**INTERNET**

**&**

**WEB TECHNOLOGY**

**6TH SEMESTER IT**

**INTERNET FUNDAMENTALS**

1. **Internet Fundamentals**
	1. Describe Motivation for internet working
	2. Narrate History & scope of internet
	3. Explain Internet protocol and standardization
	4. Discuss Role of ISP & Factors for choosing an ISP
	5. State Internet service providers in India
	6. Explain Types of connectivity such as Dial Up, leased, VSA T etc.
	7. Discuss Internet server & client modules on various operating systems

**1.1Motivation for internet working**

**Internet**

Internet is a collection of connected computers with each other in all over the world. The internet sometimes called, simply “the Net”. Ex: www (World Wide Web).

A means of connecting a computer to any other computer anywhere in the world via dedicated routers and servers. When two computers are connected over the Internet, they can send and receive all kinds of information such as text, graphics, voice, video, and computer programs.

No one owns Internet, although several organizations the world over collaborate in its functioning and development. The high-speed, fiber-optic cables (called backbones) through which the bulk of the Internet data travels are owned by telephone companies in their respective countries.

The Internet grew out of the Advanced Research Projects Agency's Wide Area Network (then called ARPANET) established by the US Department Of Defence in 1960s for collaboration in military research among business and government laboratories.

Later universities and other US institutions connected to it. This resulted in ARPANET growing beyond everyone's expectations and acquiring the name 'Internet.'

The development of hypertext based technology (called World Wide web, WWW, or just the Web) provided means of displaying text, graphics, and animations, and easy search and navigation tools that triggered Internet's explosive worldwide growth.

**Networking**

Networking is defined as the act of making contact and exchanging information with other people, groups and institutions to develop mutually beneficial relationships, or to access and share information between computers.

Networking is a process that fosters the exchange of information and ideas among individuals or groups that share common interests. Networking may fall into one of two categories: social or business. Less commonly in finance, the term "networking" may also refer to the setting up and operation of a physical computer network.

**Network**

When, you are working on single computer, you cannot share any information with another computer. To make data sharing possible, you have to connect the computer with other computer. This is known as, network. Networking begins 1960 by the U.S department of defence.

**Motivation**

* Internet communication has become a fundamental part of a life. The world famous internet service is www (World Wide Web). It contains, various information, like, crop production, stuck prices, air line traffic, etc.
* 25 years ago, a technology has been created, i.e., known as, internetworking that, makes it possible to inter connect many physical networks and operate them as, a co-ordinated unit.
* The internet technology hides, the details of network hardware and permit computer to communicate independent of their physical network connection.
* Internet technology is called, OSI (open systems inter connection). It is called, open, because unlike proprietary communication system available from one specific vendor. The specifications are publicly available. Ex: face book.
* There are many different LAN and WAN technologies In real world, computers are connected by many different technologies Any system that spans a large organization must accommodate multiple technologies .
* Internetworking is a scheme for interconnecting multiple networks of dissimilar technologies Uses both hardware and software Extra hardware positioned between networks Software on each attached computer System of interconnected networks is called an internetwork or an internet .
* An internetwork is composed of arbitrarily many networks interconnected by routers Routers can have more than two interfaces .
* Routers in an organization Would be possible to interconnect all networks in an organization with a single router Most organizations use multiple routers Each router has finite capacity; single router would have to handle all traffic across entire organization Because internetworking technology can automatically route around failed components, using multiple routers increases reliability .
* A virtual network Internetworking software builds a single, seamless virtual network out of multiple physical networks Universal addressing scheme Universal service All details of physical networks hidden from users and application programs .
* The TCP/IP Internet Protocols or, simply, TCP/IP is the mostly widely used internetworking protocol suite First internetworking protocol suite Internet concept (originally called catenet developed in conjunction with TCP/IP Initially funded through ARPA .
* Internetworking protocols Others include IPX, VINES, AppleTalk TCP/IP is by far the most widely used Vendor and platform independent Used in the Internet - 20 million computers in 82 countries

**1.2 History and scope of internet**

* The internet begins with the development of electronic computers in the 1950s initial packet of packet networking.
* U.S department of defence, awarded contracts as early as the 1960s for packet network system, including development of the ARPANET.
* ARPANET is the first network to use the internet and it used conventional point to point leased line inter connection.
* ARPA began working toward internet technology in the mid 1970s. ARPA scheduled a meeting of researchers to share idea and discuss result of experiment the group was known as, **internet research group.**
* 1979, many researcher involved in TCP/IP effort. Global internet began 1980.
* ARPA created a committee to design of the protocol and architecture of the internet, called (ICCB) Internet control and configuration board, until 1983. The internet technology becomes complete in January 1983. At the same time, (DCA) Defence Communication Agency, split the ARPANET in to two separate network, one is ARPANET and other is MILNET (for military network).
* A new protocol DARPA made an implementation, available at low cost for enlarge university researcher.
* UNIX 0.5 is available in the University of California’s Berkeley software distribution, called, Berkeley software distribution, caller, Berkeley UNIX, by Bolt Beanek and Newman (BBN) to implement TCP/IP protocol, use with UNIX.
* Berkeley UNIX provided a new 0.5, known as, a socket that, allow application to access communication protocols.
* NSF (National science foundation) took an active role in expanding the TCP/IP internet to reach many scientists as possible.
* In the late 1970, NSF founded a project known as, CSNET (Computer science network). CSNET had a goal to connect all computer scientists.
* 1985 NSF began a program to access network centered, on six super computer centers.
* 1986, it expanded a new wide area backbone network, called, NSFNET. Within seven years, internet had grown hundred individual networks. It connected nearly, 20,000 computers at university, govt. corporate research laboratories.
* 1987, it was estimated growth 15% per month.
* Medium and small companies began connecting 1990’s. Rapid expansion introduced, problem of scale unanticipated in the original design and motivated researchers to find, technique for managing large distributed resources.
* The name address of all computer attached to the internet were kept in a single file. If, a correct central file existed, network capacity was insufficient to allow, either frequent distribution. New protocols were developed and a naming system was put in place, across the global internet, that, allow any user to resolve the name of remote machine automatically, called as, DNS (Domain Name System).

**1.3 Internet protocol and standardization**

* **Protocols**

Protocol is a set of rules or conventions that, governs all aspects of data communication between a numbers of nodes. The elements of protocol are,

* **Syntax**

It refers to the structure or format of data that should be maintained. Suppose, source address are destination addresses are to be sent in a frame header, then, it is the syntax, that, will determine, which, one will come first, how many bits are assigned to each, etc.

* **Semantics**

It refers to the meaning of each section of bits. Suppose, all I’s in the destination address may have a special meaning, etc.

* **Timing**

It refers to the time and speed of sending the data.

* **Standards**

Standards are the guide lines, provided to the manufactures, vendors, government agencies and other service providers to ensure, the kind of interconnectivity, required for national and international communications.

**1.4 ISP**

* ISP stands for Internet Service Provider. An ISP is an organization that provides service for accessing, using or participating in the internet.
* ISP may be organized in various forms, such as commercial community owned, privately owned, etc.
* It refers to a company that provide, internet service including personal and business access to the internet for a monthly fee.
* An ISP is a company, that, supplies, internet connectivity to home and business customer. It support, one or more forms of internet access, ranging from traditional modem dial-up to DSL and cable modem broad band service to dedicated T1/T3 lines.
* More recently, wireless ISP that, offer internet access, through wireless LAN or wireless broad band network.
* **Factors for choosing an ISP**
* Size
* Reliability
* Performance
* Price
* **Quality of service**
* Working hours
* Technical support.
	1. **Internet service providers in India**
* BSNL
* Aircel
* Airtel
* Docomo
* Vodafone
* Idea, etc.

**1.6 Types of internet connectivity**

Technology changes at a rapid pace and so do Internet connection speeds. We reviews connection speeds ranging from dial-up to T3 and everything in between.

As technology grows, so does our need for bigger, better and faster Internet connections. Over the years the way content is presented via the [Web](http://www.webopedia.com/TERM/W/World_Wide_Web.html) has also changed drastically. Ten years ago being able to center, bold, and produce text in different colors on a webpage was something to admire. Today, Flash, animations, online gaming, streaming video, database-driven websites, ecommerce and mobile applications (to name but a few) are standards.

## Need for Speed

The need for speed has changed the options available to consumers and businesses alike in terms of how and how fast we can connect to the Internet.  The connection speeds listed below represent a snapshot of general average to maximum speeds at the time of publication. This is no doubt will change over time and Internet connection speeds also vary between [Internet Service Providers](http://www.webopedia.com/TERM/I/ISP.html) (ISP).

* **Dial-up connection**
* An analog Internet connection is both economical and slow.
* Using a [modem](http://www.webopedia.com/TERM/M/modem.htm) connected to your PC, users connect to the Internet when the computer dials a phone number (which is provided by your ISP) and connects to the network.
* Dial-up is an analog connection because data is sent over an analog, [public-switched telephone network](http://www.webopedia.com/TERM/P/PSTN.html).
* The modem converts received analog data to digital and vice versa. Because dial-up access uses normal telephone lines the quality of the connection is not always good and data rates are limited.
* Typical Dial-up connection speeds range from 2400 bps to 56 Kbps.
* It is also known as, level-2 connection. This provides connection to internet, through a dial up terminal connection.
* The computer, which, provides, internet access is known as, ‘host’ and the computer that, receives, the access is ‘client’ or ‘terminal’.
* The client uses, modem to access a host and acts as, directly connected terminal to the host. This type of connection is also known as, remote modem access.
* Host carries, all the command, that, are type or a client machine and the client computer acts as a ‘dumb’ terminal, connected to remote host.
* It is also divided into two types, i.e.

I) Shell connection

II)TCP/IP Connection

* **Shell connection**

 In shell connection, it doesn’t support, graphics display.

* **TCP/IP Connection**

The measure difference between shell and TCP/IP account is that, shell account only display, text and doesn’t support graphics, whereas, TCP/IP displays both. ⇒ It is more popular internet connection.

* Today, analog has been widely replaced by broadband (Cable and DSL).

**Components for dial-up connection**

* Computer.
* Modem
* Telephone line
* Sheller TCP/IP connection
* Internet client software.
* **Leased connection**
* It is also known as, direct internet access or level-3 connection.
* It is secure, dedicated and most expensive with leased connection.
* Computer is dedicatedly or directly connected to the internet using high speed transmission line.
* Leased inter connection are limited to large corporation and universities, who, could effort these costs.
* **VSAT connection**
* The full form of VAST is very small aperture terminal (VSAT).
* It is a two way satellite ground station.
* VSAT antenna with a dish antenna that, smaller than 3 meters.
* VSAT antennas range from 75 c.m. to 1.2 m.
* Data rates range from 4 kbit/s upto 4 mbit/s.
* VSAT are used to transmit narrow band data.
* Eg.- Transaction using credit cards.

## ISDN - Integrated Services Digital Network

* Integrated services digital network ([ISDN](http://www.webopedia.com/TERM/I/ISDN.htm)) is an international communications standard for sending voice, video, and data over digital telephone lines or normal telephone wires.
* Typical ISDN speeds range from 64 Kbps to 128 Kbps.

## B-ISDN - Broadband ISDN

* [Broadband ISDN](http://www.webopedia.com/TERM/B/broadband_ISDN_B_ISDN.html) is similar in function to ISDN but it transfers data over fiber optic telephone lines, not normal telephone wires.
* SONET is the physical transport backbone of B-ISDN. Broadband ISDN has not been widely implemented.

## DSL – Digital Subscriber Line

* DSL is frequently referred to as an "always on" connection because it uses existing 2-wire copper telephone line connected to the premise so service is delivered simultaneously with wired telephone service --  it will not tie up your phone line as an analog dial-up connection does.
* The two main categories of DSL for home subscribers are called ADSL and SDSL.  All types of DSL technologies are collectively referred to as [xDSL](http://www.webopedia.com/TERM/X/xDSL.html).
* xDSL connection speeds range from 128 Kbps to 9 Mbps.

## ADSL - Asymmetric Digital Subscriber Line

* [ADSL](http://www.webopedia.com/index.php/TERM/A/ADSL.html) is the most commonly deployed types of DSL in North America.
* Short for asymmetric digital subscriber line ADSL supports data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the upstream rate).
* ADSL requires a special ADSL modem.

