

Know Python Bytes

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WE'RE GLAD YOU'RE HERE**

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Revised Syllabus 2020-21

UNIT 3

For XII IP:

Introduction to Computer Networks

10 Marks

CONTENTS (Learning Outcomes) ☺

XII IP 2020-21

Revised syllabus and original syllabus is same for Unit-III.

Only the marks has increased from 7 to 10.

Unit 3: Introduction to Computer Networks

Introduction to networks, Types of network: LAN, MAN, WAN.

Network Devices: modem, hub, switch, repeater, router, gateway

Network Topologies: Star, Bus, Tree, Mesh.

Introduction to Internet, URL, WWW, and its applications- Web, email, Chat, VoIP.

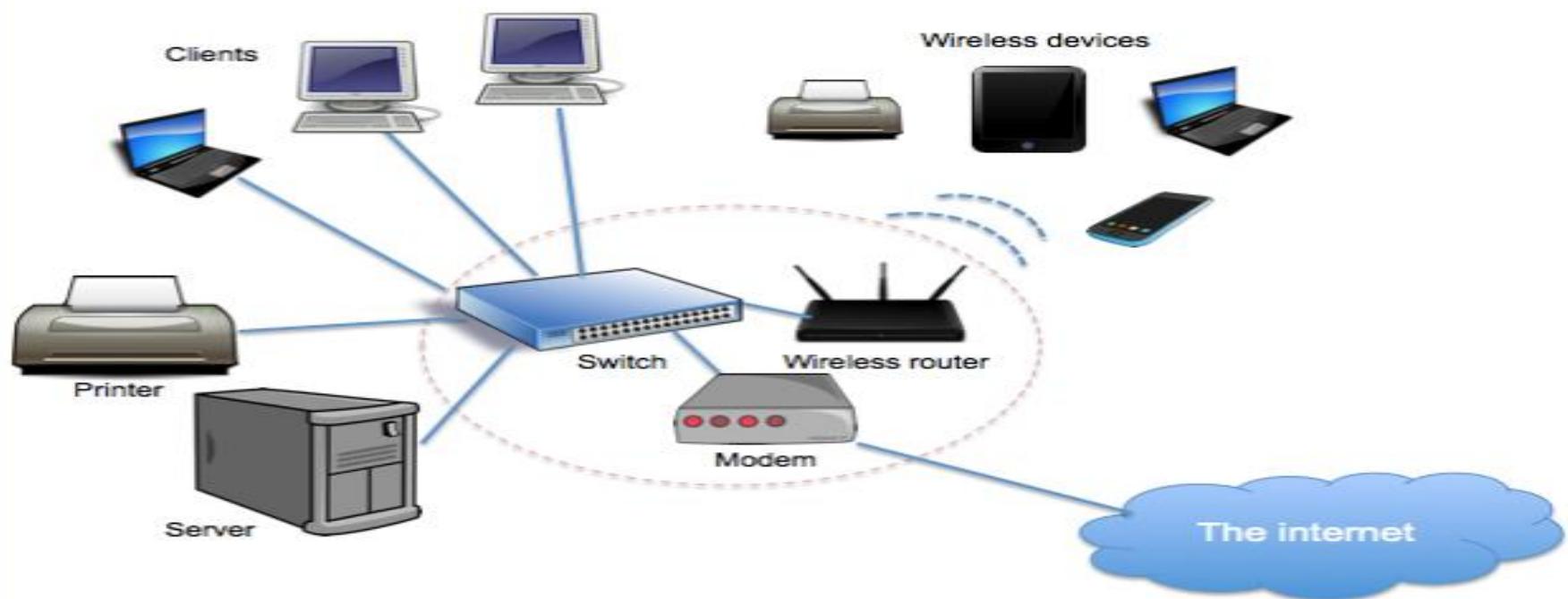
Website: Introduction, difference between a website and webpage, static vs dynamic web page, web server and hosting of a website.

Web Browsers: Introduction, commonly used browsers, browser settings, add-ons and plug-ins, cookies.

NETWORK CONCEPTS: INTRODUCTION

WHAT IS A NETWORK ?

- Network, a group of computers and associated devices that are connected by communication facilities.
- Network is an inter connected collection of autonomous computers.
- When two or more computers are joined together so that they are capable of exchanging information , they form a network.



What is the need for Networking?

- **Resource sharing** - Through a network , data , s/w and h/w resources can be shared irrespective of the physical location of the resources and the user.
- **Reliability** – A file can have its copies on two or more computers of the network.
- **Reduced Cost** – Sharing resources reduces the cost
- **Fast Communication** – Information can be exchanged at a very fast speed



WHAT are the Components of a Network?

I. Workstation or Nodes

II. Server

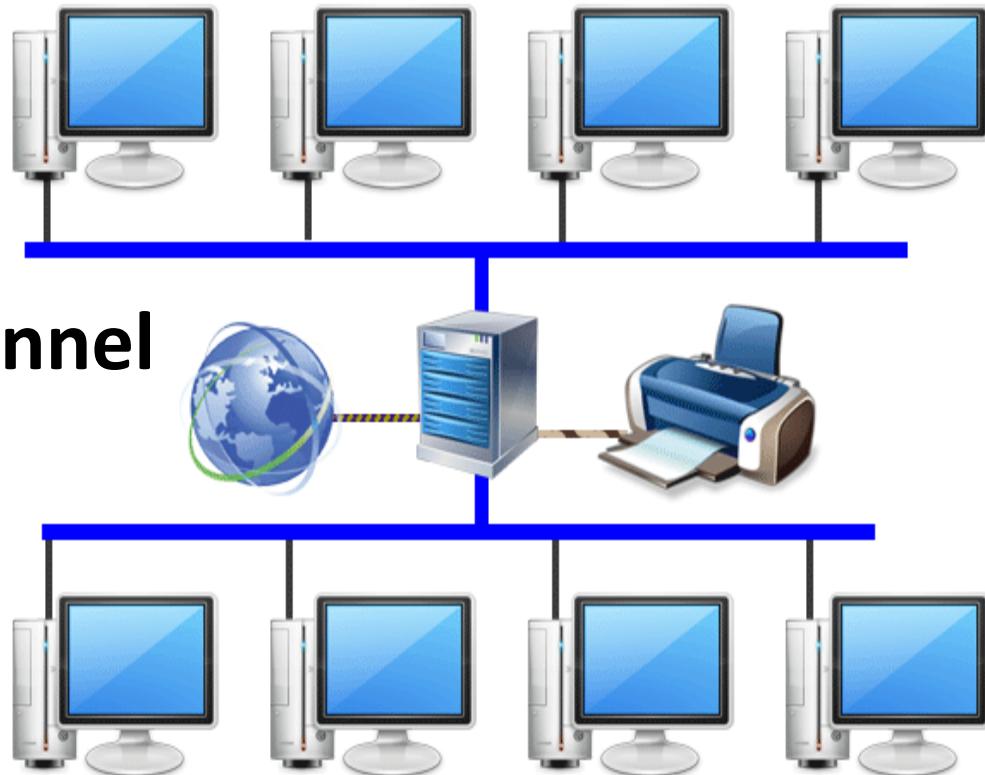
III. Client

IV. Network hardware

V. Communication Channel

VI. Software

VII. Network Services



Components of Networks contd..

I. Workstation or Nodes

It refers to a computer that are attached to a network

II. Server

The master computer is called Server. It facilitates the sharing of data, software (s/w) and hardware (h/w) .

Servers can be of two types ---

i) Dedicated Servers

- Master-Slave Network. (Clients are dependent on the server)
- On bigger network, there is a computer reserved for server's job and its only job is to help workstations access data, software and hardware resources. It does not require to double-up as a workstation /server.
- Data is backed up in the main server.
- Main server controls the security of the network.

ii) Non- Dedicated Servers

- Peer to Peer Network (Clients are not dependent on a central server)
- Workstation can double up as a Server. One computer works as a workstation as well as server.
- Each computer has to be backed up. Data can easily be deleted by the users.

Components of Networks contd..

III. Client

It is a host computer that sends request to the server for some services.

IV. Network Hardware/ Devices

Specialized hardware is required to carry out various roles in a network
For eg. Establishing connections, controlling network traffic and many more.

- NIC (Network Interface unit)
- Hub
- Switch
- Router
- Repeater
- Bridge
- Gateway
- Modem etc.

Network Interface Unit (NIU)

- It is a device attached to each workstation and server.
- Helps to make connections within the network.
- Each NIU has a unique number identifying it called node address.
- NIU is also called terminal access point (TAP).
- Also called Network Interface Card (NIC)
- Each NIC is given a unique Physical address called MAC address.

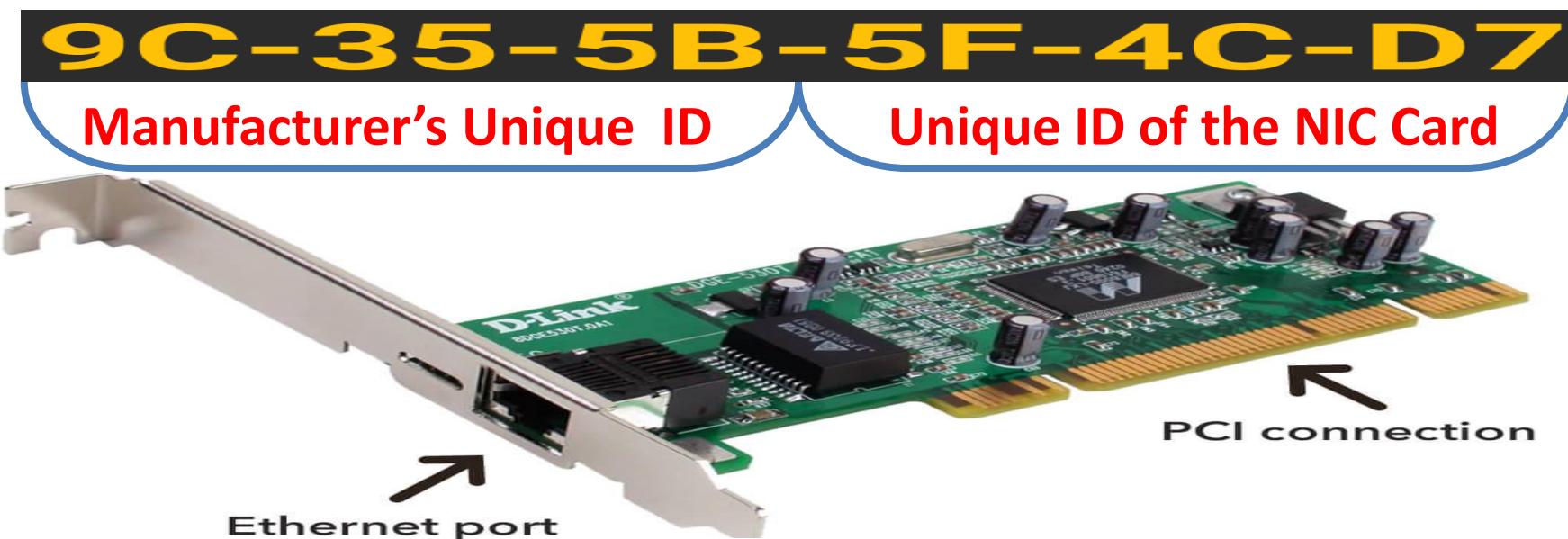


Fig. Gigabit Ethernet NIC

Components of Networks contd..

V. Communication Channel / Medium

Nodes on a network interacts with each other through various communication channel.

It can be :

WIRED: twisted pair cable, coaxial cable, optical fiber

WIRELESS: Microwave, Radiowave, Satellite, Infrared, Laser etc.

VI. SOFTWARE:

Software comprises of the Network protocols (set of rules governing the Network) and Network OS etc.

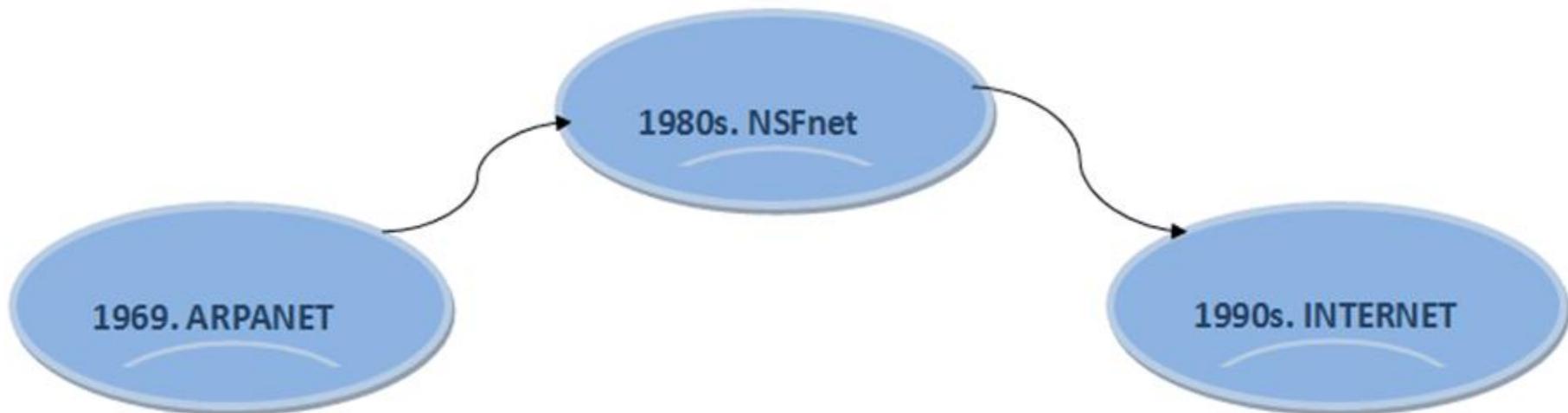
Eg. Of Network Protocols- http, ftp, SMTP, TCP/IP etc.

VII. Network Services

These are the other software applications required in a network for different functionalities for g. VOIP, DNS etc.

EVOLUTION OF NETWORKING

- **ARPANET**(Advanced Research Projects Agency NETwork):- Started in 1969,its goal was to connect computers at different universities and U.S Defence. Engineers,Scientists,students and researchers used to exchange data and messages. It was limited to certain people only.
- In 1980's **NSFnet**(National Science Foundation Network) was started to make a high capacity network which was more capable then ARPANET. It allowed only the academic research and not any kind of private business on it.
- Later in 1990's the inter networking of ARPANET, NSFnet and other private Networks resulted into **INTERNET** (INTERNETworking- A Network of Networks)



How INTERNET works? TCP/IP Protocol

INTERNET works on the basis of some protocols.

Protocols are the set of rules required for Communication.

TCP/IP[Transmission Control protocol / Internet Protocol] are the set of communication protocols used by the Internet.

It is responsible for dividing the file/message into packets on the source computer. Sending and routing them and again reassembling the packets into Destination computer.

TCP	IP
TCP provides the service of providing reliable and ordered exchange of data directly between two network hosts.	IP handles addressing and routing message across one or more networks. IP is responsible for handling the address of destination computer. So that the packets are routed to correct destination computer. IP defines addressing methods.
TCP is the protocol that major Internet applications rely on, applications such as the World Wide Web, e-mail, and file transfer.	IP is a connectionless protocol and does not need circuit setup prior to transmission.

