26/11/21 CNS - Assignment - 01

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Q 01. Write a note on FTP. Write and explain FTP commands and replies

→ FTP means "file Transfer Protocol" and refers to a group of rules that govern how computers transfer files from one system to another over the Internet. FTP enables the transfer of files back and forth between computers or through the cloud. Users require an Internet connection inorder to execute FTP transfers.

→ FTP commands.

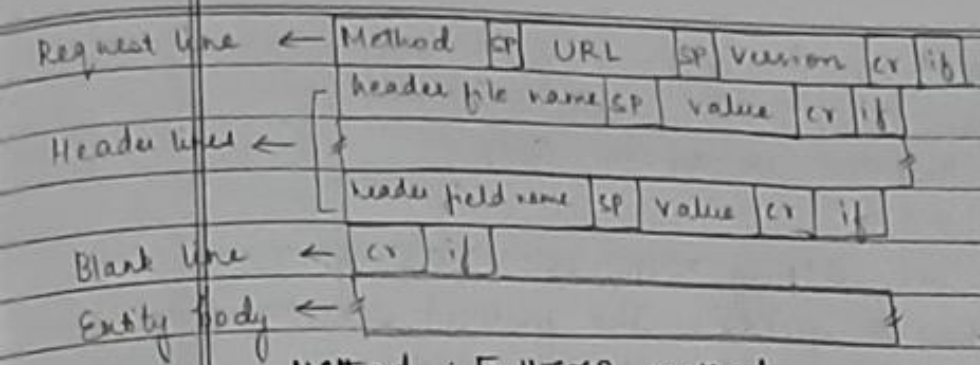
- USER username : Used to send the user identification to the server
- PASS Password : Used to send the user password to the server
- LIST : Used to ask the server to send back a list of all the files in the current remote directory
- RETER filename : Used to retriene a file from the current directory to the remote host
- STOR filename : Used to store a file into the current directory of the remote host.

→ FTP replies :

- Stop filename : Each command is followed by reply, from server to client. The replies are 3-digit no with an optional message following the number.
- 331 Username OK, password required
- 125 Data connection already open, transfer starting
- 425 can't open data connection
- 452 Error writing file

Q2. Explain the HTTP request and HTTP response message format

→ HTTP request message :

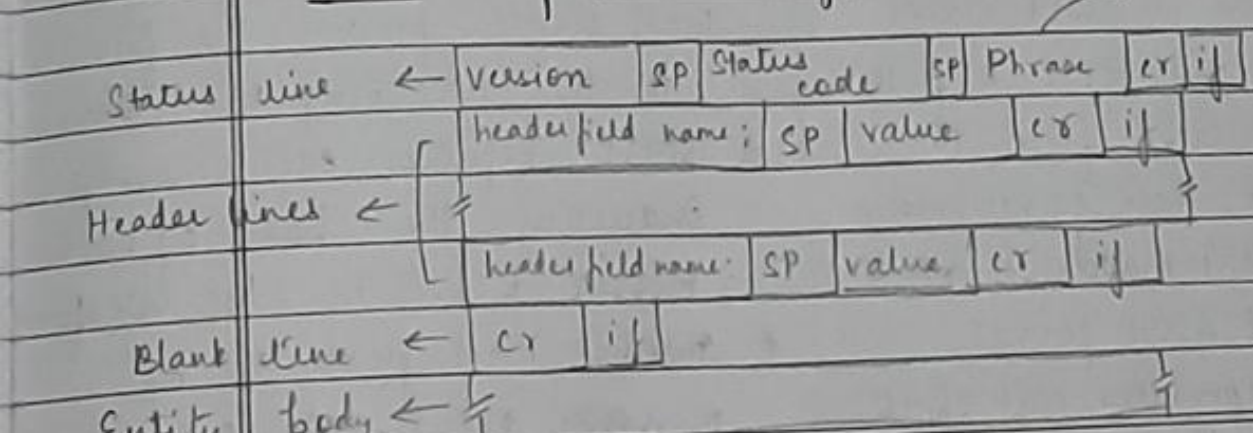


Method : 5 HTTP methods

- GET : GET method is used when the browser requests an object with the requested object identified in URL field.
- POST : With a POST message, the user is still requesting a webpage from the server.
- PUT: The PUT method is also used by applications that need to upload objects to web servers.
- HEAD: Used to retrieve header information. It is used for debugging purpose
- DELETE: allows a user / an application to delete an object on a web server.
- URL: Specifies URL for the requested object.
- Version: This field represents HTTP version, usually.
  HTTP/1.1

Eg: Headerline
Host: www.someschool.edu
⇒ Connection: Close
user-agent - Mozilla/5.0
Accept Language: fr

→ HTTP Response message :-



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Eg: HTTP/1.1 200 ok
connection: close
Date : Tue, 09 Aug 2011 15:44:04 GMT
Server : Apache/2.3.3
Last-modified Tue, 09 Aug 2011 15:11:03 GMT.

