

Network Topologies

Objectives

- Describe the basic and hybrid LAN physical topologies, and their uses, advantages and disadvantages.
- Describe the backbone structures that form the foundation for most LANs

Simple Physical Topologies

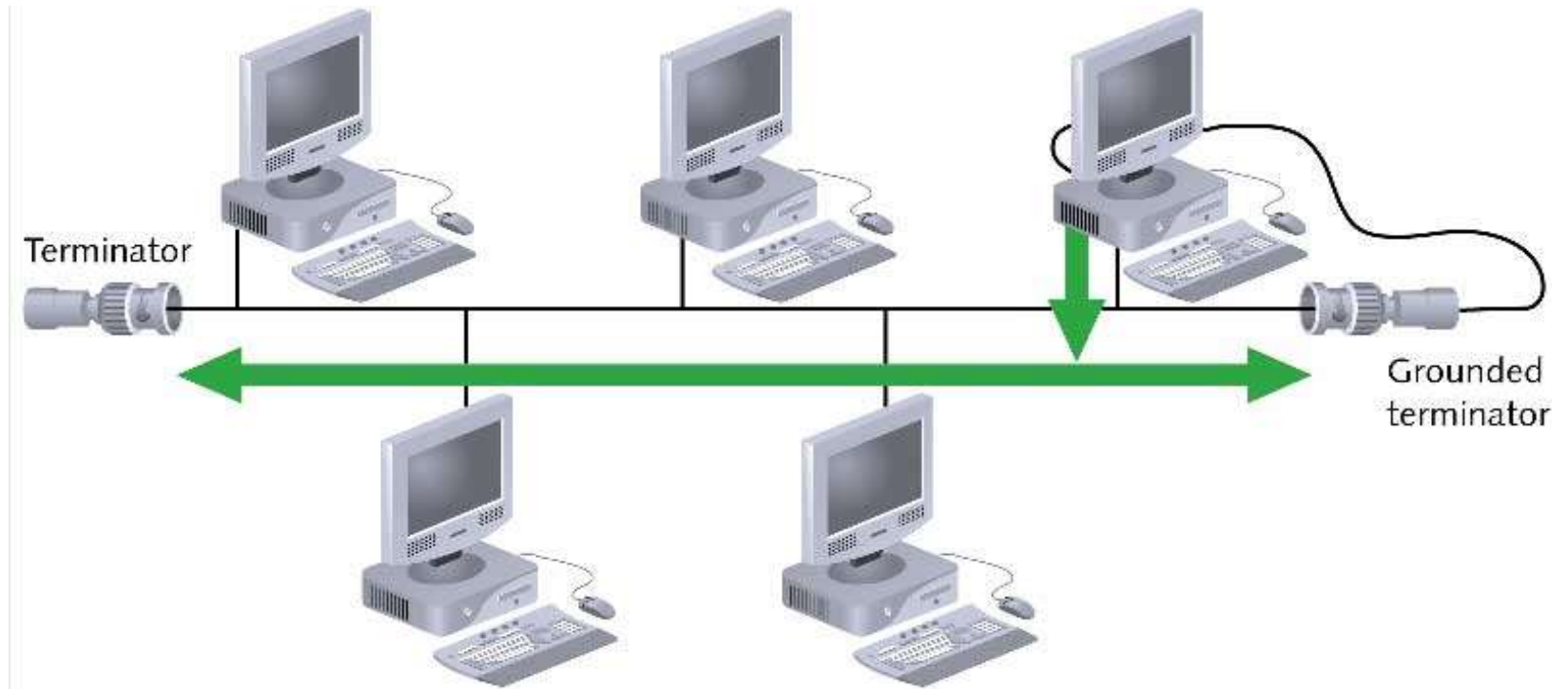
- Physical topology: physical layout of nodes on a network
- Four fundamental shapes:
 - Bus
 - Ring
 - Star
 - Mesh
- May create hybrid topologies
- Topology integral to type of network, cabling infrastructure, and transmission media used

Why we need a topology

Choosing one topology over another can impact :

