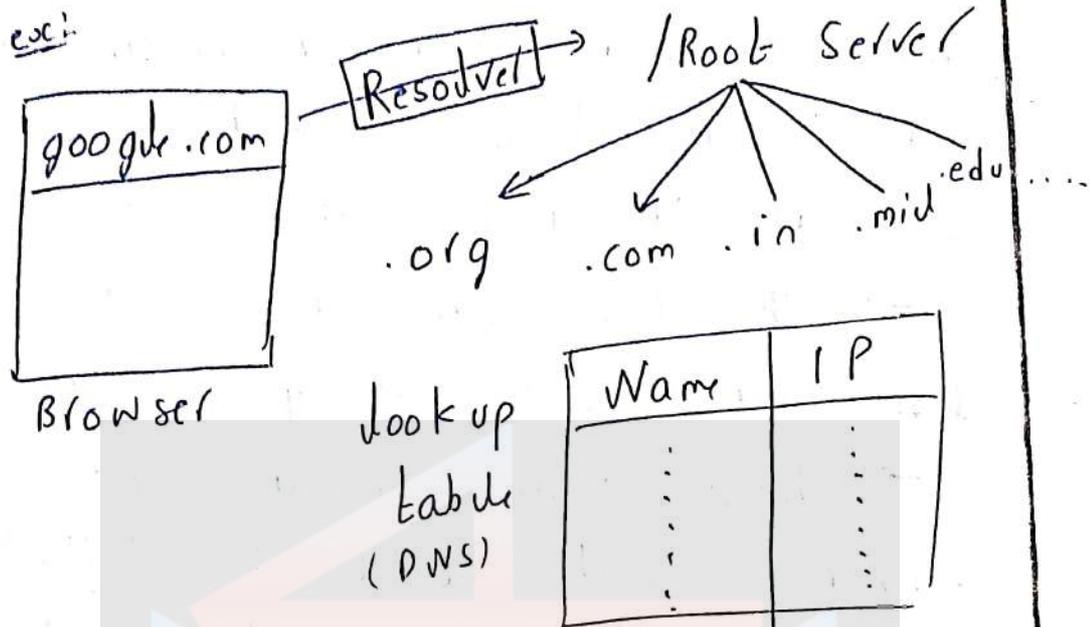


- Domain Name System (DNS), which is provided a directory service by DNS Servers.
- DNS stands for domain name system or Domain name Server.
- It is used to map the Domain name with the IP address.
- As remembering IP Address is complex DNS came into play.
- Try typing 172.217.168.196 in your browser it's the ip of google.com
- Usually IP address may change but domain name will not change.

ex:



Generic Domain:

- .com (commercial)
- .edu (education)
- .gov (government)
- .int (international)
- .mil (US armed forces)
- .net (network)
- .org (non profit organization)

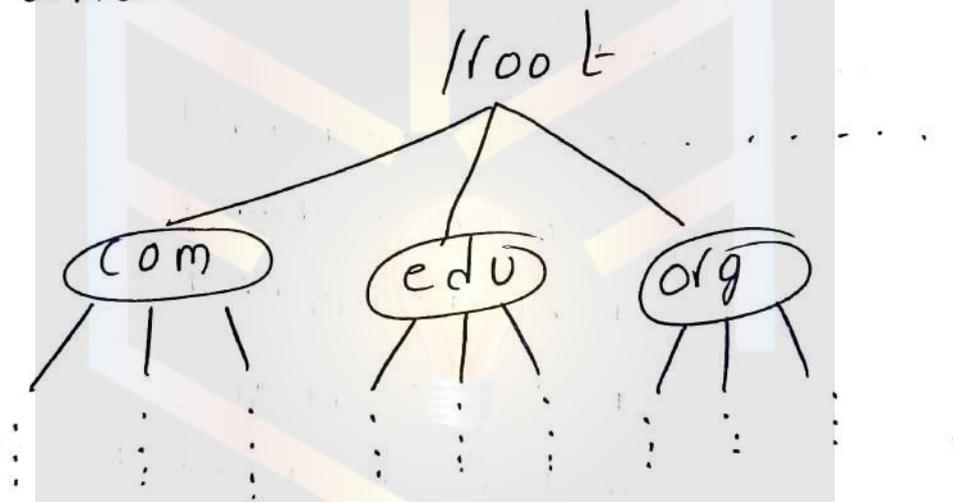
Name Servers:

→ storing all DNS in one

data based is easy by millions of access at a movement of time is the issue hence.

→ The DNS name space was divided into non overlapping zones

→ These zones contains name servers that hold the zone's information



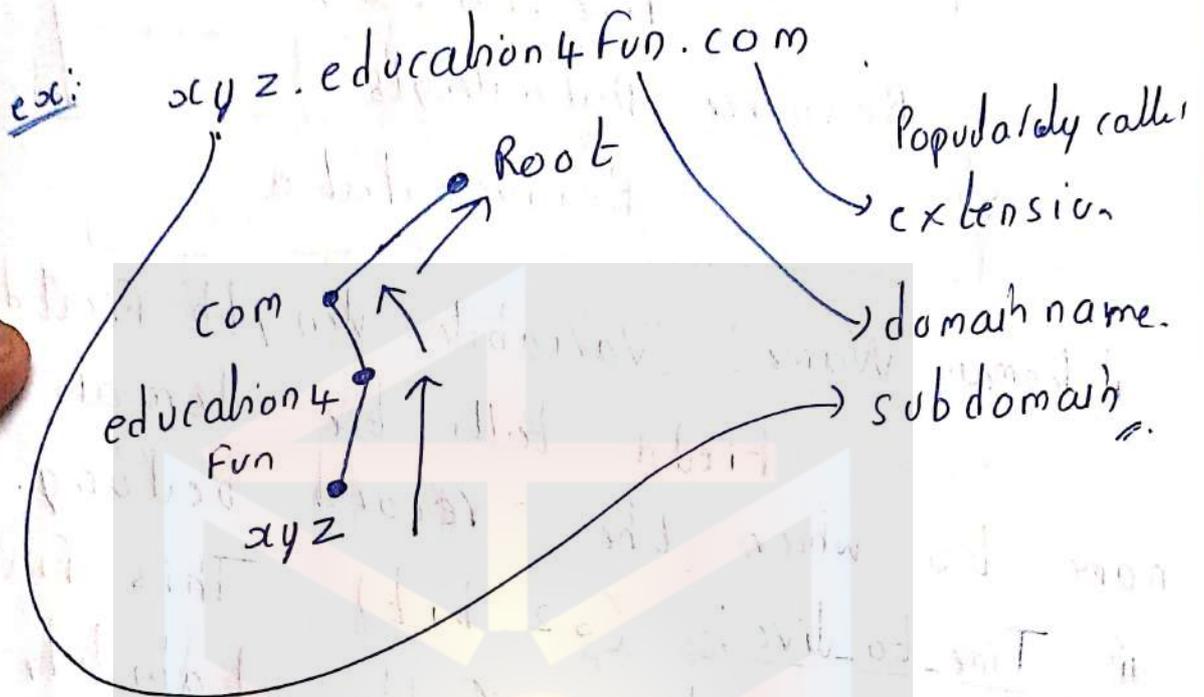
10) ~~Explain about election algorithm?~~

A

Unit - 4

Application layer, Domain Name System

→ ~~ENP assign 1~~ ~~LAG 1~~ ~~(DWS & naming server)~~



→ Resource Records :-

→ each domain name is associated with a record called the resource record

→ Format of resource record has

5 tuples.

Domain name
time-to-live

domain class

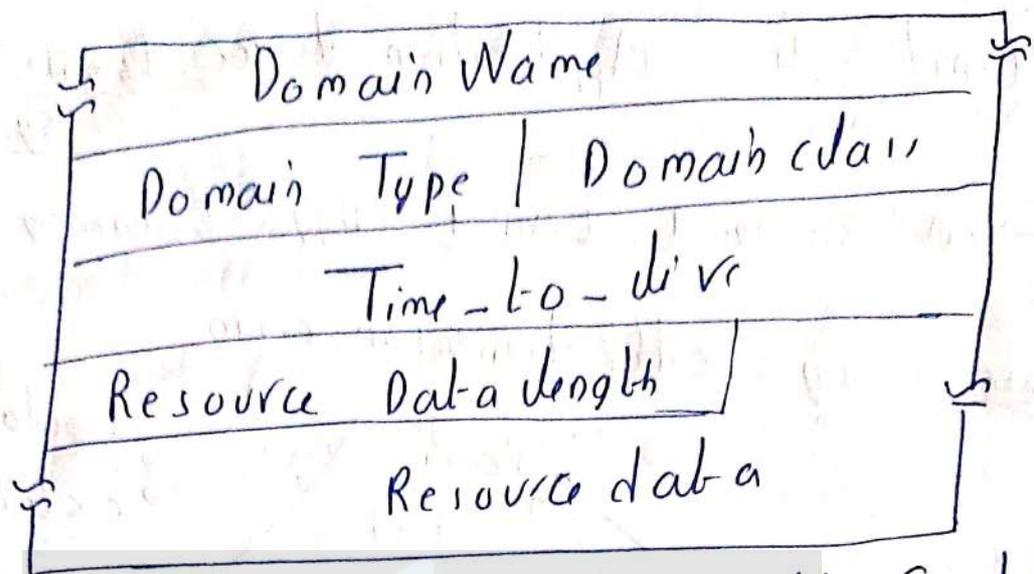
domain type

domain value

data

data

length



- i) Domain Name : (variable length field)
Field tells the domain name to which the record belong.
- ii) Time-to-live :- (32 bit) This field gives an indication of the stability of record.
if it's highly stable life time max could be 1 day (86400 sec)
else min could be 60 sec (1 min).
- iii) Domain class :- This field identifies domain class of every resource record.
- iv) Domain Types :- It specifies the type of resource record. Types of resource records

a) SOA : (Start of Authority).