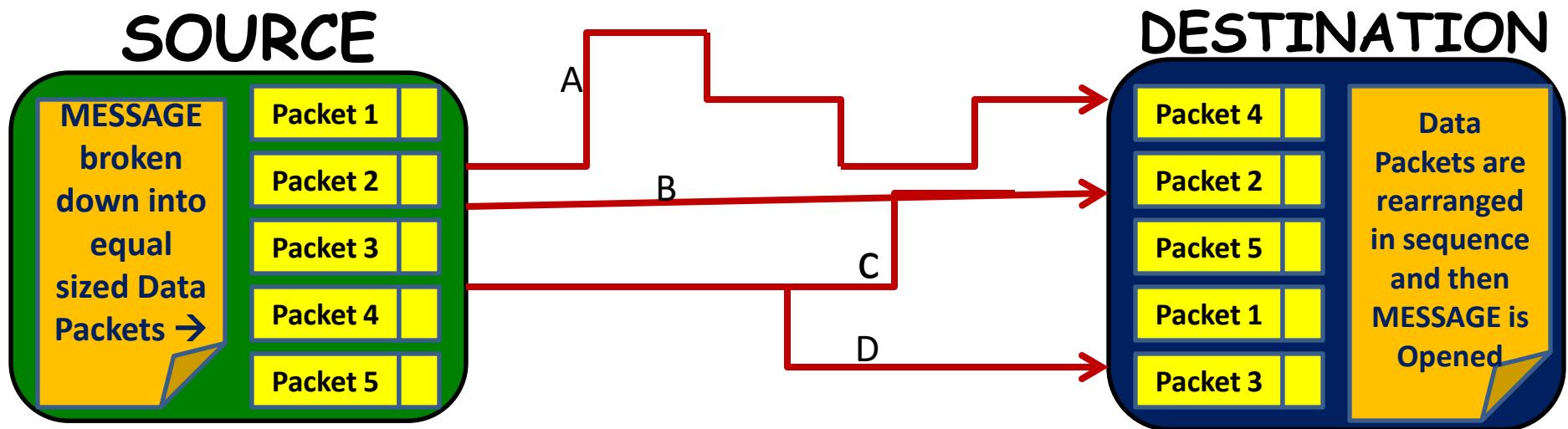
How INTERNET works? TCP/IP Protocol...contd..

- At the source computer, the message or the file/document to be sent to another computer is firstly divided into very small parts called **Packets**. A Packet generally contains some information.
- Each Packet is given a number serial wise e.g. 1,2,3.
- All these packets are then sent to the address of the destination computer.
- The Destination computer receives the packets in random manner. i.e. Packet 10 may come before packet 1.
- If a packet is erroneous or lost at the destination end, then it is demanded again.
- The packets are reassembled in their original order.



FIG: Sample Data Packet with Data part and destination address part

How INTERNET works? TCP/IP Protocol...contd..



TCP (Source side)
breaks the
message into
Data Packets

IP finds the shortest
route of the packets
from Source to
Destination.

TCP (Destination side) rearranges the Data Packets in sequence and opens the Message. If DP gets lost then it demands from the source again.

What is INTERSPACE?

Interspace is a Client/Server software program that allows multiple users to communicate online with real-time audio, Video and text chat in dynamic 3D environments.

It is most advanced form of communication.

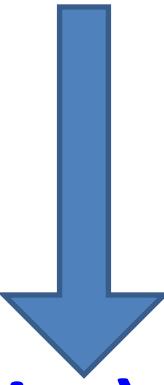
DATA COMMUNICATION TERMINOLOGIES

Data Channel:- It is the medium through which information or data is carried from one point to another.

BAUD	Unit of measurement for the information carrying capacity of a communication channel. Another unit similar to baud is bps (bits per second)
bits per Second (bps)	<p>It is a measurement unit which refers to the speed at which data is transferred.</p> <p><i>bps- bits per second kbps- kilo bits per second mbps-mega bits per second Bps-Bytes per second KBps-Kilo Bytes per second MBps-Mega Bytes per second</i></p>
BANDWIDTH	<p>Difference between the lowest and highest frequencies of a transmission channel OR</p> <p>Width of allocated band of frequencies to a channel.</p> <p>Bandwidth is the amount of information travelling through a channel at any point of time. In Analog systems its unit is hertz. It is the unit of Frequency. Also known as cycles per second.</p> <p><u>More Units of frequency:-</u></p> <p>1 KHz:-1000 cycles/sec. 1MHz:-1000KHz 1GHz:-1000 MHz. 1THz(Tera):-1000GHz.</p> <p>Ex:- Voice signal uses (3 kHz) and Television uses bandwidth of 6MHz (approx.)</p>
Data Transfer Rates	The data transfer rate is the amount of data transferred per second. bps, Bps,baud etc. are the units to measure the data transfer rate.

TYPES OF NETWORK: PAN, LAN, MAN, WAN

TYPES OF NETWORK

- Personal Area Network- PAN (**smallest in size**)
 - Local Area Network - LAN
 - Metropolitan Area Network – MAN
 - Wide Area Network – WAN (**Largest in size**)
- 

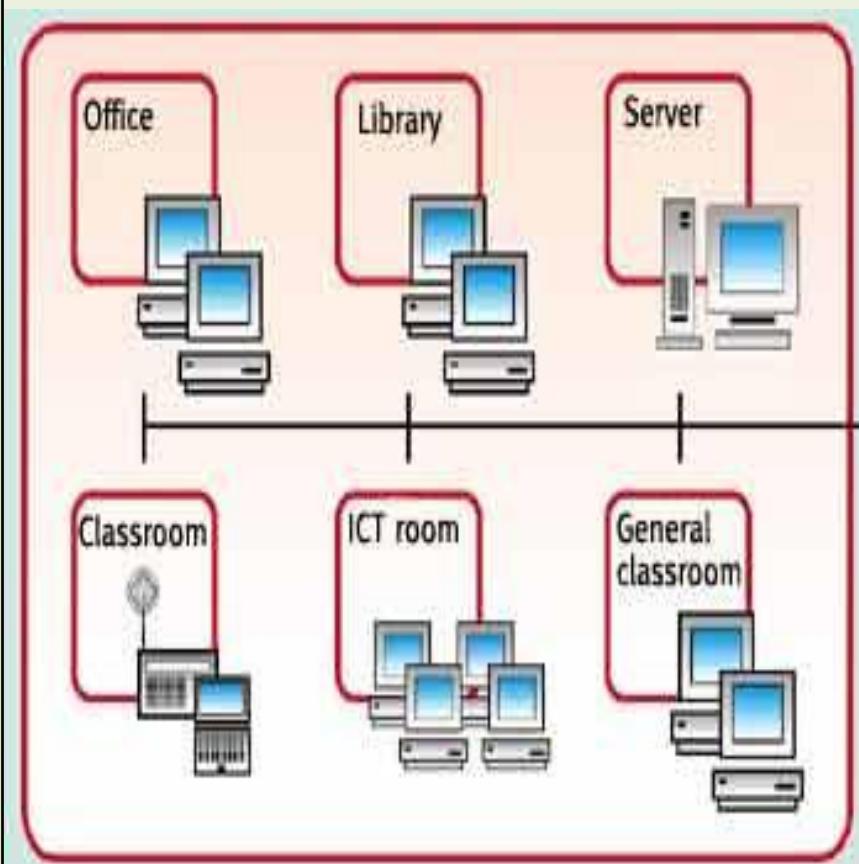
PAN (Smallest)

- Interconnection of Information Technology Devices within the range of an individual person, within a range of 10 metres.
- Eg. When you connect your Laptop, Desktop, Mobile, ipad or printer with each other. This makes your Personal Area Network.



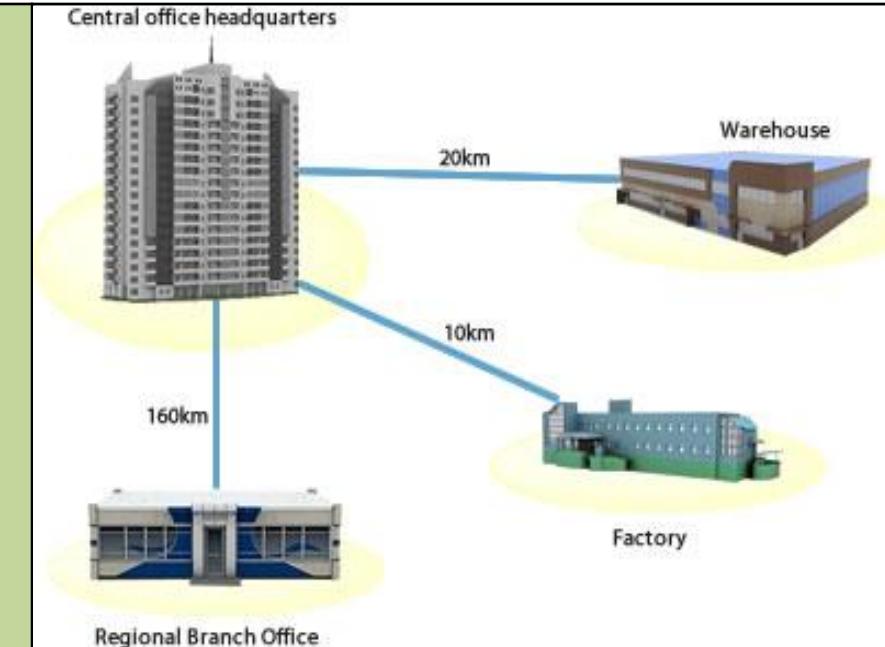
LAN

- A Local Area Network (LAN) is confined to a relatively small area. It is generally limited to a geographic area such as a lab, school, or building. Rarely are LAN computers more than a 5-10 Kms apart.
- In a typical LAN configuration, one computer is designated as the file server. It stores all of the software that controls the network, as well as the software that can be shared by the computers attached to the network.
- Computers connected to the file server are called workstations.
- On most LANs, cables are used to connect the network interface cards in each computer.



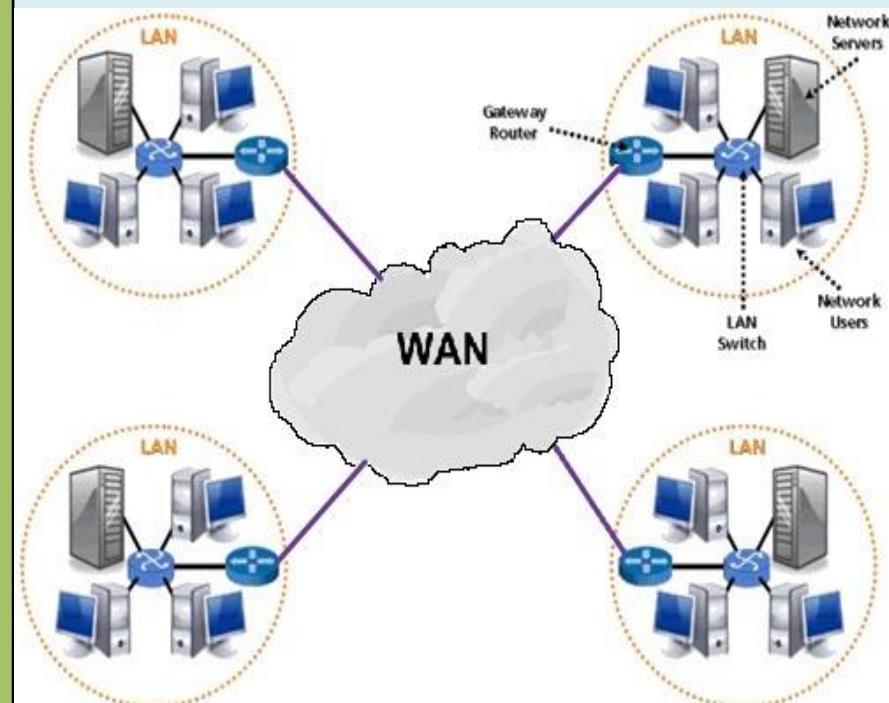
MAN

- Spread over a city
- E.g. Cable T.V. networks
- Purpose is to share h/w and s/w resources among its users.



WAN (Largest)

- It is spread across countries.
- It can be a group of LANs connected together to form a big LAN.
- Largest WAN in existence is Internet.



Difference between LAN and WAN

LAN	WAN
Diameter of not more than few km	Span entire countries
Operate at data transfer rate of several MBPS (1 to 10 MBPS)	Data rate less than 1 MBPS
Complete ownership by a single organization	Owned by multiple organizations
Very low error rates	Comparatively higher error rates

SWITCHING

TECHNIQUES:

CIRCUIT SWITCHING,
MESSAGE SWITCHING,
PACKET SWITCHING

Extra
knowledge

SWITCHING TECHNIQUES

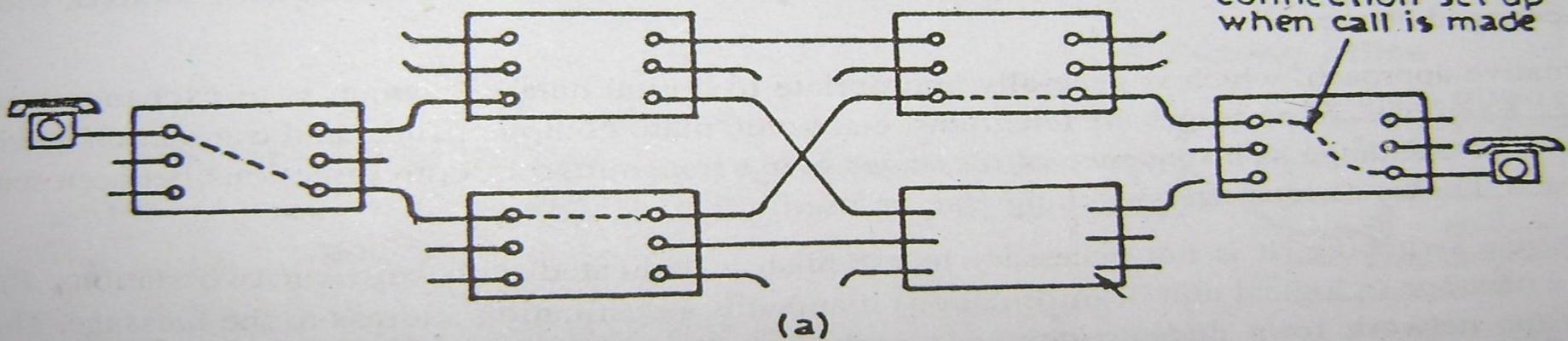
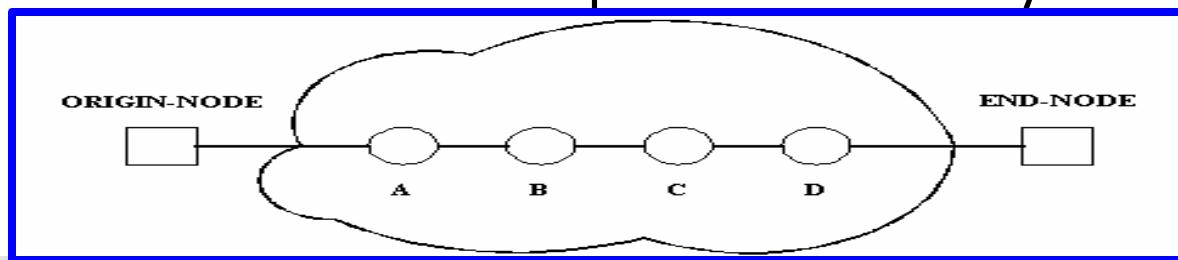
Extra
knowledge

- As in a n/w system, sharing or transfer of data and information takes place.
- This transfer of data can be done by using different switching methods as:-
 - **Circuit Switching.**
 - **Message Switching.**
 - **Packet Switching.**

Circuit Switching

Extra
knowledge

- Physical connection between the two computers is established and then data is transmitted from source to destination computer.
- When a computer places a telephone call , the switching equipment within the telephone system seeks out a physical copper path from sender's to receiver's telephone. Ex:-Telephone Lines.
- It sets up end-to-end connection between computers before any data can be sent.

