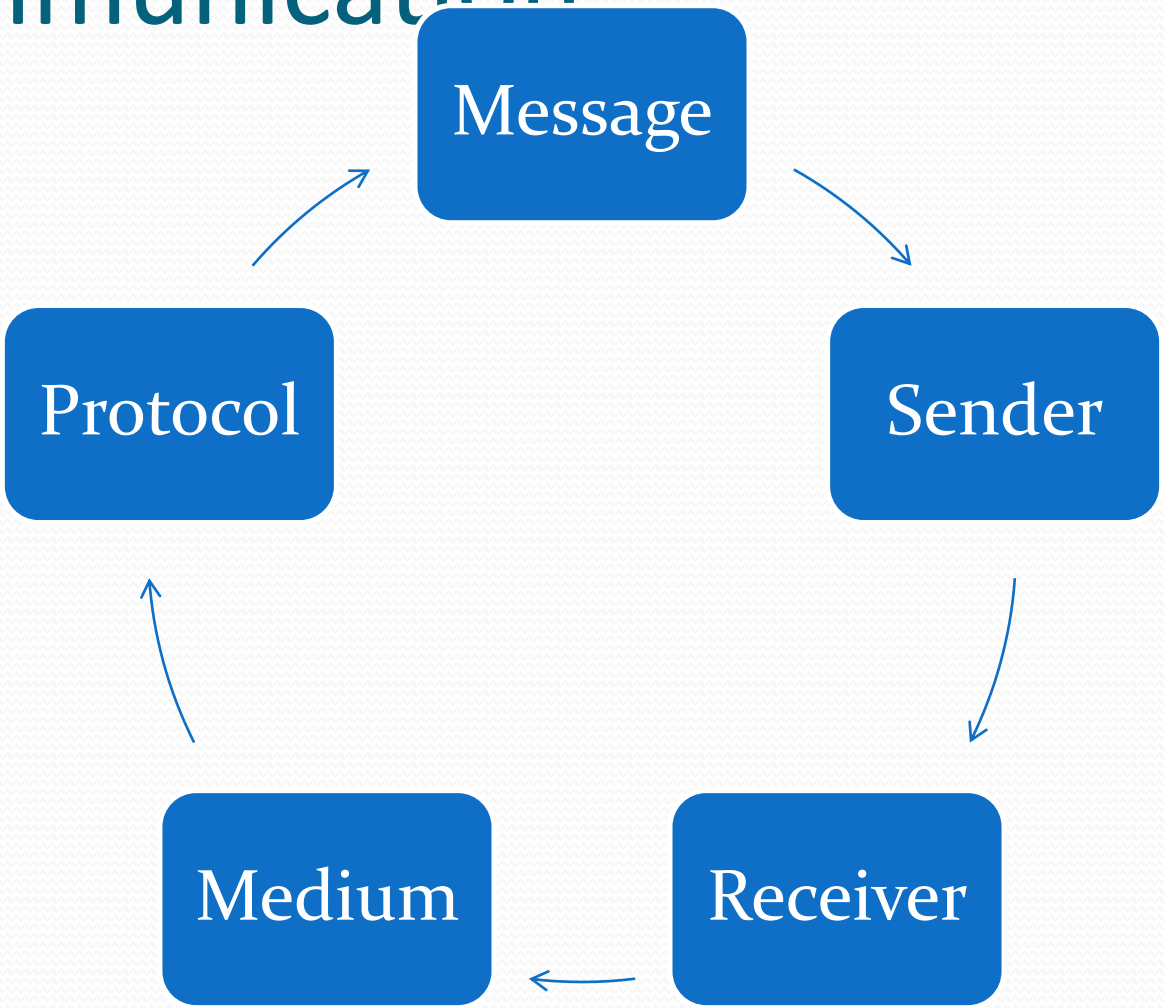
Data communication

- Data Communications is the exchange of data between two devices using some form of wired or wireless transmission medium.

