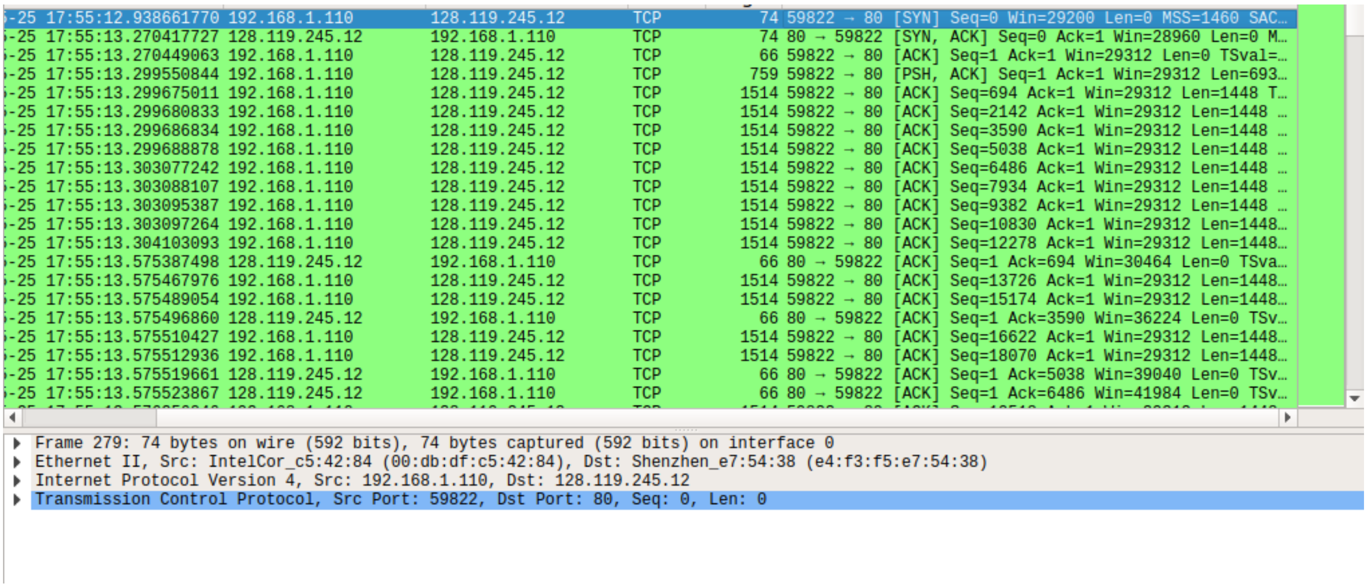
Wireshark Lab: TCP v7.0

1. Capturing a bulk TCP transfer from your computer to a remote server

获得 TCP 消息如下：



```
-25 17:55:12.938661770 192.168.1.110     128.119.245.12    TCP      74 59822 → 80 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SAC…
-25 17:55:13.270417727 128.119.245.12    192.168.1.110     TCP      74 80 → 59822 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 M…
-25 17:55:13.270449063 192.168.1.110     128.119.245.12    TCP      66 59822 → 80 [ACK] Seq=1 Ack=1 Win=29312 Len=0 TSval=…
-25 17:55:13.299550844 192.168.1.110     128.119.245.12    TCP     759 59822 → 80 [PSH, ACK] Seq=1 Ack=1 Win=29312 Len=693…
-25 17:55:13.299675011 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=694 Ack=1 Win=29312 Len=1448 T…
-25 17:55:13.299680833 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=2142 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.299686834 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=3590 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.299688878 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=5038 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303077242 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=6486 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303088107 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=7934 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303095387 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=9382 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303097264 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=10830 Ack=1 Win=29312 Len=1448…