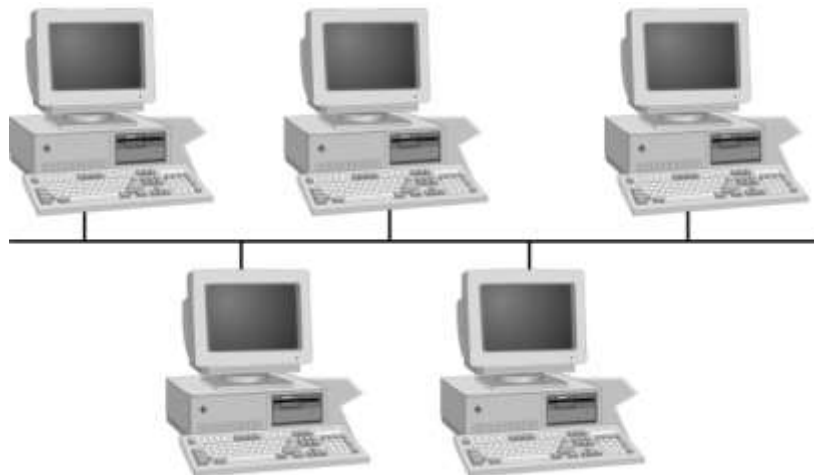
- type of equipment the network needs
- capabilities of the equipment
- network's growth
- way a network is managed

Bus



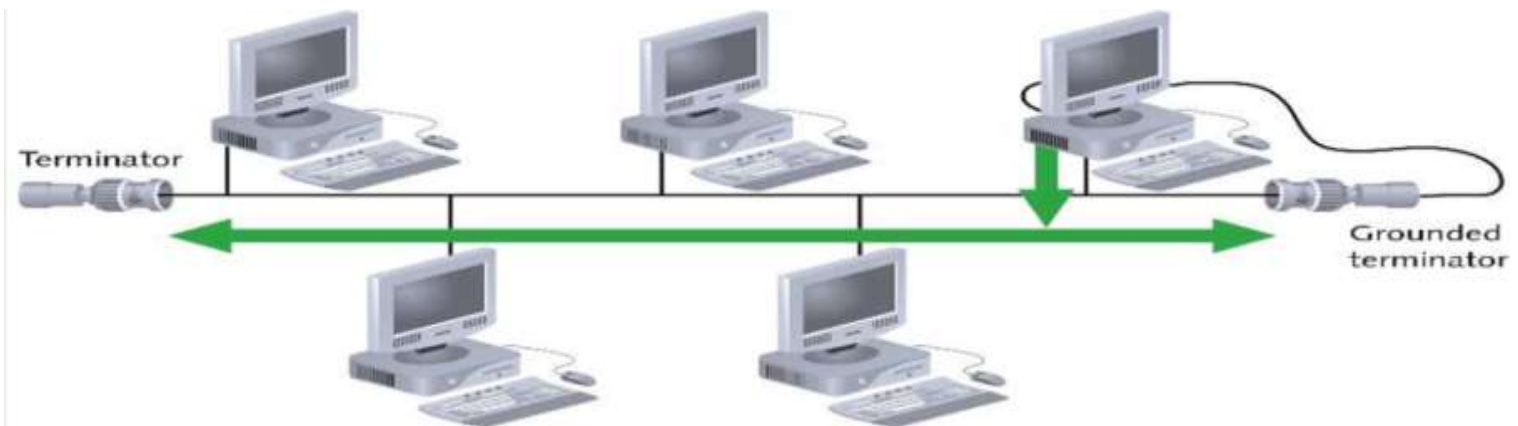
Simple Physical Topologies

- A **Bus topology** consists of a single cable—called a **backbone**—connecting all nodes on a network without intervening connectivity devices



Bus (continued)

- Devices share responsibility for getting data from one point to another
- Terminators stop signals after reaching end of wire
 - Prevent signal bounce
- Inexpensive, not very scalable
- Difficult to troubleshoot, not fault-tolerant