Components of data communication



Data transmission mode

Data transmission mode refers to the direction of signal flow between two linked devices . There are three types of transmission modes

Simplex	Half-duplex	Full-duplex

Transmission media

Refers to the physical media through which communication signals (data & information) are transmitted

Guided Media	Unguided Media
twisted pair, coaxial cable , optical fibre	Radio frequency propagation , Microwave, satellite


Radio Waves


Microwaves


Infrared

Telecommunications and Networking in Today's Business World

- What is a computer network?
  - Two or more connected computers
  - Major components in simple network
    - Client computer
    - Server computer
    - Network interfaces (NICs)
    - Connection medium
    - Network operating system
    - Hub or switch
  - Routers
    - Device used to route packets of data through different networks, ensuring that data sent gets to the correct address

Telecommunications and Networking in Today's Business World

COMPONENTS OF A SIMPLE COMPUTER NETWORK

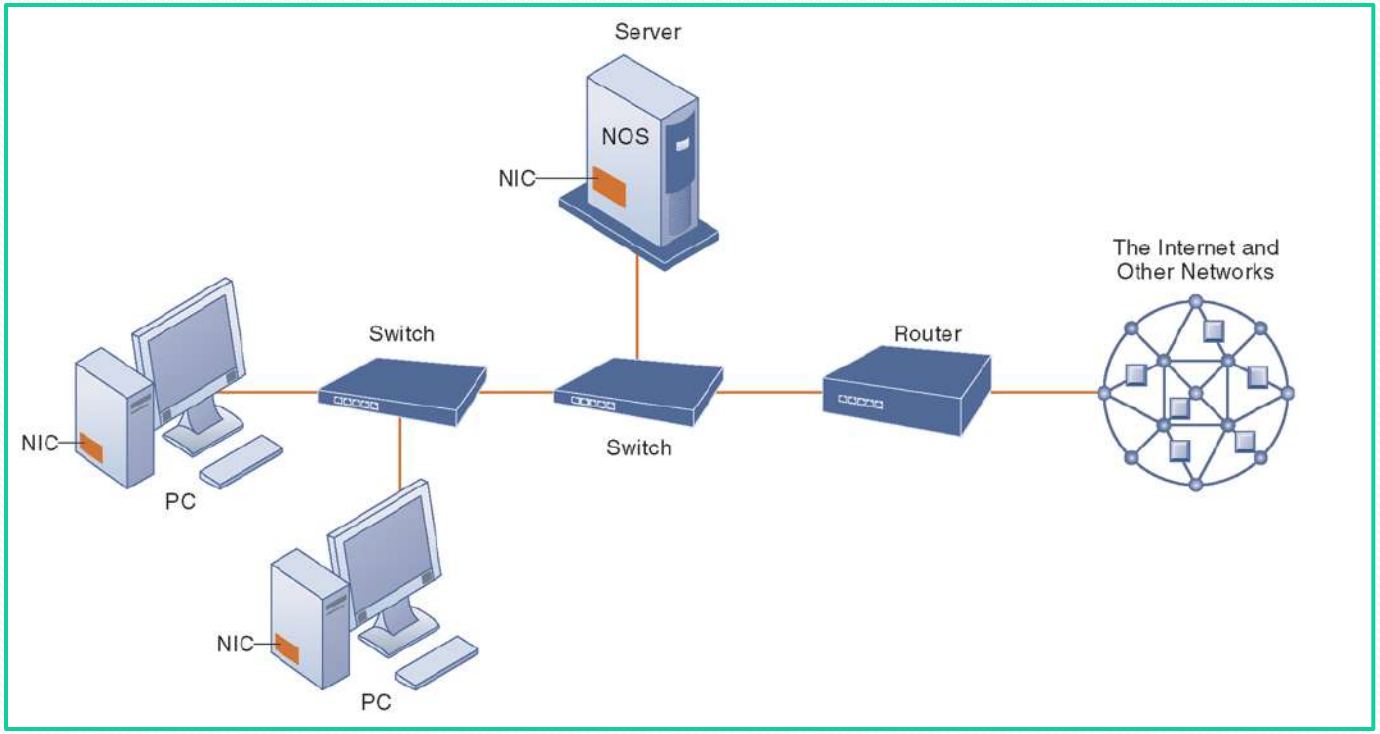


FIGURE 7-1

Illustrated here is a very simple computer network, consisting of computers, a network operating system residing on a dedicated server computer, cable (wiring) connecting the devices, network interface cards (NICs), switches, and a router.

Telecommunications and Networking in Today's Business World

CORPORATE NETWORK INFRASTRUCTURE

Today's corporate network infrastructure is a collection of many different networks from the public switched telephone network, to the Internet, to corporate local area networks linking workgroups, departments, or office floors.