-25 17:55:13.304103093 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=12278 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575387498 128.119.245.12    192.168.1.110     TCP      66 80 → 59822 [ACK] Seq=1 Ack=694 Win=30464 Len=0 TSva…
-25 17:55:13.575467976 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=13726 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575489054 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=15174 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575496860 128.119.245.12    192.168.1.110     TCP      66 80 → 59822 [ACK] Seq=1 Ack=3590 Win=36224 Len=0 TSv…
-25 17:55:13.575510427 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=16622 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575512936 192.168.1.110     128.119.245.12    TCP    1514 59822 → 80 [ACK] Seq=18070 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575519661 128.119.245.12    192.168.1.110     TCP      66 80 → 59822 [ACK] Seq=1 Ack=5038 Win=39040 Len=0 TSv…
-25 17:55:13.575523867 128.119.245.12    192.168.1.110     TCP      66 80 → 59822 [ACK] Seq=1 Ack=6486 Win=41984 Len=0 TSv…

▸ Frame 279: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0
▸ Ethernet II, Src: IntelCor_c5:42:84 (00:db:df:c5:42:84), Dst: Shenzhen_e7:54:38 (e4:f3:f5:e7:54:38)
▸ Internet Protocol Version 4, Src: 192.168.1.110, Dst: 128.119.245.12
▸ Transmission Control Protocol, Src Port: 59822, Dst Port: 80, Seq: 0, Len: 0
```

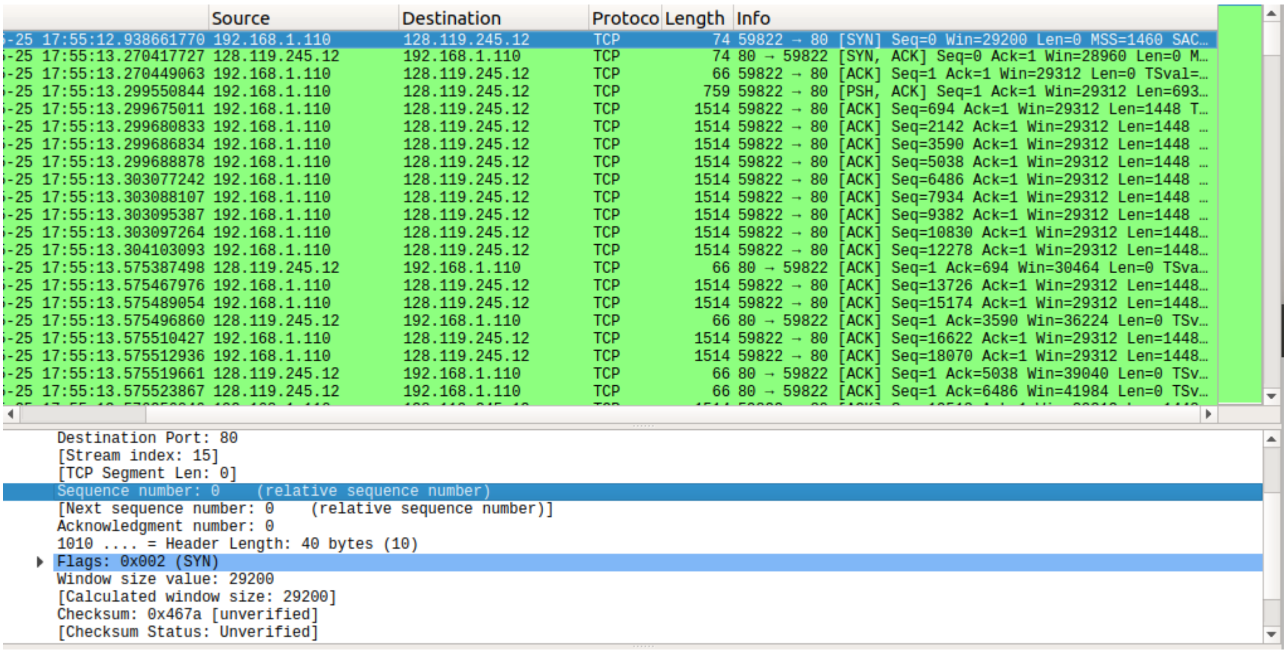
2. A first look at the captured trace

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? 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. IP address: 192.168.1.110; TCP port number: 59822
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? 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?
