

## Notes on Networking

**Network-**A network is any collection of independent computers that communicate with one another over a shared network medium. Need for networking

1. Resource sharing - files and peripherals( Sharing of files, software, Peripherals, storage)
2. Improving communication
3. Access to remote database

### Some Disadvantages Of Networking

1. Threat to data
2. Difficult to set up

### Requirements of a Network

- At least two computers - Server or Client workstation.
- Network Interface Cards (NIC)
- A connection medium, usually a wire or cable, although wireless communication between networked computers and peripherals is also possible.
- Network Operating system software, such as Microsoft Windows NT or 2000, Novell NetWare, Unix and Linux

### Network Terminologies

- (i) Node. A computer that is attached to a network is known as node.
- (ii) Workstation. A node is also called workstation
- (iii) Server. A computer that facilitates resource sharing on a network.
- (iv) NIU. NIU means Network Interface Unit. It is an interpreter that helps establish Communication between the server and the work stations.

### OR

- i) **Nodes (Workstations)** -A computer becomes a node (also called a workstation) as soon as it is attached to a network. Each user on a network works on a workstation. If there are no nodes there would be no network.
- ii) **Server** -A computer that facilitates sharing of data, software and hardware resources on the network is known as the server. A network can have more than one server also. Each server has a unique name by which it is identified by all the nodes on the network.  
Servers can be of two types:
  - a) Dedicated and
  - b) Non dedicated servers

**(a) Dedicated Servers:** These are generally used on big network installations where one computer is reserved for server's job. It helps all nodes access data, software and hardware resources. Since it does not double up as a workstation but only manages the network, so it is known as a dedicated server and such type of networks are called master- slave networks.

**(b) Non dedicated servers:** In small networks, a workstation can double up as a server. These servers are known as non dedicated servers. The small networks using such a server are known as Peer to Peer networks.

Also on a network there may be several servers that allow workstations to share specific resources - for example a file server which takes care of files related requests, a printer server taking care of printing requirements and a modem server that helps group of users to use a modem.

- iii) **Network Interface Unit** - A network interface unit is a device that is attached to each of the workstations and the server which helps to establish communication between the server and workstations.

As soon as a standalone computer becomes a workstation, it needs an interface to help establish connection with the network because without this the workstations will not be able to share network resources or communicate with each other.

The NIC basically acts like an interpreter and is also known as Terminal Access Point (TAP) or Network Interface card(NIC).

The NIC manufacturer assigns a unique physical address to each NIC card and this physical address is known as the MAC address.

**INTERSPACE** -It 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.

### DATA COMMUNICATION TERMINOLOGIES

#### Data Transfer Rate (DTR)

The data transfer rate (DTR) is the amount of data in digital form that is moved from one place to another in a given time on a network.

Data transfer rate is often measured in bits per second (bps), although the unit baud , which is one bit per second is also used.

It is commonly used to measure how fast data is transferred from one location to another.

For example, your ISP may offer an Internet connection with a maximum data transfer rate of 4Mbps.

1. Baud & bits per second (bps,Kbps,Mbps,Gbps,Tbps)- It's used to measurement for the information carry of a communication channel. It is synonymous with bps (bits per second).

### Measurement Units :-bit

- 1 Byte= 8 bits
- 1 KBps ( Kilo Byte Per Second)= 1024 Bytes ,
- 1 Kbps (kilobits Per Second) = 1024 bits,
- 1 Mbps ( Mega bits Per Second )=1024 Kbps
- 1Gbps(Giga bits per second)=1024 Mbps
- 1 Tbps(terabit per second)=1024 Gbps

**Bandwidth (Hz, KHz,MHz) -- It is amount of information transmitted or receives per unit time.**

It is measuring in Hz,KHz etc unit.

OR

It refers to the data carrying capacity of a channel or medium. Higher bandwidth communication channels support higher data rates

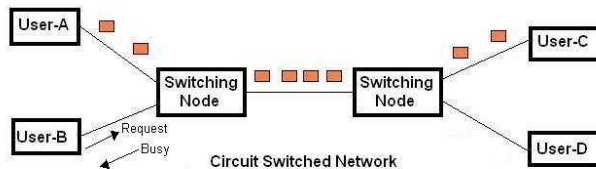
- **Data channel** - The information / data carry from one end to another in the network by channel.

## Switching Techniques

**Circuit Switching- In circuit switching network dedicated channel has to be established before the call is made between users. The channel is reserved between the users till the connection is active. It is mainly used for voice communication requiring real time services without any much delay.**

OR

Circuit Switching - In this technique, first the complete physical connection between two computers is Established and then data are transmitted from the source computer to the destination computer.



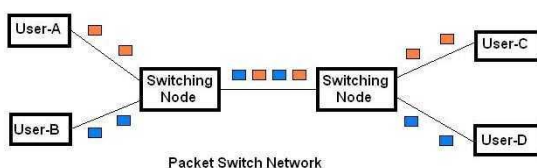
As shown in the figure 1, if user-A wants to use the network; it need to first ask for the request to obtain the one and then user-A can communicate with user-C. During the connection phase if user-B tries to call/communicate with user-D or any other user it will get busy signal from the network. E.g. Telephone call

**Packet Switching- In packet switching network unlike Circuit Switched network, it is not required to establish the connection initially.**

The connection/channel is available to use by many users. But when capacity or number of users increases then it will lead to congestion in the network. Packet switched networks are mainly used for data and voice applications requiring non-real time scenarios.

In Packet Switching, messages are broken up into packets and each of which includes a header with source, destination and intermediate node address information.

Individual Packets in packet switching technique take different routes to reach their respective destination.



As shown in the figure 2, if user-A wants to send data/information to user-C and if user-B wants to send data to user-D, it is simultaneously possible. Here information is padded with header which contains addresses of source and destination. This header is sniffed by intermediate switching nodes to determine their route and destination.E.g. Email

### Comparison b/w Circuit and Packet Switched Network

- In Packet switched networks quality of service is not guaranteed while in circuit switched networks quality is guaranteed.
- Packet switched is used for time insensitive applications such as internet/email/SMS/MMS/VOIP etc.  
In circuit switched even if user is not talking the channel cannot be used by any other users, this will waste the resource capacity at those intervals.
- Packet Switching In this there us a fixed size of packet. In this, data packets are stored in the main memory. This improves the access time.  
Circuit switching In this, firstly complete physical connection between two computers is established. After that data are transmitted from the source computer to the destination computer. E.g. In telephone call, circuit switching is used.

### Message Switching

- message switching network is sometimes called as Store and Forward Switching.
- In this Each intermediate device receive the message and store it until the nest device is ready to receive it and then this message is forwarded to the next device.
- The storing and Forwarding introduces the concept of delay. For this reasons this switching is not recommended for real time applications like voice and video.
- In case of Message Switching it is not necessary to established a dedicated path in between any two communication devices.

