

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

The Basics of Computer Networking



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Content

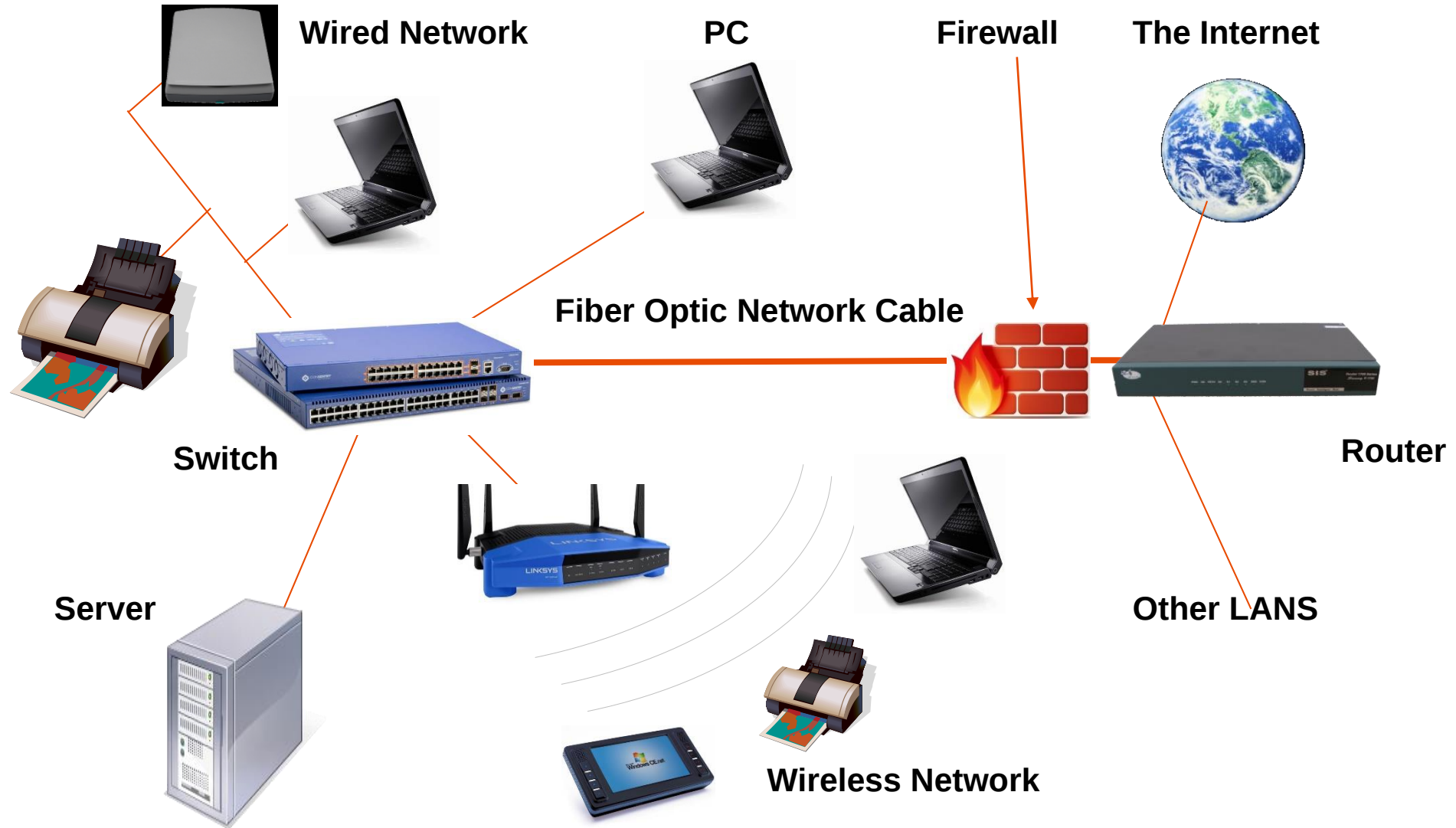
- The Computer Network
- Networking Types
- Fiber Optic Cable
- Switches ,Hubs And Routers
- Servers
- Topologies
- Firewalls
- Wireless Network
- The Internet

The Computer Network



Perhaps, the greatest advancement in technology and communication over the past 20 years has been the development of the computer network. From Emailing a friend to on-line bill paying to downloading data from the Internet to e-commerce, networking has made our world much smaller and changed the way we communicate forever.