→ Records starts with SOA
first resource recorded (created 1st).

→ It have info about

- Source host
- Contact email
- serial number
- refresh, retry & expire time
- minimum TTL

ing (an example).

b) A or AAAA (Address record) (32 bit
community)
or
128 bit

- most important record as it
connects domain name to an IP address.

- A → IPv4 - AAAA → IPv6

Name Servers
General

WINS

Zone Transfers
Start of Authority (SOA)

Serial number:

1

Increment

Primary server:

ns1.corp.com

Browse...

Responsible person:

dnsadmin.corp.com

Browse...

Refresh interval:

15 minutes

Retry interval:

10 minutes

Expires after:

1 days

Minimum (default) TTL:

1 hours

ITL for this record:

0 :1 :0 :0

(DDDDD:HH.MM.SS)

OK

Cancel

Apply

c) MX (Mail Exchange) record:-

→ Used to direct email to servers ~~from~~ ^{for} a domain.

→ When any name resolution request is given to the DNS server, where the requested name contains @ character, the DNS server will search for the MX record for the requested name to resolve the mail servers IP address.

d) NS (Name Server) record:-

→ The NS records are used to specify the name servers.

→ Indicate authoritative name servers for the zone of domain.

→ Can be used to break domain into subdomains.

e) C Name (Canonical name) record

- Alias names
- Used to configure a custom URL
- xyz.com to yxz.com =

f) PTR record: (Pointer)

- also called reverse DNS record
- reverse of A/AAAA records
- Maps an IP address to a host name.
- Used for troubleshooting.

g) TXT record: (Text)

- This record contains uninterpreted ASCII text & allow domains to identify themselves in arbitrary way.

v) Domain values: The value field of a domain can be a number, a domain name, or an ASCII string

ex of DNS

(img.)

→ Electronic mail:

→ electronic mail or simply email is one of the most popular network services.

→ Architecture & services:

The email system consists of two subsystems.

- i) User Agents (UA)
- ii) Message Transfer agents (MTA)

i) User Agents (UA):- These agents will allow people to read & send mail:

→ They are programs at clients side that provide a command based or menu based or graphical based method.

ii) Message Transfer Agents (MTA) These agents move the message from the source to the destination.

→ few basic functions:

i) Compose:- The process of creating or writing a message is called composing.

ii) Transfer:- Sending/transferring a mail from sender to the recipient.
→ establishing connection is mandatory.

iii) Reporting: This process will inform the sender about the mail sent.

iv) App Displaying: Show or display received mails

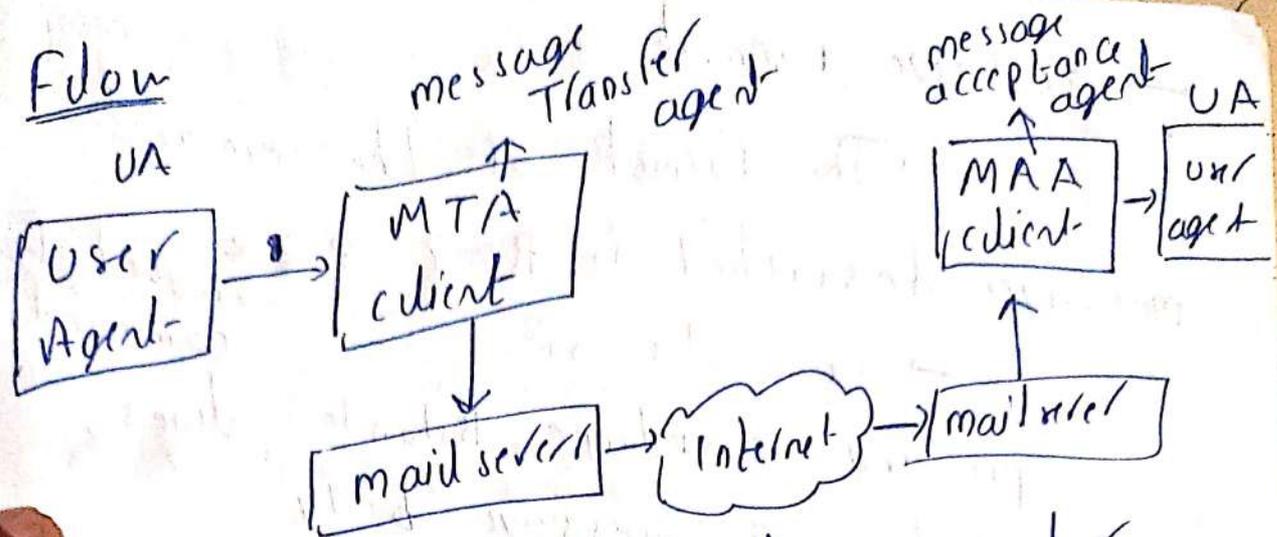
v) Disposition: It concerns about after receiving the mail what the recipient want to do. (read & delete, not read, read & saved, delete).

Few services:

i) mail Boxes: to store incoming emails

ii) Mailing list: to store list of emails

iii) Advanced features: priority mails, encrypted emails, automated reply email & so on are developed.



a sender clearly mentions, sender address, receiver address & the message (as in envelop).

<u>mail box</u>	<u>Flag</u>	<u>Sender Addr</u>	<u>Subj</u>	<u>size</u>
1	K	x	hi	100 kb
2	K A	y	RE: hello	10 kb
3	K F	z	bye	5 kb
				↓ size.

↙ message no
 ↘ sender addr
 ↘ message

K - not read (new)
 K A - read & answered
 K F - read & Forwarded
 empty - not read. (new)

→ message formats:

→ The format of the email message described in RFC 822 ^{request for command}

→ consists of primary envelope, blank lines, header fields & message body field,

→ header fields.

To : email of primary recipient

Cc : email addresses of secondary recipients

Bcc : email address of blind carbon copies

From : who wrote / created message

sender : email address of actual sender

received : line added by each transfer agent along the route

return path : can be used to find path reverse to the sender.

Few additional fields in RFC 822

Date : Date & time message sent
Reply to : email id to which replies
to be sent
message id : Unique number for referring
this message.

Subject :- Short summary of the message
in one/two lines!

→ MIME (Multipurpose Internet mail extension)

→ It is a supplementary
protocol that allows non ASCII data to
be sent through email.

→ MIME introduced because, There are some
problems/limitations in the message format
of RFC 822.

They are:
i) Text messages / emails can be
written & sent in English (ASCII) can only
be sent (no other languages are supported)

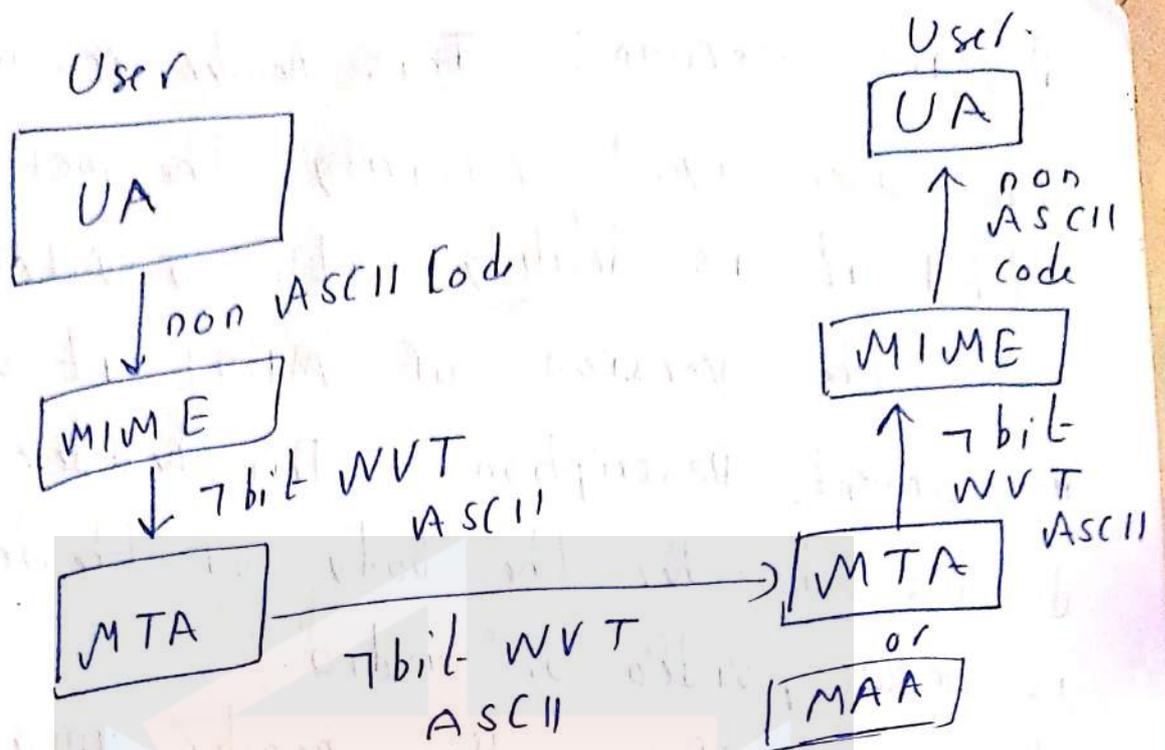
ii) sending images, audio, video or any bit files are not possible.