   IP address: 192.168.1.110; TCP port number: 59822

3. TCP Basics

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 is 0, but it is a relative sequence number. See the

following picture. SYN segment 是用来 TCP 建立连接，开始握手。



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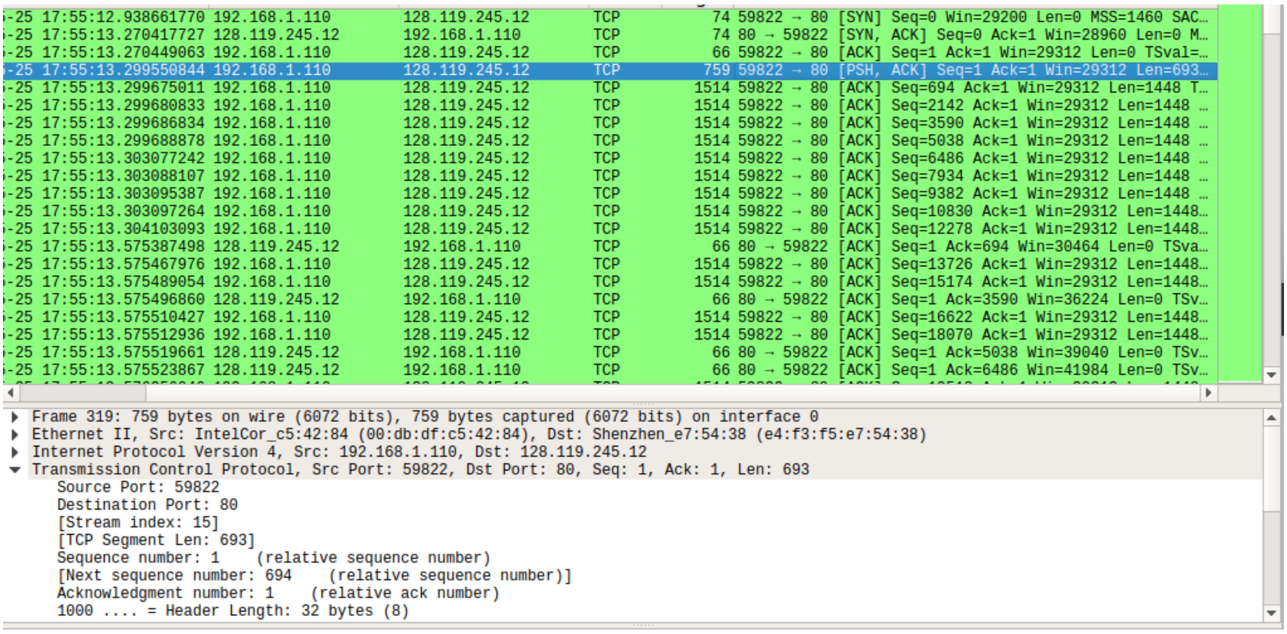
                          Source          Destination     Protoco Length Info
-25 17:55:12.938661770 192.168.1.110   128.119.245.12  TCP       74 59822 → 80 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SAC…
-25 17:55:13.270417727 128.119.245.12  192.168.1.110   TCP       74 80 → 59822 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 M…
-25 17:55:13.270449063 192.168.1.110   128.119.245.12  TCP       66 59822 → 80 [ACK] Seq=1 Ack=1 Win=29312 Len=0 TSval=…
-25 17:55:13.299550844 192.168.1.110   128.119.245.12  TCP      759 59822 → 80 [PSH, ACK] Seq=1 Ack=1 Win=29312 Len=693…
-25 17:55:13.299675011 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=694 Ack=1 Win=29312 Len=1448 T…
-25 17:55:13.299680833 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=2142 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.299686834 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=3590 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.299688878 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=5038 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303077242 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=6486 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303088107 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=7934 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303095387 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=9382 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303097264 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=10830 Ack=1 Win=29312 Len=1448…
-25 17:55:13.304103093 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=12278 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575387498 128.119.245.12  192.168.1.110   TCP       66 80 → 59822 [ACK] Seq=1 Ack=694 Win=30464 Len=0 TSva…
-25 17:55:13.575467976 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=13726 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575489054 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=15174 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575496860 128.119.245.12  192.168.1.110   TCP       66 80 → 59822 [ACK] Seq=1 Ack=3590 Win=36224 Len=0 TSv…