The Network Diagram



The Three Types of Networks

- Wide area network WAN
- A Wide Area Network exist over a large area
- Data travels through telephone or cable lines
- Usually requires a Modem
- The world's largest Wide Area Network in the Internet



WIDE AREA

Local Area Network

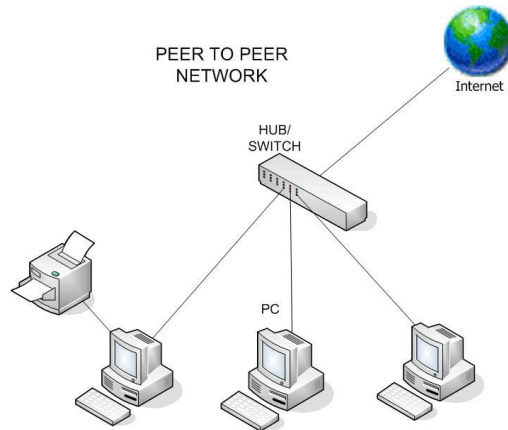
- A Local Area Network spans a relatively small area
- LAN are usually confined to one building or a group of buildings
- Data travel between network devices via network cables.
- The most common type of Local Area Network is called Ethernet



LOCAL AREA

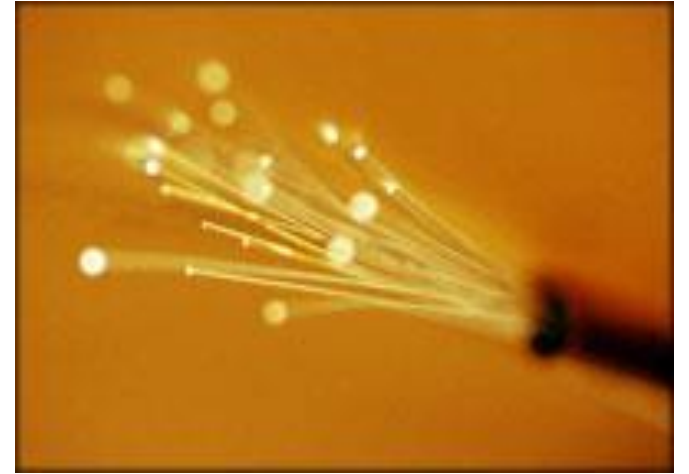
Peer to Peer Network

- Usually very small networks
- Each workstation has equivalent capabilities and responsibilities
- Does not require a switch or a hub.
- These types of networks do not perform well under heavy data loads.



Fiber Optic Cables

Fiber Optic provides the highest mode of speed. It comes in two modes, one is single mode fiber and second is multimode fiber. Single mode fiber can carry a single ray of light whereas multimode is capable of carrying multiple beams of light.



Standard Network
Copper Cable

Cont....

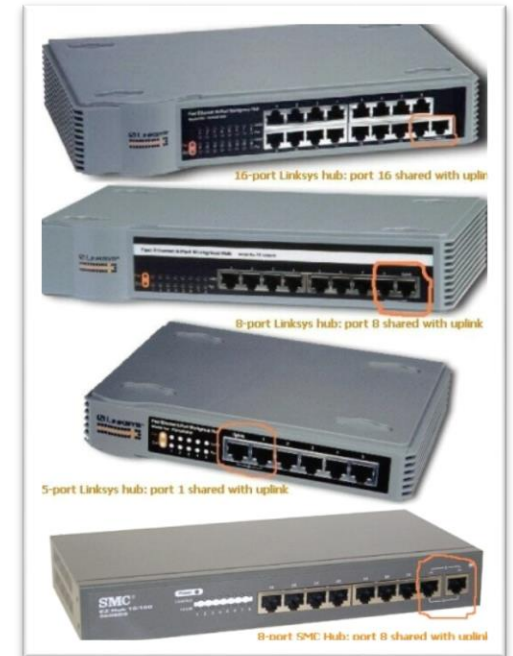
Fiber Optic works on the properties of light. The core of fiber optic cable is made of high quality glass or plastic. From one end of it light is emitted, it travels through it and at the other end light detector detects light stream and converts it to electric data.

