Chapter 5: Hints & Answers

5.3   (c) The average number of transmissions per packet is e^{3p}.

5.8   Is there more than one way to handle multiplexing?

5.15   (c) E[total delay] = 23,847 seconds. (d) For N = 80, E[total delay] = 8.84 seconds.

5.16   Hint: An ACK error will require a new successful retransmission of the frame for next ACK transmission. An ACK is not sent until a new retransmitted frame arrives at the receiver.

5.18 $E[T_{total}]$ = 0.522 seconds.

5.23   (a) You will need to draw the sequence of events carefully using graph paper or clearly-marked time intervals .   You should include the state of the send window at A and the receive sequence number at B.
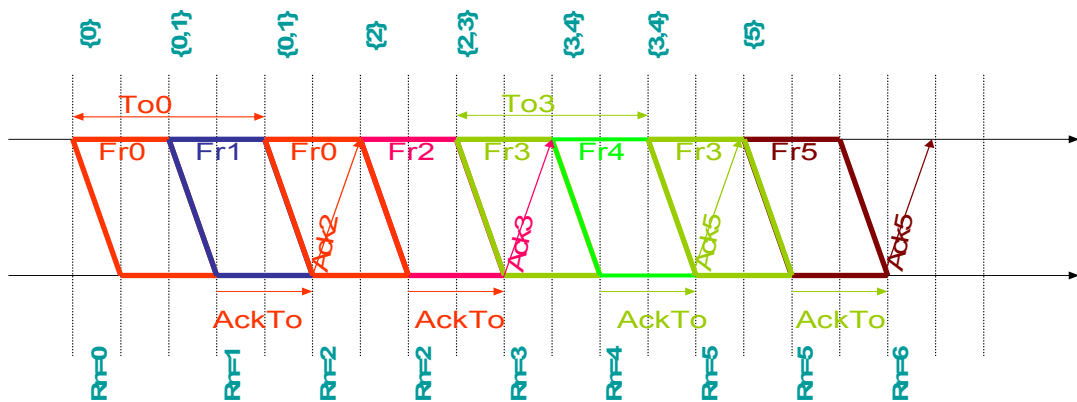
The figure shows that the timeout value of 2 is too short and causes may timeouts. Redo the problem with a timeout value of 3.

5.26   How do the differences in operation lead to differences in efficiency and delay performance?

5.27-5.28   Draw a table with columns: current state; event; sequence number; action; next state.

5.33   (b) Efficiency = 0.220 for n_f = 4096.

5.36   (a) Let a = (1 – P_b) and b = 2 (t_{proc} + t_{prop}) R + n_a, then

$$n_f = \frac{(n_o - b) \pm \sqrt{(b - n_o)^2 - 4\left[\dfrac{b + n_o}{\ln a} - bn_o\right]}}{2}$$

5.36(b)

$$n_f = \frac{n_o \pm \sqrt{n_o^2 - 4\dfrac{n_o}{\ln a}}}{2}$$

5.44   Hint: Consider how specifying the date in addition to sequence number of an event helps resolve wraparound ambiguity.

5.47   The standard deviation of the delay is 7.217 ms.

5.55   The average number of bytes examined before the beginning of the frame is identified is approximately F/2.

5.61   Time to send the message is 166.14 seconds.

5.63   Dial-up telephone modems use PPP, so you can do an Ethereal packet capture while logging into a dialup modem service to view the LCP and NCP negotiations.

5.66   For window size 7, the bit rate is 58 kbps; for window size 127, the bit rate is 1.052 Mbps.

5.75   With k = 24, P_{loss} = 0.000948.

5.76   Hint: You need to find an expression that relates γ, the rate at which information is transmitted, to λ and L.

5.77   The average number of packets sent to line 2 is 1.41 packets per T second period.