

INTERNET AND ITS APPLICATION

Abstract

The internet has revolutionized the way humans interact, communicate, and conduct business on a global scale. This abstract provides an overview of the internet and its diverse applications, highlighting its profound impact on society, economy, and technology. The internet, a vast network of interconnected computers, enables the seamless exchange of information, spanning across continents and cultures. Its applications range from communication platforms such as email, instant messaging, and social media, to information dissemination through websites, blogs, and online forums. E-commerce platforms have transformed traditional retail, offering convenience and accessibility to consumers worldwide. Moreover, the internet serves as a platform for education, research, and innovation, providing access to vast repositories of knowledge and resources. However, along with its myriad benefits, the internet also presents challenges such as cybersecurity threats, privacy concerns, and digital divides. Understanding the internet and its applications is crucial for navigating the digital landscape and harnessing its potential for positive societal impact. This abstract aims to provoke further exploration and discussion on the multifaceted nature of the internet and its implications for individuals, businesses, and societies globally.

Keywords: Instant messaging, Research, and innovation, Blogs, and online forums, Vast repositories, Cybersecurity threats, Privacy, and Digital divides.

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- INTERNET stands for International network or internetworking.
- Internet means network of networks.
- Internet is a global collection of small individual networks connected by using wire or wireless medium and network devices to form a single large network and share data, information and resource between each other.
- Internet is a worldwide network or wide area network.

I. HISTORY OF INTERNET

- Internet was first proposed by JCR Licklider of MIT (Massachusetts Institute of Technology) in 1962.
- His intention was to share military and scientific information between different organizations situated at different places in United States.
- In 1962-63 Leonard Kleinrock of University of California developed the concept of packet switching which was used as a backbone of data transmission.
- The first ever network of computers was installed at NRL (National Research Laboratory), England in 1968.
- In 1969, a more advanced network was established at Pentagon's ARPA (Advanced Research Project Agency) connecting 4 high speed computers. This network was called as ARPANet.
- In 1972, ARPANet had 23 nodes connected two different organizations of United States.
- In 1973, ARPANet had first international node which was set at England and Norway.
- In 1974, Bob Kahn and Vint Cerf proposed the foundation of network transfer protocol which is standardized as TCP/IP for ARPANet in 1983.
- In 1984, DNS (Domain Name System) was introduced.
- In 1991, WAIS (Wide Area Information Server) and GOPHER protocol was released.
- In 1992, Tim Berners Lee, WWW at CERN (Centre of European Research Network).
- Tim Berners Lee also defines URL and HTML.
- The first Internet browser "Mosaic" released in 1993 by Mark Andreessen and his team at National Centre for supercomputing applications.

II. INTERNET BACKBONE

- An Internet backbone refers to one of the principal data routes between large interconnected networks and main routers on the Internet.
- It is a very high speed data transmission line.
- A backbone is a larger transmission line that carries data gathered from smaller lines that are interconnected with it.
- The first Internet backbone was named NSFNET.
- It was funded by the U.S. government by National Science Foundation (NSF) in 1987.
- Around the world, each country has at least one backbone network that operates at very high speed.
- Internet backbones are the largest data connections on the Internet.
- Internet backbone is provided by telephone company or ISP (Internet Service Provider); e.g.: BSNL, VSNL, JIO, AIRTEL, etc.
- They required high speed bandwidth connections and high performance servers or routers.
- Today these backbones are constructed of fiber optic cables.

- A backbone which is constructed by optical fiber cable is called as Optical Carrier (OC).

III. NETWORK TECHNOLOGY

- Different network technologies can be used to create an internetwork.
- Different types of network technologies are:-
 - Ethernet
 - Token ring
 - FDDI

1. Ethernet

- Ethernet is a network technology used for connecting a number of computer system to form a local area network.
- It uses protocols to control the passing of information and to avoid simultaneous transmission by two or more systems.
- It is the most widely installed local area network technology.
- Ethernet is an IEEE 802.3 standard.
- An Ethernet LAN typically uses co-axial cable or twisted pair cable.
- Ethernet is also used in wireless LANs.
- It uses bus topology to create a local area network that uses a single co-axial cable.
- The most commonly installed Ethernet systems are called 10 BASE-T and provide transmission speed up to 10 Mbps.
- Ethernet was developed by Xerox.

2. Token ring

- It is a local area network in which all computers are connected in a ring or star topology.
- A bit or token passing scheme is used in order to prevent the collision of data between two or more computers that want to send messages at the same time.
- In this scheme a token revolves around the network of computers.
- A computer that gives the request first can get the token to transmit data through the channel and all other computer requests for the token are on the queue.
- After sending data it leaves the token and assigns it to the first computer in the queue.
- If a computer that holds the token neither sends data nor leaves the token then the computers in the queue enter into starvation.
- Token ring is an IEEE 802.5 standard.
- This is the second most widely used protocol on local area networks after Ethernet.

3. FDDI

- It stands for Fiber Distributed Data Interface.
- A FDDI network contains two token rings i.e. primary token and secondary token.
- It uses secondary token for possible backup in case of the primary ring fails.
- It uses two token rings because if the primary token ring fails then the secondary ring will complete the task.

- It uses a time token protocol.
- A token is assigned to a computer for a fixed time period with in which it either sends the data or leaves the token. So that starvation can be avoided.
- It is an IEEE 802.4 standard.
- It is used for long distance data transmission up to 200 km.
- The data transmission speed is about 200 mbps.

IV. FEATURES OF INTERNET

- Various features of internet are:-
 - Geographic distribution
 - Robust architecture
 - High speed (near light speed)
 - Universal access
 - Freedom of speech

1. Geographic distribution

- Internet is globally distributed in a single large network.
- It spreads around the world and even beyond the world.
- A key attribute of the internet is that once we have connected to any part of it, we can communicate with all of it.