To connect and access fiber optic special type of connectors are used.

HUB (Hybrid Unit Broadcast)

A hub is a device used to connect a PC to the network. The function of a hub is to direct information around the network, facilitating communication between all connected devices.

- Central Point for all computers
- Not Intelligent Device
- 10 Mbps Speed



Network Hubs

Switch (Smart HUB)

However in new installations switches should be used instead of hubs as they are more effective and provide better performance. A switch, which is often termed a 'smart hub'. Switches and hubs are 'boxes' to which computers, printers, and other networking devices are connected.

Central Point for all computers

Intelligent Device

10/100 Mbps Speed



Network Switches

IP Address

IP address Stands for **Internet Protocol** address it is also called **logical address** or **software address**

It contains Two Portions **Network-ID** and **Host-ID**

Network ID is like a **street** and Host ID is like a **house**

So it identifies a specific host on the network.

Cont....

There are two versions of IP address:

1. Internet Protocol Version 4 (IPv4)
2. Internet Protocol Version 6 (IPv6)

IP address version 4

192.168.15.125

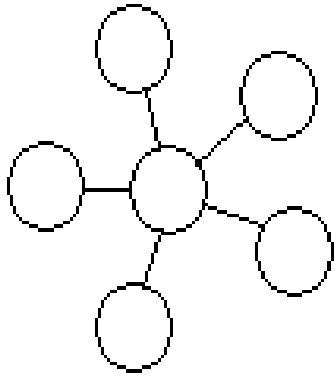
IP address version 6

2014:0db5:76c1:0000:0000:9a2e:0380:9556

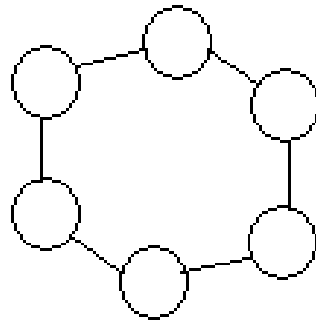
Network Topologies

Network Topology refers to the shape of a network, or the network's layout. How different nodes in a network are connected to each other and how they communicate are determined by the network's topology.

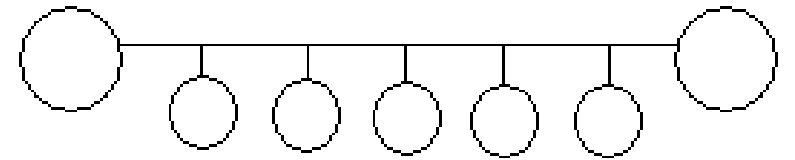
There are three basic topologies:



Star



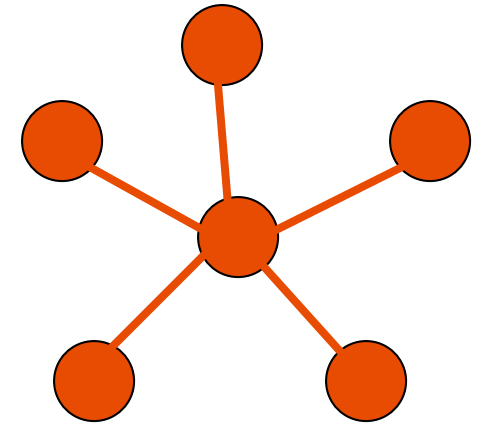
Ring



Bus

Star Topology

- All devices are connected to a central hub.
- Nodes communicate across the network by passing data through the hub or switch.
- High speed LAN



