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CS6843 - Computer Networking
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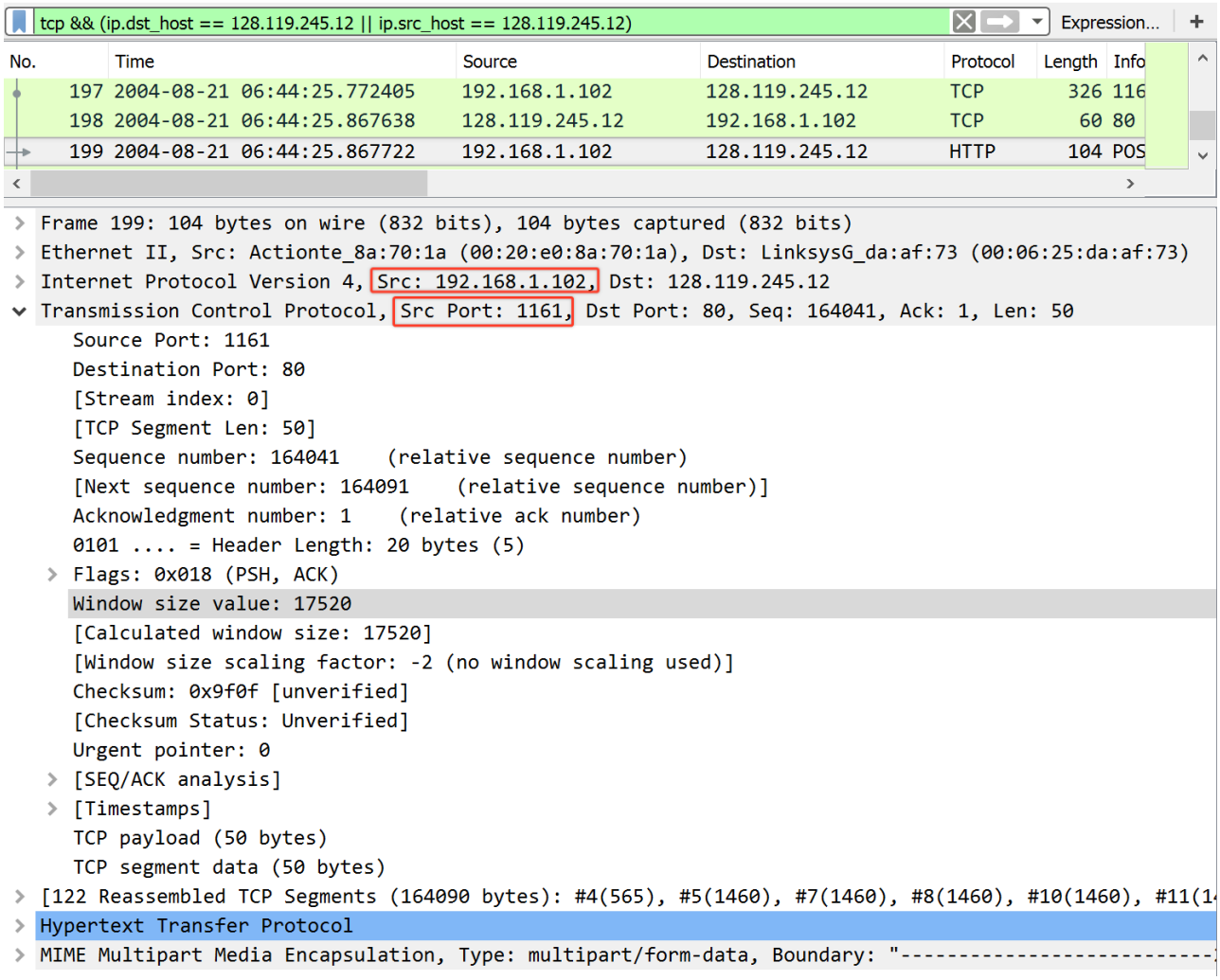
Wireshark Lab - TCP

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? To answer this question, it's probably easiest to select an HTTP message and explore the details of the TCP packet used to carry this HTTP message, using the "details of the selected packet header window" (refer to Figure 2 in the "Getting Started with Wireshark" Lab if you're uncertain about the Wireshark windows.

