Computer Science

Class XII (As per CBSE Board)

New syllabus 2023-24

Chapter 7

Network/Email Protocols ,mobile-wireless technology

Network Protocols

Network protocols are sets of rules and regulations that dictate how to format, transmit and receive data on computer network devices – like servers, routers to endpoints -- can communicate regardless of the differences in their infrastructures, designs or standards.

To successfully send or receive information, network devices must accept and follow protocol conventions .

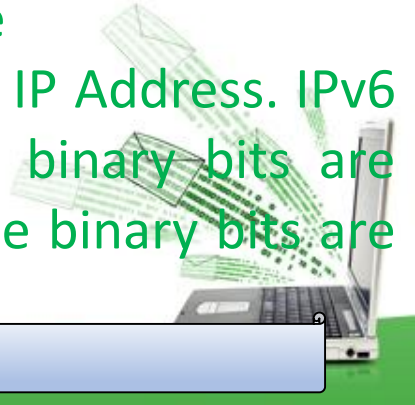
Network Protocols

TCP/IP (Transmission Control Protocol/Internet Protocol)- also referred to as the Internet Protocol Suite, is the World Wide Web's core communication system which enables every Internet-based device to communicate with every other such devices simultaneously.

An IP address is the unique numerical address of a device in a computer network that uses Internet Protocol for communication. The IP address allow you to pinpoint a particular device from the billions of devices on the Internet. Static IP Addresses-usually never change but they may be changed as a result of network administration.

Dynamic IP Addresses-These IP addresses are temporary and assigned to a computer when they get connected to the Internet each time

Two most used ip versions are ipv4 and ipv6. IPv4 is a 32-Bit IP Address. IPv6 is 128 Bit IP Address. IPv4 is a numeric address, and its binary bits are separated by a dot (.) IPv6 is an alphanumeric address whose binary bits are separated by a colon (:)



