EINTE TCP LAB

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Task 1

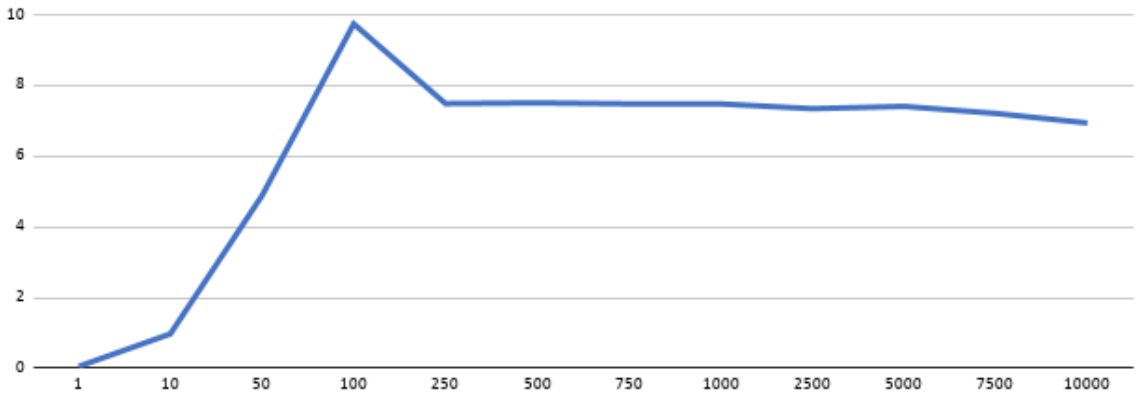
The optimal window size is calculated with this formula:

```
Optimal size = (size of the link in MB/s) x (round trip delay in seconds)
```

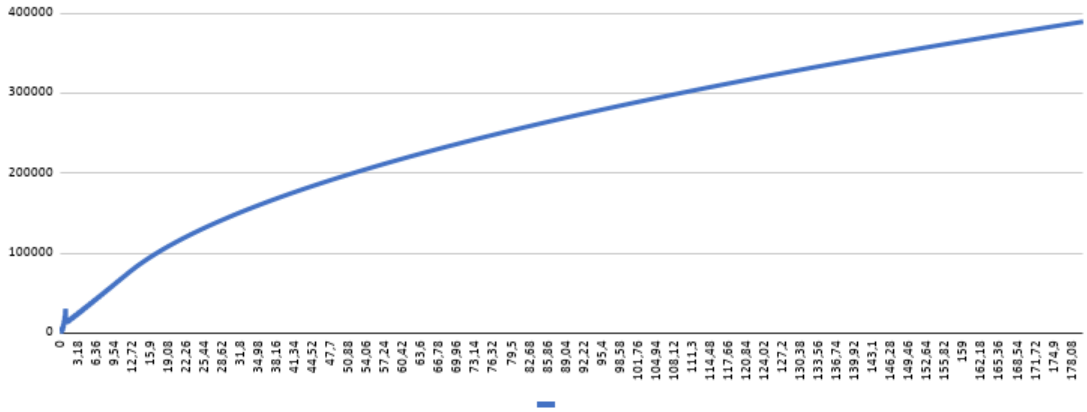
Results:

```
Simulation time      180
Initialization time  60
Active sources       [1 0 0 1]
TCP Windows          [50 5000 5000]
Link delay           50ms
Link capacity        10Mb
Link buffer          5

TCP1 Average Throughput = 4.7409351111111109 [Mbps]
      Stable Throughput = 4.890107508958943 [Mbps]
TCP2 Average Throughput = 0.0 [Mbps]
      Stable Throughput = 0.0 [Mbps]
TCP3 Average Throughput = 0.0 [Mbps]
      Stable Throughput = 0.0 [Mbps
```