2. Robust architecture

- Internet consists of large number of network computers and other devices.
- It has robust architecture.
- If any individual computer or network is damage or lost then it will not affect the other part of internet.

3. High speed

- Internet is a high speed communication technique.
- The speed of the internet is $\frac{3}{2}$ of the speed of light i.e. $2 * 10^8$ m/s.

4. Universal access

- It is a universal access network.
- It is accessible to everyone from any location at any time.

5. Freedom of speech

- Internet provides a platform for everyone to share their opinion with others.
- It provides freedom of speech to everyone through social networking site.

V. INTERNET ACCESS

- It is a process that enables individual user or an organization to access internet.
- Various types of internet access are:-
 - Gateway access connection
 - Dial-up connection
 - Direct connection
 - Cable modem connection

- DSL connection
- ISDN connection
- Wireless connection

1. Gateway access connection

- Gateway access is an internet access.
- Gateway access is also known as level-one connection.
- The gateway allows the two different types of network to talk to each other.
- But, the users of the gateway internet have limited access to the internet. They might not be able to use all the tools available on internet.
- The local internet service provider normally defines this limitation.
- Good example of network with level one connectivity within India is that of VSNL (Videsh Sanchar Nigam Limited).
- All access to the internet from India is through VSNL gateway.

2. Dial-up access connection

- It is also known as level two connection.
- This provides connection to internet through a dial up terminal connection.
- A dial up connection is an internet connection that uses telephone lines.
- Using phone lines we dial into an ISP to connect to line.
- When the line is connected to the internet, voice communication would not be available over it.
- The data transmission speed which is about 56 kbps.
- This type of connection is also known as remote modem access connection.
- This type of connection can further be divided into 3 categories:-
 - Shell connection
 - TCP/IP connection
 - ISDN connection
- To access any of these dial up connection we need the followings:-
 - Computer
 - Modem
 - Telephone connection
 - Shell or TCP/IP or ISDN account from the ISP
 - Internet client software such as internet browser.

3. Direct access

- Direct internet access is also known as leased line connection.
- It is also known as level-three connection.
- Taking internet connection directly from an ISP as a leased line is called as direct connection.
- In direct connection data can be send or receive directly to and from internet.
- Using leased line connection computer is directly connected to the internet using high speed transmission line.
- It is a secure and expensive internet connection.
- Direct access can be provided in one of the following two ways:-

- Dial up IP direct access
- It uses a modem and a telephone line to connect to internet.
- It is also uses a special software to access internet.
- It uses PPP (Point-to-Point Protocol) and SLIP (Serial Line Internet Protocol).
- The second way is when a computer is connected to a LAN that has internet connectivity is called as LAN direct connection
- It is used in universities, corporation, etc.

4. Cable Modem Connection

- A cable modem is a type of network bridge and modem that provides bidirectional data communication through radio frequency channels on a HFC (Hybrid Fiber Coax) and RFoG(Radio Frequency over Glass) infrastructure.
- Cable modems are primarily used to deliver broadband internet access in the form of cable.
- Cable connections provide high speed data transfer downstream (from the internet to computer), but are slower when sending the data from computer to internet.
- Transfer rates are affected by the number of subscribers online simultaneously.
- All connections originate on one line per street, so signals degrade as more subscribers comeonline.
- Cable connection can be used by individual subscribers to connect one computer to one line orcan be used to connect multiple computers to one line to the internet.
- Some of the features of cable internet connection are:-
 - Always connected
 - Bandwidth
 - File transfer capability
 - Signal integrity
 - Routing

5. DSL Connection

- It stands for Digital Subscriber Line.
- It is a broadband connection that transmits data over analog telephone lines.
- It provides both voice data and internet data transmission at a time using single telephonenumber.
- It divides the telephone line into 2 parts:- one part is used for voice data transmission andother part is used for internet data transmission.
- The data transmission speed is about 256 kbps to 40 Mbps.
- It is expensive.
- It is used to connect one computer per line or multiple computers per line.
- Various types of DSL connection are :-
 - SDSL (Symmetric Digital Subscriber Line)
 - ADSL (Asymmetric Digital Subscriber Line)
 - HDSL (High-data rate Digital Subscriber Line)
 - VDSL (Very-high-data rate Digital Subscriber Line)

6. ISDN Connection

- It stands for Integrated Service Digital Network.
- It is also a broadband internet connection that uses analog telephone line to transmit data digitally.
- It also provides both voice transmission and data transmission at a time.
- It is also used to connect one computer per line or multiple computers per line.
- It is generally used to provide faster speed on data transmission.

7. Wireless Connection

- A connection that does not use any cable or wire to transmit internet data through electromagnetic wave is called as wireless connection.
- It uses radio wave, micro wave, satellite, etc. for internet connectivity.
- It is used to connect a building or a campus, is called as WLAN.
- It uses an antenna to receive signal from ISP.
- The data transmission speed is faster but depends upon weather.

VI. ISP

1. It stands for Internet Service Provider.
2. It is an organization or a telephone company that provides network service to the users by taking some fee from the users.
3. “The world” was the first commercial ISP in 1989.
4. “Telerama” was founded to be the world’s 3rd ISP in 1991.
5. An ISP buys upstream data from the government and provides downstream data to the endusers by taking some fee.
6. It is also called as IAP (Internet Access Provider).
7. Examples of some ISP are BSNL (Bharat Sanchar Nigam Limited), VSNL (Videsh Sanchar Nigam Limited), MTNL (Mahanagar Telephone Nigam Limited), JIO, AIRTEL, etc.
8. ISP works as an interface between user and internet.
9. ISP uses a range of technologies to enable consumers to connect to their network.
10. For home users the most popular options include dial-up, DSL (typically ADSL), broadband wireless access, cable modem and ISDN.

