# UNIT-5: COMMUNICATION TECHNOLOGIES

## NETWORK

A network is any collection of independent computers that communicate with one another over a shared network medium for the purpose of sharing information and resources.

*Need/Advantages for networking*

1. Resource sharing - files and peripherals
2. Improving communication
3. Access to remote database

### *Evolution of Networking*

- In 1969 with the development of the first network called the ARPANET took place. The U.S. department of defence sponsored a project named ARPANET (Advanced Research Projects Agency Network) whose goal was to connect computers at different universities and U.S. defence.
- In mid 80s, the National Science Foundation created a new high capacity network called NSFnet which allowed only academic research on its network.
- So many private companies built their own networks, which were later interconnected along with ARPANET and NSFnet to form Internet - a network formed by linking two or more networks.

## INTERNET

The Internet is a system of linked networks that are worldwide in scope and facilitate data communication services such as remote login, file transfer, electronic mail, the World Wide Web and newsgroups. It connects many smaller networks together and allows all the computers to exchange information with each other through a common set of rules for communication. These rules are called protocols and the internet TCP/IP, FTP etc.

## INTER SPACE

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.

*Requirements of a Network*

- At least two computers - Server or Client workstation.
- Network Interface Cards (NIC)
- A connection medium (Guided /Unguided)
- Network Operating system software, such as Microsoft Windows NT or 2000, Novell NetWare, Unix and Linux.

## NETWORK TERMINOLOGIES

### 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.

### Server

A computer that facilitates sharing of data, software and hardware resources on the network is known as the server. Servers can be of two types:

a) Dedicated Servers: These are generally used on big network installations where one computer is reserved for server's job. It does not double up as a workstation but only manages the network.

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

### Network Interface Unit (NIU)

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

### MAC address.

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

### Bandwidth:

In electronic communication, bandwidth refers to the range of frequencies available for transmission of data. It is expressed as the difference in Hertz(Hz) between the highest frequency and the lowest frequency.

### Data Transfer rate

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. This can also be referred to as throughput, although data transfer rate applies specifically to digital data streams. Data transfer rate is often measured in bits per second (bps).

## SWITCHING TECHNIQUES

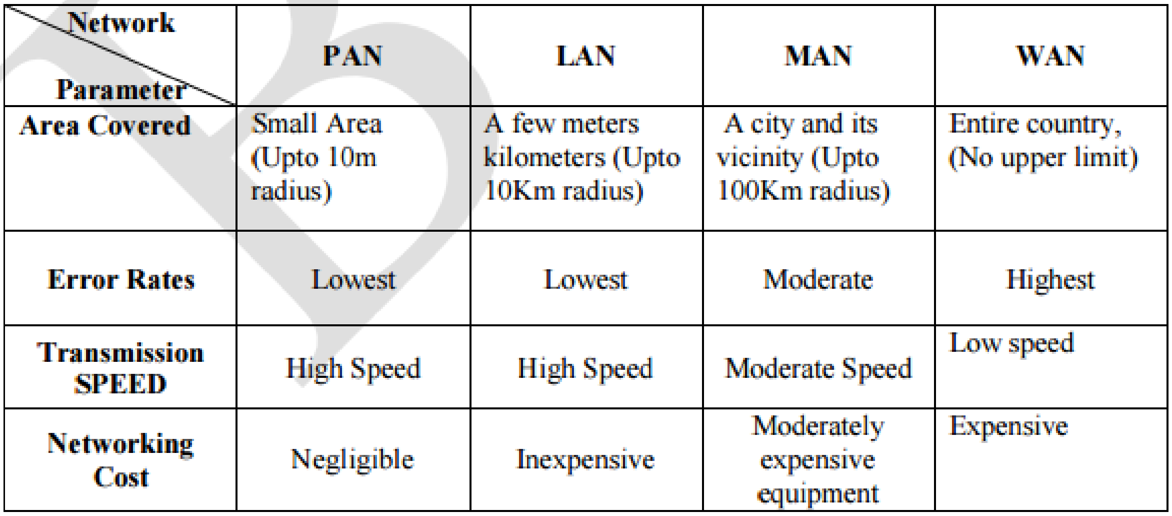
### Circuit Switching

- Circuit switching is a technique in which a dedicated and complete physical connection is established between two nodes and through this dedicated communication channel.
- The circuit guarantees the full bandwidth.