-25 17:55:13.575510427 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=16622 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575512936 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=18070 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575519661 128.119.245.12  192.168.1.110   TCP       66 80 → 59822 [ACK] Seq=1 Ack=5038 Win=39040 Len=0 TSv…
-25 17:55:13.575523867 128.119.245.12  192.168.1.110   TCP       66 80 → 59822 [ACK] Seq=1 Ack=6486 Win=41984 Len=0 TSv…

        Destination Port: 80
        [Stream index: 15]
        [TCP Segment Len: 0]
        Sequence number: 0    (relative sequence number)
        [Next sequence number: 0    (relative sequence number)]
        Acknowledgment number: 0
        1010 .... = Header Length: 40 bytes (10)
      ▸ Flags: 0x002 (SYN)
        Window size value: 29200
        [Calculated window size: 29200]
        Checksum: 0x467a [unverified]
        [Checksum Status: Unverified]
```

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? Sequence number is 0, and ACK number is 1, 这个值是表示它所期待的包的序列号。SYNACK 是三次握手的第二次握手，表明 SYN 已顺利接收，有助于二者 TCP 建立连接。
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. 序列号为1，见下图：



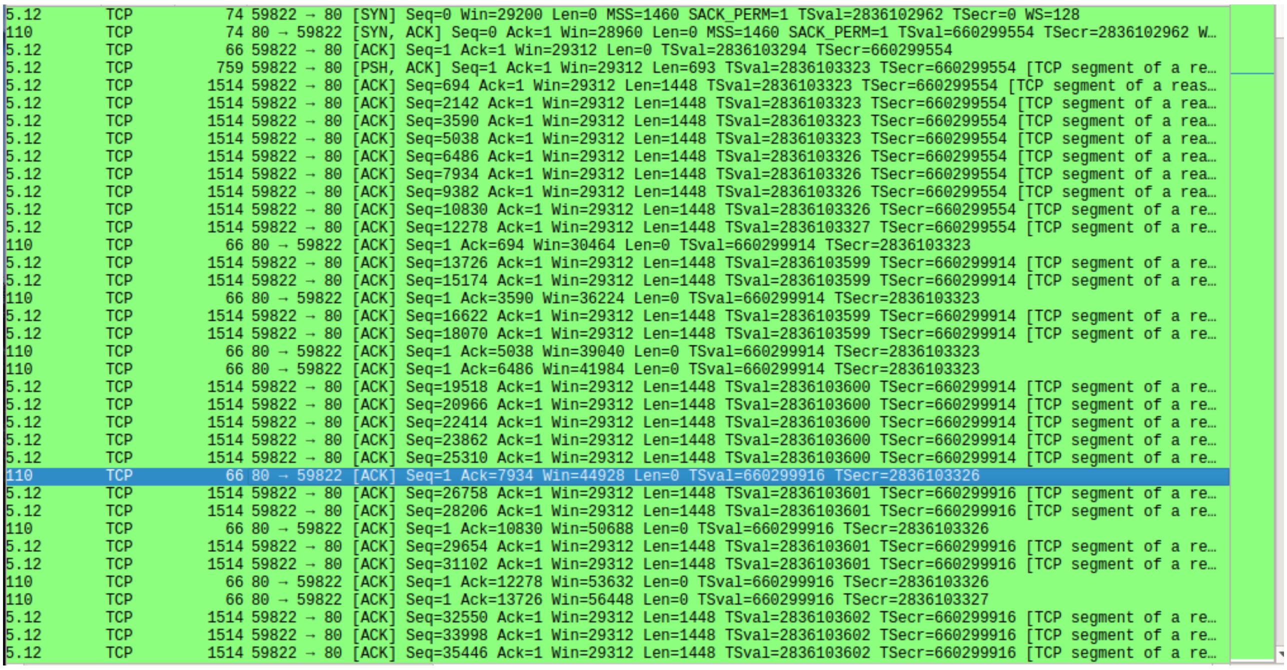
```
-25 17:55:12.938661770 192.168.1.110   128.119.245.12  TCP       74 59822 → 80 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SAC…
-25 17:55:13.270417727 128.119.245.12  192.168.1.110   TCP       74 80 → 59822 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 M…
-25 17:55:13.270449063 192.168.1.110   128.119.245.12  TCP       66 59822 → 80 [ACK] Seq=1 Ack=1 Win=29312 Len=0 TSval=…
-25 17:55:13.299550844 192.168.1.110   128.119.245.12  TCP      759 59822 → 80 [PSH, ACK] Seq=1 Ack=1 Win=29312 Len=693…
-25 17:55:13.299675011 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=694 Ack=1 Win=29312 Len=1448 T…
-25 17:55:13.299680833 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=2142 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.299686834 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=3590 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.299688878 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=5038 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303077242 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=6486 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303088107 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=7934 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303095387 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=9382 Ack=1 Win=29312 Len=1448 …
