Congestion Control Part 1

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I implemented TCP Tahoe congestion control inside a network simulator. I ran several tests on the network dropping various amounts packets and compared them to established data about how TCP congestion control works.

In each test, a 515 KB pdf was transferred between two nodes in a two node network with a bi-directional link. The bandwidth of the links was 1Mbps and the latency was 100ms. The congestion window size and packet sequence activity was recorded and graphed.

1 Tests

1.1 Slow start

This test involved transferring the PDF with no dropped packets.

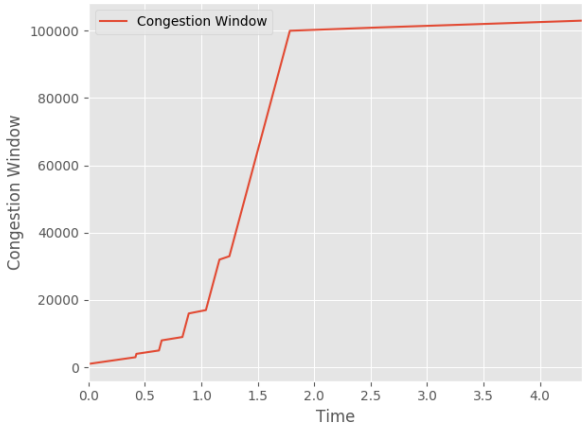

Figure 1: Congestion window for 0 dropped packets

Figures 1 shows the results of the test on the congestion window, and things look as expected. Since there are no dropped packets, the congestion window size grows rapidly until it reaches the threshold of 100,000, at which point it grows linearly.

1.2 One packet loss

This test involved transferring the PDF but dropping packet 14,000.

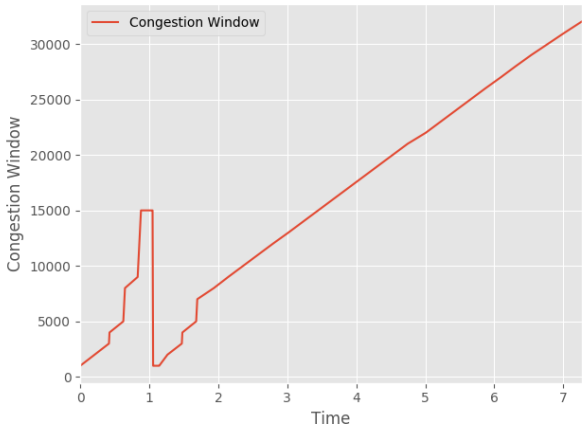

Figure 2: Congestion window for 1 dropped packet

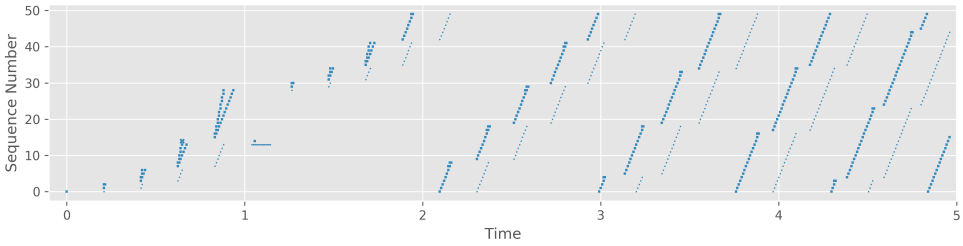

Figure 3: Packet sequence events for 1 dropped packet

Figures 2 and 3 show the results of this test. The dropped packet is represented by an X on the sequence graph. At the time the packet dropped there was a dip in the congestion window as expected.

1.3 Two packet loss

This test involved transferring the PDF but dropping packets 14,000 and 28,000.

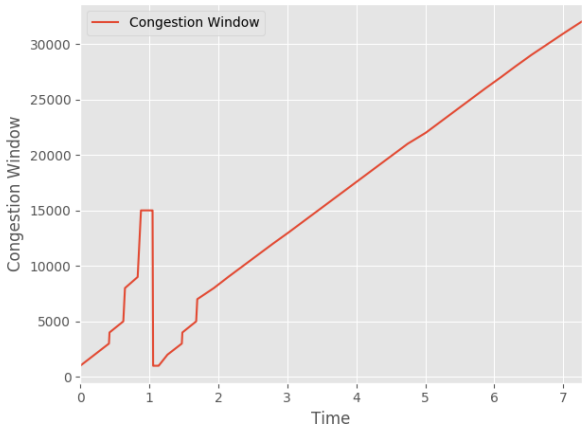

Figure 4: Congestion window for 2 dropped packets

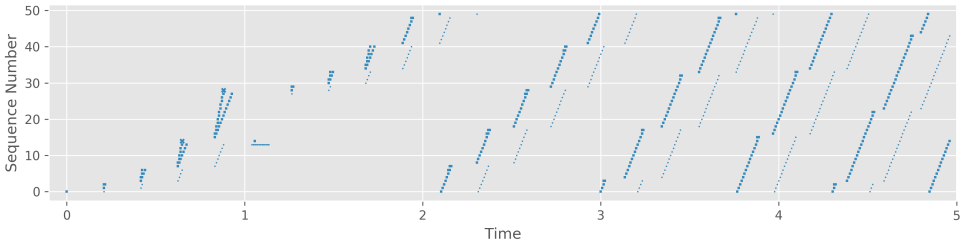

Figure 5: Packet sequence events for 2 dropped packets

The results of this test came out as expected compared to the TCP SACK paper.

1.4 Three packet loss

This test involved transferring the PDF but dropping packets 14,000, 26,000, 28,000.

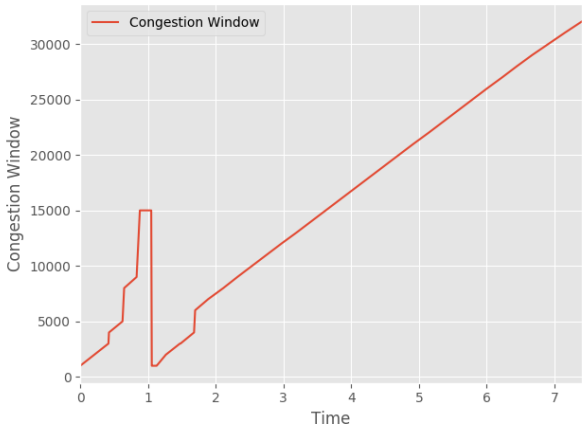

Figure 6: Congestion window for 3 dropped packets

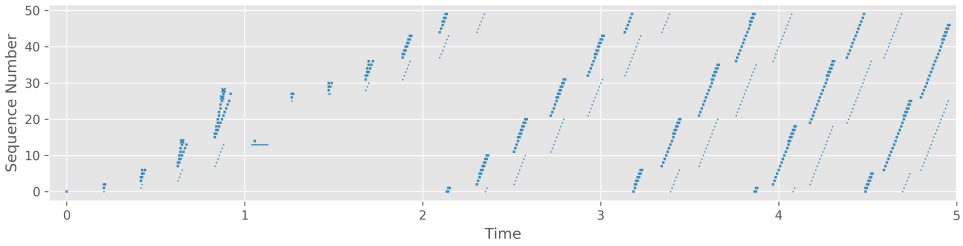

Figure 7: Packet sequence events for 3 dropped packets

The results of this test came out as expected compared to the TCP SACK paper.