Bus

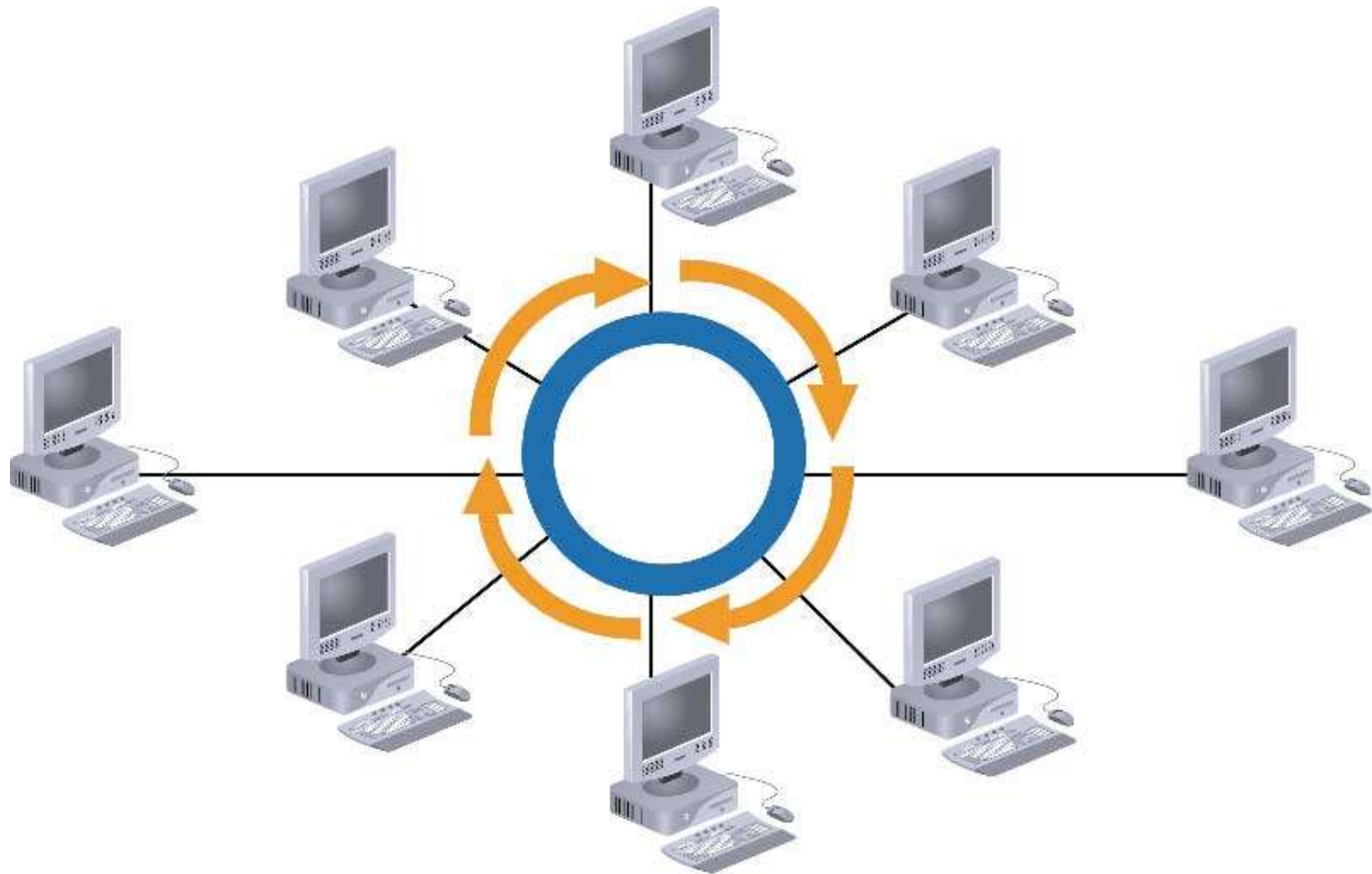
Advantages

- Works well for small networks
- Easy to install
- Relatively inexpensive to implement

Disadvantage

- Management costs can be high
- Network disruption when computers are added or removed
- A break in the cable will prevent all systems from accessing the network.
- Difficult to troubleshoot

Ring



Simple Physical Topologies

- Ring topology
 - Each node is connected to the two nearest nodes so the entire network forms a circle
 - One method for passing data on ring networks is **token passing**
 - Data travels around the network
 - Traffic flows in one direction
 - Slow performance
 - One workstation goes down; whole network goes down
 - Network is highly dependent