### Differentiate between message switching and packet switching

Ans: Message Switching – In this form of switching no physical copper path is established in advance between sender and receiver. Instead when the sender has a block of data to be sent, it is stored in first switching office, then forwarded later.

Packet Switching – With message switching there is no limit on block size, in contrast packet switching places a tight upper limit on block size.

**Transmission media** is a pathway that carries the information from sender to receiver.

Transmission media is broadly classified into two groups.

1. **Wired or Guided Media or Bound Transmission Media-** are the cables that are tangible or have physical existence and are limited by the physical geography. E.g. twisted pair cable, co-axial cable and fiber optical cable.
2. **Wireless or Unguided Media or Unbound Transmission Media-** are the ways of transmitting data without using any cables.e.g. Microwave, Radio wave, Infra red,Satellite

### COAXIAL CABLE:

Coaxial cable is very common & widely used commutation media. For example TV wire is usually coaxial.

Coaxial cable gets its name because it contains two conductors that are parallel to each other. The center conductor in the cable is usually copper. The copper can be either a solid wire or stranded martial.

CHARACTERISTICS OF COAXIAL CABLE	ADVANTAGES COAXIAL CABLE	DISADVANTAGE COAXIAL CABLE
<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Easy to install</li> <li>• Up to 10Mbps capacity</li> <li>• Medium immunity form EMI</li> <li>• Medium of attenuation</li> </ul>	<ul style="list-style-type: none"> <li>• Inexpensive</li> <li>• Easy to wire</li> <li>• Easy to expand</li> <li>• Moderate level of EMI immunity</li> </ul>	<ul style="list-style-type: none"> <li>• Single cable failure can take down an entire network</li> </ul>

### Twisted Pair Cable

- The most popular network cabling is Twisted pair.
- It is light weight, easy to install,
- inexpensive and support many different types of network.
- It also supports the speed of **100 mps.**
- Twisted pair cabling is made of pairs of solid or stranded copper twisted along each other.

- The twists are done to reduce vulnerability to EMI and cross talk. E.g. in telephone lines
- There are two types of twisted pairs cabling

1. Unshielded twisted pair (UTP)

Characteristics of UTP	Advantages of UTP	Disadvantages of UTP
<ul style="list-style-type: none"> <li>• low cost</li> <li>• easy to install</li> <li>• High speed capacity</li> <li>• High attenuation</li> <li>• Effective to EMI</li> <li>• 100 meter limit</li> </ul>	<ul style="list-style-type: none"> <li>• Easy installation</li> <li>• Capable of high speed for LAN</li> <li>• Low cost</li> </ul>	<ul style="list-style-type: none"> <li>• Short distance due to attenuation</li> </ul>

2. Shielded twisted pair (STP)

Characteristics of STP	Advantages of STP:	Disadvantages of STP:
<ul style="list-style-type: none"> <li>▪ Medium cost</li> <li>▪ Easy to install</li> <li>▪ Higher capacity than UTP</li> <li>▪ Higher attenuation, but same as UTP</li> <li>▪ Medium immunity from EMI</li> <li>▪ 100 meter limit</li> </ul>	<ul style="list-style-type: none"> <li>• Shielded</li> <li>• Faster than UTP and coaxial</li> </ul>	<ul style="list-style-type: none"> <li>• More expensive than UTP and coaxial</li> <li>• More difficult installation</li> <li>• High attenuation rate</li> </ul>

**Fiber Optics**

Fiber optic cable uses electrical signals to transmit data. It uses light. In fiber optic cable light only moves in one direction for two way communication to take place a second connection must be made between the two devices. It is actually two stands of cable. Each stand is responsible for one direction of communication.

It consists of three parts:

1. The core: glass or plastic through which the light travels.
2. The cladding : covers the core and reflects light back to the core
3. Protective coating : protects the fiber

Characteristics Of Fiber Optic Cable:	Advantages Of Fiber Optic Cable:	Disadvantages Fiber Optics:
<ul style="list-style-type: none"> <li>• Expensive</li> <li>• Very hard to install</li> <li>• Capable of extremely high speed</li> <li>• Extremely low attenuation</li> <li>• No EMI interference</li> </ul>	<ul style="list-style-type: none"> <li>• Fast</li> <li>• Low attenuation</li> <li>• No EMI interference</li> <li>• Not affected by any kind of noise.</li> <li>• High transmission capacity</li> <li>• Speed of Light</li> <li>• Suitable for broadband communication</li> </ul>	<ul style="list-style-type: none"> <li>• Hard to install</li> <li>• Installation requires care.</li> <li>• Connecting two Optical fibers is difficult.</li> <li>• Optical fibers are more difficult to solder</li> <li>• Most expensive</li> </ul>

Note: Attenuation is a general term that refers to any reduction in the strength of a signal. Attenuation occurs with any type of signal, whether digital or analog. Sometimes called loss.

Electromagnetic interference (EMI), also called radio-frequency interference (RFI) when in the radio frequency spectrum, is a disturbance generated by an external source that affects an electrical circuit by electromagnetic induction, electrostatic coupling, or conduction

Que : Write difference between coaxial and optical cable.

Ans: Coaxial cable consists of a solid wire core surrounded by one or more foil or wire shield , each separated by some kind of plastic insulator. Optical fibers consists of thin strands of glass or glass like material which are so constructed that they carry light from a source at one end of the fiber to a detector at the other end.

Q : How is coaxial cable different of optical fibre?

Ans: The data transmission characteristics of coaxial cable are considerably better than twisted pair but not better in relation to optical fibre. The coaxial cable is being used as a shared cable network, with part of the bandwidth being used for data traffic.

Optical fibre is difficult to install because they are fragile and need special care to install. One of the major advantages of optical fibre over coaxial cable is its complete immunity to noise, because the information is travelling on a modulated light beam.

**Unguided Media:-** Unguided media transport electromagnetic waves without using a physical conductor. This type of communication is often referred to as wireless communication.

The mediums used in wireless communications are air, vacuum and even water. Air is the most commonly used medium.

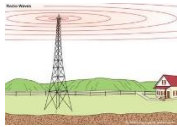
**Radio waves** – are used to transmit television and radio programs.

**Microwaves** – are used to transmit satellite television and for mobile phones.

**Infrared** – is used to transmit information from remote controls.

**Visible light** – is used in photography.

**Radiowaves-** Radio waves are normally omnidirectional. When an antenna transmits radio waves, they are propagated in all directions. This means that the sending and receiving antennas do not have to be aligned. The omnidirectional characteristics of radio waves make them useful for multicasting, in which there is one sender but many receivers. Our AM and FM radio stations, cordless phones and televisions are examples of multicasting.