## ADSL+2  - ADSL  Extension

* An extension to ADSL broadband technology that provides subscribers with significantly faster download speeds when compared to traditional ADSL connections.
* [ADSL+2](http://www.webopedia.com/TERM/A/ADSL2_plus.html) works in the same fashion as ADSL a special filter is installed on a subscriber's telephone line to split existing copper telephone lines (POTS) between regular telephone (voice) and ADSL+2.
* ADSL2+ service is most commonly offered in highly-populated metropolitan areas and subscribers must be in close geographical locations to the provider's central office to receive ADSL2+ service.

## SDSL - Symmetric Digital Subscriber Line

* Short for symmetric digital subscriber line, [SDSL](http://www.webopedia.com/TERM/S/SDSL.html) is a technology that allows more data to be sent over existing copper telephone lines (POTS).
* SDSL supports data rates up to 3 Mbps.
* SDSL works by sending digital pulses in the high-frequency area of telephone wires and cannot operate simultaneously with voice connections over the same wires.
* SDSL requires a special SDSL modem. SDSL is called symmetric because it supports the same data rates for upstream and downstream traffic.

## VDSL - Very High DSL

* Very High DSL ([VDSL](http://www.webopedia.com/TERM/V/VDSL.html)) is a DSL technology that offers fast data rates over relatively short distances — the shorter the distance, the faster the connection rate.

## Cable -  Broadband Internet Connection

* Through the use of a [cable modem](http://www.webopedia.com/TERM/C/cable_modem.html) you can have a broadband Internet connection that is designed to operate over cable TV lines.
* Cable Internet works by using TV channel space for data transmission, with certain channels used for downstream transmission, and other channels for upstream transmission.
* Because the [coaxial cable](http://www.webopedia.com/TERM/C/coaxial_cable.html) used by cable TV provides much greater bandwidth than telephone lines, a cable modem can be used to achieve extremely fast access.
* Cable providers typically implement a cap to limit capacity and accommodate more customers. Cable speeds range from 512 Kbps to 20 Mbps.

## *Wireless Internet Connections*

* [Wireless Internet](http://www.webopedia.com/TERM/W/wireless_internet.html), or wireless broadband is one of the newest Internet connection types.
* Instead of using telephone or cable networks for your Internet connection, you use radio frequency bands.
* Wireless Internet provides an always-on connection which can be accessed from anywhere — as long as you geographically within a network coverage area.
* Wireless access is still considered to be relatively new, and it may be difficult to find a wireless service provider in some areas.
* It is typically more expensive and mainly available in metropolitan areas.

## *T-1 Lines – Leased Line*

* [T-1 lines](http://www.webopedia.com/TERM/T/T_1_carrier.html) are a popular leased line option for businesses connecting to the Internet and for Internet Service Providers (ISPs) connecting to the Internet backbone.
* It is a dedicated phone connection supporting data rates of 1.544Mbps.
* A T-1 line actually consists of 24 individual channels, each of which supports 64Kbits per second.
* Each 64Kbit/second channel can be configured to carry voice or data traffic.
* Most telephone companies allow you to buy just one or some of these individual channels.
* This is known as fractional T-1access. T-1 Lines support speeds of 1.544 Mbps.
* Fractional T-1 speeds are 64 Kbps per channel (up to 1.544 Mbps), depending on number of leased channels.

## *Bonded T-1*

* A [bonded T-1](http://www.webopedia.com/TERM/B/bonded_T1.html)is two or more T-1 lines that have been joined (bonded) together to increase bandwidth.
* Where a single T-1 provides approximately 1.5Mbps, two bonded T1s provide 3Mbps or 46 channels for voice or data. Two bonded T-1s allow you to use the full bandwidth of 3Mbps where two individual T-1s can still only use a maximum of 1.5Mbps at one time.
* To be bonded the T-1 must run into the same router at the end, meaning they must run to the same ISP.
* Typical Bonded T-1 (two bonded T-1 lines) speed is around 3 Mbps.

## *T-3 Lines – Dedicated Leased Line*

* [T-3](http://www.webopedia.com/TERM/T/T_3_carrier.html) lines are dedicated phone connections supporting data rates of about 43 to 45 Mbps.
* It too is a popular leased line option.
* A T-3 line actually consists of 672 individual channels, each of which supports 64 Kbps. T-3 lines are used mainly by Internet Service Providers (ISPs) connecting to the Internet backbone and for the backbone itself.
* Typical T-3 supports speeds ranging from 43 to 45 Mbps.

## *OC3 - Optical Carrier*

* Short for [Optical Carrier](http://www.webopedia.com/TERM/O/OC.html), level 3 it is used to specify the speed of fiber optic networks conforming to the SONET standard.
* OC3 is typically used as a fiber optic backbone for large networks with large voice, data, video, and traffic needs. Speeds are 155.52 Mbps, or roughly the speed of 100 T1 lines.

## *Internet over Satellite*

* [Internet over Satellite](http://www.webopedia.com/TERM/I/IoS.html)(IoS) allows a user to access the Internet via a satellite that orbits the earth.
* A satellite is placed at a static point above the earth's surface, in a fixed position.
* Because of the enormous distances signals must travel from the earth up to the satellite and back again, IoS is slightly slower than high-speed terrestrial connections over copper or fiber optic cables.
* Typical Internet over satellite connection speeds (standard IP services) average around 492 up to 512 Kbps.

**1.7 Internet server & client modules on various operating systems**

* **Internet server**
* Server is a data center several server are mounted on a rack and connected to a KVM switch. Keyboard video and mouse.
* A server is a running instance of an application (Software) capable of accepting requests from the client and giving responses, accordingly.
* Servers often provide, essential services, across a network, either to private user, inside a large organization or to public users via the internet.
* Internet servers make the Internet possible. All of the machines on the Internet are either servers or clients.
* The machines that provide services to other machines are servers. And the machines that are used to connect to those services are clients.
* There are Web servers, e-mail servers, FTP servers and so on serving the needs of Internet users all over the world.

**Types of server**

The origin of the server is to serve – technically means that the specific computer is serving all those computers that are present in its network. It facilitates them by making queue of the printing command of several computers at a time and also acts like a file server for those applications that are accessed by the online terminals.



### ****Application Servers****

Application servers have lion’s share in computer territory between database servers and the end user, where servers are often connected to the two. They are often referred as middleware Middleware is that software which establishes a connection between two separate applications that are otherwise apart. A number of middleware products can link a database system to a Web server. It enables users to request data from database by the help of those forms that are displayed on Web browser and based on the users’ profile and request, allowing the Web server to return dynamic Web pages.

### ****List Servers****

To improve the management of mailing lists list servers are used despite of what is there type. Whether they are interactive debates open to the public or one-way lists that deliver newsletters, announcements or advertising.

### ****Chat Servers****

This server enables a number of people to share information in the environment of an internet newsgroup that offer real time discussion capabilities. It is used to refer to a number of different features of computer. To immediately respond to the input real-time operating systems are used.

### ****IRC Servers****

Internet Relay Chat is comprised of various independent networks of servers that allow users to connect to each other via an IRC network. It is an option for those who are seeking real time competence.

### ****Fax Servers****

Those organizations that want to reduce the incoming and outgoing telephone resources; a fax server is an ideal solution. However, there is a need to fax the actual document.

### ****Groupware Servers****

It is software that is designed to make the users able to work together, regardless of their location, through Internet or a corporate Intranet and to work together in a virtual environment.

### ****Mail Servers****

Mail server is as important as web server s and mail servers to send and store mails on the corporate networks through LANs and WANs and across the internet.

### ****Telnet Servers****

By the help of it users log on to a host computer and perform work as if they are working on isolated computer.

### ****News Servers****

They work as source of distribution and delivery for hundreds of available public news groups accessible over the USENET news network. USENET is global bulletin board system that can be approached via internet or via a variety of online services

### ****Proxy Servers****

These servers work in-between a client programme (commonly a Web browser) and an external server (another server on web) to filter requests, improve performance, and share connections.

* **Client server model**

Application servers are the type of middle ware, which, occupy a large chunk of computing territory between database servers and the end user and they often connected the two.

**Questions**

1. What do you mean by ISP? What is its role?
2. Name four different types of Internet Connectivity?
3. Define Internet protocol?
4. Define Internet protocol and its standardization.
5. What is ISP? Identify factor for choosing an ISP?
6. What are the different types of connectivity available in Internet? Explain.
7. Discuss the various applications and services of Internet.
8. What is VSAT connection?
9. What is Dial-up and leased connectivity?
10. State various internet service providers in India?
11. What is the scope of Internet?
12. What do you mean by ARPANET?

**TCP/IP**

1. **TCP I IP**
	1. Explain TCP I IP internet layering model
	2. Discuss Reliable stream transport service (TCP) , Need for stream delivery
	3. Properties of reliable delivery service
	4. Providing reliability
	5. Idea behind slide windows
	6. Ports connections and end points , Segment, stream, sequence number
	7. TCP segment format
	8. TCP header
	9. TCP checksum
	10. Acknowledgement
	11. Time out and retransmission
	12. Response to congestion
	13. Establishment of a TCP connection
	14. Source and destination address
	15. Protocol number
	16. Checksum
	17. Closing TCP connection
	18. TCP connection reset.

**2.1 TCP/IP Internet Layering Model**

* **TCP/IP**
* TCP/IP is the combination of 2 different types of protocol
* TCP-Transmission control protocol
* IP-Internet protocol
* TCP/IP protocol is used to communicate across any set of interconnected network. Ex.-TCP-IP connect a set of network within a single building, with in physical campus or among a set of compose etc.
* Its viability has been a large skill.
* It is the basic communication language or protocol.
* It was originally known as DOD model because the development of networking model was funded by DARPA. DARPA is Difference Advance Research Project Agency and agency of the united state of department.
* TCP/IP provides end to end connectivity specifying how data should be address packetize address, transmitted, routers and receive at the destination.

|  |  |
| --- | --- |
| OSI model  | TCP/IP model  |
| Application layer Presentation layer Session layer  | Application layer  |
| Transport layer  | Transport layer  |
| Network layer  | Internet layer  |
| Data link layer  | Network interface/link sub network layer  |
| Physical layer  | Physical layer  |

* **OSI Model:-**
* There are 7 types of OSI model.
* Application layer
* Presentation layer
* Session layer
* Transport layer
* Network layer
* Data link layer
* Physical layer
* **Application layer: -** Providing user service.
* **Presentation layer:** - Format and code conversion service.
* **Session layer**: - Establishing managing and terminating session.
* **Transport layer**: - Reliable to transmission. Easily transmission, process to process delivery.
* **Network layer**:- Root selection

Routing

* **Data link layer**: - Defining frame, error correction reliable transmission.
* **Physical layer**: - To convert analog signal to digital signal transmission the bit across the medium.
* **TCP/IP model**

TCP/IP model has 5 layers. These are:-

* Application layer
* Transport layer
* Internet layer
* Network interface/ link sub network layer/ network access layer
* Physical layer

**Application layer**:-

* Application layer is the top most layer of TCP/IP model.
* Application layer is present on top of transport layer.
* Application layer include all the higher level protocol like DNS (Domain name system), HTTP, FTP, SNMP (Simple Network Management Protocol), SMTP (Simple Mail Transport Protocol) DHCP (Dynamic host Configuration Protocol).
* Application layer defines TCP/IP application protocol and how host program interface with transport layer service to use the network.

**Transport layer:-**

* Transport layer is the 3rd layer of the TCP/IP model.
* The purpose of transport layer is to permit device on the source and destination host to carry on a conversation.
* The position of the transport layer in between the application layer or internet layer. Ex. - TCP & UDP are used UDP –(User datagram protocol)
* The transport layer defines the level of service and status of the connection used when transporting data.

**Internet layer:-**

* It is the 2nd layer of the TCP/IP model.
* The position of the layer in between transport layer and network interface layer.
* Internet layer is also responsible for routing datagram layer.
* Internet layer job is to allow host to insert packet into any network and have them to deliver independently to the destination.
* At the destination side the data packet may appear in a different order than they were sending.
* It is the jobs of the higher layer to rearrange them in order to delivery them to proper n/w application operating at the application layer. Ex. IP, ICMP (Inter control message protocol) ARP (Address resolution protocol) RARP (Reverse address resolution protocol).