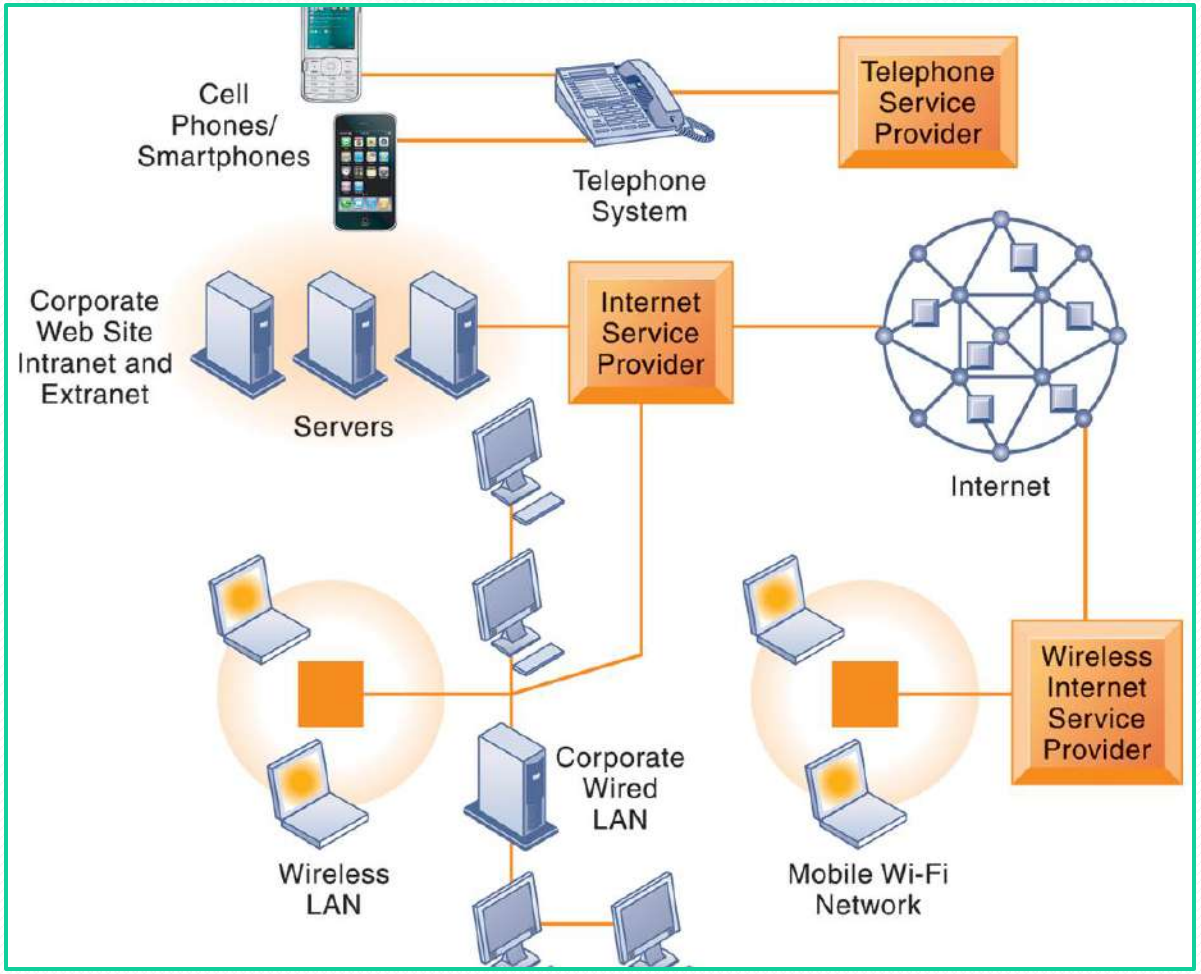


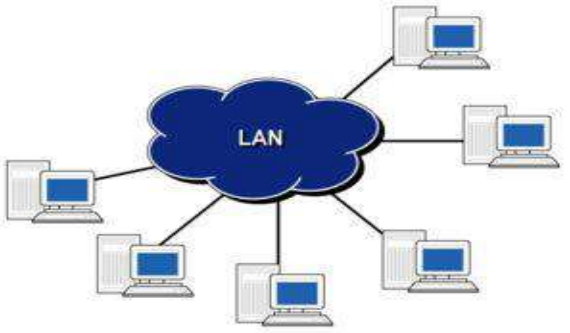
FIGURE 7-2

Types of networks

- Local Area Networks (LAN)
- Metropolitan Area network (MAN)
- Wide Area Network (WAN)

Local area network

- Network that connects communications devices within 2,000 feet(usually within same building) so that every user device on the net work can be communicate with any other.

