SOLUTION ASSIGNMENT-02 (BCS 5A & 5C)

PART-01

REVIEW QUESTIONS

R4.

No. In a P2P file-sharing application, the peer that is receiving a file is typically the client and the peer that is sending the file is typically the server.

R6.

You would use UDP. With UDP, the transaction can be completed in one roundtrip time (RTT) - the client sends the transaction request into a UDP socket, and the server sends the reply back to the client's UDP socket. With TCP, a minimum of two RTTs are needed - one to set-up the TCP connection, and another for the client to send the request, and for the server to send back the reply.

R13.

Web caching can bring the desired content "closer" to the user, possibly to the same LAN to which the user's host is connected. Web caching can reduce the delay for all objects, even objects that are not cached, since caching reduces the traffic on links

R19.

Yes, an organization's mail server and Web server can have the same alias for a host name. The MX record is used to map the mail server's host name to its IP address.

PROBLEMS

Problem 1.

a) F
b) T
c) F
d) F
e) F

Problem 7.

The total amount of time to get the IP address is
$RTT_1 + RTT_2 + \boxed{?} + RTT_n$.

Once the IP address is known, RTT_O elapses to set up the TCP connection and another RTT_O elapses to request and receive the small object. The total response time is
$2RTT_o + RTT_1 + RTT_2 + \boxed{?} + RTT_n$

Problem 8.

a)

$$RTT_1 + \boxed{?} + RTT_n + 2RTT_o + 8 \cdot 2RTT_o$$
$$= 18RTT_o + RTT_1 + \boxed{?} + RTT_n.$$

b)

$$RTT_1 + \boxed{?} + RTT_n + 2RTT_o + 2 \cdot 2RTT_o$$
$$= 6RTT_o + RTT_1 + \boxed{?} + RTT_n$$

c) Persistent connection with pipelining. This is the default mode of HTTP.

$$RTT_1 + \boxed{?} + RTT_n + 2RTT_o + RTT_o$$
$$= 3RTT_o + RTT_1 + \boxed{?} + RTT_n.$$

Persistent connection without pipelining, without parallel connections.

$$RTT_1 + \boxed{?} + RTT_n + 2RTT_o + 8RTT_o$$
$$= 10RTT_o + RTT_1 + \boxed{?} + RTT_n.$$

Problem 13.

a) In this problem we consider "frame time" to be the time needed to send out a frame. 2015 "frame times" will be needed until all five images are sent without interleaving.
b) 18 frame times are needed if interleaving is used.

PART-02

Question 1

a. Find the Round Trip Times RTT1 between the client and server1 and RTT2 between the client and server2.

RTT1= 2 * d1/s1 RTT2= 2 * d2/s2

b. If we are using a **non-persistent http protocol**, compute the total time that it would take the browser on the client to retrieve the entire document.

Delay = RTT1 (connection with server1) + RTT1 (request and response for ceng415.html) + L/R
+ RTT1 (connection with server1) + RTT1 (request and response for Image1.jpg) + L1/R
+ RTT1 (connection with server1)+ RTT1 + (request and response for Image2.jpg) +L2/R
+ RTT2 (connection with server2) + RTT2 (request and response for Image3.jpg) +L3/R
+ RTT2 (connection with server2) + RTT2 (request and response for Image4.jpg)+L4/R

c. Re-calculate the total time to retrieve the entire document, if the client browser now is using **persistent http protocol without piplining**.

