Assignment 1

COL724

Advanced Computer Networks

By: Rajeev Gupta

2019CS51018

1. Why do you see a difference in webpage fetch times with short and large router buffers?

Results:

q20: Average: 0.560100 Standard Deviation: 0.346879

q100: Average: 1.591897 Standard Deviation: 0.856235

This arises from the buffer size factor. The packets transmitted between h1 and h2 occupy the buffer space, only recognizing packet loss when it becomes saturated. As a result, larger buffer sizes naturally lead to extended time periods, as the duration to fill these buffers gets significantly prolonged. On the contrary, smaller buffers facilitate more effective TCP congestion control, which takes into account intermittent packet loss.

2. Bufferbloat can occur in other places such as your network interface card (NIC). Check the output of ifconfig eth0 on your VirtualBox VM. What is the (maximum) transmit queue length on the network interface reported by ifconfig? For this queue size, if you assume the queue drains at 100Mb/s, what is the maximum time a packet might wait in the queue before it leaves the NIC?

Calling the ifconfig shows txqueuelen=1000 and MTU=1500.

(1000 packets x 1500 bytes x 8 bits)/(100Mbps) = 0.12s

3. How does the RTT reported by ping vary with the queue size? Write a symbolic equation to describe the relation between the two (ignore computation overheads in ping that might affect the final result).

RTT = Queue_Size * Packet_Delay(0.5s < 1.0s)

In other words, the round-trip time (RTT) indicated by a ping demonstrates a direct correlation with the queue size. With a larger queue, it becomes possible to accommodate more packets, consequently leading to a straightforward rise in the overall RTT for each packet delay.

4. Identify and describe two ways to mitigate the bufferbloat problem.

For one, we can decrease the maximum buffer size. Wait will be shorter as a result.

q20: Average: 0.560100

Standard Deviation: 0.346879

q100: Average: 1.591897

Standard Deviation: 0.856235

Another approach to address bufferbloat involves implementing Active Queue Management (AQM). This method involves probabilistic packet dropping, aiming to circumvent problems linked to drop tail queues. Such issues include bursty flows and the synchronization of flows on a global scale.

5. Describe how and why your results change when you re-run the emulation

Rerunning a network emulation can lead to different results due to changing network conditions, traffic patterns, external interference, protocol behavior, and random factors. These variables can cause fluctuations in performance and outcomes.