The Disadvantage of Radio waves

Radio waves transmitted by one antenna are susceptible to interference by another antenna that is sending signals of the same frequency

**INFRARED** - Infrared is used in devices such as the mouse, wireless keyboard and printers. Some manufacturers provide a special port called the IrDA port that allows a wireless keyboard to communicate with a PC.

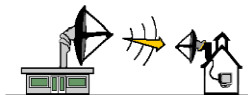
Infrared signals have frequencies between 300 GHz to 400 THz. They are used for short-range communication.

Infrared signals have high frequencies and cannot penetrate walls. Due to its short-range communication system, the use of an infrared communication system in one room will not be affected by the use of another system in the next room.e.g. TV remote control in our home .

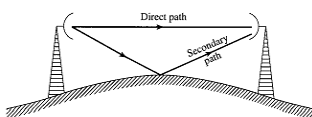
***THE DISADVANTAGES OF USING INFRARED***

Infrared signals cannot be used for long distance communication. In addition, we cannot use infrared waves outside a building because sun's rays contain infrared waves that can interfere with communication.

**Microwaves-**Microwaves are transmitted from the transmitters placed at very high towers to the receivers at a long distance.



Microwaves are transmitted in line of sight fashion, and also propagated through the surfaces.



Advantages

- Maintenance easy than cables.
- Suitable when cable can not be used.

Disadvantages

- Repeaters are required for long distance communication.
- Less Bandwidth available

Satellite

Geostationary satellites are placed around 36000 KM away from the earth's surface. In satellite communication transmitting station transmits the signals to the satellite. (It is called up-linking). After receiving the signals (microwaves) it amplifies them and transmit back to earth in whole visibility area. Receiving stations at different places can receive these signals. (It is called down-linking).



Advantage

- Area coverage is too large

Disadvantage

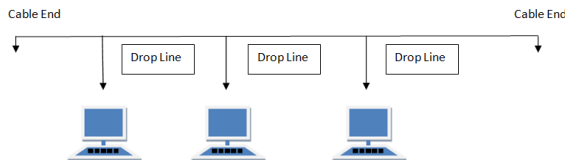
- High investment

### Types of Network Topology

Topology - is the arrangement of the various elements (links, nodes, etc.) of a computer network.

#### **BUS Topology**

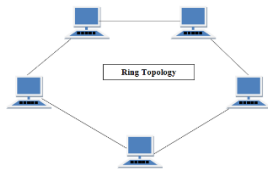
Bus topology is a network type in which every computer and network device is connected to single cable. When it has exactly two endpoints, then it is called Linear Bus topology.



<ul style="list-style-type: none"> <li>▪ Features of Bus Topology</li> <li>▪ It transmits data only in one direction.</li> <li>▪ Every device is connected to a single cable</li> </ul>	<ul style="list-style-type: none"> <li>▪ Advantages of Bus Topology</li> <li>▪ It is cost effective.</li> <li>▪ Cable required is least compared to other network topology.</li> <li>▪ Used in small networks.</li> <li>▪ It is easy to understand.</li> <li>▪ Easy to expand joining two cables together.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Disadvantages of Bus Topology</li> <li>▪ Cables fails then whole network fails.</li> <li>▪ If network traffic is heavy or nodes are more the performance of the network decreases.</li> <li>▪ Cable has a limited length.</li> <li>▪ It is slower than the ring topology.</li> </ul>
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#### **RING Topology**

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbours for each device.

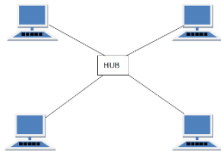


<p>Features of Ring Topology</p> <ul style="list-style-type: none"> <li>▪ A number of repeaters are used for Ring topology with large number of nodes, because if someone wants to send some data to the last node in the ring topology with 100 nodes, then the data will have to pass through 99 nodes to reach the 100th node. Hence to prevent data loss repeaters are used in the network.</li> <li>▪ The transmission is unidirectional, but it can be made bidirectional by having 2 connections between each Network Node, it is called Dual Ring Topology.</li> <li>▪ In Dual Ring Topology, two ring networks are formed, and data flow is in opposite direction in</li> </ul>	<p>Advantages of Ring Topology</p> <ul style="list-style-type: none"> <li>▪ Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.</li> </ul>	<p>Disadvantages of Ring Topology</p> <ul style="list-style-type: none"> <li>▪ Troubleshooting is difficult in ring topology.</li> <li>▪ Adding or deleting the computers disturbs the network activity.</li> <li>▪ Failure of one computer disturbs the whole network.</li> </ul>
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<p>them. Also, if one ring fails, the second ring can act as a backup, to keep the network up.</p> <ul style="list-style-type: none"> <li>Data is transferred in a sequential manner that is bit by bit. Data transmitted, has to pass through each node of the network, till the destination node.</li> </ul>	<ul style="list-style-type: none"> <li>Cheap to install and expand</li> </ul>	
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### STAR Topology

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all other nodes are connected to the central node.



<p><b>Features of Star Topology</b></p> <ul style="list-style-type: none"> <li>Every node has its own dedicated connection to the hub.</li> <li>Hub acts as a repeater for data flow.</li> <li>Can be used with twisted pair, Optical Fibre or coaxial cable.</li> </ul>	<p><b>Advantages of Star Topology</b></p> <ul style="list-style-type: none"> <li>Fast performance with few nodes and low network traffic.</li> <li>Hub can be upgraded easily.</li> <li>Easy to troubleshoot.</li> <li>Easy to setup and modify.</li> <li>Only that node is affected which has failed, rest of the nodes can work smoothly.</li> </ul>	<p><b>Disadvantages of Star Topology</b></p> <ul style="list-style-type: none"> <li>Cost of installation is high.</li> <li>Expensive to use.</li> <li>If the hub fails then the whole network is stopped because all the nodes depend on the hub.</li> <li>Performance is based on the hub that is it depends on its capacity</li> </ul>
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### TREE Topology

It has a root node and all other nodes are connected to it forming a hierarchy. It is **also called hierarchical topology**. It should at least have three levels to the hierarchy.



<ul style="list-style-type: none"> <li>Features of Tree Topology</li> <li>Ideal if workstations are located in groups.</li> <li>Used in Wide Area Network.</li> </ul>	<ul style="list-style-type: none"> <li>Advantages of Tree Topology</li> <li>Extension of bus and star topologies.</li> <li>Expansion of nodes is possible and easy.</li> <li>Easily managed and maintained.</li> <li>Error detection is easily done.</li> </ul>	<ul style="list-style-type: none"> <li>Disadvantages of Tree Topology</li> <li>Heavily cabled.</li> <li>Costly.</li> <li>If more nodes are added maintenance is difficult.</li> <li>Central hub fails, network fails.</li> </ul>
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Q Write two advantage and disadvantage of networks.

Ans **Advantage:**

- We can share resources such as printers and scanners.
- Can share data and access file from any computer.

