Unit-5

① Write short notes on
(a) WWW (b) SNMP (c) Digital video

② WWW:
The World Wide Web is a Collectⁿ of interlinked web pages that can be accessed over internet

-) It uses HTTP protocol to transmit web pages, which are usually written in HTML.
-) WWW provides services such as websites, online shopping, videos & social media

b) SNMP (Simple Network Management Protocol)
SNMP is a network protocol used for monitoring & managing network devices such as routers, switches, servers & printers
It works based on manager-agent model:
manager: system that monitors device
agents: software running on each device.
SNMP collects data like CPU usage, network traffic & send alerts when prbm occurs

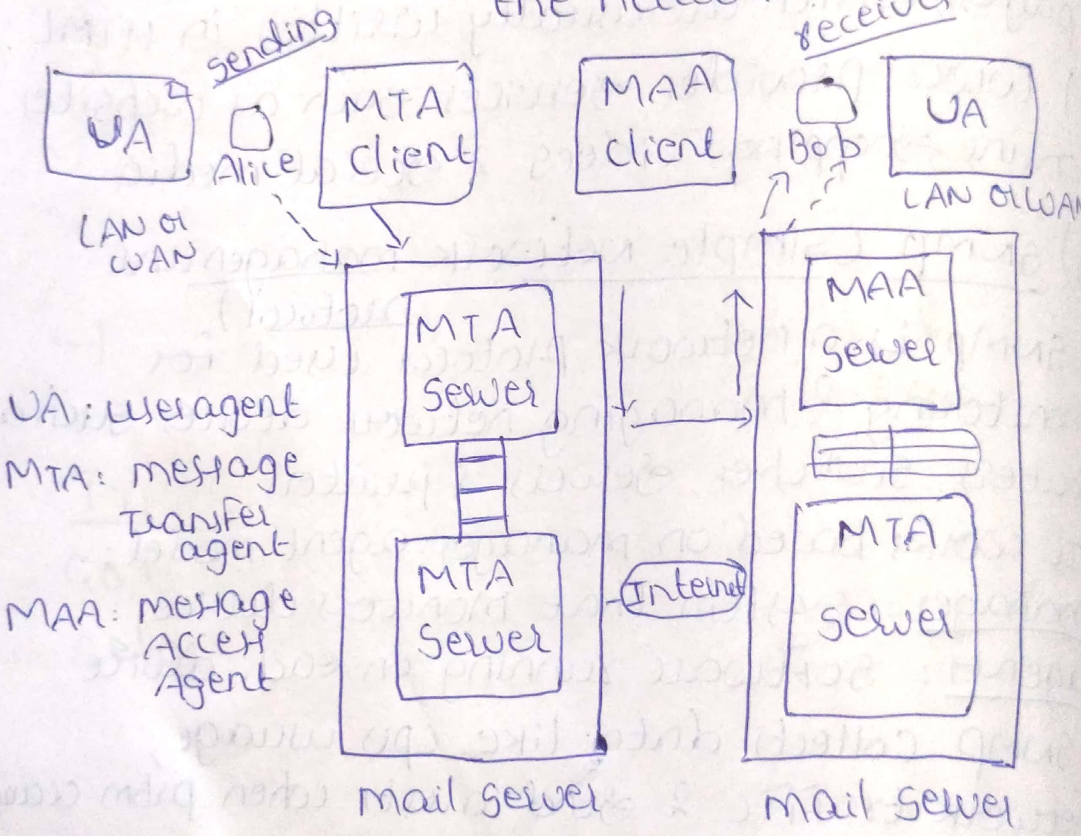
c) Digital video:
Digital video is video content stored in digital (binary) format instead of analog signals.
+ It uses compression techniques like MPEG, H.264 to reduce file size.
-) Digital video allows easy editing, storage & transmission over networks (eg. Youtube)

-) It provides higher quality & better Flexibility compared to analog video.

(2) Describe the Architecture of Email & its services.

=) Email is an electronic message sent from one device to another.

=) Email architecture defines how an email is created, transferred, delivered across the network



Email Architecture

(1) User Agents (UA)

. These are applicat^n used by user to compose, send, receive, read & manage emails

Ex: Gmail, Outlook

2. Transfer Agents (MTA)

→ MTAs are responsible for sending emails from sender's server to receiver's server.

→ They use SMTP (Simple mail Transfer Protocol) to transfer messages blw mail servers.

→ Ex: send mail, Post Fix.

3) Message Access Agents (MAA)

→ After the email reaches the recipient's server, MAAs allow the user to retrieve the email.

→ They use protocols such as:

- POP3 - download email to client.
- IMAP - reads email directly from server.

Email services:

1) Composition: Allows users to write messages, attach files, insert images etc.

2) Transfer: moves the email from sender to receiver using SMTP.

3) Reporting: Notifies user if an email is delivered, delayed or failed.

4) Displaying: Enables user to read received messages in readable format.