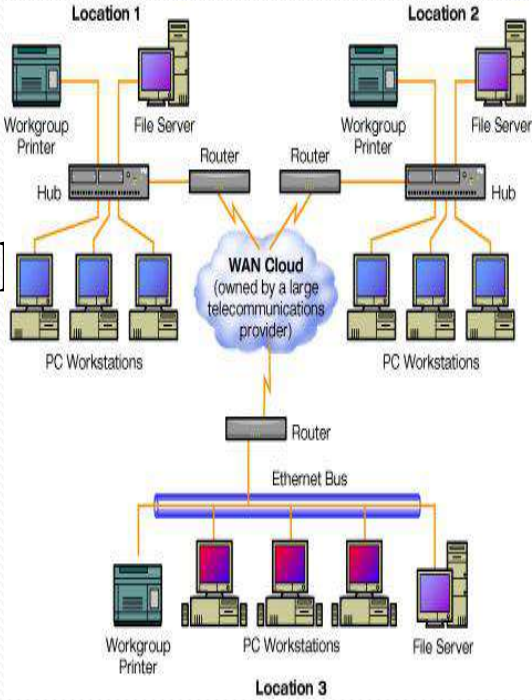


Metropolitan area network

- Spread over metropolitan area such as a city
- Connecting number of LANs
- MAN may be operated by one organization (a corporate with several offices in a city) or be shared resources used by several organisations in the same city

