COVID-19 Health Safety Camtasia (Staff Only)

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Grade	**2.00** out of 20.00 (**10**%)

Question **1**
Correct
Mark 1.00 out of 1.00

Which of the following statements is correct?

Select one:

- a. DNS and First Person Shooter Games typically use UDP ✔
- b. E-mail and DNS typically use UDP
- c. DNS and BitTorrent typically use UDP
- d. E-mail, DNS, BitTorrent and First Person Shooter Games use UDP
- e. BitTorrent, DNS and First Person Shooter Games typically use UDP

The correct answer is: DNS and First Person Shooter Games typically use UDP

Question **2**
Incorrect
Mark 0.00 out of 1.00

Host A sends a 128-byte TCP segment carrying a sequence number of 100 to Host B. Host B receives it correctly and sends an ACK to Host A. What is the *acknowledgement number* in the ACK?

Select one:

- a. 101 ✖
- b. 228
- c. 227
- d. 226

The correct answer is: 228

Question **3**
Correct
Mark 1.00 out of 1.00

TCP uses flow control to ensure that _______________

Select one:

- a. sender's buffer does not overflow
- b. receiver's buffer does not overflow ✔
- c. the network is not congested
- d. to reduce transmission delay of TCP segments

The correct answer is: receiver's buffer does not overflow

Question **4**
Incorrect
Mark 0.00 out of 1.00

A BitTorrent client C only sends data to a peer P if P sends data to C at a rate fast enough to merit inclusion in C's top uploaders list.

Select one:

- a. True ✖
- b. False

The correct answer is: False

Question **5**
Not answered
Marked out of 1.00

Assume that 10 clients (each running on a separate machine) are simultaneously communicating with a web server using HTTP1.1 and requesting 5 objects each (do not consider a separate index page). Assume that the web server has sufficient resources to service all received requests simultaneously. How many sockets are simultaneously open on each client machine and on the web server? Provide a short explanation.

(a) Since the clients are using HTTP1.1 (persistence with pipelining), all objects will be requested and transmitted over a single TCP connection between each client and the server. Thus, each client will have one TCP socket open.

The server will service all 10 clients simultaneously. Thus, the server will have 10 sockets open, 1 socket to communicate with each client. In addition, the server will also have a welcome socket open. Thus, in total, there will be 11 sockets open at the server.

Question **6**
Not answered
Marked out of 1.00

For the question above, now assume that the 10 clients are using HTTP1.0 with parallel connections and are requesting 5 objects each (do not consider a separate index page). Assume that each client can open as many parallel connections as required and that the web server has sufficient resources to service all received requests simultaneously. How many sockets are simultaneously open on each client machine and on the web server? Provide a short explanation.

(a) Since the clients are using HTTP1.0 (non-persistent HTTP), each object will be requested and transmitted over a distinct TCP connection between each client and the server. Thus, each client will have five TCP sockets open.

The server will service all 10 clients simultaneously. Thus, the server will now have 50 sockets open (10 clients x 5 sockets each). In addition, the server will also have a welcome socket open. Thus, in total, there will be 51 sockets open at the server.

Question **7**
Not answered
Marked out of 1.00

Why isn’t SMTP used by a user agent to *retrieve* e-mail from the mail server? What is typically used instead?

SMTP is a push protocol, whereas receiving e-mail requires “pull” semantics. IMAP, POP, and HTTP are typically used for a client to retrieve e-mail.