**Disadvantage:**

- Server faults stop applications from being available.
- Network faults can cause loss of data.

Q What are the factors that must be considered before making a choice for the topology?

Ans There are number of factors to consider in before making a choice for the topology, the most important of which are as following : (a) Cost. (b) Flexibility (c) Reliability

Q What are the similarities and differences between bus and tree topologies?

Ans . **Similarities:**

- In both Bus and Tree topologies transmission can be done in both the directions, and can be received by all other stations.
- In both cases, there is no need to remove packets from the medium.

**Difference:**

- Bus topology is slower as compared to tree topology of network.
- Tree topology is expensive as compared to Bus Topology

Q What are the limitations of star topology?

Ans

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

Q When do you think, ring topology becomes the best choice for a network?

Ans Ring topology becomes the best choice for a network when,

- Short amount of cable is required.
- No wiring closet space requires

Q .Write the two advantages and two disadvantages of Bus Topology in network.

Ans **Advantage:**

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

**Disadvantage :**

- Slower as compared to tree and star topologies of network
- Breakage of wire at any point disturbs the entire network

Q Briefly mention two advantages and two disadvantages of Star Topology in network.

Ans **Advantage:**

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

**Disadvantage :**

- Requires more cable length than a linear topology.
- If the hub, switch, or concentrator fails, nodes attached are disabled.

Q. Write two disadvantages of twisted pair cables.

Ans **Disadvantage :**

- It is not capable of carrying signal to long distance.
- It connects only up to 100 meters.

**Personal Area Network**

A personal area network, or PAN, is a computer network organized around an individual person within a single building. This could be inside a small office or residence. A typical PAN would include one or more computers, telephones, peripheral devices, video game consoles and other personal entertainment devices.

If multiple individuals use the same network within a residence, the network is sometimes referred to as a home area network, or HAN.

**Local Area Network**

A local area network, or LAN, consists of a computer network at a single site, typically an individual office building. A LAN is very useful for sharing resources, such as data storage and printers. LANs can be built with relatively inexpensive hardware, such as hubs, network adapters and Ethernet cables.

The smallest LAN may only use two computers, while larger LANs can accommodate thousands of computers

**Metropolitan Area Network**

A metropolitan area network, or MAN, consists of a computer network across an entire city, college campus or small region. A MAN is larger than a LAN, which is typically limited to a single building or site. Depending on the configuration, this type of network can cover an area from several miles to tens of miles. A MAN is often used to connect several LANs together to form a bigger network.

When this type of network is specifically designed for a college campus, it is sometimes referred to as a campus area network, or CAN.

## Wide Area Network

A wide area network, or WAN, occupies a very large area, such as an entire country or the entire world. A WAN can contain multiple smaller networks, such as LANs or MANs. The Internet is the best-known example of a public WAN.

Que: What is the difference between WAN and MAN?

Ans: MAN (Metropolitan Area Network) is the network spread over a city.

WAN (Wide Area Network) spread across countries

Que : What term we use for a software/hardware device, which is used to block, unauthorized access while permitting authorized communications. This term is also used for a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy for all(in and out) computer traffic between different security domains based upon a set of rules and other criteria.

Ans : Firewall

Q What is the difference between LAN and WAN?

A LAN The network which is confined to a building or a block is called local area network, e.g.school.

WAN The network which is spread across country or continent is called wide area network, e.g. Internet.

## NETWORK DEVICES

**Modem:** A device that enables a computer to transmit data over, telephone or cable lines. . A modem converts between these two forms. It modulates an analogue carrier signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information. This is why modem is an acronym of MODulator/DEModulator. The goal of this process of modulation - demodulation is to produce a signal that can be transmitted easily and decoded to reproduce the original digital data.

**Ethernet Card-** An Ethernet card is a **kind of network adapter** and is also known as Network Interface Card (NIC). These adapters support the Ethernet standard for high-speed network connections via cables. An Ethernet Card contains **connections for either coaxial or twisted pair cables or even for fibre optic cable.**

Newer Ethernet cards are installed usually by the manufacturer inside the desktop computers that resemble credit cards are readily available for laptop and other mobile computers. These insert conveniently into slots on the side or front of the device.

**RJ-45:** RJ-45 , short form of Registered Jack - 45 , is an eight wired connector that is used to connect computers on a local area network(LAN), especially Ethernet. RJ-45 connectors look similar to the RJ-11 connector used for connecting telephone equipment, but they are somewhat wider.

**Switch:** A small hardware device that joins multiple computers together within a LAN. It is used to break a network into different sub-networks called subnet or LAN segments. This prevents traffic overloading on the network. Switches are another fundamental part of many networks because they speed things up. They allow different nodes of a network to communicate directly with one another in a smooth and efficient manner. In simple terms, a network switch is a small hardware device that joins multiple computers together within one local area network (LAN).

*Network switches appear nearly identical to network hubs, but a switch generally contains more intelligence than a hub. We can say that a switch is an intelligent hub and is obviously more expensive than a hub. Unlike hubs, network switches are capable of inspecting data packets as they are received, determining the source and destination device of each packet, and forwarding them appropriately. By delivering messages only to the connected device intended, a network switch conserves network bandwidth and offers generally better performance than a hub.*

**Repeater:** An electronic device that amplifies the received signal and then retransmits it on the network .

*Active hubs, for example, are repeaters. Active hubs are sometimes also called "multiport repeaters," but more commonly they are just "hubs."*

In WiFi, access points may function as repeaters.

A repeater cannot do the intelligent routing performed by bridges and routers. It cannot filter the traffic to ease congestion and also cannot work across multiple network architectures.

**Router:** A network device that connects two networks with different protocols. g. Routers provide connectivity inside enterprises, between enterprises and the Internet, and within an Internet Service Provider (ISP). Routers can be wireless or wired.

**Gateway:** A network device that **connects two dissimilar networks.**

The computers that control traffic within your company's network or at your local Internet Service Provider (ISP) are gateway nodes.

A network gateway can be implemented completely in software, completely in hardware, or as a combination of both. In the network for an enterprise, a computer server acting as a gateway node is often also acting as a proxy server and a firewall server. Here a proxy server is a node that is not actually a server but just appears to be so and a firewall is a system designed to prevent unauthorised access to or from a private network.

*A gateway is often associated with both a router, which knows where to direct a given packet of data that arrives at the gateway, and a switch, which furnishes the actual path in and out of the gateway for a given packet. It expands the functionality of the router by performing data translation and protocol conversion.*

*You will sometimes see the term default gateway on network configuration screens in Microsoft Windows.*

*In computer networking, a default gateway is the device that passes traffic from the local subnet to devices on other subnets.*

*The default gateway often connects a local network to the Internet, although internal gateways for local networks also exist.*

**Wi-Fi card:** A small, portable card that allow your computer to connect to the internet through a wireless network.

***Wi-Fi transmission is through the use of radio waves.*** s. The antenna transmits the radio signals and these signals are picked up by Wi-Fi receivers such as computers and cell phones equipped with Wi-Fi cards. These devices have to be within the range of a Wi-Fi network to receive the signals. The Wi-Fi card then reads the signals and produces a wireless internet connection. Once a connection is established between user and the network, the user will be prompted with a login screen and password if the connection being established is a secure connection.

***Wi-Fi cards can be external or internal.*** If a Wi-Fi card is not installed in your computer, you may purchase a USB antenna attachment and have it externally connected to your device. Many newer computers, mobile devices etc. are equipped with wireless networking capability and do not require a Wi-Fi card.

**Wi-Fi-** Wi-Fi is the name of a popular wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections. Wi-Fi is simply a trademarked phrase that means IEEE 802.11x.

Wi-Fi networks have no physical wired connection between sender and receiver by using radio frequency (RF) technology -- a frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space.

**Wi-fi Max** - Acronym for Worldwide Interoperability ***for Microwave Access***, it is Based on Wireless MAN technology. It is a wireless technology optimized for the delivery of IP centric services over a wide area, it is a scalable wireless platform for constructing alternative and complementary broadband networks.it is a certification that denotes interoperability of equipment built to the IEEE 802.16 or compatible standard.

WiMAX is one of the hottest broadband wireless technologies around today. WiMAX systems are expected to deliver broadband access services to residential and enterprise customers in an economical way.

Loosely, WiMax is a standardized wireless version of Ethernet intended primarily as an alternative to wire technologies (such as Cable Modems, DSL and T1/E1 links) to provide broadband access to customer premises.

WiMAX would operate similar to WiFi, but at higher speeds over greater distances and for a greater number of users. WiMAX has the ability to provide service even in areas that are difficult for wired infrastructure to reach and the ability to overcome the physical limitations of traditional wired infrastructure.

### Exercise

1. Explain the following devices: (a.) Switch (b.) Repeater (c.) Router (d.) Gateway (e.) Wi-Fi Card

2. Show a network layout of star topology and bus topology to connect 4 computers.
3. Ms. Anjali Singh, in charge of Knowledge centre in ABC school, recently discovered that the communication between her centre and the primary block of the school is extremely slow and signals drop quite frequently. The distance between these two blocks is 140 meters.
  - a. Name the type of network.
  - b. Name the device which may be used for smooth communication.
4. ABC International School is planning to connect all computers, each spread over distance of 50 meters. Suggest an economic cable type having high speed data transfer to connect these computers.
5. Sahil wants to transfer data across two continents at very high speed. Write the name of the transmission medium that can be used to do the same. Write the type of network also.
6. Mayank wants to transfer data within a city at very high speed. Write the name of the wired transmission medium that he should use. Write the type of network also.
7. Mr. Akash wants to send/receive email through internet. Which protocol will be used for this purpose?
8. Answer the following questions in the context of a computer lab with 100 computers.
  - a. Which device is used to connect all computers inside the lab?
  - b. Which device is used to connect all computers to the internet using telephone wire?
9. Name the device that establishes an intelligent connection between a local network and external network with completely different structures.
10. Name the network device that works like a bridge to establish connection between two networks but it can also handle networks with different protocols.

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## NETWORK PROTOCOL

**Protocol:** A special set of rules that two or more machines on a network follow to communicate with each other.

### Some of the important protocols being used are as follows:

**Transmission Control Protocol / Internet protocol(TCP/IP)** -TCP/IP are the two protocols that are used together and together they form the backbone protocol of the internet. They can also be used for private networks i.e. intranets and extranets. When you are set up with direct access to the Internet, your computer is provided with a copy of the TCP/IP program  
TCP/IP has two major components: TCP and IP.

**Transmission Control Protocol(TCP):** The Transmission Control Protocol(TCP) breaks the data into packets that the network can handle efficiently. It manages the assembling of a message or file into smaller packets that are transmitted over the Internet. It verifies all the packets when they arrive at the destination computer and then reassembles them in proper order.

**Internet protocol(IP):** It gives distinct address (called IP address) to each data packet. An IP address is a unique identifier for a node or host connection on an IP network. An IP address is a 32 bit binary number usually represented as 4 decimal values, each representing 8 bits, in the range 0 to 255 (known as octets) separated by decimal points. This is known as "dotted decimal" notation

**File Transfer Protocol(FTP):** It is used for transferring files from one system to another on the internet. FTP establishes two connections between the hosts. One connection is used for data transfer and the other for control information. The control connection remains connected during the entire interactive FTP session while the data connection is opened and closed for each file transfer. FTP can transfer both ASCII i.e. plain text and binary files but the mode has to be set in the FTP client.

**HyperText Transfer Protocol(HTTTP):** It is the protocol that is used for transferring hypertext files on the World Wide Web. HTTP has three important features.

**Firstly**, it is connectionless. After a request is made, the client disconnects from the server and waits for a response. To process the request, the server has to re-establish the connection with the client.  
**Secondly**, HTTP is media independent. This means any type of data(text , images , sound , video etc.) can be sent by HTTP as long as both the client and server know how to handle the data content.

**Thirdly** HTTP is stateless. This is because the server and the client are aware of each other only during a request.

**Afterwards, they get disconnected. Hence neither the client nor the browser can retain information between different request across the web pages.**

**Point-to-Point Protocol(PPP):** It is used for communication between two computers using a serial interface. It was basically designed to help communication between two systems through telephone lines as it supports transmission of network packets over a serial point to point link. It supports

various authentication schemes such as Password Authentication Protocol(PAP) and Challenge Handshake Authentication protocol(CHAP).

**Simple Mail Transfer Protocol (SMTP):** It allows transmission of email over the Internet. SMTP has a major disadvantage that it is relatively easy to send a message with a fake sender address.

**Post Office Protocol 3(POP3):** It receives and holds email for an individual until they pick it up. (SMTP has a disadvantage that if the destination computer is not online, mails cannot be received. So the SMTP server receives the mail on behalf of every host and the respective host then interacts with the SMTP server to retrieve messages by using a client server protocol called POP3.)

**Many popular email programs, including Microsoft Outlook, are automatically designed to work with POP3.** Each POP3 mail server has a different address, which is usually provided to an individual by their web hosting company. This address must be entered into the email program so that the program can connect effectively with the protocol. The individuals receiving POP3 email will have to input their username and password in order to successfully receive email.

**Telnet: It is Remote Access Protocol.** Telnet protocol is used for creating a connection with a remote machine. Telnet clients are available for all major operating systems viz. Mac OS X, Windows, Unix, and Linux.