Network Protocols

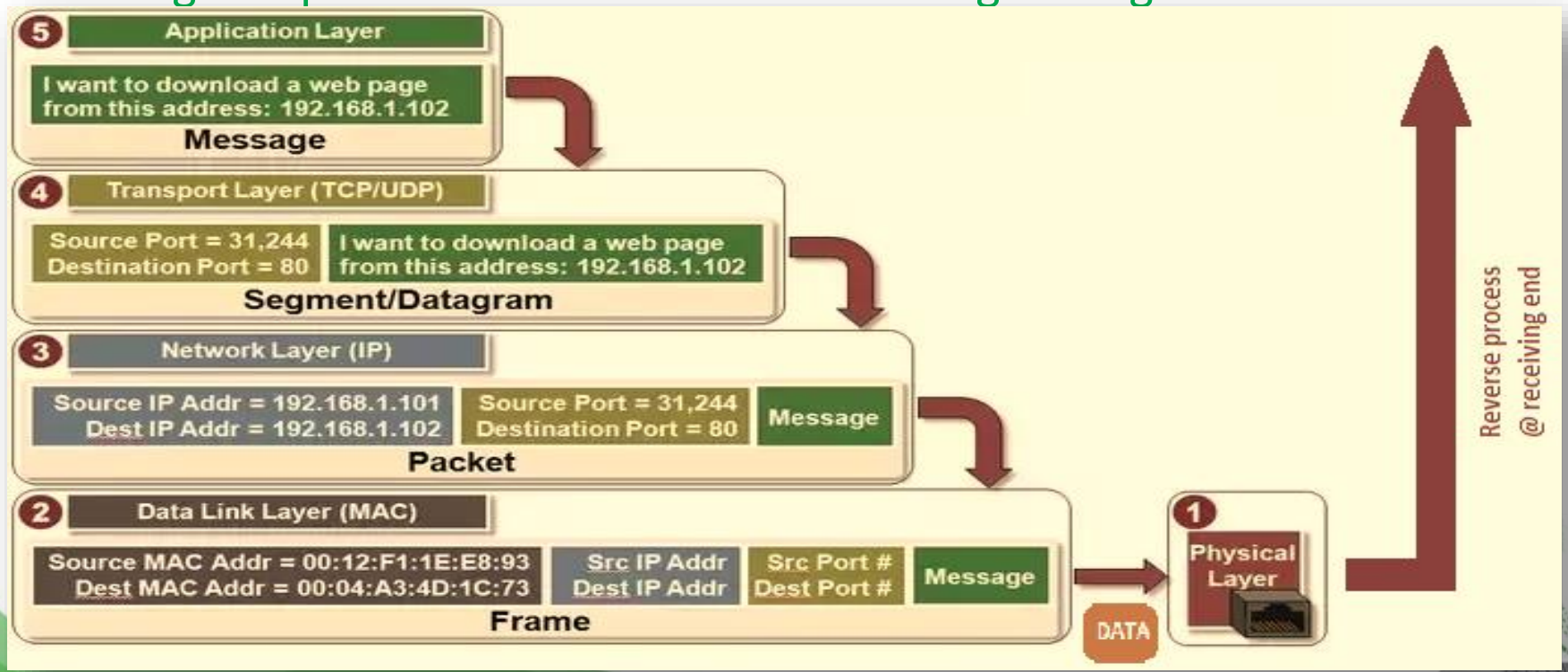
IPv4 ADDRESS CLASS -

Class	Address Range	Supports
Class A	1.0.0.1 to 126.255.255.254	Supports 16 million hosts on each of 127 networks.
Class B	128.1.0.1 to 191.255.255.254	Supports 65,000 hosts on each of 16,000 networks.
Class C	192.0.1.1 to 223.255.254.254	Supports 254 hosts on each of 2 million networks.
Class D	224.0.0.0 to 239.255.255.255	Reserved for multicast groups.
Class E	240.0.0.0 to 254.255.255.254	Reserved for future use, or Research and Development Purposes.

Of the five address classes, three—Class A, B, and C—were designated for unicast single source–to–single destination communication. Addresses in Class D were reserved for IP Multicast applications, which allows one-to-many communication. Class E addresses were reserved for experimental purposes.

Network Protocols

How TCP/IP WORKS -worksTCP/IP is a two-layered program: the higher layer (TCP) disassembles message content into small "data packets" that are then transmitted over the Internet to be re-assembled by the receiving computer's TCP back into the message's original form.



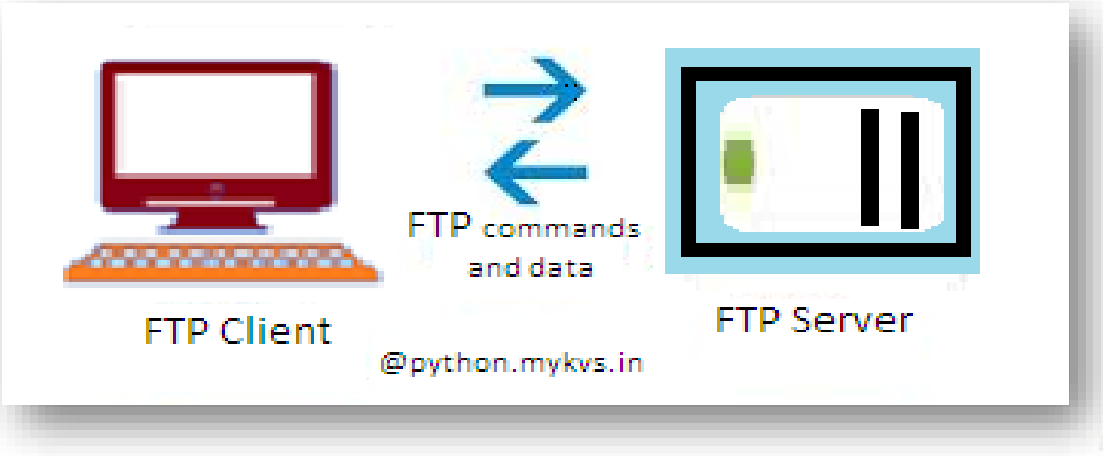
Network Protocols

TCP/IP and Higher-Level Applications - Many higher-level apps that ecommerce businesses need to be familiar with utilize and/or are built on TCP/IP.