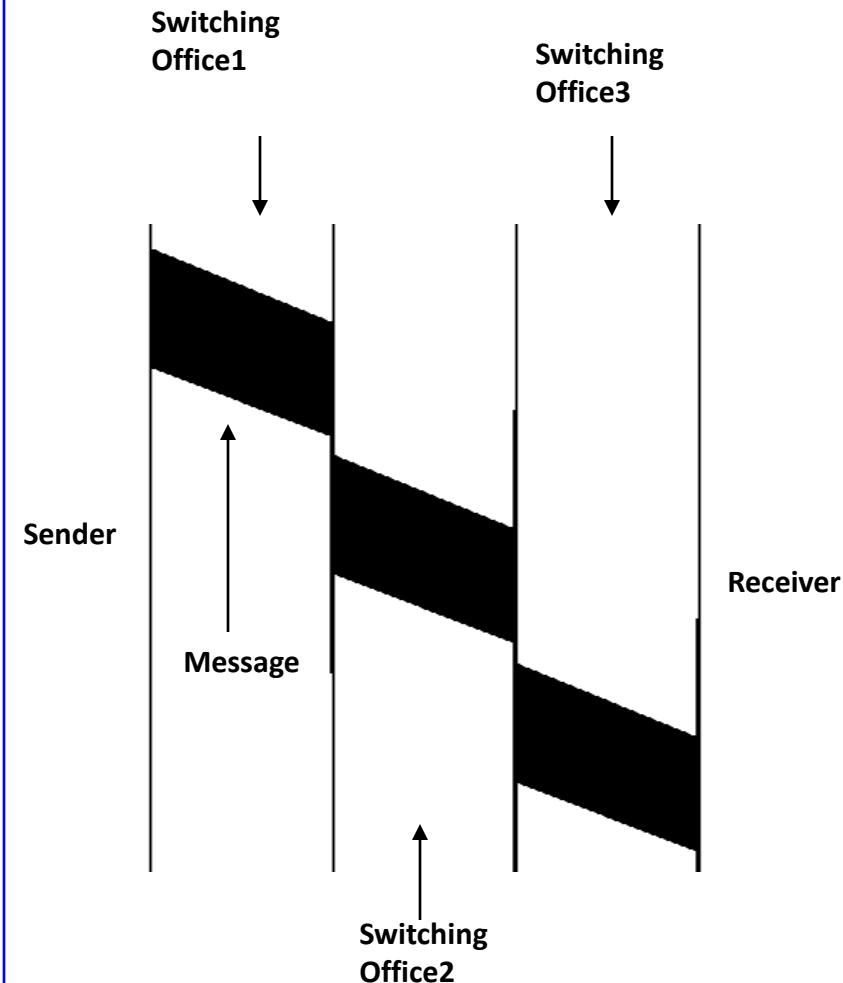


Circuit Switching

Message Switching

Extra
knowledge

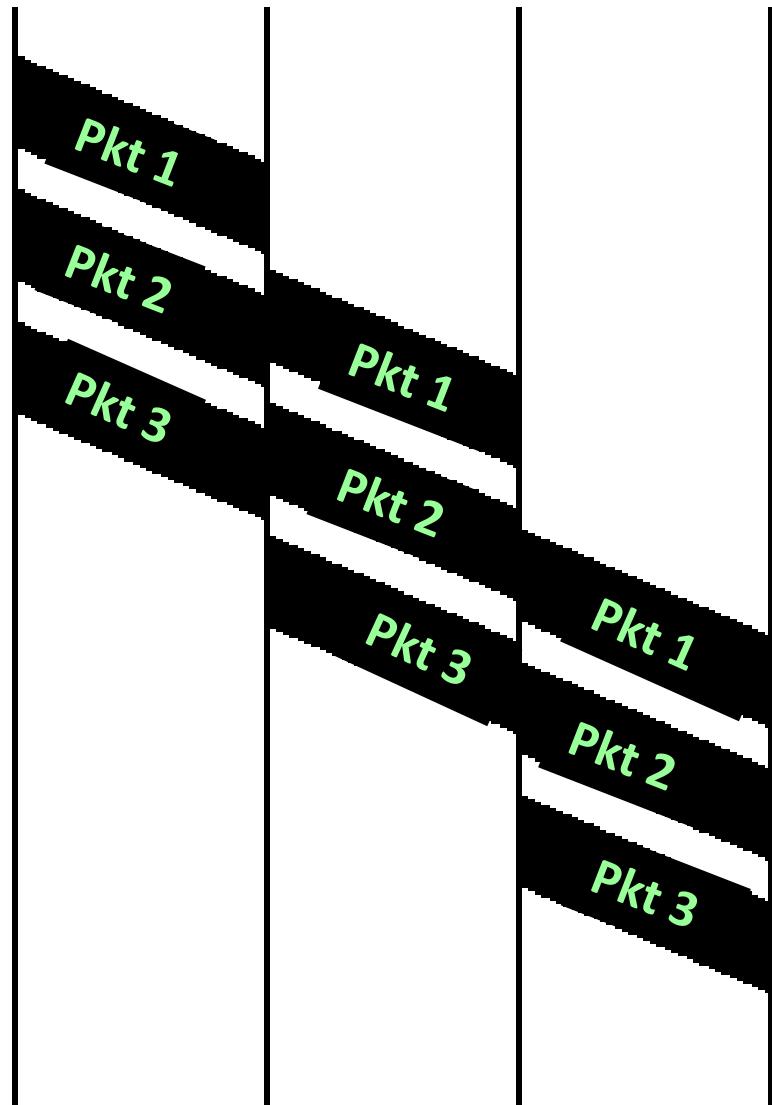
- The source comp sends the data to the switching office first which stores the data in its buffer.
- It then looks for a free link to another switching office and then sends the data to this office.
- Process is continued till the data is delivered to the destination computer.
- It is also known as store and forward technique.
- Eg. Mails forwarded through Message switching technique



Packet Switching

Extra
knowledge

- There is a tight upper limit on the block size. In message switching there was no upper limit.
- A fixed size of packet is specified.
- All the packets are stored in main memory in switching office. In message switching packets are stored on disk.
- This increases the performance as access time is reduced.



TRANSMISSION MEDIA OF NETWORK :

GUIDED MEDIA

(TWISTED PAIR, COAXIAL CABLE, OPTICAL FIBER)

UNGUIDED MEDIA

(RADIOWAVE, MICROWAVE, SATELLITE COMMUNICATION,
INFRARED, LASER)

TRANSMISSION MEDIA

Transmission Media “*connecting media*” is the medium through which two nodes get connected on a Network.

These are of two types-

I) Guided Media. (Cables)

- Twisted Pair
- Co-axial Cable
- Fiber Optics

II) Unguided Media. (Waves – without the use of cable)

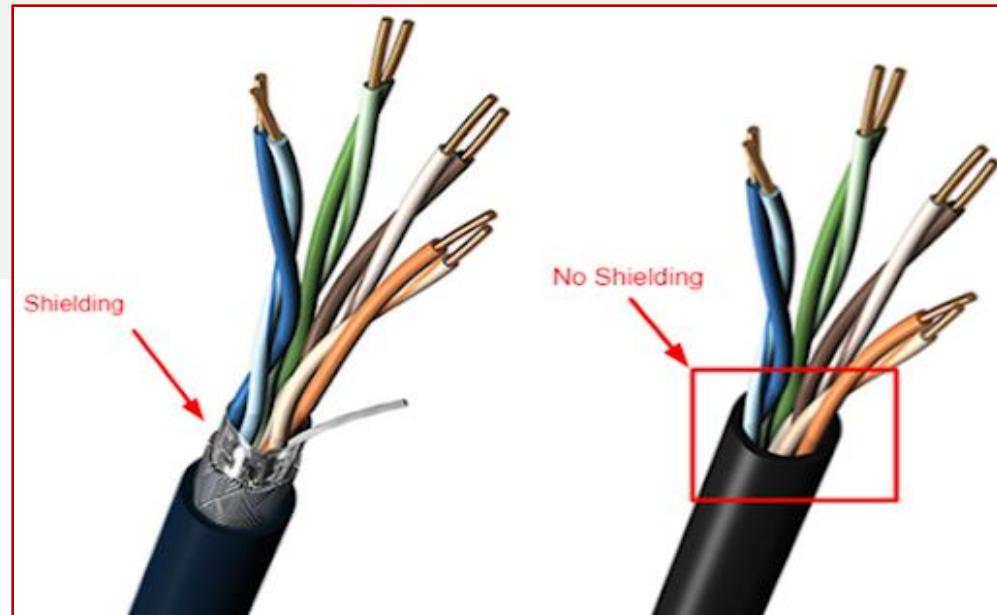
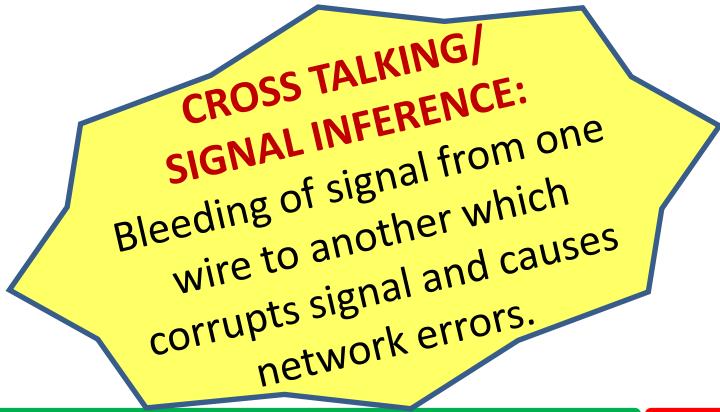
- Radio Waves
- Microwave
- Satellite Waves
- Infrared
- Laser

TWISTED PAIR - (Guided Media)

- It consists of two insulated copper wires twisted together in a helical form (like DNA) to reduce interference from closer by similar pair.
- Twisted pairs require repeaters for longer distances.
- Ex:- Used in telephone lines.

Types of Twisted pairs:-

- 1) **Shielded Twisted Pair (STP)**
- 2) **Unshielded Twisted Pair (UTP)**



Advantages of TWISTED PAIR

- ✓ Inexpensive.
- ✓ Easy to install and maintain.
- ✓ It can be easily connected.
- ✓ It has a low weight.
- ✓ Flexible - can be bent easily.

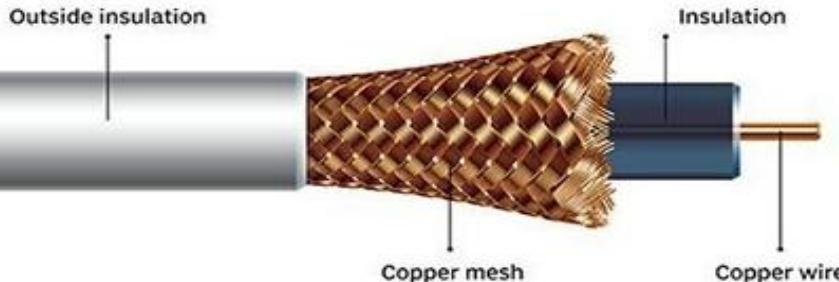
Disadvantages of TWISTED PAIR

- Requires repeaters over long distances.
- Low bandwidth makes it unsuitable for broadband.
- Can easily pick up noise signals.
- Maximum data rate is just 1 Mbps.
- Easy to trap - to penetrate (Unsecure).

CO-AXIAL CABLE -- (Guided Media)

- Due to structure of Co-Axial cable, it is resistant to interference and signal weakening that other cables may experience.
- It supports high data rates. Used for TV Signals. For Ex:-cable TV

Coaxial cable



Advantages of CO-AXIAL CABLE:-

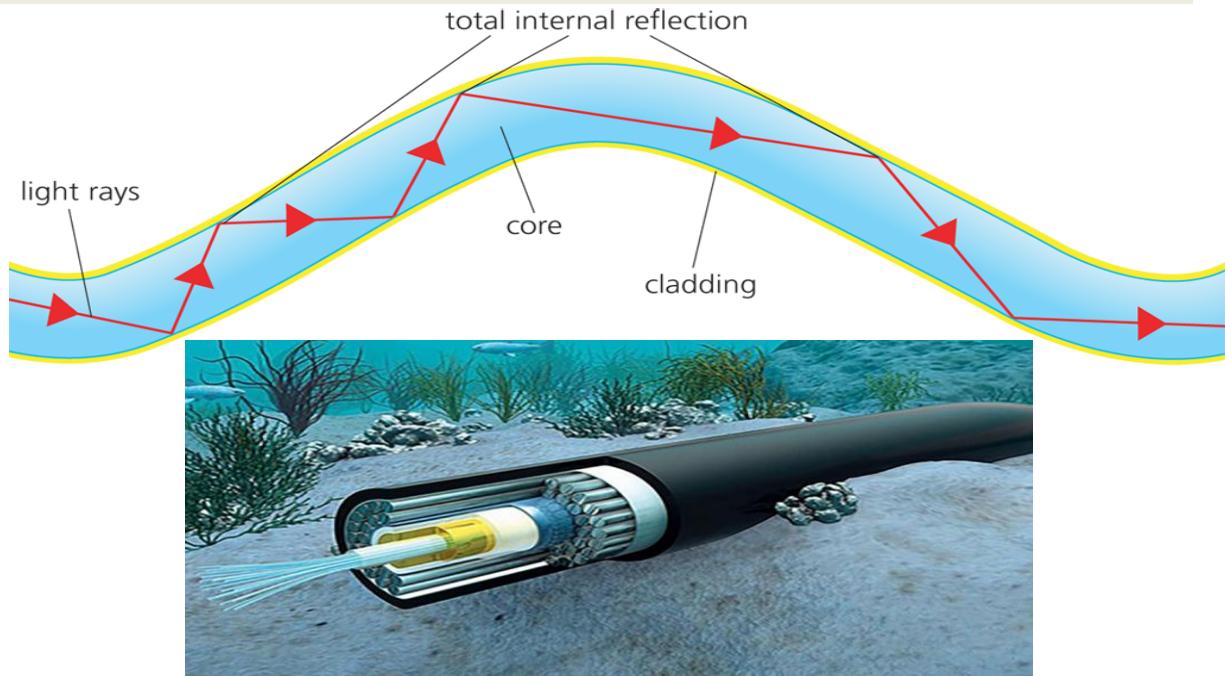
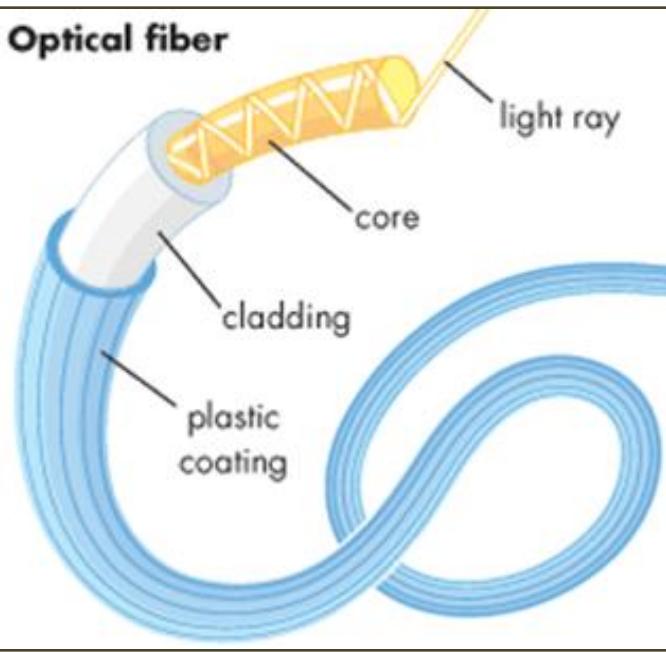
- Widely available.
- Good noise immunity.
- Higher bandwidth.
- Higher Speed(Data transfer) up to 10 Mbps.
- Can be used for Broadband transmission.

Disadvantages of CO-AXIAL CABLE:-

- More expensive than twisted-pair wiring.
- They are not compatible with twisted Pair.
- Inflexible → can't be bent sharply.

OPTICAL FIBRES -- (Guided Media)

- It is used to carry digital data signals in the form of modulated pulses of light.
- It consists of extremely thin cylinder of glass called core, surrounded by a concentric layer of glass known as cladding.



Advantages of OPTICAL FIBER :-

- ✓ Fast transmission (~100 Mbps)
- ✓ Not subject to interference.
- ✓ Difficult to tap i.e penetrate (Secure).
- ✓ Lowest transmission lost over long distances.
- ✓ High transmission capacity.

Disadvantages of OPTICAL FIBER:-

- More Expensive.
- Required skilled installation and maintenance.
- Cabling is inflexible i.e can't be bent easily.

Despite its disadvantages, it is the future of industry.

RADIOWAVE – (Unguided media)

It makes use of Radio frequencies for radio wave transmission. For Ex:- We are well known of Radios which receives signals from broadcasting station using radio waves.