-25 17:55:13.303097264 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=10830 Ack=1 Win=29312 Len=1448…
-25 17:55:13.304103093 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=12278 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575387498 128.119.245.12  192.168.1.110   TCP       66 80 → 59822 [ACK] Seq=1 Ack=694 Win=30464 Len=0 TSva…
-25 17:55:13.575467976 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=13726 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575489054 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=15174 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575496860 128.119.245.12  192.168.1.110   TCP       66 80 → 59822 [ACK] Seq=1 Ack=3590 Win=36224 Len=0 TSv…
-25 17:55:13.575510427 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=16622 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575512936 192.168.1.110   128.119.245.12  TCP     1514 59822 → 80 [ACK] Seq=18070 Ack=1 Win=29312 Len=1448…
-25 17:55:13.575519661 128.119.245.12  192.168.1.110   TCP       66 80 → 59822 [ACK] Seq=1 Ack=5038 Win=39040 Len=0 TSv…
-25 17:55:13.575523867 128.119.245.12  192.168.1.110   TCP       66 80 → 59822 [ACK] Seq=1 Ack=6486 Win=41984 Len=0 TSv…

 ▸ Frame 319: 759 bytes on wire (6072 bits), 759 bytes captured (6072 bits) on interface 0
 ▸ Ethernet II, Src: IntelCor_c5:42:84 (00:db:df:c5:42:84), Dst: Shenzhen_e7:54:38 (e4:f3:f5:e7:54:38)
 ▸ Internet Protocol Version 4, Src: 192.168.1.110, Dst: 128.119.245.12
 ▾ Transmission Control Protocol, Src Port: 59822, Dst Port: 80, Seq: 1, Ack: 1, Len: 693
     Source Port: 59822
     Destination Port: 80
     [Stream index: 15]
     [TCP Segment Len: 693]
     Sequence number: 1    (relative sequence number)
     [Next sequence number: 694    (relative sequence number)]
     Acknowledgment number: 1    (relative ack number)
     1000 .... = Header Length: 32 bytes (8)
```

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 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.

- 第一次： 序列号：1；发送时间：2019/5/25 17:55:13.299550844；ACK接收时间：17:55:13.575387；RTT：0.275836654s；EstimatedRTT：0.275836654s。
- 第二次： 序列号：694；发送时间：2019/5/25 17:55:13.299675011；ACK接收时间：未检测到；RTT：-；EstimatedRTT：0.275836654s。
- 第三次： 序列号：2142；发送时间：2019/5/25 17:55:13.299680833；ACK接收时间：17:55:13.575497；RTT：0.275816027s；EstimatedRTT：0.2758340756s。
- 第四次： 序列号：3590；发送时间：2019/5/25 17:55:13.299686834；ACK接收时间：17:55:13.575520；RTT：0.275832827s；EstimatedRTT：0.2758339195s。
- 第五次： 序列号：5038；发送时间：2019/5/25 17:55:13.299688878；ACK接收时间：17:55:13.575524；RTT：0.275834989s；EstimatedRTT：0.2758340532s。