- FTP (the Internet's File Transfer Protocol)
- HTTP (the Internet's Hyper-text Transfer Protocol)
- Telnet, which enables logging on computers from remote locations
- SMTP (Simple Mail Transfer Protocol)

Network Protocols

FTP – FTP, or File Transfer Protocol, is one of the standard internet protocols used to transfer data files between a client(FTP client) and a server(FTP server) over a computer network. It was developed in the early 1970s by Abhay Bhushan (alumni IIT Kanpur),while he was a student at MIT. FTP was initially created to allow for the secure transfer of files between servers and host computers over the ARPANET Network Control Program (a precursor to the modern internet).Nowadays it is being used for uploading files on webserver after non anonymous ftp(means username and password available with you).downloading is possible as anonymous ftp(no password is required).FTP is available in two mode – text mode ftp(where user have to give commands in text form) and GUI ftp(graphical interaction is possible).

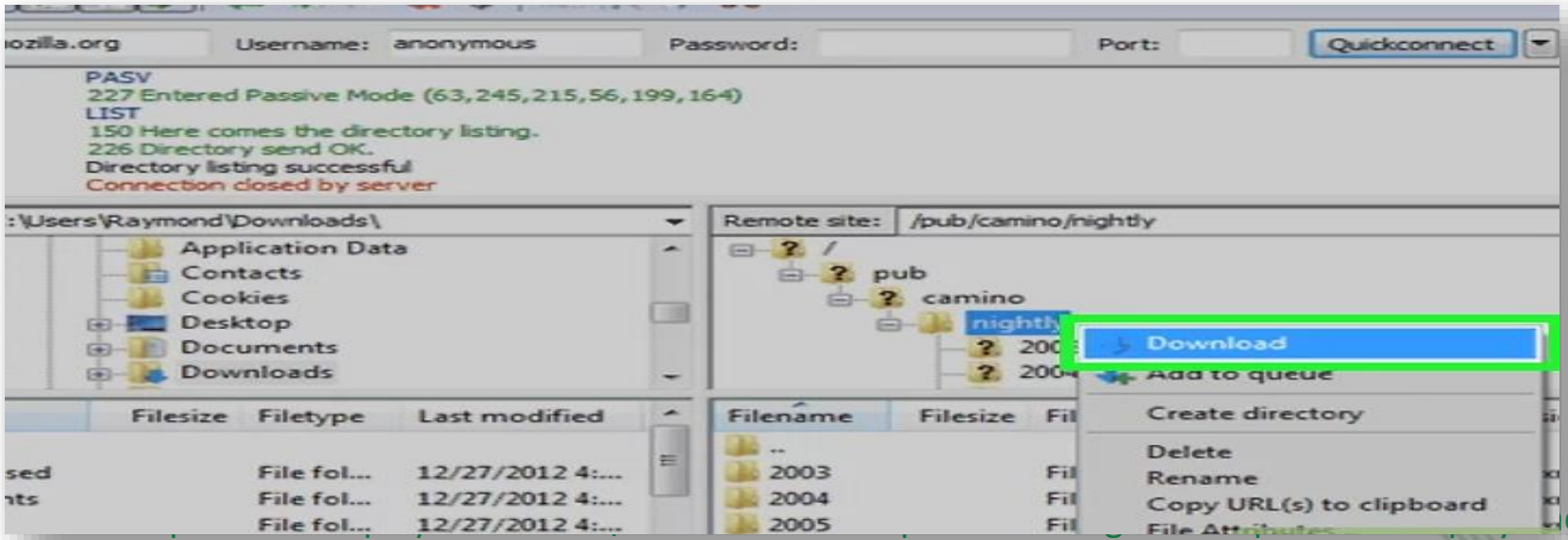


Some of the more popular, and reliable, FTP Clients currently operating in the industry are FileZilla,WinSCP,Cyberduck,gFTP

Network Protocols

How to work on FTP – Here we are using Filezilla.

1. Download filezilla then Install filezilla
2. Open site manager from file menu and click on new site button
3. Type credential available of any domain
4. Press ok, It will connect our computer with remote computer ,screen will be something like this



5. e file structure of remote computer.through simple drag and drop we can download upload(receive file from remote computer to local computer) or upload(sending file to remote computer from local computer) the files.

