Q1
9 Points

TCP packets are being sent from a client to a server. The MSS is equal to 1460 bytes, and each TCP packet is sent with the maximum capacity.
For the questions below, show your work or explain your responses.

Q1.1
5 Points

How many TCP packets can be sent before the sequence number field in the TCP header will wrap around to where it began?

2^32 TCP packets.

Q1.2
2 Points

How much time (in seconds) will this take on a 1 Mbit/s link?

8 * 2^32 / 1000000 = 34359 seconds

Q1.3
2 Points

How much time (in seconds) will this take on a 1 Gbit/s link?

8 * 2^32 / 1000000000 = 34 seconds

Q2
10 Points

Host A is transferring a file of size S to host B using TCP. A sends the file data in fixed-size packets equal to the Maximum Segment Size (MSS), a predetermined value. B sends an acknowledgment immediately upon receiving a data segment. Let R be the round trip delay between A and B. The advertised receiver window size of host B is W . In this problem, we assume the TCP connection is already established and that the transmission time is negligible. TCP performs the slow start and congestion avoidance mechanisms, and there is no error or packet loss during transmission

Q2.1
5 Points

Given W = 3∗MSS, S = 10∗MSS, how long does it take for the file to be sent and acknowledged? Your answer should be in terms of R. Show your work.

No files uploaded

Q2.2
5 Points

Given W = 6∗MSS, S = 15∗MSS, how long does it take for the file to be sent and acknowledged? Your answer should be in terms of R. Show your work.

No files uploaded

Q3
15 Points

Q3.1
5 Points

Recall that we discussed two TCP variants in class: TCP Tahoe and TCP Reno. However, in practice, most machines use TCP Reno. What is the primary reason why people have moved away from TCP Tahoe?

The primary reason why people have moved away from TCP Tahoe is that Reno can go into fast recovery mode and retransmit when it receives three duplicates acks. For the following duplicate acks like the fourth, fixth, etc, the cwind increases by one. Once the receiver finally receives the missing packet, TCP will move to congestion avoidance or slowstate when it is a timeout.

Q3.2
5 Points

Give an example of a case where the fast retransmit in TCP Reno would result in unneces- sary packets being sent.

Reno's Fast ReTransmit feature will re transmit the segment without waiting for the timeout to expire. Because of this, we may sometimes transmit an unnecessary packet if the segment wasn't actually lost.

Q3.3
5 Points

What sequence of events would lead to TCP Reno re-entering the slow start phase after being in the congestion avoidance phase? Give a concrete example.

Q4
25 Points

Q4.1

10 Points

What are **three** Major Differences Between UDP and TCP Protocols?

TCP is connection oriented whilst USP is a message oriented and connectionless protocol. TCP uses timeout while UDP only uses checksum to avoid errors. TCP data packets have a sequence number in the header while UDP data packets arrive in no fixed order.

Q4.2

5 Points

Which protocol is faster: UDP or TCP? Why?

UDP is faster because than TCP because their non-existent ACK packet permits a continuous packet stream.

Q4.3

5 Points

What is a Denial of Service (DoS) attack?
Why would these attacks be useful to an attacker?

A Denial of Service attack is a cyber attack in which someone makes a resource unavailable to its intended users by flooding the target with traffic or sending information that triggers a crash. They can deflect attention away from their intended target too and conduct secondary attacks.

Q4.4

5 Points

What are the advantages when using SYN Cookies? Are there any disadvantages? (Make sure to give examples)

Some advantages of using SYN cookies is that the server doesn't need to allocate resources after the first SYN packet. The client also doesn't have to be aware that the server is using the cookies. Some disadvantages of

SYN cookies is that TCP options can't be negotiated, ACK or sequence numbers are only 32 bits long, and also may cause vulnerability to cryptonalysis after receiving a lot of cookies.

Q5
20 Points

Q5.1
10 Points

If we generalize from the stop-and-wait protocol to a sliding window protocol, where k packets can be sent but unacknowledged, what is the minimum number of distinct sequence numbers that we would need for this protocol to work correctly? Why?

Q5.2
10 Points

Suppose we are using a sliding window protocol with a window size of 128 KB and a round- trip time of 100 milliseconds. What is the expected sending rate of this protocol in units per second (e.g., bytes per second, kilobytes per second, etc.)?

Q6
10 Points

Q6.1
5 Points

Suppose that a TCP connection at a sender has a receiver's advertised window of r and a congestion window of c. What is the value of the sender's window?

Q6.2
5 Points

Suppose that we design a variant of TCP that uses MIAD (multiplicative increase, additive decrease) as the congestion control mechanism for updating the congestion window. What would happen if two of our TCP flows compete at a bottleneck router?

Q7
25 Points

Q7.1
10 Points

Recall that TCP has two phases: slow start and congestion control. What is the primary
purpose of the slow start phase?

Q7.2
5 Points

What about the primary purpose of congestion control?

Q7.3
10 Points

Explain the TCP Handshake process and explain its ***two*** important functions.

Homework 4

UNGRADED

STUDENT
Kaitlyn Wong

TOTAL POINTS
- / 114 pts

QUESTION 1

(no title) 9 pts

1.1 (no title) 5 pts

1.2 (no title) 2 pts

1.3 (no title) 2 pts

QUESTION 2

(no title) 10 pts

2.1 (no title) 5 pts

2.2 (no title) 5 pts

QUESTION 3

(no title) 15 pts

3.1 (no title) 5 pts

3.2 (no title) 5 pts

3.3 (no title) 5 pts

QUESTION 4

(no title) 25 pts

4.1 (no title) 10 pts

4.2 (no title) 5 pts

4.3 (no title) 5 pts

4.4 (no title) 5 pts

QUESTION 5

(no title) 20 pts

5.1 (no title) 10 pts

5.2 (no title) 10 pts

QUESTION 6

(no title) 10 pts

6.1 (no title) 5 pts

6.2 (no title) 5 pts

QUESTION 7

(no title) 25 pts

7.1 (no title) 10 pts

7.2 (no title) 5 pts

7.3 (no title) 10 pts