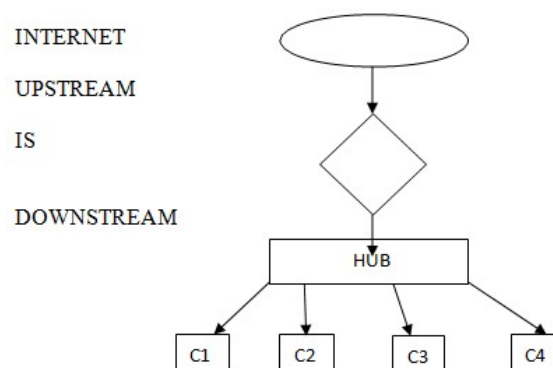


Figure 1: ISP

VII. INTERNET PROTOCOL

- Protocol is a set of rules that governs network communication.
- Internet means network of networks that connect computers and network around the wholeworld as a single global network.
- Several rules are used in internet during exchange of data and information between devices ofnetwork is called as internet protocol.
- Protocol generally defines rules of how and when a device can send or receive the data.
- Several types of internet protocol used in the internet are:-
 - TCP/IP
 - EMAIL
 - FTP
 - HTTP
 - USENET
 - GOPHER
 - TELNET
 - WAIS

1. TCP/IP

- It stands for Transmission Control Protocol/Internet Protocol.
- Both the protocols are combinely used for data transmission over the network.
- Internet protocol works at network layer of OSI model and TCP works at transport layer of OSI model.
- IP divides a message into smaller bits called as packets.
- Each packet with a sequence number of source and destination is send independently orseparately.
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- Each packet with a sequence number of source and destination is send independently orseparately.
- IP is responsible for system to system delivery of data.
- TCP is responsible for exact delivery of data.
- TCP is responsible for process to process delivery of data.
- TCP retransmits the failed packets.
- TCP makes the sequence of the packet and reconstruct the data into its original form.

2. FTP

- It stands for File Transfer Protocol.
- This is used for transferring a file from one computer to another through internet.
- FTP commonly used for uploading a webpage to a web server so that it may be seen on theWorld Wide Web (WWW).
- A server computer that stores all the files is called as FTP server.
- An FTP client is a computer that takes service from the FTP server.
- FTP also works on client-server principle.
- It is an application layer protocol of OSI model.

3. HTTP

- It stands for Hypertext Transfer Protocol.
- The protocol that is used to transfer web pages or HTML pages from one computer to another using internet is called HTTP.
- It is an application layer protocol.
- It is the protocol used by web server to allow web pages to be shown in a web browser.
- The address bar of the web browser has the prefix http:// in front of the address.
- It works on client-server principle.
- A web server which stores all the web documents is called as HTTP server.
- An HTTP client sends a request to HTTP server for transferring web pages called as HTTP client request.
- The HTTP server processed the client request and gives response to the requested client called as HTTP server response.

4. E-MAIL

- It stands for Electronic-mail.
- It uses three different protocols:-
 - SMTP (Simple Mail Transfer Protocol)
 - IMAP (Internet Mail Access Protocol)
 - POP3 (Post Office Protocol 3)
- SMTP is a protocol used for sending mail, while IMAP & POP3 are used for receiving mail.

5. USENET

- It is a news protocol.
- It uses NNTP (Network News Transfer Protocol).
- NNTP is used for serving Usenet posts.
- Usenet is similar to the forums that many websites have.
- Forum means a place or meeting where people can exchange and discuss ideas.
- Usenet is divided into several areas.
- Some of the forum that are included in Usenet are:- 'comp.' for discussion of computer related topics, 'sci.' for discussion of scientific subjects, etc.

6. GOPHER

- It is an application layer protocol that provides the ability to extract and view web documents stored on remote web servers.
- It is used as a search tool.
- Gopher was designed to access a web server through the internet.
- This protocol is used to search documents or information from different websites.
- Gopher server is used to store all the documents in the server which can be served to gopher client.
- It is based on client-server principle in which gopher client will send request to gopher server then gopher server will process the request and give response to the requested gopher client.

7. TELNET

- It stands for Telecommunication Network.
- It is a protocol used for remote login to a distance computer.
- By using telnet the user can access remote information stored in a remote computer, for that there is a need of special program called as telnet client program.
- Using telnet client program a client login into a remote server through a user id and password.
- Example:- Teamviewers application, Anydesk application, etc.

8. WAIS

- It stands for Wide Area Information Server.
- It is a protocol used to search document on internet from many websites at a time.
- It makes an index of the searched document of the database.
- A WAIS database index created by a person.
- It provides or assigns ranking to each information accessed by the user that helps the user to choose the most popular items
- A WAIS client program is used to access information from WAIS database through WWW .
- It can work with other protocols like gopher, telnet, etc.

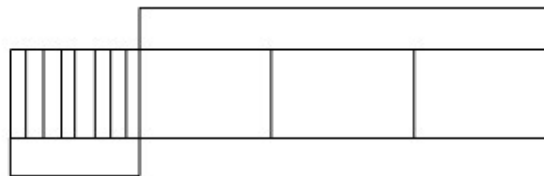
VIII. IP ADDRESS

- It is a unique number assigned to every machine connected to a network for its identification.
- IP address is also called as internet address.
- It is a logical address of 32 bits or 4 bytes or 4 octets.
- An IP address has two parts, such as :-
 - **Net ID:** It is used to identify networks.
 - **Host ID:** It is used to identify a machine connected to a network.
- The 4 octets of an IP address are separated by dots (.)
- Example:- 122.16.5.7
- Each octet contains 1 byte or 8 bits with $2^8=256$ (ranking from 0 to 255) unique values.
- The first octet represent total number of networks i.e. 256 networks.
- As per IPV4 IP addresses have the sizes of 32 bits or 4 bytes.
- As per IPV6 IP addresses have the sizes of 128 bits or 16 bytes.
- There are 2^{32} number of unique IP addresses can be created in IPV4.
- The IP address 0.0.0.0 is called as default network IP address.
- The IP address 255.255.255.255 is called as broadcast IP address.
- The IP address 127.0.0.1 is called as loopback IP address.
- There are five classes of IP address are used. Such as:-
 - Class A IP address
 - Class B IP address
 - Class C IP address
 - Class D IP address
 - Class E IP address