**Network access layer:-**

* It is the 1st layer of the TCP/IP model.
* It defines how data is physically sent through the network.
* How bits are electrically signal by hardware device the interface directly with a network medium such as co axial cable, optical fibber.
* The protocol use in this layer Ethernet frame relay.

**2.2 Need for system delivery**

* At the lowest level compute communication network provide un reliable packet delivery.
* Packet can be list or destroyed when transmission error interface with data or network hardware failed or network become too heavily loaded.
* At the highest level of application program needs to send large volume of data from one computer to another computer.
* It requires programmer to build error detection and recovery because it is difficult to design understand or modify one goal of N/W protocol research has been to find general purpose solution to the problem of providing reliable system delivery.

**2.3Properties of reliable delivery services**

* **Stream orientation:-**
* When 2 application programme transfer large volume of data. Data is viewed as a stream of bit’s divided in to 8 bit acted or bytes.
* The stream delivery service passes to the receiver exactly the same sequence of acted or bytes the sender passes to it on the source machine.
* **Virtual circuit connection:-**
* Making a stream transfer is analogues placing a telephone “call”
* Before transfer construct, both the sending and receiving application programme interact with their respective operating system.
* One application places a “call” which must be accepted by the other.
* The two operating system communicate by sending messages across the interact verifying that the transfer is Authorized both sides are ready.
* Once all detail having settle the protocol module inform the application programme that connection has establish the transfer can begin.
* During transfer protocol software on the 2 machine continues communicate to verify that the data is received correctly.
* **Buffer transfer:-**
* Application programme send a data stream across the virtual circuit by repeatedly passing data octets to the protocol software.
* At the receiving end the protocol software delivery the octet from the data streams exactly some at the sender side.
* Protocol software, it’s free to divide the stream into packet independent of the piece.
* If the application program chooses to generate extremely large block to data the protocol software divide each block into smaller place for transmission.
* The stream service provides a push mechanism that application used to force to immediate transfer.
* At the sender side push force protocol software to transfer data that has been generated without waiting to feet a buffer.
* **Unstructured stream:-**
* It is important to understand that, the TCP/IP stream service does not honour, structure data streams. For example, there is no way for a payroll application to have the stream service, mark boundaries between employee- records.
* Application programme, using the stream service must understand and agree on stream format, before incite a connection.
* **Full duplex connection:-**
* TCP/IP stream service allows con- current transfer in both directions, such, connection are called, full duplex.
* Full duplex connection consists of two independent stream, following in opposite direction.

**2.4 Providing reliability**



Time out and re transmission occur, when a packet is lost.

* The dotted lines show the time that would be taken by the transmission of a packet and its acknowledgement.
* Reliable stream delivery service guaranty to deliver a stream of data sent from one machine to another machine without duplication and data loss.
* Most reliable protocol used a fundamental technique, known as, possible ack, with re transmission.
* The sender keeps a record of each packet it sends and wait for a ack, before sending the next pocket.
* The sender retransmits the packet. The timer expired, before an acknowledgment arrives.
* The sender start a timer, often transmit a packet. When, the timer expires, the sender assumes that, the packet was lost. Then the sender retransmits the pocket again.
* Avoiding duplication, the reliable protocol service, assigning each packet, a sequence no.

**2.5 Idea behind slide windows**

* It makes stream transmission efficient to achieve reliability.
* The sender transmits a packet and then waits for an ack, before transmitting media.
* A data only flow between the machines in one direction at any type of the network is capability of any both directions.
* A simple positive ack. Waste amount of network bandwidth, because it must delay. Sending a new packet, until receive an acknowledgment.
* The sliding window protocol uses network bandwidth because they allows to sender to transmit to multiple pocket before waiting for an ack.



* The protocol places a small fixed size window on the sequence and transmits all packets.
* A packet is an ack if it has been transmitted, but no ack has been received.
* The no of packet that can be ack at any given time with the window size is limited small fixed number.
* In sliding window protocol window sizes, the sender is permit to transmit 8 packets.
* Once the sender receives and ack for the 1st packet inside the window then send the next packet.
* If a packet is los the timer expires the sender transmits the packet again.
* The window partition the sequence of packet in to 3 set.
* Those packets to the write have not been transmitted.
* Those packet lie in the window and being transmitted.
* And those packet to the left of the window has been transmitted, receive and ack.



**2.6 Ports, connection and end points**

* TCP uses protocol port numbers to identify the ultimate destination within a machine.
* Each port is assigned small integer used to identify it concept layering.

|  |  |
| --- | --- |
| Application  |  |
| Reliable stream (TCP)  | User datagram (UDP)  |
| Internet (IP)  |  |
| Network interface  |  |

* TCP provides a reliable stream service while UDP provides an un reliable datagram delivery service. Application programs use both.
* When use discussed UDP ports, we said to think of each port as a queue into which protocol software places arriving datagram.
* TCP ports are much more complex because a given port number does not correspond to a single object.
* TCP has been built on the connection abstraction.
* TCP uses the connection, not the protocol port, as its fundamental abstraction, connections are identified by a pair of end points.
* TCP defines an end point to be a pair of integers, where host is the IP address for a host and port is a TCP port on that host 128.10.2.3,25.

 Host Port

* Because TCP identifies a connection by a pair of endpoints, a given TCP port number can be shared by multiple connections on the same machine.

**Segments, streams and sequence numbers:-**

* TCP views the data stream as a sequence of ocets or bytes that it divides into segments for transmission.
* TCP window mechanism makes it possible to send multiple segments before an circuit segment arrives.
* The TCP form of a sliding window protocol also solves the end to end flow control problem.
* The TCP sliding window mechanism operates at the octet level not at the segment on packet level.
* The first pointer makes the left of the sliding window separating octets that have been sent and acknowledged from octets yet to be acknowledged.
* A second pointer marks the right of the sliding window and defines the highest octet in the sequence that can be sent before more acknowledgments are received.
* The third pointer marks the boundary inside the window the separates those octets that have already been sent from those octets that have not been sent.

1

2

3

4

5

6

7

8

9

10

11

* It is a TCP slide window.
* TCP connections are full duplex.

**2.7 TCP segment format**

* The unit of transfer between TCP software on two machine is called a segment.
* Segment are exchanged to establish connection, transfer data send acknowledgement, creating window size and close connection.
* Because TCP causes piggy backing, an acknowledgement travelling from machine. A to machine B may travelling the same segment from machine A to Machine B.
* Each segment is divided into two parts a header followed by data. The header, known as the TCP header, carries the excepted identification and control information.
* Source port and destination port contain the TCP port numbers that identify the application programs at the ends of the connection.
* The acknowledgement number filed identification is the number of the octet that the source expects to receive next.
* The HLEN field contains an integer that specifies the length of the segment header measured in

32-bit.

* It is needed because the options field varies in length, depending on which options have been included.



TCP segment format

**2.9 TCP checksum**

* The check sun field in the TCP header contains A 16 bit integer to verify the integrity of the data as well as TCP header.
* To compute the check sum TCP S/W on the sending machine follow a procedure.
* It depnds on pseudo header to the segment enough ‘O’ bit to make the segment the multiple of 16 bit and computer the 16 bit check sum.
* TCP doesnot count the pseudo header the exact same as an UDP.
* Whenever a data gram arrives a TCP segment must past to be TCP sources and destination IP address, form the datagram as well as segment.

 0 8 16 31

|  |  |  |
| --- | --- | --- |
| Source IP Address  |  |  |
| Destination IP Address  |  |  |
| Zero  | Protocol  | TCP Length  |

TCP checksum format

* The sending TCP assign a field protocol the value that the under line delivery system.
* IP datagram carrying TCP value = total length.
* At the receiving end the information is used pseudo header is extracted to verify the segment arrived at the correct destination intact.

**2.10 Acknowledgements**

* Acknowledgments cannot easily refer to datagram or segments.
* Because retransmitted segment include data more than originally.
* The receiver collects data from arriving segment and reconstructs an exact copy of the stream being sent.
* Because segment travel in IP datagram, they can be lost or delivered act of order.
* So the receiver uses the sequence numbers to recorder segment.
* The receiver always ack the longest, contiguous prefix of the stream that has been received correctly.
* A TCP ack specifies the sequence number of the next octek, that the next receiver obtech to receive.
* The TCP ack scheme is called cumulative because it reports how much of the stream is accumulated.
* Lack of information about the successful transmission the makes cumulative ack. Ex. suppose that first segment is lost, but they arrive receiver send an the ack but each ack specifies.
* If the sender follow the accepted standard and retransmit only the first ack segment.

**2.11 Timeout and retransmission**

* TCP expects the destination to send ack whenever it successfully receives nex data from the data stream.
* TCP starts a timer and waits for an ack, if the timer expires before data in the segment has been acknowledged.
* TCP retransmission differs from the algorithm used in many network protocols.
* A segment travelling between a pair of machines may traverse a single low delay network or it may be travel across multiple intermediate networks.
* The total time required for a segment to travel the destination and an ack return to the source.
* TCP accommodate varying internet delays by using and adaptive retransmission.
* To collect the data needed for an adaptive algorithm TCP records the time at which each segment is sent and the time at which an acknowledgement arrives for the data.
	+ Round Trip time
	+ RTT = {<\*old-RTT) + (i-<) \* New-RTT)
* Choosing a value for L close to 1 makes the weighted average to change the last a short time.
* TCP compute a timeout value as a function of the current round trip is implementations of TCP used a constant weighting factor B(B>I).
* Choosing a value of B can be difficult because the packet lost quickly, B=I TCP is larger than any small delay where cause retransmission.

**2.12 Response to congestion**

* TCP software designed by considering the interaction between two end point to a connection.
* TCP must also react to congestion in an internet.
* Congestion is a condition of delay caused by an overload of datagram at one or more switching point.
* Congestion simple means increase delay it is used for timeout and retransmission.
* TCP must reduce transmission rate when congestion occurs.
* Most transport protocols use timeout and transmissions so they respond to increased delay by retransmitting data grams.
* The increased traffic will produce, increased delay leading to increased traffic. The condition is known as congestion collapse.
* To avoid congestion, the TCP stands new recommends using two techniques:-
	+ Slow start
	+ Multiplicative decrease
* There are two techniques to avoid congestion slow start and multiplicative decrease.
* To controlling congestion TCP maintains a window limit.
	+ Allowed –window = min (Receive-advertisement – congestion – window)
* TCP reduces the congestion window by half for every loos, it decreases the window exponentially if loss continues.
* If loss continues, TCP eventually limits transmission to a single datagram before transmitting.
* Slow start recovery whenever starting traffic on a new connection or increasing traffic after a period of congestion start the congestion window at the size of a single segment and increase the congestion window by one segment each time an acknowledgement arrives.
* To avoid increasing the window size too quickly and causing additional congestion, TCP adds one additional restriction.

**2.13 Establishment of a TCP connection**

* To establish a connection, TCP uses a three way handshake



* The first segment of a handshake can be identified because it has the SYN + bit sent in the code field.
* The second message has both the SYN bit and Ack its set, indicating that it acknowledges the first STN segment as well as continuing the handshake.
* TCP software on one machine waits passively for the handshake, and the TCP software on another machine initiates it.
* The handshake is carefully designed to work even of both machines attempt to initiate a connection simultaneously.
* The three way handshake is both necessary and sufficient for correct synchronization between the two ends of connection.
* The protocol must use a time out mechanism and retransmit lost requests are delayed unit after a connection has been established used and terminated.

**2.17 Closing a TCP connection:-**

* TCP is used to communicate, can terminate the conversion gracefully using the close operation. TCP uses a modified three way handshake to close connections.
* When an application program tells TCP that it has no more data to send TCP will close the connection in one direction.
* The sending TP finished transmitting the remaining data, wait for the receiver to knowledge it, and then sends a segment with the FIN bit set.
* The receiving TCP acknowledges the FIN segment and informs the application program on its end that no more data is available.
* Once a connection has been closed in a given direction TCP refers to accept more data for that direction. But acknowledgments is able to flow even after connection is closed.

 

* Here break connections occur after receives the FIN segment. Instead of generating a second FIN segment immediately, TCP sends an acknowledgement and then informs the application of the request to shutdown.
* When the application program instructs TCP to shutdown the connection.