The setup has two parts:-

1)Transmitter

2)Receiver

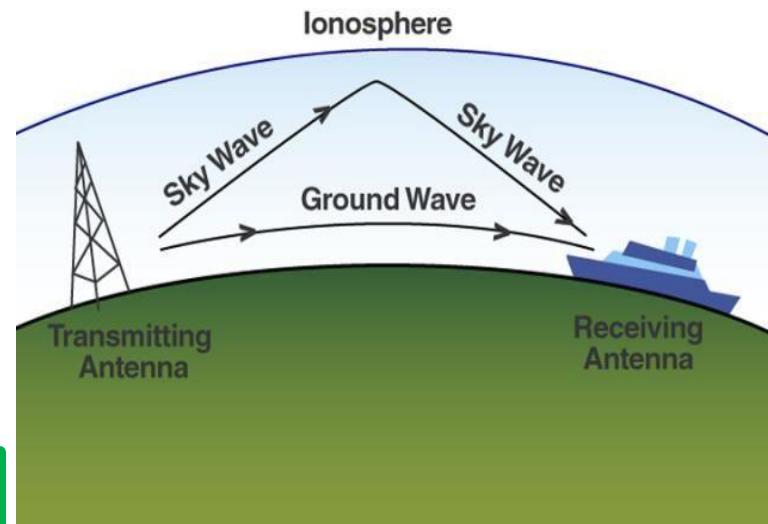
Both the transmitter and receiver uses antennas to radiate and capture the radio signals.

Advantages of RADIOWAVE:-

- ✓ It offers mobility.(You can use radios while moving).
- ✓ Cheaper than guided media as no cables or digging is required.
- ✓ They can also be used for communication over oceans, mountains or other difficult areas where cabling is not easy or possible at all.
- ✓ No need of Land acquisition rights required for laying or repairing cables.

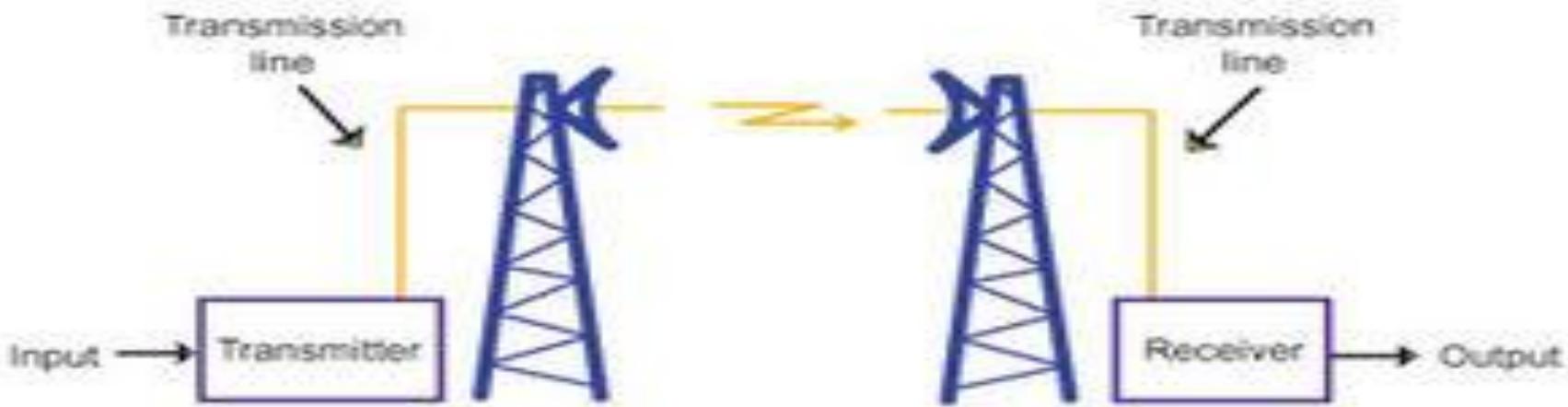
Disadvantages of RADIOWAVE:-

- Insecure.
- Signals are affected by weather effects like rains, thunder storms etc.



MICROWAVE – (Unguided media)

- These signals are used for long distance communication.
- This type of transmission consist of transmitter(source), receiver(destination) and atmosphere.
- The signals are transmitted by using parabolic antennas mounted over towers.



Advantages of MICROWAVE Communication:-

- ✓ Cheaper than guided media as no cables or digging is required.
- ✓ They can also be used for communication over oceans, mountains or other difficult areas where cabling is not easy or possible at all.
- ✓ No need of Land acquisition rights required for laying or repairing cables.

Disadvantages of MICROWAVE Comm:-

- Insecure and could be trapped easily.
- Signals are affected by weather effects like rains, thunder storms etc.
- Implementation and maintenance requires high skills.
- Bandwidth allocation is extremely limited.

SATELLITE COMMUNICATION – (Unguided media)

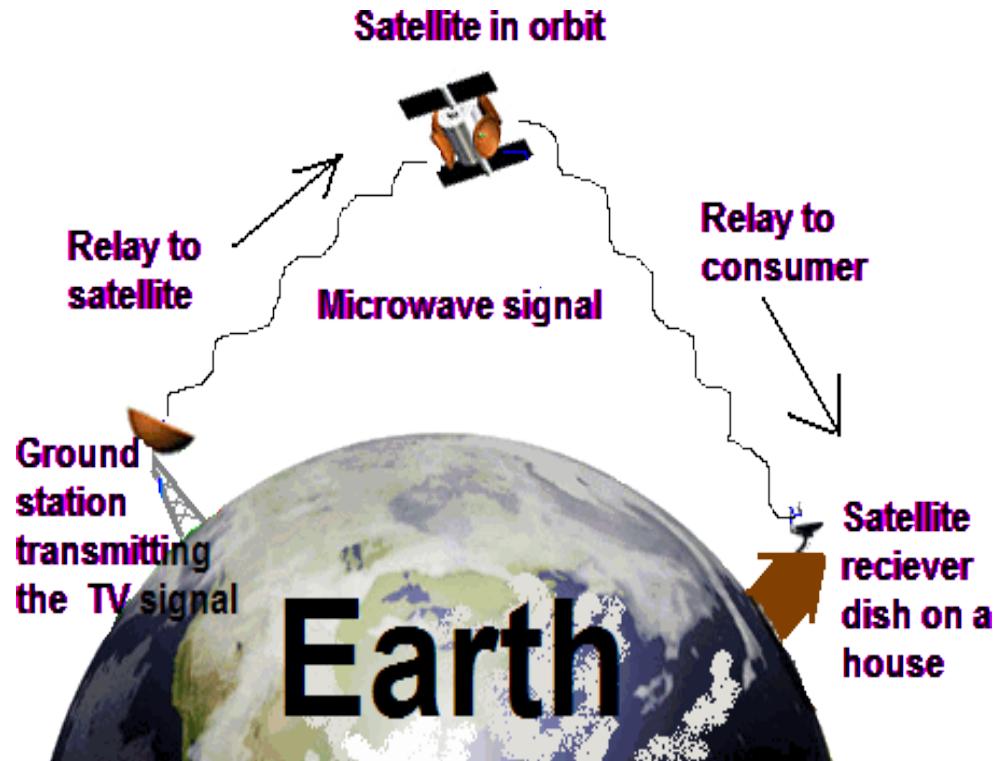
It uses satellites for transmission. The earth station consist of a satellite dish and communication equipment to send and receive data from satellites. Satellite communication is one of the applications of Microwave communication.

Process of communication:-

The Satellite receives data/signals from earth station, amplify them and retransmit them to other side of earth in only one step.

Advantages of SATELLITE :-

- ✓ Its coverage area is quite large.
- ✓ Cheaper.
- ✓ Can easily handle heavy traffic.
- ✓ Reliable communication and used as a emergency backup facility when guided media fails due to disaster.



Disadvantages of SATELLITE:-

- High investment cost as satellite is required to be placed over earth's surface.
- Technology limitations prevents from placing high aperture antennas on satellite platform which results into over crowding of bandwidth.

INFRARED – (Unguided media)

Infrared :-

- Uses infrared lights for communication.
- Ex:- TV Remotes, Car Remote, Wireless Speakers, Infrared Thermometers

Advantage of INFRARED:-

Secured transmission

Disadvantage of INFRARED:-

Infrared cannot penetrate walls.



LASER – (Unguided media)

Laser:-

- It requires direct Line Of Sight (LOS).
- It is unidirectional like microwave .
- It requires a laser transmitter and a photo sensitive receiver at each end.

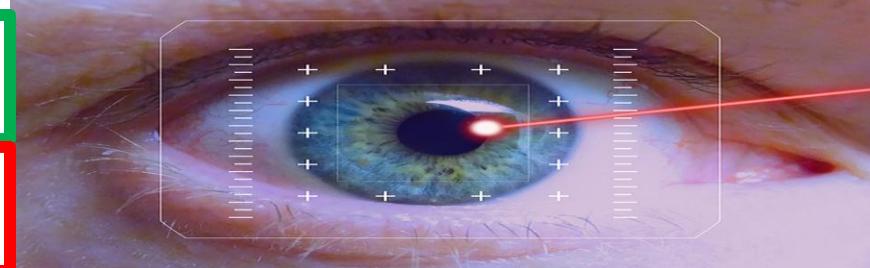
Ex:- Medical Sciences, Treatments, Industries

Advantage of LASER:-

Laser is faster than microwave.

Disadvantage of LASER:-

It can be adversely affected by weather.



NETWORK

TOPOLOGY:

(STAR, BUS/LINEAR,
RING/CIRCULAR, TREE,
MESH, FULLY CONNECTED)

NETWORK TOPOLOGY

The pattern of interconnection of nodes on a network is called the topology.

FACTORS for choosing a Topology or a network are:-

- ✓ Cost:- which offers minimum installation cost based on the network under consideration.
- ✓ Flexibility:- Can offer easy move of existing nodes and adding new ones.
- ✓ Reliability:- Offers least failure.

TYPES OF TOPOLOGIES

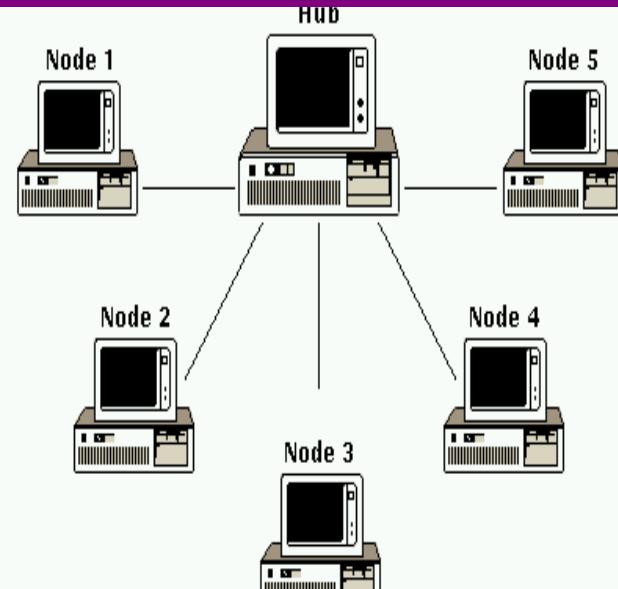
- STAR Topology
- BUS Topology
- RING/CIRCULAR Topology
- TREE Topology
- GRAPH Topology
- MESH Topology
- FULLY CONNECTED Topology

STAR TOPOLOGY

A star topology is designed with each node (file server, workstations, and peripherals) connected directly to a central network hub or concentrator

Data on a star network passes through the hub or concentrator before continuing to its destination.

The hub or concentrator manages and controls all functions of the network. It also acts as a repeater for the data flow.

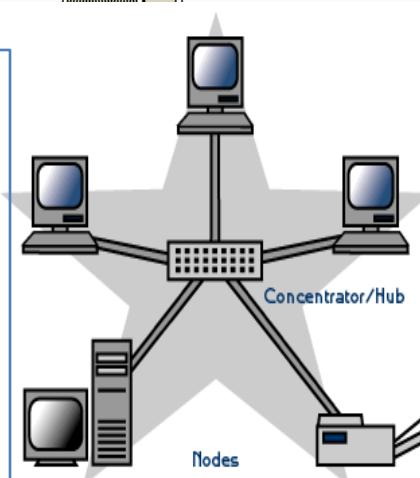


Advantages of a STAR Topology

- Easy to install and wire.
- No disruptions to the network when connecting or removing devices.
- Easy to detect faults and to remove parts.

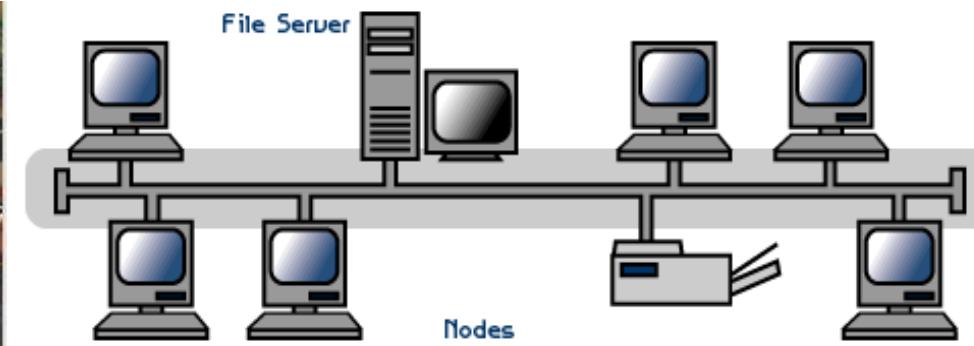
Disadvantages of a STAR Topology

- Requires more cable length than a linear topology.
- If the hub or concentrator fails, nodes attached are disabled.
- More expensive than linear bus topologies because of the cost of the concentrators.



BUS TOPOLOGY

- A linear bus topology consists of a main run of cable with a terminator at each end .
- All nodes (file server, workstations, and peripherals) are connected to the linear cable.



Advantages of a Linear BUS Topology

- Easy to connect a computer or peripheral to a linear bus.
- Requires less cable length than a star topology.

Disadvantages of a Linear BUS Topology

- Entire network shuts down if there is a break in the main cable.
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Nodes must be intelligent . Each node is directly connected to the central bus.

RING / CIRCULAR TOPOLOGY

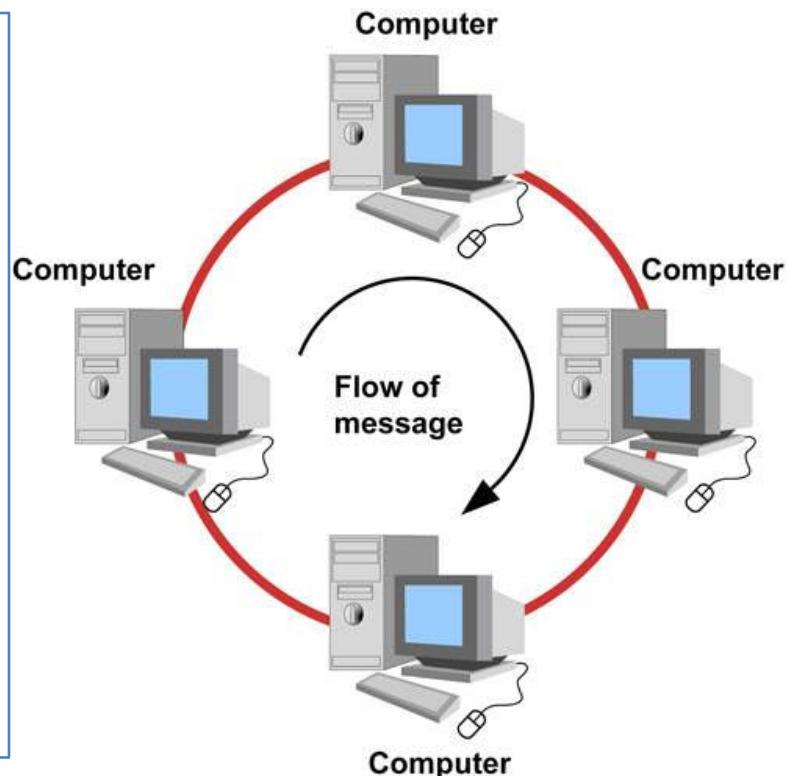
- In it each node have two and only two neighbouring nodes. Data packet is received from one neighbour and is transmitted to the next.
- After passing through each node it is received at the sending node and then the packet is removed from the n/w.
- Data travels in one direction in the ring like structure.

