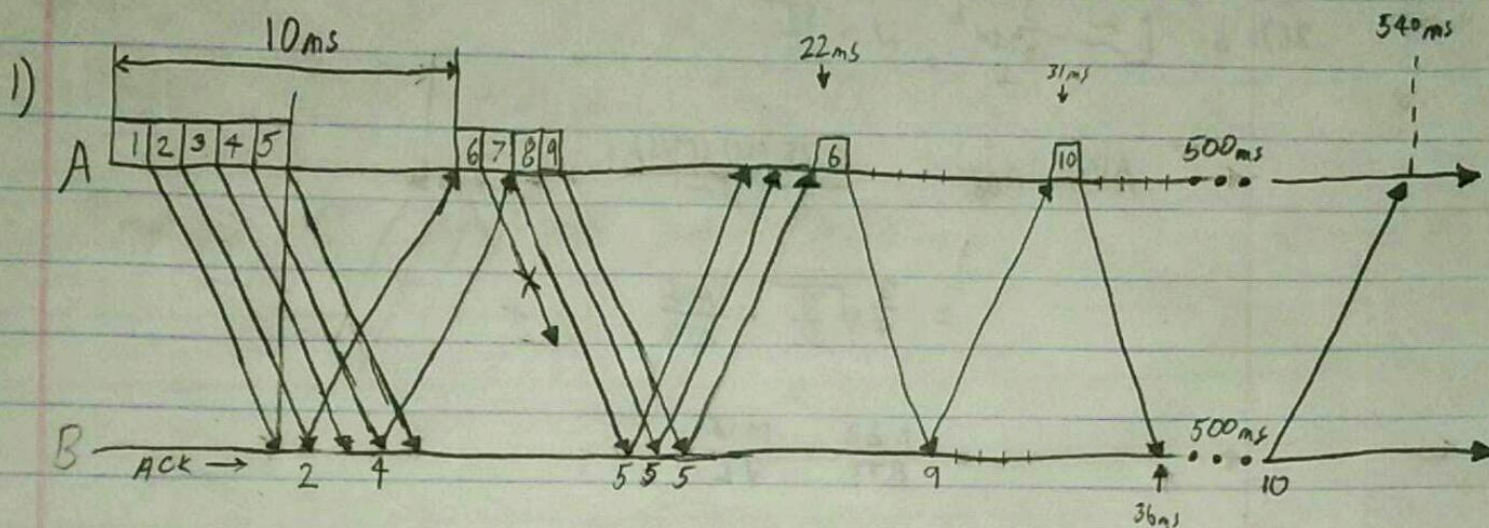


CS 132 - NETWORKS: HOMEWORK 3



2)a. a) FROM INTERVALS $[1, 6]$ AND $[23, 26]$

b) FROM INTERVALS $[6, 16]$ AND $[17, 22]$

c) BY TRIPLE DUPLICATE ACK

d) BY A TIMEOUT

e) 32

f) 21

g) 13

h) 7

i) Congestion window = 7; SSTHRESH = 4

j) SSTHRESH = 21; Congestion = 4

k) $1+2+4+8+16+21 = 52$ packets

2)b. a) $\frac{W}{2} + (\frac{W}{2} + 1) + \dots + W = \sum_{n=0}^{W/2} (\frac{W}{2} + n)$

$$= (\frac{W}{2} + 1) \frac{W}{2} + \sum_{n=0}^{W/2} n$$

$$= (\frac{W}{2} + 1) \frac{W}{2} + \frac{\frac{W}{2} (\frac{W}{2} + 1)}{2}$$

$$= \frac{W^2}{4} + \frac{W}{2} + \frac{W^2}{8} + \frac{W}{4} = \frac{3}{8} W^2 + \frac{3}{4} W; \text{ Loss RATE is } \frac{1}{\frac{3}{8} W^2 + \frac{3}{4} W}$$

$$2b) b. L \approx \frac{3}{8} W^2, W = \sqrt{\frac{8}{3L}}$$

$$AVG. RATE = \frac{0.75 (W) (MSS)}{RTT}$$

$$= \frac{3}{4} \sqrt{\frac{8}{3L}} \cdot \frac{MSS}{RTT}$$

$$= \frac{1.22}{RTT} \cdot \frac{MSS}{\sqrt{L}}$$

3) 1. Client IP: 192.168.1.109
Client Port: 2538

2. gaia.cs.umass.edu IP: 128.119.245.12
gaia.cs.umass.edu Port: 80

3. Client IP: 128.195.15.148
Client Port: 36308

4. BY GIVEN TRACE FILE:

SEQUENCE No: 0 PACKET No: 1

FLAGS: 0x002 (SYN)

5. SEQUENCE No: 0 PACKET No: 2

ACKNOWLEDGE VALUE: 1

Determined by SYN PACKET SEQUENCE NUMBER + 1.

FLAGS: 0x012 (SYN, ACK)

6. SEQUENCE No: 1 PACKET No: 4

3) 7.	SEQUENCE NUMBER	Time	RTT	ESTIMATED RTT ($\alpha = 0.125$)
SENT	1	0.026477		
	566	0.091737		
	2026	0.054026		
	3486	0.054690		
	4946	0.077405		
	6406	0.078157		
ACK	566	0.053937	0.0122	0.0122
	2026	0.077294	0.023268	0.0135835
	3486	0.124085	0.069395	0.0205599375
	4946	0.169118	0.091713	0.02445407031
	6406	0.217299	0.139142	0.04316506152

8. 565 bytes, 1460 bytes, 1460 bytes, 1460 bytes, 1460 bytes

9. 6780 bytes. No, window size is large enough

10. No. INFO DID NOT SHOW TCP Retransmission

11. 1400 bytes. Yes, THERE ARE TIMES ACK ARE SENT FOR EVERY OTHER PACKET

12. $\frac{164091 \text{ bytes}}{5.461175 - 0.026477} = 30193,214048 \text{ bytes/second}$

13. slow start: [1-13], CONGESTION AVOIDANCE AFTER

14. $\frac{152999 \text{ bytes}}{1.160063000 - 0.504549000} = 233312,078397 \text{ bytes/second}$

NO SLOW START, CONNECTION WAS ALREADY ACTIVE WITH CONGESTION AVOIDANCE