Network Protocols

Practice site for FTP

Demo for Web-based Administration:
Location: http://demo.wftpserver.com:5466/
Username: demo-admin
Password: demo-admin

Demo for Web-based Client:
Location: http://demo.wftpserver.com/
Username: demo-user
Password: demo-user

Practice it

Login using your own client with FTP, FTPS, SFTP protocol:
Location: demo.wftpserver.com
Username: demo-user
Password: demo-user
FTP Port: 21
FTPS Port: 990
SFTP Port: 2222

Courtesy - https://www.wftpserver.com/onlinedemo.htm

Network Protocols

Point-to-Point Protocol (PPP) is an open standard protocol that is mostly used to provide connections over point-to-point serial links. The main purpose of PPP is to transport Layer 3 packets over a Data Link layer point-to-point link. PPP can be configured on:

Asynchronous serial connection like Plain old telephone service (POTS) dial-up

Synchronous serial connection like Integrated Services for Digital Network (ISDN) or point-to-point leased lines.

PPP consists of two sub-protocols:Link Control Protocol (LCP): set up and negotiate control options on the Data Link Layer (OSI Layer 2). After finishing setting up the link, it uses NCP.

Network control Protocol (NCP): negotiate optional configuration parameters and facilitate for the Network Layer (OSI Layer 3).

Before a PPP connection is established, the link must go through three phases of session establishment:

1. Link establishment phase: In this phase, each PPP device sends LCP packets to configure and test the data link
2. Authentication phase (optional): If authentication is enabled, either PAP or CHAP will be used. PAP and CHAP are two authentication protocols used in PPP
3. Network layer protocol phase: PPP sends NCP packets to choose and configure Network Layer protocol (OSI Layer 3) to be encapsulated and sent over the PPP data link

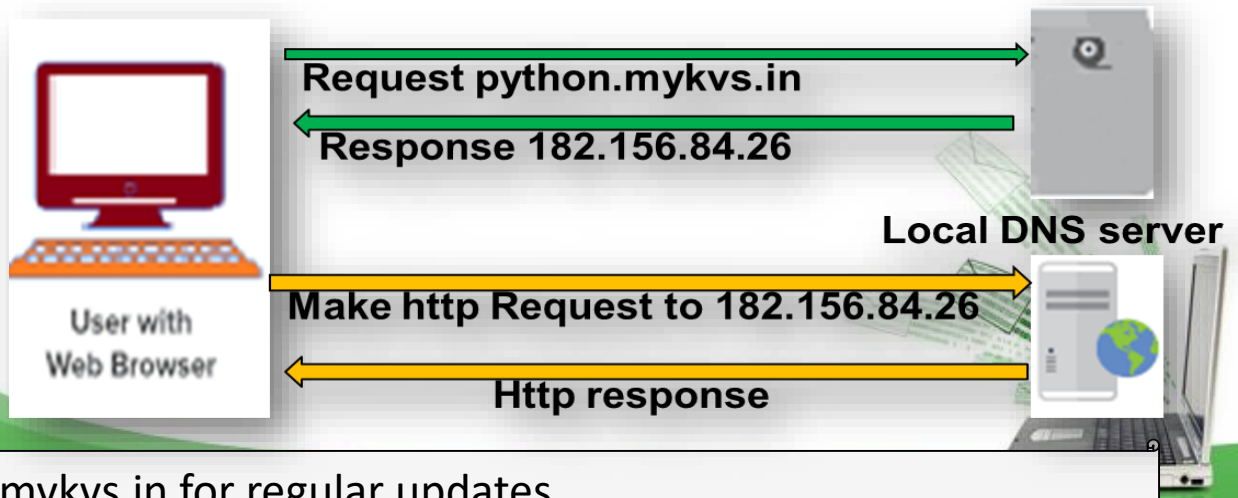
Network Protocols

HTTP - HTTP stands for hypertext transfer protocol and is used to transfer data across the Web. It allow users of the World Wide Web to exchange information found on web pages. When accessing any web page entering http:// in front of the address tells the browser to communicate over HTTP.

How It Works-

It is a connectionless text based protocol. Clients (web browsers) send requests through *request object* of http to web servers for web pages / images etc.Web server respond accordingly through *response object* of http After this cycle(request – response), the connection between client and server across the Internet is disconnected. A new connection must be made for each request(means for each web page).

This diagram shows the working of http protocol. Working with dns server and working with web Server both.



Network Protocol

HTTPS(Hyper text transfer protocol secure) - helps prevent intruders from tampering with the communications between your websites and your users' browsers. It scramble the messages using that "code" so that no one in between can read the message. It keeps our information safe from hackers.

Https uses the "code" on a Secure Sockets Layer (SSL), sometimes called Transport Layer Security (TLS) to send the information back and forth.