1. Class A IP address

- The class A IP address contains 126 networks from 1 to 126.
- It is used for large size organization like Google.
- It contains approximately half of the total IP address.
- In class A IP address, the first octet is used for net ID and the last three octets are used for host ID.
- The first bit of the first octet of class A IP address is always zero.
- Each network has $2^{24}-2$ number of unique IP address.
- Example:- 126.17.255.190

Host ID

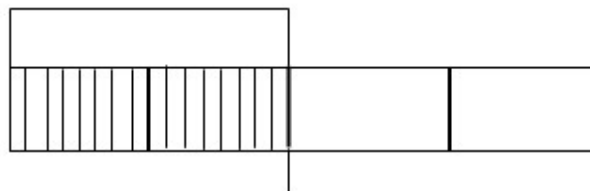


Net ID

2. Class B IP address

- The class B IP address contains 64 networks ranking from 128 to 191.
- It is used for medium size organization.
- It contains $\frac{1}{4}$ th of the total IP address.
- In class B IP address, the first two octets are used for net ID and the last two octets are used for host ID.
- The first two bits of first octet of class B IP address are 1 and 0 respectively.
- Each network has $2^{16}-2$ number of unique IP address.
- Example:- 128.55.254.1

Net ID



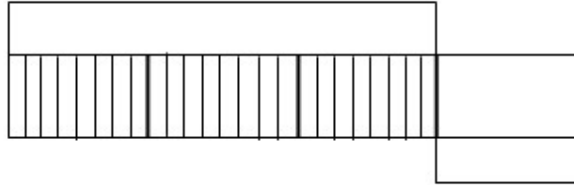
Host ID

3. Class C IP address

- The class C IP address contains 32 networks ranking from 192 to 223.
- It contains $\frac{1}{8}$ th of the total IP address.
- It is used for small size organization.
- In class C IP address, the first three octets are used for net ID and the last octet is used for host ID.

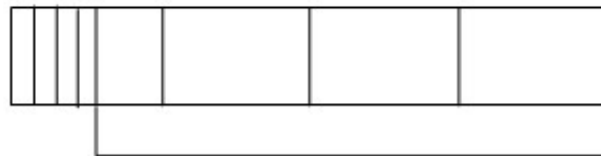
- The first three bits of the first octet of class C IP address are 1, 1 and 0 respectively.
- Each network has 2^8-2 number of unique IP address.
- Example:- 192.222.156.46

Net ID
 Host ID



4. Class D IP Address

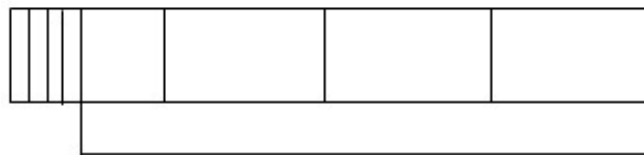
- The class D IP address contains 16 networks ranking from 224 to 239.
- It contains $1/16^{\text{th}}$ of the total IP address.
- It is a special IP address used for multicasting.
- In class D IP address, all the four octets are used for host ID.
- The first 4 bits of the 1st octet are 1, 1, 1 and 0 respectively.
- Each network has 2^{28} numbers of unique IP address.
- Example:- 224.255.254.173



Host ID

5. Class E IP Address

- The class E IP address contains 16 networks ranking from 240 to 255.
- It contains $1/16^{\text{th}}$ of the total IP address.
- It is a special IP address used for experiment and research.
- In class E IP address, all the four octets are used for host ID.
- The first four bits of the 1st octet are 1, 1, 1 and 1 respectively.
- Each network has 2^{28} numbers of unique IP address.
- Example:- 240.255.216.140



Host ID

IX. DOMAIN NAME

- Whenever we have to communicate with a computer on internet, we can do so by using its IP address.
- But it is practically impossible for a person to remember the IP address of all the computers to communicate with.
- Therefore a system has been developed which assigns names to some computers (web servers) and maintains a database of these names and corresponding IP address.
- These names are called domain names.
- Examples of some of the domain names are:-
 - Dheodisha.gov.in
 - Youtube.com
- Domain names are used to identify particular web server.
- For example; in the address, <http://india.gov.in/> the domain name is india.gov.in.
- Each domain names are assigned by the organization named ICANN (Internet Corporation for Assigned Names and Numbers).
- A domain name usually has more than one part:- top level domain name and sub-domain name.
- In the above example, .in is the top level domain name. .gov is the sub-domain of .in and India is the sub-domain of .gov.
- There are only a limited number of top level domains and these are divided into two categories:-
 - Generic top level domain
 - Country code top level domain

1. Generic top level domain

- A domain name with three letter extension is called as generic top level domain.
- These domain names represent international level.
- Examples:-
 - .com – commercial business
 - .Edu – educational institutions
 - .gov – government agencies
 - .mil – military
 - .biz – business

2. Country code top level domain

- A domain name with two letter extension is called as country code top level domain.
- These domain names represent country level.
- Examples:-
 - .in – India
 - .au – Australia
 - .ca – Canada
 - .nz – New Zealand
 - .pk – Pakistan
 - .jp – Japan
 - .us – united states of America

3. Alternative Domain Names

- Each domain names are assigned by the organization named ICANN (Internet Corporation forAssigned Names and Numbers).
- ICANN approved several new extensions of domain name which are not specific to anycountry are called as alternative domain name.
- Example: - .info, .coop, .aero, etc.