⇒ The status line has 3 fields: The protocol version field a status code and corresponding status message.

→ The status code and associated phrase indicate the result of the request

→ 200 ok: Request succeeded & the information is returned in response

→ 301 moved permanently: Requested object has been permanently moved

→ 400 Bad Request: This is a generic error code indicating that the request couldn't be understood by server.

→ 404 Not found: The requested document doesn't exist on this server.

→ 505 HTTP version not supported: The requested HTTP protocol version is not supported by the server.

B03. Compare HTTP and SMTP.

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HTTP	SMTP
* pull protocol: Someone loads information a web server and user use HTTP to pull the information from the server at their convinience	* Push protocol: The sending mail server pushes the file to the receiving mail server
* HTTP doesn't mandates data to be in 7-bit ASCII-format	* SMTP requires each message including the body of each message to be in 7 bit-ASCII format
* HTTP encapsulates each object in its own http response message	* Internet mail places all of message objects into one message

B04
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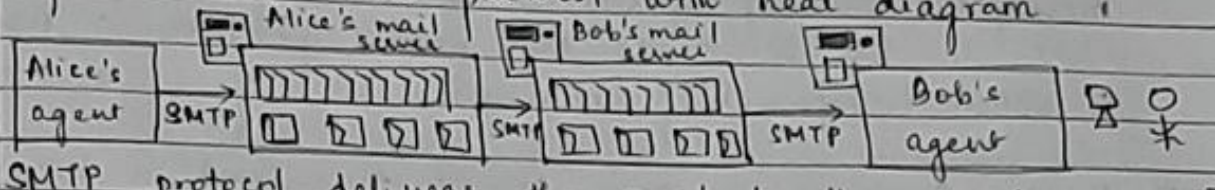
B 04 Explain mail access protocol with neat diagram :

→ 

SMTP protocol delivers the mail to the mail server. To fetch the mail from mail server receiver uses mail access protocols. There are currently a number of popular mail access protocols. Including post office protocol version 3 (POP3), Internet mail Access protocol (IMAP) and HTTP

→ POP 3 :- PO3 is an extremely simple mail access protocol. With the TCP connection established POP3 progresses through 3 phases: authorization, transaction & update

(i). Authorization phase: During the authorization phase the user agent sends a username, and - password to authenticate the user.

(ii) Transaction phase : During this phase, the user agent retrieves messages also during this phase The user agent can mark messages for deletion, remove deletion marks and obtain mail statics

(iii) update phase: After client has issued the quit command ending the pop 3 session at this time, the mail server deletes the messages that were marked for deletion.

→ IMAP : An IMAP server will associate each message with a folder ; when a message 1st arrives at the server it is associated with recipient's INBOX into a new, user created folder, read the message delete the message & so on. The IMAP protocol provides commands to allow users to create folders and move messages from one folder to another. IMAP also provides commands that allow users to search remote folders for

messages matching specific criteria. Another important IMAP, that it has commands that permit feature a user agent to obtain components of messages.

B07 →

B05. Explain 3 classes of DNS servers organized in hierarchy.