Telnet is most likely to be used by program developers and anyone who has a need to use specific applications or data located at a particular host computer. It gives the user the opportunity to be on one computer system and do work on another, which may be anywhere across the globe. Telnet provides an error free connection which is always faster than the latest conventional modems.

### **Chat Protocol and VOIP**

**Chatting-** A real time informal communication over the Internet is chatting. A chat program is software which is required for chatting over the internet. AOL Instant Messenger, Campfire, Internet Messenger, MSN Messenger are some commonly used chat programs.

**IRC (Internet Relay Chat):** IRC protocol is used for chatting. It is based on client/server model.

**VOIP:** VOIP stands for voice over internet protocol. It enables the transfer of voice using packet switched network rather than using public switched telephone network.

**ATA -** ATA stands for analog-to-digital converted. It is used to connect the telephone device to the computer. It takes the analog signals from the phone and converts them to digital signals. These digital signals can now be transmitted over the internet.

**Some providers also are bundling ATAs free with their service.**

**IP phones -** IP phones appear much like an ordinary telephone or cordless phone. They are directly connected to the router or the LAN. They have all the hardware and software necessary right onboard to handle the IP call. **IP Phones are sometimes called VoIP telephones, SIP phones or Soft phones.**

**Computer-to-computer -** It is the most easy and simplest way to use VoIP. The basic hardware requirements are as follows: Computer Internet Speakers Microphone The only cost involved with computer - to- computer VoIP is the monthly ISP fee.

### **Exercise**

1. Neha wants to upload and download files from/to a remote internal server. Write the name of the relevant communication protocol, which will let her do the same.
2. Meha wants to upload hypertext document on the internet. Write the name of protocol, which will let her do the same.
3. This protocol is used for communication between two personal computers using a serial interface and connected by a phone line. Write the name of the protocol.
4. This protocol is used to transfer email over internet. What is the name of the protocol?
5. This protocol is used to implement remote login. What is the name of the protocol?
6. This protocol is used for chatting between two groups or between two individuals. Write the name of the protocol.
7. This protocol is used to transfer of voice using packet switched network. Write the name of the protocol.
8. Explain Remote Access Protocol.
9. Why we need VoIP protocol?
10. Differentiate between FTP and HTTP.
11. Differentiate between VoIP and IRC.
12. Write the basic hardware requirements for VoIP.
13. Why TCP/IP based applications are considered to be stateless?

**The 1G Mobile System** was introduced in late 1970s and early 1980s. **The 1G mobile system was based on the *analog cellular technology*. They only had voice facility available and were based on circuit-switched technology.** In 1G mobile systems voice was modulated to a frequency of about 150MHz and higher. **They used radio towers for transmission.** The major **drawbacks of the 1G system were its low capacity, poor voice links and no security.**

### **Frequency Division Multiple Access(FDMA).**

In this, each user utilizes a portion of the frequency bandwidth available. Each user has its own frequency domain.

#### **CDMA**

It stands for **Code Division Multiple Access**. In this, **each user is allocated a unique code sequence.** On the sender's end, the data signal is encoded using the given unique code. The receiver decodes the signal according to the unique code and recovers the original data.

#### **TDMA**

It stands for Time Division Multiple Access. In this, each user is allowed to transmit only within specified time intervals. Different users transmit in different time slots. When users transmit, they occupy the whole frequency bandwidth.

### **The 2G mobile system**

They used digital signals for transmissions of voice. 2G enabled the mobile systems to provide paging, SMS, voicemail and fax services. Both voice and data conversations were digitally encrypted. **The 2G system was based on GSM technology.** GSM stands for Global System for Mobile Communication. **GSM technology is a combination of FDMA and TDMA.** With GSM, all subscriber and wireless provider information is stored on interchangeable modules known as SIM (Subscriber Identification Module) cards. By swapping out the SIM card, users can painlessly switch phones or providers. They used circuit switching.

They **used GPRS (General Packet Radio Service)** in addition to GSM. **With 2.5G services like MMS, sending pictures through e-mail became possible.** GPRS technology was also a major step towards 3G mobile system.

### **3G Mobile System**

The 3G technology adds multimedia facilities to 2G phones by allowing video, audio, and graphics applications. With the advent of **3G technology watching streaming video or video telephony became a reality.** The idea behind 3G is to have a single network standard instead of the different types adopted in the US, Europe, and Asia. **3G mobile systems are also known as Universal Mobile Telecommunications System (UMTS) or IMT-2000.** They can sustain higher data rates and open the door to many Internet style applications.

- A single family of compatible standards that can be used worldwide for all mobile applications.
- Support for both packet-switched and circuit-switched data transmission.
- Data rates up to 2 Mbps (depending on mobility).
- High bandwidth efficiency

#### **4G networks**

**4G networks** will be based on packet switching only. It will be able to support faster transmission. They are projected to provide speeds up to 100 Mbps while moving and 1Gbps while stationary. **It is a wireless access technology. 4G can provide better-than-TV quality images and video-links.**

#### **Network security**

**Network security** deals with policies adopted by network administrator to protect the network from unauthorized access and misuse of network resources. It also ensures that the authorized users have adequate access to all the network resources.

#### **VIRUS**

If you observe that your system

- takes longer time to load applications
- shows unpredictable program behaviour
- shows inexplicable changes in file sizes
- has inability to boot,
- has strange graphics appearing on your screen

This could be because of your computer being infected by a virus.

**Virus** is a malicious program that attaches itself to the host program. It is designed to infect the host program and gain control over the system without the owner's knowledge. The virus gets executed each time the host program is executed. Also it has the tendency to replicate. They can spread through external media such as CDs, browsing infected internet sites and from email attachments.

#### **Types of Viruses:**

- **File Virus:** These viruses infect and replicate when it gets attached to MS-DOS program files with EXE or COM extensions.
- **Boot sector virus:** These viruses infect the boot sector of floppy disks or hard drives. Boot sector of a drive contains program that participates in booting the system. A virus can infect the system by replacing or attaching itself to these programs
- **Macro virus:** These viruses infect and replicate using the MS Office program suite, mainly MS Word and MS Excel. The virus inserts unwanted words or phrases in the document.

#### **WORM**

*Worm is also a malicious program like a virus. But unlike viruses, it does not need to attach itself to a host program. A worm works by itself as an independent object. It uses security holes in a computer networks to replicate itself. A copy of the worm scans the network for another machine that has a specific security hole. It copies itself to the new machine using the security hole, and then starts replicating from there, as well.*

#### **Trojan horse**

A Trojan horse is a program that contains hidden malicious functions. Trojan Horses trick users into installing them by appearing to be legitimate programs. Once installed on a system, they reveal their true nature and cause damage. Some Trojan horses will contact a central server and report back information such as passwords, user IDs, and captured keystrokes. Trojans lack a replication routine and thus are not viruses by definition.

#### **SPAM**

The term spam means endless repetition of worthless text. In other words, unwanted messages or mails are known as Spam. At times internet is flooded with multiple copies of the same message, it is nothing but spam. Most spam is commercial advertising. In addition to wasting people's time, spam also eats up a lot of network bandwidth. When the user browses a website.

#### **Protection from SPAM**

1. Scramble your eMail address-We often have to share our eMail address online. It requires an attentive and intelligent mind to recognize a scrambled eMail address and re-assemble it into a functional format.

2. Hide your eMail address in an image-A similar solution is to hide the eMail address within an image. There are several tools that will do this for you. One which provides many other functions is EmailCover. Not only does it produce an image containing your eMail address in a CAPTCHA format, it also hosts the image and provides you with a set of links you can use to embed the image in your website, signature or on social network sites. Using the bookmark feature you can directly share your eMail address with the most popular sites. Finally, the tool records how often the image has been viewed.

3. Encode your eMail address-If you must post an active eMail link, for example to give people a quick and easy way to contact you, you can encode your eMail address in a way that is not readable by spambots, which extracts eMail addresses from websites.

4. Hide eMail behind a test-With a tool called scr.im, you can protect your eMail address by hiding it behind a simple test. At scr.im's start page you enter your eMail address and the site will provide you with an ultra short scrimmed URL, along with custom HTML to share your eMail address on Twitter, Facebook, within HTML documents and in forums. The link will lead anyone needing your eMail address to a quick test. If they manage to pass the test, they will be rewarded with a fully active link to your eMail address.

5. Don't share your eMail address-The last resort is to not share your eMail address at all. Set up temporary inboxes or forms through which you can be contacted indirectly. For example whspr! allows you to create a temporary form, which will relay messages to your eMail address. Users have to prove they are human by passing a CAPTCHA test.

#### **COOKIES**

When the user browses a website, the web server sends a text file to the web browser. This small text file is a cookie. Generally a cookie contains the name of the website from which it has come from and a unique ID tag.

Some cookies last only until the browser is closed. They are not stored on your hard drive. They are usually used to track the pages that you visit so that information can be customised for you for that visit. On the other hand, some cookies are stored on your hard drive until you delete them or they reach their expiry date. These may, for example, be used to remember your preferences when you use the website.

## **FIREWALL**

**A firewall is hardware or software based network security system.** It prevents unauthorized access (hackers, viruses, worms etc.) to or from a network. **Firewalls are used to prevent unauthorized internet users to access private networks connected to the Internet.**

A firewall examines all traffic routed between the two networks to see if it meets certain criteria. If it does, it is routed between the networks, otherwise it is stopped. A firewall filters both inbound and outbound traffic. **A firewall may allow all traffic through unless it meets certain criteria, or it may deny all traffic unless it meets certain criteria.**

## **Cybercrime**

Cybercrime is defined as a crime in which a computer and internet is used in an illegitimate way to harm the user. Cyber criminals may use computer technology to access personal information, business trade secrets, or use the internet for exploitive or malicious purposes. Cybercrimes can be against persons or against property or against the government. The list of Cyber Crimes includes

- harassment by computer (Cyber Stalking, defamation)
- pornography
- illegal downloads, plagiarism
- software piracy/counterfeiting, copyright violation of software, counterfeit hardware, black market sales of hardware and software, theft of equipment and new technologies
- fraud (credit card fraud, fraudulent use of ATM accounts, stock market transfers, telecommunications fraud), theft of (electronic) money

## **Cyber law**

**Cyber law** is an attempt to integrate the challenges presented by human activity on the internet with legal system of laws applicable to the physical world.

In the IT Act the word 'computer' and 'computer system' have been so widely defined and interpreted to mean any electronic device with data processing capability, performing computer functions like logical, arithmetic and memory functions with input, storage and output capabilities and therefore any high-end programmable gadgets like a washing machine or switches and routers used in a network can all be brought under the definition.

### **Some of the CYBER OFFENCES UNDER THE IT ACT**

- Tampering with computer source documents - Section 65
- Hacking -Section 66
- Publishing of information which is obscene in electronic form -Section 67

## **Intellectual property rights (IPR) issues**

Intellectual property rights are the rights given to an individual over the invention of their own. They usually give the creator an exclusive right over the use of his/her creation for a certain period of time.

There are only three ways to protect intellectual property

### **(i)Patent**

A Patent is a term used for a specific product designed by an individual. The designer is given exclusive rights over the patent for a limited period of time. With help of the patent right, the owner can stop others from making, using or selling the product design. The owner can take a legal action if someone uses the patent without his/ her permission

In order to obtain a patent, the following conditions should be met:

- The product should be new
- It should be capable of being made or used in some kind of industry
- It should not be a scientific or mathematical discovery
- It should not be a dramatic, musical dramatic or artistic work

### **(ii)Trademark**

Trademark can be defined as a name or a different sign or a device identifying a product or a service. The product or the service is produced or provided by a specific person or a company. A Trademark

is also known as brand name. It should be officially registered and legally restricted to the use of the specific person or the company.

### **(iii) Copyright**

Copyright is the term used for a written document. A legal action can be taken, if copyrights are violated. The following category of work can be considered for copyrights. E.g. literary works, musical works, including any accompanying words, dramatic works, including any accompanying music, pantomimes and choreographic works, pictorial, graphic and sculptural works, motion pictures and other audio visual works, sound recordings, architectural works, computer programs and websites.

### **HACKING**

The term was used for people who engaged themselves in harmless technical experiments and fun learning activities.

A computer enthusiast, who uses his computer programming skills to intentionally access a computer without authorization is known as hacking.

A hacker accesses the computer without the intention of destroying data or maliciously harming the computer.

*Another term commonly used with hacking is cracking.*

**Cracking** can be defined as a method by which a person who gains unauthorized access to a computer with the intention of causing damage.

## **Introduction to Web Services**

**HTML (Hypertext Markup Language)** HTML is language that helps in creating and designing web content. It is a markup language. It has a variety of tags and attributes for defining the layout and structure of the web document. It is designed to display the data in formatted manner. A HTML document has the extension .htm or .html. Hypertext is a text which is linked to another document.

### **XML (EXtensible Markup Language)**

1. XML is a markup language like HTML.
2. It is designed to carry or store data. In contrast to HTML, it is not designed to display data. Unlike HTML, it does not have predefined tags.
3. It is possible to define new tags in XML. It allows the programmer to use customized tags.
4. XML is case sensitive. XML is designed to be self descriptive. XML is a W3C recommendation. XML documents form a tree structure. For Example

```
<root>
<child>
<subchild>.....</subchild>
</child>
</root>
```

### **WWW (World Wide Web)**

WWW can be defined as a hypertext information retrieval system on the Internet. WWW consists of web pages, which use HTML to interchange information on the internet. All the webpages on WWW use HTTP transfer protocol for any information with the capability for making hypertext jumps

### **Web page**

Web page is an electronic document designed using HTML. It displays information in textual or graphical form. It may also contain downloadable data files, audio files or video files. Traversal from one webpage to another web page is possible through hyperlinks.