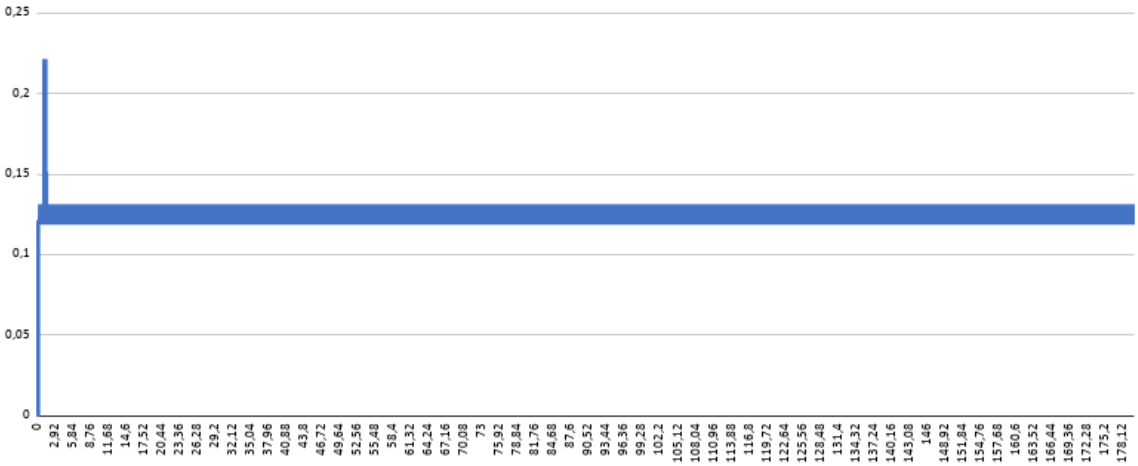
- TCP connection throughput as a function of window size:



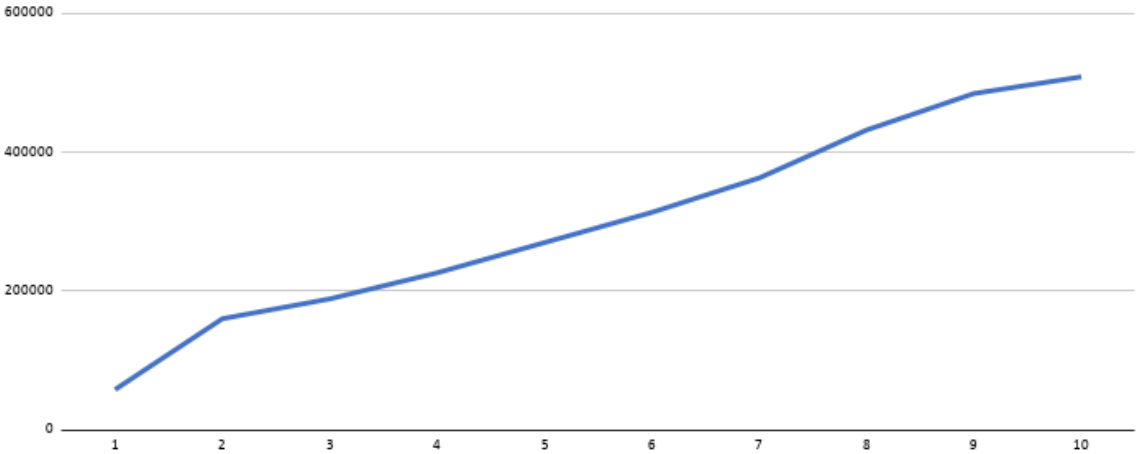
- cwnd size:



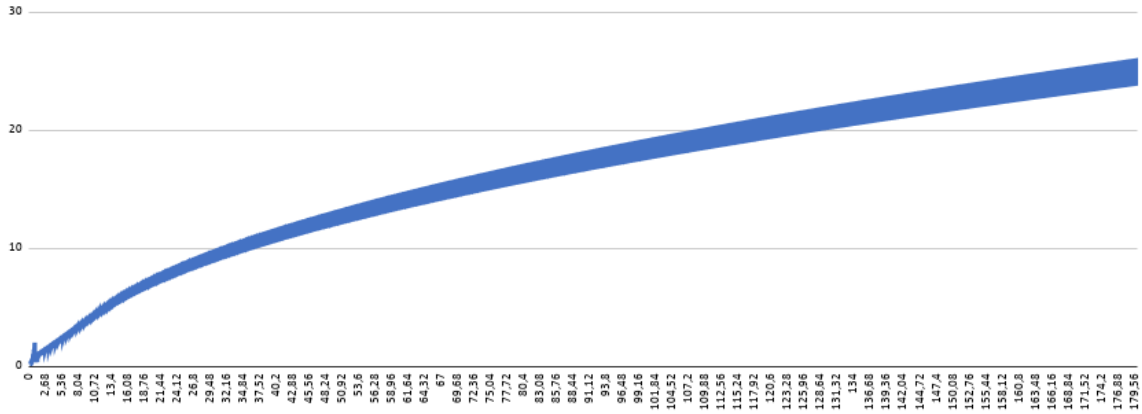
- rtt:



- TCP momentary throughput (calculated for 1s periods)

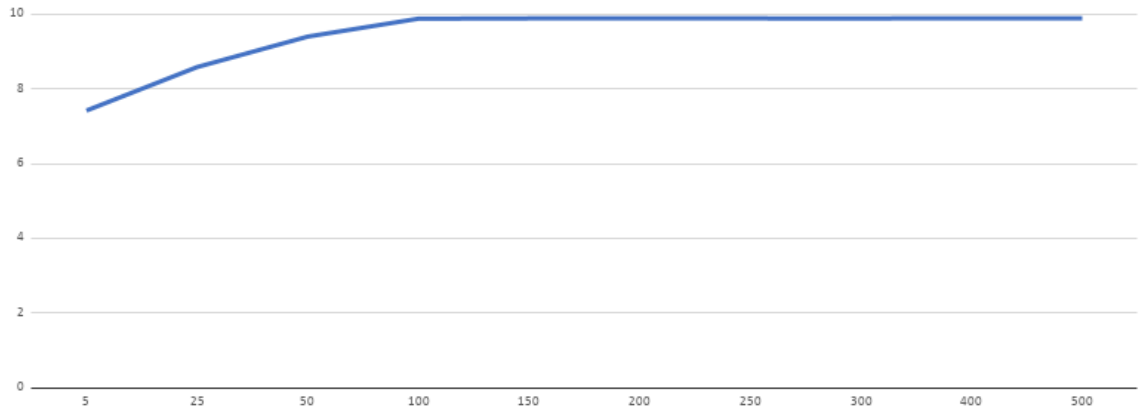


- TCP momentary throughput estimated of the base of cwnd and rtt:



Task 2

- TCP connection throughput as a function of buffer size on R1-R2 link:



The optimal buffer size is around 100

Results for lowest buffer:

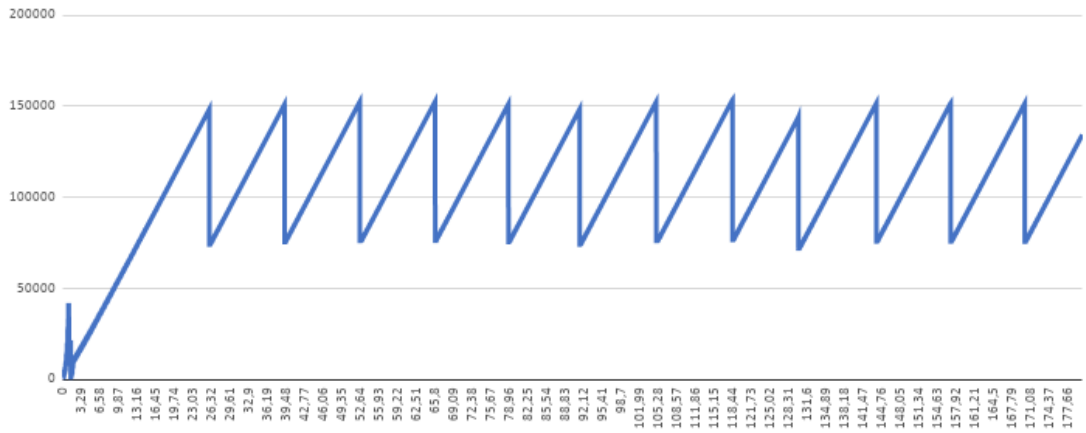
```
Simulation time      180
Initialization time  60
Active sources       [1 0 0 1]
TCP Windows          [5000 5000 5000]
Link delay           50ms
Link capacity        10Mb
Link buffer          5

TCP1 Average Throughput = 7.0699351111111106 [Mbps]
      Stable Throughput = 7.4960246687221836 [Mbps]
TCP2 Average Throughput = 0.0 [Mbps]
      Stable Throughput = 0.0 [Mbps]
TCP3 Average Throughput = 0.0 [Mbps]
      Stable Throughput = 0.0 [Mbps]
```

Results for the optimal buffer:

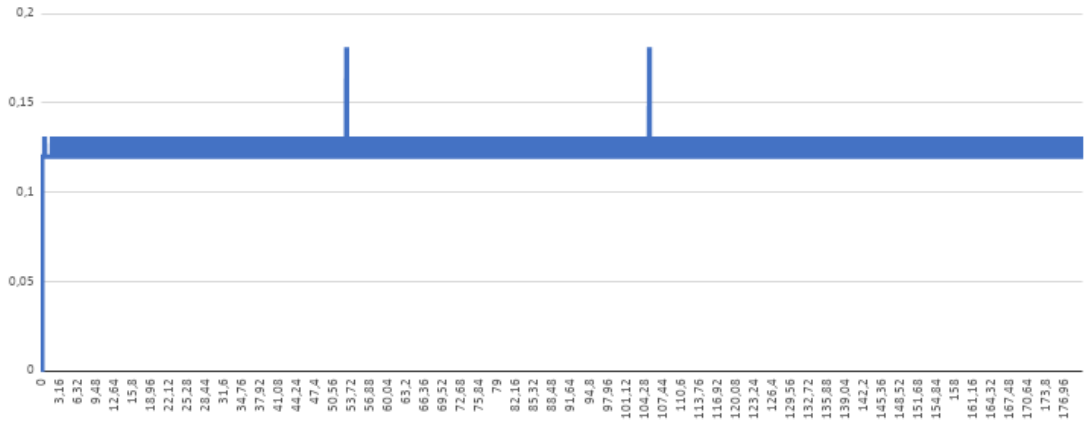
```
Simulation time      180
Initialization time  60
Active sources       [1 0 0 1]
TCP Windows          [5000 5000 5000]
Link delay           50ms
Link capacity        10Mb
Link buffer          100

TCP1 Average Throughput = 9.2020684444444445 [Mbps]
      Stable Throughput = 9.8729227435616878 [Mbps]
TCP2 Average Throughput = 0.0 [Mbps]
      Stable Throughput = 0.0 [Mbps]
TCP3 Average Throughput = 0.0 [Mbps]
      Stable Throughput = 0.0 [Mbps]
```

For the lowest buffer

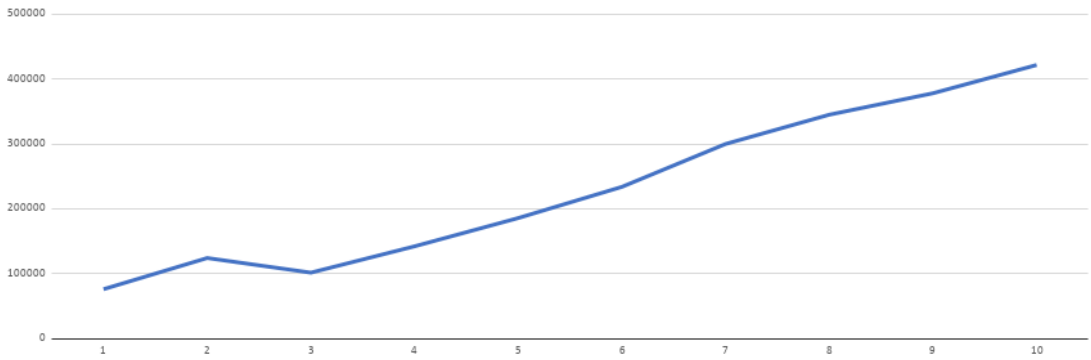
- cwnd size:



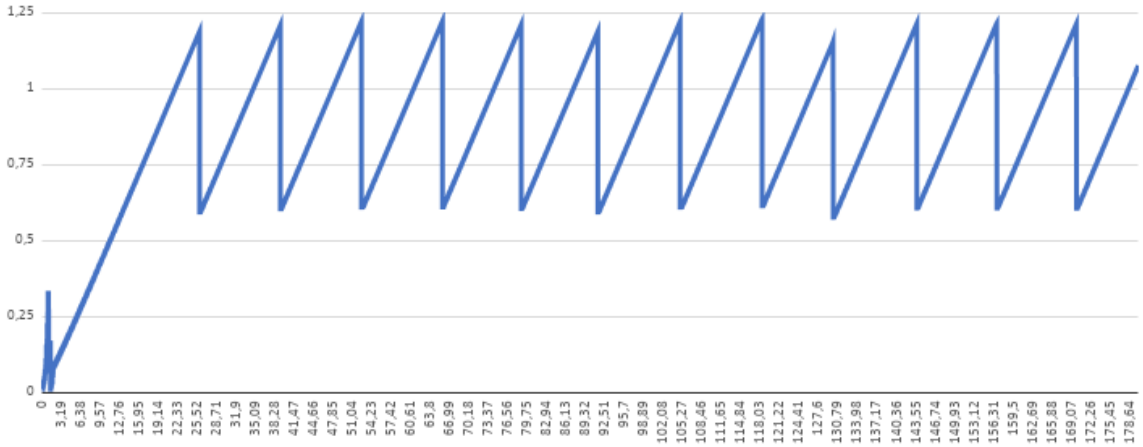
- rtt:



- TCP momentary throughput (calculated for 1s periods):

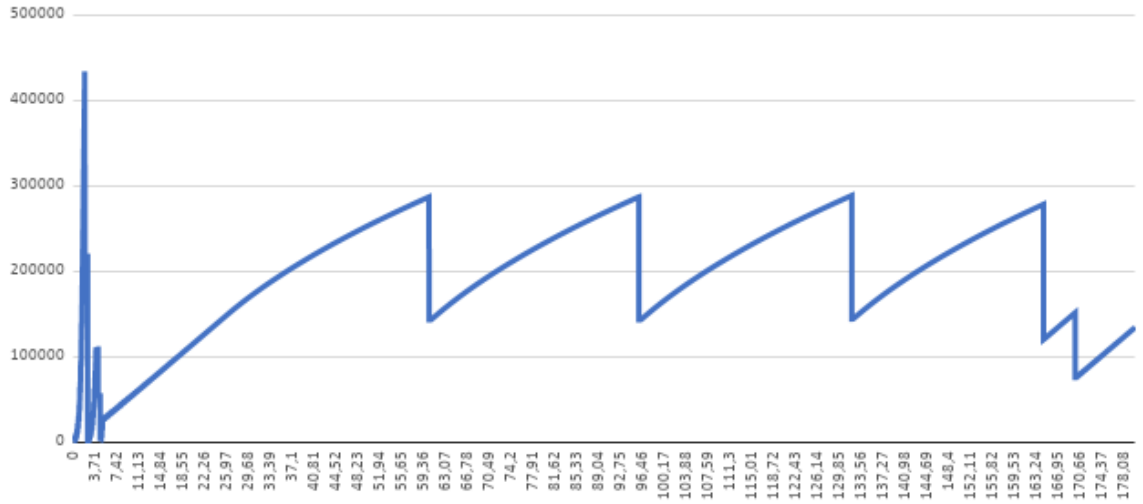


- TCP momentary throughput estimated of the base of cwnd and rtt:

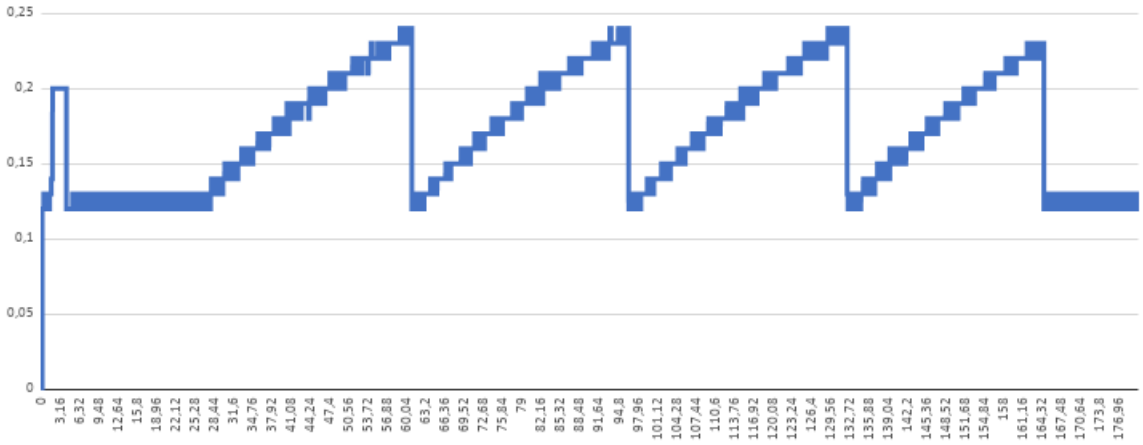


For the optimal buffer:

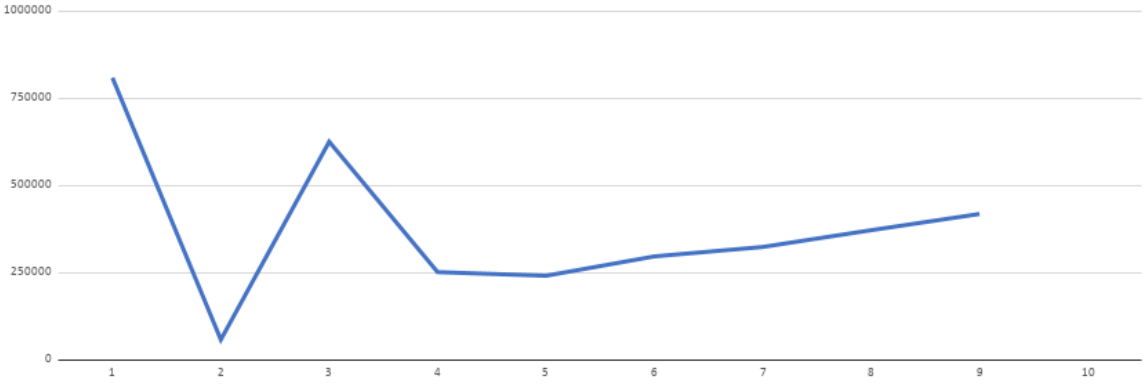
- cwnd size:



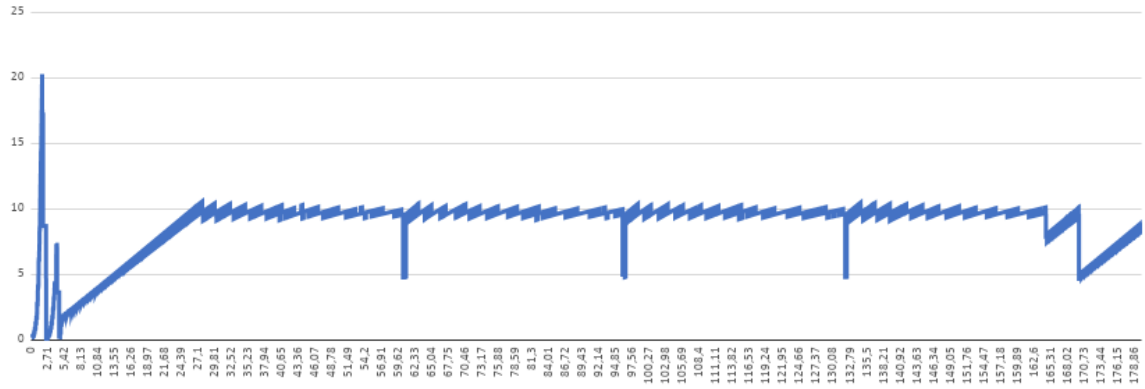
- rtt:



- TCP momentary throughput (calculated for 1s periods):

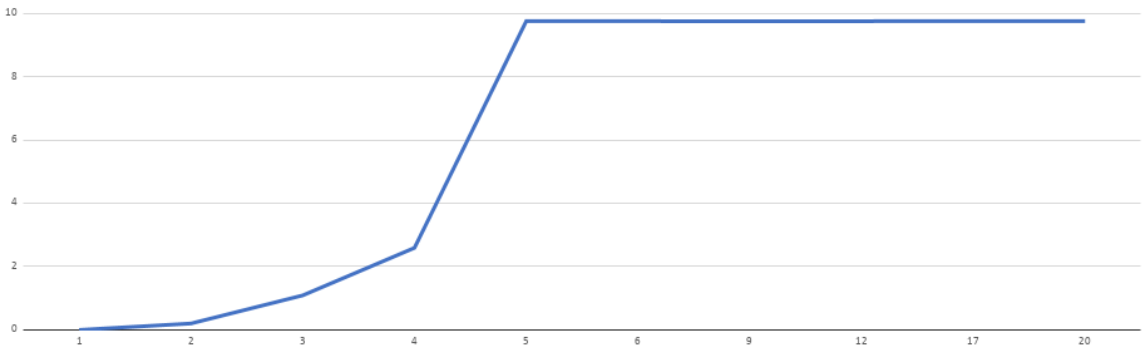


- TCP momentary throughput estimated of the base of cwnd and rtt:



Task 3:

- Throughput:




```
Simulation time      180
Initialization time  60
Active sources       [1 0 0 1]
TCP Windows          [100 5000 5000]
Link delay           50ms
Link capacity        10Mb
Link buffer          5

TCP1 Average Throughput = 8.8194684444444444 [Mbps]
      Stable Throughput = 9.751212601049815 [Mbps]
TCP2 Average Throughput = 0.0 [Mbps]
      Stable Throughput = 0.0 [Mbps]
TCP3 Average Throughput = 0.0 [Mbps]
      Stable Throughput = 0.0 [Mbps]
```

The results are different because with one hundred window size packets, the best buffer length is five. In the second task the window size was bigger so we needed a bigger buffer