Ring

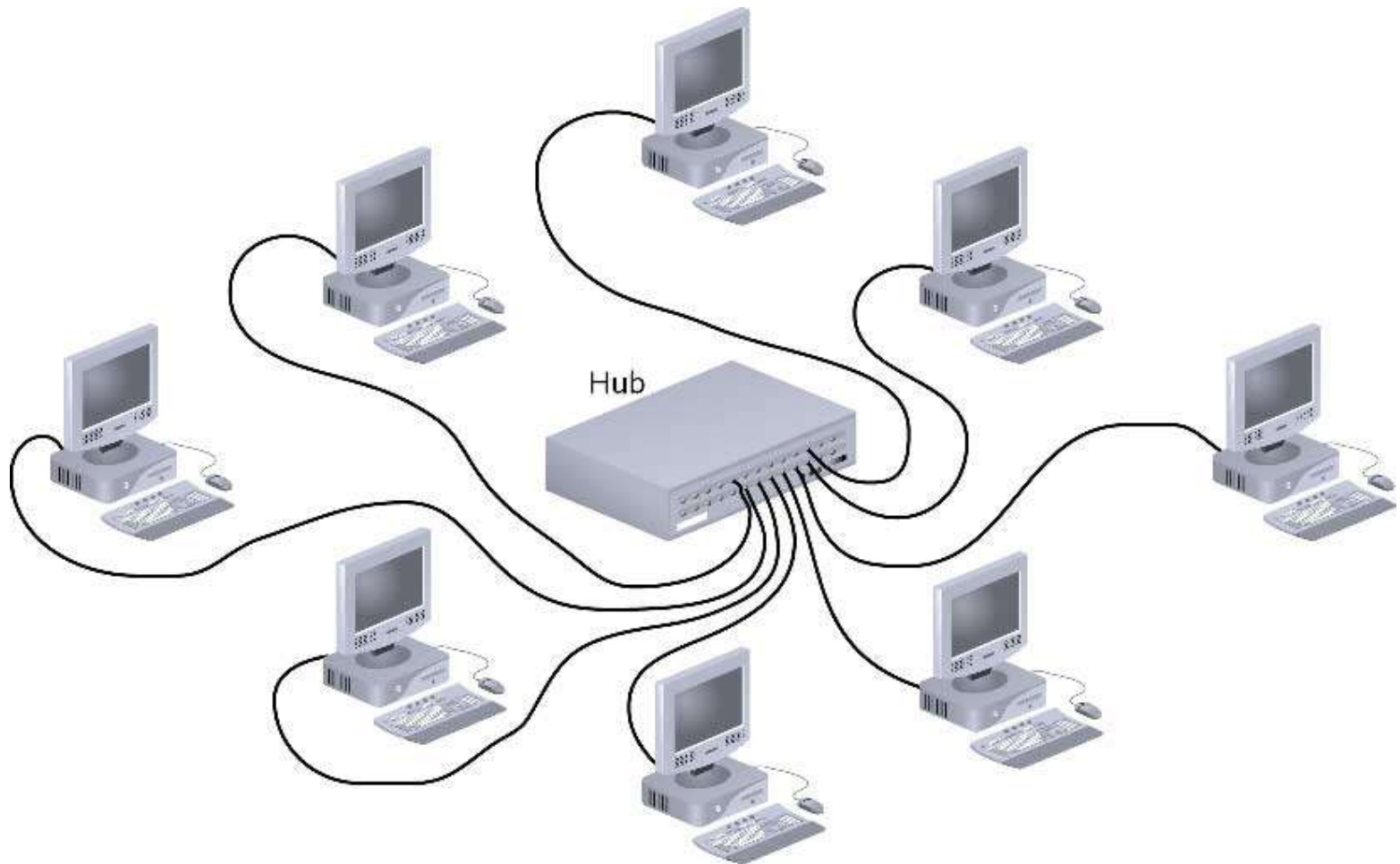
Advantages

- Cable faults are easily located, making troubleshooting easier
- Ring networks are moderately easy to install

Disadvantage

- Expensive
- Requires more cable and network equipment at the start
- Expansion to the network can cause network disruption
- A single break in the cable can disrupt the entire network