### Packet Switching

- Packet switching is a switching technique in which packets are routed between nodes over data links shared with other traffic.
- Each packet contains a "header" with information necessary for routing the packet from source to destination.
- the packets from many different sources can share a line, packets are generally accepted onto the network on a first-come, first-served basis. If the network becomes overloaded, packets are delayed or discarded ("dropped").

### Types of Networks: (Difference between LAN/WAN/MAN/PAN)



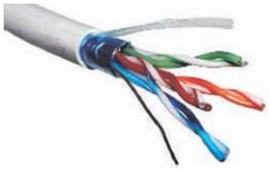
| Network<br>Parameter | PAN | LAN | MAN | WAN |
|---|---|---|---|---|
| Area Covered | Small Area (Upto 10m radius) | A few meters kilometers (Upto 10Km radius) | A city and its vicinity (Upto 100Km radius) | Entire country, (No upper limit) |
| Error Rates | Lowest | Lowest | Moderate | Highest |
| Transmission SPEED | High Speed | High Speed | Moderate Speed | Low speed |
| Networking Cost | Negligible | Inexpensive | Moderately expensive equipment | Expensive |

# TRANSMISSION MEDIA

**Wired Media or Guided Media:**

| Cable<br>Parameter ↓ | Twisted Pair Cable | Coaxial Cable | Optical Fiber Cable |
|---|---|---|---|
| **Data Transfer Rate** | 10mbps-10gpps | 100mbps | More than 100 Gbps |
| **Data Transfer Range** | 100m | 185m-500m | - |
| **Interference Susceptibility** | More | Less than Ethernet Cable | NIL |
| **Cost of Cable** | Least Cost | More than Ethernet | Very Expensive |

## 1. Twisted Pair Cables



*A twisted pair cable*

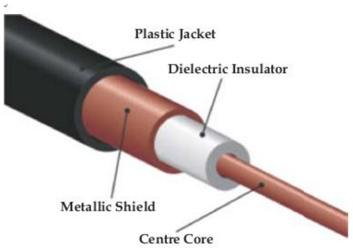
Advantages:

1. It is capable of carrying a signal over long distances without amplification.
2. It is simple, low weight, easy to install and easy to maintain.
3. It is an adequate and least expensive medium for low speed (up to 10 mbps) applications where the distance between the nodes is relatively small.

Disadvantages:

1.It can easily pick up noise signals.
2.Being thin in size, it is likely to break easily.
3.It is unsuitable for broadband applications.

## 2. Coaxial Cables



http://upload.wikimedia.org/wikipedia/commons/thumb/f/f4/Coaxial_cable_cutaway.svg/500px-Coaxial_cable_cutaway.svg.png

*A coaxial cable*

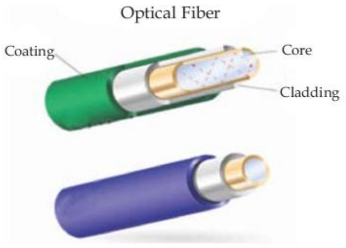
Advantages

1. Data transmission characteristics are better than that of twisted pair.
2. It can be used for broadband communication i.e. several channels can be transmitted simultaneously.
3. It offers high bandwidth (up to 400 mbps)

Disadvantages

1.It is expensive as compared to twisted pair cables

## 3.Optical Fibres



*Layers of an Optical Fiber*

Advantages

1. It is immune to electrical and magnetic interference.
2. It is highly suitable for harsh industrial environments.
3. It guarantees secure transmission and has a very high transmission capacity.
4. It can be used for broadband transmission where several channels can be handled in parallel.

Disadvantages

1.It is difficult to install and maintain since they are quite fragile.
2.It is most expensive of all cables.
3.Connecting two fibres together or even connecting the light source with the cable is a difficult
process. Hence connection loss is a common problem
4.Light can reach the receiver out of phase.

## Wireless Transmission Media

**Radio Waves** - Radio waves have a frequency range of 3 KHz to 3GHz. These waves are easy to generate, can travel long distances and can penetrate buildings easily. That's why they are widely used for communication, both indoors and outdoors.
Eg- Cordless phones, AM and FM radio broadcast, Garage door openers etc.