Hence - The solution was proposed in RFC 1341 & updated in RFC's 2045 - 2049. This is called MIME

→ MIME uses the same RFC 822 message format, but added structure to body & define encoding rules for non ASCII messages.

→ MIME is a supplementary protocol that allow non ASCII data to be sent through email.

→ MIME transforms non ASCII data at the sender side to 7-bit ASCII data & delivers them to the client - MTA/MAA to be sent through internet. The message at the receiver side is transformed back to the original data.



MIME header:

- 1) MIME version :- Identifies version of the MIME used.
- 2) Content Description :- human readable string tell what is in the message.
- 3) Content Id :- Unique identifier.
- 4) Content Transfer encoding :- method to encode body for transmission.
- 5) Content Type :- Type & Format of the content.

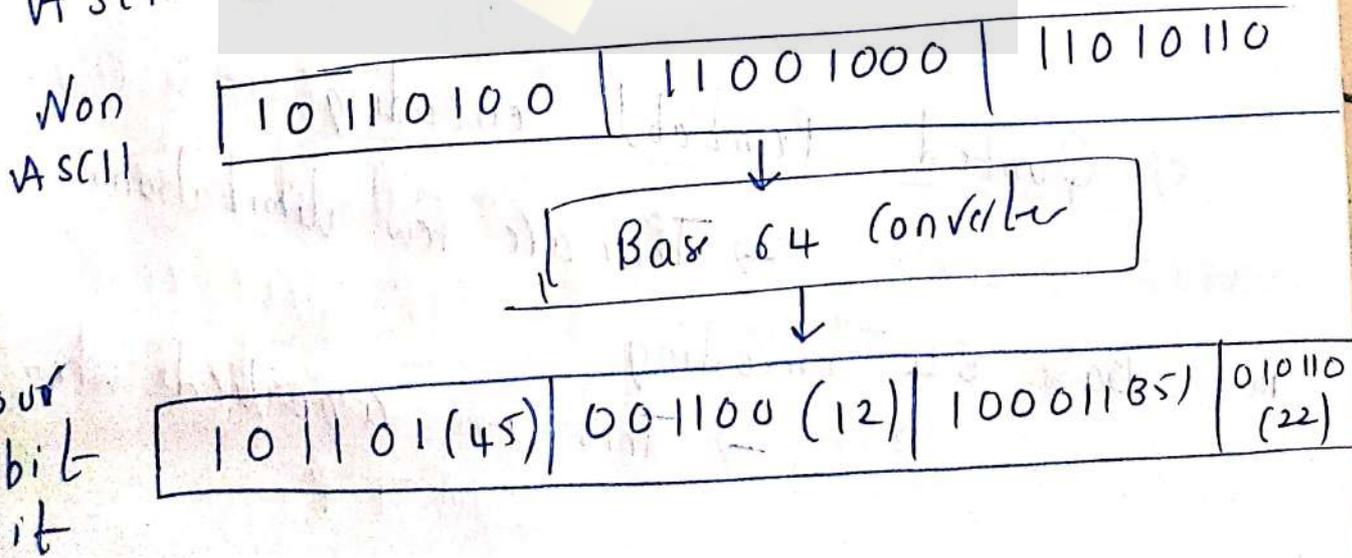
- i) MIME version :- This header informs the user agent receiving the message that it is dealing with a MIME & the version of MIME it uses.
- ii) Content Description :- This header defines whether the body of the message is image / video or audio.
- iii) Content ID :- This header uniquely identifies the content of the message.
- iv) Content Transfer encoding :- This header defines the method to encode the message. (5 methods).

a) 7 bit Encoding :- This scheme uses 7 bit Non ASCII encoding. The length of line should not exceed 1000 characters.

b) 8 bit encoding: This is 8 bit encoding in which each line should not exceed more than 1000 characters (executable files use this) UTF-8 (in HTML)

c) Binary encoding: This is also 8 bit encoding & the length of line can exceed more than 1000 characters. (SMTP protocol will do transfer binary data).

d) Base 64 encoding: - In this scheme group of 24 bits are broken up into 6 four bit units being sent as a legal ASCII character.



img

e) Quoted Printable encoding:-
ex of encoding.

img

e) Quoted Printable encoding:-

→ There are few limitations
in Base 64 encoding

→ This is applied when

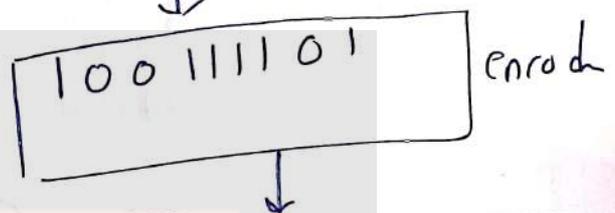
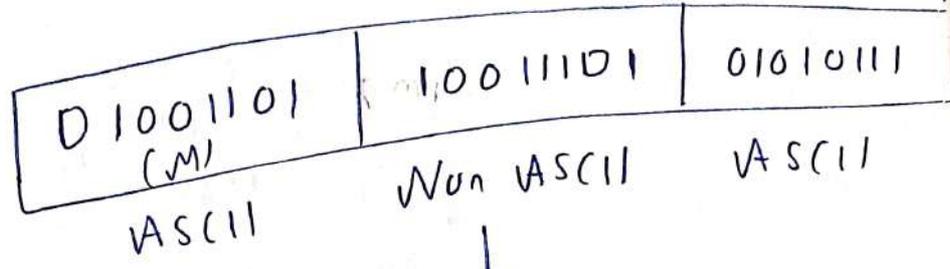
BASE64 INDEX TABLE

0	A	16	Q	32	g	48	w
1	B	17	R	33	h	49	x
2	C	18	S	34	i	50	y
3	D	19	T	35	j	51	z
4	E	20	U	36	k	52	0
5	F	21	V	37	l	53	1
6	G	22	W	38	m	54	2
7	H	23	X	39	n	55	3
8	I	24	Y	40	o	56	4
9	J	25	Z	41	p	57	5
10	K	26	a	42	q	58	6
11	L	27	b	43	r	59	7
12	M	28	c	44	s	60	8
13	N	29	d	45	t	61	9
14	O	30	e	46	u	62	+
15	P	31	f	47	v	63	/

A 65	n 110	d 100	
01000001	01101110	01100100	
0100000	010110	111001	100100
16	22	57	36
Q	W	5	k

ASCII characters with a small no
ASCII portions.