   Source IP: `192.168.1.102`

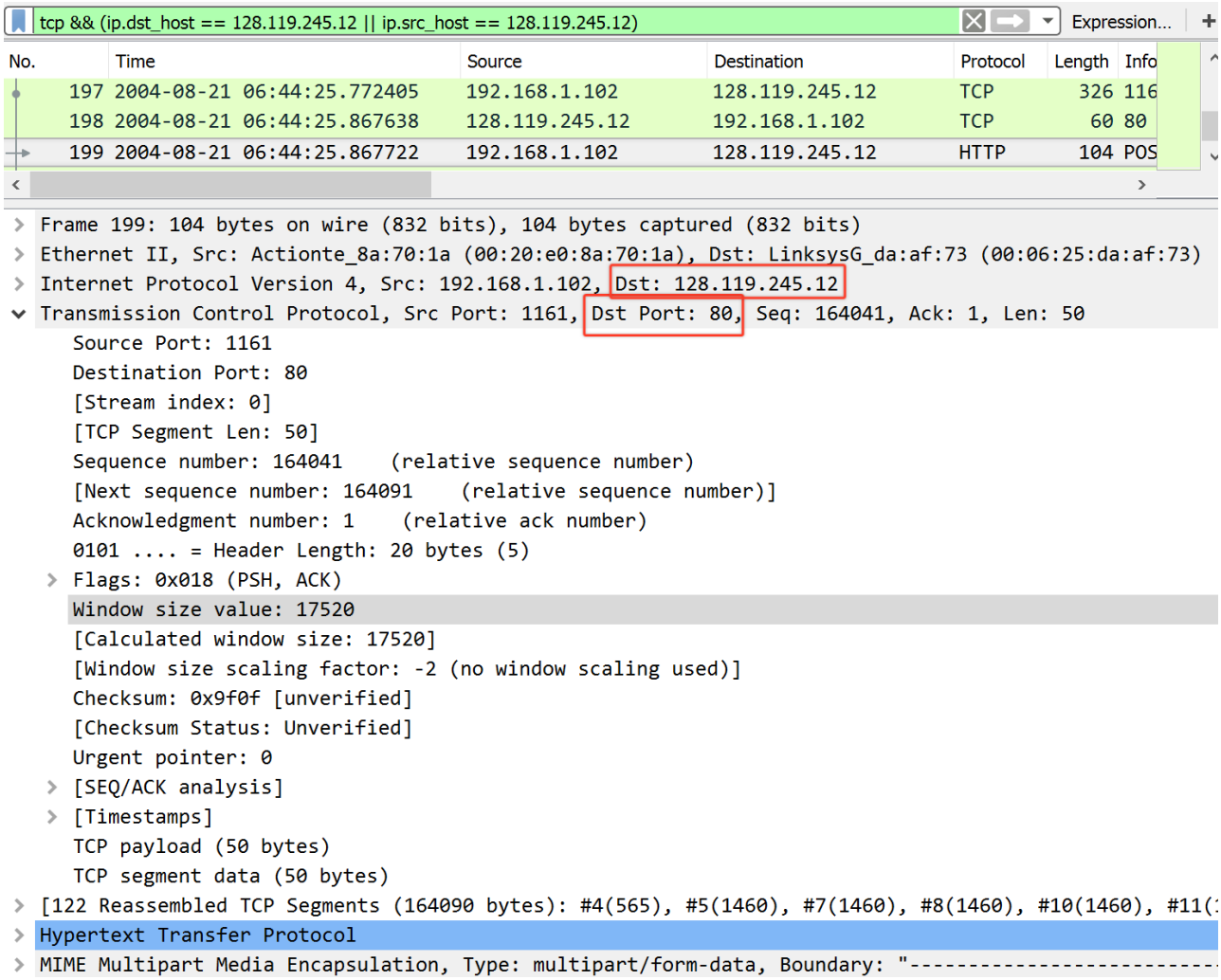
   Source Port: `1161`