Question **8**

Not answered

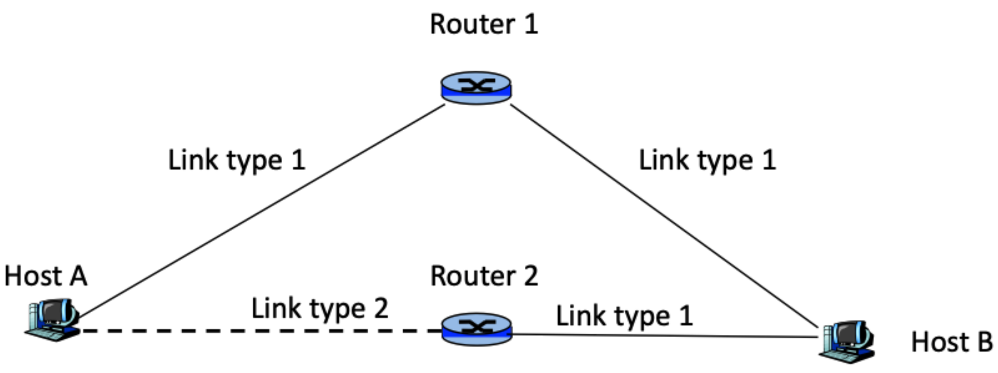
Marked out of 1.00

Suppose every link in the network carries two classes of traffic – voice over IP calls and e-mail messages, with a separate queue for each class. When deciding which packet to send next, the router first selects the head of the queue containing the voice traffic, and only sends an e-mail packet if the voice queue is empty. Does the e-mail traffic have *any* effect on the performance experienced by the voice calls? If so, what can be done to minimize the effects?

Yes, the e-mail traffic can still have an effect. If no VoIP packets are present, the router starts transmitting an e-mail packet. A VoIP packet that arrives while the e-mail packet is in flight must wait for the ongoing transmission to complete, introducing delay related to the size of the e-mail packet. Limiting the maximum size of packets can help reduce the effect.

Information

Consider the network in the figure below. Host A can choose between two different paths to communicate with host B. Host can choose to send packets via either Router 1 or Router 2 to host B. The communication links are of two different types, as indicated in the figure. The characteristics of these two types of links are:



Link type 1: Each link is of length 2000km, propagation speed is 2×10^8 m/s and bandwidth is 100kbps.

Link type 2: Each link is of length 4000km, propagation speed is 2×10^8 m/s and bandwidth is 50kbps.

Host A wishes to transmit a message of size 4Kbytes to host B. It breaks this message into 4 packets of equal size. Neglect any packet headers. Remember that routers work on the store-and-forward principle.

Assume that the processing delay and queuing delay in the routers are negligible. You may also approximate file sizes to be an order of 10 (i.e. 4Kbytes = 4000 bytes instead of 4096 bytes).

Question **9**

Not answered

Marked out of 2.00

If host A chooses to send the packets via Router 1, determine the time it takes to move the packets from host A to host B, i.e., beginning from the time that host A starts to send the first bit of the first packet till the time that host B receives the last bit of the last packet.

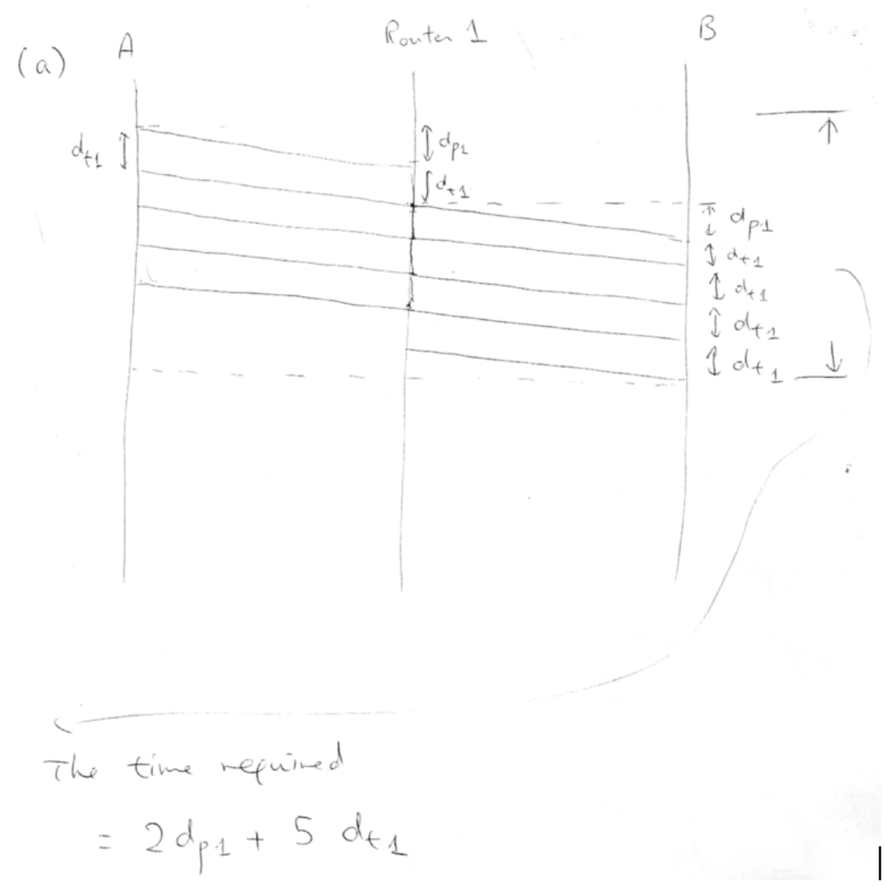
You are encouraged to draw a timing diagram to help you visualise the delays. However, you are NOT required to upload such a diagram with your answers.