Advantages of a RING Topology

- Short cable length
- No wiring spaces required in the building
- High speed network using Optical fiber

Disadvantages of a RING Topology

- One node causes network failure
- It is very difficult to diagnose faults
- Network reconfiguration is difficult as shutting down one section of the network causes the network to be shutdown as a whole.



TREE TOPOLOGY

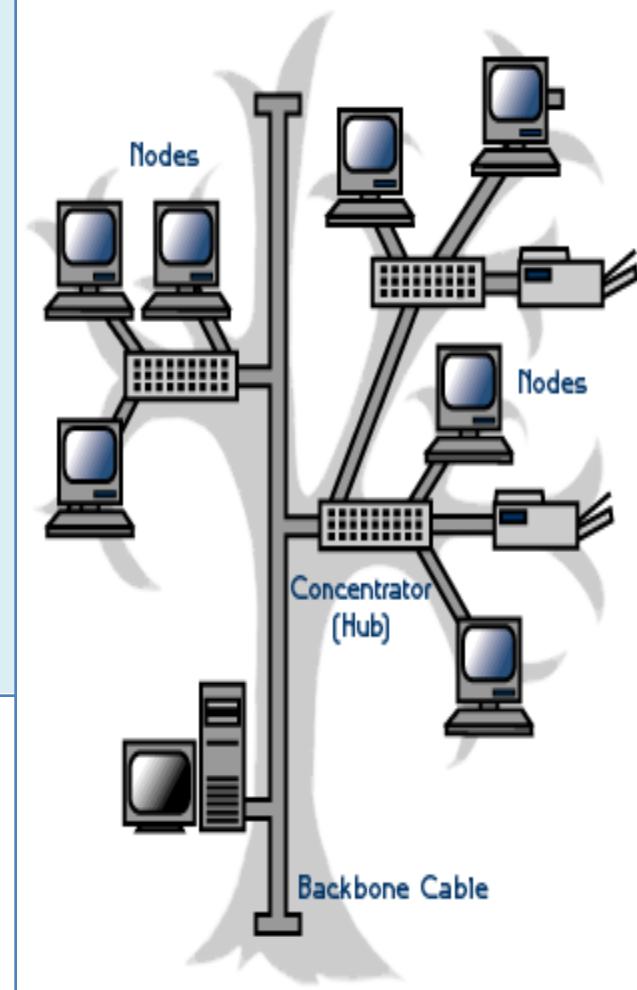
- A tree topology **combines characteristics of linear BUS and STAR topologies.**
- Inverted tree like structure, with the central root branching and sub-branching to the extremities.
- It consists of groups of star-configured workstations connected to a linear bus backbone cable.
- Tree topologies allow for the expansion of an existing network, and enable schools to configure a network to meet their needs

Advantages of a TREE Topology

- Point-to-point wiring for individual segments
- It is highly flexible
- Centralized monitoring

Disadvantages of a TREE Topology

- Overall length of each segment is limited by the type of cabling used.
- If the backbone line breaks, the entire segment goes down.
- It is difficult to configure the network, if there is a single point of failure.
- More wire is required than other topologies



MESH TOPOLOGY

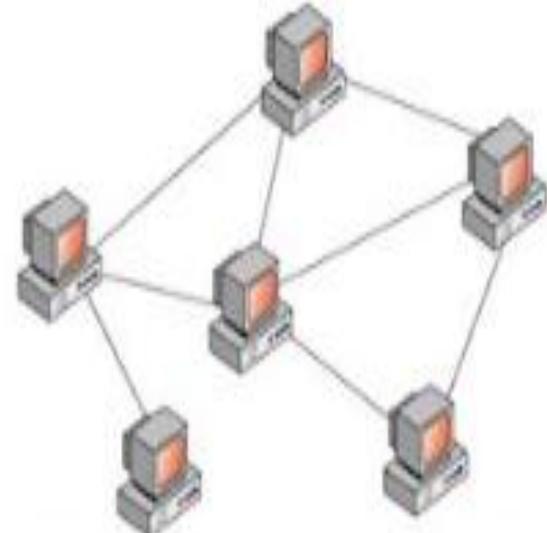
In it each node is connected to more than one node to provide an alternative route (If in case, the host is either busy or down).

Advantages of MESH Topology

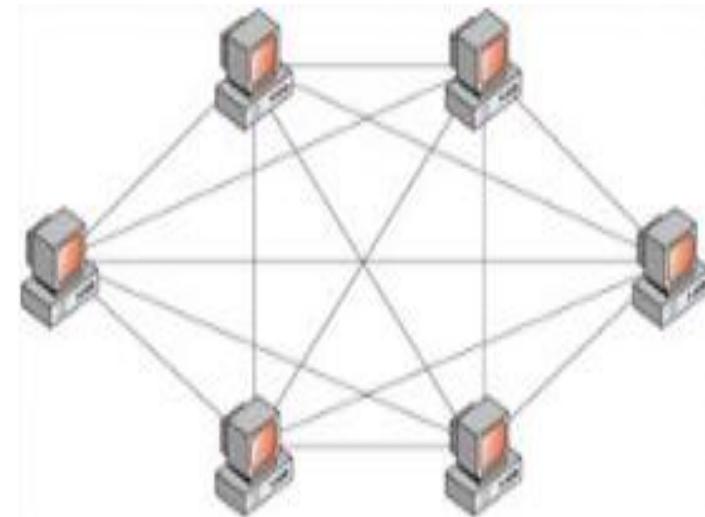
- ✓ Good for long distance networking
- ✓ Extensive alternative back up support
- ✓ Rerouting and pass through capabilities
- ✓ Ideal for distributed Networking

Disadvantages of MESH Topology

- The **cost** to implement is higher than other network topologies
- Building and maintaining the topology is difficult and time consuming.



MESH Network



**FULLY CONNECTED –
MESH NETWORK**

Considerations When Choosing a Topology:

- **Money.** A linear bus network may be the least expensive way to install a network; you do not have to purchase concentrators.
- **Length of cable needed.** The linear bus network uses shorter lengths of cable.
- **Future growth.** With a star topology, expanding a network is easily done by adding another concentrator.
- **Cable type.** The most common cable in schools is unshielded twisted pair, which is most often used with star topologies.

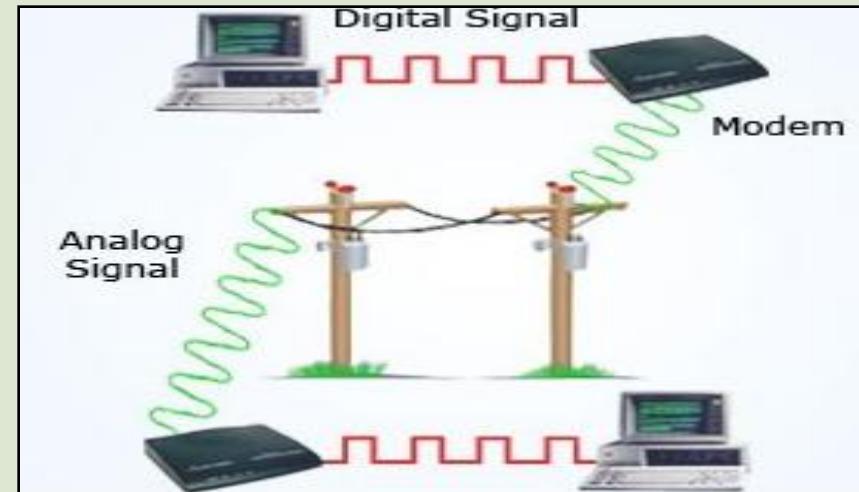
NETWORK DEVICES:

(MODEM, RJ-45, HUB,
SWITCH, REPEATER,
ROUTER, BRIDGE, GATEWAY)

NETWORK DEVICE: MODEM

MODEM (Modulator-Demodulator)

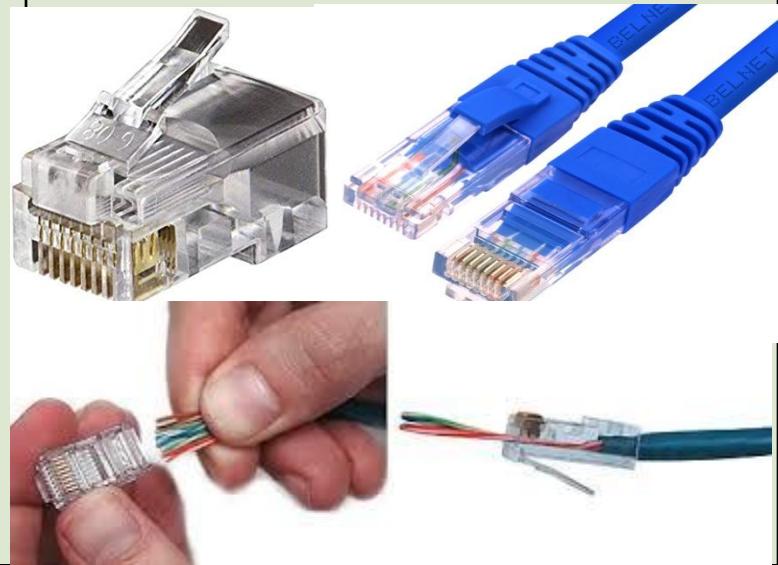
- It is a device that allows to connect and communicate computers via telephone lines.
- As telephone lines uses Analog signals and computers uses Digital Signals, so for communication these needs to be interchanged.
- So, Modulator converts a digital signal into Analog and Demodulator does vice versa.
- It can be of two types:- **Internal Modem and External Modem**



NETWORK DEVICE: **RJ45**

RJ-45 (Registered Jack-45)

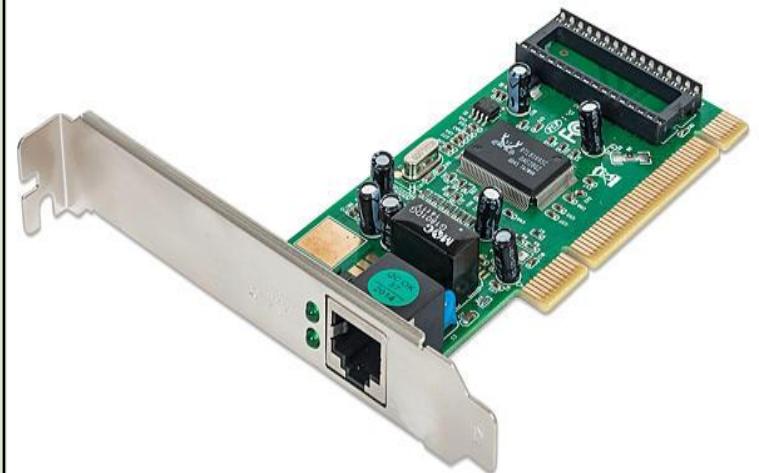
- It is an 8 wire connector used to connect computers on LAN.
- All registered jack is a standardized telecommunication network interface for connecting voice and data equipment to a service provided by a local exchange carrier or long distance carrier. (*wikipedia*)



NETWORK DEVICE: **ETHERNET CARD**

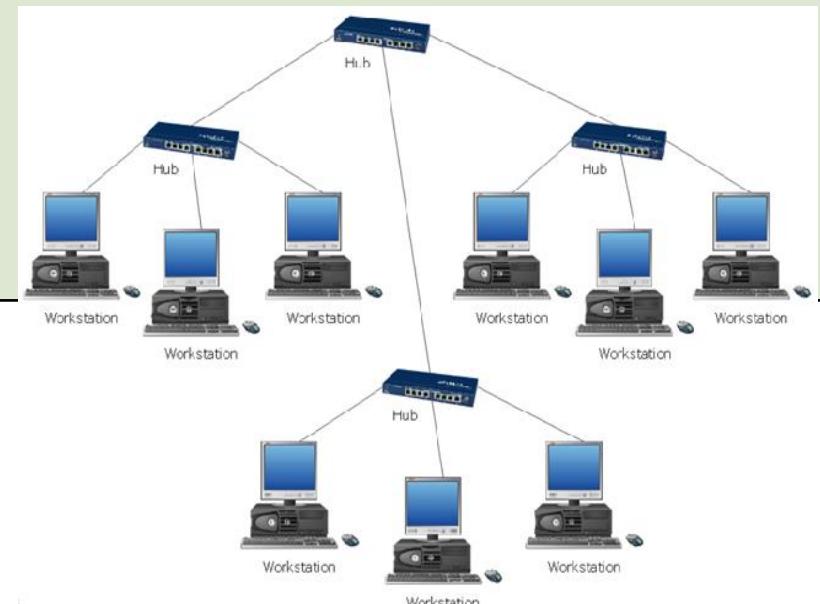
ETHERNET CARD:-

- Ethernet is a LAN architecture and computers that are part of this architecture have to install a special card called Ethernet card.
- It contains connections for coaxial or twisted pair or both and also slot for Fiber optics cable.
- Ethernet Card is an example of NIC



NETWORK DEVICE: HUB

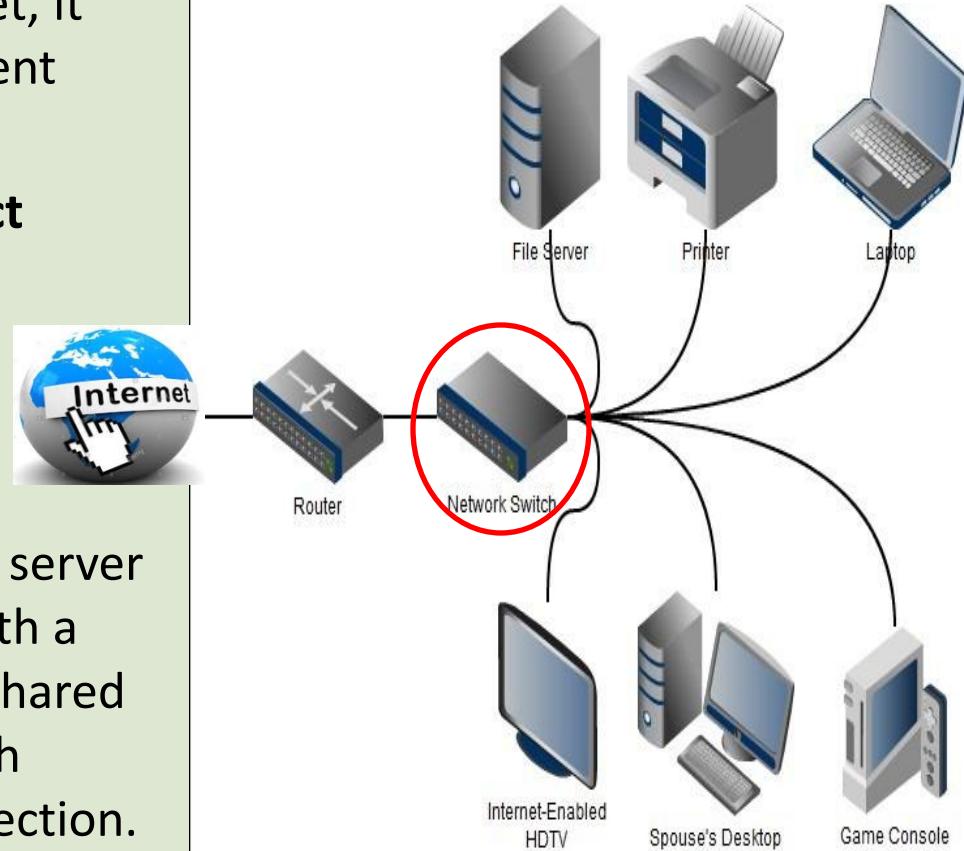
- A common connection point for devices in a network which are mainly used to connect segments of a LAN.
- A hub contains multiple ports.
- A Passive hub serves simply as a conduit for the data, enabling it to go from one device (or segment) to another.
- Active hub electrically amplify the signal as it moves from one connected device to another.
- Support 8, 12 or 24 RJ-45 ports
- Mostly used in Star or Ring topology.



