第三次作业

P3.

$$\begin{array}{r} 01\,01\,00\,11 \\ +\ 01\,10\,01\,10 \\ \hline 10\,11\,10\,01 \\ 01\,11\,01\,00 \\ \hline 10\,01\,01\,11\,01 \\ = \\ \hline 00\,10\,11\,10 \end{array}$$

∴ 和的反码是 11010001

接收方通过求 3个8bit字节与 checksum 的和来检测错误。若该和当中含有0，则有一个bit的错误，所有一个bit的错误都能测出，但2个bit的错可能测不出。比如 第1个字节的最后1个bit 错为0，而 第2个字节的最后一个bit 错为1，也对求和结果无影响时。所以检测不出这2个错误。

P15.

$$t_{trans} = \frac{L}{R} = \frac{1500 \times 8\ bit/pkt}{10^9\ bit/s} = 12\ \mu s/pkt$$

$$U_{sender} = \frac{L/R * n}{RTT + L/R} = \frac{0.012n}{30.012} \geq 0.9$$

$n \geq 2251$ ∴ 当窗口长度设为2251时，利用率超过90%

P31.

0→1 EstimatedRTT = (1−0.125)*100 + 0.125*106 = 100.75(ms)

DevRTT = (1−0.25)*5 + 0.25*|106−100.75| = 5.06(ms)

TimeoutInterval = 100.75 + 4*5.06 = 120.99(ms)

1→2 EstimatedRTT = (1−0.125)*100.75 + 0.125*120 = 103.15(ms)

DevRTT = (1−0.25)*5.06 + 0.25*|120−103.15| = 8(ms)

TimeoutInterval = 103.15 + 4*8 = 135.15(ms)

2→3 EstimatedRTT = (1−0.125)*103.15 + 0.125*140 = 107.76(ms)

DevRTT = (1−0.25)*8 + 0.25*|140−107.76| = 14.06(ms)

TimeoutInterval = 107.76 + 14.06*4 = 164(ms)

3→4 EstimatedRTT = (1−0.125)*107.76 + 0.125*90 = 105.54(ms)

DevRTT = (1−0.25)*14.06 + 0.25*|90−105.54| = 14.42(ms)

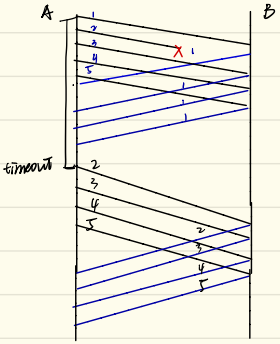
TimeoutInterval = 105.54 + 14.42*4 = 163.22(ms)

4→5 EstimatedRTT = (1−0.125)*105.54 + 0.125*115 = 106.71(ms)

DevRTT = (1−0.25)*14.42 + 0.25*|115−106.71| = 12.88(ms)

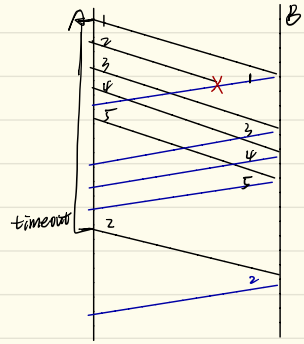
TimeoutInterval = 106.71 + 4 * 12.88 = 158.23(ms)

P47 (a) 对 GBN



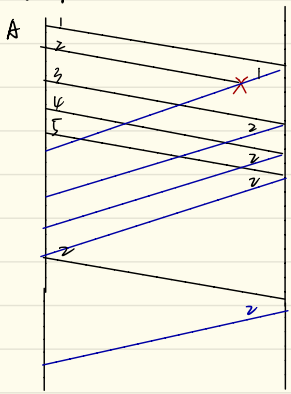
A 发送了 9 个报文段
B 发送了 8 个 ACK

对 SR



A 发送了 6 个报文段
B 发送了 5 个 ACK

对 TCP



A 发送了 6 个报文段
B 发送了 5 个 ACK

(b) TCP，因为 TCP 使用快速重传而无须等待 timeout

P 40. (a) 慢启动运行在 [1-6] 和 [23-26]

(b) 拥塞避免在 [6-16] 和 [17-22]

(c) 根据 3 个冗余 ACK.

(d) 根据超时，所以拥塞窗口设为 1

(e) ssthresh 的初始值为 32

(f) ssthresh = 21

(g) ssthresh = 29/2 = 14

(h) $1+2+4+8+16+32=63<70$

$63+31=94>70$

∴ 在第7个传输轮回内发送第70个报文段.

(i). $ssthresh=8/2=4$

窗口长度为 $4+3=7$

(j) $ssthresh=21$

窗口长度为 K

(K) $1+2+4+8+16+21=52$