ĐẠI HỌC QUỐC GIA THÀNH PHỐ HỒ CHÍ MINH
TRƯỜNG ĐẠI HỌC BÁCH KHOA
KHOA KHOA HỌC & KỸ THUẬT MÁY TÍNH

MẠNG MÁY TÍNH (CO3094)

Báo cáo Lab 2_3a: Wireshark Lab – TCP

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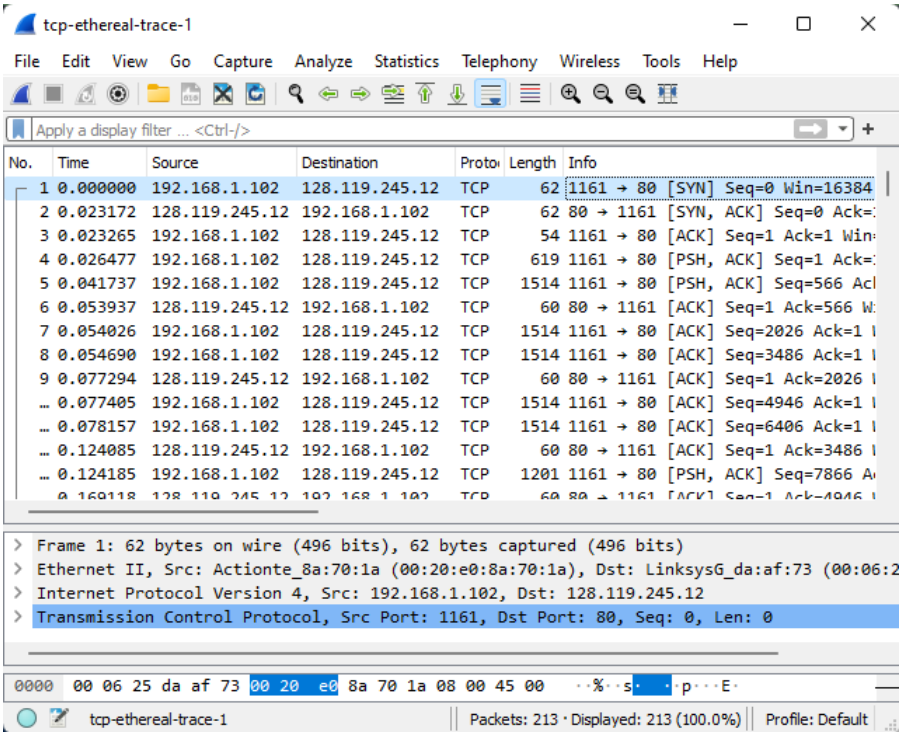
Tp. Hồ Chí Minh, Tháng 10/2021

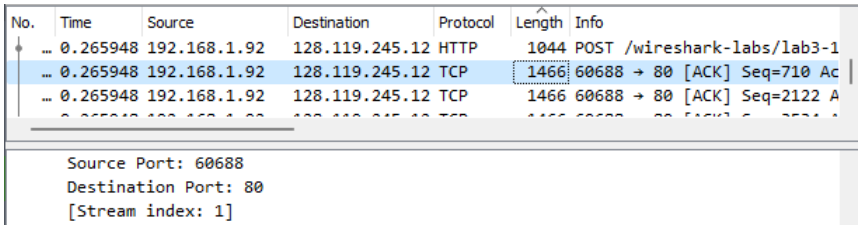
1 A first look at the captured trace

1. *What is the IP address and TCP port number used by the client computer (source) that is transferring the file to gaia.cs.umass.edu?*
   Answer:
   Client computer (source):
   IP address: 192.168.1.102
   TCP port number: 1161.