Data with
ASCII &
Non ASCII



10011101 is qD
in hexadecimal,

v) Content Types :- nature of the
message body

Format : Content Type < type/subtype
; parameters >

i) Types subtypes Meaning

img

→ Message Transfer

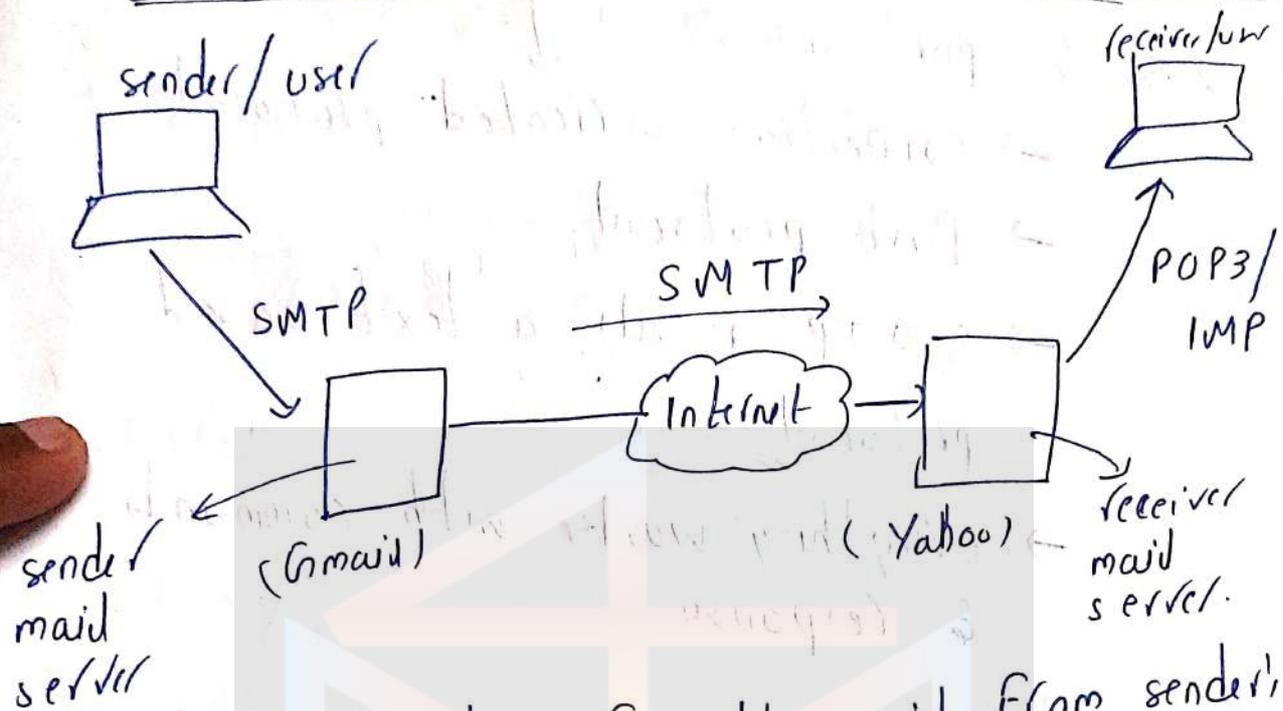
→ Message transfer system is related with sending message from sender to the receiver.

→ The connection is established from the source machine to destination after once connection was established ~~from~~^{now} message can be transferred.

→ The TCP/IP protocol that supports email on internet is SMTP.

Type	Example subtypes	Description
text	plain, html, xml, css	Text in various formats
image	gif, jpeg, tiff	Pictures
audio	basic, mpeg, mp4	Sounds
video	mpeg, mp4, quicktime	Movies
model	vrml	3D model
application	octet-stream, pdf, javascript, zip	Data produced by applications
message	http, rfc822	Encapsulated message
multipart	mixed, alternative, parallel, digest	Combination of multiple types

→ SMTP (Simple Mail Transfer Protocol):



→ SMTP transfer the mail from sender's mail server to the receiver's mail server

→ SMTP is used 2 times

b/n sender → sender mail server

b/n sender mail server → receiver mail server

→ SMTP is a set of communication guidelines that allow to transmit an email over the internet

→ It is an application layer protocol.

→ SMTP use TCP port number 25 & port 465

↓
→ connection oriented protocol

→ Push protocol.

→ SMTP is also a text based protocol

→ everything works with commands & response

commands:

i) HELO: Used by client to identify himself

eg HELO: ~~famv@xyz.com~~ → client

ii) MAIL FROM: to identify the sender.

eg MAIL FROM: <famv@xyz.com>

iii) RCPT TO: to identify the recipient

eg RCPT TO: <rani@xyz.com>

iv) Data :- Send actual message.

⇒ DATA
< message >

v) QUIT :- To terminate the message.

⇒ QUIT

vi) RSET :- To reset the connection.

⇒ RSET

vii) VRFY :- Verify the address of recipient.

⇒ VRFY : < rani@xyz.com >

viii) HELP :- help in understanding command.

⇒ HELP : DATA -

Response

i) Positive Condition Reply

→ 211 - System status

→ 214 - help

→ 220 - service ready

→ 221 - service closing.

→ 250 - OK

ii) Transient Negative completion reply

→ 421 - Service NA

→ 450 - mailbox NA (not available)

→ 451 - command aborted

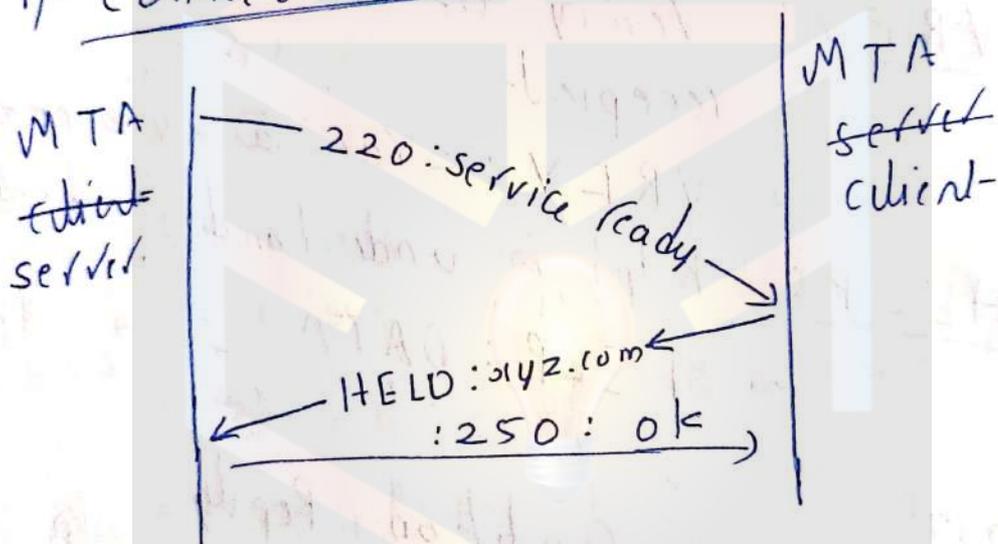
iii) Permanent Negative coupling reply

→ 500 - Syntax error

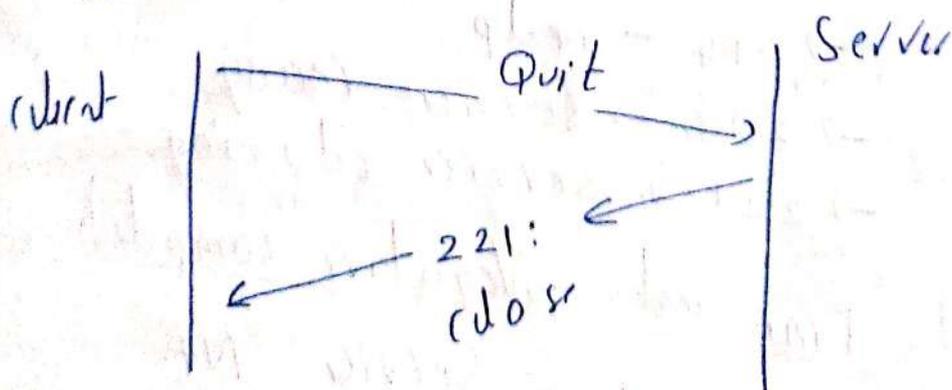
→ 554 - transaction failed

mail transfer Phases:-

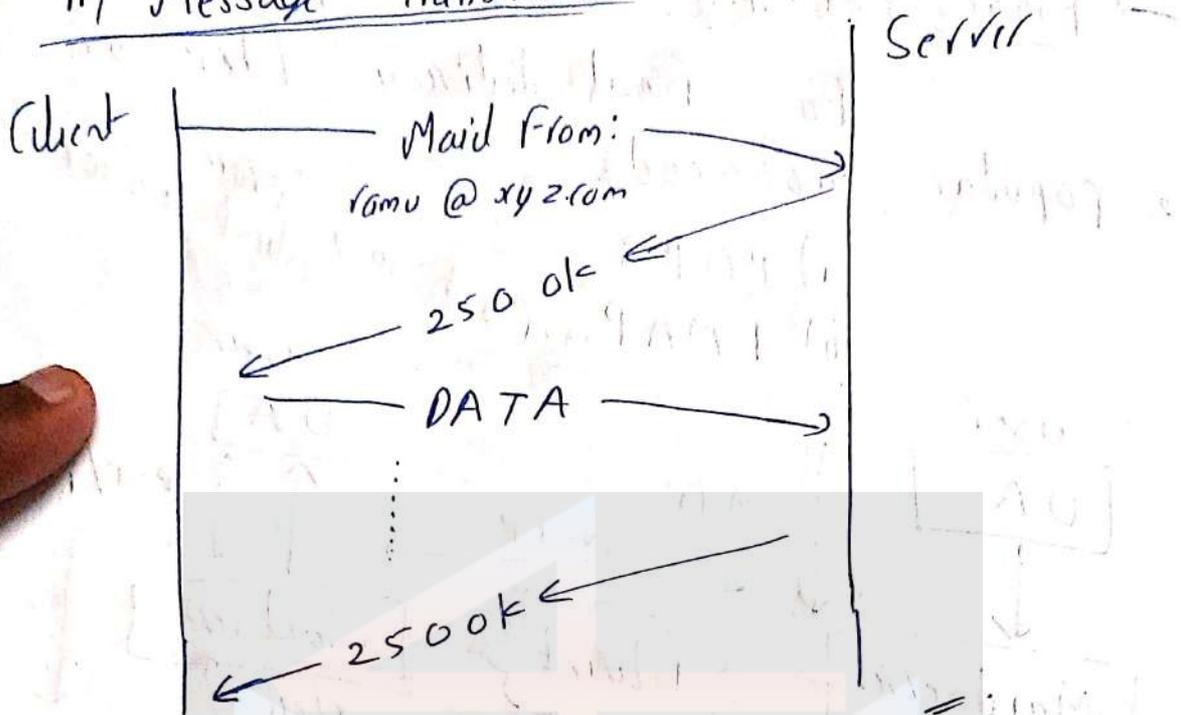
i) Connection establishment:-



iii) Connection termination



ii) Message Transfer:



ex

img

Bob's mail server
(SMTP client)

SMTP commands and
replies

Alice's mail server
(SMTP server)

1- Send an EHLO
message

EHLO

2- Receive an EHLO
message and respond
appropriately

250

3- Identify the sender
to Alice's SMTP server

MAIL FROM: <Bob@gmail.com>

4- This sender is OK
with me

250

5- Identify
the recipient to Alice's
SMTP server

RCPT To: <Alice@yahoo.com>

6- This recipient is OK
with me

250

7- I am about to send
you the email
message, ready?

