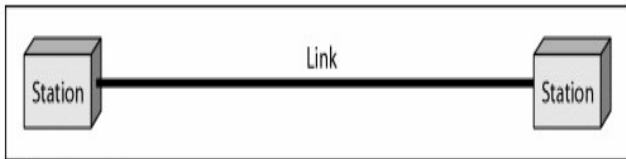


Principles of Data Communications

Reference Book: Data Communications and Networking by Behrouz A. Forouzan

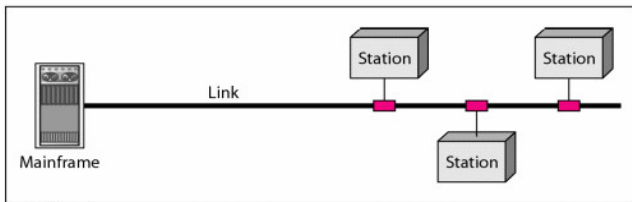
Types of Connection

- Point-to-Point



a. Point-to-point

- Multipoint



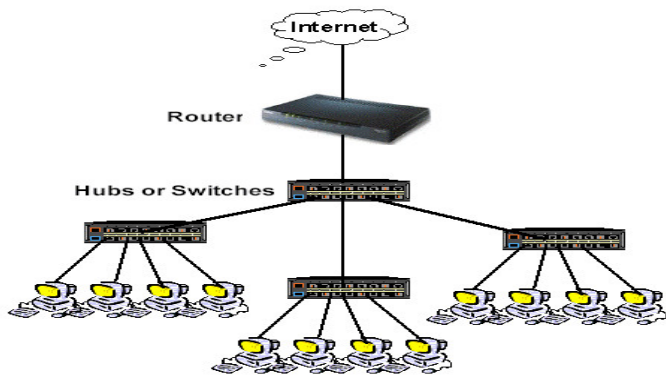
b. Multipoint

- An Internet service provider (ISP) is an organisation that provides services for accessing, using, or participating in the Internet.
- eg) BSNL, Airtel, Jio etc.