**2.18 TCP connection reset:-**

* An application program uses the close operation to shutdown a connection when it finished using it.
* Closing connections is considered a normal port of use, analogous to closing fields.
* Sometimes abnormal conditions arise that force an application program or the network software to break a connection.
* TCP provides a reset facility for such abnormal dis connections.
* To reset connections, one side initiates termination by sending a segment with the RST bit in the code filed set.
* The other side responds to a reset segment immediately by aborting the connection.
* TCP also informs the application program that a reset accured.

INTERNET PROTOCOL

**3.1 Connectionless Delivery System**

* The most fundamental internet service consists of a packet delivery system.
* Unreliable service because delivery is not guaranteed. The pocket may be lost, duplicated, delayed, or delivered out of order.
* The service is called connectionless because each packet is treated independently form all other.
* A sequence of packet sent form one computer to another may travel over different path or some may be lost while other are delivered.
* Service is called best effort delivery because the internet s/w makes earnest attempt to delivery packet.

**3.4 Purpose of the Internet protocol**

* The protocol that defines the unreliable connectionless delivery mechanism is called the internet protocol.
* Current version protocol is version 4 i.e. called IPV4.
* IP protocol provides three definitions.
	+ 1st = The IP defines the base unit of data transfer used throughout a TCP/IP internet.
	+ 2nd = IP software performs the forwarding function choosing a path over which a packet will be sent.
	+ 3rd = IP includes a set of rules that embody the idea of unreliable delivery.

**Rules defines**

* How hosts and routers should process packets.
* How and when error messages should be generated.
* Condition under which packets can be discarded.
* TCP/IP enables cross platform, or heterogeneous networking.
* Good failure recovery
* High error – rate handling
* Low data overhead
* Platform independent.
* The ability to add networks without interrupting existing services.
* Today, all computers connecting to the internet or internet like private wide area networks are essentially using this protocol.

**3.5 IP Datagram**

* The TCP/IP protocols were built to transmit data over the ARPANET, which was a *packet switching network*.
* A *packet* is a block of data that carries with it the information necessary to deliver it - in a manner similar to a postal letter, which has an address written on its envelope.
* A packet switching network uses the addressing information in the packets to switch packets from one physical network to another, moving them toward their final destination.
* Each packet travels the network independently of any other packet.
* The *datagram* is the packet format defined by IP. Pictorial representation of an IP datagram is displayed in the figure.
* The first five or six 32-bit words of the datagram are control information called the *header*. By default, the header is five words long; the sixth word is optional. Because the header's length is variable, it includes a field called Internet Header Length (IHL) that indicates the header's length in words. The header contains all the information necessary to deliver the packet.



**IP datagram format**

* IP delivers the datagram by checking the *Destination Address* in word 5 of the header. The Destination Address is a standard 32-bit IP address that identifies the destination network and the specific host on that network.
* If the Destination Address is the address of a host on the directly attached network, the packet is delivered directly to the destination.
* If the Destination Address is not on the local network, the packet is passed to a gateway for delivery.
* *Gateways* are devices that switch packets between the different physical networks. Deciding which gateway to use is called *routing*. IP makes the routing decision for each individual packet.

**3.10 Direct and indirect delivery:-**

* we can divide forwarding into two forms direct delivery and indirect delivery. Direct delivery, the transmitting of a datagram from one machine areas a single physically new directly to another.
* Two machine can engage in direct delivery may in the both attach directly to the same underlying physical transmission.
* Indirect delivery occurs token the destination is of on a directly attaching network.

**Datagram delivery over a source network**

* Transmission of an IP datagram between two machines on a single physical network does not process routers.
* The sender is capsulate the datagram in a physical frame, binds the destination IP address to a physical H/W address and sends the resulting frame directly to the destination is efficient.

**Indirect delivery:-**

* Routers in a TCP/IP internet form a cooperative interconnected structure datagram pass from router to router until they reached router that can deliver the datagram directly.

**3.11 Table – Driven IP routing.**

* IP routing algorithm create an internet routing table on each machine that store information about possible destination and how to reach them.
* Both hasts and routers route datagram both have IP routing table.
* It every routing table contained information about every possible destination address.

**3.12 Default routes**

* Another technique used to hide information and keep routing table sizes small consolidates multiple entries into a default case.
* The idea is to have the IP routing software first look in the routing table for the destination networks.
* Default routing is specially usefully when a site has a small set of local addresses and only one connection to the rest of the internet.
* Default routes work will in host computers that attach to a single physical network and reach only one router loading to the local net and default that points to the only router.

**3.13 Host specific routes:-**

* Most IP routing software allows per host routes to be specified as a special case.
* Having per host routes gives the local network administrator more control over network use, permits testing and can also be used to control access for security purpose.
* When debugging network connect imsor routing tables the ability to specify special route to one individual machine turns out to be especially useful.

**3.14 Routing with IP address**

* Except of determination the time to live and re computing the check sum, IP routing does not alter the original datagram.
* The datagram source and destination address remain unaltered, they always specify the IP address of the original source and the IP address of the ultimate destination.
* When IP executes the routing algorithm it selects a new IP address. The IP address of the machine to which the datagram should be sent next.
* After executing the routing algorithm IP passes the datagram and the next hop address to the network interface responsible for the physical network which the data gram must be sent.
* The network interface software birds the next hop address to a physical address places the datagram in the data portion of the frame and sends.

**Obtaining a subnet mask:-**

* The subnet technology masks configuration of either fixed or variable length easy.
* The standard specifies that a 32 bit mask is used to specify and division.
* Thus, a site using subnet addressing must choose a 32 bit subnet mask for each network.
* Bits in the subnet mask are set +01 if machine on the network treat the corresponding bit in the IP address as port of the chest identifier.
* For example the 32 bit subnet mask: (11111111 11111111 11111111 00000000).
* Specifies that the first three octets identify the network and the fourth octet identifies a host on that network.
* For example :- 128,10 is the network number then suppose {128,10-1.0}

**3.15 Benefits of TCP/IP**

The primary advantages of using TCP/IP are summarized below:

* TCP/IP can be used to establish connections between different types of computers and servers. Providing this type of interoperability is one of the main advantages of TCP/IP.
* TCP/IP is an industry standard, open protocol. This means that it is not controlled by one institute.
* TCP/IP operates independently of the operating system.
* TCP/IP includes support for a number of routing protocols.
* Enables internetworking between organizations.
* TCP/IP has a scalable, client/server architecture.
* TCP/IP includes support for name and address resolution services, including Domain Name Service Dynamic Host Configuration Protocol and Windows Internet Name Service.

The disadvantages of TCP/IP are summarized below:

* IPX is faster than TCP/IP.
* TCP/IP is intricate to set up and manage.
* The overhead of TCP/IP is higher than that of IPX.

SUBNET ADDRESS EXTENSION

**4.2 Minimizing Network Numbers**

* The original classful IP addressing scheme to handle all possibilities, but it has a minor weakness.
* Growth has been most apparent in the connected internet, where the size has been doubling every nine to fifteen months.
* The large population of networks with trivial size stresses the entire Internet design because it means
* immense administrative overhead is required merely to manage network addresses,
* the routing tables in routers are extremely large, and
* the address space will eventually be exhausted.
* To minimize the number of addresses used, we must avoid assigning network pre-fixes whenever possible, and the same IP network prefix must be shared by multiple physical networks.

**4.3 Transparent Routers**

* The transparent router scheme is based on the observation that a network assigned a class A IP address can be extended through a simple trick illustrated in Figure.
* The trick consists of arranging for a physical network, usually a WAN, to multiplex several host connections through a single host port.
* A special purpose router, T, connects the single host port from the wide area net to a local area network.
* T is called a transparent router because other hosts and routers on the WAN do not know it exists.
* The transparent router also accepts datagram from host. The transparent router also accepts datagram from hosts on the local area network and router them across the WAN toward their destination.
* To make demultiplexing efficient, transparent router often divided the IP address into multiple parts and encodes information in unused parts.

**Advantages**

* They required fewer network addresses because the local area network doesn’t need a separate IP prefix.
* They can support load balancing. If two transparent routers connect to the same local area network, traffic to hosts on that network can be split between them.

**Disadvantages**

* They only work with networks that have a large address space from which to choose host addresses.
* They work best with class A networks, and they do not work well with class C networks.
* They are not conventional routers; transparent routers do not provide all the same services as standard routers.

**4.4 Subnet addressing**

* Subnetting is the most widely used techniques because it is the most general and because it has been standardized. In fact, subnetting is a required part of IP addressing.
* A site has a single glass class B IP network address assigned to it, but it has to or more physical networks
* Only local routers know that there are multiple physical nets and how to route traffic among them ; routers in other autonomous system route all traffic as if there were a single physical network.



* The site is using the single class B network address 128.10.0.0 for two networks.
* Except for router R, all routers in the internet route as if there were a single physical net.
* Once a packet reaches R, it must be sent across the correct physical network to its destination.
* To make the choice of physical network efficient, the local site has chosen to use the third octet of the address to distinguish between the two networks.
* The manager assigns machines on one physical net addresses of the form 128.10.1.X, and machines on the other physical net addresses of the form 128.10.2.X, where X, the final octet of the address, contain a small integer used to identify a specific host.
* To choose a physical network, R examines the third octet of the destination address and routes datagram’s with value I to the network labelled 128.10.1.0 and those with value 2 to the network labelled 128.10.2.0
* Conceptually, adding subnets only changes the interpretation of IP addresses slightly.
* Instead of dividing the 32-bit IP address into a network prefix and a host suffix, subnetting divides the address into a network portion and a local portion.
* A 32-bit IP address as having an internet portion and a local portion, where the internet portion identifies a site, possibly with multiple physical networks, and the local portion identifies a physical network and host at that site.
* Subnet addressing with a class B address that had a 2-octet internet portion and a 2-octet local portion.
* To make routing among the physical network efficient , the site administrator in our example chose to use one octet of local portion to identify a physical network, and the other octet of the local portion to identify a host on that network.

|  |  |
| --- | --- |
| Internet part | Local part |
|  |
| Internet part | Physical network | Host |

* The result is a form of hierarchical addressing that leads to corresponding hierarchical routing.
* The top level of the routing hierarchy (i.e., other autonomous systems in the internet) uses the first two octets when routing, and the next level (i.e., the local site) uses an additional octet.
* Finally, the lowest level (i.e., delivery across one physical network) uses the entire address.
* For ex: U.S. telephone system, where a 10-bit phone number is divided into a 3-disit area code, 3-disit exchange, and 4-disit connection.

**Advantage**

* It accommodates large growth because it means a given router does not need to know as much detail about distant destinations as it does about local ones.

**Disadvantage**

* Choosing a hierarchical structure is difficult, and it often becomes difficult to change a hierarchy once it has been established.

**4.5 Flexibility in Subnet Address Assignment**

* The TCP/IP standard for subnet addressing recognizes that not every site will have the same needs for an address hierarchy; it allows sites flexibility in choosing how to assign them.
* Why such flexibility is desirable, imagine a site with five networks interconnected, as shown in the figure.
* Suppose the site has a single class B network address that it wants to use for all physical networks. How should the local part be divided to make routing efficient?



* The site will choose a partition of the local part of the IP address based on how it expects to grow. Dividing the 16-bit local part into an 8-bit network identifier and an 8-bit host identifier allows up to 256 net works , with up to 256 hosts per network.

 **Subnet Bits Number of subnets Hosts per subnet**

0 1 65534 2 2 16382 3 6 8190 4 14 4094 5 30 2046 6 62 1022 7 126 510

8 254 254

9 510 126

10 1022 62 11 2046 30 12 4094 14

13 8190 6

14 16382 2

* An organization that adopts fixed- length subnetting must choose a compromise.
* If the organization has large number of physical network, the networks cannot contain many hosts; if the number of hosts on a network is large, the number of physical networks must be small.
* For example allocating 3 bits to identify a physical network results in up to 6 networks that each support up to 8190 hosts.
* Allocating 12 bits results in up to 4094 networks, but restricts the size of each to 62 hosts.

**4.7 Subnet mask representation:-**

* Specifying subnet mask in binary is bot ack work and prone to errors.
* Therefore most software allows alternative representation.
* There are three topple for representing subnet address and subnet mask.