5) Disposition: Allows user to reply, forward, save and etc.

③ Write short notes on a) static web page
b) Dynamic web page.

a) Static web page:

=) A static web page is a webpage whose content remains the same for every user & does not change unless manually updated by developer.

=) It is created using HTML, CSS & javascript

=) Static pages are fast, easy to host & suitable for small websites like company info pages.

=) However, they cannot interact with the database or generate real-time content.

-) It's loading speed is faster as no server processing.

b) Dynamic web page:

=) A dynamic web page is a webpage whose content changes automatically based on user interaction, time or data stored in a database.

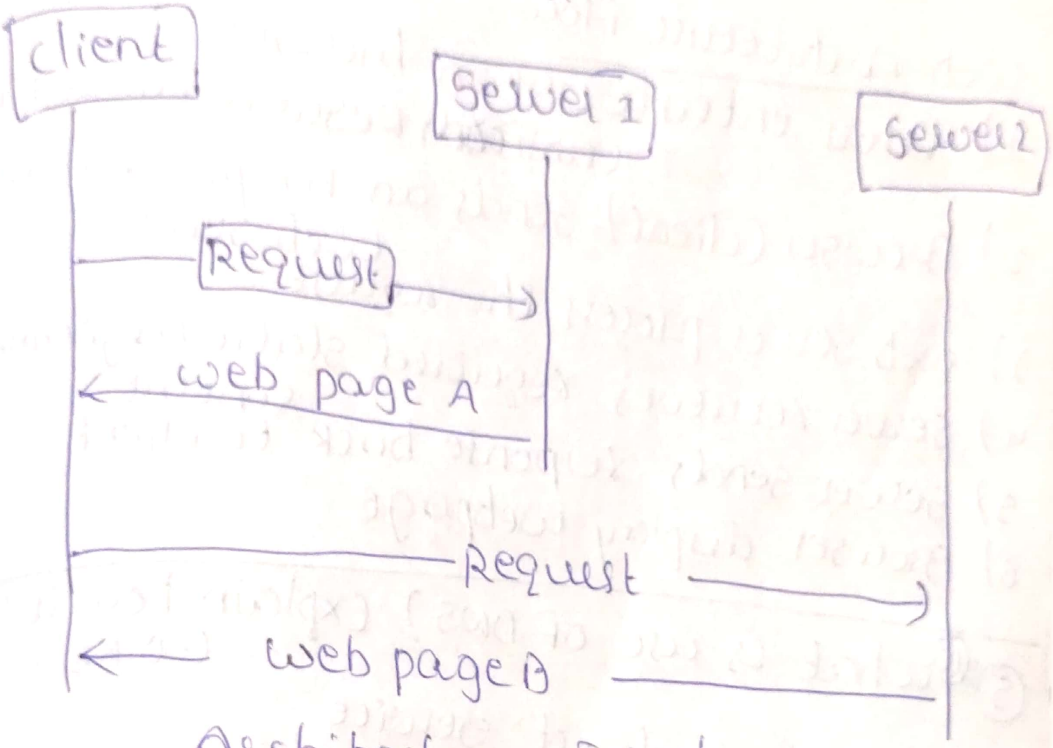
-) It uses a server-side technologies like PHP, Node.js, Python, or Framework.

Ex: Social media Feeds, E-commerce sites, dashboards.

=) Dynamic pages are interactive & flexible but require more processing & backend logics

-) It's loading speed is slightly slower as server side processing.

The architecture of the web is based on client server model, where users request web resources and servers provides them using standard protocols.



Architecture of web (www)

(i) Web clients (Browser)

- There are applicⁿ like chrome, FireFox.
- They send requests to webservers using HTTP / HTTPS.
- They display web pages using HTML, CSS & J.S.

ii) Web Servers

- A web server stores web pages, images, videos & applicⁿs
- It receives client requests & responds with required resources

ex: Apache..

iii) HTTP / HTTPS protocol
- HTTP is commun? protocol blw client & server
- HTTPS is secure version using encrypt?

iv) Web content → static & Dynamic content (Fixed)

Web Architecture Flow

1) User enters a URL in browser (Uniform Resource Locator)
2) Browser (client) sends an HTTP/S request to web server
3) Web server process the request
4) Server retrieves required static / dynamic content
5) Server sends response back to client
6) Browser display webpage

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(5) (10) What is use of DNS? Explain how it works.

=) DNS is a direct service.

→) DNS is used to translate human-readable domain names (like www.google.com) into IP addresses (like 142.250.16)

→) DNS converting given host name to IP address.

→) We are remembering every host address is difficult. that's why we can mapping address into IP.

→) DNS is one of the most important systems in internet (acts like phonebook)

Working:

(i) When you type a website name in the browser, a DNS query begins (It converts host name into an IP address)

(ii) The browser first checks if IP address is already stored in:
- Browser cache
- O.S cache

If found, no further lookup is needed

iii) ... cache, the request goes to the DNS Resolver provided by ISP.