4. DNS

- It stands for Domain Name System.
- It is a server that maintains domain name and their corresponding IP address in a database.
- DNS maps domain name into its corresponding IP address.
- This process of mapping domain name into its corresponding IP address by DNS is called asdomain name resolution.

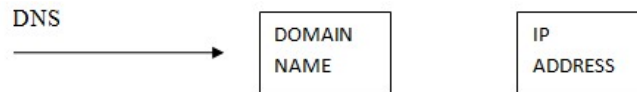


Figure 2: Domain name resolution

5. MAC

- It stands for Media Access Control.
- Each NIC has a unique address assigned by its manufacturer.
- This address is known as MAC address of the card.
- It is used to uniquely identify an NIC by its MAC address.
- MAC address of an NIC is permanent and never changes.
- This address is a 12-digit hexadecimal or 48-bits number.
- MAC address are usually written in one of the following two formats:-
MM:MM:MM:SS:SS:SS
MM-MM-MM-SS-SS-SS
- The first half (MM:MM:MM) of a MAC address contains manufacturer ID number and secondhalf (SS:SS:SS) of a MAC address represents the serial number assigned to the NIC by its manufacturer.
- Example:- 00:0A:C9:14:C8:35

Where 00:0A:C9 is the manufacturer ID and 14:C8:35 is the serial number.

6. ARP

- It stands for Address Resolution Protocol.
- It is a protocol that maps IP address into MAC address.



7. RARP

- It stands for Reverse Address Resolution Protocol.
- It is a protocol that maps MAC address into IP address.

RARP



8. Web Page

- A web page is a web document display in a web browser.
- A web page is a page on internet written in HTML.
- Web means resource of information on internet.
- An HTML page or web page has .html or .htm extension.
- Web page may contain text, image, audio, video document.
- A web page can be displayed by using a web browser like Mozilla Firefox, internet explorer, Google chrome, etc.
- Example:- hello.html
<HTML>
<HEAD>
<TITLE> HELLO WORLD </TITLE>
</HEAD>
<BODY>
WELCOME TO THE
 GURUKUL COLLEGE OF +2 SCIENCE
</BODY>
</HTML>

9. Website

- Website is a collection of web pages that are hyperlinked with each other.
- The first page of the web site is called as home page.
- All the web pages in a website are hyperlinked with each other so that by clicking on a hypertext a new page will be open.
- An address that is used to locate a particular website on internet is called website address.
- Example:- www.google.com
www.odisharesult.nic.in www.yahoo.com www.facebook.com
- According to use, following types of websites are available:-
 - Commercial website
 - Organization website
 - Educational website
 - Game sites
 - Employment website
 - News sites
 - Government websites

10. Web Server

- A web server is a computer that hosting one or more websites.
- “Hosting” means that all the web pages and their supporting files are available on that computer.
- The web server will send any web page from the website to any user’s browser as per the user request.
- When the website is not responding, it actually means that the web server is not responding therefore the website is not available.
- When we say server is not responding it means that no websites on that web server are available.
- A web server is the collection of one or more than one websites.

11. WWW

- It stands for World Wide Web.
- WWW is a collection of web pages, websites around the whole world.
- It was developed by Tim Berners Lee about 1992.
- To locate a particular website WWW must be used. (<http://www.google.com>)
- It supports mainly HTTP, FTP, TELNET, GOPHER, WAIS protocols.
- It is a W3C recommendation.
- WWW is the exciting area of innovation and discovery.
- It contains a very large amount of information which can be accessible by the user.
- WWW can access each protocol on the web, but it has its own protocol which is known as HTTP.

12. Web Browser

- A web browser is a software program installed on computer, mobile phone or any other electronic device by using which we can easily access internet.
- Google chrome, Mozilla Firefox, opera mini, safari, etc. are the name of popular web browsers.
- A person requires a web browser to open a search engine.
- The most popular web browsers are internet explorer and Mozilla Firefox.
- Web browser is used to access web pages and websites.
- The first web browser was “mosaic”.

Types of web browser:

- Internet explorer:
 - It was developed by Microsoft INC. (International company).
 - It is the default web browser of Microsoft windows operating system.
 - It was written in visual basic (VB).
 - Internet explorer application is available in the website Microsoft.com.
- Mozilla Firefox:
 - It was developed by Mozilla corporation in 2004.
 - It was written in java script, C++, XUL (XML User-interface Language).

- It runs on cross-platform.
- Mozilla Firefox application is available in the website firefox.com.
- Opera mini:
 - It is a graphical web browser developed by opera software company, Norway in 1997.
 - It also runs on cross platform.
 - It was written in C++, java and pike.
 - It is available in opera.com.
- Safari:
 - It is a graphical web browser developed by apple INC. in 2003.
 - It is used in iPhone operating system.
 - It was written in C++, objective C, swift language.
- Google chrome:
 - It is a graphical web browser developed by Google INC. in 2008.
 - It runs on Microsoft windows operating system and android operating system.
 - It is available in the website google.com/chrome.
 - It was written in java script.

13. Search Engine

- A search engine is also a program that can search for the entered keyboard text and bring thematches document and web page.
- Google, yahoo, Bing, DuckDuckGo etc. are the most popular search engine.
- It is not required for opening a web browser.
- The first search engine was “yandex”.
- The most popular search engine is Google.
- It is used to access or search entered keyboard text.
- A search engine operates on following steps:-
Step-1: web crawling Step-2: indexing Step-3: searching
- Web crawling:
 - The process of retrieving information stored on different databases or websites by a web crawler or spider is called as web crawling.
- Indexing:
 - It is a process of arranging information retrieved by the web crawler.
 - The information arranged in index database according to their rank or use or view.
- Searching:
 - It is a process to search required information from the index.