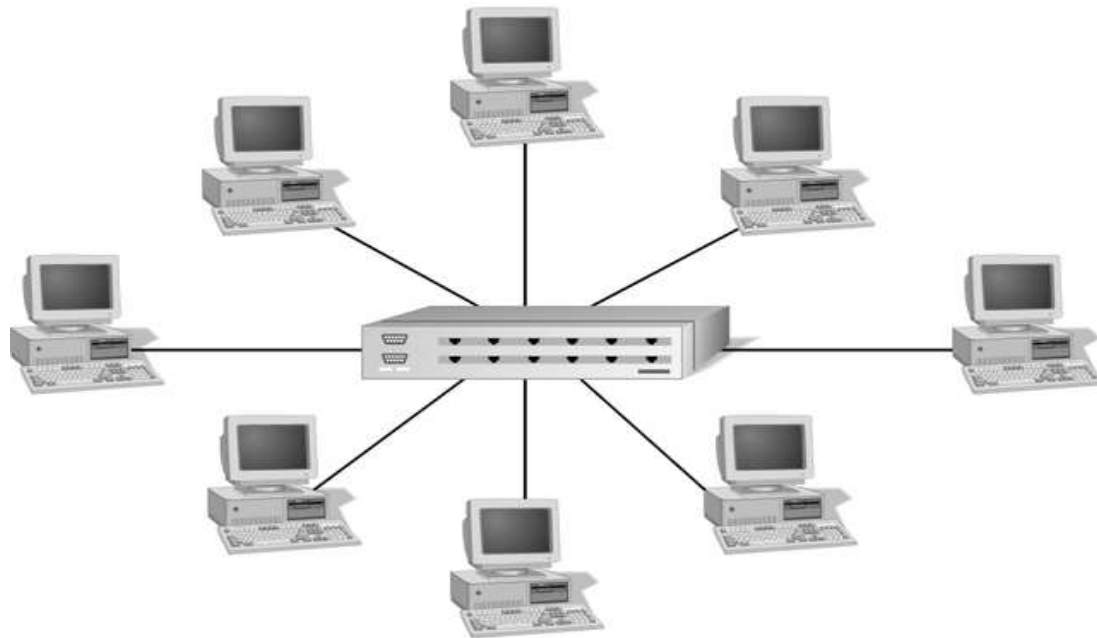
Star



Simple Physical Topologies

Star topology

- Every node on the network is connected through a central device called **hub or switch**.



Star (continued)

- Any single cable connects only two devices
 - Cabling problems affect two nodes at most
- Requires more cabling than ring or bus networks
 - More fault-tolerant
- Easily moved, isolated, or interconnected with other networks
 - Scalable
- Supports max of 1024 addressable nodes on logical network