- 第六次： 序列号：6486；发送时间：2019/5/25 17:55:13.303077242；ACK接收时间：17:55:13.577849；RTT：0.274772166s；EstimatedRTT：0.2757013173s。

8. What is the length of each of the first six TCP segments? 分别为693、1448、1448、1448、1448、1448 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? 如下图所示，最短为28960 Bytes，看样子非常充足。



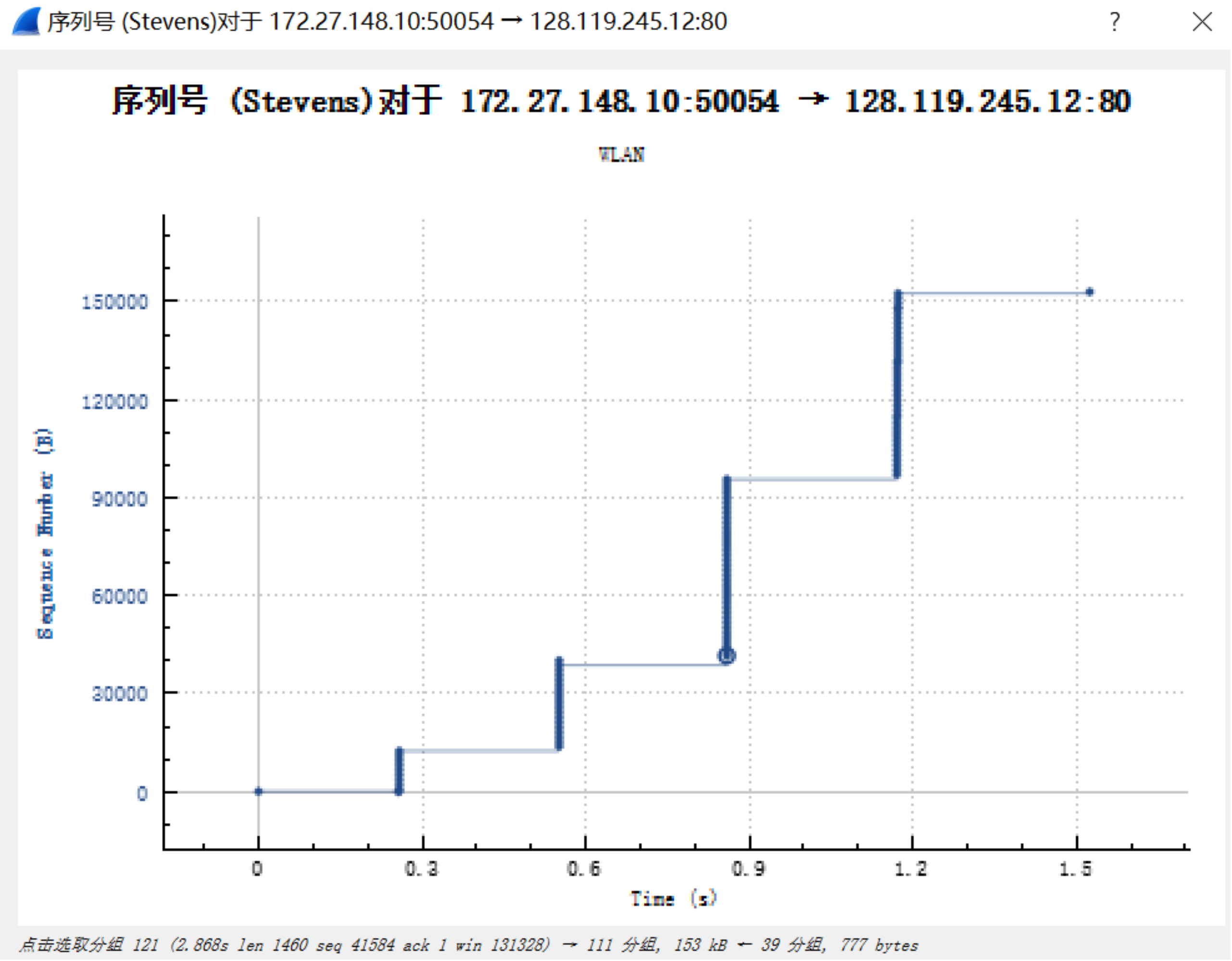
```
5.12        TCP        74 59822 → 80 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=2836102962 TSecr=0 WS=128
110         TCP        74 80 → 59822 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK_PERM=1 TSval=660299554 TSecr=2836102962 W…
5.12        TCP        66 59822 → 80 [ACK] Seq=1 Ack=1 Win=29312 Len=0 TSval=2836103294 TSecr=660299554
5.12        TCP       759 59822 → 80 [PSH, ACK] Seq=1 Ack=1 Win=29312 Len=693 TSval=2836103323 TSecr=660299554 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=694 Ack=1 Win=29312 Len=1448 TSval=2836103323 TSecr=660299554 [TCP segment of a reas…
5.12        TCP      1514 59822 → 80 [ACK] Seq=2142 Ack=1 Win=29312 Len=1448 TSval=2836103323 TSecr=660299554 [TCP segment of a rea…
5.12        TCP      1514 59822 → 80 [ACK] Seq=3590 Ack=1 Win=29312 Len=1448 TSval=2836103323 TSecr=660299554 [TCP segment of a rea…
5.12        TCP      1514 59822 → 80 [ACK] Seq=5038 Ack=1 Win=29312 Len=1448 TSval=2836103323 TSecr=660299554 [TCP segment of a rea…
5.12        TCP      1514 59822 → 80 [ACK] Seq=6486 Ack=1 Win=29312 Len=1448 TSval=2836103326 TSecr=660299554 [TCP segment of a rea…
5.12        TCP      1514 59822 → 80 [ACK] Seq=7934 Ack=1 Win=29312 Len=1448 TSval=2836103326 TSecr=660299554 [TCP segment of a rea…
5.12        TCP      1514 59822 → 80 [ACK] Seq=9382 Ack=1 Win=29312 Len=1448 TSval=2836103326 TSecr=660299554 [TCP segment of a rea…
5.12        TCP      1514 59822 → 80 [ACK] Seq=10830 Ack=1 Win=29312 Len=1448 TSval=2836103326 TSecr=660299554 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=12278 Ack=1 Win=29312 Len=1448 TSval=2836103327 TSecr=660299554 [TCP segment of a re…
110         TCP        66 80 → 59822 [ACK] Seq=1 Ack=694 Win=30464 Len=0 TSval=660299914 TSecr=2836103323
5.12        TCP      1514 59822 → 80 [ACK] Seq=13726 Ack=1 Win=29312 Len=1448 TSval=2836103599 TSecr=660299914 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=15174 Ack=1 Win=29312 Len=1448 TSval=2836103599 TSecr=660299914 [TCP segment of a re…
110         TCP        66 80 → 59822 [ACK] Seq=1 Ack=3590 Win=36224 Len=0 TSval=660299914 TSecr=2836103323