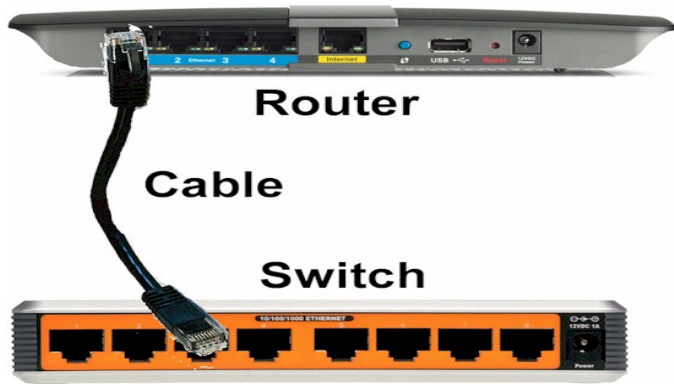
Router, Switch



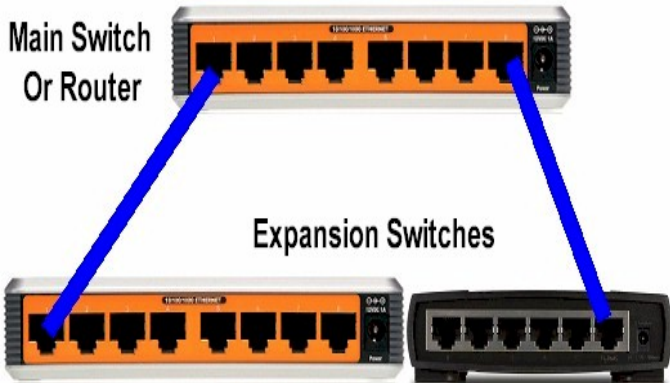
Network Layout



Router, Switch



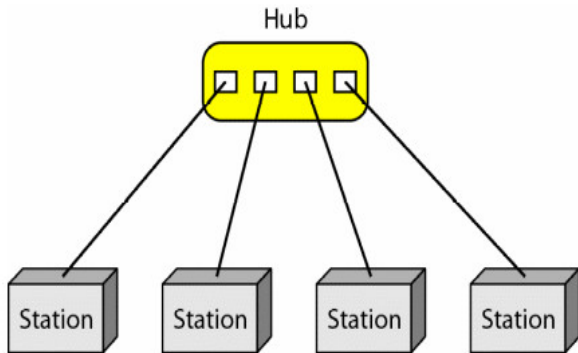
Router, Switch



Network Topology

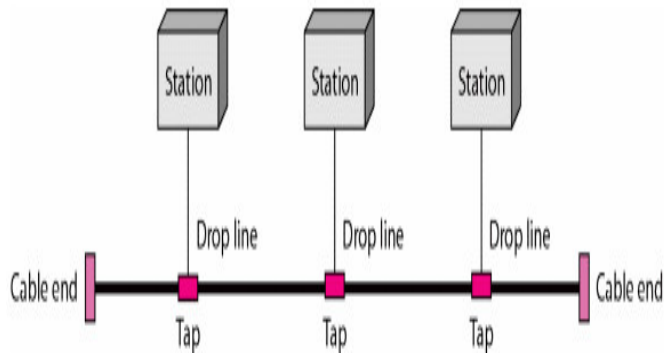
- Refers to the way in which a network is laid out physically
- 4 basic topologies
 - Star
 - Bus
 - Ring
 - Mesh

Star Topology



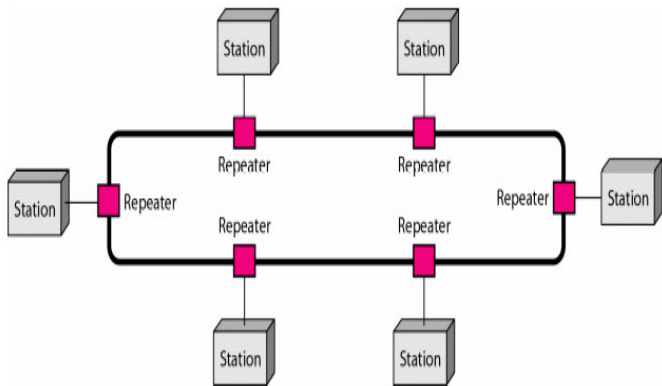
- Each device has a dedicated p2p link only to the central controller
- Devices are not directly linked to one another
- Less expensive than mesh
- Advantage: Robustness - If one link fails only that link is affected, all other links remain active
- Disadvantage: Single point of failure

Bus Topology



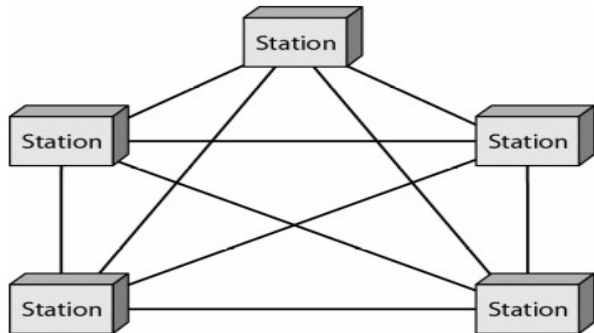
- One long cable acts as a backbone to link all the devices in a network
- There is a limit on the number of taps that a bus can support
- Advantage: Ease of installation; uses less cabling compared to mesh or star
- Disadvantages
 - Difficult reconnection and fault isolation
 - May be difficult to add new devices
 - Signal reflection at the taps can cause degradation in quality
 - A fault or break in the bus cable stops all transmission
 - Traditional ethernet LANs can use a bus topology

