PartA - Wireshark

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1 High level view of the analysis_pcap_tcp :

- Files : analysis_pcap_tcp.java and TCPDataPacket.java
- **TCPDataPacket** contains all the information about each packet such as source port, destination port, sequence number, destination number, flag on the packet, window, dataoffset, packetLength, payload, timestamp etc.
- **Working of analysis_pcap_tcp:**
  - Reads assignment2.pcap file, converts to byte array and iterates through all the packets to perform the following.
  - Sets the packet's information based on its position in the byte array.
  - It populates the sourceMap (source port with all the packets sent from the source), receiveMap(source port with all the packets received)
  - The start of the TCP flow is recognized by SYN(2) flag on the packet and the end of the TCP flow by FIN_ACK(17) and hence we get the number of flows.
  - For each flow, to get the data packets we loop through sent packets and received packets, to find a match between them by comparing source port of sent packet to destination port of received port and the acknowledge of the sent packet to sequence number of the received packet.
  - We print the first two matches for each follow.
  - For each flow, compute the throughout by looping through all the sent packets to get the sentpackets time and length.
    currentSentPacketsTime = currentSentPacketsTime / 1000; — convert to seconds
    currentSentPacketsLength = currentSentPacketsLength * 0.000008; — convert byte to mega bits

    Empirical Throughput = $\frac{currentSentPacketsLength}{currentSentPacketsTime}$ Mbits/sec

- For each flow, we computer the Loss rate on all the data packets:

  Loss $= \frac{Sent-Received}{Sent}$
- For each flow, calculate the average RTT on all data packets using the following:

  averageRTT = 0.875*averageRTT + 0.125*(receivedPacketTS-sentPacketTS)
- To calculate the theoretical throughput, the averageRTT and loss rate computed above are being used :

  TheoreticalTput $= \frac{1.22*1460*0.000008*1000}{averageRTT*\sqrt{}(lossRate)}$

2 analysis_pcap_tcp Program

Attached.

3 Answers

- **Total Number of flows** : 3
- **First two transactions of each flow**:
  TCP Flow 1 for 43502 :
  Transaction 1:
  Source : 43502 Destn: 80 Seq : 2558634654 Ack : 3429921723 Window size :3
  Source : 80 Destn : 43502 Seq : 3429921723 Ack : 2558634654 Window size :3
  Transaction 2 :
  Source : 43502 Destn : 80 Seq : 2558636102 Ack : 3429921723 Window size :3
  Source : 80 Destn : 43502 Seq : 3429921723 Ack : 2558636102 Window size :3
  TCP Flow 2 for 43500 :
  Transaction 1 :
  Source : 43500 Destn : 80 Seq : 3636173876 Ack : 2335809728 Window size :3
  Source : 80 Destn : 43500 Seq : 2335809728 Ack : 3636173876 Window size :3
  Transaction 2 :
  Source : 43500 Destn : 80 Seq : 3636175324 Ack : 2335809728 Window size :3
  Source : 80 Destn : 43500 Seq : 2335809728 Ack : 3636175324 Window size :3
  TCP Flow 3 for 43498:

Transaction 1 :
Source : 43498 Destn : 80 Seq : 705669127 Ack : 1921750144 Window size :3
Source : 80 Destn : 43498 Seq : 1921750144 Ack : 705669127 Window size :3
Transaction 2 :
Source : 43498 Destn : 80 Seq : 705670575 Ack : 1921750144 Window size :3
Source : 80 Destn : 43498 Seq : 1921750144 Ack : 705670575 Window size :3

- **Empirical Throughout**:
  - **TCP Flow 1 for 43502** : 11.856454054054053 Mb/s
  - **TCP Flow 2 for 43500** : 10.283823076923076 Mb/s
  - **TCP Flow 3 for 43498** : 42.0195104477612 Mb/s
- **Loss Rate**:
  - **TCP Flow 1 for 43502** : 0.3741403
  - **TCP Flow 2 for 43500** : 0.32564393
  - **TCP Flow 3 for 43498** : 0.40817204
- **Average RTT**:
  - **TCP Flow 1 for 43502** : 74.6703912554608 ms
  - **TCP Flow 2 for 43500** : 72.78796336326735 ms
  - **TCP Flow 3 for 43498** : 72.46018800501683 ms
- **Theoretical Throughout**:
  - **TCP Flow 1 for 43502** : 0.3119873648016483 Mb/s
  - **TCP Flow 2 for 43500** : 0.3430612092049741 Mb/s
  - **TCP Flow 3 for 43498** : 0.3078091958489019 Mb/s
- We observe that the theoretical throughput is lesser than empirical throughput as the empirical throughput considers only the sent packets whereas the theoretical throughout considers averageRTT and loss rate as well and would be dependent on these two factors. Lower these values higher would be the throughput.