NETWORK DEVICE:

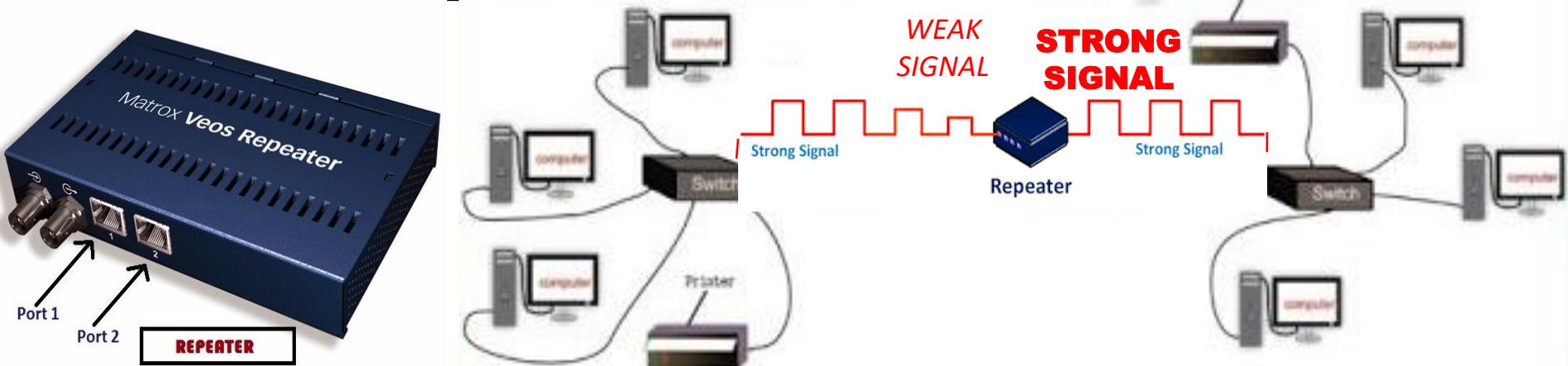
SWITCH

- ✓ A switch ([switching hub](#)) in the context of networking refers to a device which filters and forwards data packets across a network.
- ✓ A Switch keeps a record of the MAC addresses of the devices attached to it.
- ✓ When the switch receives a data packet, it forwards the packet directly to the recipient device by looking up the MAC address.
- ✓ **We need a SWITCH or a HUB to connect computers on a Network.**
- ✓ A network switch can utilize the full throughput potential of a networks connection for each device .
- ✓ For example, a network of 5 PCs and a server all connected with 10Mbps UTP cable, with a HUB the throughput(10Mbps) would be shared between each device, with a SWITCH each device could utilize the full 10Mbps connection.



NETWORK DEVICE: REPEATER

- ✓ A **REPEATER** is an electronic device that receives a weak or low-level signal and retransmits it at a higher level or higher power, so that the signal can cover longer distances without degradation.
- ✓ Repeaters are installed along the way between sender and receiver, in case of longer distance transmission to ensure that the data packets reach their destination.
- ✓ Repeaters are of two kinds:
 - **AMPLIFIER** : Amplifies all the incoming signal transmitted over the network along with concurrent noises.
 - **SIGNAL REPEATER** : amplifies only the signal and discard the noise. It collects the inbound packet on the network and then retransmits as if it were starting from the source station.



NETWORK DEVICE: **ROUTER**

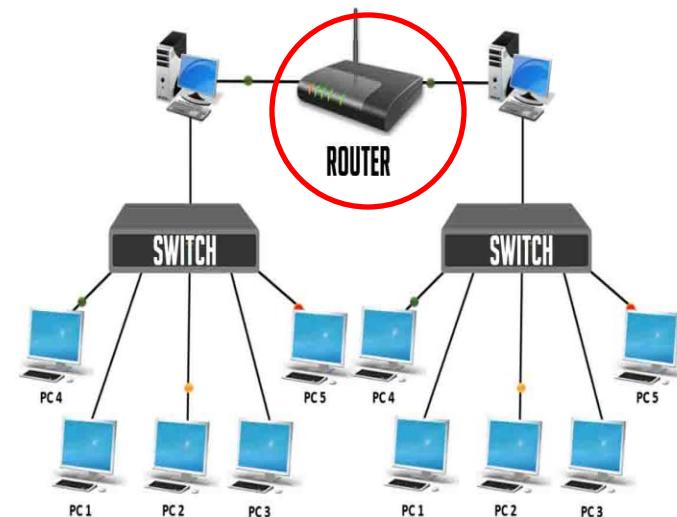
- ✓ Router is a specialized network device used to interconnect different types of computer network that uses different protocols and forward data packets between computer networks.
- ✓ Routers perform the traffic directing functions on the Internet. Data sent through the internet, such as a web page or email, is in the form of data packets. A packet is typically forwarded from one router to another router through the networks that constitute an Internetwork (Internet) until it reaches its destination node.
- ✓ Most routers have multiple Ethernet ports on the back of the device. This allows you to connect multiple devices to the router in order to “share” the Internet connection. A router without a built-in modem will also need to be connected to an ADSL modem in order to translate analogue signal to digital information.
- ✓ Router can be wired or wireless.



Front side of the Router

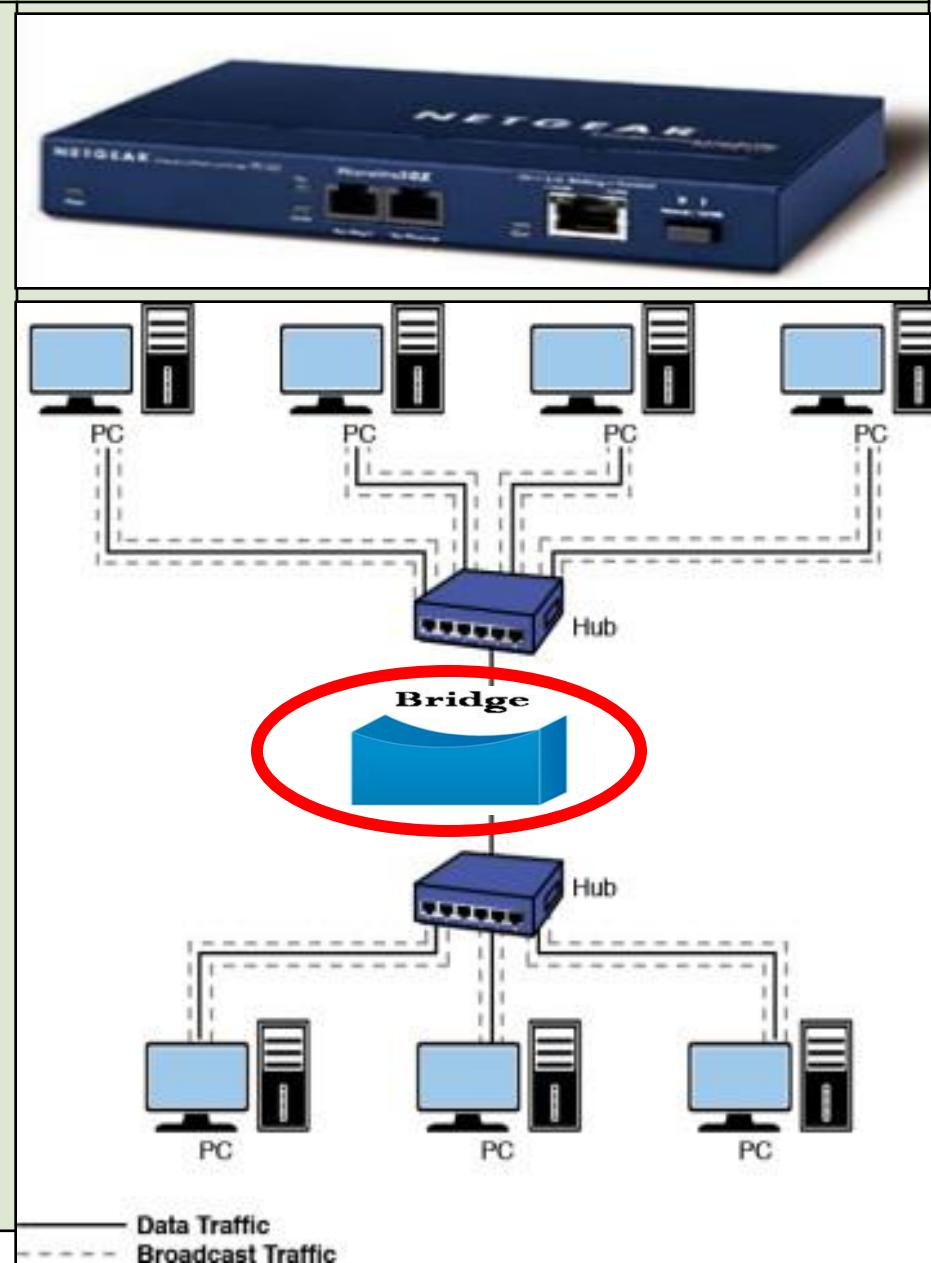


Back side of the Router



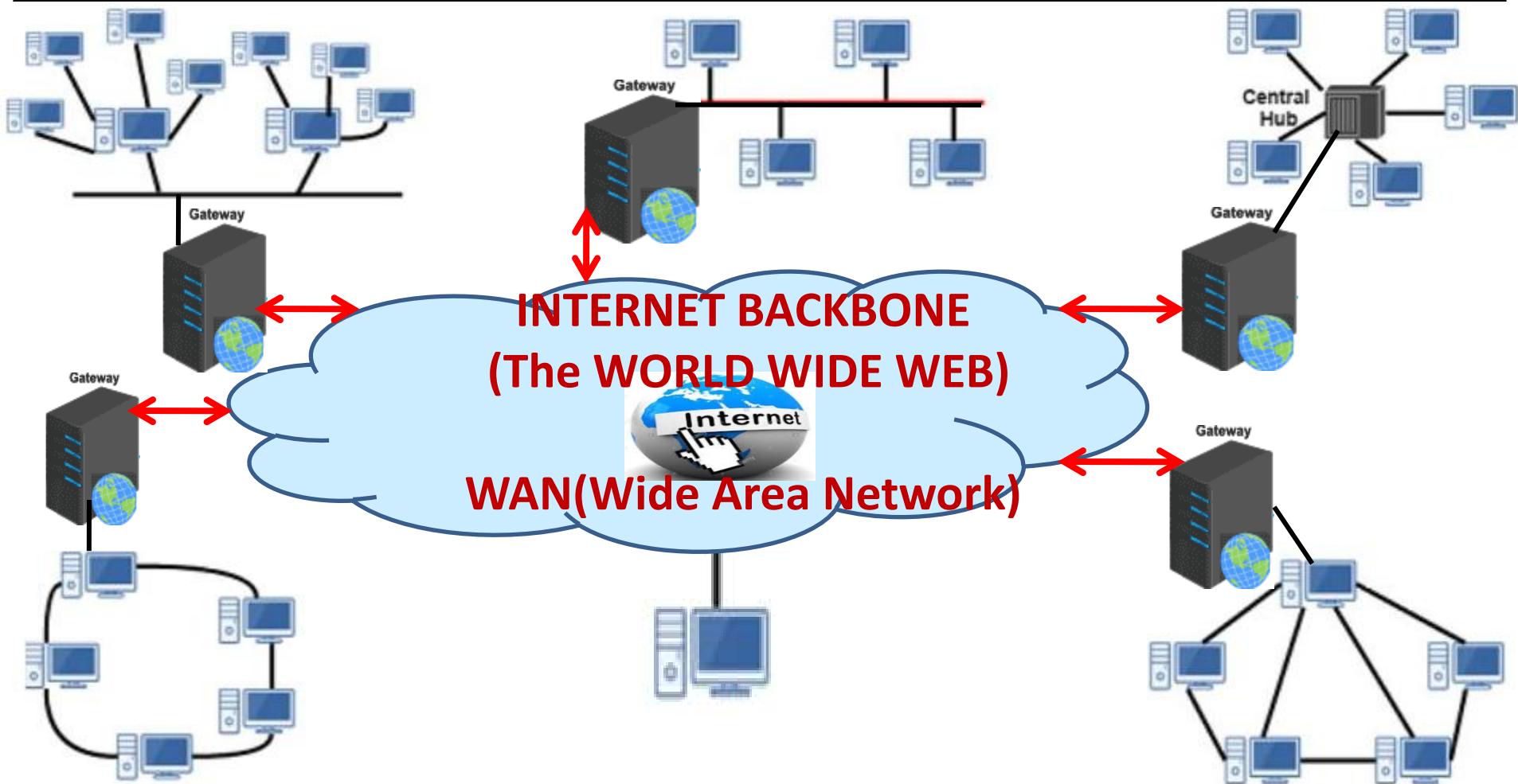
NETWORK DEVICE: BRIDGE

- In telecommunication networks, a bridge is a product that **connects a local area network (LAN) to another local area network that uses the same protocol** (for example, Ethernet or Token Ring).
- Bridge acts on MAC/Physical Address
- You can envision a bridge as being a device that decides whether a message from you to someone else is going to the local area network in your building or to someone on the local area network in the building across the street.
- A bridge examines each message on a LAN, "passing" those known to be within the same LAN, and forwarding those known to be on the other interconnected LAN (or LANs).



NETWORK DEVICE: **GATEWAY**

- Gateway is a device that connects dissimilar networks.
- Establishes intelligent connection between a local network and external networks with completely different structures.
- Gateway is the ISP(Internet Service Provider) that connects the user to the internet.
- Gateway can also act as Firewall, API Gateways etc.

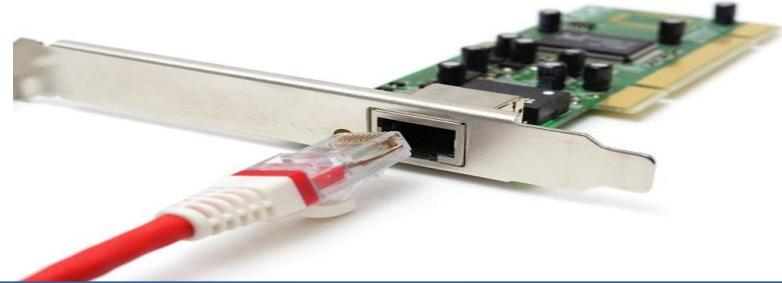


A QUICK RECAP OF NETWORK DEVICES

Modem



RJ-45 connector with Ethernet Card



Hub



Gateway



Router



Repeater



Bridge

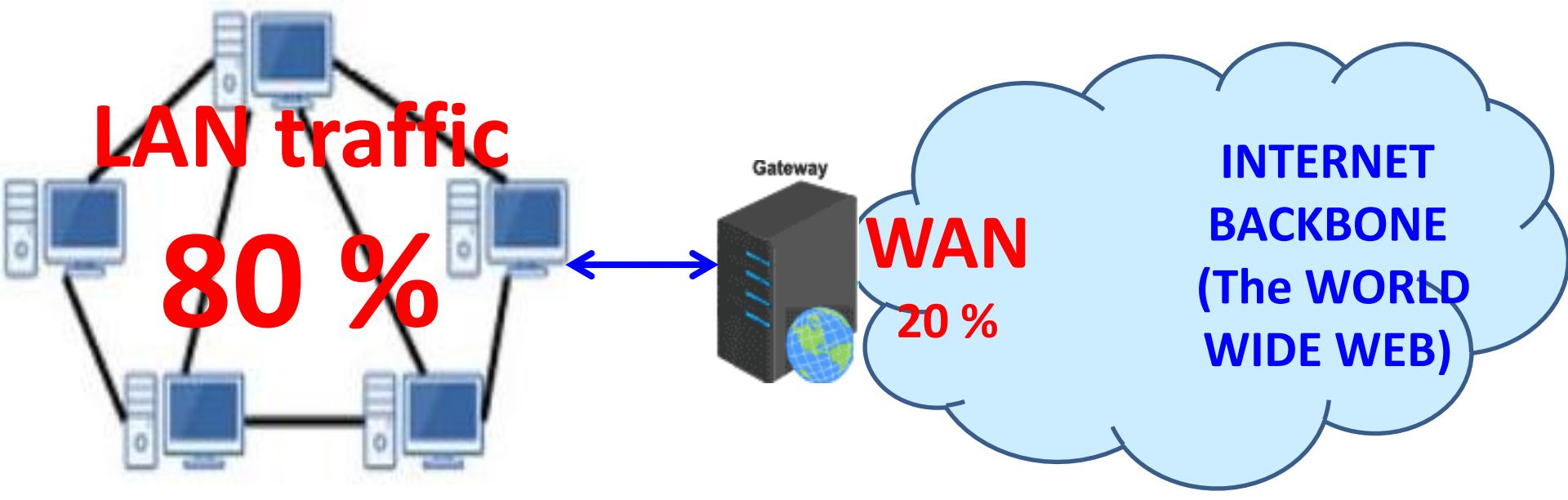


Switch



80-20 Network Rule

80 percent of the traffic on a given network segment is local to LAN (destined for the target in the same workgroup), and not more than 20 percent of the network traffic should need to move across a backbone(the spine that connects various subnetworks)-WAN.