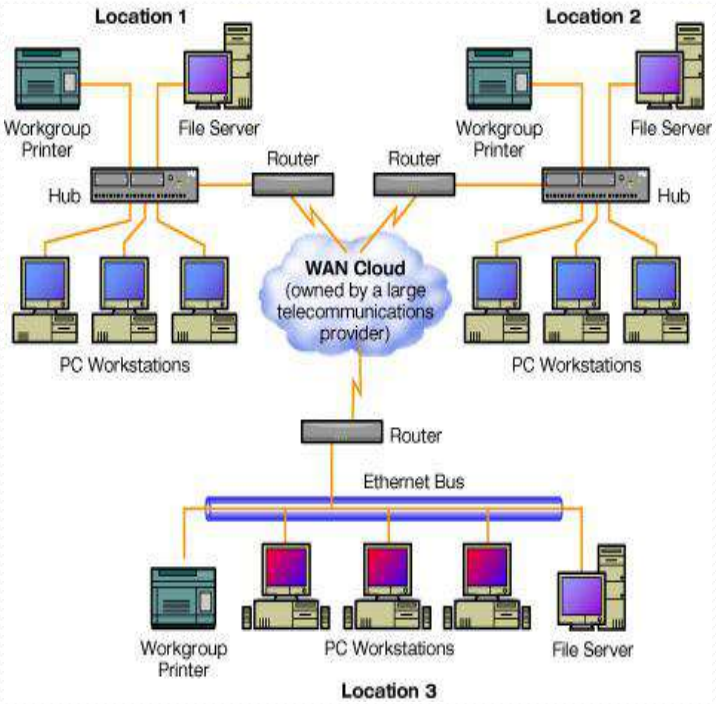
Wide area network

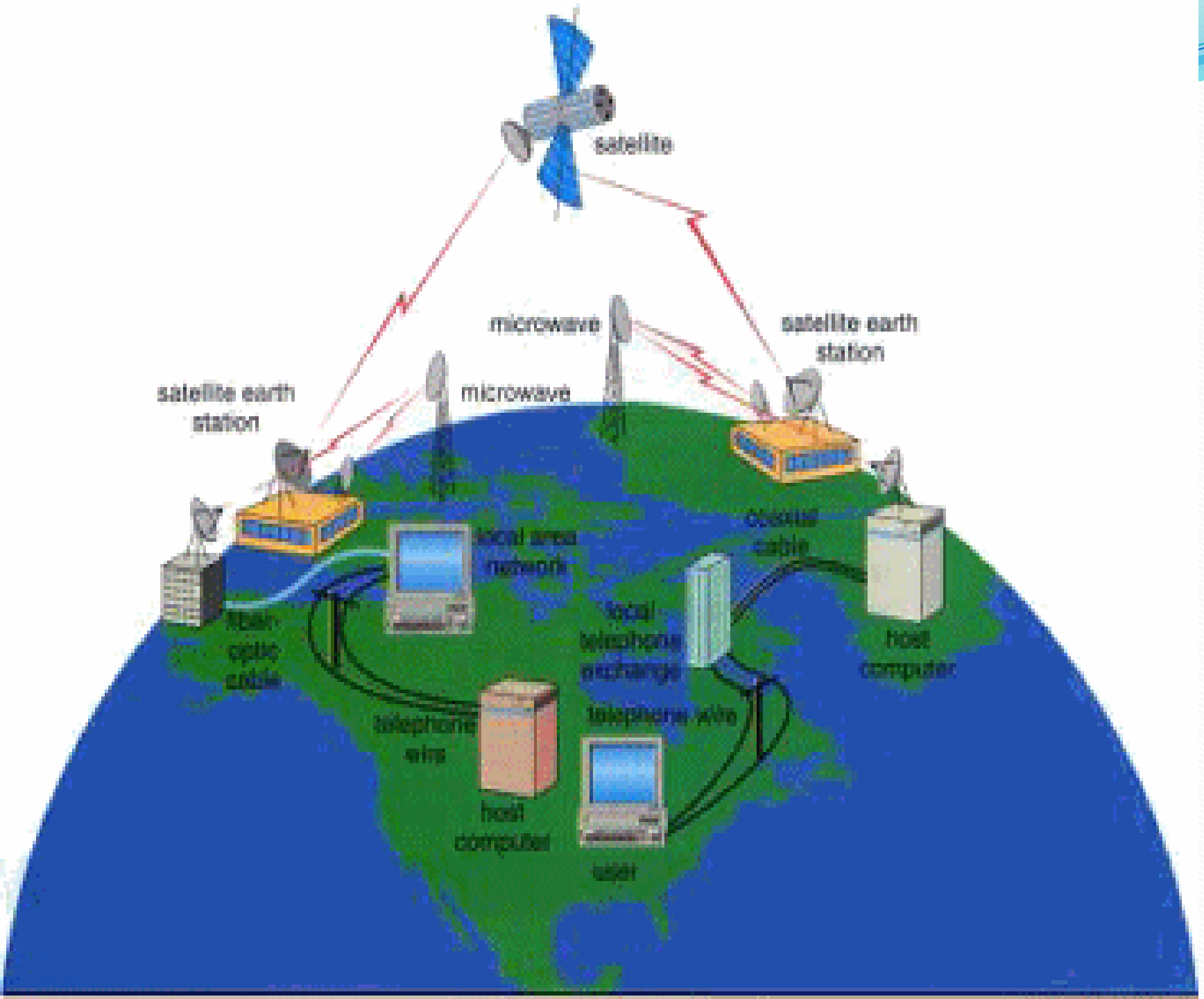
- System of interconnecting many computers over a large geographical area such as cities , states , countries or even whole world.
- Networks that covers wide geographic areas include regional networks such as a companies or international networks suc communications services providers may commercials privately owned or public
- Largest WAN---INTERNET



Wide area network

Networks that covers wide geographic areas include regional networks such as a telephone companies or international networks such as global communications services providers may be commercials privately owned or public.



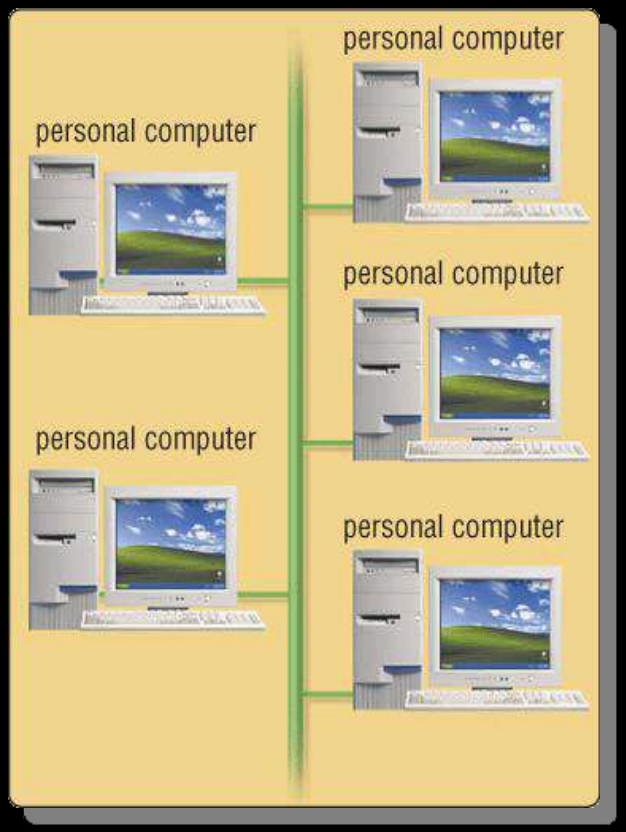

satellite
microwave
satellite earth station
satellite earth station
microwave
local area network
coaxial cable
fiber optic cable
local telephone exchange
host computer
telephone wire
telephone wire
host computer
laser

Network topologies

- Topology refers to the way network is laid out either physically or logically
- Networks shape
- Five basic topologies: Bus, Ring , Star , Tree, Mesh

BUS TOPOLOGY

- All computers and devices connected to central cable or bus.
- Consists of a main run of cable with a terminator at each end.
- Popular on LANs because they are inexpensive and easy to install.



