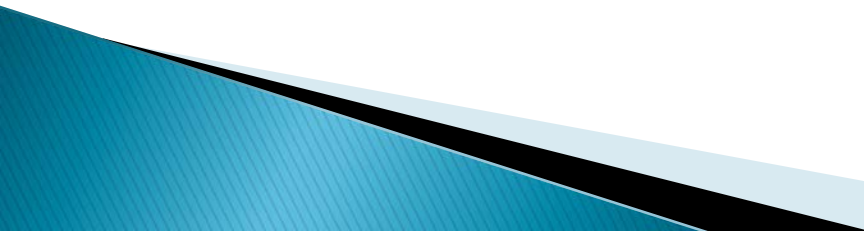- Difficult to troubleshoot

Hybrid Topology
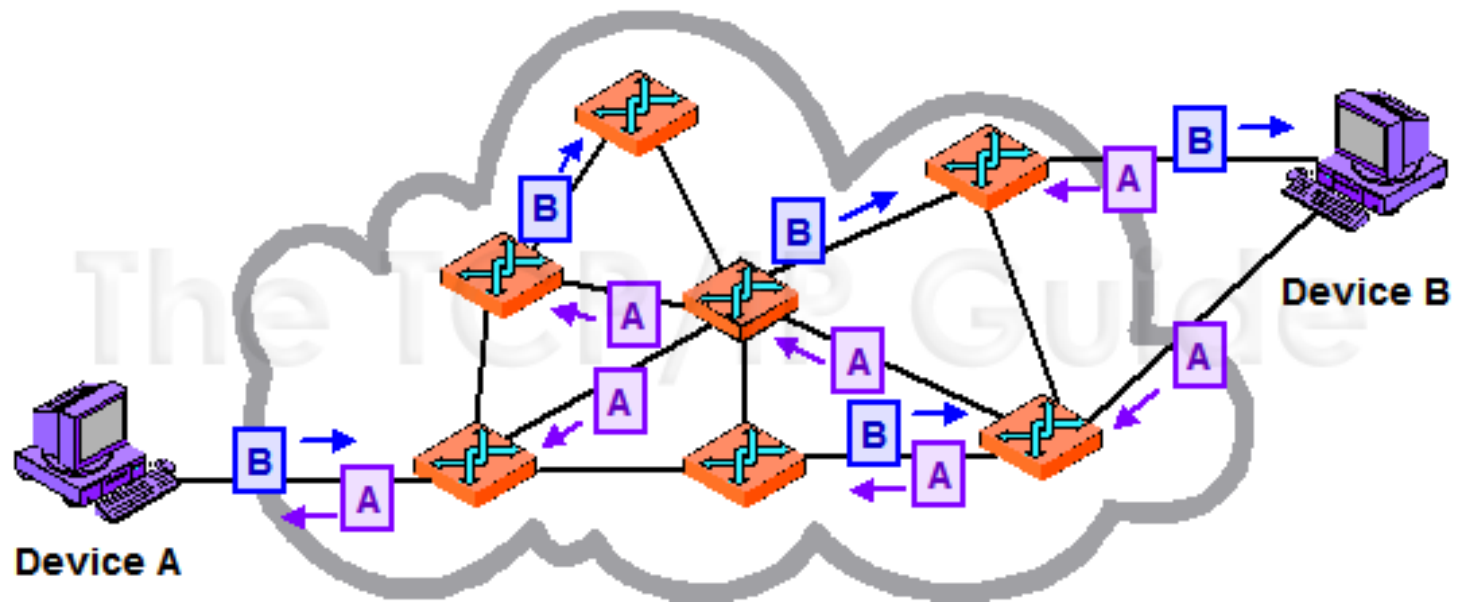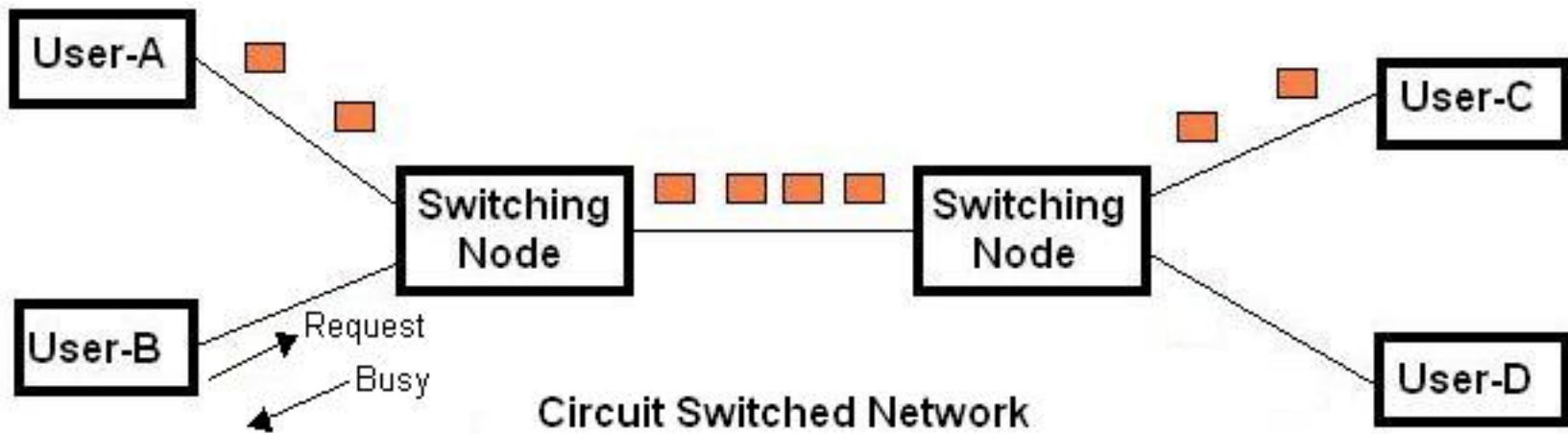
Hybrid Topology (2)