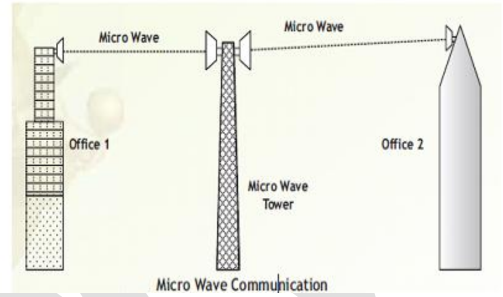
Omni Directional Radio waves

Characteristics of Radio Wave Transmission:

- These waves are Omni-directional, so the transmitting and receiving antennas need not be aligned.
- It offers ease of communication over difficult terrain
- Less secure mode of transmission

**Micro Waves** - Micro waves have a frequency range of 300MHz (0.3 GHz) to 300 GHz. This range has some overlapping portion (0.3GHz - 3GHz) with radio waves as there is no clear-cut demarcation between radio waves and micro waves. Microwaves travel in straight lines and cannot penetrate any solid object.

- Its Free from land acquisition rights
- The transmission is in straight lines so the transmitting and receiving antennas need to be properly aligned ( line of sight transmission)



Micro Wave Communication

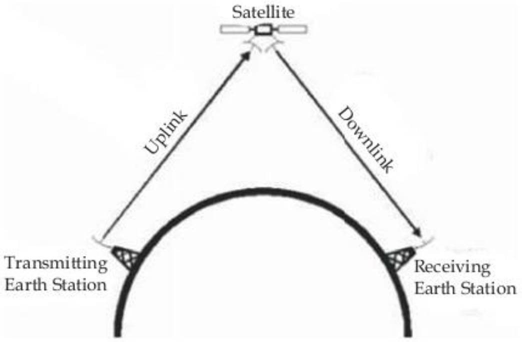
**Infrared Waves** - Infrared waves have a frequency range of 300 GHz to 400 THz.
Characteristics of Infrared Wave Transmission:

- It is a line of sight transmission; therefore information passed to one device is not leaked to another device.
- No government license is required for their use
- The waves do not cross any solid object in between

**Bluetooth** - Bluetooth technology uses radio waves in the frequency range of 2.402 GHz to 2.480 GHz. This technology is used for short range communication (approx. 10m) in a variety of devices for wireless communication.
Eg- Baby monitors, door openers, and cell phones

**Satellite Link -** Satellite links are used for very long distance wireless communication which may range from intercity to intercontinental.

- This system is expensive
- Requires legal permissions.



*http://www.radio-electronics.com/info/satellite/communications_ satellite/communications_satellite.gif*

*Fig: Satellite Communication*

## TOPOLGIES

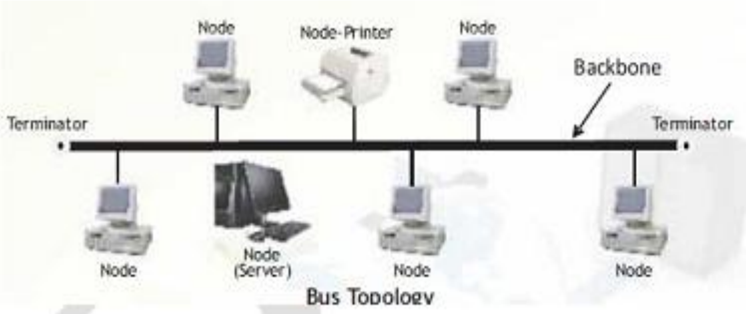
**Bus Topology:** In bus topology all the nodes are connected to a main cable called backbone.

Advantages of Bus Topology

i) Since there is a single common data path connecting all the nodes, the bus topology uses a very short cable length which considerably reduces the installation cost.
ii) The linear architecture is very simple and reliable.
iii) Additional nodes can be easily connected.

Disadvantages of Bus topology

i) Fault detection and isolation is difficult.
ii) If the central bus length becomes too long, then repeaters might have to be used to amplify the signal. The use of repeaters makes reconfiguration necessary.



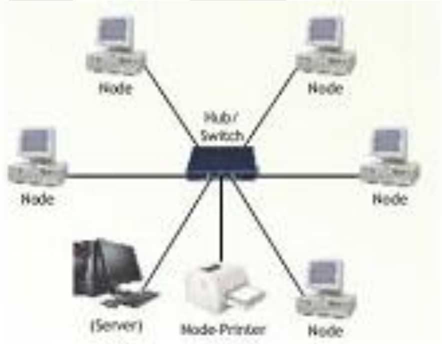
**Star Topology:** In star topology each node is directly connected to a hub/switch. If any node has to send some information to any other node, it sends the signal to the hub/switch. This signal is then broadcast (in case of a hub) to all the nodes but is accepted by the intended node(s).