{<network number>, <subnet number>, <host number>

* In this representation the value 1 means “alones” for example, if the subnet mask for a class B network is 255-2550, it can be written {-1,-1,0}.
* Address value are some times more important than bit field, consider the 3-tuple {128.10, -0,Q}.
* Thus, the 3 topple can be used to represent sets of address or abstract ideas. For example {<network number>, -1, -1} .

**4.8 Routing in the presence of subnet:-**

* The standard IP forwarding algorithm must be modified to work with subnet addresses.
* All hosts and routers attached to a network that uses subnet addressing must use the modified algorithm, which is called subnet forwarding or subnet routing.
* There is a network Ip network address N the host H does not directly attach to a network that has a subnet address, if must use subnet forwarding to decide whether to send datagram destined for network N to router R1 or router R2.
* It could be agreed that it can send to either router or let them handle the problem, but that solution means not all traffic will flow a shortest path.
* In larger examples:-The different between an optimal and no optimal path can be significant.

Net 1 (not a subnet address)

R1

HH

R2

Net2 (Subnet

of address N)

Net3 (Subnet of

address N

**UDP**

**5.1 Introduction to UDP:-**

* It provides the primary mechanism that application program used to send datagram private mechanism to sent datagram to other application.
* UDP provide protocol port. UDP contain both a destination port and a source port.
* The UDP software at the destination to deliver message to correct recipient from 1 machine to another.
* UDP user underlines internet protocol to transform 1 machine to another.
* It is doesn’t use ack to makes your message arrive.
* It doesn’t provide feedback to control the rate at which information close between the machines.
* The UDP provide and unreliable connection less delivery service, using IP to transform message between machine.

**5.3 Format of UDP message**



* Each UDP message is called a user datagram.
* It consists of two parts: i) a UDP header and ii) a UDP data area.
* The UDP header is divided into four 16-bit fields that specify the port from which the message was sent.
* The source port and destination port contain the 16-bit UDP protocol.
* Port numbers used to demultiplex datagram process waiting to replies message.
* The source port is optional.
* The length field contains a count of octets in the UDP datagram, including the UDP header and the user datagram.
* The UDP checksum is optional and need not be used at all. Value of zero in the checksum field means that the checksum has not been completed.

DOMAIN NAME SYSTEM

**6.1 DNS (Domain name System)**

* This is a hierarchical structure which represent for all (domain name server).
* It is used to convert IP address into the high level machine.

**Name for machine**

* The machine reflect a small environment used for address and name.
* The destination between address and name is initiatively appealing, it is artificial.
* Any name is mercy an identifier that consists of a sequence of character chosen from a finite alphabet.

**6.2 Internet Domain:-**

* The domain name system (DNS) is the system that provides name to address mapping for the internet.
* DNS has two, conceptually independent aspects.
* The first is abstract:- It specifies the name syntax and rules for delegating authority over names.
* The second is concrete:- It specifies the implementation of a distributed computing system that efficiently maps names to address.
* The section consider the name syntax, and after sections examine the implementation.
* The domain name system uses a hierarchical naming scheme known as domain name.

Cs Govt. Edu.

Department education institute name

**Top level domain:-**

* Conceptually, the top level names permit two completely different naming hierarchies: geographic and organization.
* The geographic scheme divides the universe of machines by country.

**6.4 Mapping domain name to address:-**

* The rules for name syntax and delegation of out hornet, the domain name scheme includes an efficient, reliable, general purpose, distributed system for mapping names to address.
* The system is distributed in the technical sense, meaning that a set of servers operating at multiple sites co-operatively solve the mapping problem.
* The domain mechanism for mapping names to addresses consists of independent cooperative systems called name servers.
* The client software called a name resolver, user one or more names servers when translating a name.

**6.5 Domain name resolution:-**

Root server

Server for

.com

Server for

.edu

Server for

.gov

Server for us.

Server for

ibm.com

Server for

va.vs

Server for

ref.gov

Server for

purdue.edu

* Domain name resolution proceeds top down, starting with root name server and proceeding to servers located at the leaves of the three.
* There are two ways to use the domain name system:- by contacting name servers one at a time or asking the name server system to performs the complete transaction.
* A declaration of the, class of the name the type of answer, desired and a code that specifies whether the name server showed translate the name completely.
* It stands the query to a name server for resolution.
* When a domain name server receives a query it checks to see if the name lies in the sub domain for which it is an authority.
* If the name server cannot resolve the name completely it checks to see what type of interaction the client specified.
* A client must known how to contact at least one name server.

**6.6 Efficient transaction:-**

* It may see natured to solve queries by working down the tree of name servers, doing so can lead to inefficiencies for three reasons.
* First most name resolution refers to local names, these found within the same subdivision of the names pace as the machine from which they require originates.
* Tracing a path through the hierarchy to contact the local authority would be inefficient.
* Second, if each name resolution always started by contacting the top ms lances of the hierarchy, the machine at the point would become over loaded.
* Third, failure of machines at a top most level of the hierarchy would prevent name resolution.
* The telephone number hierarchy mentioned earlier helps explain.
* Although telephone numbers are assigned hierarchically they are resolved in a better up fashion.
* We have said that most queries to name servers refer to local names.

**6.7 Abbreviation domain name:-**

* The telephone number hierarchy illustrates another useful feature of local resolution name abbreviation.
* Abbreviation provides a method of shorting name when the resolving process can supply part of the name automatically.
* A subscriber omits the area code when dialling a local telephone number.
* The resulting digits form an abbreviated name assumed to lie within the same area code as the subscriber’s phone.
* Abbreviation also works well for machine names.
* For example within the computer science department of produce, the abbreviated name is equivalent to meaningful domain name minu.cs.purduc.edu.
* Most client software implements abbreviations with a domain name suffix list.
* The domain name systems only maps full domain names into address.

**6.8 Obtaining authority for sub domain:-**

* Before an institution is granted authority for an official second level domain, it must agree to operate a domain name server that meets internet standards.
* Of course a domain name server must obey the protocol standards that specify message formats and the rules for responding to requests.
* A single physical server can handle more than one part of the naming hierarchy.
* Server implementation is also complicated because the internet authority requires that the information in every domain name server be replicated.
* Information must appear in at least two servers that do not operate on the same computer.
* Usually servers support concurrent actionist allowing work to proceed on later requests while earlier ones are being processed.
* A sub tree of names managed by a given name server forms a zone of authority.

**Questions**

1. Briefly explain about user Datagram Protocol?
2. Explain TCP/IP internet layering model?
3. Explain the working of Domain Name System?
4. How subnet mask is represented? Explain through example?
5. Explain how sliding window protocol works?
6. Explain how congestion is handled in TCP/IP?
7. Explain how routing of datagram takes place in internet working.
8. Describe various properties of the Reliable Delivery Service?
9. Describe about Acknowledgement, Retransmission and timeouts?
10. Explain how establish a TCP connection?
11. Explain how closing a TCP connection and Connection Reset?
12. Describe about ports, connections and end points?
13. Identify advantages of sliding window protocol.
14. What do you by subnet address extension? Give one example.
15. Define IP address. How many bits are there in IP address?
16. Identify different field of TCP segment format. Draw a diagram to illustrate each held and explain their function?
17. Differentiate Direct and Indirect delivery service?
18. Define Benefits of TCP/IP?
19. Short Notes:
	1. Define UDP
	2. Domain Name System
	3. TCP segment format
20. What are the ports of IP address? How many bits are there in IP address?
21. Write down three way hand shaking of connection establishment with diagram 2?
22. What is congestion? Explain techniques used in congestion avoidance.

**INTERNET APPLICATIONS AND SERVICES**

**E-Mail**

 E-mail is nothing but electronic mail by it use can send and receive message.

### 7.1 Email networks

To facilitate electronic mail exchange between remote sites and with other organizations, telecommunication links, such as dialup modems or leased lines, provided means to transport email globally, creating local and global networks.

* In 1971 the first [ARPANET](http://en.wikipedia.org/wiki/ARPANET) email was sent and through [RFC 561](http://tools.ietf.org/html/rfc561), [RFC 680](http://tools.ietf.org/html/rfc680), [RFC 724](http://tools.ietf.org/html/rfc724), and finally 1977's [RFC 733](http://tools.ietf.org/html/rfc733), became a standardized working system.
* PLATO IV was networked to individual terminals over leased data lines prior to the implementation of personal notes in 1974.
* Unix mail was networked by 1978's [uucp](http://en.wikipedia.org/wiki/Uucp), which was also used for [USENET](http://en.wikipedia.org/wiki/USENET) newsgroup postings
* BerkNet, the Berkeley Network, written by [Eric Schmidt](http://en.wikipedia.org/wiki/Eric_Schmidt) in 1978 and included first in the Second Berkeley Software Distribution provided support for sending and receiving messages over serial communication links. The Unix mail tool was extended to send messages using BerkNet.
* The [deliver mail](http://en.wikipedia.org/wiki/Delivermail) tool written by [Eric Allman](http://en.wikipedia.org/wiki/Eric_Allman) in 1979 and 1980 (and shipped in 4BSD) provided support for routing mail over different networks including Arpanet, UUCP, and BerkNet. (It also provided support for mail user aliases.
* The mail client included in 4BSD (1980) was extended to provide interoperability between a variety of mail systems.
* [BITNET](http://en.wikipedia.org/wiki/BITNET) (1981) provided electronic mail services for educational institutions. It was based on the IBM VNET email system.
* In 1984, IBM PCs running DOS could link with [FidoNet](http://en.wikipedia.org/wiki/FidoNet) for email and shared bulletin board posting.

**Working principle E-mail**

* When a user compose a message and type a recipient the mail interface program consult the local alias to replace the recipient with the map version before passing to the message to the delivery system.
* The alias system allow a single user to have multiple mail identifier by mapping a set of identifier to a single person.
* The set of recipient associate with an identifier to a list of identifier make it possible to establish a mail that receipt input message and send it to a large set of recipient.

⇒

The set of recipient associate with an identifier

is called are electronic mailing list.

User

interfac

e

Alias expansion

and forwarding

Outgoing

nece spool

area

Client back

ground

framing

Mail boxes for

incoming

Server

accept

mail

User

reads mail

Use

r send

mail

* If the alias database specifies that most address x map to replacement y alias expansion will rewrite definition address x change into y.

**Mail alias explanation can be dangerous:-**

* A map mail address x into mail address y while site B map mail address y into address x are site A.

**Electronic Mail Address:-**

* Electronic mail known as the format of electronic mail address the format of anial address.

**Local part @ domain name:-**

* Domain name is the domain name of a mail destination to which the mail should be delivered.
* Mail gateway make address complex outside the internet must either address the mail to the nearest mail gateway. A site using TCP/IP standard for mail would interpret the address.
* Send the message to mail exchange relay her percentage side is used to user name from destination machine.

**7.2 Electronic mail protocols:-**

* + - SMTP
		- IMaP4
		- Pop3
		- **SMTP**
* SMTP is simpler than any other MTP (Mail Transfer protocol) it does not specify how mail stored or how frequently mail system attend to send a message.
* Communication between client and server consist of readable as key text.
* The server responds by identifying itself an a communication has been established.
* Mail transaction beginning with a mail command that if the sender id then from field that contain the address to which ever should be reported.
* After all successful mail command the server issues a series of RCPT command that identify recipient of mail message.
* After all recipient mail command have been acknowledge the sender issues a data command.
* A data command inform the receiver the receiver than the sender is ready to transfer a complete mail message.
* The mail-message consist of different type of character.
* Carriage return
* Line feed
* Period

**Mail retrieval and mail box manipulation**

* The SMTP transfer scheme implies that a server must remain ready to accept E-mail at all time. The client attends to send a message as soon as us enter.
* If the 1st stage when a user is assigned mailbox on a computer that has a permanent internet connection.
* The computer runs a permanent SMTI server which allows remain ready to accept E-mail we establish a connect through dial up connection.

