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Sec-6F

CN PRACTICE QUESTIONS #02

Q1) a. False

→ There are four objects hence four connections since eac connection transports exactly one request message and one response message.

→ Each object will have its own request message rather than one collective message for all.

b. True

Both of these webpages are on the same physical ser

c. False.

This is not true because connection b/w client and server closes in non-persistent HTTP, therefore two distinct HTTP messages cannot be carried over a single TCP segment

d. False

Date: Time at which request was created

e. False: Some HTTP response messages have an empty message body.

(Q2) SMS enables text-message transmission and reception between mobile phones over cellular networks. An extended version of SMS i.e. MMS support photographic images, longer text messages and innumerable functionalities. SMS and MMS follow SS#7 protocol.

(Q3).

* I-MESSAGE AND WHATSAPP

→ i-message supports PQ3 protocol, sending text messages, images, audio, files and video over a Wi-fi or cellular network. Whatsapp on the other hand follows XMPP (Extensible Messaging and Presence Protocol) allowing the user to send data over the Internet.

Both i-message and whatsapp differ in the sense that they employ data plans and TCP/IP networks to send messages. SMS on the other hand incorporates the use of message plans bought by a wireless provider. Furthermore, i-message and Whatsapp permit transfer of image and video files. Finally, SMS doesnot work over a Wi-fi or cellular data.

Q3) Transportation-layer protocols :
* TCP → HTTP
* UDP → DNS

Application-layer protocols :
* DNS
* HTTP

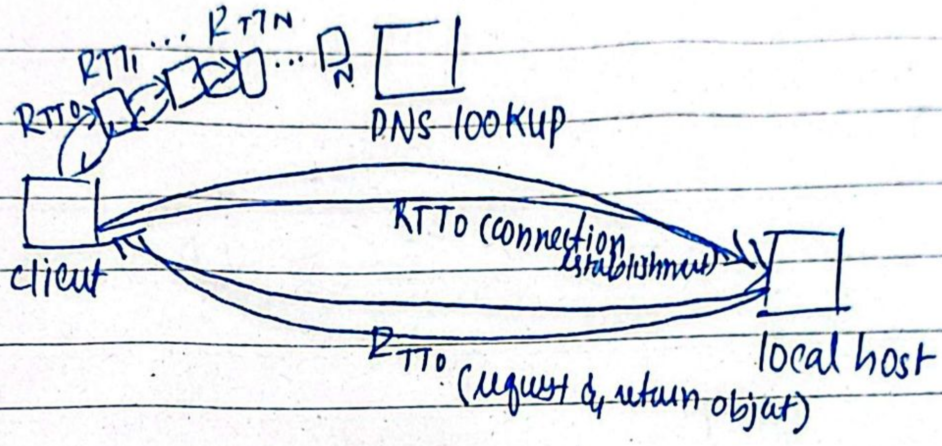
Q4) a. gaia.cs.umass.edu
b. HTTP 1.1
c. Keep-alive ⇒ Persistent HTTP
d. IP address cannot be fetched in an HTTP connection. The provided information is not enough to fetch the IP. An IP diagram would be required conveying the TCP segment that transmitted the HTTP GET request

Q5) a. The server was able to locate the document successfully because the status code is 200 and OK

b. Sat, 10 Dec 2006 18:27:46 GMT
c. 3874 bytes
d. <!doc. This is a persistent connection because of the Keep-Alive field.

Q6) Round-Trip time required to fetch IP address:

$RTT_1 + RTT_2 + \dots + RTT_N$



$R_{TT0} \rightarrow$ Connection request

$+\ R_{TT0} \rightarrow$ Request and return object

$\therefore\ 2RTT_0 + RTT_1 + RTT_2 + \dots + R_{TTN}$

Q7) Object size $= L = 1 \times 10^6$ bits

access link $= R = 15 \times 10^6$ bps

delay

b $\alpha = 16$ requests/sec

Transmission delay (1) $= \dfrac{L}{R} = \dfrac{1 \times 10^6}{15 \times 10^6} = 0.067s$

Traffic Intensity (1.b) $= \dfrac{\alpha L}{R} = 0.067 \times 16 = \cancel{1.067}s$

$= 1.072s$

Avg. access delay $= d_{prop} + \dfrac{1}{(1-1.5)}$

$= 3 + \dfrac{0.067}{1-1.072} = 2.069s$

b) miss rate = 0.4

hit rate = 0.6

$\therefore$ avg. access delay $= \dfrac{6}{(1.6 \cdot \text{missrate})}$

$= \dfrac{0.067}{0.4 \times 1.072} = 0.15625\ s$

Cache installed in LAN network

avg. response time = $0.15625 + 3 = 3.15625\ s$

For cache miss = $0.4 \times 3.15626 = 1.2625s$

Q8) Periodically take a snapshot of DNS caches in local DNS servers. The web server that appear most frequently in DNS caches are the popular ones.

Q9) There is a way to determine if an external website was likely accessed from a computer in your apartment a couple of seconds ago.

Example:

" dig xyz com" will return query time for xyz.com. An entry of xyz.com is cached in a local DNS cache, so query time will be 0 ms.

22) Q10) $f = 20GB = 20 \times 1024 = 20480 MB$

$u_s = 30 MBPs$

$d_i = 2 MBPs$

$N = 10, 100, 1000$

$u_1 = 300 KBps = 300/1024 = 0.29 MBPs$

$u_2 = 700 KBPs = 700/1024 = 0.68 MBPs$

$u_3 = 2 MBps$

$d_i = d_{min} = 2 MBps$

⊕ File distribution time : Client-server = ?

