Computer Networks HM 5 Solution

Chapter 5 exercises

5. The two-segment-lifetime timeout results from the need to purge old late duplicates, and uncertainty of the sender of the last ACK as to whether it was received. For the first issue we only need one connection endpoint in TIMEWAIT; for the second issue, a host in the LAST_ACK state expects to receive the last ACK, rather than send it.

8. The sequence number doesn't always begin at 0 for a transfer, but is randomly or clock generated.

9. (a) The advertised window should be large enough to keep the pipe full; delay (RTT) × bandwidth here is 100ms × 100Mbps = 10Mb = 1.25 MB of data. This requires 21 bits (2^{21} = 2,097,152) for the **`AdvertisedWindow`** field. The sequence number field must not wrap around in the maximum segment lifetime. In 60 seconds, 750MB can be transmitted. 30 bits allows a sequence space of 1024 MB, and so will not wrap in 60 seconds. (If the maximum segment lifetime were not an issue, the sequence number field would still need to be large enough to support twice the maximum window size; see "Finite Sequence Numbers and SlidingWindow" in Section 2.5.)

12. (a) This is 125MB/sec; the sequence numbers wrap around when we send 2^{32} B = 4GB. This would take 4GB/(125MB/sec) = 32 seconds.

    (b) Incrementing every 32 ms, it would take about $32 \times 4 \times 10^9$ ms, or about four years, for the timestamp field to wrap.

20. (a)

T=0.0	'a' sent
T=1.0	'b' collected in buffer
T=2.0	'c' collected in buffer
T=3.0	'd' collected in buffer
T=4.0	'e' collected in buffer
T=4.1	ACK of 'a' arrives, "bcde" sent
T=5.0	'f' collected in buffer
T=6.0	'g' collected in buffer
T=7.0	'h' collected in buffer
T=8.0	'i' collected in buffer
T=8.2	ACK arrives; "fghi" sent