* **POP (Post Office Protocol)**
* In case of mail system we use pop 3 message.
* The most popular protocol is used to transfer a E-mail message form a comp to mail box.
* The user first send a login and password authentication the session.
* Once authentication has been accepted the user client send a command to retrieve a copy of one or more message and to delete the message from the permanent mail box.
* The computer with permanent mail box must run with two-server.
	+ SMTP server
	+ POP server
* SMTP server access mail send to a user and add each incoming message to the user permanent mail box.
* POP 3 message is used to extract message from the mail box.
* The two server must co-ordinate used of the mail box so that it’s a message arrive via SMIT mail user is extracting via POP3
* **IMAP4**
* Internet message access protocol.
* IMAP defined an abstraction known as mail box.
* Like pop3 a user run an IMAP4 client that contact the server to retrieve message.
* IMAP4 allows a user to dynamically create, delete or rename. IMAP4 also provide extended functionality for message retrieval and processing.
* A user can obtained information about a message or examine header file without retrieving the entire message.

**7.3 Format of an e-mail message**

* Internet email messages consist of two major sections:
* *Header* – Structured into [fields](http://en.wikipedia.org/wiki/Field_%28computer_science%29) such as From, To, CC, Subject, Date, and other information about the email.
* *Body* – The basic content, as unstructured text; sometimes containing a [signature block](http://en.wikipedia.org/wiki/Signature_block) at the end. This is exactly the same as the body of a regular letter.
* The header is separated from the body by a blank line.

### Message header

* Each message has exactly one [header](http://en.wikipedia.org/wiki/Header_%28computing%29), which is structured into [fields](http://en.wikipedia.org/wiki/Field_%28computer_science%29). Each field has a name and a value.
* Email header fields can be multi-line, and each line should be at most 78 characters long and in no event more than 998 characters long.
* The message header must include at least the following fields:
* *From*: The [email address](http://en.wikipedia.org/wiki/Email_address), and optionally the name of the author(s). In many email clients not changeable except through changing account settings.
* *Date*: The local time and date when the message was written. Like the *From:* field, many email clients fill this in automatically when sending. The recipient's client may then display the time in the format and time zone local to him/her.
* *Message-ID*: Also an automatically generated field; used to prevent multiple delivery and for reference in In-Reply-To: (see below).
* *In-Reply-To*: [Message-ID](http://en.wikipedia.org/wiki/Message-ID) of the message that this is a reply to. Used to link related messages together. This field only applies for reply messages.
* Common header fields for email include:[[66]](http://en.wikipedia.org/wiki/Email#cite_note-66)
* *To*: The email address(es), and optionally name(s) of the message's recipient(s). Indicates primary recipients (multiple allowed), for secondary recipients see Cc: and Bcc: below.
* *Subject*: A brief summary of the topic of the message.
* *Bcc*: [Blind carbon copy](http://en.wikipedia.org/wiki/Blind_carbon_copy); addresses added to the SMTP delivery list but not (usually) listed in the message data, remaining invisible to other recipients.
* *Cc*: [Carbon copy](http://en.wikipedia.org/wiki/Carbon_copy); Many email clients will mark email in one's inbox differently depending on whether they are in the To: or Cc: list.
* [Content-Type](http://en.wikipedia.org/wiki/Content-Type): Information about how the message is to be displayed, usually a [MIME](http://en.wikipedia.org/wiki/MIME) type.
* *Precedence*: commonly with values "bulk", "junk", or "list"; used to indicate that automated "vacation" or "out of office" responses should not be returned for this mail, e.g. to prevent vacation notices from being sent to all other subscribers of a mailing list.
* *References*: [Message-ID](http://en.wikipedia.org/wiki/Message-ID) of the message that this is a reply to, and the message-id of the message the previous reply was a reply to, etc.
* *Reply-To*: Address that should be used to reply to the message.
* *Sender*: Address of the actual sender acting on behalf of the author listed in the From: field (secretary, list manager, etc.).
* *Archived-At*: A direct link to the archived form of an individual email message.

## 7.4 E-Mail Routing

|  |
| --- |
| * Firstly, incoming emails go through spam filtering gateways, and all clean messages are then sent to the destination mail server.
* Mail routing goes a step beyond spam filtering to make a carbon copy of specified emails based on rules and send this copy to additional recipient(s).
* The rules for the carbon copy generation can be based on the sender or recipient.
* Messages are still delivered to the original recipient.
* Mail routing helps an organization keep track of important emails.
* For example, you may wish to have a copy of all emails addressed to sales@yourdomain.com This email address is being protected from spambots. You need JavaScript enabled to view it. delivered to an additional archiving email system in addition to your primary mail server. Used correctly, mail routing could give your business a competitive edge.
 |

**7.5 E-Mail Client**

* An email client, email reader or more formally mail user agent (MUA) is a [computer program](http://en.wikipedia.org/wiki/Computer_program) used to access and manage a user's [email](http://en.wikipedia.org/wiki/Email).
* Popular locally installed email clients include
	+ [Microsoft Outlook](http://en.wikipedia.org/wiki/Microsoft_Outlook)
	+ [Windows Live Mail](http://en.wikipedia.org/wiki/Windows_Live_Mail)
	+ [IBM Lotus Notes](http://en.wikipedia.org/wiki/Lotus_Notes)
	+ [Pegasus Mail](http://en.wikipedia.org/wiki/Pegasus_Mail)
	+ [Mozilla](http://en.wikipedia.org/wiki/Mozilla_Foundation)'s [Thunderbird](http://en.wikipedia.org/wiki/Mozilla_Thunderbird)
	+ [Apple Inc.](http://en.wikipedia.org/wiki/Apple_Inc.)'s [Mail](http://en.wikipedia.org/wiki/Mail_%28application%29).
* A web application that provides message management, composition, and reception functions is sometimes also considered an email client, but more commonly referred to as [webmail](http://en.wikipedia.org/wiki/Webmail).
* Popular web-based email clients include
	+ [Gmail](http://en.wikipedia.org/wiki/Gmail)
	+ [Lycos Mail](http://en.wikipedia.org/wiki/Lycos_Mail)
	+ [Mail.com](http://en.wikipedia.org/wiki/Mail.com)
	+ [Outlook.com](http://en.wikipedia.org/wiki/Outlook.com)
	+ [Yahoo! Mail](http://en.wikipedia.org/wiki/Yahoo%21_Mail).

**7.6 Public domain software**

**Public domain software** is [software](http://en.wikipedia.org/wiki/Software) that has been placed in the [public domain](http://en.wikipedia.org/wiki/Public_domain), in other words there is absolutely no ownership such as [copyright](http://en.wikipedia.org/wiki/Copyright), [trademark](http://en.wikipedia.org/wiki/Trademark), or [patent](http://en.wikipedia.org/wiki/Patent). Unlike other classes of licenses, there are no restrictions as to what can be done with the software. The software can be modified, distributed, or sold even without any attribution.

**7.7 FTP: - File transfer protocol**

* This commonly used for exchanging file. It work on the principle of client server one is called server and the other is called client.
* Once connection has been established the client can do a no. of file manipulation such as uploading and downloading of files.
* **The main objective of FTP-** To promote computer program and data. To encourage indirect or implicate used of remote computer. To transfer data reliable or efficiently.
* **FTP Related terminology**
* **FTP Command:-** The commands that are used for FTP.
* **FTP Server:**- This is used for upload or download of file.
* **FTP Site:**- the collection of file and program on an FTP server.
* **Download:**- To transfer a copy of file from a remote computer to a local computer.
* FTP does not need a password through user

**FTP server and authentication:-** HT/IP also have the facilities of FTP server as handling the exchange of file.

**7.8** **FTP client**

* FTP clients are program that enable the user to upload and download file.
* **FTP clients also work a windows 95, 98, XP, UNIX, MAC, and LINUX.**

**Type of FTP Client:-**

1. Line mode FTP
2. GUI FTP
3. Browser base FTP
4. Using line made FTP
5. **Line Made FTP:-**Ex-are operating system are the windows, mac, linux are unix, these are capable of FTP client program.
6. **GUI FTP:-**Some FTP client provide Graphical user interface and their completely stand alone.

Ex.-IP Switch, Inc etc.

1. **Browser base FTP:-**Must web browser like Microsoft internet explorer net cape navigator and fire for include FTP client and they provide used they easy way to download and upload file.
	1. **Telnet Protocol**

|  |  |
| --- | --- |
|  | * Telnet is a network protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminal connection.
* User data is interspersed in-band with Telnet control information in an 8-bit byte oriented data connection over the Transmission Control Protocol (TCP).
* Telnet, by default, does not encrypt any data sent over the connection (including passwords), and so it is often practical to eavesdrop on the communications and use the password later for malicious purposes; anybody who has access to a router, switch, hub or gateway located on the network between the two hosts where Telnet is being used can intercept the packets passing by and obtain login, password and whatever else is typed with a packet analyzer.
* Most implementations of Telnet have no authentication that would ensure communication is carried out between the two desired hosts and not intercepted in the middle.
* Several vulnerabilities have been discovered over the years in commonly used Telnet daemons.
 |

**7.11Telnet Client**

A telnet-client is a computer that the user interacts with, while the telnet-server processes the commands. The telnet-client is usually a [terminal emulator](http://www.emtec.com/zoc/terminal-emulator.html), i.e. a software that allows a remote computer to receive keyboard input from, and send formatted text to the user's computer.

[ZOC](http://www.emtec.com/zoc/index.html) is the [telnet client](http://www.emtec.com/q/telnet-client.html) that can handle all the basic terminal functions as well as a wealth of additional, useful features. This telnet client takes advantage of the computing power of a PC to allow you to automate tasks (such as logging on or retrieving data automatically), log sessions on screen or file (for documentation or later review), copy data between a text processor and the remote server, and much more.

**7.12 IRC (Internet relay chart)**

* Charting is based on multiuser then multi channel.
* IRC is nothing but a virtual meeting place.
* IRC is the most famous and popular chart program that has been implemented an a range of platform.
* The operating system are windows MAX, UNIX, MIRC.
* IRC was developed by Jarkko.in the year 1988.
* To replace a program called MUT (Multi user task).
* IRC is based on the principle of client server here we use MIRC program.

**Channel and mode:-**

* All the channel in a server is using the command list that list all correctly available channel. Here we use # string for channel.
* User can join to channel using the command join # which are available across the enter IRC network.
* Both user and channel may have made.
* Here I is used for invisible and V used for visible.

**7.13 WWW (World Wide Web)**

* The web consist of a large set of document.
* Web page is classified as a hyper media document.
* It can content either other than text.
* Hyper is used for linking.
* A web browser consist of an a application program that a user to access and display.
* The data representation standard used for web page depend on its content.
* Here, web page is consist of text, picture and other multimedia element.
* Users are attracted to www because it is interacting, easy to use and combine graphics sound and animation.
* Web page represent a series of document after using html.
* Using www, we can jump from one link to another, then, we can go directly to go to the resource, if we know the URL.

**7.14 Browser**

A **web browser** (commonly referred to as a **browser**) is a [software application](http://en.wikipedia.org/wiki/Software_application) for retrieving, presenting and traversing information resources on the [World Wide Web](http://en.wikipedia.org/wiki/World_Wide_Web). An *information resource* is identified by a [Uniform Resource Identifier](http://en.wikipedia.org/wiki/Uniform_Resource_Identifier) (URI/URL) and may be a [web page](http://en.wikipedia.org/wiki/Web_page), image, video or other piece of content. [Hyperlinks](http://en.wikipedia.org/wiki/Hyperlinks) present in resources enable users easily to navigate their [browsers](http://en.wikipedia.org/wiki/Browse) to related resources.

Although browsers are primarily intended to use the World Wide Web, they can also be used to access information provided by [web servers](http://en.wikipedia.org/wiki/Web_servers) in [private networks](http://en.wikipedia.org/wiki/Private_networks) or files in [file systems](http://en.wikipedia.org/wiki/File_systems).

The major web browsers are

* [Firefox](http://en.wikipedia.org/wiki/Firefox),
* [Internet Explorer](http://en.wikipedia.org/wiki/Internet_Explorer),
* [Google Chrome](http://en.wikipedia.org/wiki/Google_Chrome),
* [Opera](http://en.wikipedia.org/wiki/Opera_%28web_browser%29), and
* [Safari](http://en.wikipedia.org/wiki/Safari_%28web_browser%29).