2. *What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection?*
   Answer:
   Destination computer: gaia.cs.umass.edu
   IP address: 128.119.245.12
   TCP port number: 80



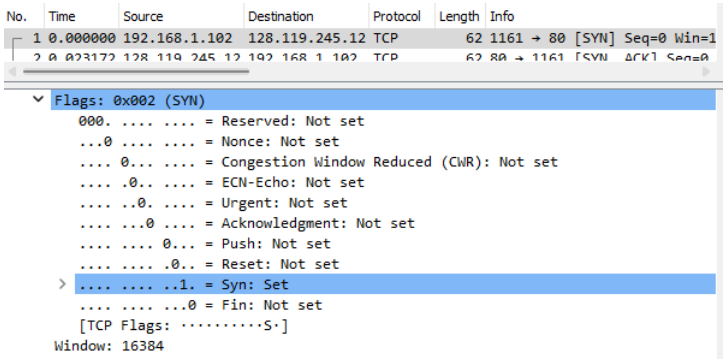
3. *What is the IP address and TCP port number used by your client computer (source) to transfer the file to gaia.cs.umass.edu?*
   Answer:
   My client computer (source):
   IP address: 192.168.1.91
   TCP port number: 60688



2 TCP basics

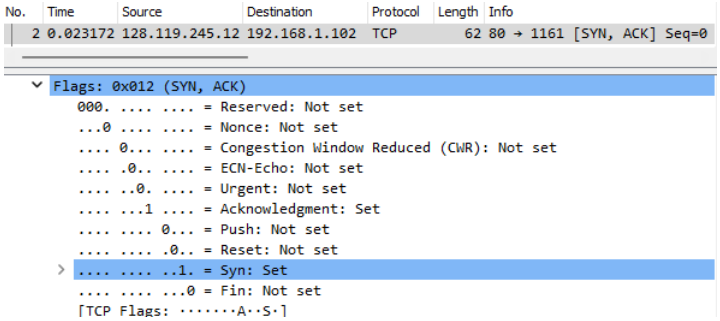
4. *What is the sequence number of the TCP SYN segment that is used to initiate theTCP connection between the client computer and gaia.cs.umass.edu? What is it in the segment that identifies the segment as a SYN segment?*
Answer:

   - Sequence number of the TCP SYN segment is used to initiate the TCP connection between the client computer and gaia.cs.umass.edu. The value is 0 in this trace.
   - The SYN flag is set to 1 and it indicates that this segment is a SYN segment.

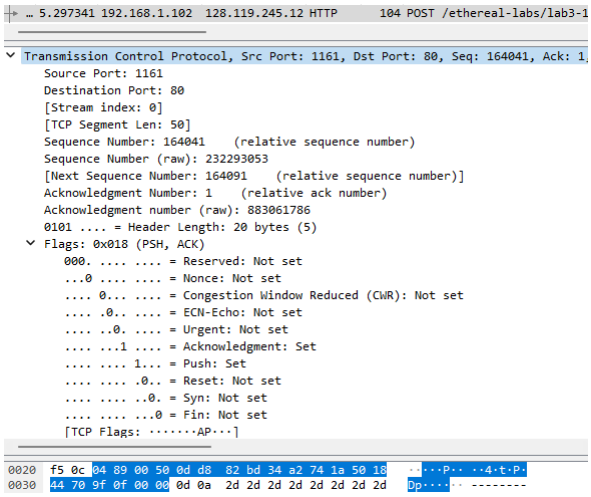


5. *What is the sequence number of the SYNACK segment sent by gaia.cs.umass.edu to the client computer in reply to the SYN? What is the value of the Acknowledgement field in the SYNACK segment? How did gaia.cs.umass.edu determine that value? What is it in the segment that identifies the segment as a SYNACK segment?*
Answer:

   - Sequence number of the SYNACK segment from gaia.cs.umass.edu to the client computer in reply to the SYN has the value of 0 in this trace.
   - The value of the ACKnowledgement field in the SYNACK segment is 1. The value of the ACKnowledgement field in the SYNACK segment is determined by gaia.cs.umass.edu by adding 1 to the initial sequence number of SYN segment from the client computer (i.e. the sequence number of the SYN segment initiated by the client computer is 0.).
   - The SYN flag and Acknowledgement flag in the segment are set to 1 and they indicate that this segment is a SYNACK segment.