Ring Topology



- Each device is linked to only its immediate neighbors
- Addition or deletion of a device requires changing only two connections
- Disadvantage: Media and traffic considerations: max. ring length and no. of devices
- Unidirectional traffic- disadv: if one breaks, it disables the entire network - Solved by using a dual ring

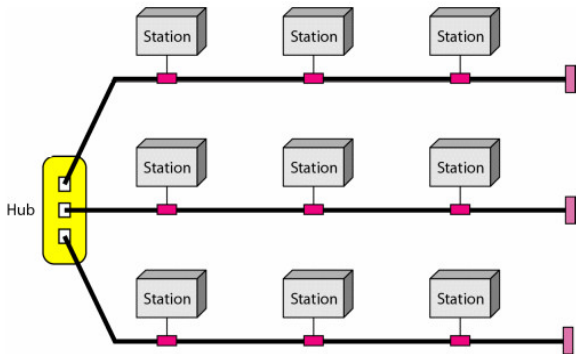
Mesh Topology



Mesh Topology

- Every device has a dedicated point-to-point link to every other device
- $n(n-1)$ physical links; $n(n-1)/2$ duplex mode links
- Every device must have $(n-1)$ Input/Output ports (I/O ports)
- Advantages
 - Traffic problems can be eliminated
 - Robust: if one link fails, it doesn't affect the entire system
 - Privacy, Security
 - Fault identification and fault isolation is easy
- Disadvantages
 - Lot of cabling and I/O ports are required
 - Expensive hardware
 - Lot of space required (on walls, ceilings etc.); (eg) telephone regional offices in which each regional office needs to be connected to every other regional office

Topology????

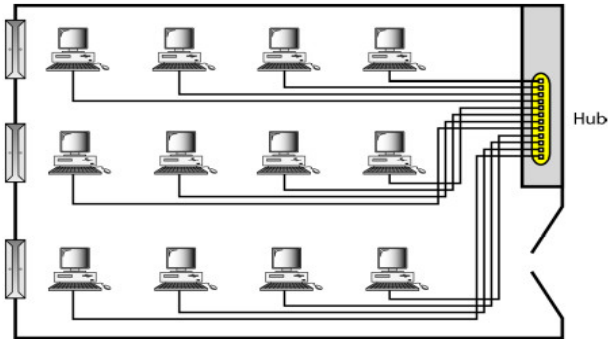


Network Types

- LAN (Local Area Network)
- WAN (Wide Area Network)
- * MAN (Metropolitan Area Network), PAN (Personal Area Network) etc.

LAN (Local Area Network)

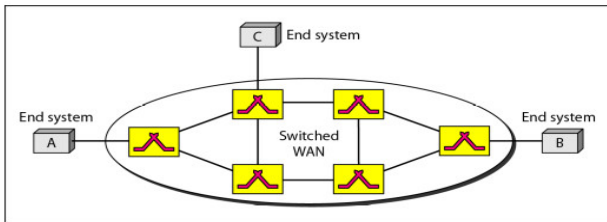
- usually privately owned and connects some hosts in a single office, building or campus
- Each host in a LAN has an identifier, an address, that uniquely defines the host in the LAN



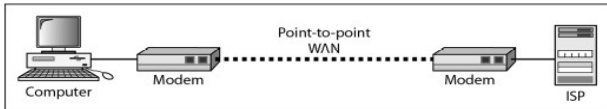
WAN (Wide Area Network)

- WAN provides long-distance transmission of data, image, audio, and video information over large geographic areas that may comprise a country, a continent, or even the whole world.
- A WAN can be as complex as the backbones that connect the Internet or as simple as a dial-up line that connects a home computer to the Internet.
- Types of WAN
 - Point-to-point WAN: a network that connects two communicating devices through a transmission media (cable or air)
 - Switched WAN: is a network with more than two ends; combination of several point-to-point WANs that are connected by switches