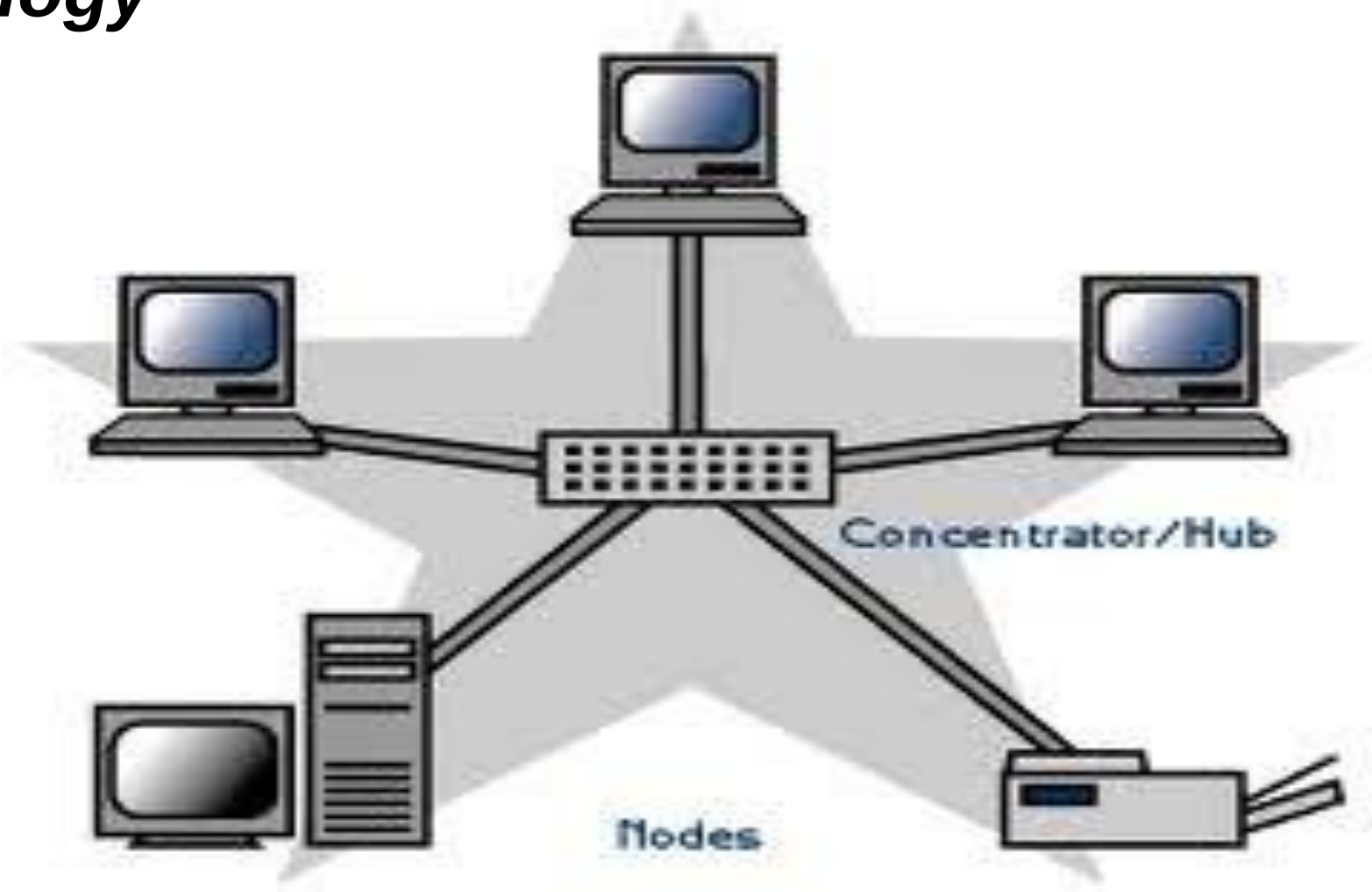
Advantages of star topology

- 1) Compared to Bus topology it gives far much better performance
- 2) Easy to connect new nodes or devices
- 3) Centralized management. It helps in monitoring the network
- 4) Failure of one node or link doesn't affect the rest of network

Disadvantages of star topology

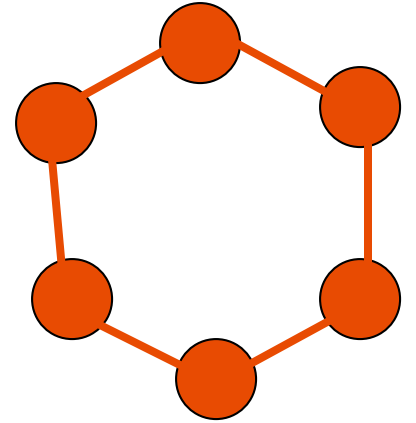
- 1) If central device fails whole network goes down
- 2) The use of hub, a router or a switch as central device increases the overall cost of the network
- 3) Performance and as well number of nodes which can be added in such topology is depended on capacity of central device

Star topology



Ring Topology

- All devices are connected to one another in the shape of a closed loop.
- Each device is connected directly to two other devices, one on either side of it.