6. *What is the sequence number of the TCP segment containing the HTTP POST command? Note that in order to find the POST command, you'll need to dig into the packet content field at the bottom of the Wireshark window, looking for a segment with a "POST" within its DATA field.*
Answer:
Sequence number: 164041
No. 4 segment is the TCP segment containing the HTTP POST command. The sequence number of this segment has the value of 1.



7. *Consider the TCP segment containing the HTTP POST as the first segment in theTCP connection. What are the sequence numbers of the first six segments in theTCP connection (including the segment containing the HTTP POST)? At what time was each segment sent? When was the ACK for each segment received? Given the difference between when each TCP segment was sent, and when its acknowledgement was received, what is the RTT value for each of the six segments? What is the EstimatedRTT value (see Section 3.5.3, page 242 in text) after the receipt of each ACK? Assume that the value of the EstimatedRTT is equal to the measured RTT for the first segment, and then is computed using the EstimatedRTT equation on page 242 for all subsequent segments.*
Answer:
The HTTP POST segment is considered as the first segment. Segments 1 – 2 are No. 199, 203 in this trace respectively. The ACKs of segments 1 – 3 are No. 200, 201, 202 in this trace.

Segment 1 sequence number: 164041
Segment 2 sequence number: 1

The sending time and the received time of ACKs are tabulated in the following table.

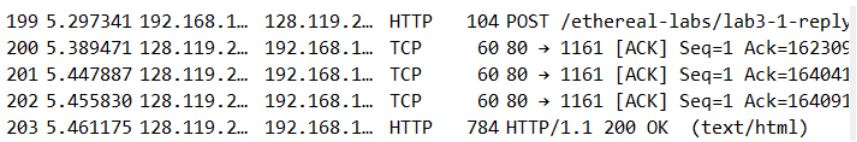
	Sent time	ACK received time	RTT (seconds)
Segment 1	5.297341	5.389471	0.09213
Segment 2	5.297341	5.447887	0.150546
Segment 3	5.297341	5.455830	0.158489

$$EstimatedRTT = 0.875 * EstimatedRTT + 0.125 * SampleRTT$$

EstimatedRTT after the receipt of the ACK of segment 1:
$EstimatedRTT = RTT\ for\ Segment\ 1 = 0.09213\ second$

EstimatedRTT after the receipt of the ACK of segment 2:
$EstimatedRTT = 0.875 * 0.09213 + 0.125 * 0.150546 = 0.09943$

EstimatedRTT after the receipt of the ACK of segment 3:
$EstimatedRTT = 0.875 * 0.09943 + 0.125 * 0.158489 = 0.10681$



8. *What is the length of each of the first six TCP segments?*
Answer:
First TCP segment: 163411 bytes

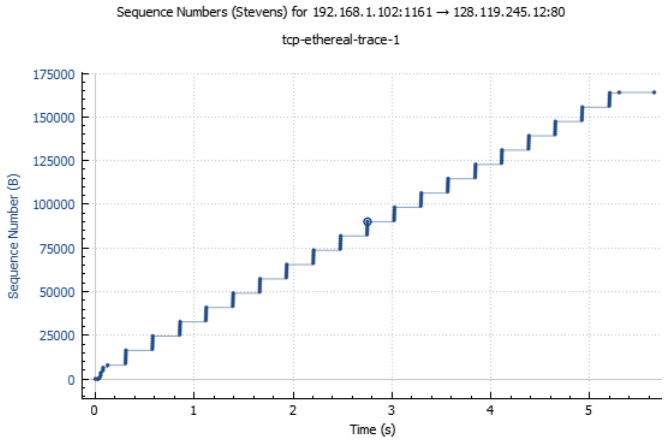
Second TCP segment: 416 bytes

```
199 5.297341 192.168.1…  128.119.2…  HTTP    104 POST /ethereal-labs/lab3-1-r
[HTTP request 1/1]
[Response in frame: 203]
File Data: 163411 bytes
203 5.461175 128.119.2…  192.168.1…  HTTP    784 HTTP/1.1 200 OK  (text/h
[Request in frame: 199]
[Request URI: http://gaia.cs.umass.edu/ethereal-labs/lab3-1-reply.htm]
File Data: 416 bytes
```

