

Assignment #3

- ✓ 연습문제 P27, P28, P40 풀이과정을 포함하는 답안을 작성하시오.
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P27.

Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back to back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A.

- ① In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number?

A. 첫번째 seg seqNum = 127, 데이터 크기: 80 byte

Sequence Number: $127 + 80 = 207$

Source port number: 302

Destination port number: 80

- ② If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number?

A.

Acknowledgment number: 207

Source port number: 80

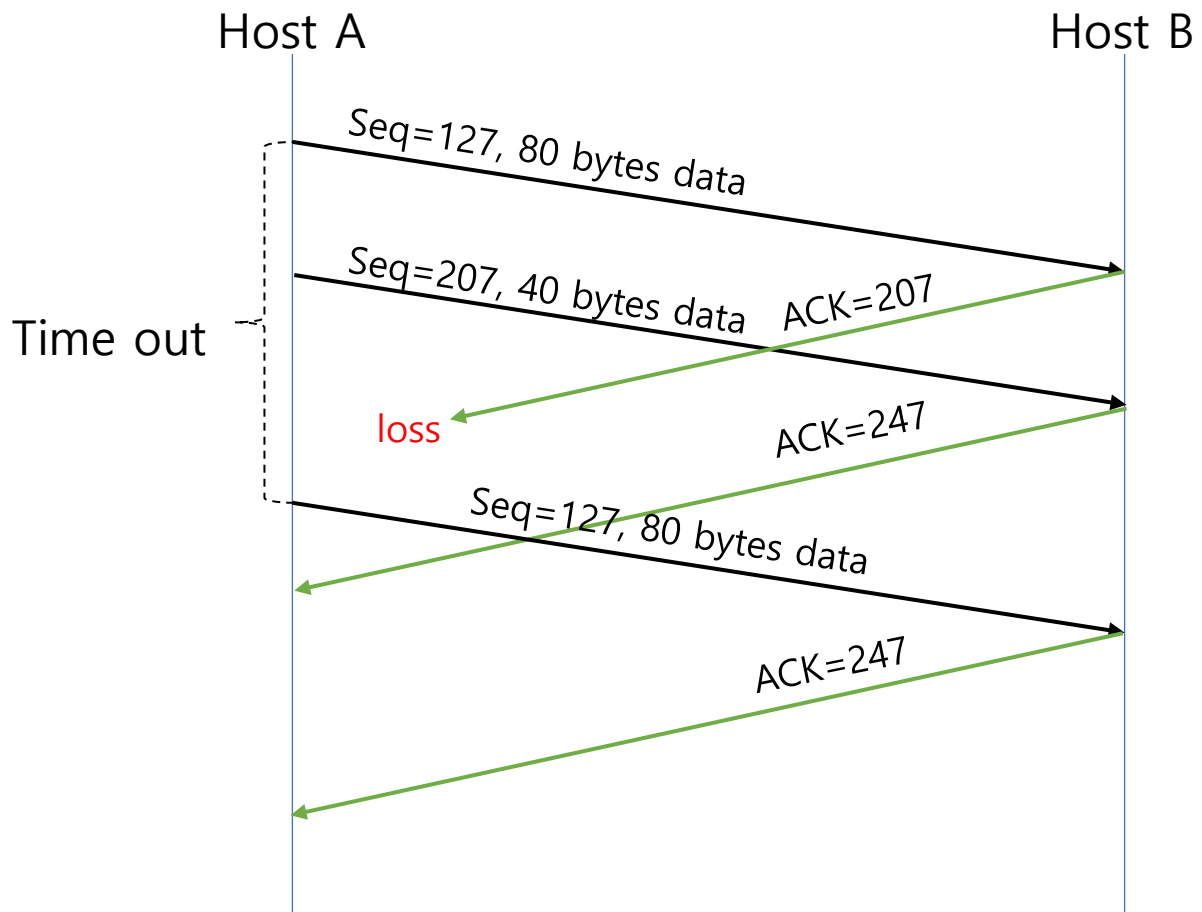
Destination port number: 302

- ③ If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?

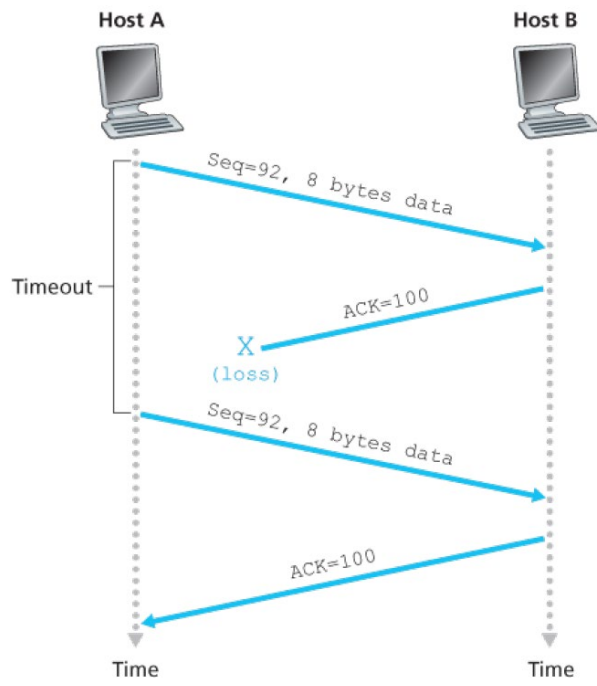
A. 126byte까지 모두 수신했기 때문에, 다음번호인 127을 ack번호로 전송

Acknowledgement number: 127

- ④ Suppose the two segments sent by A arrive in order at B. The first acknowledgment is lost and the second acknowledgment arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgments sent. (Assume there is no additional packet loss.) For each segment in your figure, provide the sequence number and the number of bytes of data; for each acknowledgment that you add, provide the acknowledgment number.