File distribution time : Peer-peer = ?

$D_{c-s} = ?$, $D_{p2p} = ?$

(i) $N = 10$:

$$D_{c-s} = \max\left\{\frac{Nf}{u_s}, \frac{f}{d_{min}}\right\}$$

$$= \max\left\{\frac{(10)(20480)}{30}, \frac{20480}{2}\right\}$$

$$= \cancel{68267}\ 10240$$

$N = 100$:

$$D_{c-s} = \max\left\{\frac{(100)(20480)}{30}, \frac{20480}{2}\right\}$$

$$= 68267$$

$\underline{N = 1000:}$

$$D_{c-s} = \max\left\{\frac{1000(20480)}{30}, 10240\right\}$$

$$= 682667$$

$\ast$ $\underline{P2P:}$

$\underline{N = 10, u_1 = 0.29 MBps}$

$$D_{p2p_{(i)}} = \max\left\{\frac{F}{u_s}, \frac{F}{d_{min}}, \frac{NF}{u_s + \sum_{i=1}^{N} u_i}\right\}$$ $N = ($ $\sum_{i=1}^{10} u_{10} = 4$

$$= \max\left\{\frac{20480}{\cancel{0.29}\ 30}, \frac{20480}{2}, \frac{(10)(20480)}{30 + (10 \times 0.29)}\right\}$$

$$= \{682.67, 10240, 6224.9\}$$
$$= 10240$$

$\underline{N = 10, u_1 = 0.29 MBps, u_2 = 0.68 MBps}$

$$D_{p2p(ii)} = \max\left\{\frac{20480}{30}, \frac{20480}{2}, \frac{(10)(20480)}{30 + \cancel{((10)(0.29))} + (10)(0.68}\right.$$

$$= \{682.67, 10240, 5158.6\}$$
$$= 10240$$

$N = 10, u_1 = 0.29 \cancel{M}Bps, u_2 = 0.\cancel{68} MBps, \underline{u_3 = 2 MBps}$

$D_{P2P3} = max\{682.67, 10240, 5158.6\}$
$= 10240$

$\underline{N = 100, u_1 = 0.29 MBps}$

$$D_{P2P} = max\left\{\frac{20480}{2}, \frac{20480}{30}, \frac{(100)(20480)}{30 + (100 \times 0.29)}\right\}$$

$= max\{682.67, 10240, \cancel{634}\ 34538\}$
$= 34538$

$\underline{N = 100, u_2 = 0.68 MBps}$

$$D_{P2P} = max\left\{682.67, 10240, \frac{(100)(20480)}{30 + (100 \times 0.68)}\right\}$$

$= 20822.6$

$\underline{N = 100, u_3 = 2}$

$$D_{P2P} = max\left\{682.67, 10240, \frac{(100)(20480)}{30 + (100 \times 2)}\right\}$$

$= 10240$

$N = 1000, u_1 = 0.29$

$= 634$ ~~2~~

$N = 1000, u_2 = 0.8$

$= 28700$

$N = 1000, u_2 = 2$

$=$ ~~10089~~ 10240

Client - Server:

	N		
	10	100	1000
300 Kbps	10240	68267	682667
u 700 Kbps	10240	68267	682667
~~7~~62 Mbps	10240	68267	682667

Peer-to-Peer:

	N		
	10	100	1000
300 kbps	10240	34538	63412
u 700 Kbps	10240	20822	28700
2 Mbps	10240	10240	10240

Q11) a. $\frac{u_s}{N} \leq d_{min}$

$\frac{u_s}{N} \rightarrow$ Server sends file to each client in parallel

$d_{min} \rightarrow$ download rate

Time for each client to receive file $= \frac{F}{u_s/N} = \frac{NF}{u_s}$

Since all clients receive the file in this time, overall dist. time is also Nf/u_s.

b. $u_s/N \geq d_{min}$

$u_s \geq N \cdot d_{min}$

Time for each client to receive file $= F/d_{min}$ (each client receive at rate d_{min})

c. Proof: $\max\{Nf/u_s, F/d_{min}\}$

$D_{c-s} \rightarrow \max\{NF/u_s, F/d_{min}\}$

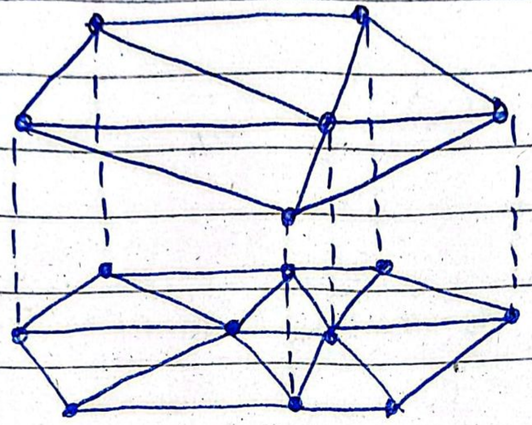
$D_{c-s} \geq \max\{Nf/u_s, F/d_{min}\} \rightarrow$ 1

$u_s/N \leq d_{min}$: $D_{cs} = \frac{Nf}{u_s}$

$D_{cs} = F/d_{min}$ when $u_s/N \geq d_{min}$

$\therefore \frac{NF}{u_s} = \frac{F}{d_{min}}$

Q12)



No. of vertices = N
No. of edges = N(N-1)/2

Q13) a. If enough peers exist in the swarm for a long time, then Bob can receive data through optimistic unchoking by other peers

b. His free-riding can be made more efficient by running a client on each host, letting each client "free-ride" and combine collected chunks from different hosts into a single file.