DATA

8- I am ready. Send
message, end with "."
on a line by itself

354

9- Send message one
line at a time.
Terminate with a "."

Email message line by line

10- I accept the
message for delivery

.

11- Terminate this
session

250

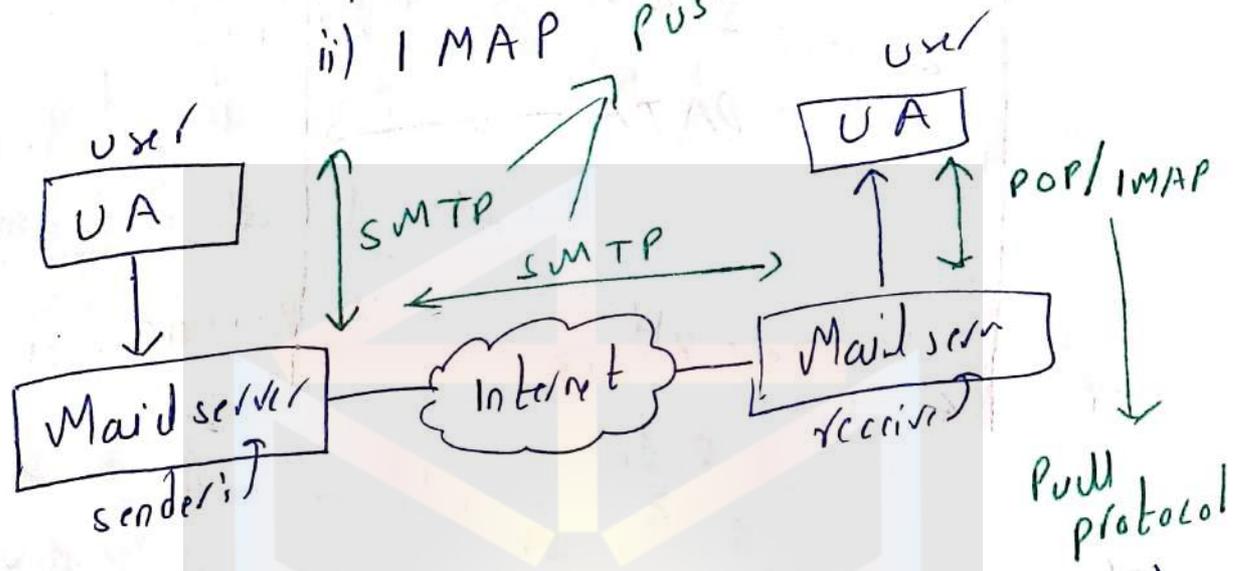
QUIT

12- Closing
connection

221

→ Final Delivery:-

For final delivery there are 2 popular protocols
 i) POP3
 ii) IMAP



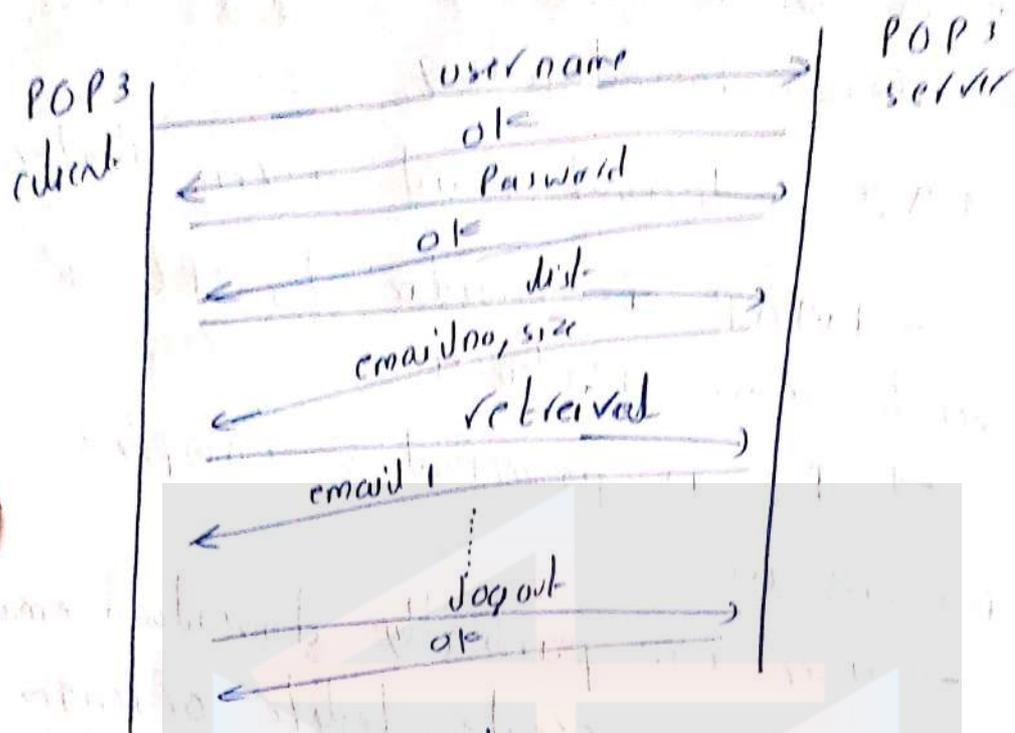
i) POP3 (Post Office Protocol Version 3)

→ POP3 protocol is used to pull or receive email from ISP

→ It is simple & has limited

functionality.

→ Once connection is established mails are copied from ISP to the user.



2 modes

Delete mode

→ mail is deleted from the mailbox after retrieval.

Keep mode

→ mails can be read/retrieved & also stored in system.

Disadvantages of POP3 :-

- i) Doesnot allow users to organize mails on server.
- ii) User cannot have separate folders to store mails

iii) No partial checking content of mail before downloading

→ IMAP Internet mail access Protocol

→ IMAP is similar to POP3 but with more features.

→ It is powerful & complex.

Few features are

→ user can partially download email

→ user can create, delete or rename

the mailbox on server

→ user can search contents of

the email

→ user can also check email

headers prior to downloading

→ user can create folders to

organize the mails in hierarchy.

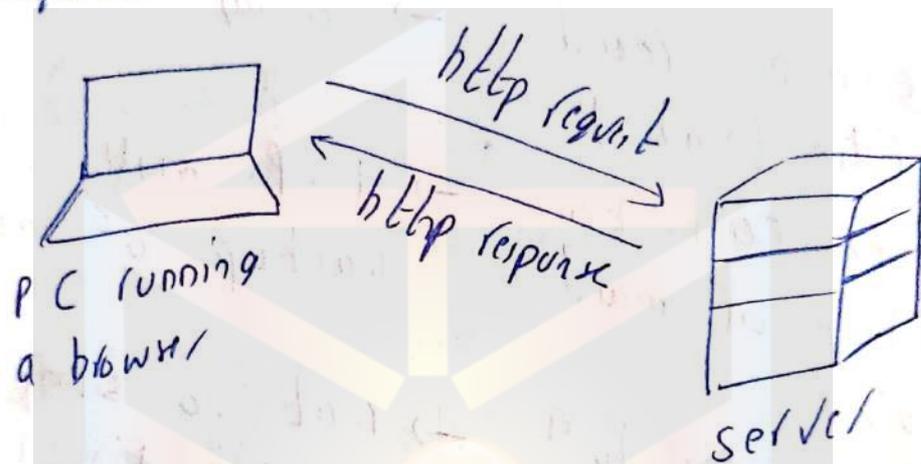
- | | | |
|--|------------|--|
| <p>→ <u>POP 3</u></p> <p>→ Defined in RFC 1939</p> <p>→ Uses 110 TCP port for connection</p> <p>→ emails are stored in user's PC</p> <p>→ can be read offline (saved)</p> <p>→ user need to backup of mail box</p> <p>→ very simple to implement</p> | <p>v/s</p> | <p><u>IMAP</u></p> <p>→ Defined in RFC 2060</p> <p>→ Uses 143 TCP port for connection</p> <p>→ emails are stored on ISP server.</p> <p>→ only online mode.</p> <p>→ ISP will have backup of mail box.</p> <p>→ not so simple to implement.</p> |
|--|------------|--|

→ HTTP (Hyper Text Transfer protocol)

- HTTP is a web application layer protocol.
- it has been used with world wide web (www) since 1990.
- It follows client-server model.