WAN

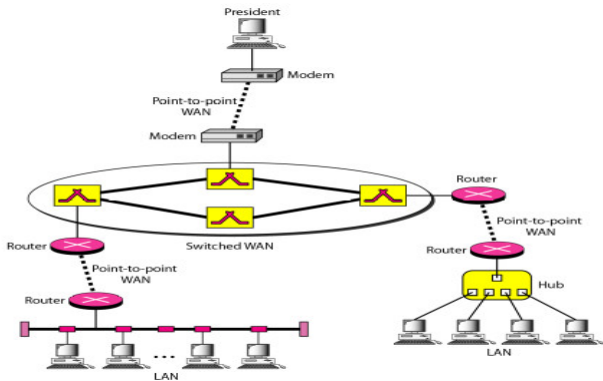


a. Switched WAN



b. Point-to-point WAN

LAN+WAN

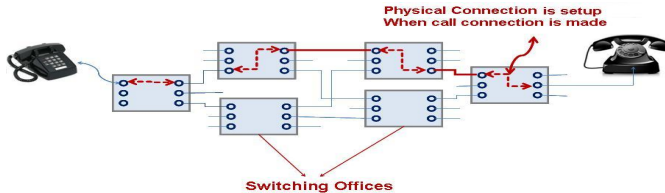


MAN (Metropolitan Area Network)

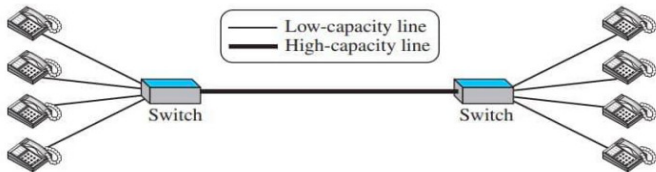
- MAN is a network with a size between a LAN and a WAN
- It normally covers the area inside a town or a city
- It is designed for customers who need a high-speed connectivity, normally to the Internet, and have endpoints spread over a city or part of city

- An internet is a switched network in which a switch connects at least two links together.
- A switch needs to forward data from a network to another network when required.
- Types
 - Circuit Switched Network
 - Packet Switched Network

Circuit Switched Network



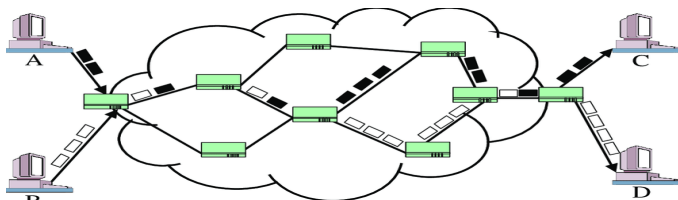
Circuit Switched Network



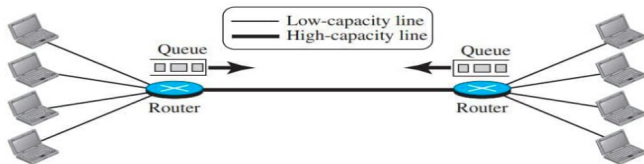
Circuit Switched Network

- A dedicated connection, called a circuit is always available between the 2 end systems, the switch can only make it active or inactive.
- 2 cases
 - All telephone sets are busy. 4 on one side is talking to 4 on the other side. The capacity of the thick line is fully used.
 - Only one telephone set at one side is connected to a telephone set on the other side. Only one-fourth of the capacity of the thick line is used.
- Efficient when it is working at its full capacity.

Packet Switched Network



Packet Switched Network



Packet Switched Network

- The communication between 2 ends is done in blocks of data called packets.
- Instead of communication, we see the exchange of information through data packets between computers.
- Store and forward
- Router has a queue that can store and forward
- If high capacity line has twice the capacity of low capacity line- no waiting time if there are only 2 computers to communicate. Otherwise, packets wait in queue and are delivered in order.

- Types of Connection
- Network Topologies
- Types of Networks
- Switching

THANK YOU