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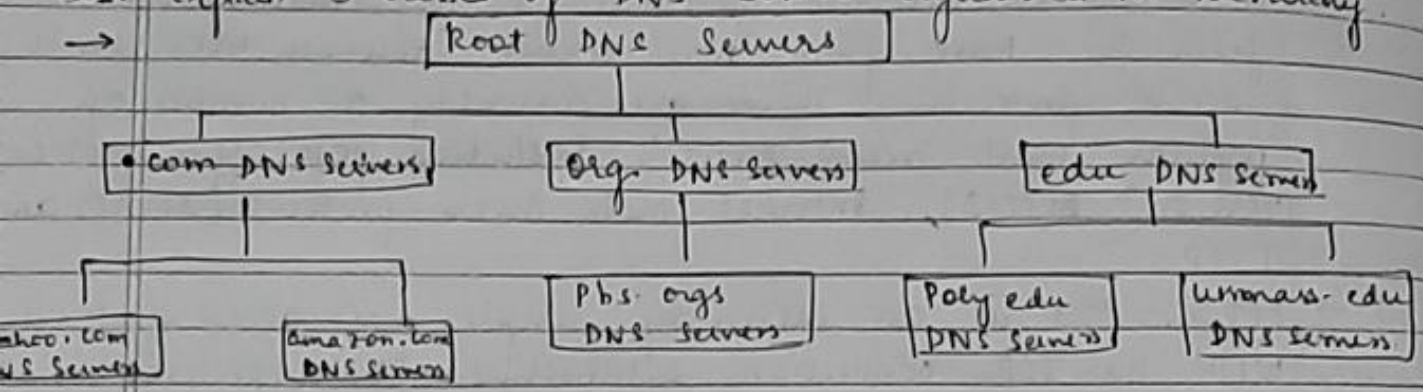

- There are 3 classes of DNS servers - root DNS servers, top-level domain (TLD) DNS servers and authoritative DNS servers - and organized in hierarchy.
- ROOT DNS Servers: In Int there are 13 root DNS servers located in North America. We referred 13 root DNS servers as if it were a single server. each server is actually a network of replicated servers. for both security and reliability purposes. All together there are 247 root servers.
- TLD Servers: 3 servers are responsible for top-level domains such as com, org, net, edu & gov.
- Authoritative DNS servers: Every organisation with publicly accessible hosts on the Internet must provide publicly accessible DNS records that maps the names of those hosts to IP addresses.
- There is another important type of DNS server called a local DNS server. This doesn't strictly belong to the hierarchy of servers.

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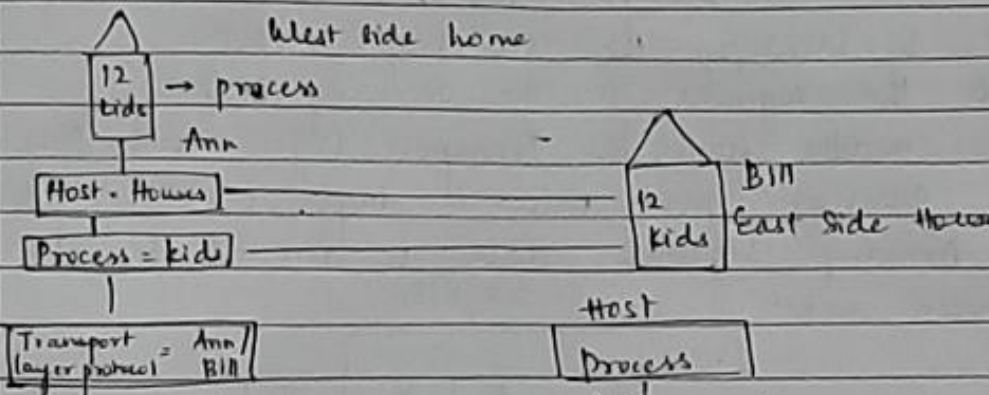
Q07. Explain the relationship between transport and network layer.

→ A transport layer protocol provides for logical communication b/w application processes running on different hosts and a network layer protocol provides logical-communication between hosts. Consider 2 houses, one on the East Coast and the other on the west coast, with each house being home to a 12 kids.



application messages = letters in envelopes
processes = cousins
hosts = houses
transport-layer protocol = Ann and Bill
network layer protocol = postal service

⇒ In this postal service provides logical communication between the 2 houses - the postal service moves mail from house to house not from person to person.

Q08: Explain transport layer multiplexing and de-multiplexing.

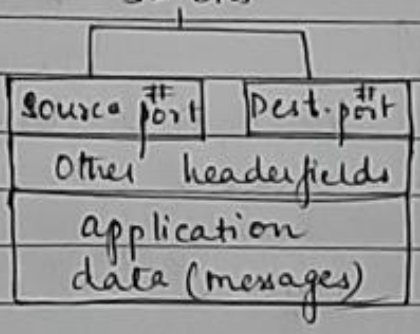
→ Socket: Sockets are used to pass data from the network to the process and vice-versa

→ Multiplexing: The job of combining data chunks from different sockets to create segment.