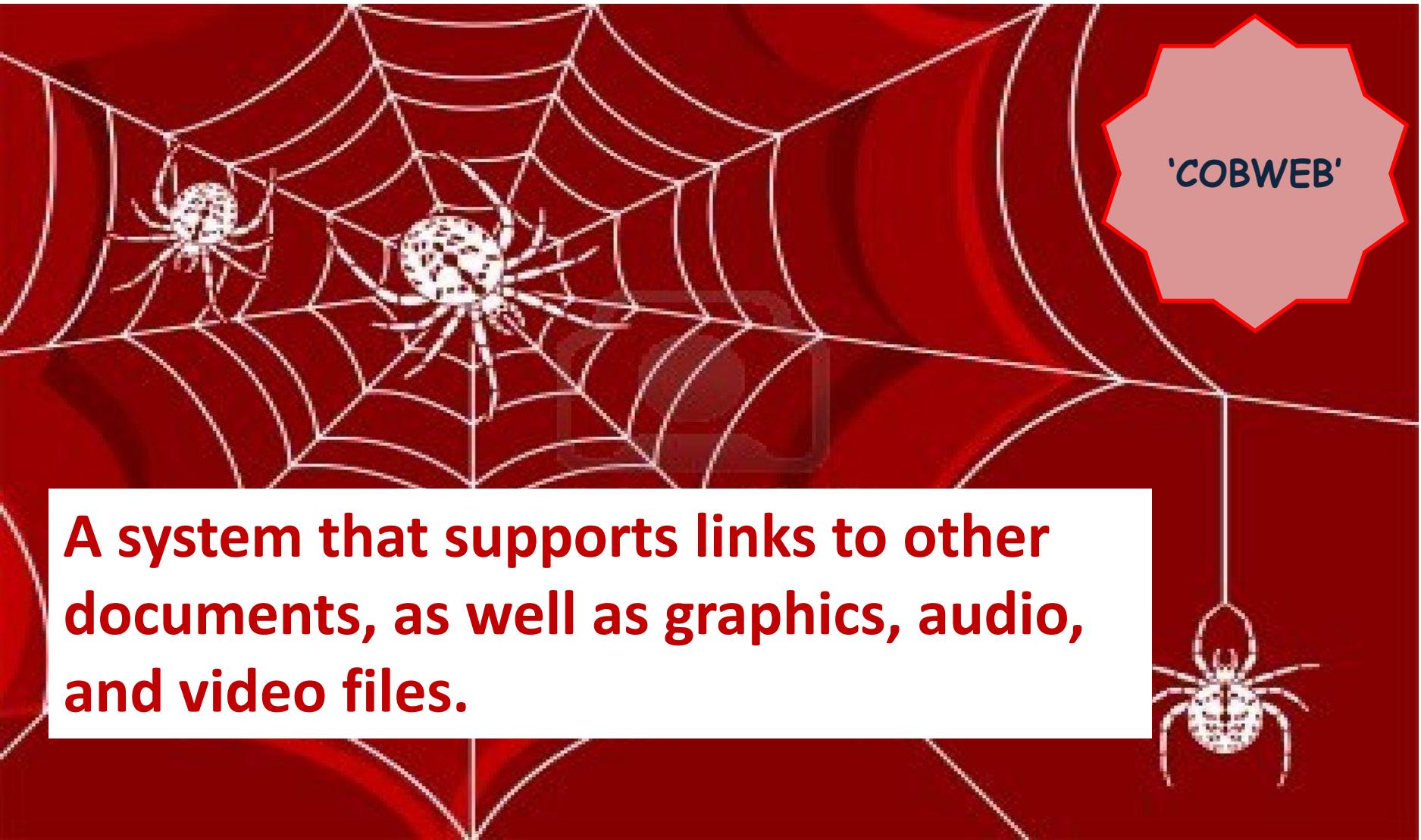


WEB SERVICES:

INTRODUCTION TO WEB WORLD-
WWW, WEB CLIENT, WEB SERVER,
WEB BROWSER & ITS TYPES,
WEB PAGE, WEBSITE, URL, DOMAIN
NAMES (DNS), WEB HOSTING

FROM WHERE THE TERM ‘WEB’

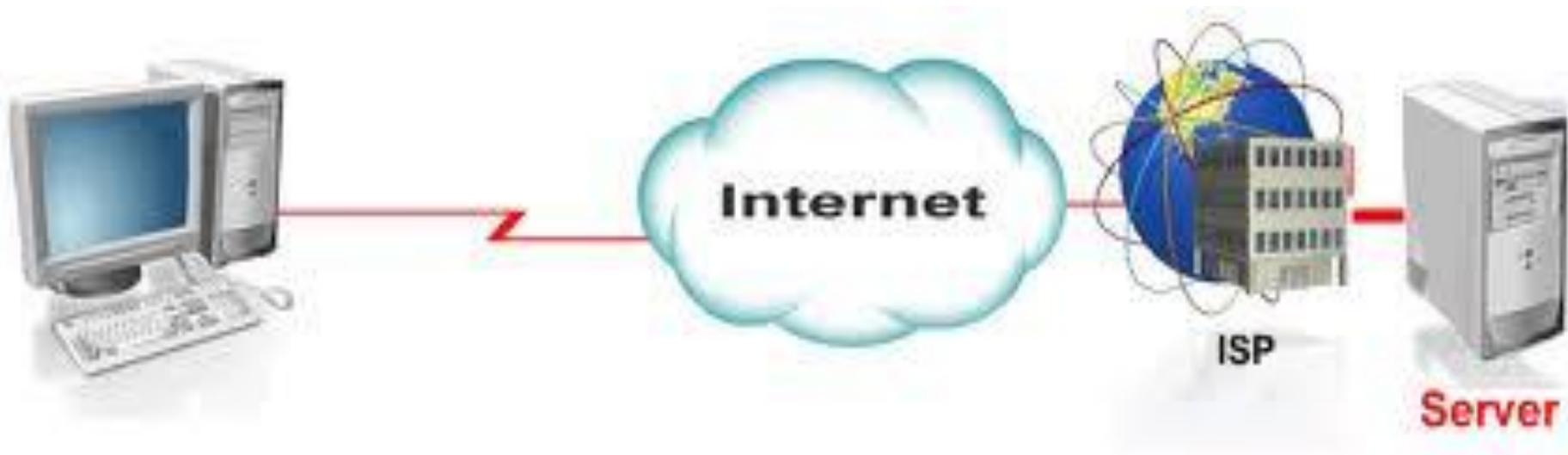
HAS COME?



A system that supports links to other documents, as well as graphics, audio, and video files.

BUILDING BLOCKS OF WORLD WIDE WEB

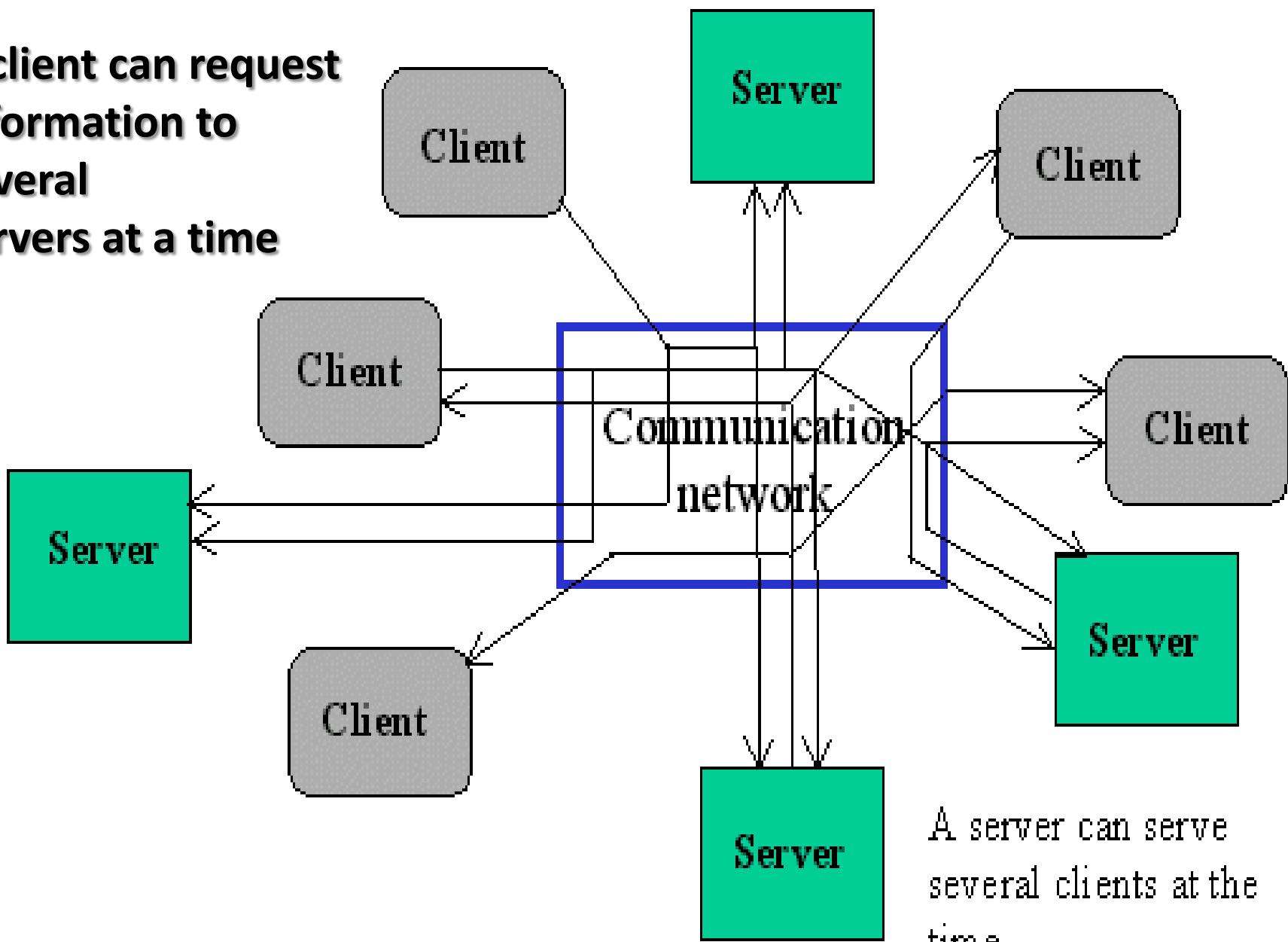
- A **Web Client** is any machine that requests information to the Server.



Web Server is basically a PC that is designed to accept requests from remote computers and send on the information requested by the client through the internet (web browser).

Figure 1: The Concept of Client/Server Computing

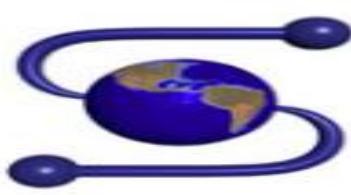
A client can request information to several servers at a time



At your service...

- A **Web Browser** (commonly referred to as a **browser**) is a software application for retrieving, presenting and traversing information resources on the World Wide Web(WWW).





NCSA Mosaic - 1993



>



Netscape Navigator - 1994



Internet Explorer - 1995



Opera - 1996



Safari - 2003



>



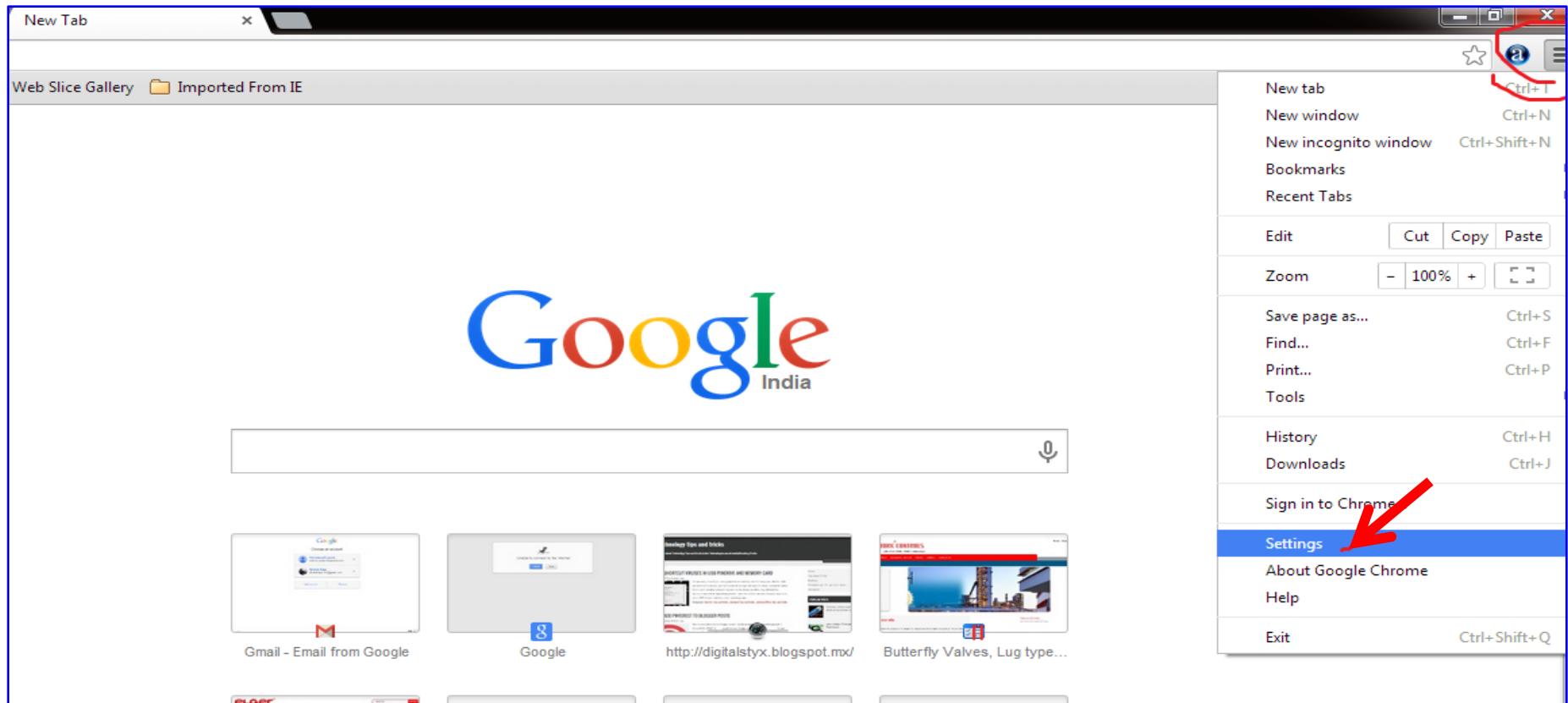
Firebird (1998) > Firefox - 2004



Chrome - 2008

WEB BROWSERS

WEB BROWSER Settings



Web browsers can typically be configured with a built-in menu. Depending on the browser, the menu may be named *Settings*, *Options*, or *Preferences*. The menu has different types of settings. For example, users can change their home page and default search engine. They also can change default web page colors and fonts. Various network connectivity and privacy settings are also usually available.

WEB BROWSERS **(ADD-ONS, PLUG-INS, COOKIES)**

ADD-ONS are tools which integrate into your **browser**. They're similar to regular apps or programs, but only run when the **browser** runs. **Add-ons** can allow the viewing of certain types of Web content, such as Microsoft's Silverlight or Adobe Flash Player, necessary for Netflix movies and YouTube videos, respectively.