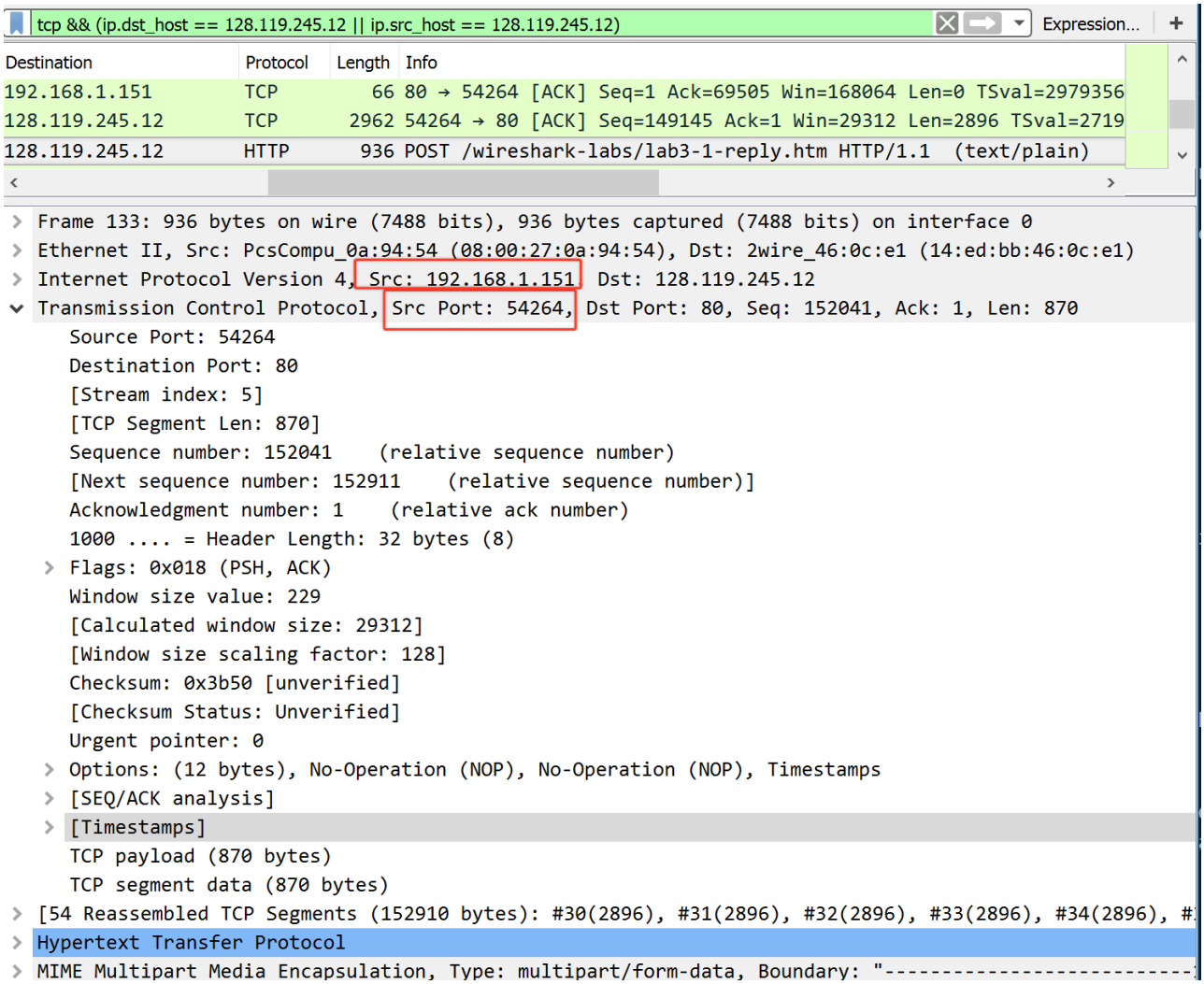
2. What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection?