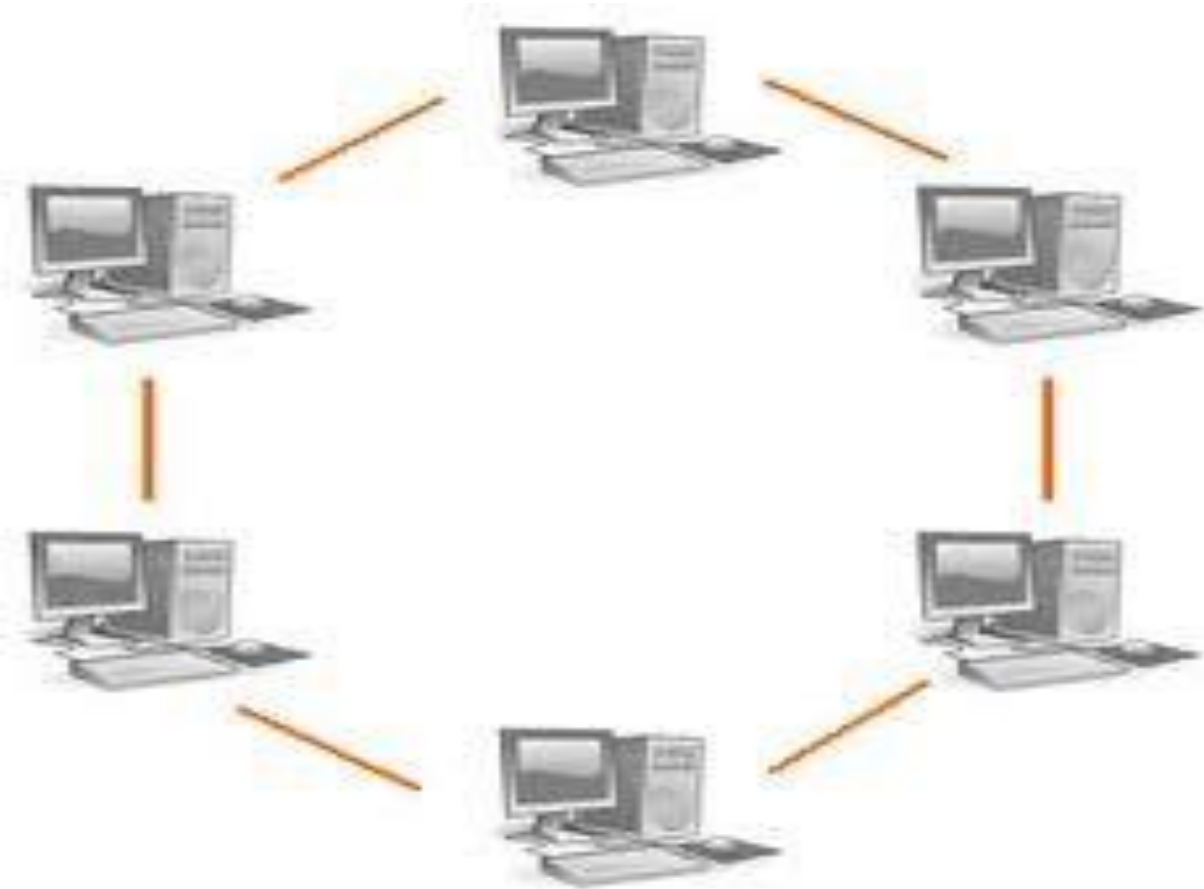
Advantages of Ring topology

- 1) This type of network topology is very organized
- 2) Performance is better than that of Bus topology
- 3) No need for network server to control the connectivity between workstations
- 4) Additional components do not affect the performance of network
- 5) Each computer has equal access to resources