DIFFERENTIATION BETWEEN THE THREE TYPES OF NETWORK TOPOLOGY

BUS

ADVANTAGE	DISADVANTAGE
1) Easy to connect computer or peripheral to a linear bus.	1) Entire network shuts down if there is a break in the main cable.
2) Requires less cable length than a star topology.	2) Terminators are required at both ends of the backbone cable.
	3) Difficult to identify the problem if the entire network shuts down.

RING TOPOLOGY

- Cable forms closed ring or loop, with all computers and devices arranged along ring.
- Data travels from device to device around entire ring, in one direction.
- Primarily is used for LANs, but also is used in WANs.

DIFFERENTIATION BETWEEN THE THREE TYPES OF NETWORK TOPOLOGY

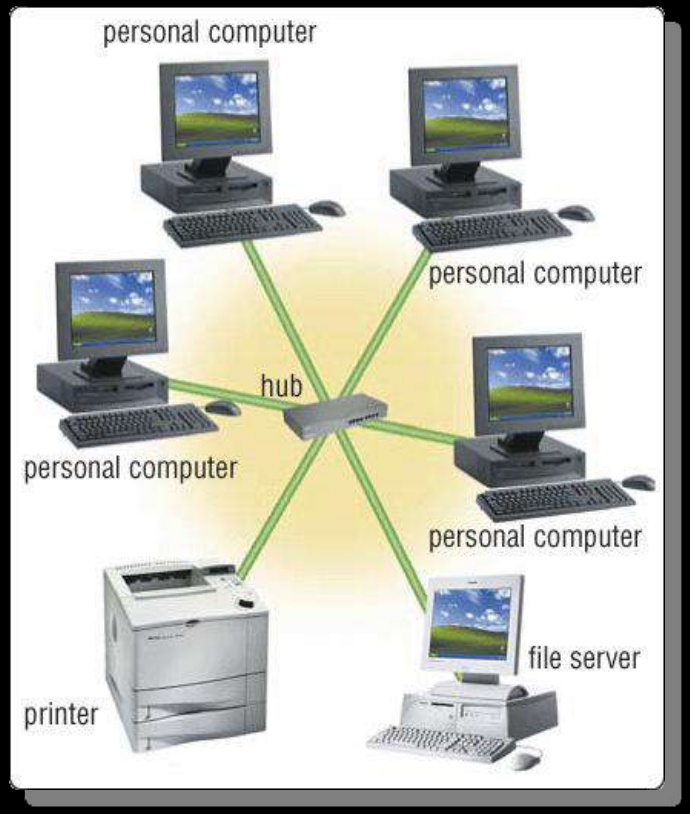
RING

ADVANTAGE	DISADVANTAGE
1) Data is quickly transferred without a 'bottle neck'.	**1) Data packets must pass through every computer between the sender and recipient therefore, this makes it slower.**
2) The transmission of data is relatively simple as packets travel in one direction only.	**2) If any of the nodes fail then the ring is broken and data cannot be transmitted successfully.**
	3) It is difficult to troubleshoot the ring.

STAR TOPOLOGY

- All devices connect to a central device, called **hub.**

- All data transferred from one computer to another passes through hub.



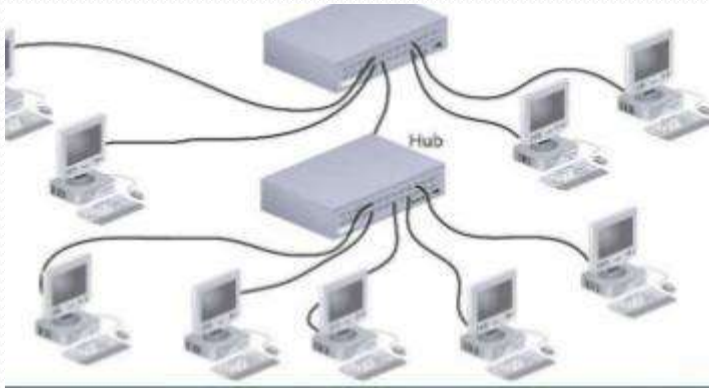
DIFFERENTIATION BETWEEN THE THREE TYPES OF NETWORK TOPOLOGY

STAR

ADVANTAGE	DISADVANTAGE
1) Easy to install and wire.	**1) Requires more cable length than a linear topology.**
2) Security can be implemented in the hub/switch.	**2) If the hub or concentrator fails, nodes attached are disabled.**
3) **Easy to detect faults and to remove parts.**	**3) More expensive than linear bus topologies because of the cost of the concentrators.**

