COMP2322 Computer Networking Homework Three

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March 11, 2024

Question 1

a) Since the TCP sequence number contains 4 bytes, namely, 32 bits, the maximum of sequence number is $2^{32}-1$, and there are 2^{32} possible sequence numbers from 0 to $2^{32}-1$. As the sequence number is incremented by the number of bytes of the file sent, the maximum value of L should be $2^{32} = 4294967296$.

b) As $MMS = 880\,\text{bytes}$, the number of segments required is

$$\left\lceil \frac{2^{32}}{880} \right\rceil = 4880645.$$

Therefore, the number of bytes of all headers is

$$4880645 \times 56 = 273316120,$$

and the number of bytes of all data is

$$2^{32} + 273316120 = 4568283416.$$

Thus, the transmission time is

$$\frac{4\,568\,283\,416\,\text{bytes}}{200\,\text{Mbps}} \approx 182.73\,\text{s}.$$

Question 2 Knowing that $SampleRTT_1 = 108\,\text{ms}$, $EstimatedRTT_0 = 100\,\text{ms}$, and $\alpha = 0.15$, we can get that

$$EstimatedRTT_1 = 0.15 \times 108 + (1-0.15) \times 100 = 101.2\,\text{ms}.$$

Furthermore, since $SampleRTT_2 = 110\,\text{ms}$, there comes

$$EstimatedRTT_2 = 0.15 \times 110 + (1-0.15) \times 101.2 = 102.52\,\text{ms}.$$

Therefore, while $\beta = 0.25$ and $DevRTT_0 = 6\,\text{ms}$, we have

$$DevRTT_1 = 0.25 \times |108 - 100| + (1-0.25) \times 6 = 6.5\,\text{ms},$$

and also,

$$DevRTT_2 = 0.25 \times |110 - 101.2| + (1-0.25) \times 6.5 = 7.075\,\text{ms}.$$

Therefore, the TCP timeout interval after each of the samples is obtained arrives

$$TimeoutInterval_1 = 101.2 + 4 \times 6.5 = 127.2\,\text{ms},$$

and

$$TimeoutInterval_2 = 102.52 + 4 \times 7.075 = 130.82\,\text{ms}.$$