- Old networks are updated and replaced, leaving older segments
- Hybrid Topology – combines two or more different physical topologies
- Commonly Star-Bus or Star-Ring
- Star-Ring uses a MAU (Multistation Access Unit

Switching Techniques

- Connection Oriented Service (eg. Circuit Switching)
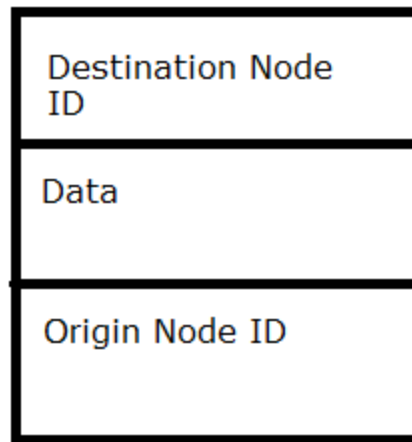- Connection Less Service (eg. Packet Switching)

Circuit Switching

- Circuit or route is established between the sender and receiver, before the start of transfer of data.
- Eg. Telephone System
- A **request signal** is sent over the network to set up the connection with the reciever, intermediate nodes (switching nodes) are identified.
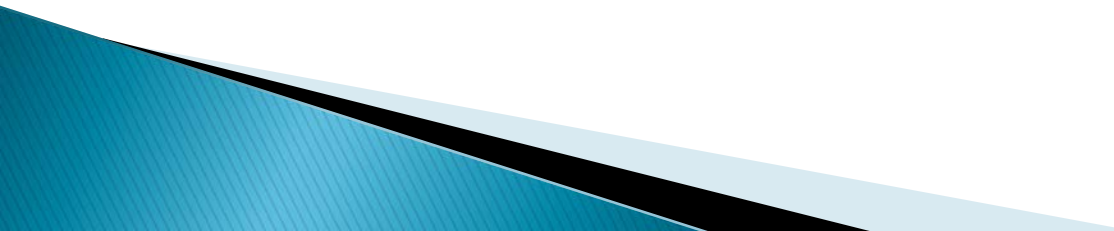- If the path is set up, destination node sends the **accepted signals** back

Circuit Switched Network

Device A

Device B

Packet Switching

- Eg. Post Office
- Network divides the data into small block of data called packets.

Destination Node ID
Data
Origin Node ID

A Packet

- The packets are sent to the intermediate node
- The intermediate node checks the destination id, if it does not matches, it forwards the packet to the next available node.
- This process continues till the packet reaches to the destination.

Packet Switching