→ client :- browser that requests, receives (using HTTP protocol) & displays web objects

- server :- web server sends (using HTTP protocol) objects in response to requests



→ HTTP uses TCP to transfer message/files

process → client initiates TCP connection (create

socket) to server, port 80.

→ server accepts TCP connection from client

→ HTTP message/files exchanged b/w browser & web server

→ TCP connection closed

→ HTTP request methods:

→ HTTP is made general for object-oriented applications. So operations are called methods.

i) Get: The GET method requests the server to send the page (by which we mean object, in the most general case).

GET filename HTTP/1.1

ii) HEAD: Read a web page header.

iii) PUT: Store a web page (opposite of get)

iv) Post: Append/create the webpage

v) Delete: Remove the web page.

vi) TRACE: It is used to know what request the server actually got. If they are not being processed.

vii) Connect :- Connect through a proxy.
 viii) Options :- It provides the client to know its properties or of a specific file by giving the server. (header/method)

status response codes

<u>Code</u>	<u>meaning</u>	<u>examples</u>
1xx	Information	100 = server agrees to handle client's request
2xx	Success	200 = request successful
3xx	redirection	301 = page moved.
4xx	client-error	403 = Forbidden page 404 = page not found.
5xx	server error	500 = internal server error 503 = try again later.

→ HTTP message headers

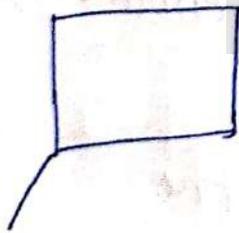
→ requests & responses may be followed by more information than are request headers & response headers respectively

img of HTTP message header

→ Performance Enhancement

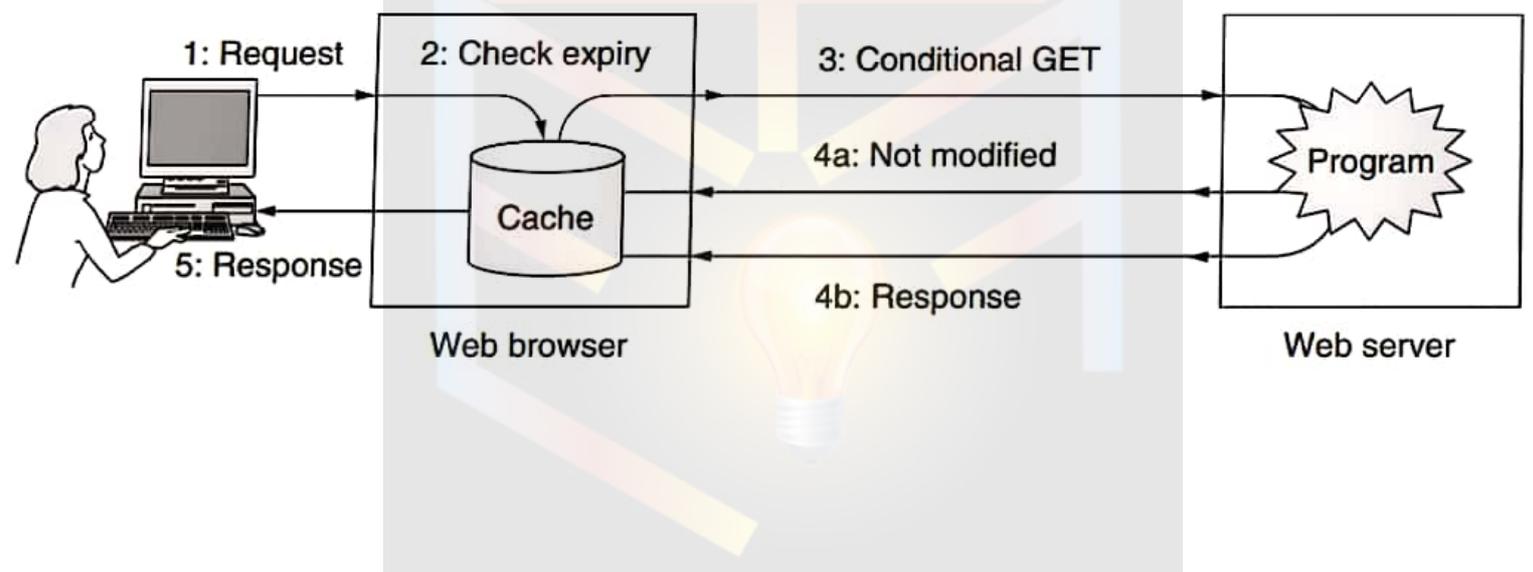
Different techniques can be implemented to increase the performance of world wide web.

i) Caching :- The process of storing a copy of image of a web page that is frequently visited is called caching.



img.

UOII.



→ now a day's every website user its own cache's so that when website is down the cache view can be delivered

→ explaining diagram could be enough

→ user sends request

→ if cache exist (not expired)

then we get the cached view

→ else will be passed to server

& now while returning files

are updated in cache if they

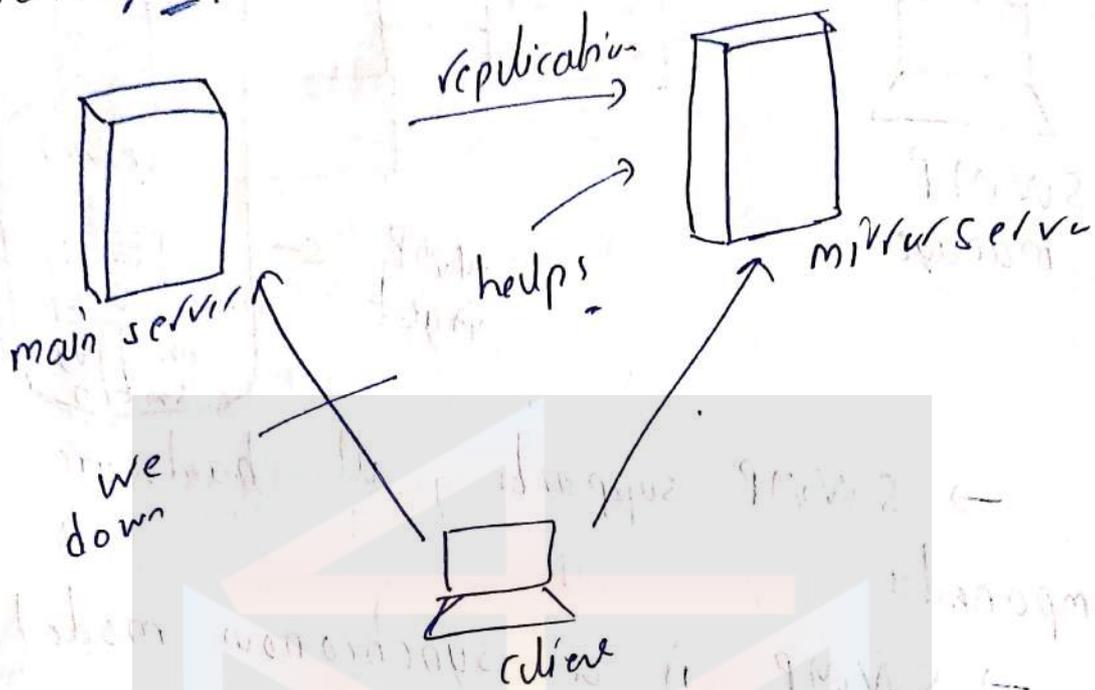
are updated

→ & finally user get's a view

ii) Server replication: Server replication is a server side technique used for enhancing the performance.

→ In this technique, the server creates duplicate copies of their content and archive them at multiple locations.

→ The way of replication is called mirroring.



