Started on	Tuesday, 27 October 2020, 11:10 AM
State	Finished
Completed on	Tuesday, 27 October 2020, 11:49 AM
Time taken	39 mins 46 secs

Information

We know smtp.gmail.com is the mail server of gmail.com and ns1.google.com and ns2.google.com are the authoritative DNS servers for google.com. The questions below are about the following DNS Resource Records (a - f) where the entry types are masked (XXX).

(a) (gmail.com, smtp.gmail.com, XXX, 2 days)

(b) (smtp.gmail.com, 108.177.125.10, XXX, 2 days)

(c) (google.com, ns1.google.com, XXX, 2 days)

(d) (google.com, ns2.google.com, XXX, 2 days)

(e) (ns1.google.com, 216.239.32.10, XXX, 2 days)

(f) (ns2.google.com, 216.239.34.1, XXX, 2 days)

Answer the 6 multiple-choice questions below. You may select multiple choices. However, note that selecting additional choices beyond the correct answer(s) will be considered incorrect.

Question **1**
Complete
Marked out of 0.50

Which of the above Resource Records are Type A entries?

Select one or more:

- [ ] (a)
- [x] (b)
- [ ] (c)
- [ ] (d)
- [x] (e)
- [x] (f)
- [ ] None of the provided records

Question **2**
Complete
Marked out of 0.50

Which of the above Resource Records are type MX entries?

Select one or more:

- [ ] (a)
- [ ] (b)
- [ ] (c)
- [ ] (d)
- [ ] (e)
- [ ] (f)
- [x] None of the provided records

Question **3**
Complete
Marked out of 0.50

Which of the above Resource Records are type NS entries?

Select one or more:

- [ ] (a)
- [ ] (b)
- [x] (c)
- [x] (d)
- [ ] (e)
- [ ] (f)
- [ ] None of the provided records

Question **4**
Complete
Marked out of 0.50

Which of the above Resource Records are Type CNAME entries?

Select one or more:

- [x] (a)
- [ ] (b)
- [ ] (c)
- [ ] (d)
- [ ] (e)
- [ ] (f)
- [ ] None of the provided records

Question **5**
Complete
Marked out of 0.50

Which of the above Resource Records are stored in the .com TLD servers?

Select one or more:

- [ ] (a)
- [ ] (b)
- [x] (c)
- [x] (d)
- [x] (e)
- [x] (f)
- [ ] None of the provided records

Question **6**
Complete
Marked out of 0.50

Which of the above Resource Records are stored at an authoritative DNS servers?

Select one or more:

- [ ] (a)
- [x] (b)
- [ ] (c)
- [ ] (d)
- [x] (e)
- [x] (f)
- [ ] None of the provided records

Information

Assume a webpage comprised of 10 objects which includes the index.html file, 8 embedded images and one embedded audio clip. The 10 objects are so small that: (i) their transmission time is negligible and (ii) each object can be completely transmitted in one TCP segment. Consider a client wishing to download the webpage.

You are asked to make the following assumptions:

- the round trip time between the client and all servers is **T**
- the time to set up and tear down a TCP connection is **S** and **F**, respectively. You must account for both these times in your computations. Note that, **S** includes the 3-way handshake (SYN, SYN-ACK, ACK) and **F** includes the time for sending FINs and ACKs from both endpoints.
- there are no packet losses.
- the client knows the IP address of all servers (i.e. neglect DNS resolution delay).
- neither the client nor any of the servers support parallel TCP connections.

Answer the following 5 questions. No explanations are required. Simply write the expression for each answer which should ONLY contain the variables **T**, **S** and **F** (e.g., 20T+100S+50F) in the space provided.

Question **7**
Complete
Marked out of 0.60

Assume that the client uses non-persistent HTTP for downloading the web page. What is the time required to complete the transfer of the web page (including the time for setting up and tearing down each TCP connection involved)?

Answer: 10(S+T+F)

Question **8**
Complete
Marked out of 0.60

Assume that the client uses persistent HTTP without pipelining for downloading the web page. What is the time required to complete the transfer of the web page (including the time for setting up and tearing down each TCP connection involved)?

Answer: S+10T+F

Question **9**
Complete
Marked out of 0.60

Assume that the client uses persistent HTTP with pipelining for downloading the web page. What is the time required to complete the transfer of the web page (including the time for setting up and tearing down each TCP connection involved)?

Answer: 10(S+T+F)

Question **10**
Complete
Marked out of 0.60

Now assume that all 10 objects are located on 10 different servers (one object on each server). The client can only have one active TCP connection at any given time. Assume that the round trip time between the client and each of the 10 servers is **T**. Neglect DNS queries.