9. *What is the minimum amount of available buffer space advertised at the received for the entire trace? Does the lack of receiver buffer space ever throttle the sender?*
Answer:
The minimum amount of buffer space (receiver window) advertised at gaia.cs.umass.edu for the entire trace is 5840 bytes, which shows in the first acknowledgement from the server. This receiver window grows steadily until a maximum receiver buffer size of 62780 bytes. The sender is never throttled due to lacking of receiver buffer space by inspecting this trace.

```
125 3.291672 128.119.2…  192.168.1…  TCP      60 80 → 1161 [ACK] Seq=1 Ack=99125 Win=62780 Len=0
  2 0.023172 128.119.2…  192.168.1…  TCP      62 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0
```

10. *Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?*
Answer:
There are no retransmitted segments in the trace file. We can verify this by checking the sequence numbers of the TCP segments in the trace file. In the TimeSequence-Graph (Stevens) of this trace, all sequence numbers from the source (192.168.1.102) to the destination (128.119.245.12) are increasing monotonically with respect to time. If there is a retransmitted segment, the sequence number of this retransmitted segment should be smaller than those of its neighboring segments.

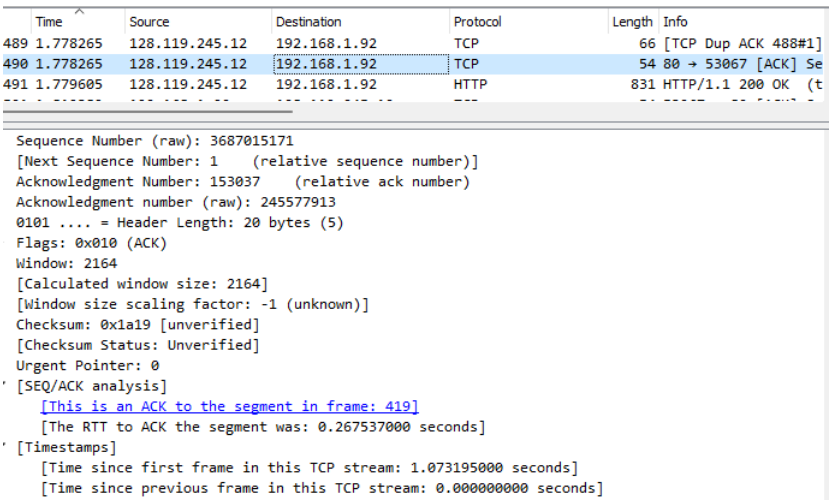


11. *How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment (see Table 3.2 on page 250 in the text).*
Answer:

12. *What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value.*
Answer:

The computation of TCP throughput largely depends on the selection of averaging time period. As a common throughput computation, in this question, we select the average time period as the whole connection time. Then, the average throughput for this TCP connection is computed as the ratio

between the total amount data and the total transmission time. The total amount data transmitted can be computed by the difference between the sequence number of the first TCP segment (1) and the acknowledged sequence number of the last ACK (153037). Therefore, the total data are 153037 - 1 = 153036 bytes. The whole transmission time is 1.073195. Hence, the throughput for the TCP connection is computed as 153036/1.073195 = 142.599 KByte/sec



Note: Em bị mắc lỗi nên phải capture lại. Nên số liệu khác so với những phần trên. Vì làm trong thời gian có hạn nên mắc nhiều sai sót. Em xin lỗi thầy, mong thầy châm chước ạ.

3 TCP congestion control in action

13. *Use the Time-Sequence-Graph(Stevens) plotting tool to view the sequence number versus time plot of segments being sent from the client to the gaia.cs.umass.edu server. Can you identify where TCP's slowstart phase begins and ends, and where congestion avoidance takes over? Comment on ways in which the measured data differs from the idealized behavior of TCP that we've studied in the text.*
Answer:

14. *Answer each of two questions above for the trace that you have gathered when you transferred a file from your computer to gaia.cs.umass.edu*
Answer: