Cmpt 434 A3 - Part B

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1.

$R = 40 \times 10^6$ b/s $(1 \text{ byte}/8 \text{ bits}) = 5 \times 10^6$ bytes/s

$= \boxed{5 \text{ MBps}}$

$S = 0.0005$ s

$M = 1.0 \times 10^9$ b/s $(1 \text{ byte}/8 \text{ bits}) = 1.25 \times 10^8$ bytes/s

$MS = B + RS \Rightarrow B = MS - RS$

$B = 1.0 \times 10^9$ b/s $(0.0005\text{s}) - 40 \times 10^6$ b/s (0.0005s)

$= 500 \times 10^3$ b $- 20 \times 10^3$ b

$= 480 \times 10^3$ b $(1 \text{ byte}/8 \text{ bits}) = 60 \times 10^3$ bytes

$= \boxed{60 \text{ MB}}$

$\boxed{R = 5 \text{ MBps}, \; B = 60 \text{MB}, \; M = 125 \text{ MBps}}$

2.

a) Forwarded towards next hop router of entry # 3 with address 10.11.47.127 on interface A.

b) Forwarded towards next hop router of entry # 1 with address 10.11.32.7 on interface A.

c) Forwarded towards next hop router of entry # 2 with address 10.11.0.73 on interface B.

d) Forwarded towards destination host of entry #4 at address 10.11.44.222 on interface A.

* Justification on next page.

a) · Entry #1 is not a match because the high order bit positions 25 and 26 do not match the prefix.
· Entry #3 is a match because the high order 23 bits match the prefix.

b) · Entry #1 is a match because the high order 26 bits match the prefix.

c) · Entry #1 is not a match because the high order byte position 3 does not match the prefix.
· Entry #3 is not a match because the high order bit positions 19-23 do not match the prefix.
· Entry #4 is not a match because the high order bit position 20 does not match the prefix.
· Entry #2 is a match because it is a catch all that does not need to match the address and the prefix.

d) • Entry #1 is not a match because the high order byte position 3 does not match the prefix.
• Entry #3 is not a match because the high order bit positions 22 and 23 do not match the prefix.
• Entry #4 is a match because the high order 20 bits match the prefix.

(3.) $SRTT = \alpha SRTT + (1-\alpha)RTT$

$\alpha = 0.875, \quad 1-\alpha = 0.125$

1. $SRTT = 0.875(125\,ms) + 0.125(80\,ms)$
   $= 109.375\,ms + 10\,ms$
   $= 119.375\,ms$
2. $SRTT = 0.875(119.375\,ms) + 0.125(80\,ms)$
   $= 104.453125\,ms + 10\,ms$
   $= 114.453125\,ms$
3. $SRTT = 0.875(114.453125\,ms) + 0.125(80\,ms)$
   $= 100.1464844\,ms + 10\,ms$
   $= 110.1464844\,ms$
4. $SRTT = 106.3781738\,ms$
5. $SRTT = 103.0809021\,ms$
6. $SRTT = 100.1957893\,ms$
7. $SRTT = 97.67131567\,ms$

∴ 7 measurements of the new RTT are required before the SRTT drops below 100 ms.

4. $SRTT = \alpha\, SRTT + (1-\alpha)\, RTT$

$\alpha = 0.875, \quad 1-\alpha = 0.125$

$RTTVAR = \beta\, RTTVAR + (1-\beta)\,|SRTT - RTT|$

$\beta = 0.75, \quad 1-\beta = 0.25$

$RTO = \max[RTO_{min}, SRTT + 4(RTTVAR)]$

The largest such N is 5. Refer to the provided spreadsheet for the first such N that triggers a timeout, which is 6.

Note that only iterations past 25 are considered, so that the pattern can be properly analyzed.

N	RTT	SRTT	RTTVAR	RTO
6	125	125	93.75	500
6	125	125	70.3125	406.25
6	125	125	52.734375	335.9375
6	125	125	39.55078125	283.203125
6	125	125	29.66308594	250
6	500	171.875	104.2785645	588.9892578
6	125	166.015625	88.46282959	519.8669434
6	125	160.8886719	75.31929016	462.1658325
6	125	156.4025879	64.34011459	413.7630463
6	125	152.4772644	55.12440205	372.9748726
6	125	149.0426064	47.35395312	338.4584188
6	500	192.9122806	112.2873947	642.0618594
6	125	184.4232455	99.0713574	580.7086751
6	125	176.9953398	87.302353	526.2047518
6	125	170.4959223	76.85074533	477.8989037
6	125	164.808932	67.59029201	435.1701001
6	125	159.8328155	59.40092289	397.4365071
6	500	202.3537136	118.9622638	678.2027687
6	125	192.6844994	106.1428227	617.2557901
6	125	184.223937	94.41310125	561.876342
6	125	176.8209448	83.76506215	511.8811934
6	125	170.3433267	74.1596283	466.9818399
6	125	164.6754109	65.53857395	426.8297067
6	500	206.5909845	122.5061843	696.6157218
6	125	196.3921115	109.7276661	635.3027759
6	125	187.4680975	97.91277397	579.1191934
6	125	179.6595853	87.09947681	528.0574926
6	125	172.8271372	77.2813919	481.9527048
6	125	166.848745	68.42323018	440.5416658
6	500	208.4926519	124.1942597	705.2696906
6	125	198.0560704	111.4097124	643.6949198
6	125	188.9240616	99.53829967	587.0772603

6	125	180.9335539	88.63711323	535.4820068
6	125	173.9418597	78.71329984	488.795059
6	125	167.8241272	69.74100668	446.7881539
6	500	209.3461113	124.9692272	709.22302
6	125	198.8028474	112.1776322	647.5133763
6	125	189.5774915	100.277597	590.6878797
6	125	181.505305	89.33452404	538.8434012
6	125	174.4421419	79.36142851	491.8878559
6	125	168.2618742	70.33653992	449.6080339
6	500	209.7291399	125.32012	711.0096198
6	125	199.1379974	112.5245893	649.2363547
6	125	189.8707477	100.6111289	592.3152635
6	125	181.7619043	89.64882277	540.3571953
6	125	174.6666662	79.65328363	493.2798008
6	125	168.458333	70.60454596	450.8765168
6	500	209.9010413	125.4781491	711.8136379
6	125	199.2884112	112.6807146	650.0112698

(5.) a) TCP is in slow start mode in rounds
- 1-7
- 22-26

b) By triple duplicate ACK.

c) By timeout.

d) ssthresh = 64, because this is the value at which AI mode begins.

e) ssthresh = 70/2 = 35, because this is the value when segment loss is detected.

f) ssthresh = 35, because no further segment loss has been detected.

g) cwnd will become 16/2 = 8 and ssthresh will become 16/2 = 8.