Advantages of Star Topology

i) Failure of a single connection does not affect the entire network. It just involves disconnecting one node.
ii) Fault detection is easier.
iii) Access protocols being used in a Star network are very simple since the central node has the control of the transmission medium for data transmission

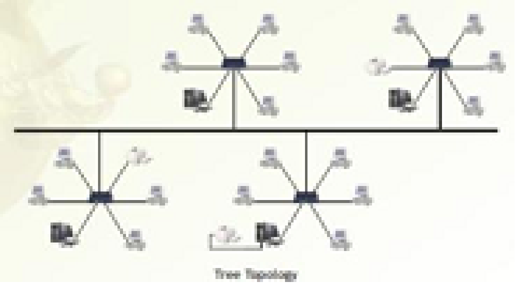
Disadvantages of Star Topology

i) Since every node is directly connected to the centre, so large amount of cable is needed which increases the installation cost of the network.
ii) The entire network is dependent on the central node. If the central node fails the entire network goes down.



**Tree Topology:** Tree topology is a combination of bus and star topologies. It is used to combine multiple star topology networks.

- All the stars are connected together like a bus.
- It integrates multiple star topologies together onto a bus.
- In its simplest form, only hub devices connect directly to the tree bus.
- Tree topology is best suited for applications which have a hierarchical flow of data and control.



## NETWORK DEVICES

**Modem**

A modem (Modulator - Demodulator) is a peripheral device that enables a computer to transmit data over, telephone or cable lines. It modulates an analogue signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information.

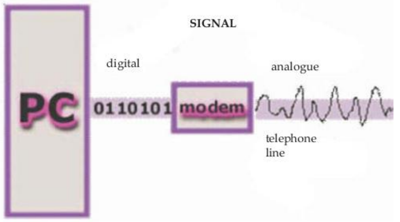


*Fig: Working of a Modem*

### 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.

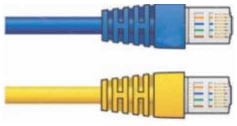


Fig: RJ-45

### NIC:

Any computer which has to be a part of a computer network must have an NIC (Network Interface / Unit) installed in it. An NIC (Network Interface Card) is a device that enables a computer to connect to a network and communicate.

### HUB:

A Hub is an electronic device that connects several nodes to form a network and redirects the received information to all the connected nodes in broadcast mode.

### SWITCH:

A Switch is an intelligent device that connects several nodes to form a network and redirects the received information only to the intended node(s).

### REPEATER :

A Repeater is a device that is used to regenerate a signal which is on its way through a communication channel. A repeater regenerates the received signal and re-transmits it to its destination.

### GATEWAY:

A Gateway is a device, which is used to connect different types of networks and perform the necessary translation so that the connected networks can communicate properly.

### ROUTERS

A Router is a network device that works like a bridge to establish connection between two networks but it can handle networks with different protocols.

### Wi-Fi Card

Wi-Fi cards are small and portable cards that allow your desktop or laptop computer to connect to the internet through a wireless network.

**Q1. Why switch is called an Intelligent Hub?**

Ans. Hub connect different devices in the network but switch have some advance features like monitoring, check IP address and manages traffic.

**Q2. Why would you prefer the following:**

a. Hubs over repeaters -

Hubs would be preferred over repeaters when more than two computers are to be networked. Hubs can connect multiple computers simultaneously.

b. Bridges over Hubs-

Bridges would be preferred over hubs when we do not want to broadcast data frames. Bridges can filter network traffic based on MAC Address.

c. Switch over network devices-

Switch can replace multiple bridges and offers dedicated bandwidth to each LAN segment.

d. Switch over Hubs-

- Switch is faster than hub.
- With hubs, connected computers share the bandwidth but with switches, the connected computers communicate at full bandwidth.
- switch is full duplex (Two-way communication) rather hub is half duplex (bi-directional communication)

**Q3. Why routers are smarter than hubs and switches?**

Ans. 1. Using a routing table that stores calculated paths, routers makes sure that the data packets are travelling through the best possible paths to reach their destinations. If a link between two routers fails, the sending router can determine an alternate route to keep traffic moving.