**A web page can be classified into two types:**

**(i) Static web page:** A web page which displays same kind of information whenever a user visits it, is known as a static web page. A static web page generally has .htm or .html as extension

**(ii) Dynamic web page:** An interactive web page is a dynamic webpage. A dynamic web page uses scripting languages to display changing content on the web page. Such a page generally has php, .asp, or .jsp as extension.

A scripting language is a programming language which can be embedded or integrated with other languages.

**Some of the most widely used scripting languages are JavaScript, VBScript, PHP, Perl, Python, Ruby, and ASP. They have been used extensively to create dynamic web pages.**

### **Dynamic web pages support two types of scripting:**

- **Client-Side Scripting** On some web pages the contents change in response to an action done by the user, for example a click from the mouse or a key press from a keyboard action. Such pages use client-side scripting. In this technology, the content is generated on the user's local computer.

### **VB Script and Java Script are examples of client-side scripting languages.**

- **Server -Side Scripting** Some web pages use applications running on the server to generate the web content. Such pages use server-side scripting language. Web page display the current time and date, forums, submission forms, shopping carts etc., use server-side scripting.

### **ASP, JSP, PHP are examples of server-side scripting languages.**

**Website:** Related webpages from a single web domain is termed as a website. A website has multiple webpages providing information about a particular entity.

**Web browser** Web browser is software program to navigate the web pages on the internet. A browser interprets the coding language of the web page and displays it in graphic form.

A web browser allows anyone to access the web without even knowing commands used in software languages to design a web page.

Internet works on client-server model. A web browser is a client which requests the information from the web server. The web server sends the information back to the client. The web address of the webpage written on the address bar tells the web browser which page to access.

#### **Web Browser is of two types:**

- Text based browsers
- Graphical browsers

### **URL (Uniform resource locator)**

Web address of the web page written on the address bar of the browser is known as the uniform resource locator (URL). A URL is a formatted text string used to identify a network resource on the Internet. Network resources are files that can be plain Web pages, text documents, graphics, downloadable files, services or programs. Every network resource on the web has a unique URL.

#### **The URL text string consists of three parts:**

- network protocol
- host name or address
- file or resource location

The textstring of a URL has the following format:  
protocol://server/path/resource

#### **Network Protocol**

The network protocol substring identifies the protocol to be used to access the network resource. These strings are short names followed by the three characters '://' . Other examples of protocols include http, gopher, wais, ftp and mailto.

#### **URL Host/Server**

The host name or address substring identifies the host/server that holds the resource. Hosts names are sometimes called domain names.

For example: www.School.com is a domain name

Host names are mapped into numeric IP addresses. The domain name www.school.com may have IP address 192.2.100.1.

An IP address is a binary number that uniquely identifies computers and other devices on a TCP/IP network. Services in the name of one host can be provided by many servers, which have different IP addresses. One server, with one IP address, can provide services in the name of many hosts. So there is not a one-to-one relationship between host name and IP address. It is more convenient for the user to remember a numeric IP address than the domain name.

Host names are mapped to IP addresses by a server known as a DNS server, or domain nameserver. DNS stands for Domain Name Service. In a large network, many DNS servers may collaborate to provide the mapping between host names and IP addresses.

### **URL Resource Location(URL)**

The file or resource location substring contains a path to one specific network resource on the host/server. Resources are normally located in a host directory or folder.

For example: www.school.com/syllabus/preprimary/nursery.htm is the location of this Web page including two subdirectories and the file name.

When the location element is omitted such as in http:// www.school.com/, the URL conventionally points to the root directory of the host and often a home page.

### **Web Server**

A Web server is a computer or a group of computers that stores web pages on the internet. It works on client/server model. It delivers the requested web page to web browser. Web servers use special programs such as Apache or IIS to deliver web pages over the http protocol.

Each server has a unique IP address and domain name. In order to access a webpage, the user writes the URL of the site on the address bar of the browser. The machine on which the browser is running sends a request to the IP address of the machine running the web server for that page. Once the web server receives that request, it sends the page content back to the IP address of the computer asking for it. The web browser then translates that content into all of the text, pictures, links, videos, etc.

A single web server may support multiple websites or a single website may be hosted on several linked servers.

### **Web hosting**

Web hosting is the process of uploading/saving the web content on a web server to make it available on WWW. In case a individual or a company wants to make its website available on the internet, it should be hosted on a web server.

### **Web 2.0**

The term web 2.0 was given by O'Reilly Media in 2004. Web 2.0 refers to new generation of dynamic and interactive websites.

Web 2.0 websites uses a new programming language called **AJAX (Asynchronous JavaScript and XML)**.

AJAX helps a dynamic website connect to the web server and download small amount of data based on the interaction with the user. In this technology only the part of the website which is updated is reloaded. The entire page does not get reloaded each time. This helps in making the website interactive.

### **Applications supported by web 2.0 are as followings:**

- blogging
- social bookmarking
- RSS
- wikis and other collaborative applications
- interactive encyclopaedias and dictionaries
- Advanced Gaming

**Cloud computing** is a type of computing that relies on *sharing computing resources* rather than having local servers or personal devices to handle applications.

In cloud computing, the word "cloud" is used for "*the Internet*," so the phrase *cloud computing* means "a type of Internet-based computing," where different services — such as servers, storage and applications — are delivered to an organization's computers and devices through the Internet. The cloud infrastructure is maintained by the cloud provider, not the individual cloud customer.

### **EXERCISE**

1. Mona is confused between the terms Domain name and URL. Explain the difference with the help of suitable example.
2. Identify the Domain name and URL from the following.  
<http://www.ABCSchool.in/home.aboutus.html>
3. Mr. Rohan wants to prevent unauthorized access to/from his company's local area network. Write the name of the system, which he should install to do the same.
4. Define the following with reference to threats to network security. (i) Worm (ii) Trojan Horse
5. In this mode, each user has its own frequency domain. Write the name of this accessing mode.
6. In this mode, each user is allocated with a unique code sequence. Write the name of this accessing mode.
7. In this mode, each user is allowed to transmit data only within specified time intervals. Write the name of this accessing mode.
8. It means endless repetition of worthless text. In other words, it contains unwanted messages or mails. What is the name of this concept?
9. When the user browses a website, the web server sends a text file to the web browser. What is the name of this?
10. It is defined as a crime in which a computer and internet is used in an illegitimate way to harm the user. What is the name of this crime?
11. A person who gains unauthorized access to a computer with the intention of causing damage. What is the name of this crime?