Do not simply write the final answer. Show us your work (just type it in the space provided).

Let us begin with a number of basic calculations:

- Propagation delay in link type 1 (d_{p1}) = 2000 x 10^3/2 x 10^8 = 0.01 s
- Transmission delay in link type 1 (d_{t1}) = 8 x 1024/100 x 10^3 = 0.08 s (approx. 1024 by 1000)
- Propagation delay in link type 2 (d_{p2}) = 4000 x 10^3/2 x 10^8 = 0.02 s
- Transmission delay in link type 1 (d_{t2}) = 8 x 1024/50 x 10^3 = 0.16 s (approx. 1024 by 1000)

From the timing diagram below, the time required = $2d_{p1} + 5d_{t1}$ = 2(0.01) + 5(0.08) = 0.42 s.



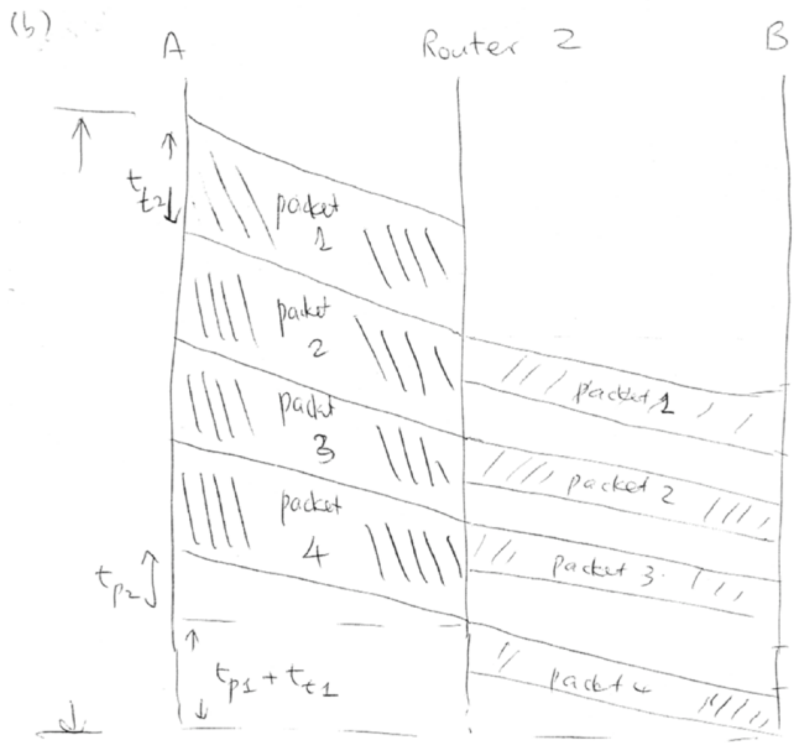
Question **10**

Now assume that host A chooses to send the packets via Router 2 to host B. Determine the time it takes to move the packets from host A

You are encouraged to draw a timing diagram to help you visualise the delays. However, you are NOT required to upload such a diagram with your answers.

Do not simply write the final answer. Show us your work (just type it in the space provided).

From the timing diagram below, the time required = $d_{p1} + d_{t1} + d_{p2} + 4d_{t2}$ = 0.01 + 0.08 + 0.02 + 4(0.16) = 0.75 s.



The time required

$= d_{p1} + t_{t1} + d_{p2} + 4\, t_{t2}$

Information

Alice works at a search engine startup called Searchzilla (www.searchzilla.com) whose main competitor is Google (www.google.com). She would like to crush her competitor in the "non-traditional" way by messing up with DNS servers. Recalling from her COMP3331/9331 class that DNS servers cache A and NS records from DNS replies, Alice realises she can configure the authoritative DNS server of Searchzilla (nspowned.searchzilla.com) to return incorrect results for arbitrary domains. If other DNS servers cache Alice's malicious results, they will return bad results. Help Alice complete her master plan to hijack Google's domain name by writing down exactly what Alice's name server returns upon receiving a DNS query. To be precise, what Alice wants to achieve is that when anyone on the Internet types www.google.com in their browser, they should be presented with the Searchzilla webpage rather than Google's. Assume that the Searchzilla web server (www.searchzilla.com) is running on 9.9.9.9 and the authoritative name server for Searchzilla, nspowned.searchzilla.com is running on 9.9.9.10. Recall that DNS records are of the format <name, value, type, ttl>.

Question **11**

Not answered

Marked out of 3.00

Can you precisely outline the steps that Alice would have to undertake to launch the aforementioned attack? You must explicitly provide the DNS records that she will have to configure and explicitly state which servers these records must be stored/updated in.

Alice would configure the following entries in her authoritative name server (i.e. in 9.9.9.10)

www.searchzilla.com 9.9.9.9 A long-TTL (standard A record for searchzilla, not specific to the attack)

www.searchzilla.com ns1.google.com NS long-TTL (malicious entry which suggests the name server for searchzilla is the name server for google)

ns1.google.com 9.9.9.10 A long-TTL (malicious entry that incorrectly maps the google name server to the authoritative name server for searchzilla).

www.google.com 9.9.9.9 A long-TTL (malicious entry that incorrectly maps www.google.com to the searchzilla web server)

Alice would encourage users on the Internet to visit her website, www.searchzilla.com

When Alice's name server receives a type A DNS query for www.searchzilla.com, it will return the 2nd and 3rd record (from above) in the reply. The 2nd record would be included in the authority section of the reply and the 3rd record will be included in the additional section.

If the local DNS server of this user blindly caches these records, then future queries for www.google.com will be directed to Alice's authoritative name server, 9.9.9.10 (as a result of the 3rd record). Alice's name server will reply back with the 4th record to such queries. As a result, the user querying for www.google.com will instead be presented with the searchzilla home page. To be precise, the GET request for the google home page will be sent to the searchzilla web server, which will reply back with the searchzilla home page, which could be designed to look like google's web page)

Question **12**

Not answered

Marked out of 1.00

What must a robust DNS server implementation do to counter this attack?

A robust DNS server implementation should be less trustful of results returned by other DNS servers and only cache information that's directly relevant to the queried domain and which is coming from the authoritative name servers. In the above example, since google.com is not a subdomain of searchzilla.com, a correct DNS server implementation should ignore all information related to google.com in the results, i.e. the 2nd and 3rd records would no be cached.

Information

Suppose that a sender and receiver are connected via a point-to-point link that has 1 Mbps bandwidth and a one-way propagation delay of 4.5 ms. Assume that the sender always has data for transmission and that the size of each data packet is 125 Bytes. Neglect any headers. Also, assume that the size of Ack packets is negligible. **Answer each of the following for both go-back-n and selective-repeat sliding window schemes.**

Question **13**

Not answered

Marked out of 2.00

Assuming that the link is error-free, what should be the size of the window (in terms of the number of packets) to achieve a throughput of 0.8 Mbps.

Do not simply write the final answer. Type in your explanation/logic.

Remember, to answer this question for both Go-back-N and Selective Repeat.

The time to transmit one data packet, T = 125 x 8 bits /1Mbps = 1ms

RTT = 2 x one-way propagation delay = 9ms

As discussed in the lecture slides on this topic, the utilization of the link when a sliding window protocol with window size N, is given by,

U = NT/(T + RTT)

Achieving a throughput of 0.8Mbps on a 1Mbps link implies that the utilisation should 0.8.

Thus, 0.8 = N x 1ms /1ms + 9ms. This results in N = 8 packets.

Question **14**
Not answered
Marked out of 2.00

What is the minimum number of bits needed to represent the sequence numbers corresponding to the above window size? Recall that an *n* bit sequence number results in a range of sequence numbers from *0* to 2^n*-1*.

Do not simply write the final answer. Type in your explanation/logic.

Remember, to answer this question for both Go-back-N and Selective Repeat.

Go-back-N:

To achieve a window size of 8 with GBN, we will need 9 unique sequence numbers (1 more than the window size). Thus, it is necessary to have a 4-bit sequence number space in GBN.

Selective repeat:

As was discussed in the lecture notes, with SR, the window size must be less than or equal to half the size of the sequence number space. Thus, in order to accommodate a window size of 8, we need at least 16 unique numbers, which implies that SR would require a 4-bit sequence number space.