Homework 3

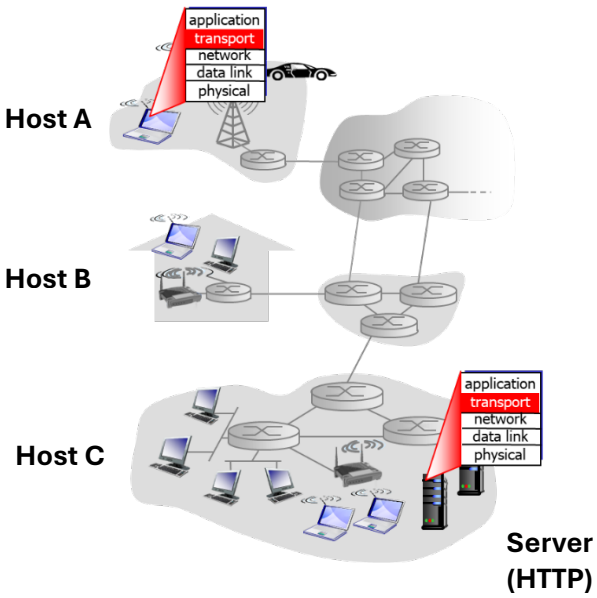


Figure 1

1. Figure 1 shows Hosts A, B, and C communicating with a Server running an HTTP service located on a different network.

   a. Discuss the differences between the services provided by the transport layer and the network layer

   b. Discuss the transport layer actions at the sender to send a segment to the server.

   c. Discuss the transport layer actions at the receiver to send a segment to the server.

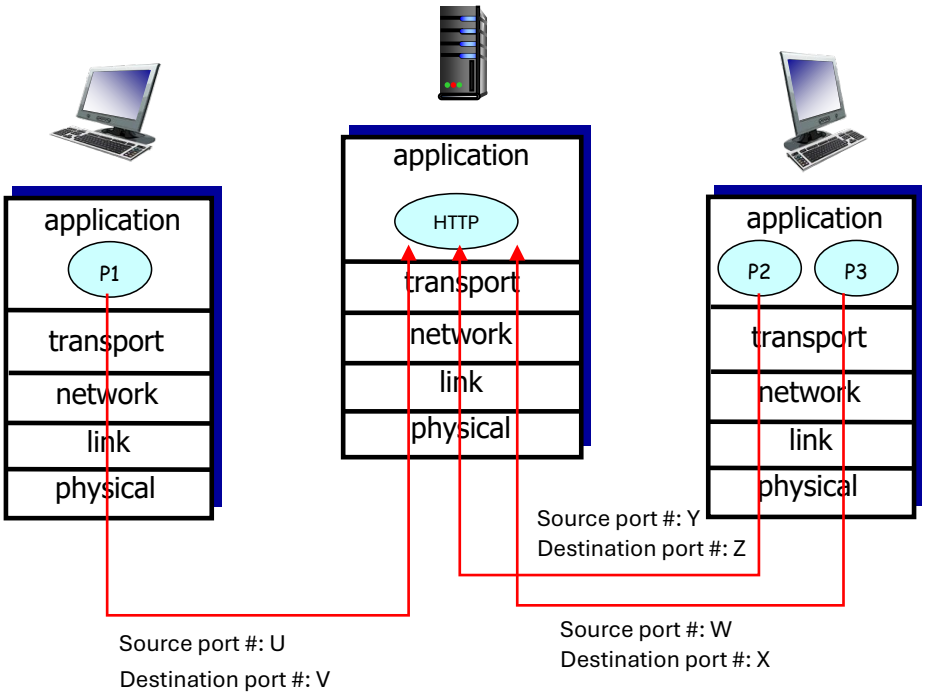


Figure 2

2. Figure 2 shows two hosts running processes P1, P2, and P3 (as described by Figure 2) and are communicating to the server running a HTTP service.

   a. Assume that connectionless-demultiplexing is used. Describe how the processes P1, P2 and P3 can send data to the HTTP application running at the server.

   b. Assume that a connection oriented demultiplexing is used. Describe how the processes P1, P2 and P3 communicates with the server on the HTTP service.

   c. Fill in the values of U, V, W , X, Y and Z for the following port numbers of processes P1, P2 and P3. **P1: 11798, P2: 25692, P3: 45901**

Source port #	Dest port #
10981	53
Length	X
16	
Application Data (Payload)	

Figure 3

3. Figure 3 shows the contents of a Universal Datagram Protocol (UDP) header carrying a payload.

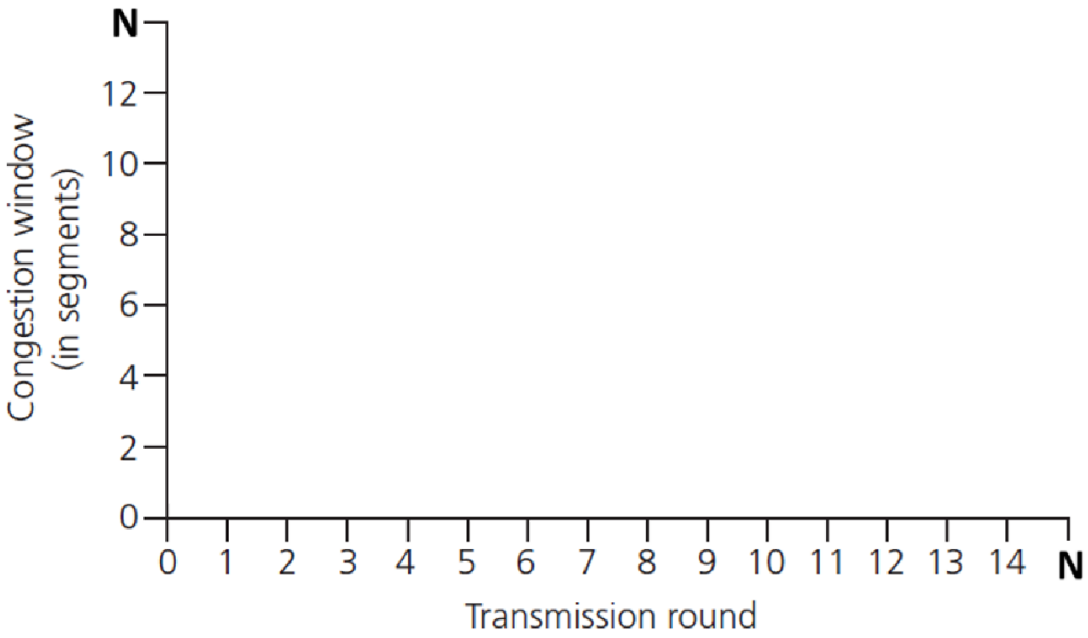
   a. Calculate the value of X. Show your workings.

   b. Suppose that the UDP packet was corrupted during transmission, such that the destination port number is changed from 53 to 61. Show in your working that the received UDP packet was corrupted using the value of X.

4. Answer the questions about congestion control based on the parameters below.

Description	Parameters
TCP TYPE	TCP TAHOE
SSTHRESH	8
3 DUPLICATE ACK	TR (Transmission Round) 10
TIMEOUT	TR (Transmission Round) 15
LAST TRANSMISSION ROUND	TR (Transmission Round) 20

   a. Draw the graph for congestion window (in segments) versus transmission round.



b. What is the total segment send?

c. Identify which transmission round is slow start (exponential).

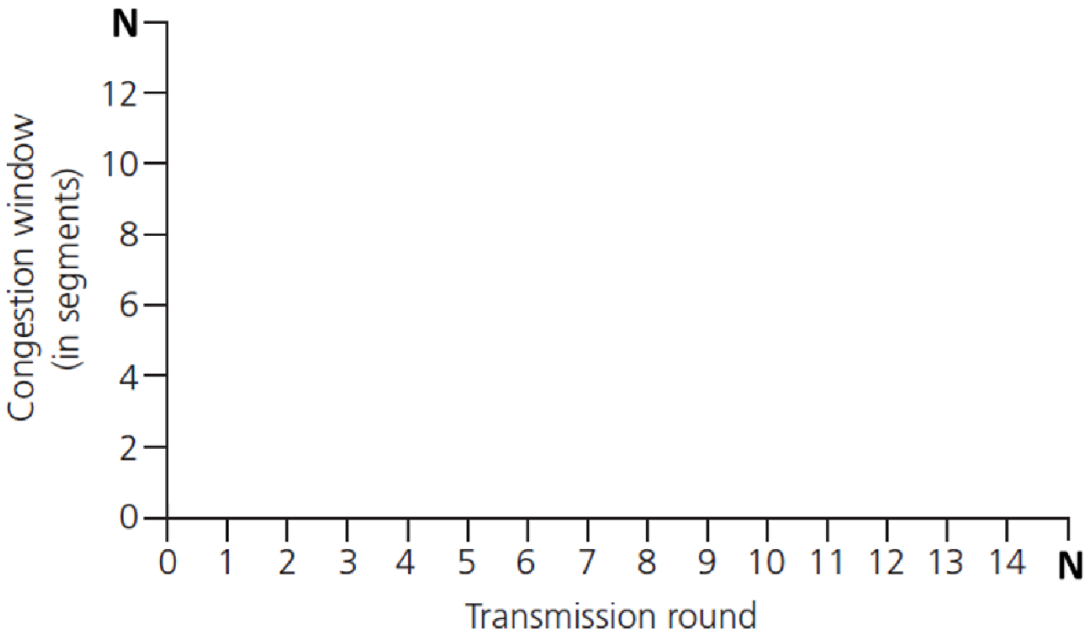
d. Identify which transmission round is congestion avoidance (linear).

e. Answer the questions about congestion control based on the parameters below.

5. Answer the questions about congestion control based on the parameters below.

Description	Parameters
TCP TYPE	TCP RENO
SSTHRESH	8
3 DUPLICATE ACK	TR (Transmission Round) 10
TIMEOUT	TR (Transmission Round) 13
LAST TRANSMISSION ROUND	TR (Transmission Round) 20

a. a. Draw the graph for congestion window (in segments) versus transmission round.



b. What is the total segment send?

c. Identify which transmission round is slow start (exponential).

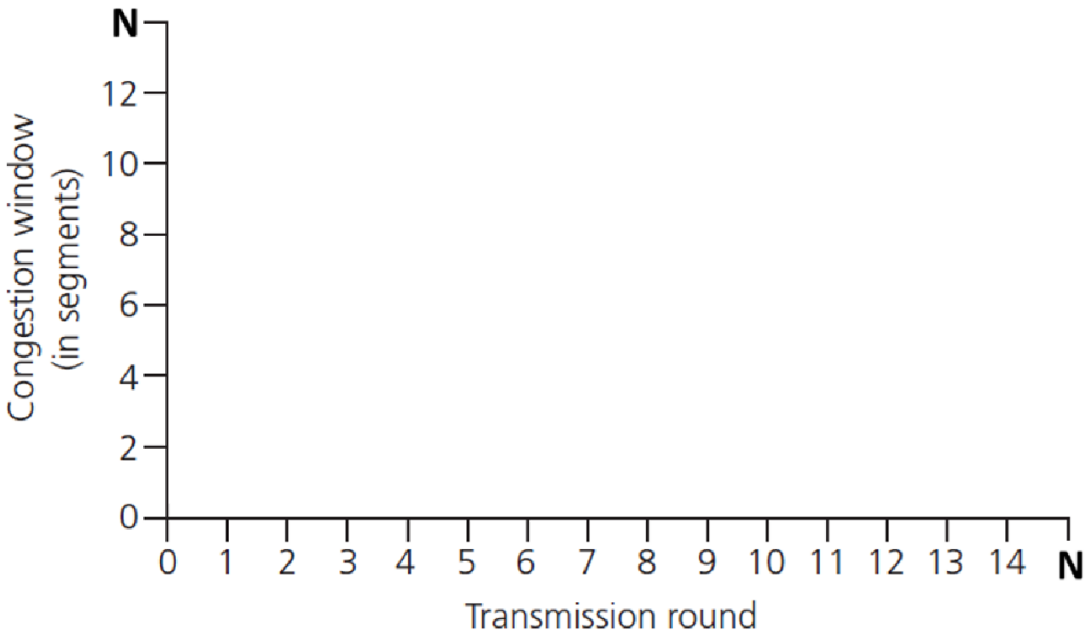
d. Identify which transmission round is congestion avoidance (linear).

6. Compare the results between question four (4) and five (5).

7. Answer the questions about congestion control based on the parameters below.

Description	Parameters
TCP TYPE	TCP RENO
SSTHRESH	8
3 DUPLICATE ACK	TR (Transmission Round) 7
TIMEOUT	TR (Transmission Round) 13
LAST TRANSMISSION ROUND	TR (Transmission Round) 20

a. Draw the graph for congestion window (in segments) versus transmission round.



b. What is the total segment send?

c. Identify which transmission round is slow start (exponential).

d. Identify which transmission round is congestion avoidance (linear).

8. Consider Figure 1. Assuming TCP Reno is the protocol experiencing the behavior shown above, answer the following questions. In all cases, you should provide a short discussion justifying your answer.

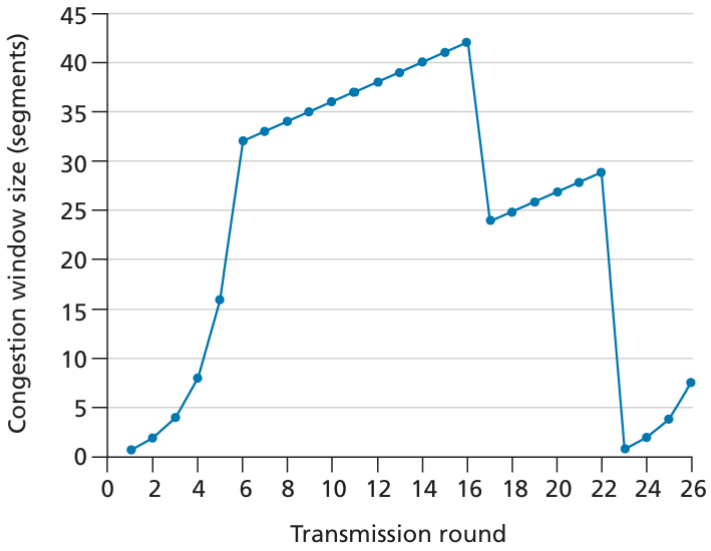


Figure 1: TCP window size as a function of time

a. Identify the intervals of time when TCP slow start is operating.

b. Identify the intervals of time when TCP congestion avoidance is operating.

c. After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?

d. After the 22nd transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?

e. What is the initial value of ssthresh at the first transmission round?

f. What is the value of ssthresh at the 18th transmission round?

g. What is the value of ssthresh at the 24th transmission round?

h. During what transmission round is the 70th segment sent?

i. Assuming a packet loss is detected after the 26th round by the receipt of a triple duplicate ACK, what will be the values of the congestion window size and of ssthresh?

j. Suppose TCP Tahoe is used (instead of TCP Reno), and assume that triple duplicate ACKs are received at the 16th round. What are the ssthresh and the congestion window size at the 19th round?

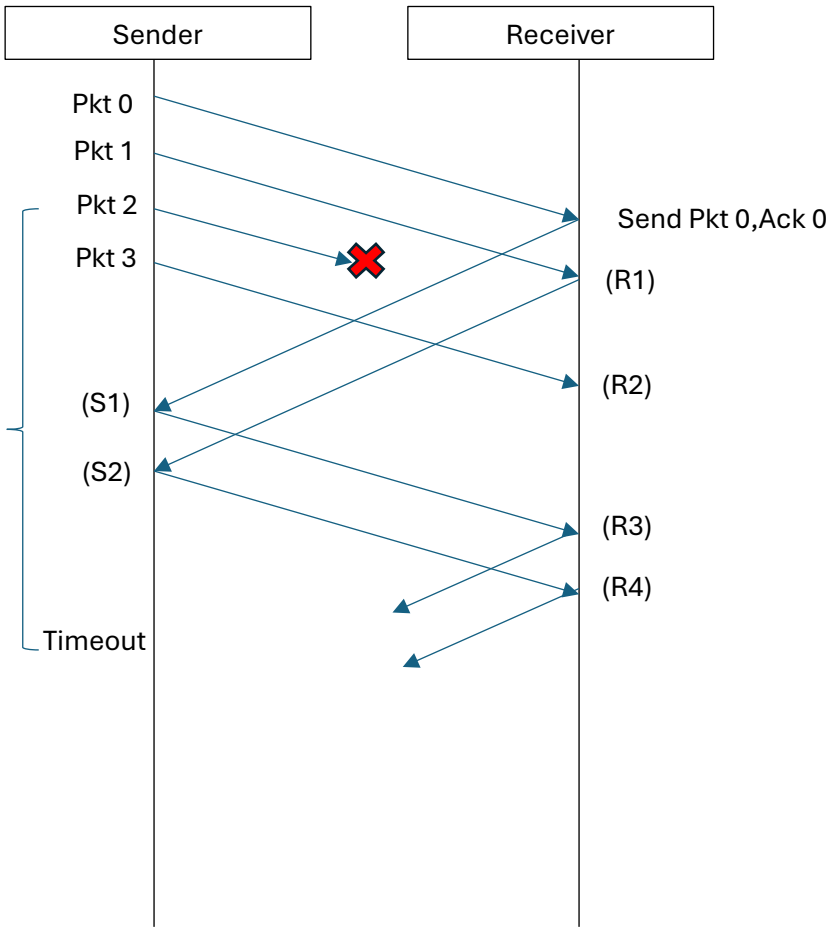


Figure 4

9. Figure 4 shows the sender sending four packets in a pipeline to the receiver. Packet 2 was lost during transmission

   a. Complete the time diagram for R1, R2 and S1, S2 when the Go-back-N protocol is used.

   b. What would happen to the packets sent by the sender in S1 and S2 once they are received by the receiver?

   c. Continue Figure 4 after timeout for Packet 2 have expired and Packet 2 is received by the receiver.

10. Answer the questions based on Figure 4.

    a. Complete the time diagram for R1, R2 and S1, S2 when the Selective-Repeat protocol is used.

    b. What would happen to the packets sent by the sender in S1 and S2 once they are received by the receiver?

    c. Continue Figure 4 after timeout for Packet 2 have expired using the Selective Repeat Protocol.