PLUG-IN (or **plugin**, **add-in**, **addin**, **add-on**, or **addon**) is a software component that adds a specific feature to an existing computer program. When a program supports plug-ins, it enables customization.

Eg. Graphics software use plug-ins to support file formats and process images.
(c.f. Photoshop plugin)

BROWSER COOKIES:- Cookies are files created by sites you visit. They make your online experience easier by saving browsing information. With cookies, sites can:

- i. **Keep you signed in.**
- ii. **Remember your site preferences.**
- iii. **Give you locally relevant content.**

WEBSITE AND WEB PAGES

- A location on a web / net server is a website.
- The documents residing on web sites are known as web pages.





URL and DOMAIN NAMES

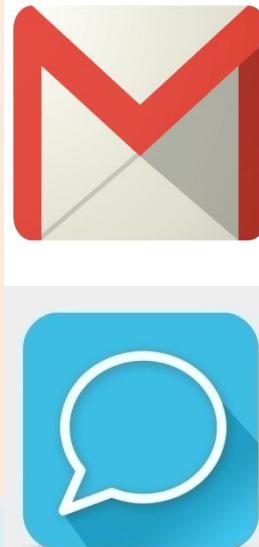
- WWW is built on a set of rules called Hypertext Transfer protocol (HTTP) and to define the web page the language used is Hypertext Markup Language (HTML).
- URL is the Uniform Resource Locator who uses IP address of a website in order to access it.
- URL is actually the domain name of the website
- Domain name (DNS) is the unique name given to the website.
- A file's Internet address, or URL, is determined by the following:
 - The type of server or protocol
e.g. https://
 - The name/address of the server on the Internet(domain name)
e.g. https://no1kanchrapara.kvs.ac.in/
 - The location of the file on the server(this location may be related as a "path" through the file hierarchy)
e.g. https://no1kanchrapara.kvs.ac.in/academics/admission-detail

WWW Applications:

Web, E-mail, Chat, VoIP

WEB- A web application (or web app) is an application software that runs on a web server, unlike computer-based software programs that are stored locally on the Operating System (OS) of the device. Web applications are accessed by the user through a web browser with an active internet connection.

Eg. Web applications include online forms, shopping carts, word processors, spreadsheets, video and photo editing, file conversion, file scanning, and email programs such as Gmail, **Yahoo** and AOL. Popular applications include Google Apps and Microsoft 365.

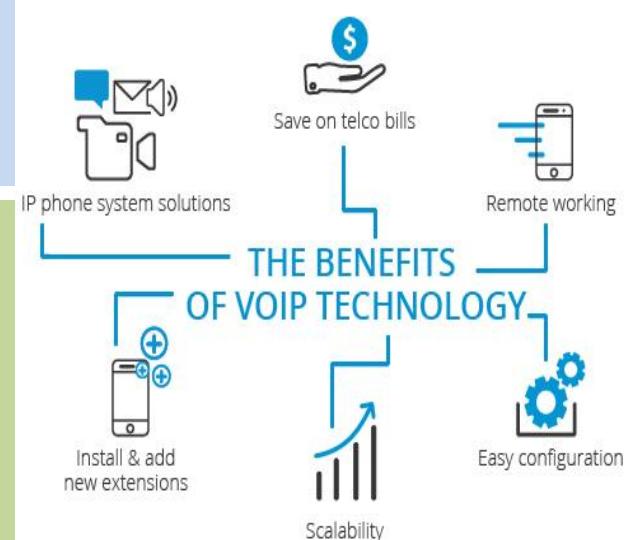


Chat icon

E-Mail- Electronic mail (**email** or e-mail) is a method of exchanging messages ("mail") between people using electronic devices. Eg. Gmail, rediffmail

Chat- Online **chat** may refer to any kind of communication over the Internet that offers a real-time transmission of text messages from sender to receiver. Eg. Yahoo Messenger

VoIP-VoIP (Voice over Internet Protocol) is the technology that converts your voice into a digital signal, allowing you to make a call directly from a computer, a **VoIP** phone, or other data-driven devices. ... You may also hear it referred to as IP telephony, internet telephony, broadband telephony, or broadband phone service. Eg. Skype



Some Commonly used Internet Protocols



- **HTTP(Hyper Text Transfer Protocol)** used on the WWW(World Wide Web) for transferring web pages and files contained in web pages such as images.
- **FTP(File Transfer Protocol)** used for transferring files from one machine to another.
- **SMTP(Simple Mail Transfer Protocol)** used for email.
- **Telnet Protocol** used to open remote-machine access(telnet) sessions.

HTTP(Hyper Text Transfer Protocol)

used on the
WWW(World Wide Web) for transferring web pages and files
contained in web pages such as images.

Extra
knowledge

- **HTTP is an application-level** but light & fast protocol.
- It's a generic, stateless, object oriented protocol.
- It has been in use by **WWW** since 1990.
- *It consists of two fairly distinct items:*
 1. set of **requests** from browsers to servers
 2. set of **responses** going the other way.
- HTTP allows an open-ended set of methods to be used to indicate the purpose of a request.
- **HTTP** has different built-in methods to allow users to open a web page, to disconnect an existing connection, to read the header of a webpage, to append to an existing resource or to store a webpage etc.



FTP(File Transfer Protocol) used for transferring files from one machine to another.

Responsible for Downloading and Uploading services on internet.



Extra
knowledge

SMTP(Simple Mail Transfer Protocol) **SMTP** stands for Simple Mail Transfer Protocol. **SMTP** is a set of communication guidelines that allow software to transmit an electronic mail over the internet is called Simple Mail Transfer Protocol. It is a program used for sending messages to other computer users based on e-mail addresses.

SLIP(Serial Line Internet Protocol)

SLIP is an encapsulation of the Internet **Protocol** designed to work over serial ports and modem connections. **SLIP** encapsulates IP packets. **IP protocol** is the only **protocol** supported by **SLIP**. **SLIP** has been largely replaced by the Point-to-Point **Protocol (PPP)**, which has more features and **does** not require a predefined IP address configuration.

PPP(Point to Point Protocol)

More developed protocol than SLIP, as it transfers additional data, better suited to data transmission over the Internet (the addition of data in a frame is mainly due to the increase in bandwidth). **PPP** encapsulates datagram.

STATIC AND DYNAMIC web pages

STATIC PAGES

A **Static web page** is a web page (often HTML documents) that is delivered to the user exactly as it is stored , which displays the same information for all users, from all contexts

Pre-built content is same each time the page is loaded.

Content only changes when someone updates and publishes the file and sends it to the server for uploading.

Uses HTML Codes

Ex. ABOUT US,MISSION,VISION,CONTACT US information given on your school website. A page of Tagore Poems.

DYNAMIC PAGES

A **dynamic web page** is an interactive web page (often Dynamic HTML) with web content that varies, based on the results of a search or any script executed .

Contents is generated "on-the -fly" and changes regularly

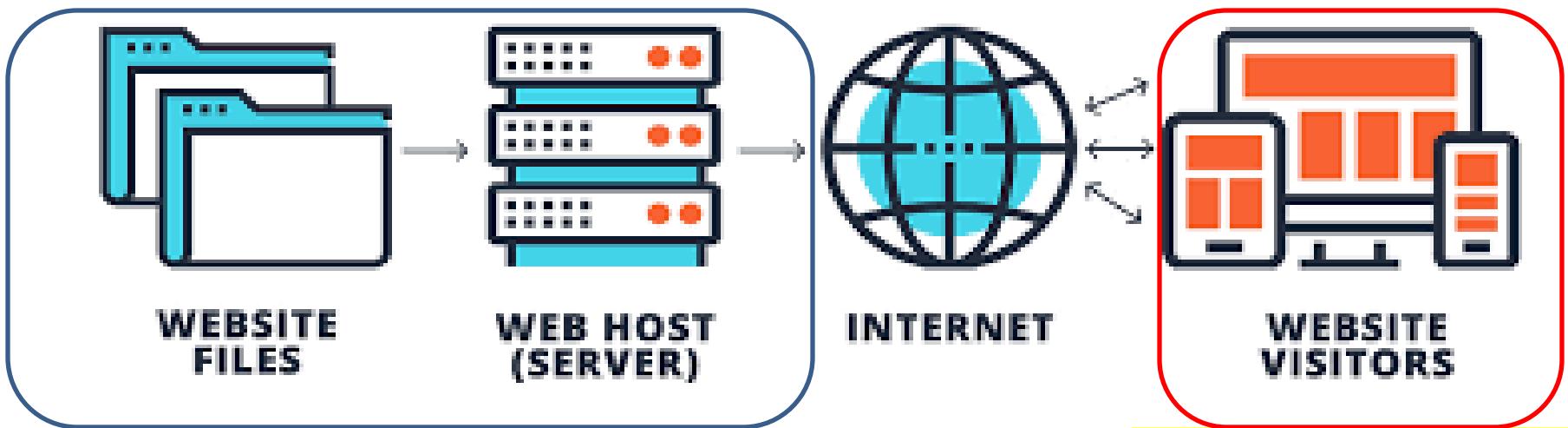
Page contains "server-side" code, allows the server to generate unique content when the page is loaded.

Uses DynamicHTML, ASP,PHP,JSP codes.

Example : Amazon pages for buying items, Facebook, upcoming events from a calendar and changing each day for the different Calendar events

WEB HOSTING

Web hosting is a means of hosting web-server application on a computer system through which electronic content on the internet is readily available to any web browser client.



**WEBSITE FILES which are hosted on
the WEB HOST SERVER**

USERS OF WEBSITE

TYPES OF WEB HOSTING

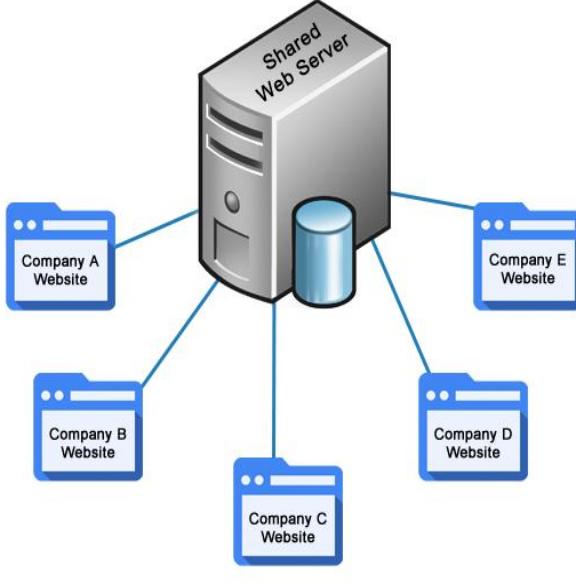
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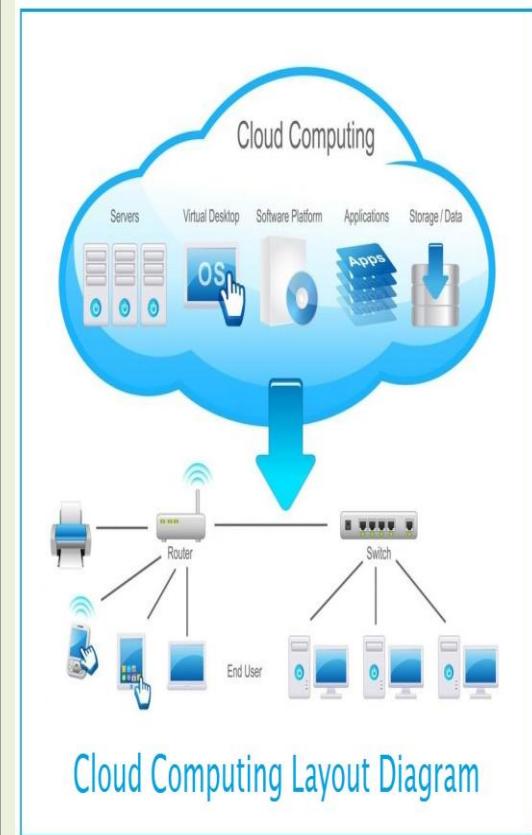
FREE HOSTING

- Free website hosting is a free non-paid web hosting service.
- Many web hosts who provide subdomains to anyone who want to make website can go for Free Web hosting.
Eg. Knowpythonbytes.blogspot.com

WordPress.com,
Blogger,Wix,
Weebly,GoDaddy
Squarespace,
Google
Cloud Hosting,

The screenshot shows the homepage of the Weebly website. In the top left corner, there's a logo for 'FREE VIRTUAL SERVERS'. The top navigation bar includes links for Home, Web Hosting, Domains, Build A Website, Extras, and WordPress Hosting. The main content area features a blue banner with the text 'FREE web hosting meets an award winning website builder' and a logo for 'weebly + FREE web hosting' with a cloud icon. To the right, there's a green button with the text 'start your website in 30 seconds' and a white button below it with the text 'Absolutely free GET STARTED'.

2	<h2>SHARED HOSTING</h2> <ul style="list-style-type: none"> ➤ Shared hosting is perfect for entry-level website hosting (beginners) ➤ Website will be stored on the same server as multiple other websites. ➤ With a shared hosting plan, all domains share the same server resources, such as RAM and CPU . ➤ As all resources are shared, the cost of shared hosting plans are relatively low ➤ Efficiency is compromised in shared hosting 	
3	<h2>DEDICATED WEB HOSTING</h2> <ul style="list-style-type: none"> ➤ Dedicated hosting gives website owners the most control over the server where the website is stored ➤ Website owner has full root and admin access, and controls the security and operating system . ➤ Dedicated Server is exclusively rented for the website.(Most expensive Web hosting) ➤ High level of technical expertise is required for the installation and ongoing management of the server. 	 <p>Dedicated Web Hosting</p>

4	<h3>VIRTUAL PRIVATE SERVER (VPS) HOSTING</h3> 	<p>❑ VPS hosting is unique because each website is hosted within its own space on the server and more customization, though it still shares a physical server with other users.</p> <p>❑ VPS is not able to handle incredibly high traffic levels and site performance can still be affected by other sites on the server.</p> <p>❑ VPS hosting offers the cost benefits of shared hosting with the control of dedicated hosting.</p>	
5	<h3>CLOUD WEB HOSTING</h3>	<ul style="list-style-type: none"> ❖ It is the current buzzword of the tech industry. ❖ In cloud, many computers work together, run applications using combined computing resources and is scalable(can grow over time) ❖ It's a hosting solution that works via a network and enables companies to consume the computing resource like a utility. ❖ Website owners do not build and maintain their own computing infrastructure. ❖ The resources that are being used are spread across several servers, reducing the chance of any downtime due to a server malfunction. ❖ The website owner only pays for what they need. 	 <p>Cloud Computing Layout Diagram</p>

6

CO-LOCATION HOSTING

- A Co-location host is a data-centre facility where organizations can rent space for servers and other computing hardware. Space is typically leased by the rack, cabinet or cage.
- The co-location service provides the building, cooling, bandwidth, power, and physical security.
- The client provides servers and storage.
- Co-location hosting saves cost and secures data.



Dedicated Hosting



Rent Servers



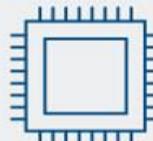
Customers rent servers as well as the infrastructure needed to house and maintain them



Colocation Hosting



Own Hardware



Companies own their own hardware, but are looking to augment its usefulness by **renting server space in a data center**

6 ADVANTAGES OF COLOCATION FOR YOUR BUSINESS



REDUCED IT COSTS- SAVE ON INITIAL INFRASTRUCTURE INVESTMENT



SCALEABLE ENTERPRISE ARCHITECTURE



RELIABLE PROFESSIONAL 24/7 SUPPORT



PHYSICAL SECURITY WITH MULTI-SECURITY LAYERED PROTOCOLS



IMPROVED NETWORK SECURITY



REDUNDANCY/REDUCED DOWNTIME

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Dhanpat Rai Publication 2020 Edition



THANK YOU
FOR YOUR
PATIENT HEARING ☺

Education is the passport to the future, for tomorrow belongs to those who prepare for it today.