2. Routers provide connectivity inside enterprises, between enterprises and the Internet, and within an Internet Service Provider (ISP). Routers can be wireless or wired.

# NETWORK PROTOCOLS

## HTTP (Hyper Text Transfer Protocol):

- HTTP is the protocol that is used for transferring hypertext (i.e. text, graphic, image, sound, video etc.) between two computers and is particularly used on the World Wide Web.
- When an HTTP client (a browser) sends a request to an HTTP server (web server), the server sends responses back to the client. This transfer of requests and responses is done following HTTP protocol.
- HTTP has three important features.
    1. 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.
    2. Secondly, HTTP is media independent. This means any type of data(text , images , sound , video etc.) can be sent.
    3. 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.

## TCP/IP (Transmission Control Protocol / Internet Protocol):

TCP/IP are the two protocols that are used together and together they form the backbone protocol of the internet.

**TCP working**

TCP/IP is a two-layer protocol. When data is to be sent from one computer to another over internet, it is first broken into smaller packets which are actually sent. When these packets are received by the receiver computer, they are assembled into the original message. This job of dividing the original message into packets and re-assembling the received packets into the original message is done following TCP protocol.

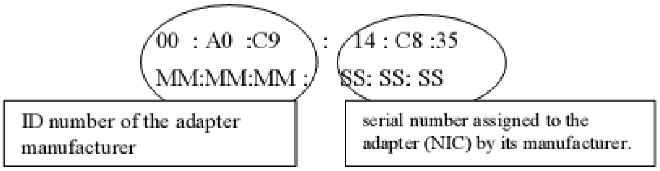
**IP (Internet Protocol) Working**

Internet protocol is followed to ensure that each of these packets gets to the right destination. Different packets from the same message may be routed differently, but they reach the same destination and are reassembled there.

**An IP (Internet Protocol) address** is a unique 4 digit hexadecimal number assigned to each node on a network. IP address settings of a node can be changed by the user.

- An IP address is a group of four bytes (or 32 bits) each of which can be a number from 0 to 255. Example: 59.177.134.72

**MAC (Media Access Control) address** is a unique 12 digit (6 digits for manufacturer code and 6 digits for serial number) hexadecimal number assigned to each NIC. MAC address of an NIC never changes.


00 : A0 :C9
MM:MM:MM :
:
14 : C8 :35
SS: SS: SS
ID number of the adapter manufacturer
serial number assigned to the adapter (NIC) by its manufacturer.

**IP Address Vs MAC Address:**

1. IP address is assigned by the network administrator or the internet service provider while the MAC address is assigned by the manufacturer.

2. If a computer is transferred from one network to another, its IP address gets changed where as the MAC address remains the same.

3. IP address it is usually possible to track the tentative location of the computer but this is not the case with a MAC address.

**Q. Explain why TCP/IP is said to be "stateless"?**

- Each client request is considered a new request unrelated to any previous one.
- For phone conversations no dedicated connection is required for entire duration. This makes the network paths freely available for everyone to use.

### FTP(File Transfer Protocol)

FTP is based on Client/Server principle. By giving the ftp command with any remote address, the file transfer can be initiated.
FTP can transfer both ASCII i.e. plain text and binary files but the mode has to be set in the FTP client. **BUT** If you attempt to transfer a binary file (such as a program or music file) while in text mode, the transferred file becomes unusable.

**Q. What is the significance of anonymous users in FTP? Can user anonymous upload? Why?**

- In order to use FTP effectively, one needs to be an authorized user. However, anonymous FTP is a method whereby FTP allows servers allow the general public to access files on FTP server.
- On many UNIX FTP servers, there is an incoming directory. If this directory is there, then anonymous users have permission to upload only in this directory and no where else.

### Point to Point Protocol (PPP)

PPP (Point to Point Protocol): It is a protocol for direct communication between two computers using a serial interface, typically a personal computer connected by phone line to a server. Most Internet service providers (ISPs) use PPP for customer dial-up access to the Internet.

**Features**

- It encapsulates and packages your computer's TCP/IP packets into PPP frames and then forwards them to the server over serial transmission lines such as telephone lines, ISDN etc.
- PPP defines the format of frame to be exchanged between devices.
- It supports various authentication schemes such as Password Authentication Protocol (PAP) and Challenge Handshake Authentication protocol(CHAP).