14. E-Mail

- It stands for Electronic mail.
- It is an electronic technology that is used to send or receive the document electronically.
- It is a high speed transmission mode.
- It can transfer text, audio, video, etc.
- Each user of an e-mail is assigned by a unique name for his or her e-mail account. This is known as e-mail address.
- It is generally of the form `user_name@domain_name`.

- For example:- aka2k8@gmail.com
- The user name and the domain name are separated by the special character @.
- E-mail address can be written in uppercase, lowercase or proper case.
- Spaces are not allowed in e-mail address.
- It uses different protocols like SMTP, IMAP, POP, etc.

15. Advantages of e-mail

- It is a faster medium of communication.
- It is less expensive because it only needs an internet connection.
- It is a more reliable medium of communication because there is no need of any stamp.
- It is a user friendly data transmission mode.
- It can send or receive e-document as an attachment and also which can be printable.
- The receiver does not need to be online to receive an e-mail.

16. Disadvantages of e-mail

- The receiver does not aware whether an e-mail comes to its inbox while he is offline.
- E-mail does not prevent from fraud.
- There may be a chance of sending unintended recipient due to wrong e-mail id.
- Junk e-mails or spam are the undesirable e-mails may be received by the receiver.
- There may be a chance of frustration when the receiver does not read the e-mail or give no response.
- It is fully dependent on internet.
- E-mail accounts can be hacked by the hackers.

X. E-MAIL PROTOCOLS

- E-mail uses some set of rules (protocols) to properly transmit the information.
- They include SMTP, IMAP and POP.

1. SMTP

- It stands for Simple Mail Transfer Protocol.
- It was first proposed in 1982.
- It is a standard protocol used for sending e-mail efficiently and reliably over the internet from client to mail server or between the mail servers.

2. IMAP

- It stands for Internet Mail Access Protocol.
- It was proposed in 1986.
- There exist 5 versions of IMAP as: IMAP, IMAP2, IMAP3, IMAP2bis, IMAP4.
- It is a standard protocol that is used to receive mail from the mail server.
- It is a standard e-mail protocol that stores e-mail messages on a mail server but allows the end user to access the messages and make changes on the mail server whenever end user make any changes on its mail.

3. POP

- It stands for Post Office Protocol.
- There are several versions of POP, but the POP3 is the current standard.
- It is a standard e-mail protocol that has the same rule as IMAP, but it is generally used to support a single client.

4. Components of an e-mail

- E-mail message comprises of different components: e-mail header (from, date, to, subject, CC, BCC), greeting, text and signature.

5. E-Mail Header

- **From:** This field indicates the sender's address i.e. who send the e-mail.
- **Date:** This field indicates the date when the e-mail was sent.
- **To:** It indicates the receiver's address i.e. to whom the e-mail is send.
- **Subject:** This field indicates the purpose of e-mail.
- **CC:** It stands for Carbon Copy. It includes those receivers addresses whom we want to keep informed but not exactly the intended receiver.
- **BCC:** It stands for Black Carbon Copy/Blind Carbon Copy. It is used when we do not want one or more of the receivers to know that someone else was copied on the message.

6. How to send an e-mail

We can send an e-mail message by using the following steps:-

Step-1:

Open the website where we have an e-mail account by using a web browser.
<http://www.google.com>

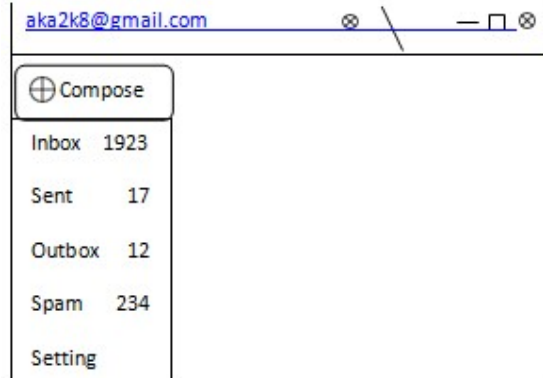
Step-2:

A login page will appear on the screen to login into the e-mail account. To login an e-mail account we have to insert our e-mail id and password.



Step-3:

After sign in or login that particular e-mail account will open.



Step-4:

To send or write an e-mail click on the *compose* option then give the receiver's e-mail id, write the e-mail, attach the file if any, then send.

From: aka2k8@gmail.com
To: triveniagrawal94@gmail.com
CC: ashishmtech2013@gmail.com
BCC: amitka85@gmail.com
Subject: MORNING WISHES
HELLO: WISH YOU A VERY GOOD MORNING LIFE
<input type="button" value="SEND"/>

6. SMS

- SMS stands for Short Message Service.
- SMS is used to send text message to mobile phones.
- The message can typically be up to 160 characters in length.
- It was originally created for the phone that uses GSM (Global System for Mobile communication) but now all the major cell phone systems support it.
- Fortunately, text messages sent through SMS do not require the receiver's phone to be ON in order for the message to be successfully transmitted.
- The SMS service will hold the message at the sender side until the receiver turns on his/her phone.

7. Voice Mail

- It is a communication service used to transfer voice message from one device to another device through internet.
- It uses VoIP (Voice over Internet Protocol).
- It can be used for both private communication as well as group communication.

8. Chatting

- On the internet, chatting is talking to other people who are using the internet at the same time as we are using.
- Usually, this “talking” means the exchange of type messages between individual users or group of users.
- It is used for real time interaction between two or more online user through a chat messenger.
- It is an instant messaging system.
- Various types of web chat programs are AOL (America Online), gTalk, Whatsapp, facebook messenger, etc.
- Through chatting user can transfer audio, video, animation, text, image, etc.