Disadvantages of Ring topology

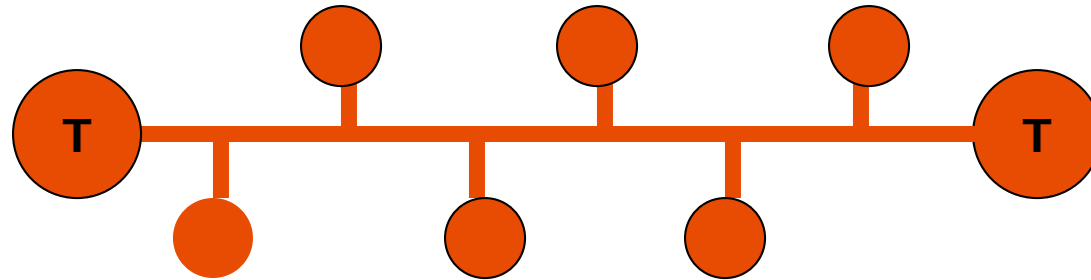
- 1) Each packet of data must pass through all the computers between source and destination, slower than star topology
- 2) If one workstation or port goes down, the entire network gets affected
- 3) Network is highly dependent on the wire which connects different components

Ring topology



Bus Topology

- All devices are connected to a central cable, called the bus or backbone.
- There are terminators at each end of the bus that stops the signal and keeps it from traveling backwards.



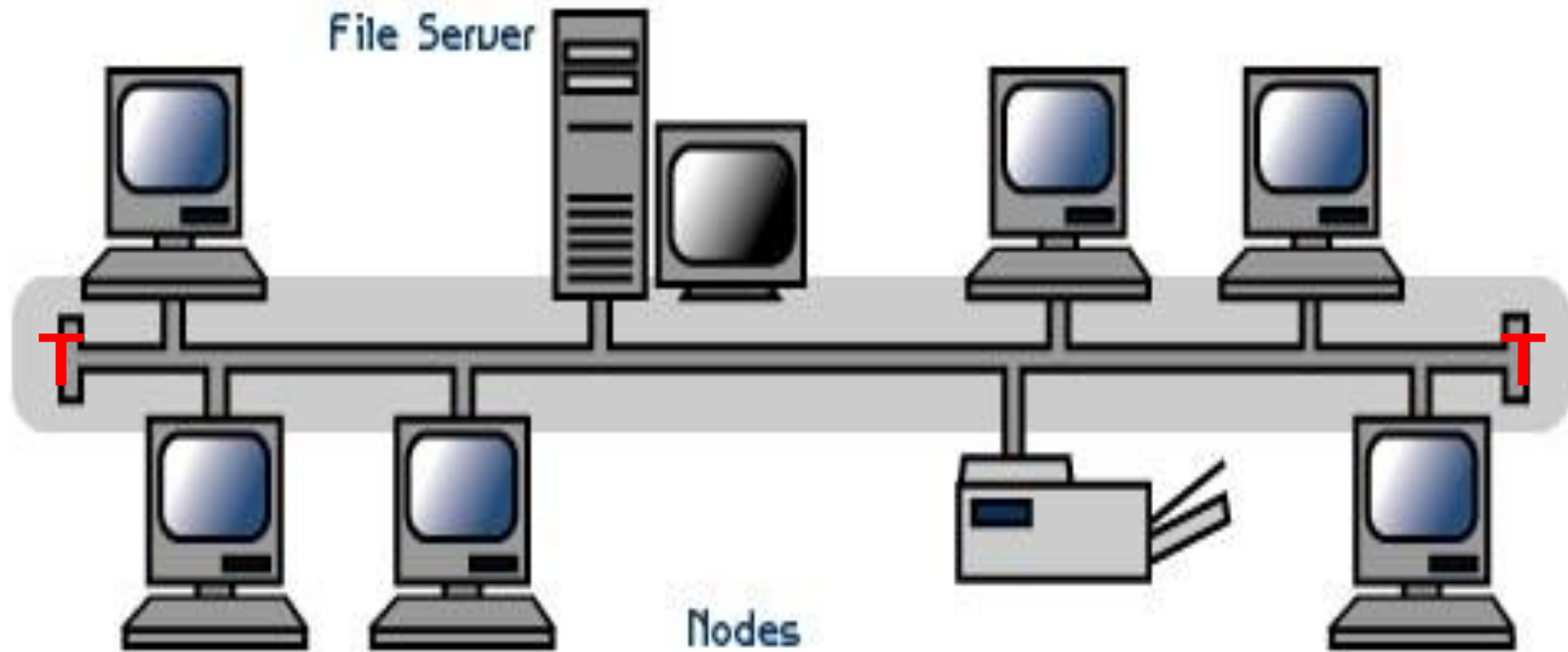
Advantages of Bus topology

- 1) Easy to implement and extend
- 2) Well suited for temporary networks that must be set up in a hurry
- 3) Typically the least cheapest topology to implement
- 4) Failure of one station does not affect others