Delay = RTT1(connection with server1) + RTT1 (request and response for

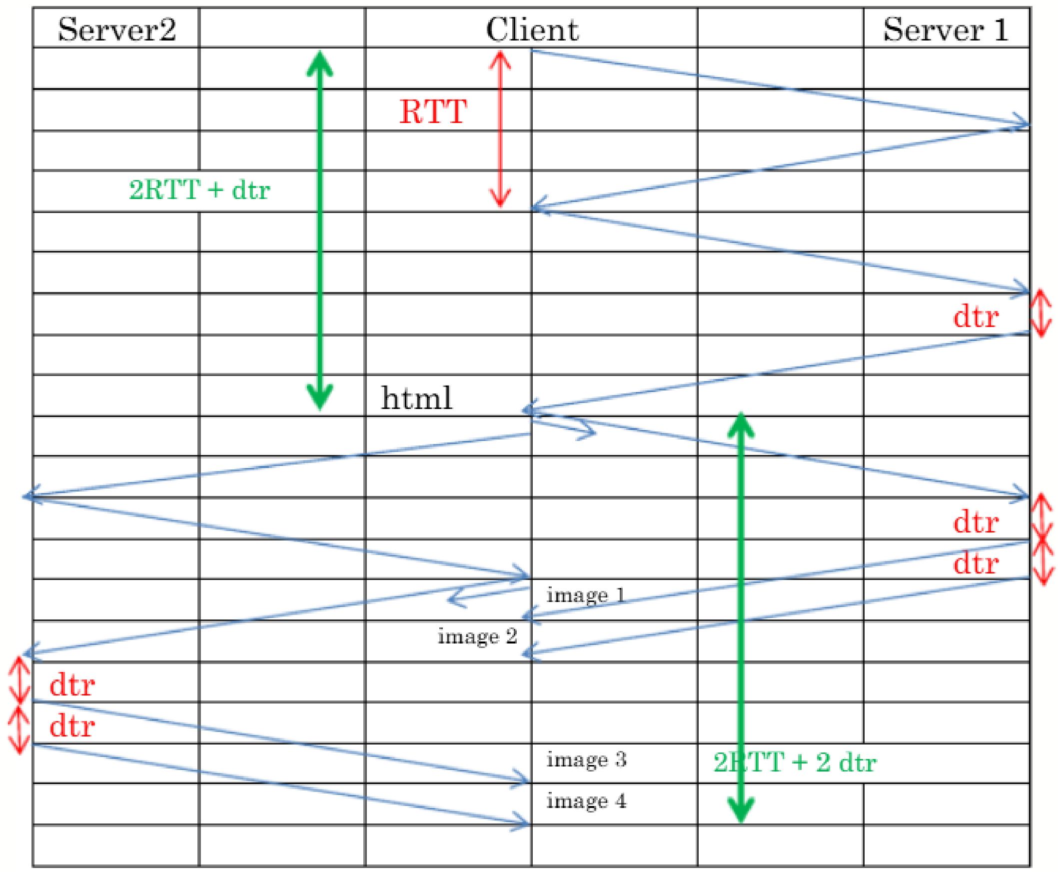
ceng415.html)+L/R

+ RTT1 (request and response for Image1.jpg) + L1/R

+ RTT1 (request and response for Image2.jpg) +L2/R

+ RTT2 (connection with server2) + RTT2 (request and response for Image3.jpg) +/L3/R
+ RTT2 (request and response for Image4.jpg) +L4/R

d. Recalculate the total time to retrieve the entire document. If the browser this time supports persistent with pipelining http protocol. (**Assuming same distance and same image length).**



Delay = 2RTT + dtr + 2 RTT + 2dtr

Question 2

Total DNS Time = 5 + 33 + 35 + 4 = 77 ms

RTT between client and HTTP server: RTT_HTTP = 77 ms

For HTTP: 1 RTT (for handshake) + 1 RTT (for request/response)

(1) Single Base HTML Object:

Total Time = DNS + RTT (HANDSHAKE) + RTT (REQUEST/RESPONSE)

= 77 + 77 + 77 = 231 ms

(2) Base + 10 small objects, non-persistent HTTP, no parallelism:

Total Time = DNS + 2RTT (Base) + 2(10)RTT (for 10 embedded objects)

= 77 + 2(77) + 2(10)(77) = 1771 ms

(3) Base + 10 small objects, non-persistent HTTP, up to 5 parallel TCP connections:

Total Time = DNS + 2RTT (Base) + (ceil(10/5) * 2RTT)

= 77 + 154 + 308 = 539 ms

(4) Base + 10 small objects, persistent HTTP (no pipelining), up to 5 parallel TCP connections:

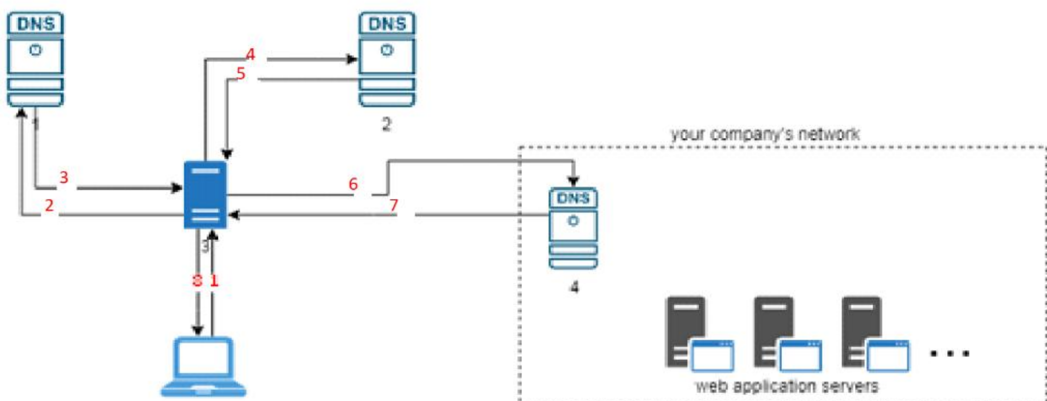
Total Time = DNS + 2RTT (Base) + [Existing Base Connection + new 4 Connections Required]

= DNS + 2RTT + 3RTT (per new connection – But, all connections will start in parallel, so 1*3RTT is fine) = 77 + 154 + 231 = 462 ms

Question 3

NAME	VALUE	TYPE
www.TheBestCompany.com	dns.authServ.TheBestCompany.com	NS
dns.authServ.TheBestCompany.com	152.79.111.57	A

Draw the arrows and label each arrow with a sequence number below: (3)



Question 4

a) The time to transmit an object of size L over a link or rate R is L/R. The average time is the average size of the object divided by R:

Δ = (850,000 bits)/(15,000,000 bits/sec) = .0567 sec

The traffic intensity on the link is given by $\beta\Delta$=(16 requests/sec)(.0567 sec/request) = 0.907. Thus, the average access delay is (.0567 sec)/(1 - .907) ≈ .6 seconds. The total average response time is therefore .6 sec + 3 sec = 3.6 sec.

b) The traffic intensity on the access link is reduced by 60% since the 60% of the requests are satisfied within the institutional network. Thus the average access delay is (.0567 sec)/[1 – (.4)(.907)] = .089 seconds. The response time is approximately zero if the request is satisfied by the cache (which happens with probability .6); the average response time is .089 sec + 3 sec = 3.089 sec for cache misses (which happens 40% of the time). So the average response time is (.6)(0 sec) + (.4)(3.089 sec) = 1.24 seconds. Thus the average response time is reduced from 3.6 sec to 1.24 sec.

Question 5

Total time = $60 \times 30 + 40 \times 31 = 1800 + 1240 = 3040$ ms.