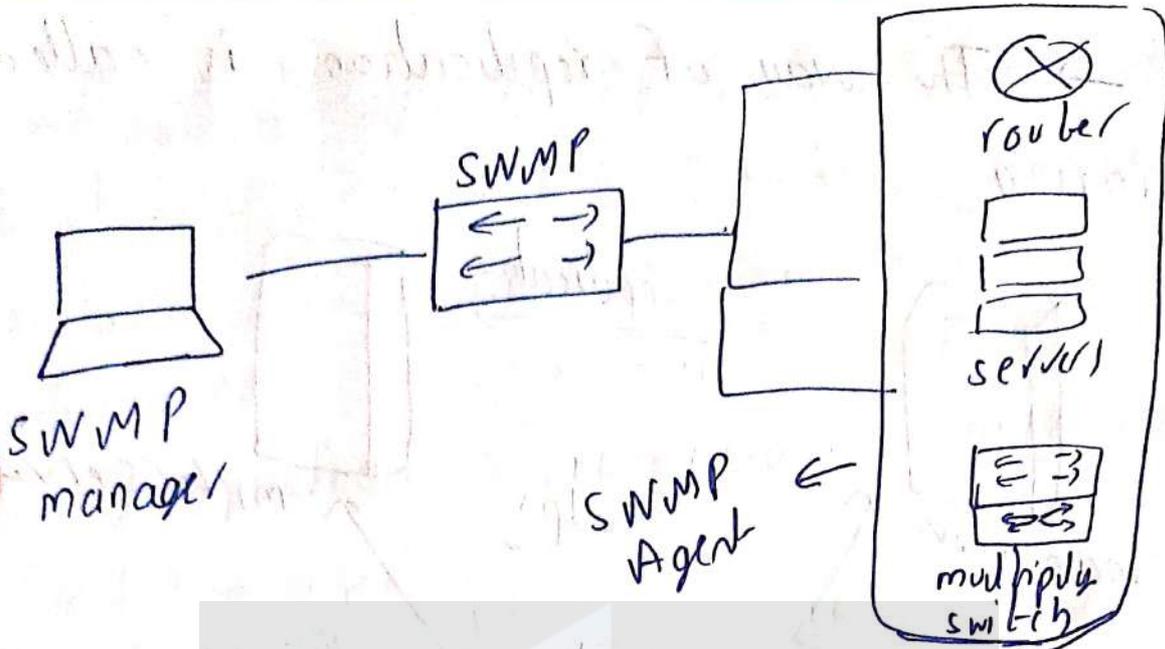
→ SNMP: (Simple network management protocol)

→ From the name itself we can clearly say that this protocol is to manage / monitor networks.

→ Used for monitoring network

→ Detect network fault.

components SNMP manager, SNMP, SNMP agents



→ SWAMP supports all hardware components

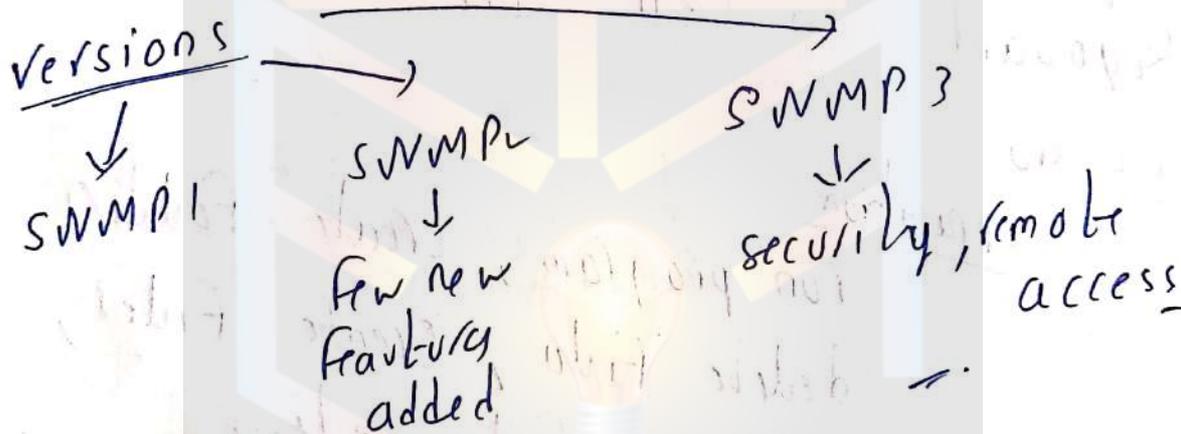
→ SWAMP is a synchronous model
it use commands like

- GET :- to get data
- RESPONSE :- response from the device
- GETNEXT :- to get data (continue)
- GETBULK :- to get from bulk (no. of device)
- SET :- To resolve error by setting flags.
- Trap :- To show faults.

i) SNMP agent :- Data is collected & managed here

ii) SNMP Manager :- Control & understands & reacts to the situations.

iii) Management Information Base (MIB) :- a text file to store all transactions (what-are done) in .mib file.



→ Telnet :- (Terminal Network)

(1969) (Telecommunication network)

→ A terminal emulation program that can be used to access remote server systems

→ It is a simple command line tool which allows you to send commands from your PC to control a server & administrate that server just as if you were available there.

→ The commands are in simple english & can be typed using a keyboard to tell the server what to do.

operations

run program, create folders, delete files, create files, transfer files etc...

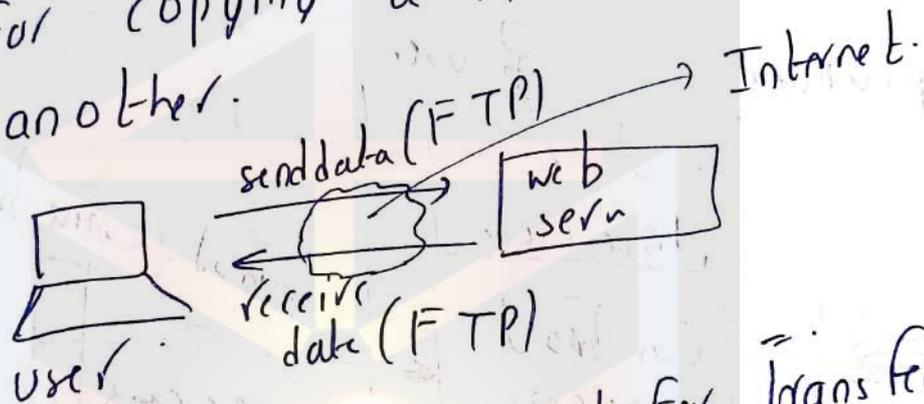
→ Telnet can be used on OS like windows, mac os, unix / linux.

→ It is fast

→ commands are all sent in clear text (no encryption)

→ Hence no commonly used, now a days. [SSH is used]
Security is added

→ File transfer protocol (FTP): FTP is the standard mechanism provided by TCP/IP for copying a file from one host to another.

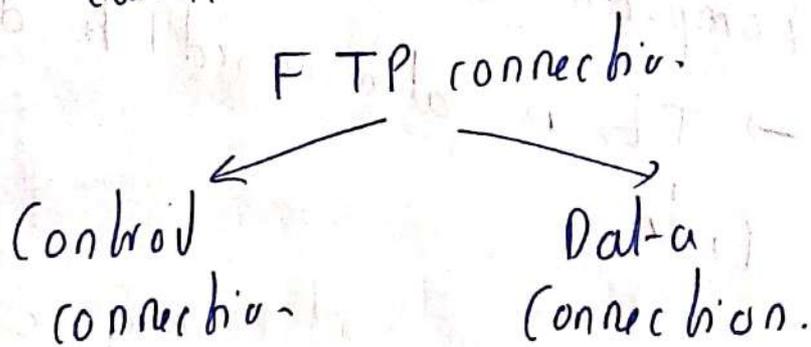
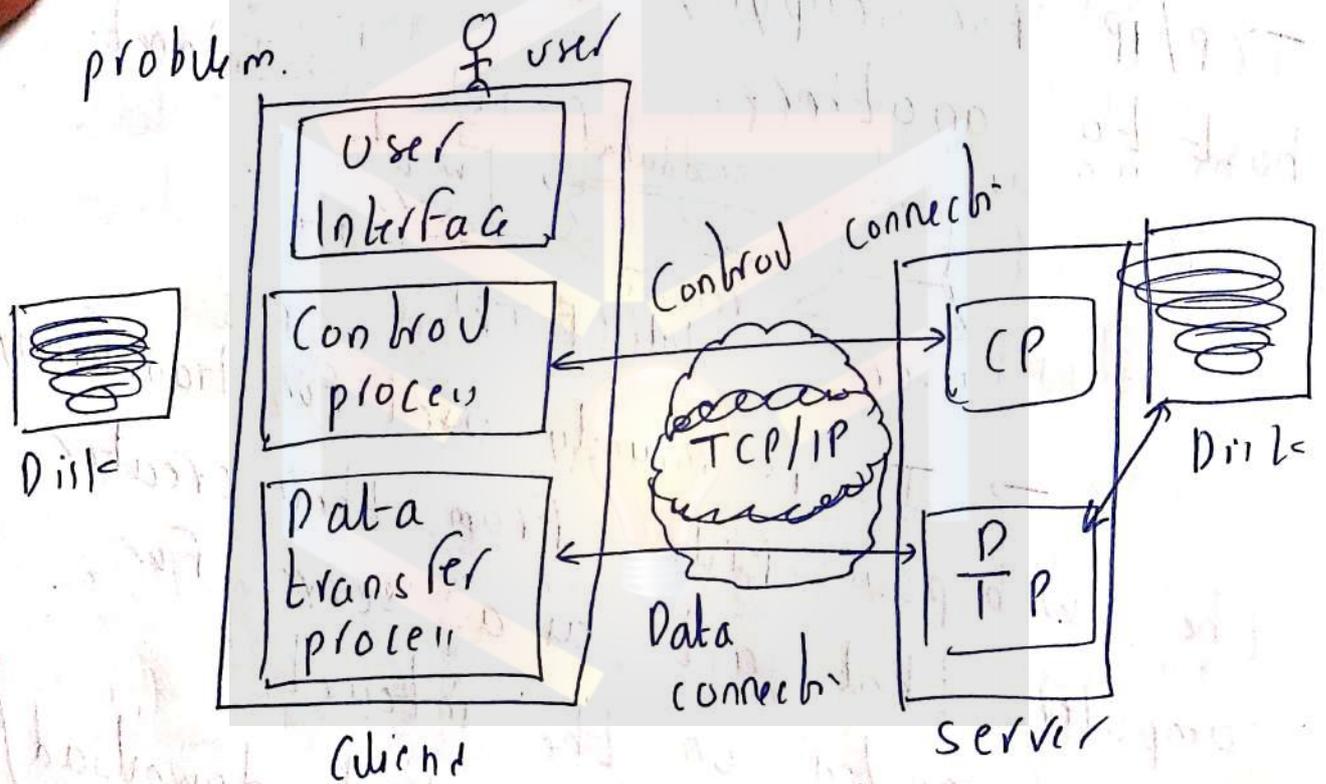


→ It is mainly used for transferring the web page files from their creator computer that acts as a server for other computers on the internet.