**Questions**

1. Define Browser. Name two browsers?
2. Define internet relay chart?
3. Define the function of default Router?
4. Define FTP?
5. Define PoP3?
6. Define Telnet?
7. What is a Browser? Describe how a website is registered and created?
8. Explain how IRC network and server works?
9. Identify the applications and services of Internet?
10. Explain working of E-mail and describe components of an E-mail message format.
11. What is the function of Internet Browser?
12. Explain how e-mail works in internet working?
13. Define E-mail. Why it is used?
14. Advantages of E-mail?
15. Write down any two names of E-mail protocol.
16. Explain www?

**HTML AND INTERACTIVE TOOLS**

**8.1 HTML & interactive tools**

* HTML stands for Hypertext Mark up language.
* HTML is the basic tool for designing the web page.
* It uses some standard tags to tell your web browser how to display the web page you have requested for this reason its called markup language.
* It uses tags as mark up codes in an HTML document. A tag is a symbol in HTML that has a special meaning.
* It is a documentation language to mark the heading, title, table and forms.

**Some Feature of HTML:-**

* It is not a programming language but a Mark-up Language.
* It is a text oriented language as it uses characters to express the contents of a web page.
* Just link any other programming language it does not need to be translated into the machine language.
* HTML document can be viewed an any platform.

**1 HTML TAGS:-**

When a web page is to be developed the two things are planned.

* Content of the page
* Appearance of the page.

The appearance of the web page is coded in HTML language using HTML tags.

* HTML tags are the special keywords enclosed between the angle brackets ( <&> ) that convey a meaning to the web browser about how to display the contents followed by there.
* In HTML must of the tags are used in pairs i.e. with each starting tag there is an ending tag.

Ex. – To display some text in bold letters. The HTML tags are

< B > ------ </B>

(Starting tag) (ending tag)

* Each starting tag begin with <> and end tag </>.
* The starting tag tells the browser from where to start the formatting and the ending tag tells upto where the text has to be formatted.
* There are some tags which do not need ending tag.

Ex. To draw horizontal line across documents i.e. <HR> This types of tags are called empty tag.

**TAG ATTRIBUTES:-**

* Tag attributes are the special words used inside the opening and closing tag to control the tags behavior.
* There could be more than one attributes for a tag separated by a space in between.

Ex: < BODY . BGCOLOR – “RED” TEXT = “GREEN”>

Tag name Attribute Attribute Value Attribute Attribute Value

* All the attribute value should be enclosed with double quote marks (“”) except letter (A-Z, a-Z), Number (0-9), by then (-).

**Base HTML TAGS:-**

* HTML documents is made up of various tags but there are some basic HTML tags used in all HTML document to identify document parts.
* The HTML Tag
* The Head Tag
* The Title Tag
* The Body Tag

**HTML TAG [<HTML> ------</HTML>]**

* This tag surround the whole document which marks the start and end of the HTML document.
* It helps the browser to understand that this is the HTML document.
1. **HEAD TAG [<HEAD>--------</HEAD>]**
* Head tag is used to define the document header.
* It is placed between the HTML tag and contains the information like title, style documents description etc.
1. **TITLE TAG [<TITLE>------</TITLE>]**
* Title tag appears within the head tags.
* The information enclosed by the title tag appears in the title bar.
1. **BODY TAG [<BODY>--------</BODY>]**
* Body tag appears after the head tag
* All the contents of the web page i.e. text, graphics, links etc. are enclosed in between the body tags.

**STRUCTURE OF HTML DOCUMENT**

 <HTML>

 HEAD

BODY

HTML

<HEAD>

<TITLE>----------------------</TITLE> -- TITLE BAR

</HEAD>

<BODY>

----------- ------------

</BODY>

</HTML>

* The <body> tag has several attributes like
* Background design (background)
* Background color (bagcolor)
* Text color (text)
* Link color (link)
* Active link color (alink)
* Visited link color (Vemk)

**8.2 Headings**

* Heading can be created with tags h1, h2\_\_\_\_\_\_\_\_\_h6.
* H1 will make a bigger heading h2 will make smaller one and h3 make still a smaller heading and so on.

Ex.- <h1> Education System </h1> (biggest)

<h2> Education system </h2>

-------------------------------------

-------------------------------------

<h6> Education system (/h6> (smallest)

* Also we can align the heading to left right or center using ALIGN attribute in <hn> tag

Ex.- <H1, Align = “Center”> Heading text <//H1>. This will display the heading text at the center of the web page.

**HTML Editor**

* The HTML editor is basically written in notepad.

**Border**

This is basically used to define the border of the table.

Q.1 – Write a html program body color yellow, table color red, table width = 50, border = 6.

Ans.:

<html>

<head><title></title></head>

<body>

<table bg color = “Red” Boarder = “6” width = “50”>

</table>

</body>

</html>

**Table by color:-**

* This is used to represent table color.

**Width:-**

* This is basically used to define width of the table.

**8.3 LIST TAG**

* As n MS word HTML also offers us to create numbered or bulleted list to represent a list of item.
* There are two types of lists.
	+ Ordered
	+ Un ordered
* This section introduces two more tags <OI> and <uI>

**Unordered lists**

|  |
| --- |
| Output Places visited * America
* Canada
* Brazil
 |

* In unordered list each item is preceded by a bullet as they do not follow specific order.
* The unordered list is represented by <uI> tag and </UI> tag.
* UI> is given at the beginning and </UI> tag is given at the end.
* Each list item is given <li>
* The bullet can be any one of the following symbols.
* Disc
* Circle
* Square

Ex. <uI type = square> we shall get square symbol

<UI type = circle> we shall get circle

<UI type = Disc> we get disc

Ex. - <html>

<head>

<title>

Unordered list

</title>

</head>

<body>

<h1> places visited </h1>

<ui>

<li> America

<Li> Canada

<Li> Brazil

</UL)

</Body></html>

|  |
| --- |
| Output * Ms word
* Ms excel
* Ms

Access  |

**Syntax of unordered use**

<ul>

<li> Item 1

<li> item 2

<li> item 3

..

..

..

<li> item n

</ul>

<ul>

<li> ms word

<Li> ms excel

<Li> ms acess

</Ui>

**Order list:-**

* In HTML order list is represented by <OL> in the place of <UI>⇒ In HTML <OL> tag to define a sequential arranged list of item.
* It has a ending tag i.e. </0L>
* The <LI> or list item tag represent individual items of the list.

**Syntax :**<OL>

<LI> Item 1

<LI> Item 2

</OL>

<Li> is empty

|  |
| --- |
| Metro cities of India 1. Delhi
2. Mumbai
3. Chennai
4. Kolkata
5. Bangalore
 |

Tag i.e. no need if end tag here

Ex:

Ans:

<html>

<head>

<title>

Order list

</title>

</head>

<body>

<h1> Metro cities of india </h1>

<OL>

<Li> Delhi

<Li> Mumbai

<Li> Chennai

<Li> Kolkata

<Li> Bangalore

</OL>

</body>

</html>

|  |  |
| --- | --- |
| 1. | Asia 1. India
2. Pakistan
 |
| 2. | Europe i>Switzerland ii>German  |

Q2.

<html>

<head>

<title></title>

</head>

<body>

<OL>

<OL type = “1”>

<Li> Asia

<OI type = “a”>

<Li> India

<Li> Pakistan

</OI><OI><OI type = “2”>

<Li> Europe

<OI> type = “I”

<Li> Switzerland

<Li> German

</OI>

</body>

</html>

**<strike>:-**

* It is used to create a strike an the letter or word.

**<sup>:-**

* This is used for super power tag

N2 = n(sup> 2 </sup>

N2 = n<sub> 2</sub>

**<centre>:-**

* This tag is used to represent the word or letter or paragraph in center.

 **<EMP>:-**

* This is used to represent the word or letter by emphasizing.

**Alignment:-**

 → Right → Justify

Q. **write a HTML program to H2O = 2H2+O2**

→ left

<html>

<head>

<title> BL</title>

</head>

<body>

H<sub>2</sub>0 = 2H<sub>2</sub>+0<sub>2</sub>

</body>

</html>

**Type Attribute :-**

* Type attribute is used to change the numbering format.
* We can use the upper/ lower case letter and roman numeric’s for numbering.

**Syntax**

<0L type = “Numbering code”>

Code Number style

* A Uppercase letter (A, B, C --------------)
* a Lower case letter (a, b, c, --------------)
* I Roman numerical upper case (I, II, III,--------)
* i Roman numerical lower case (i, ii, iii,--------)
* 1 Arabic numerical (1, 2, 3, --------------)

**Start attribute:-**

* Start attribute is used to establish the beginning of the list sequence no. in case we want to start the list with some other no.

|  |  |
| --- | --- |
| **Syntax**<OL Start = “n”>‘n’ = starting no of list.  |  |
| Ex. <OL type = “A” start = “5”><Li> PEN <Li> PENCIL <Li> COPY <Li> SCALE  | OUTPUT1. PEN
2. PENCIL
3. COPY
4. SCALE
5. ERASER
 |

<Li> ERASER

</OL>

**8.5 Image**

**Syntax for image:-**

<Img Src = “Image url”

Attribute – name = “attribute value” more attributes”>

* The Src attribute specified the source of the picture.
* It gives the file name of the picture file.

**Attribute of Image**

* Width: - it sets the width of the image.
* Height: - it sets the height of the image.
* Border: - it sets the border around the image.
* SRC:- it specifies the URL
* Alt: - it is an alternate text.
* Alignment: - This is used for left, right and center.
* Valign: - It is vertical alignment of the image and takes value of the top button or center.
* Hspace: - It is used to horizontal space.
* Vspace: - It is used for vertical space.
* Name: - It is used for the name of the image.

**8.6 Hypertext link:-**

* WWW is a collection of millions of web pages connected with each other through links available on the web page in the shape of images, buttons or text etc.
* By clicking on these links you can move from one page to another three links are called HYPERLINKS

**THE ANCHOR TAG <A>**

* HTML anchor tag <A> which was HREF attributes to specify the name of the web document to be linked.
* It is a container tag which enclosed the text or image to be used as a link on a page.

**Syntax:-**

<A HREF = “name of html document”> text/image </A>

HTML document to be linked with complete path hypertext which when clicked opens the liked

document

Ex:-

<A HREF = “D:/Images/flower.html> click here to see flower page </A>

Will appear like

Click here to see flower page

**8.7 URL(Uniform Resource locator)**

* URL stands for ***U***niform ***R***esource ***L***ocator (URL) it is the global [address](http://www.webopedia.com/TERM/A/address.html) of [documents](http://www.webopedia.com/TERM/D/document.html) and other [resources](http://www.webopedia.com/TERM/R/resource.html) on the [World Wide Web](http://www.webopedia.com/TERM/W/World_Wide_Web.html).
* The first part of the URL is called a protocol identifier and it indicates what [protocol](http://www.webopedia.com/TERM/P/protocol.html) to use, and the second part is called a resource name and it specifies the [IP address](http://www.webopedia.com/TERM/I/IP_address.html) or the [domain name](http://www.webopedia.com/TERM/D/domain_name.html) where the resource is located.
* The protocol identifier and the resource name are separated by a colon and two forward slashes.
* For example, the two URLs below point to two different [files](http://www.webopedia.com/TERM/F/file.html) at the domain pcwebopedia.com. The first specifies an [executable file](http://www.webopedia.com/TERM/E/executable_file.html) that should be fetched using the FTP protocol; the second specifies a [Web page](http://www.webopedia.com/TERM/W/web_page.html) that should be fetched using the [HTTP protocol](http://www.webopedia.com/TERM/H/HTTP.html):
* 100%
* ftp://www.pcwebopedia.com/stuff.exe
* **http://www.pcwebopedia.com/index.html**
* The term "Web address" is a synonym for a URL that uses the [HTTP](http://www.webopedia.com/TERM/H/HTTP.html) / HTTPS protocol.
* The Uniform Resource Locator (URL) was developed by Tim Berners-Lee in 1994 and the Internet Engineering Task Force ([IETF](http://www.webopedia.com/TERM/I/IETF.html)) URI working group. The URL format is specified in [RFC 1738 Uniform Resource Locators (URL)](http://www.ietf.org/rfc/rfc1738.txt).

**8.8 Tables in HTML**

* In html the beginning of a table is marked by <table> tag and the end is marked by </table> tag.
* If we want a border of a table then we write.