→ Demultiplexing: The job of delivering the data to the correct socket.

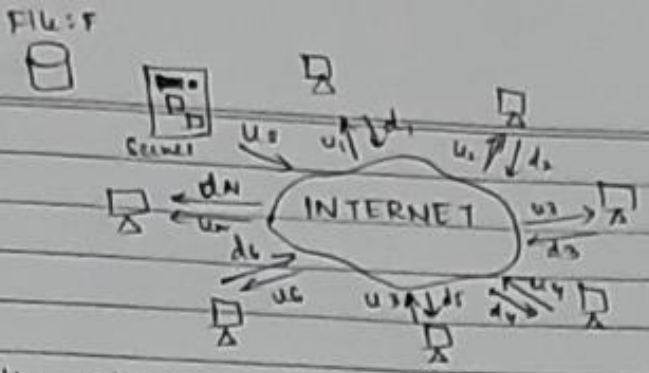
→ In multiplexing:
* At the sender, transport layer, Gather information (data chunks) at the source host from different sockets
* Encapsulates data chunks with header to create segment
* pass the segment to the network layer

⇒ In Demultiplexing:
* At the receiver, transport layer, Examines the fields in the segment to identify the receiving socket.
* Directs the segment to the receiving socket
* In the middle hosts, the Transport layer must Demultiplex segments arriving from network layer to either process P1 or P2. Arriving segments data is directed to the corresponding process socket.



Q06: Explain Scalability of P2P architecture / Illustrate simple quantitative model for distribution to a fixed set of peers.

→ As shown in the fig, the server and the peers are connected to the Internet with access links. Denote the upload rate of the server's access link by u_s, the upload rate of the ith peer's access link by u_i, and the download rate of the ith peer's access link by d. Also denote the size of the file to be distributed (in bits) by F and the number of peers that want to obtain a copy of the file by N.
The distribution time is time it takes to get a copy of file to all N peers.



- In the client-server architecture, none of the peers aids in distributing the file we make the following observations.

→ The server must transmit one copy of the file to each of the N peers. Thus the server must transmit NF bits. Since the server's upload rate is u_s, the time to distribute the file must be atleast NF/u_s.

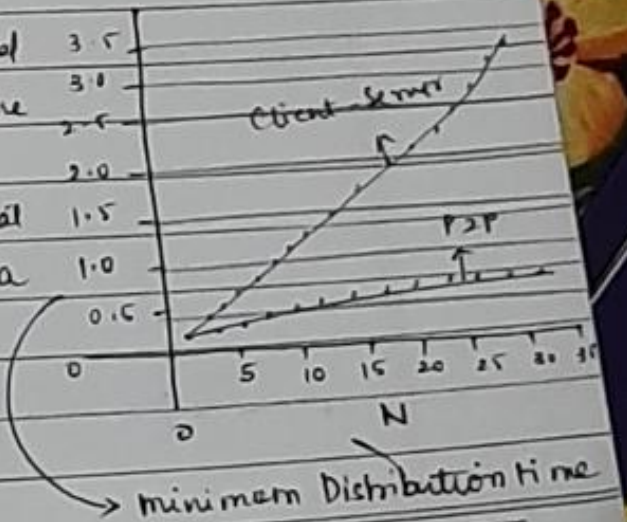
→ Let d_{min} denote the download rate of the peer with the lowest download rate, i.e $d_{min} = \min\{d_1, d_2, \ldots d_N\}$. The peer with the lowest download rate can't obtain all F bits of the file in less than F/d_{min} seconds. Thus the minimum distribution time is atleast F/d_{min}.

$$D_{cs} \geq \max\left\{\frac{NF}{u_s}, \frac{F}{d_{min}}\right\}.$$

- finally observe that the total upload capacity of the system as a whole is equal to the upload rate of the server (+) the upload rates of each of individual peers, i.e $u_{total} = u_s + u_1 + \ldots + u_N$. The system must deliver (upload) F bits to each of N peers, thus delivering a total of NF bits. This cannot be done at a rate faster than u_{total}. Thus, the minimum distribution time is also atleast $NF/(u_s + u_1 + \ldots + u_N)$

$$D_{p2p} \geq \max\left\{\frac{F}{u_c}, \frac{F}{d_{min}}, \frac{NF}{u_c + \sum_{i=1}^{N} u_i}\right\}$$

D_{p2p} - minimum distribution time for P2P.



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