Assume that the client uses persistent HTTP with pipelining for downloading the web page. What is the time required to complete the transfer of the web page (including the time for setting up and tearing down each TCP connection involved)?

Answer: 10(S+F+T)

Question **11**
Complete
Marked out of 0.60

Now assume that the index page and 7 embedded images are on one server, while the remaining image and audio clip are on another server.

The client can only have one active TCP connection at any given time. Assume that the round trip time between the client and both servers is **T**. Neglect DNS queries.

Assume that the client uses persistent HTTP with pipelining for downloading the web page. What is the time required to complete the transfer of the web page (including the time for setting up and tearing down each TCP connection involved)?

Answer: 2S+2F+7T

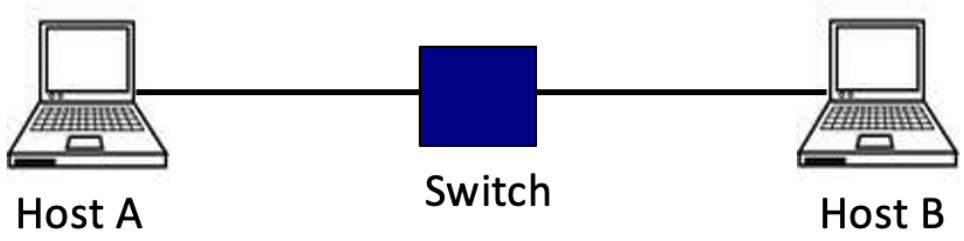
Question **12**
Complete
Marked out of 1.00

BitTorrent uses a "tit-for-tat" incentive mechanism for selecting peers to whom a particular peer would upload chunks. Consider a peer who has finished downloading the file but wishes to continue seeding the file to other peers (i.e. continue uploading chunks of that file) participating in the torrent. Will "tit-for-tat" still be useful for this peer? Explain why or why not in 2-3 sentences. Answers without explanations will not receive marks.

In the case that this peer has finished the download, the concept of tit-for-tat will not be useful anymore as the peer no longer requires to download packets. This is due to the fact that tit-for-tat being a function that allows the recieval of files through the giving of files, reducing the problem of leeching. This, as a result of the peer not needing to download, makes seeding simply a thing done for the benefit of other downloading peers.

Information

Consider the network shown in the picture below. Host A wishes to send a message containing **M** bits to Host B. There is an intermediate packet switch connecting the two hosts. The transmission rate of both links is **R** bits per second and the propagation delay on each link is **T** sec. Assume that the processing and queuing delays are negligible and that there is no other traffic on the network. Assume that there is a fixed header of **N** bits associated with each packet transmitted in the network (irrespective of the size of the packet).



Answer the 3 questions below. You are only required to provide the final expression of the total delay for each answer. No explanations are necessary. Your expressions should only contain the variables introduced in the question (i.e., introduced above - **M**, **R**, **T**, **N** and introduced below in the third question - **K)**

Note: It may be useful for you to draw timing diagrams similar to the ones in the lecture slides and homework questions. However, you are not required to submit any diagrams.

Question **13**
Complete
Marked out of 0.50

Assume that host A sends all M bits in one single packet. How much time does it take to send the data from host A to host B?

d(nodal) = d(trans) + d(prop)

Assuming that d(queuing) and d(processing) are negligible.

d(trans) = L/R = (M+N)/R (seconds)

d(prop) = T (seconds)

Thus total delay is = (M+N)/R + T (seconds

Question **14**
Complete
Marked out of 1.25

Assume that host A divides the M bit message into two equally sized packets (M is exactly divisible by 2). How much time does it take to send the data as two packets from host A to host B?

Assuming that M bit message is divided into 2 equal packets,

Total delay = 2 d(trans) + d(prop) (from drawn diagram)

d(trans) = ((M/2)+N))/R (seconds)

d(prop) = T (seconds)

Therefore total delay = 2((M/2)+N)/R + T = (M+2N)/R + T

Question **15**

Complete

Marked out of 1.25

Assume that host A divides the M bit message into **K** equally sized packets (M is exactly divisible by K). How much time does it take to send the data as K packets from host A to host B?

From above, we can extrapolate a similar pattern.

For instance, assume K is 3, then

d(trans) = ((M/3)+N))/R (seconds)

d(prop) = T (seconds)

And thus total delay = 3(M/3+N)/R + T

Therefore the formula for K equally sized packets is = K((M/K)+N)/R + T