Essentially, we need three things to encrypt data:

- The data to be sent/encrypted
- A unique encryption key
- An encryption algorithm (a math function that garbles the data)

asymmetric encryption is used in https. Asymmetric means we are using two different keys, one to encrypt and one to decrypt.

This encryption is now done at TLS rather than SSL.

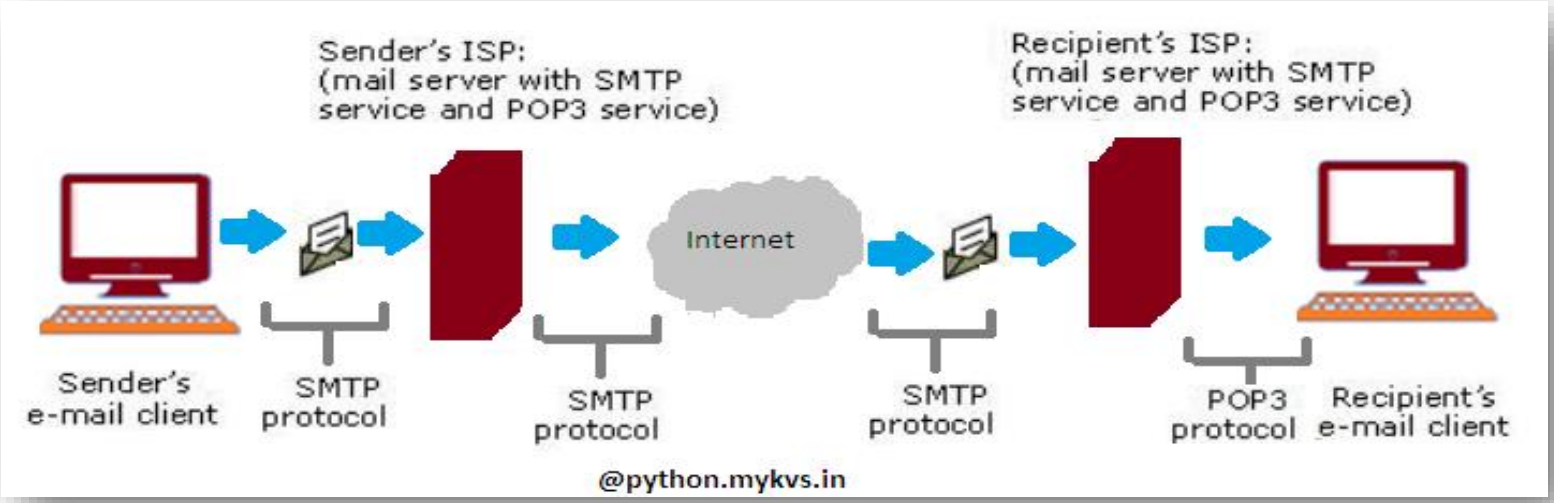
Network Protocols

Remote login – A remote login facility permits a user who is using one computer to login to remote computer or interact with a program on another computer. Command given at remote location is processed by server and result displayed over remote location.

Telnet – Telnet is most popular protocol for accessing remote site/server. Using telnet client software on our computer, we can make a connection to a telnet server (that is, the remote host). Once our telnet client establishes a connection to the remote host, our client becomes a virtual terminal, allowing us to communicate with the remote host from our computer. In most cases, we need to log into the remote host, which requires that we have an account on that system. Occasionally, we can log in as guest or public without having an account.Generally it is used in unix based client server system to interact.