Disadvantages of Bus topology

- 1) Difficult to administer/troubleshoot
- 2) Limited cable length and number of stations
- 3) A cable break can disable the entire network; no redundancy
- 4) Maintenance costs may be higher in the long run
- 5) Performance degrades as additional computers are added

Bus topology



Firewalls

- A firewall is a software that can be loaded on to a network that can serve as a block against destructive forces away from a network of computers.
- Packets of data are analyzed against a set of standards called filters.
- Filters block certain designated IP addresses.



Routers

Whether a Router is traditional or wireless, its purposes remain the same.

Routers are specialized computers that send your messages and those of every other Internet user speeding to their destinations along thousands of pathways.

Routers are crucial devices that let messages flow between networks, rather than within networks.



Standard Router

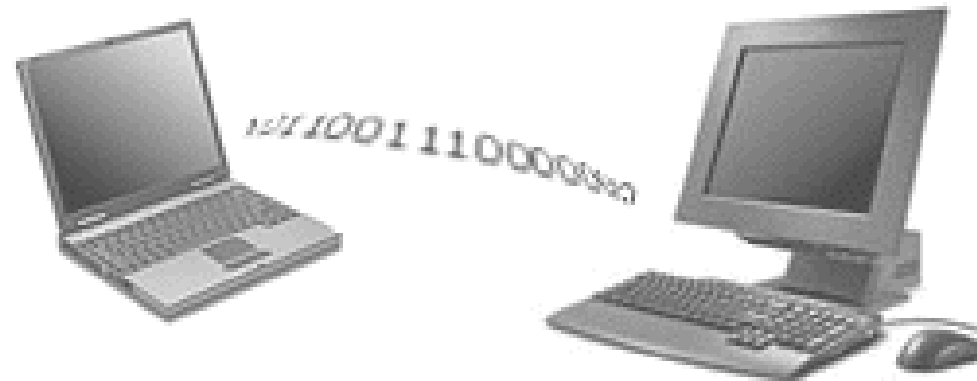


Wireless Router

Introduction To Wireless Network

What is a wireless network?

- A technology that enables two or more computers or smart phones... to communicate without network cabling



Different Wireless Networks

Bluetooth

- 2.45 gigahertz radio waves, but emits weak signals
- Limited distance to 10 meters, but travels through walls
- Radio-frequency also used by baby monitors, garage door openers, and cordless phones

Wireless Fidelity (Wi-Fi)



Wireless networking that produces a wireless connection between a device and a network or the Internet

High data rate (max of 11 Mbps)

- In the case of interference, speed drops in halves (11 Mbps to 5.5 Mbps to 2Mbps to 1Mbps)

Advantages:

- Fast (11 Mbps)
- Reliable
- Long Range (up to 1000 Ft. outdoors, 400 Ft. indoors)
- Easy integration to wired networks

Disadvantages:

- Speed may fluctuate

The Internet

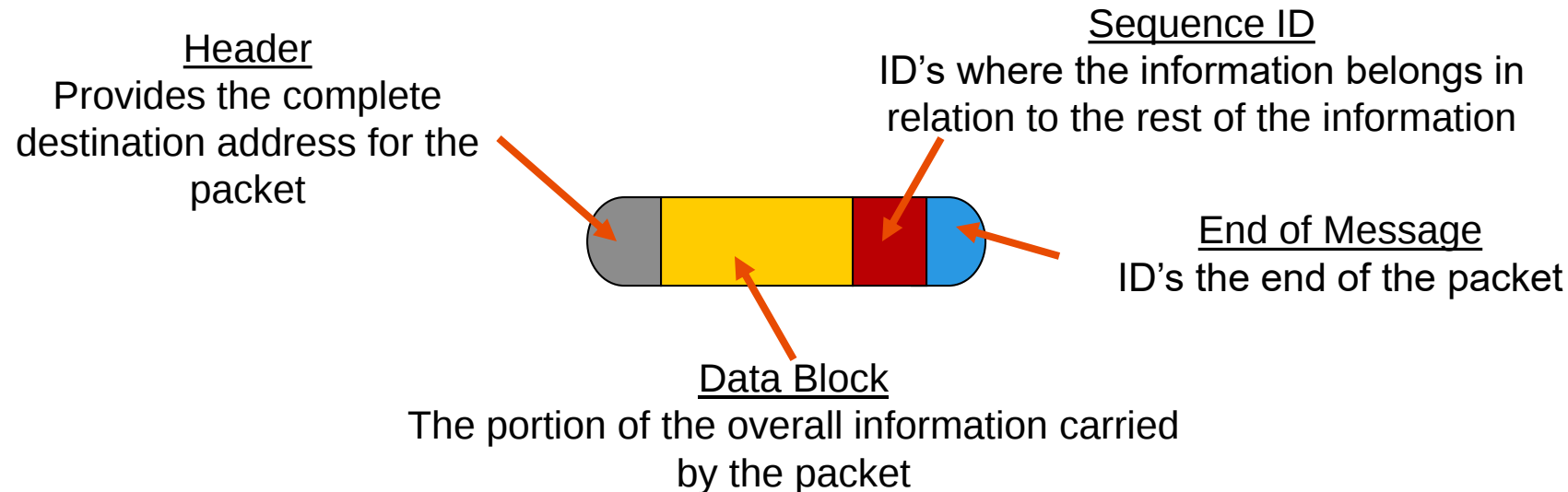


The simplest definition of the Internet is that it's a network of computer networks

The Internet

How Information Travel Through the Internet

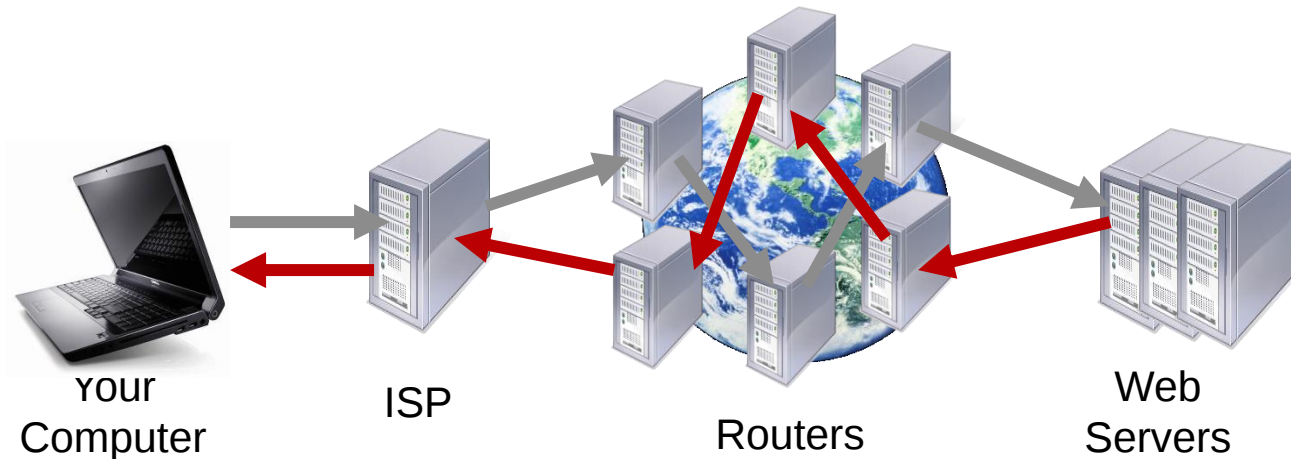
A page on the Internet—whether it's full of words, images or both—doesn't come to you in one shipment. It's translated into digital information, chopped into 1500 byte pieces called PACKETS, and sent to you like a puzzle that needs to be reassembled. Each part of the packet has a specific function:



The Internet

How Information Travel Through the Internet

When you connect to a Web site through an ISP and start exchanging information, there isn't a fixed connection between your computer and the Web server computer hosting the Web site. Instead, information is exchanged using the best possible path at that particular time. Special computers called routers determine these paths, avoiding slow links and favoring fast ones.





Best Of Luck

Design By: Aziz Rahman Marouf