

CSE310 - Assignment 2

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Problem 1

Consider transferring an enormous file of L bytes from Host A to Host B. Assume an MSS of 536 bytes.

1. What is the maximum value of L such that the TCP sequence numbers are not exhausted? Recall that the TCP sequence number field has 4 bytes.

The maximum value of L is 2^{32} or roughly 4,294,967,296 bytes. The TCP protocol indicates a packet containing or requesting the n th byte of a transmitting file by using n as the sequence or acknowledgment number, which is bounded by the size of the header fields - 32 bytes representing an offset of up to 2^{32} .

2. For the L you obtain in (a), find how long it takes to transmit the file. Assume that a total of 66 bytes of transport, network, and data-link header are added to each segment before the resulting packet is sent out over a 155 Mbps link. Ignore flow control and congestion control so A can pump out the segments back to back and continuously.

First the number of segments $n = \frac{4,294,967,296}{536} = 8012998.68657$, rounded up to 8,012,998 segments. Since there is only one data link, the transmission time will be $\frac{N*L}{R} = \frac{8,012,998*(66+536)Bytes}{155*10^3 Bps} = 248.971602374$ seconds.

Problem 2

Suppose that the five measure SampleRTT values are 106 ms, 120 ms, 140 ms, 90 ms, and 115 ms. Compute the EstimatedRTT after each of these SampleRTT values is obtained, using a value of $\alpha = 0.125$ and assuming that the value of EstimatedRTT was 100 ms just before the first of these five samples were obtained. Compute also the DevRTT after each sample is obtained, assuming a value of $\beta = 0.25$ and assuming the value of DevRTT was 5 ms just before the first of these five samples was obtained. Last, compute the TCP TimeoutInterval after each of these samples is obtained.

$$UpdatedEstimatedRTT = (1 - \alpha)EstimatedRTT + \alpha SampleRTT$$

$$UpdatedDevRTT = (1 - \beta)DevRTT + \beta |SampleRTT - EstRTT|$$

$$TCPTimeout = EstimatedRTT + 4 * DevRTT$$

EstimatedRTT	SampleRTT	UpdatedEstimatedRTT	DevRTT	UpdatedDevRTT	TCPTimeout
100ms	106ms	100.75ms	5ms	5.0625ms	120ms
100.75ms	120ms	103.15625ms	5.0625ms	8.00781ms	121ms
103.15625ms	140ms	107.76122ms	8.00781ms	14.06555ms	135.18749ms
107.76122ms	90ms	105.54150ms	14.06555ms	14.43454ms	164.02342ms
105.54150ms	115ms	106.72382ms	14.43454ms	12.89495ms	163.27966ms
106.72382ms			12.89495ms		158.30362ms

Problem 3

Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1.17/24. Also suppose that Subnet 1 is required to support at least 60 interfaces, Subnet 2 is to support at least 90 interfaces, and Subnet 3 is to support at least 12 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.

Subnet 1: 223.1.17.0/26 - IP range of 223.1.17.0[000000] or $2^6 = 64$ IPs containing 62 hosts

Subnet 2: 223.1.17.128/25 - IP range of 223.1.17.1[0000000] or $2^7 = 128$ IPs containing 126 hosts

Subnet 3: 223.1.17.64/26 - IP range of 223.1.17.01[000000] or $2^6 = 64$ IPs containing 62 hosts