Ex.<table border>

* If we want a bigger border then we can also give number to represent the size of the border. Ex.<table border = 5>
* In table various tags are also used like
* <tr> = for row
* <th> = specifies the heading row of the table
* <tl> = (cell) specifies the table item <b> = bold

Ex.

<html>

<head>

<title>

Places visited

</title>

</head>

</body>

<table border = 5>

<b> places visited </b>

<tr>

<tr> Date<th>country<th> purpose

<tr>

<td> Dec 28,2002 <td> USA<td> meeting

<tr>

<td> Dec 29,2002 <td> Canada party

</table>

</body>

</html>

**Output**

|  |  |  |
| --- | --- | --- |
| Places visited  |  |  |
| Data  | Country  | Purpose  |
| Dec 28, 2002  | USA  | MEETING  |
| Dec 29, 2002  | Canada  | Party  |

**Frame Definition**

* The definition of the frame is given using the <Frame> tag
* The <frame> tag may have any of the following attributes.
* Source html address (Src)
* Name of the frame (name)
* Margin width (margin width)
* Scrolling button (scrolling)
* Can it be resized (no resize)

**Border:-**

* Border attributes specifies the width of the border of each frame in pixel.

**Frame Border**

* It specifies weather a 3D border should be displayed between frame.
* The attribute specifies yes or no value.

**Frame spacing:-**

* Specify the amount of space between frame.

**Loading the content of frame html:-**

* The frame element indicate what goes on each frame set.

**The frame element attribute:-**

* Src indicate the file that should be used in the frame.

**Name:-**

* Name attribute allow give to a frame. It is used to indicate which frame a document should be loaded.

**Frame shown:-**

* The attribute specified border of the frame are shown.

**Margin width:-**

* Allow to specify the width of the left and right.

**Scrolling:-**

* It content the appearance of the scroll bar that appear on the frame this take yes or no value.

**Frame set:-**

* Frame divided browser window into several piece or plane.
* Each plane containing a separate html document. The window divided into frames in a similar pattern to the way tables are organized into rows and column.

**Few Drawbacks of frame set:-**

* Same browser don’t print will define frame set some time the page will be displayed differently on different computer due to different screen reservation.
* The browser back button might not work at the user.
* There are few browser that don’t support frame technology.

**Program**

<html>

<head>

<title>

**Frame set**

</title>

</head>

<frame set rows = “20%, 60%, 20%”>

<frame src = “-----/A.html>

<frame src = “------/B.html>

<frame src = “------/C.html>

<body>

-----------------------

</body>

</frame set>

</html>

i> <html>

<head><title> C</title></head>

<body>

<img src = “0012” P=”A” >

</body>

</html>

ii> <html>

<head><title> C</title></head>

<body>

<img src = “0113” P=”B” >

</body>

</html>

iii> <html>

<head><title> C</title></head>

<body>

<img src = “00113” P=”C” >

</body>

</html>

**Form tag:**

* Using forms we can design a web page on which a user can communicate his wish , option, suggestion etc.
* A form tag is define as <form> tag and end with a </form>tag.
* Form tag has 3 attributes –
* action
* ,method ,
* enctype .

**Elements of a form:**

* selection list box
* input box
* text area

**Selection list box:**

* A selection list presents a list of option to the user.
* The user can select his choice from the list tag .
* The selectin list box created with <select> tag and ends with </select>tag.
* <select> tag has also 3 attribute.
* Name attribute
* Size attribute
* Multiple attribute

 Ex: <select name =”namebox”>

<option>priya</option>

<option>sunil</option>

</select>

**Input elements:**

* Check box
* Radio button
* Text field
* Password field
* Button
* Submit button
* Reset button

**Text field and submit button:**

<html>

<head></head>

<body>

<form name=”biodata \_form ”>

<h3>enter your age please</h3>

<input type=”text ” name=”age”>

<Input type=”submit” value= “submit age”>

</form>

</body>

</html>

**Password field:**

<html>

<head>

<title></title>

</head>

<body>

<form name= “my form”>

User id : <input type=text name=id><br>

Password:<input type=password name=pword><br>

<input type= submit value=go>

</form>

</center>

</body></html>

**Font tag:**

* The font tag is start with <font> and end with</font>tag.
* It has two attributes namely – face and size.

Ex: <font face= time roman size = 35>

 Web technology book by dr c.xavier

</font>

**Text field**

* The most commonly used input element in text field.
* Its common usage include name, date of birth, address, email address, login name etc. Name : <input.type=”text”.name=”name”>

|  |
| --- |
| R. Chand  |

* **Output**

Name :

**Password field**

* Password field are similar to text field except that character entered are displayed as dots or asterisks.

Password:<input type = “password”name=”pass”>

* This code creates a password field with the name “pass”.
* Output password :

**<label> tag**

* The content of the <lebel> tag is a piece of ordinary text.
* It is used to add a label to a form field.
* to make the association for attribute is required.
* Value of for attribute must be same as id.

Ex. <label for = “married”>

Married

|  |
| --- |
| √ |

<input type = “cheekbox” id = “married”>

</lebel>

**Output:-** Married

**Check box:-**

* A check box is like a toggle switch.
* It can be in either of two states checked or un-checked.
* Check boxes allow select on or more option.
* Check box is created using the <input> tag specifying the type = “checkbox”.

Ex.

Which of the following items do you have? <br>

<input type =”checkbox” name = “car” value = “yes”> car<br>

<input type=“check box” name = “computer” value = “yes”> computer <br>

**Output:-**

|  |  |
| --- | --- |
| Which of the following items do you have?

|  |
| --- |
|  |

 Car Computer  |

**8.10 CGI**

* CGI stand for common gateway interface.
* CGI defines a standard way in which information may be passed to and from the browser and server.
* A CGI script is may program that run on a web server.
* CGI script can exist many form perl script UNIX, C & C++ program.

**CGI Architecture:-**

* It is a set of standard that define how information is exchanged between web server and a custom script.

(

CGI Architecture diagram)

Web Browser

HTTP SERVER

CGI program

Database

HTTP PROTOCOL

* The browser contacts the HTTP web server and demand for URL.
* The web server will look for the file name if it finds the file then send back to the browser.
* Web browser take response from web server and display the received file or message.

**8.11 VB Script**

* VB script or called visual basic scripting edition.
* It is an Active scripting language developed by Microsoft that is modeled on visual basic.
* VB script is not case sensitive scripting.
* CGI program is used to process the form’s developed by Microsoft.
* The language of VB script is m deled on visual buster, and therefore can be reviewed using similar categories:- procedures, control structures, contents, variable error handling and so on.

Q. **write a VB script program that will point today’s data and time?**

<html>

<head>

<script language = “vbscript”>

Document. Write (“today’s date is “& Data ());

Document. Write (“the time is “& time());

</Script>

<head>

<body>

</body>

</html>

**8.12 JAVA SCRIPT**

* Java script was designed to add interactivity to HTML pages.
* Java script is a scripting language.
* Java script is usually embedded directly into HTML pages.
* Java script can react to event if can read and write html document.
* Java script can be used to validate data.
* It can be used to detect the visitor browser it is used to create cookies.
* Java script is an interpreted language means that scripts execute without preliminary completion.

**what can java script do?**

* Java script gives HTML designer a programming tool. (Java script is a powerful scripting language that helps HTML designer to effectively and interactively design websites and web page in a very simple and efficient way).
* Java script can react to event.
* Java script can read and write HTML elements.
* Java script can be used to validate data.

**Step to write 1st java script program**

* Open the Note pad
* Type the below code
* Save this file name with the extension .html or .htm (eg. Script 1.html)
* Open the browser
* Open the script1.html file on to the browser.

Ex. **Script 1 .html**

<html>

<head>

<title> my first java script program </title>

<script language = “Java Script”>

Document. Write (“Hello world”)

</Script>

</head>

My first java script program hello world

**8.13 XML**

* XML is widely used to exchange data between two homogeneous and heterogeneous applications.
* XML stand for extensible markup language.
* It is the only one markup language, where every big organizations using this.
* When we look at the history, it was the GML (generalized markup language) where implementation cost was so high, later GML becomes ISO certified named as SGML (standard generalized markup language)
* But still the implementation cost was so high so later a new markup language was developed, to meet the requirement

→ To design page

→ To share the data

→ To store the data

→ To exchange the data

→ It is the mother of other markup language

* Software developer use UML to define object oriented system, XML allows developer to exchange design data over the internet and interact with multiple vendors, using a variety of tool and application.

**XML APPLICATION:-**

* This is used to create customized tags for publishing documents online.
* XML is based on mathematical formula is document and chem. Ml (Chemistry work up language).
* It is a standard used XML based language for making of mathematical formula.
* XML is widely used to exchange data between two homogeneous or heterogeneous applications.
* XML will be used to define business in application.
* A customized XML tag could usually be used for command for a browser to download the plug in for corresponding set of standard tag.

**Comparison of HTML and XML**

|  |  |
| --- | --- |
| HTML  | XML  |
| →→→→→→ | It stands for Hyper text markup language. It is used for displaying the information. We can use the fixed tag. All tag need not to be closed. It does not give any compilation error. Inside HTML we can embed XML file.  | →→→→→ | It stand for extensible markup language. It is used for describing data of virtual any time. We can use user defined tag. All tag needs to be closed. It gives compilation error.  |
|  | → | We can also embed HTML inside XML.  |

**Advantage of XML as a Technology:-**

* **Modularity:-**HTML appears to have DTD (document type definition) .HTML has a limit less no of DTD on the other hand there is only on for each type of document.
* **Extensibility:-**XML will powerful linking mechanism allow to link to Material without requiring the link target.
* **Distribution:**- In addition to linking introduce a for more sophisticated method of including links target.
* **Internationality:**- both HTML and SGML relay heavily on ASCII. XML is based on UNICODE and require all html software to support UNICODE.
* **Data orientation:**- XML operate on data orientation rather than read ability by human.

**Design goal of XML**

* The user must be able to view XML document as quickly and easily as html document.
* XML should be beneficial to wide variety of application such as authoring browsing and contain analysis.
* XML design should be prepare quickly XML was needed immediately and was develop as quickly as possible.
* The design should be formed and concise. XML document shall be easy to create.

**8.14 Rules for XML**

The name can contain letter no and other character. Name must not start with a number and other character.

* Names must start with XML letter names can not contain space .XML document after have a parallel database where filed names parallel database where field names parallel width elements name.

Examples<author name><published name>

**Empty tag:-**

It is the tag which don’t have closing tag.

**Comments in XML file:-**

<text> welcome to XML tutorial

</text>

<this is a comment>

<subject>

**Processing instruction**

* An XML file can contain processing instruction that give command or information to an application that is processing the XML data.
* Where target is the name of application that is expected to do expressing.

**Well form tag:-**

One of the important features of a XML file is a well from file.

* All the tag should have a classing tag.

**8.15 Structure of XML**

Hello. XML

<? XML version =”1.0”>

<P.00>

Hello XML

<\F00>

 Here the sharing of file is done by using .XML

**XML prolog:-**

* XML file always start with a prolog an attribute is a name value separate by an equal sign.
* Every XML document should begin with an XML declaration that specify the version XML. <? XML version = “1.0”>
* The declaration may also contain an additional information.

<? XML version = “1.0” encoding = “ISO-8895.1” standard alone = “yes”?>

**Version:-**

* If identify the version of XML markup language used in the data.

**Encoding:-**

* It identifies the character set use to encode data.

**Standard alone:-**

* It tells whether or not this document reference an external entity or external data type.

**Elements and attribute:-**

Each tag in a XML file can have element and attribute.

<Email to = “admin @ may domain.com”>

From = “user @ my site.com>

Subject = “introducing XML

<\email>

**8.17 Concept of DTD**

* It stands for document type definition.
* A DTD define a structure of the XML document.
* DTD list the element attribute then entity and the notation that can be used in a document.
* The document type definition declaration must be first in the document after processing instruction.
* Creating DTD is just like creating table in database. DTD specify the structure of data by declaring the data.

**Questions**

01.Describe the different ports of a XML document?

02.Explain CGI?

03.Explain VB script?

04.Explain Java Script?

05.Explain features of HTML?

06.Explain various tags used in HTML?

07.Identify different components of HTML document with an example?

08.How HTML is different from XML?

09.Difference between CGI and VB script?

10.Explain DTD?