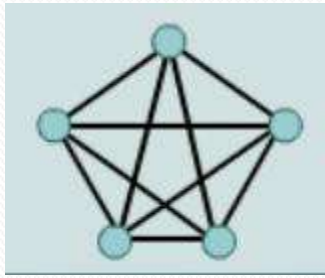
Tree topology

- Combines characteristics of linear bus and star topologies
- Majority of nodes connect to a secondary hub that in turn is connected to central hub
- ADVANTAGES: Distance to which a signal can travel increases, easy expansion
- DISADVANTAGES: backbone breaks , entire segment down , difficult to configure



mesh topology

- Every node has a dedicated point to point link to every other node.
- Message sent on a mesh can take several possible paths from source to destination
- A fully connected mesh network has n(n-1)/2 physical links to link n devices
- ADVANTAGES: eliminates network congestion, one link becomes unusable it does not disable entire system
- DISADVANTAGES: cabling, hardware expensive



Network devices

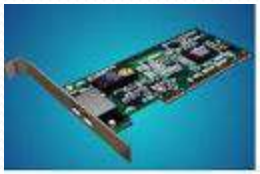
Interconnect individual computers and ensure they communicate efficiently

1. Network interface card
2. Repeater
3. Hub
4. Bridge
5. Switch
6. Router
7. Gateway

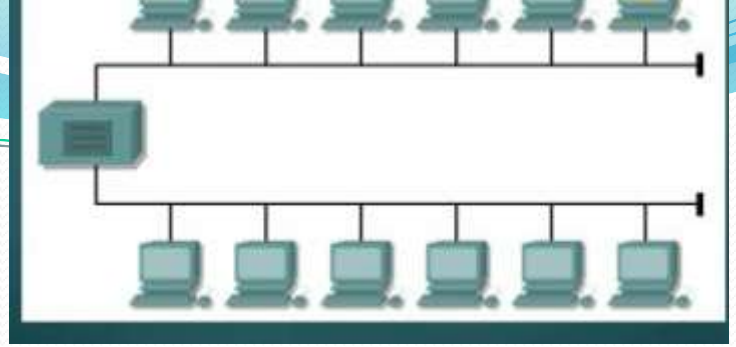
Network devices

1. Network interface card
2. Repeater
3. Hub
4. Bridge
5. Switch
6. Router
7. Gateway

- First contact between a machine & network



Network devices



1. Network interface card
2. Repeater
3. Hub
4. Bridge
5. Switch
6. Router
7. Gateway

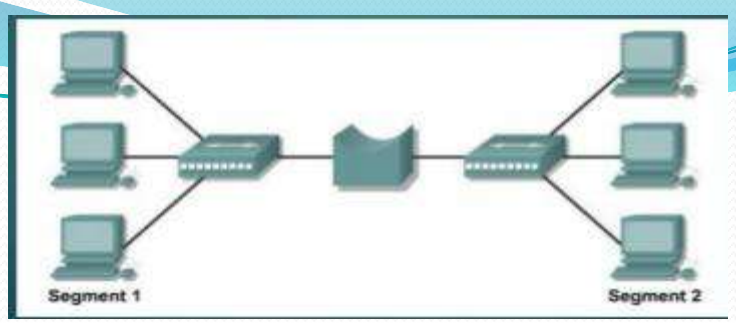
- Signals that carry information within a network can travel a fixed distance before attenuation endangers the integrity of the data
- Repeater installed on the link receives signal, regenerates it & sends refreshed copy
- Used to regenerate signal when it exceeds specification limits
- LAN using a star topology with twisted pair cable..limit 100 metres..when exceeds repeater used.

network devices

1. Network interface card
2. Repeater
3. Hub
4. Bridge
5. Switch
6. Router
7. Gateway

- Small box that connects individual devices on a network so that they can communicate
- 4 to 400 ports
- When signal received on one port it is regenerated to all other ports.