9. IRC

- It stands for Internet Relay Chat.
- It is a multiuser, multichannel and mass chatting system.
- It consists of more than one server and more than one client.
- It can create communication between multiple users and multiple servers.
- When the client of a server not directly connected to another client of another server then a server can be used as a mediator between these two servers.
- It is a global, distributed, real time chat system that operates over the internet.
- Once users are connected to an IRC server, they can converse with other users connected to any server in the IRC network.
- IRC provides group communication as well as personal communication.
- It also provides data transfer and file sharing facility as well.
- Popular ongoing IRC channels are #hottub, #riskybus.
- The most common IRC networks are IRCnet, EFnet.
- IRC is a chatting protocol.
- In IRC, channels are used as a group within a particular IRC network.

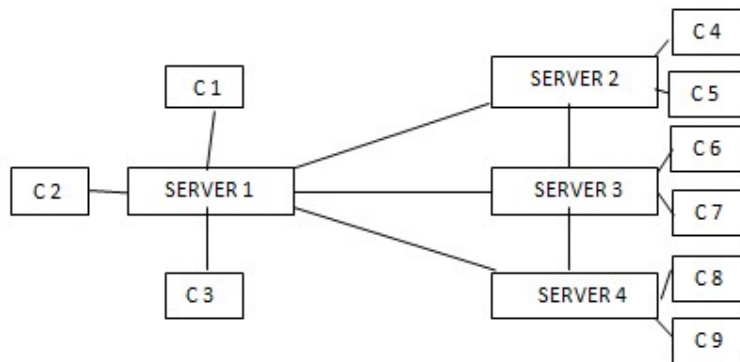


Figure 2: IRC network

XI. VIDEO CONFERENCING/ITS

- Video conferencing means to conduct a conference between two or more participants at different sites by using computer networks to transmit audio and video data.
- This is also known as ITS (Internet Telephony System).
- It uses VoIP (Voice over Internet Protocol), which converts voice signal into digital signal at sender sites and digital signal into voice signal at receiver sites.
- Each participant has a video camera, microphone and speaker mounted on his/her computer for video conferencing.
- Two distance users can speak, see and listen to each other through internet by using a video conferencing.
- Two participants can be connected with each other through internet by using a video chat application or software like Whatsapp, messenger, etc.
- It consists of following components:-
 - End devices
 - Proxy/gate keeper
 - Gateway

1. URL:-

- It stands for Uniform Resource Locator.
- An address or a path used to locate a particular information or resource on internet is called as URL.
- URL is a string of characters used to identify a resource over a network uniquely.
- It provides a complete link or path for a resource on network by using a web browser.

Example:- http://www.google.com:/information_technology

2. Parts of an URL:-

- A URL consists of following parts:-
Service protocol://site name or domain name:[port number]/path?query

- Service protocol:-
- It is the first part of a URL.
- It provides a particular service to extract resources on internet.
- It is followed by://.
- Example of service protocol are http://, ftp://, etc.
- Site name/Domain name:-
- It is the second part of URL.
- It provides the site name or domain name of the website from which we want to extract information.
- It is followed by:.
- Port number:-
- It is a unique number used for the service to be used in the internet.
- The default port number is 1234.
- It is optional.
- It is followed by forward slash (/).
- Path or query:-
 - It is the last part of the URL.
 - It provides the information about the file resources we want to search.
 - Example of searching information about URL :-
HTTP://www.google.com:(80)/information_technology?URL
 - Query section is preceded by ?

3. Mobile Communication

- Wireless mobile communication is a fastest communication technique having millions of users around the world.
- Cellular phones are becoming the essential part of our everyday life and business.
- Cellular system provides bidirectional voice and data communication around the world.
- Cellular system design provides the reusability of frequency spectrum.
- A particular frequency can be used over a specific location called as cell and the coverage area is divided into non-overlapping cells.
- In 1st generation of cellular system analog communication system are used, but from second generation digital communication system or technique are used.

The following are the various types of the evolution of mobile communication techniques:-

- First generation (1G)
 - Second generation (2G)
 - Third generation (3G)
 - Fourth generation (4G)
 - Fifth generation (5G)
- First generation (1G):-
 - 1G mobile network uses analog signal to transmit voice calls between sender and receiver by using frequency modulation technique for radio transmission.
 - It uses FDMA (Frequency Division Multiple Access) technique with channel

capacity of 30 kHz.

- The data transmission speed of 1G is up to 2.9 kbps.
 - 1G mobile network can not convert voice signal or analog signal to digital mode.
 - There is no facility for transmission of image, video, etc.
 - 1G mobile network does not provide global roaming service.
 - 1G mobile network provides low data transmission capacity and poor voice quality.
- Second generation (2G)
 - The second generation of wireless mobile communication started around 1990.
 - 2G mobile communication was based on low band digital data signaling.
 - This generation offers additional service like SMS (Short Message Service) , picturemessage service, etc.
 - In this generation two types of digital modulation schemes are used : TDMA (TimeDivision Multiple Access) and CDMA (Code Division Multiple Access).
 - The frequency band of 2G mobile communication technique is 850 to 1900 MHz.
 - The most popular 2G wireless technology is known as GSM (Global System for Mobilecommunication).
 - The data transmission speed of 2G is up to 171.2 kbps.
 - 2G communication technique is used for both voice, data signal transmission.
 - CDMA technology is used in 2G for providing clearer voice quality.
 - Based upon the CDMA a new telephone technology was introduced, called as WLL(Wireless in Local Loop).
 - Third generation (3G)
 - 3G represents third generation of mobile communication.
 - It uses various wireless technologies like CDMA 2000, EDGE, HSDPA, etc.
 - 3G mobile communication system provides multimedia service through mobile phones.
 - IMT-2000 (Internet Mobile Telecommunication-2000) is the official name for 3G to provide wireless access to global telecommunication system.
 - Data bandwidth in 3G is 2 Mbps to 21 Mbps.
 - Peak upload rate in 3G is 5 Mbps.
 - Peak download rate in 3G is 21 Mbps.
 - 3G provides the facility like web browsing, e-mail, video conferencing, etc.
 - Fourth generation:-
 - The fourth generation mobile communication system is introduced in the year 2010.
 - 4G connections will be faster than the 3G connections.
 - It uses various wireless technologies like LTE, Wi-MAX, Wi-Fi, etc.
 - Data bandwidth in 4G is 2Mbps to 1Gbps.
 - Peak upload rate in 4G is 100Mbps.
 - Peak download rate in 4G is 1Gbps.
 - 4G provides high quality service with ant time and any where facility.
 - Fifth generation
 - 5G represents the fifth generation of mobile communication.
 - 5G mobile communication system uses IPV6 network.