   Destination IP: `128.119.245.12`

Destination Port: 80



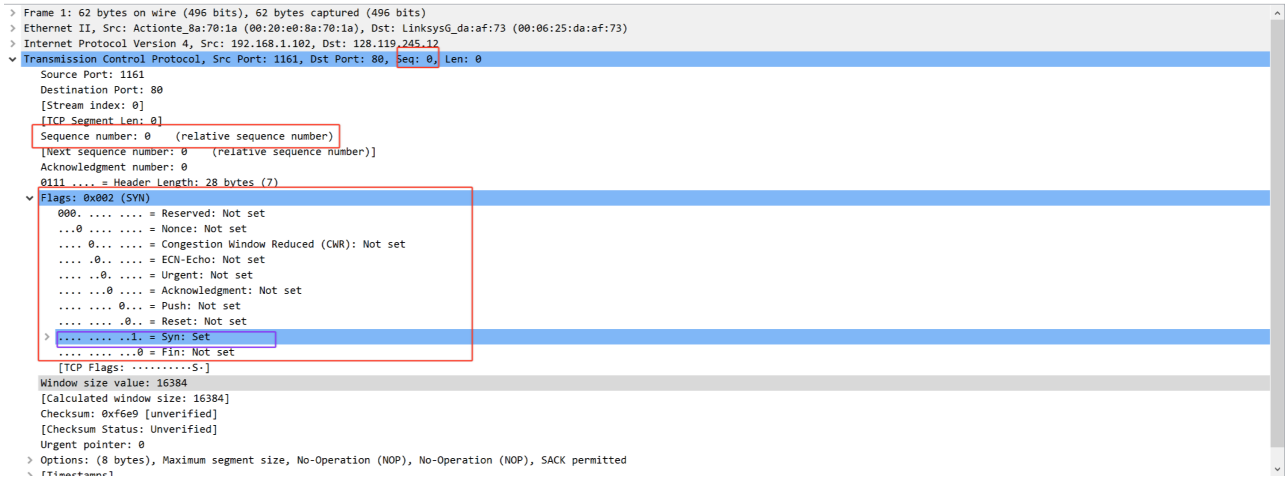
3. What is the IP address and TCP port number used by your client computer (source) to transfer the file to gaia.cs.umass.edu? Source IP: 192.168.1.151 Source Port: 54264



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

   Sequence Number: 0

   The SYN flag is the only flag set in the TCP packet, identifying it as a SYN packet.



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 Acknowledgementfield 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? Sequence Number: 0

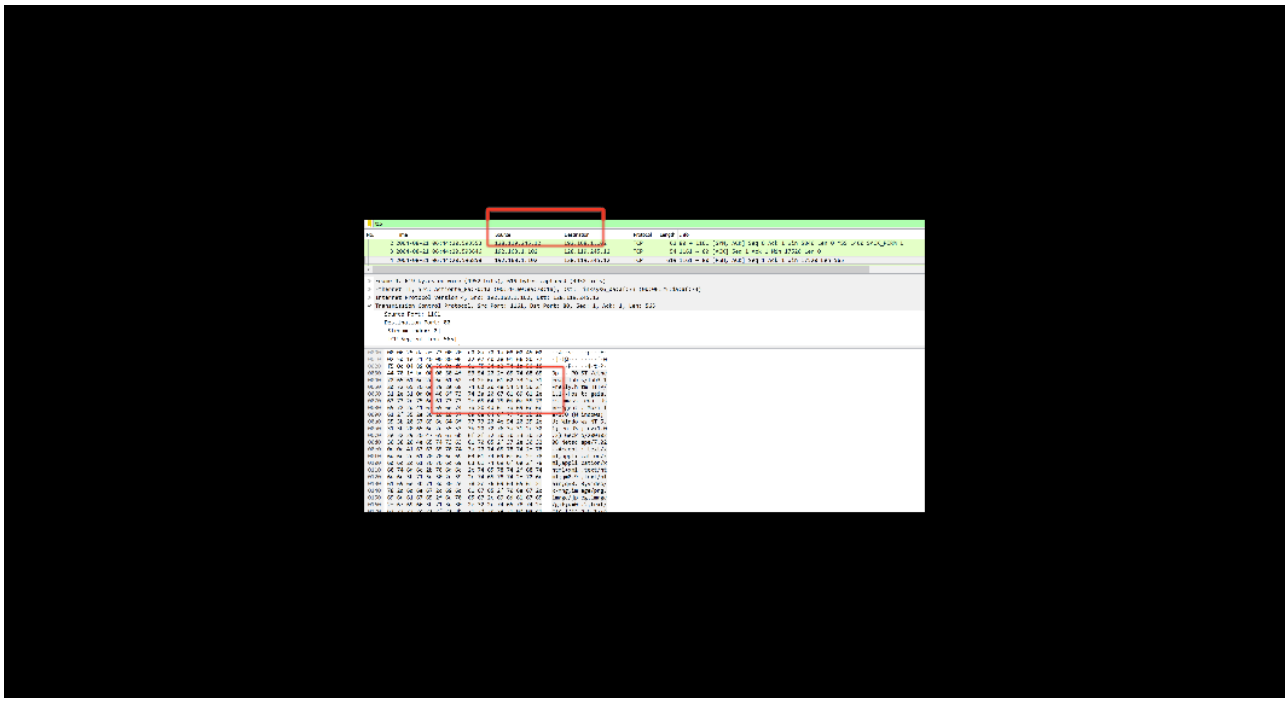
   The value of the ACK field in the SYNACK segment is 1. This is determined by adding 1 to the original sequence number of the SYN segment on the server. Both the SYN and ACK flags are set to 1, marking