network devices



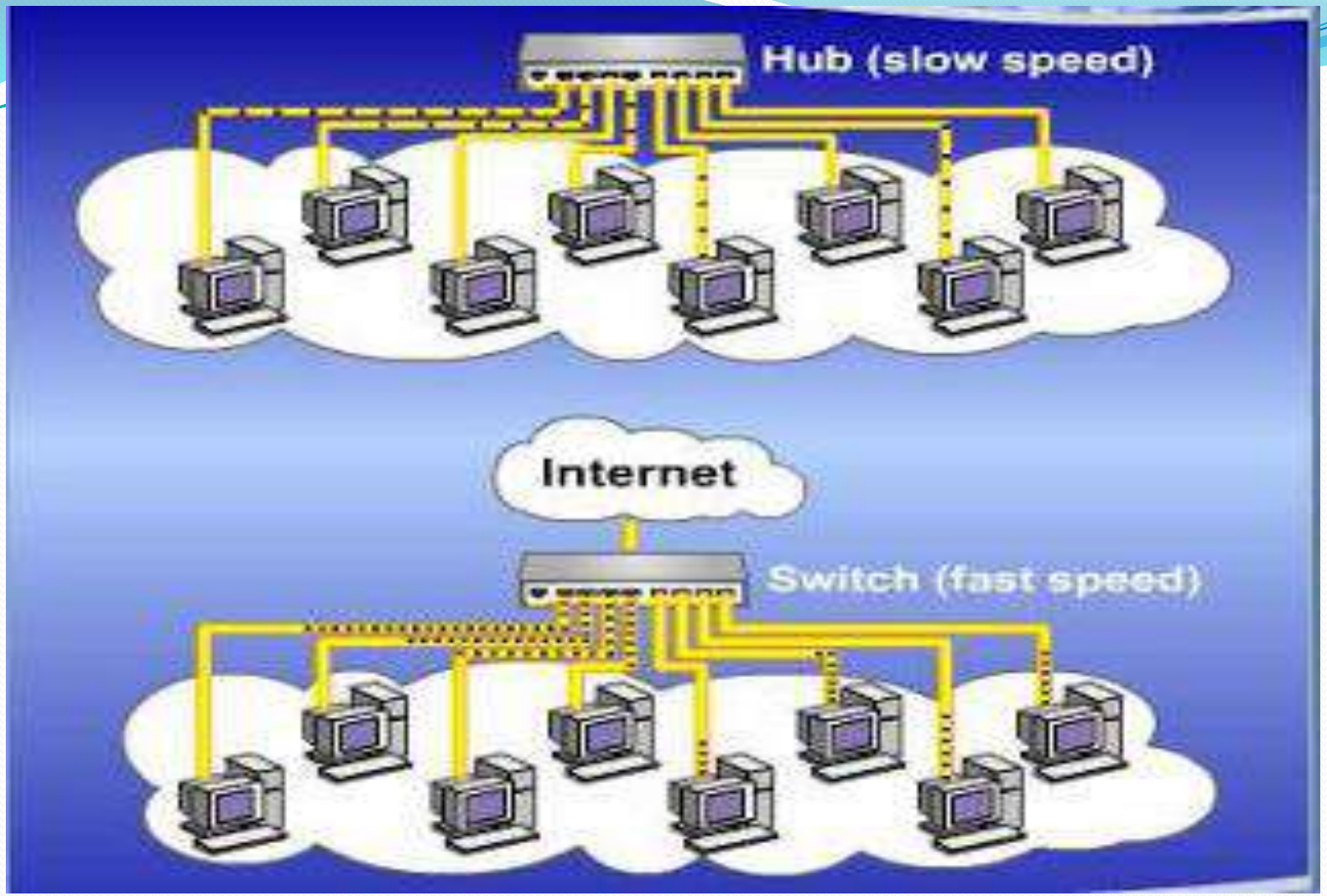
1. Network interface card
2. Repeater
3. Hub
4. Bridge
5. Switch
6. Router
7. Gateway

- Device that allows division of a large network into 2 smaller , more efficient networks
- Used to connect different type of topologies
- Same protocol networks

network devices

1. Network interface card
2. Repeater
3. Hub
4. Bridge
5. Switch
6. Router
7. Gateway

- Multi port bridge
- Capable of inspecting data packets as they are received , determining source & destination device of that packet & forward it.


Hub (slow speed)
Internet
Switch (fast speed)

network devices

1. Network interface card
2. Repeater
3. Hub
4. Bridge
5. Switch
6. Router
7. Gateway

- Aim is to trace the best route for information to travel.
- They can listen to the entire network to determine which sections are the busiest- they can redirect data around until they clear up

network devices

1. Network interface card
2. Repeater
3. Hub
4. Bridge
5. Switch
6. Router
7. Gateway

- Protocol converter
- Gateway accepts packet formatted for one protocol & converts it into another protocol.