## E-Mail PROTOCOLS

### Simple Mail transfer protocol (SMTP):

SMTP is a simple mail transfer protocol that controls the transfer of email messages on Internet. It only works for outgoing messages. So when an email has to be sent, the address of their ISP’s SMTP server has to be given. The actual mail transfer is done through Message Transfer Agents(MTA).

**Uses / Significance**

- It simplifies the communication of email messages between servers. It allows the server to break up different parts of a message into categories
- The other purpose of SMTP is to set up communication rules between servers.

**SMTP has a major disadvantage**

- SMTP has a disadvantage that if the destination computer is not online, mails cannot be received.
- It is relatively easy to send a message with a fake sender address. This results in spread of many email-based viruses. ESMTP was designed to get rid of this problem - slightly updated version of the SMTP protocol
- ESMTP (Extended Simple Mail Transfer Protocol):
  This was created to allow transmission of multimedia through email. When someone sends a picture or music file through their email program, ESMTP communication codes are used to identify the kind of data being transferred. Multipurpose Internet Mail Extension(MIME) is a supplementary protocol that allows non ASCII data to be sent through SMTP. Please note that MIME is not a protocol and cannot replace SMTP.

### Post Office Protocol Version 3 (POP3)

Post Office Protocol 3 or POP3 is the third version of a widespread method of receiving email which receives and holds email for an individual until they pick it up.

**Significance**

- POP3 makes it easy for anyone to check their email if their email program is configured properly to work with the protocol.
- it can work with virtually any email program, as long as the email program is configured to host the protocol. Many popular email programs, including Microsoft Outlook, are automatically designed to work with POP3.

## REMOTE ACCESS PROTOCOL

### TELNET

Telnet is the main internet protocol for creating a connection with a remote machine. It allows you to connect to remote computers (called remote hosts) over a TCP/IP network (such as the Internet). Once your telnet client establishes a connection to the remote host, your client becomes a virtual terminal, allowing you to communicate with the remote host from your computer.

Telnet clients are available for all major operating systems viz. Mac OS X, Windows, Unix, and Linux.

- It 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. AOL Instant Messenger,Campfire, Internet Messenger, MSN Messenger are some commonly used chat programs.

### Internet Relay Chat (IRC)

IRC protocol is used for chatting. It provides chatting between groups or between two individuals.

*It was developed by JarkkoOikarinen in Finland in the late 1980s.* It is based on client/server model.

The IRC server transports the message from one client to another. IRC server identifies every user through a unique nickname. Each user is assigned a unique channel in case multiple discussions are taking place.

### 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. By using VOIP software, phone calls can be done using standard internet connection. There are three different methods of VoIP service in common use today:

ATA - ATA stands for analog-to-digital converted. It is used to connect the telephone device to the Computer.

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

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.

## MOBILE TELECOMMUNICATION TECHNOLOGIES

### Cloud Computing

The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer. This is an emerging area of demand based resource sharing, resulting into drastic saving of energy and cost. This is also referred to as 'Green IT'.    Eg- Drop Box

## GSM

GSM (Global System for Mobile Communication) operates on the wedge spectrum called a carrier. In this, each user is assigned a different time slot so that until the ongoing call is finished, no other subscriber can have access to this.
GSM has slow data transfer speed. It offers maximum download speed of 384 kbps.

## CDMA

CDMA (Code Division Multiple Access) is based on spread spectrum technology which makes the optimal use of available bandwidth. CDMA has fast data transfer rate. It offers a maximum download speed of 2 mbps.

## FDMA

It stands for Frequency Division Multiple Access. In this, each user utilizes a portion of the frequency bandwidth available. Each user has its own frequency domain.

## 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.

## WLL

Wireless local loop (WLL), is the use of a wireless communications link for delivering plain old telephone service or Internet Access to telecommunication customers.

## 1G technology

1G technology was used in the first mobile phones. 1G used analog radio signals. 1G was introduced in 1980s. It was based on the analog cellular technology. They only had voice facility available and were based on circuit-switched technology.
*The major drawbacks* were its low capacity, poor voice links and no security.

## 2G technology (based on GSM technology):

2G technology used a digital format and introduced text messaging. 2G enabled the mobile systems to provide paging, SMS, voicemail and fax services.