Email Protocols

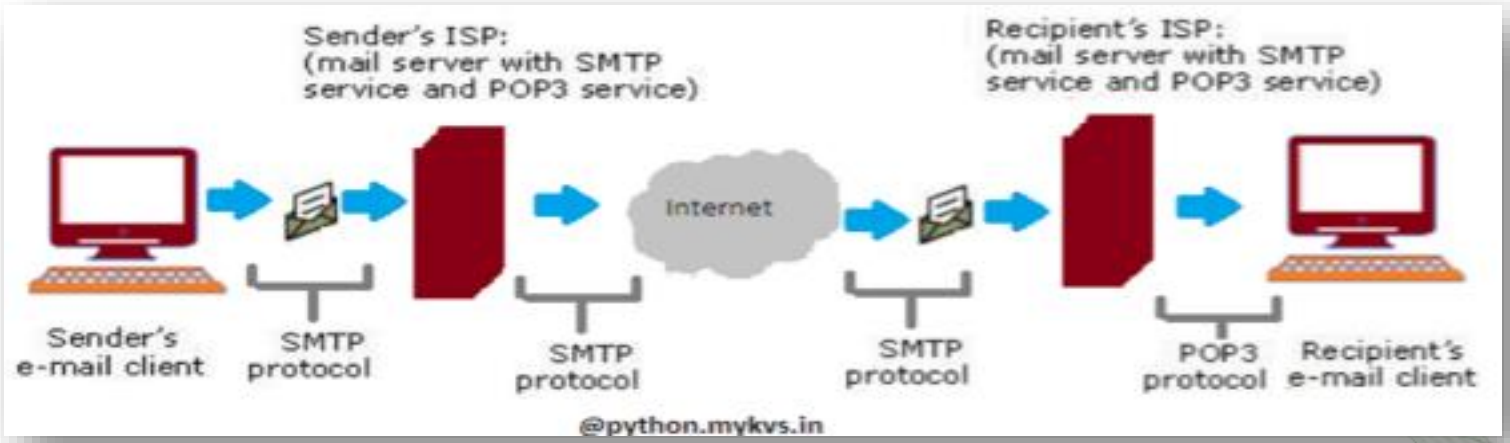
Email –Electronic mail is a facility that allows users to transmit messages across the internet in fast and secure manner.



Email created using email client program->on press of send button ,it is delivered to sender's mail server through SMTP(Simple mail transfer protocol)->which further transmit the same through internet to recipient's mail server->whenever recipient's email client program's inbox is opened,that email is delivered to inbox through POP3 (post office protocols 3rd version)->which user will read in email client program.

Email Protocols

SMTP – Most of the internet systems use SMTP as a method to transfer mail from one user to another. SMTP is a push protocol and is used to send the mail to email server. it is usually used with one of two other protocols, POP3 or IMAP, that let the user save messages in a server mailbox and download them periodically from the server.An alternative to SMTP that is widely used in Europe is X.400. Many mail servers now support Extended Simple Mail Transfer Protocol (ESMTP), which allows multimedia files to be delivered as e-mail.



The SMTP model is of two type :

- End-to- end method
- Store-and- forward method

The end to end model is used to communicate between different organizations whereas the store and forward method is used within an organization.

Email Protocols

POP3 – Post Office Protocol version 3 (POP3) is a standard mail protocol used to receive emails from a remote server to a local email client. POP3 allows us to download email messages on our local computer and read them even when we are offline. Note, that when we use POP3 to connect to our email account, messages are downloaded locally and removed from the email server. This means that if we access our account from multiple locations, that may not be the best option for us. On the other hand, if we use POP3, our messages are stored on our local computer, which reduces the space of email account uses on your web server.

Protocols for chat & video conferencing

VOIP – Voice over Internet Protocol (VoIP), is a technology that allows us to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line.
VoIP services convert our voice into a digital signal that travels over the Internet. If we are calling a regular phone number, the signal is converted to a regular telephone signal before it reaches the destination. VoIP can allow us to make a call directly from a computer, a special VoIP phone. In addition, wireless "hot spots" in locations such as airports, parks, and cafes allow us to connect to the Internet and may enable us to use VoIP service wirelessly.

Advantages:

- Less Cost
- Accessibility
- Flexibility
- Voice Quality
- Extra/Less Expensive Features

Disadvantages:

- Reliable Internet Connection Required
- Power Outages/Emergencies
- Latency

Protocols for chat & video conferencing

Services provided by VOIP – Phone to phone,pc to phone ,phone to pc,voice to email,ip phone,toll free number,call center applications,vpn,unified messaging etc.

Protocols used for VOIP are

- Session Initiation Protocol (SIP)- connection management protocol developed by the IETF
- H.323 - one of the first VoIP call signaling and control protocols that found widespread implementation.
- Real-time Transport Protocol (RTP)- transport protocol for real-time audio and video data
- Real-time Transport Control Protocol (RTCP)- sister protocol for RTP providing stream statistics and status information
- Secure Real-time Transport Protocol (SRTP) - encrypted version of RTP
- Session Description Protocol (SDP) - file format used principally by SIP to describe VoIP connections