the segment as a SYNACK segment.

```
tcp && (ip.dst_host == 128.119.245.12 || ip.src_host == 128.119.245.12)
No.  Time                        Source          Destination     Protocol  Length  Info
     1 2004-08-21 06:44:20.570381 192.168.1.102   128.119.245.12  TCP         62 1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1
     2 2004-08-21 06:44:20.593553 128.119.245.12  192.168.1.102   TCP         62 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS=1460 SACK_PERM=1
     3 2004-08-21 06:44:20.593646 192.168.1.102   128.119.245.12  TCP         54 1161 → 80 [ACK] Seq=1 Ack=1 Win=17520 Len=0

> Frame 2: 62 bytes on wire (496 bits), 62 bytes captured (496 bits)
> Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.102
v Transmission Control Protocol, Src Port: 80, Dst Port: 1161, Seq: 0, Ack: 1, Len: 0
    Source Port: 80
    Destination Port: 1161
    [Stream index: 0]
    [TCP Segment Len: 0]
    Sequence number: 0    (relative sequence number)
    [Next sequence number: 0    (relative sequence number)]
    Acknowledgment number: 1    (relative ack number)
    0111 .... = Header Length: 28 bytes (7)
  v Flags: 0x012 (SYN, ACK)
      000. .... .... = Reserved: Not set
      ...0 .... .... = Nonce: Not set
      .... 0... .... = Congestion Window Reduced (CWR): Not set
      .... .0.. .... = ECN-Echo: Not set
      .... ..0. .... = Urgent: Not set
      .... ...1 .... = Acknowledgment: Set
      .... .... 0... = Push: Not set
      .... .... .0.. = Reset: Not set
    > .... .... ..1. = Syn: Set
      .... .... ...0 = Fin: Not set
      [TCP Flags: ·····A··S·]
    Window size value: 5840
    [Calculated window size: 5840]
    Checksum: 0x774d [unverified]
    [Checksum Status: Unverified]
    Urgent pointer: 0
  > Options: (8 bytes), Maximum segment size, No-Operation (NOP), No-Operation (NOP), SACK permitted
  > [SEQ/ACK analysis]
```

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.
   Sequence Number: 1



7. Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection. What are the sequence numbers of the first six segments in the TCP 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 EstimatedRTTvalue (see Section 3.5.3, page 242 in text) after the receipt of each ACK? Assume that the value of the EstimatedRTTis equal to the measured RTT for the first segment, and then is computed using the EstimatedRTTequation on page 242 for all subsequent segments.Note:Wireshark has a nice

feature that allows you to plot the RTT for each of the TCP segments sent. Select a TCP segment in the "listing of captured packets" window that is being sent from the client to the gaia.cs.umass.edu server. Then select: Statistics->TCP Stream Graph->Round Trip Time Graph.
|| `Sequence Number` | Sent Time | `ACK` Received | `RTT` | `EstimatedRTT` ||---|---|---|---|---|---|||||||||||||||||||||

8. What is the length of each of the first six TCP segments?
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?
10. Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?
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).
12. What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value
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.
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