[Hint: timing diagram의 예시]



P28.

Host A and B are directly connected with a 100 Mbps link. There is one TCP connection between the two hosts, and Host A is sending to Host B an enormous file over this connection. Host A can send its application data into its TCP socket at a rate as high as 120 Mbps but Host B can read out of its TCP receive buffer at a maximum rate of 50 Mbps. Describe the effect of TCP flow control.

Host A에서 B로 최대 120Mbps의 속도로 보내지만, B에서는 최대 50Mbps속도로 TCP 수신 버퍼에서 읽을 수 있으므로 결국 계속해서 데이터를 보내다 보면 TCP 수신 버퍼가 가득 찰 것이다.

그럼 Host B는 데이터를 다시 수신할 수 있을 때까지 Host A에 데이터를 보내지 말라고 신호를 보낸다.

그리고 데이터를 읽고 다시 받고, 중지했다가 반복하면서 TCP 흐름제어가 이루어진다.

P40.

Consider **Figure 3.58** . 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.

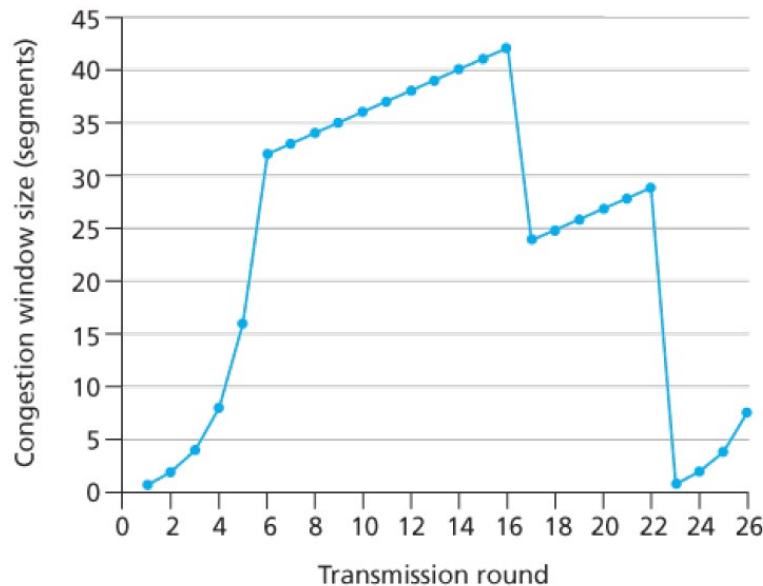


Figure 3.58 TCP window size as a function of time

- ① Identify the intervals of time when TCP slow start is operating.
A. Slow start는 2배씩 증가시키는 것이기 때문에 1~6, 23~26
- ② Identify the intervals of time when TCP congestion avoidance is operating. After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?
A. Congestion avoidance는 1씩 증가시키기 때문에 6~16, 17~22
- ③ After the 22nd transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?
A. 22번째 전송 이후 timeout에 의해 segment loss가 확인되고, 그로 인해 Congestion window는 1이 되었다.
- ④ What is the initial value of *ssthresh* at the first transmission round?
A. Slow start가 32까지 가고 congestion avoidance가 시작되기 때문에 first transmission round에서의 ssthresh값은 32

⑤ What is the value of *ssthresh* at the 18th transmission round?

A. Packet loss가 발생하면 ssthresh값은 packet loss가 발생될 시점의 congestion window값의 절반으로 설정된다.

Packet loss가 발생한 16th transmission round에서 congestion window 값이 42이기 때문에, 18th transmission round의 ssthresh값은 $42 / 2 = 21$

⑥ What is the value of *ssthresh* at the 24th transmission round?

A. 5번과 같은이유, Packet loss가 발생한 22th transmission round의 congestion window 값이 29이기 때문에, 24th transmission round의 ssthresh 값은 $29 / 2 = 14$ (나머지 버림)이 된다.

⑦ During what transmission round is the 70th segment sent?

A. 1st transmission round에서 1개의 패킷 전송(1)

2nd transmission round에서 2개의 패킷 전송($1+2=3$)

3rd transmission round에서 4개의 패킷 전송($3+4=7$)

4th transmission round에서 8개의 패킷 전송($7+8=15$)

5th transmission round에서 16개의 패킷 전송($15+16=31$)

6th transmission round에서 32개의 패킷 전송($31+32=63$)

7th transmission round에서 33개의 패킷 전송($63+33=96$)

따라서 70th segment는 7th transmission round에서 전송된다.

⑧ 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*?

A. Triple duplicate ACK가 일어나면 ssthresh값과 congestion window는 현재 congestion window의 절반이 된다. 따라서 ssthresh값과 congestion window 값은 26th transmission round의 congestion window 값 8의 절반인 4가 된다.