- It is also called as WWW (Wireless World Wide Web).
- It is the future generation for mobile communication.
- It uses advanced LTE technique.
- The downloading speed is about 1Gbps and uploading speed is about 512 mbps.
- It will provide very high speed data transmission.

XII. SOME WIRELESS MOBILE COMMUNICATION TECHNOLOGIES

1. CDMA

- It stands for Code Division Multiple Access.
- It is used in 2nd generation (2G) and 3rd generation (3G) wireless communication.
- CDMA uses spread spectrum technology to break up speech into small, digitized segments and encode them to identify each call.
- CDMA technology are used for providing clearer voice quality with less background noise .
- CDMA distinguishes between multiple transmission carried simultaneously on a single wireless signal.
- Based upon the CDMA a new telephone technology was introduced which is called as WLL(Wireless in Local Loop).

2. WLL

- It stands for Wireless in Local Loop.
- It is a new telephone technology which was introduced based upon the CDMA.
- This technology is used in the 2nd generation of mobile communication.
- In this technology the voice is transmitted through radio signals within a range of 30 to 35 km.
- Using CDMA each phone was given a code to send or receive voice and data signal.
- In CDMA technique the spectrum technology break up the speech into small, digitized segments and encode them to identify each call.
- CDMA distinguishes between multiple transmissions carried simultaneously on a single wireless signal.

3. GSM

- It stands for Global System for Mobile communication.
- It is the most popular 2G wireless technology.
- It uses the TDMA (Time Division Multiple Access) scheme.
- In this technology each frequency is divided using TDMA scheme into eight timeslots and allows eight simultaneous calls on the same frequency.
- The protocol allows large number of users to access one radio frequency by allocating timeslots to multiple voice or data calls.
- The net data rate in GSM is around 14.4 kbps.

4. Wi-Fi

- Wi-Fi stands for Wireless Fidelity.
- Wi-Fi technology is used in 4th generation of mobile communication.
- Wi-Fi is a universal wireless networking technology that uses radio frequencies to transfer data.
- Wi-Fi allows high-speed internet connections without the use of cables.
- It is also 10 times faster than a regular dial-up connection.
- To access Wi-Fi, we need Wi-Fi enabled devices (laptops, mobile, etc.).
- These Wi-Fi enabled devices can send and receive data wirelessly in any location equipped with Wi-Fi access.

5. Wi-MAX

- Wi-MAX stands for Worldwide interoperability for Microwave Access.
- Wi-MAX technology is used in 4th generation of mobile communication.
- Wi-MAX would operate as similar as Wi-Fi, but at higher speeds over greater distances and for a greater number of users.
- Wi-MAX has the ability to provide service even in areas that are difficult for wired infrastructure to reach.
- Wi-MAX is one of the hottest broadband wireless technologies around today.
- Wi-MAX systems are expected to deliver broadband access services to residential and enterprise customers in an economic way.
- Wi-MAX is a standardized wireless version of Ethernet intended primarily as an alternative to wire technologies (such as cable modems, DSL, etc.) to provide broadband access to customer premises (house).

6. LTE

- It stands for Long Term Evolution.
- LTE technology is used in 4th generation of mobile communication.
- LTE was evolved from the Universal Mobile Telecommunication System (UMTS), which in turn evolved from the Global System for Mobile Communications (GSM).
- LTE technology is mainly used for the mobile network system.
- Current application under this technology can provide services like; web browsing, videoconferencing, cloud computing, game services, etc.

7. GPRS

- It stands for General Packet Radio System.
- This technology is used in 3rd generation of mobile communication.
- GPRS is also known as GSM-IP (Global System Mobile Communications – Internet Protocol).
- This technology keeps the users of this system online, allows to make voice calls, and access internet on-the-go.
- GPRS is a packet-based wireless communication services that offers data speed up to 144kbps.

8. EDGE

- It stands for Enhanced Data rates for Global Evolution.
- It is used in 3rd generation of mobile communication.
- It is a high-speed wireless data service technology that can deliver speeds of up to 384kbps using all GSM channels.
- This service allows the possibility of the delivery of multimedia and other broadband facilities to the mobile phones and computer users.

9. UMTS

- It stands for Universal Mobile Telecommunications Service.
- It is used in 3rd generation of mobile communication.
- It is used to provide packet-based wireless broadband service.
- It is used for the transmission of text, digitized voice, video and multimedia at data rates up to 2Mbps.

10. TDMA

- TDMA stands for Time Division Multiple Access.
- It is a scheme used in the most popular GSM technology.
- It is mainly used in 2nd generation of mobile communication.
- In GSM technology each frequency is divided using TDMA scheme into eight timeslots and allows eight simultaneous calls on the same frequency.
- The protocol used by this scheme allows large number of users to access one radio frequency by allocating timeslots to multiple voice or data calls.

11. FDMA

- FDMA stands for Frequency Division Multiple Access.
- It is used in 1st generation of mobile communication.
- By using this scheme, each frequency band allocated for wireless cellular telephone communication is divided into 30 channels.
- Each channel can be used to carry a voice signal at a time, so by using FDMA scheme we can carry multiple voice signals over a single frequency band at a time.
- By the use of FDMA, each channel can be assigned to only one user at a time.