→ It is also used to download/share files.

→ Although transferring files from one system to another is very simple & straight forward, but there could be many problems (like different file systems, text, data representation)

→ FTP protocol will solve this problem.



i) Control Connection: The control connection uses very simple rules for communication. → Through control connection, we can transfer a line of command or line of response at a time. → remain connected through entire FTP session.

ii) Data Connection: The data connection uses very complex rules as data types may vary → Open's & closed For each file transfer. Add pdf at the (desktop) end =

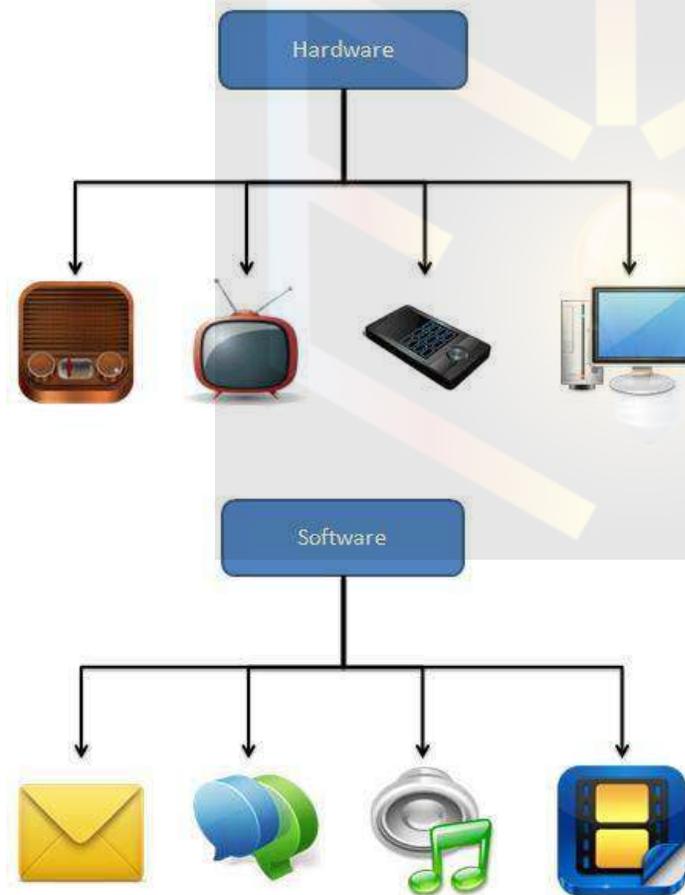
From:

https://www.tutorialspoint.com/multimedia/multimedia_introduction.htm

Multimedia

By definition Multimedia is a representation of information in an attractive and interactive manner with the use of a combination of text, audio, video, graphics and animation. In other words we can say that Multimedia is a computerized method of presenting information combining textual data, audio, visuals (video), graphics and animations. For examples: E-Mail, Yahoo Messenger, Video Conferencing, and Multimedia Message Service (MMS).

Multimedia as name suggests is the combination of Multi and Media that is many types of media (hardware/software) used for communication of information.



Components of Multimedia

Following are the common components of multimedia:

- **Text**- All multimedia productions contain some amount of text. The text can have various types of fonts and sizes to suit the professional presentation of the multimedia software.
- **Graphics**- Graphics make the multimedia application attractive. In many cases people do not like reading large amount of textual matter on the screen. Therefore, graphics are used more often than text to explain a concept, present background information etc. There are two types of Graphics:
 - **Bitmap images**- Bitmap images are real images that can be captured from devices such as digital cameras or scanners. Generally bitmap images are not editable. Bitmap images require a large amount of memory.
 - **Vector Graphics**- Vector graphics are drawn on the computer and only require a small amount of memory. These graphics are editable.
- **Audio**- A multimedia application may require the use of speech, music and sound effects. These are called audio or sound element of multimedia. Speech is also a perfect way for teaching. Audio are of analog and digital types. Analog audio or sound refers to the original sound signal. Computer stores the sound in digital form. Therefore, the sound used in multimedia application is digital audio.
- **Video**- The term video refers to the moving picture, accompanied by sound such as a picture in television. Video element of multimedia application gives a lot of information in small duration of time. Digital video is useful in multimedia application for showing real life objects. Video have highest performance demand on the computer memory and on the bandwidth if placed on the internet. Digital video files can be stored like any other files in the computer and the quality of the video can still be maintained. The digital video files can be transferred within a computer network. The digital video clips can be edited easily.
- **Animation**- Animation is a process of making a static image look like it is moving. An animation is just a continuous series of still images that are displayed in a sequence. The animation can be used

effectively for attracting attention. Animation also makes a presentation light and attractive. Animation is very popular in multimedia application

Applications of Multimedia

Following are the common areas of applications of multimedia.

- **Multimedia in Business-** Multimedia can be used in many applications in a business. The multimedia technology along with communication technology has opened the door for information of global work groups. Today the team members may be working anywhere and can work for various companies. Thus the work place will become global. The multimedia network should support the following facilities:
 - Voice Mail
 - Electronic Mail
 - Multimedia based FAX
 - Office Needs
 - Employee Training
 - Sales and Other types of Group Presentation
 - Records Management
- **Multimedia in Marketing and Advertising-** By using multimedia marketing of new products can be greatly enhanced. Multimedia boost communication on an affordable cost opened the way for the marketing and advertising personnel. Presentation that have flying banners, video transitions, animations, and sound effects are some of the elements used in composing a multimedia based advertisement to appeal to the consumer in a way never used before and promote the sale of the products.
- **Multimedia in Entertainment-** By using multimedia marketing of new products can be greatly enhanced. Multimedia boost communication on an affordable cost opened the way for the marketing and advertising personnel. Presentation that have flying banners, video transitions, animations, and sound effects are some of the elements used in composing a multimedia based advertisement to appeal to the

consumer in a way never used before and promote the sale of the products.

- **Multimedia in Education-** Many computer games with focus on education are now available. Consider an example of an educational game which plays various rhymes for kids. The child can paint the pictures, increase reduce size of various objects etc apart from just playing the rhymes. Several other multimedia packages are available in the market which provide a lot of detailed information and playing capabilities to kids.
- **Multimedia in Bank-** Bank is another public place where multimedia is finding more and more application in recent times. People go to bank to open saving/current accounts, deposit funds, withdraw money, know various financial schemes of the bank, obtain loans etc. Every bank has a lot of information which it wants to impart to its customers. For this purpose, it can use multimedia in many ways. Bank also displays information about its various schemes on a PC monitor placed in the rest area for customers. Today on-line and internet banking have become very popular. These use multimedia extensively. Multimedia is thus helping banks give service to their customers and also in educating them about banks attractive finance schemes.
- **Multimedia in Hospital-** Multimedia best use in hospitals is for real time monitoring of conditions of patients in critical illness or accident. The conditions are displayed continuously on a computer screen and can alert the doctor/nurse on duty if any changes are observed on the screen. Multimedia makes it possible to consult a surgeon or an expert who can watch an ongoing surgery line on his PC monitor and give online advice at any crucial juncture.

In hospitals multimedia can also be used to diagnose an illness with CD-ROMs/ Cassettes/ DVDs full of multimedia based information about various diseases and their treatment. Some hospitals extensively use multimedia presentations in training their junior staff of doctors and nurses. Multimedia displays are now extensively used during critical surgeries.

- **Multimedia Pedagogues-** Pedagogues are useful teaching aids only if they stimulate and motivate the students. The audio-visual support to a pedagogue can actually help in doing so. A multimedia tutor can provide multiple numbers of challenges to the student to stimulate his

interest in a topic. The instruction provided by pedagogue have moved beyond providing only button level control to intelligent simulations, dynamic creation of links, composition and collaboration and system testing of the user interactions.

- **Communication Technology and Multimedia Services-** The advancement of high computing abilities, communication ways and relevant standards has started the beginning of an era where you will be provided with multimedia facilities at home. These services may include:

- Basic Television Services
- Interactive entertainment
- Digital Audio
- Video on demand
- Home shopping
- Financial Transactions
- Interactive multiplayer or single player games
- Digital multimedia libraries
- E-Newspapers, e-magazines