- With GSM, all subscriber and wireless provider information is stored on interchangeable modules known as SIM (Subscriber Identification Module) cards.
- 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 technology

3G technology has introduced more efficient ways of carrying data, making it possible to have faster web-services, live chat, fast downloading, video conferencing etc. over mobile phones. 3G mobile systems are also known as Universal Mobile Telecommunications System (UMTS) or IMT-2000.
Features: 1) Support for both packet-switched and circuit-switched data transmission.
2) Data rates up to 2 Mbps (depending on mobility).
3) High bandwidth efficiency
Today we are living in the world of 3G.

## 4G Technology

4G stands for fourth generation of mobile technology. Change from one generation to another involves a major advancement in the technology used. 4G will provide internet access, high quality streaming video and "anytime, anywhere" voice and data transmission at a much faster speed than 3G. The "anytime, anywhere" feature of 4G is also referred to as "MAGIC" (Mobile multimedia; Anytime/anywhere; Global mobility support; Integrated wireless solution; Customized personal services).

- 4G networks will be based on packet switching only.
- They are projected to provide speeds up to 100 Mbps while moving and 1Gbps while stationary. It is a wireless.

# NETWORK SECURITY

**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.
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.
***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. A worm works by itself as an independent object. It uses security holes in a computer networks to replicate itself. 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, report back information such as passwords, user IDs, and captured keystrokes.

**Spam**

The term spam means endless repetition of worthless text i.e unwanted messages or mails are known as Spam.
It also eats up a lot of network bandwidth.

**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.

**Firewall**

A firewall is hardware or software based network security system. It prevents unauthorized access (hackers, viruses, worms etc.)to or from a network. A firewall permits only that data to enter or leave a computer/Network for which permissions have been granted by the computer/network administrator. A firewall filters both inbound and outbound traffic.

**Intrusion Problems**: An Intrusion problem is an attempt to mischievously steal some information from someone's computer. Examples of Intrusion are: snooping and Eavesdropping.

- **Snooping** refers to gaining unauthorized access to another person's or organization's data.
- **Eavesdropping** refers to gaining unauthorized access to another person's or organization's data while the data is on its way on the network.

**Denial of service attacks:** A Denial of Service (DoS) attack is an attempt to make one or more network resources unavailable to their legitimate users. Examples of such attacks are:

- ✓ Denial of Access to Information: Corrupting, Encrypting, or changing the status of information so that it is not accessible to its legitimate user.
- ✓ Denial of Access to Application: Forced shutting of an application as soon as the user opens it.
- ✓ Denial of Access to Resources: Blocking a resource, may be a printer or scanner or USB port, of a computer from proper working.
- ✓ Denial of Access to a Website: Continuously sending bulk requests to a website so that it is not available to any other user.

## HACKER

A hacker is a person intentionally interested in gaining knowledge about computer systems & possibly using the knowledge for playful pranks.

## CRACKER

Crackers are the malicious programmer who breaks into secure systems. They can easily be identified because their actions are malicious.

# CYBER CRIME

**Cybercrime** is defined as a crime in which a computer and internet is used in an illegitimate way to harm the user. Cyber 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.

The increase in Internet traffic has led to a higher proportion of legal issues worldwide. "INFORMATION TECHNOLOGY ACT, 2000" [ITA- 2000] was enacted by Parliament of India to protect the field of e-commerce, e-governance, e-banking as well as penalties and punishments in the field of Cyber Crimes. The above Act was further amended in the form of IT Amendment Act, 2008 [ITAA-2008].

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

**1. Patents**

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.

**2. Trademarks**

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.

**3. Copyrights**

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.

- ✓ literary works
- ✓ musical works, including any accompanying words
- ✓ dramatic works, pictorial, graphic and sculptural works, architectural works,computer programs and websites

# INTRODUCTION TO WEB SERVICES

### HTML(Hypertext Markup Language)

- HTML is language the helps in creating and designing web content. It is not case sensitive.
- 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. XML (EXtensible Markup Language)

### XML (Extensible Markup Language)

- It is designed to carry or store data. In contrast to HTML, it is not designed to display data.
- it does not have predefined tags. It is possible to define new tags in XML. XML is case sensitive.
- XML is deigned to be self-descriptive. XML is a W3C recommendation.

### WWW (World Wide Web):

WWW can be defined as a hypertext information retrieval system on the Internet.
*Tim Berners -Lee is the inventor of WWW.*
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:
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
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.

## Scripting language

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. 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.
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.

### Web browser

Web browser is software program to navigate the web pages on the internet. 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.
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

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.

**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.

**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 Applications supported by web 2.0 are as followings:

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