5.12        TCP      1514 59822 → 80 [ACK] Seq=16622 Ack=1 Win=29312 Len=1448 TSval=2836103599 TSecr=660299914 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=18070 Ack=1 Win=29312 Len=1448 TSval=2836103599 TSecr=660299914 [TCP segment of a re…
110         TCP        66 80 → 59822 [ACK] Seq=1 Ack=5038 Win=39040 Len=0 TSval=660299914 TSecr=2836103323
110         TCP        66 80 → 59822 [ACK] Seq=1 Ack=6486 Win=41984 Len=0 TSval=660299914 TSecr=2836103323
5.12        TCP      1514 59822 → 80 [ACK] Seq=19518 Ack=1 Win=29312 Len=1448 TSval=2836103600 TSecr=660299914 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=20966 Ack=1 Win=29312 Len=1448 TSval=2836103600 TSecr=660299914 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=22414 Ack=1 Win=29312 Len=1448 TSval=2836103600 TSecr=660299914 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=23862 Ack=1 Win=29312 Len=1448 TSval=2836103600 TSecr=660299914 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=25310 Ack=1 Win=29312 Len=1448 TSval=2836103600 TSecr=660299914 [TCP segment of a re…
110         TCP        66 80 → 59822 [ACK] Seq=1 Ack=7934 Win=44928 Len=0 TSval=660299916 TSecr=2836103326
5.12        TCP      1514 59822 → 80 [ACK] Seq=26758 Ack=1 Win=29312 Len=1448 TSval=2836103601 TSecr=660299916 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=28206 Ack=1 Win=29312 Len=1448 TSval=2836103601 TSecr=660299916 [TCP segment of a re…
110         TCP        66 80 → 59822 [ACK] Seq=1 Ack=10830 Win=50688 Len=0 TSval=660299916 TSecr=2836103326
5.12        TCP      1514 59822 → 80 [ACK] Seq=29654 Ack=1 Win=29312 Len=1448 TSval=2836103601 TSecr=660299916 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=31102 Ack=1 Win=29312 Len=1448 TSval=2836103601 TSecr=660299916 [TCP segment of a re…
110         TCP        66 80 → 59822 [ACK] Seq=1 Ack=12278 Win=53632 Len=0 TSval=660299916 TSecr=2836103326
110         TCP        66 80 → 59822 [ACK] Seq=1 Ack=13726 Win=56448 Len=0 TSval=660299916 TSecr=2836103327
5.12        TCP      1514 59822 → 80 [ACK] Seq=32550 Ack=1 Win=29312 Len=1448 TSval=2836103602 TSecr=660299916 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=33998 Ack=1 Win=29312 Len=1448 TSval=2836103602 TSecr=660299916 [TCP segment of a re…
5.12        TCP      1514 59822 → 80 [ACK] Seq=35446 Ack=1 Win=29312 Len=1448 TSval=2836103602 TSecr=660299916 [TCP segment of a re…
```

10. Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question? 没有。通过查看有没有重复的序列号。
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). 看起来至少是2个包，因为 7) 小问找不到第二个包的ACK。