Star

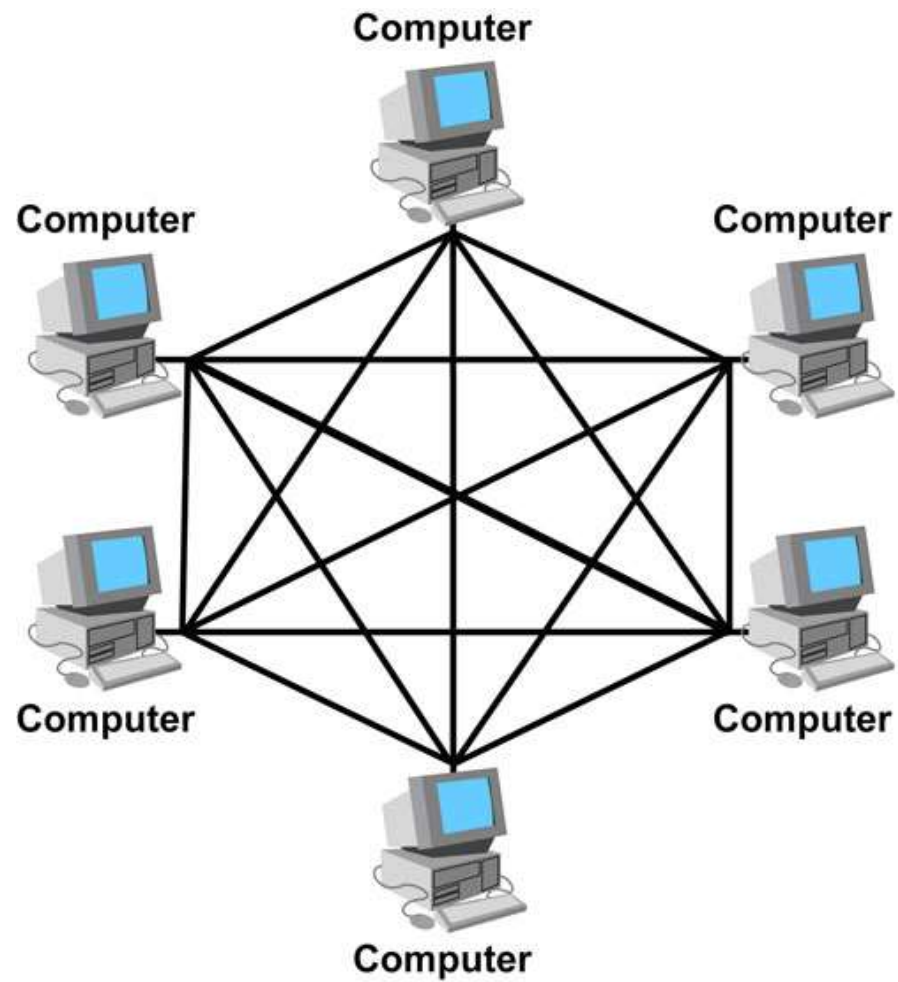
Advantages

- Good option for modern networks
- Low startup costs
- Easy to manage
- Offers opportunities for expansion
- Most popular topology in use; wide variety of equipment available

Disadvantage

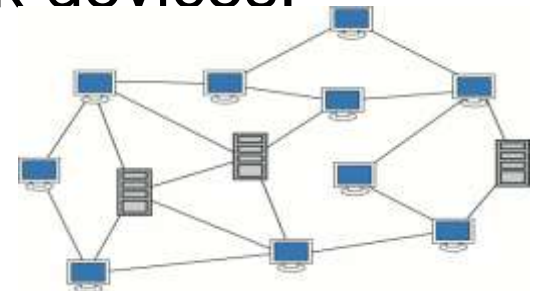
- Hub is a single point of failure
- Requires more cable than the bus

Mesh



Simple Physical Topologies

- Mesh Topology: 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.



Mesh

Advantages

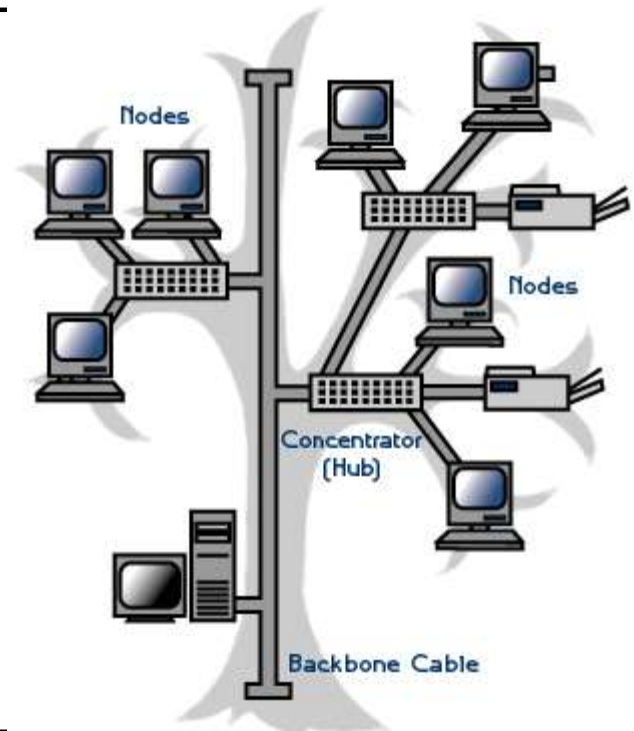
- Robust
- There is the advantage of privacy or security
- The network can be expanded without disruption to current uses
- Point to point links make fault identification and fault

Disadvantage

- Requires more cable than the other LAN topologies
- Complicated implementation
 - Installation and reconnection are difficult.
 - Sheer bulk of wiring can be greater than the available space can accommodate
 - Expensive

Hybrid Physical Topologies

- One example of **Hybrid Topology** is **Tree topology**
- **Tree topology** is a combination of Bus and Star topology.
- It consists of groups of star-configured workstations connected to a linear bus backbone cable.
- If the backbone line breaks, the entire segment goes down
- An example of this network could be cable -



Choosing a Topology

- **BUS**

- network is small
- network will not be frequently reconfigured
- least expensive solution is required
- network is not expected to grow much

- **STAR**

- it must be easy to add/remove PCs
- it must be easy to troubleshoot
- network is large
- network is expected to grow in the future

- **RING**

- network must operate reasonably under heavy load
- higher speed network is required
- network will not be frequently reconfigured