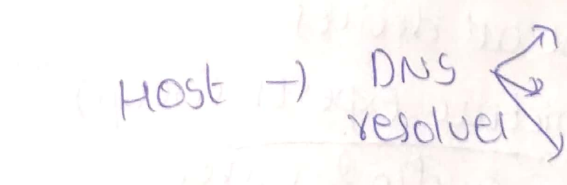
iv) The resolver asks the Root DNS server where to find the domain's top level domain server. Ex: (TLDs: .com, .org, .net). (TLD)

v) The TLD server responds with the Authoritative Name server responsible for domain.

vi) Authoritative server sends back the exact IP address of requested domain.

vii) The IP address is returned to browser & the browser can now reach web server.

viii) Finally, ~~web~~ browser sends a request to website's IP address & loads the page.



Adv of DNS:

- Easy domain name management.
- Distributed & decentralized.
- Fast lookups with caching.
- supports load balancing

Disadv:

- DNS attacks (DNS spoofing).
- If DNS server fails, website becomes unreachable.
- Uses UDP → no built-in security.

(6) Details about JPEG & MPEG

(i) JPEG (joint photographic Experts Group)

JPEG is a widely used image compression standard designed for photographs & complex images.

Key points:

- uses lossy compression, meaning some data is removed to reduce file size.
- provides high compression ratio with acceptable image quality
- works well for digital photos, web images & scanned pics.
- File extensions: .jpg, .jpeg

Adv:

- small file size
- Good quality for natural images
- supported by almost all devices

ii) MPEG (moving picture Experts Group)

MPEG is a family of audio & video compression standards used for digital video & multimedia

Key points:

- Designed for video compression (moving images) & audio.
- uses both lossy video compression & temporal compression meaning it stores only changes b/w them.

Ex: -MPEG-1, -MPEG-2

- used in streaming, broadcasting, DVDs.
- Extensions: .mp4, .mpg, .m4v.

important versions:

MPEG-1 : Video CDs, early digital video
MPEG-2 - Digital TV, DVDs.
MPEG-4 - Modern streaming (youtube, mobile video)

1) Discuss about protocols used blw mail transfer agents?

mail Transfer Agents (MTAs) are responsible for sending and receiving emails blw mail servers.

→ The main protocol used blw MTAs is SMTP, but several related protocols support the overall email system

SMTP (Simple mail Transfer protocol)

SMTP is the primary protocol used blw MTAs.

→ SMTP is standard protocol used for sending emails across internet
→ It is mainly used for server to server (MTA to MTA) communicn & for sending mail from a client to mail server.

Key points:

- used for sending emails from one mail server to another.
- server pushes email to another server (push based model)
- operates on port 25
- uses text based commands like HELO, MAIL FROM.
- ensures reliable email transfer blw MTAs

Why SMTP used btw MTAs

- It supports store and forward message delivery
- Handles server to server communic?
- Works efficiently even with network delay.

(ii) ESMTP (Extended SMTP)

-) ESMTP is enhanced version of SMTP

Key Features:

- Supports authentication, encryption & large messages
- Adds additional commands like EHLO.
- used by modern MTAs like postFix, sendmail.

* Mail Transfer Agents use SMTP as the primary protocol for transferring emails btw mail servers. Modern systems use ESMTP to support additional feature.

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(8) Describe working of SNMP in managing protocols.

Working:

SNMP works based on a manager-agent model.

i) SNMP manager sends Request

The manager sends SNMP requests to device to:

- collect data (traffic, errors)
- change config^n.
- Requests are sent using SNMP oper^n like. GET, GET-NEXT, ...

(ii) SNMP Agent Runs on Every Device
Each network device has SNMP agent
that:
. collects device inform?
. stores data in MIB
i) Agents run continuously in background.
ii) MIB stores device inform?
(management inform base)
Every device has MIB containing:
. Interface status
. IP addresses
. Errors

=). SNMP manager requests or receives data
from SNMP Agents.
. Agents collect & store device data in MIB
. SNMP uses GET, SET messages for monitoring
& control.
. Agents send TRAP messages to manager
in case of failures
. Manager analyzes data & helps maintain
health of network

Q) Write about streaming of a
i) Digital Audio ii) Digital video

(i) D.A :

Digital audio stream is process of transmit audio data over a network in real time so that user can listen without download the entire File.

How it works:

- Audio is recorded & digitized (converted to binary)
- It is compressed using audio detects like MP3, AAC
- audio is divided into small packets and sent over network.
- A buffer at receiver stores a few seconds of data to avoid interruptions
- audio player decodes the packets & plays the continuously

b) D.V :

D.V streaming is real time delivery of video content over internet without waiting for full download.

How it works:

- video is recorded and digitized into frames
- It is compressed using video codes like H.264, H.265
- video is split into segments/packets & sent to viewer.
- A client buffer stores data temporarily ensure smooth playback.
- The player decodes frames & display