12. What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value.

4. 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. 没有

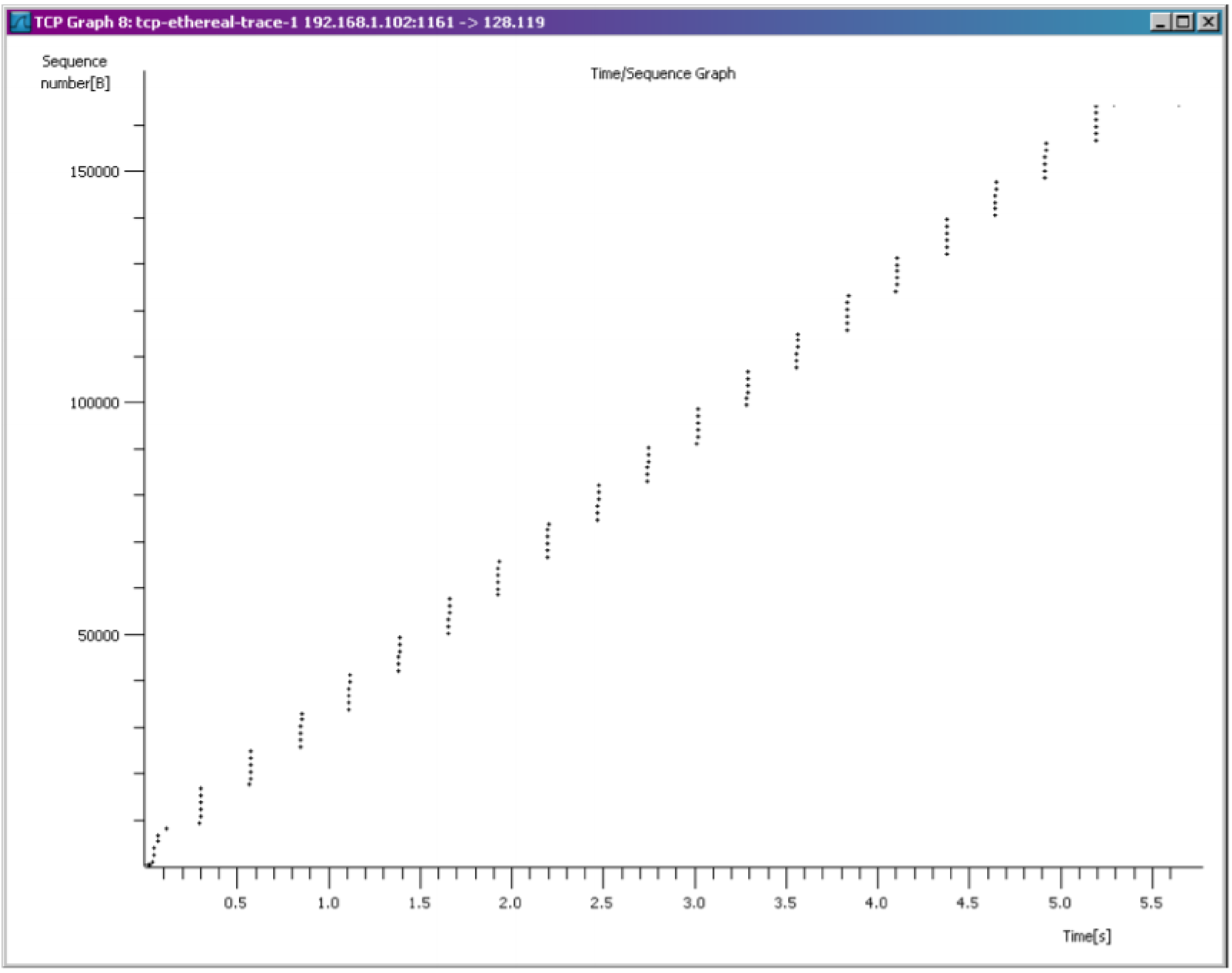
看到题目中的效果，如下图：（重新使用 TCP，包与之前不同）



序列号 (Stevens)对于 172.27.148.10:50054 → 128.119.245.12:80

点击选取分组 121 (2.868s len 1460 seq 41584 ack 1 win 131328) → 111 分組, 153 kB ← 39 分組, 777 bytes

所以下面使用题目图来分析：



可以看到一开始指数形式为慢启动过程，0.3s之后线性增加为拥塞控制机制。