LAB4

牛庆源 PB21111733

- **1.and2.**

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.102	128.119.245.12	TCP	62	1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SAC
2	0.023172	128.119.245.12	192.168.1.102	TCP	62	80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MS
3	0.023265	192.168.1.102	128.119.245.12	TCP	54	1161 → 80 [ACK] Seq=1 Ack=1 Win=17520 Len=0
4	0.026477	192.168.1.102	128.119.245.12	TCP	619	1161 → 80 [PSH, ACK] Seq=1 Ack=1 Win=17520 Len=565
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [PSH, ACK] Seq=566 Ack=1 Win=17520 Len=1
6	0.053937	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0
7	0.054026	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460
8	0.054690	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460
9	0.077294	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=2026 Win=8760 Len=0
10	0.077405	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=4946 Ack=1 Win=17520 Len=1460
11	0.078157	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=6406 Ack=1 Win=17520 Len=1460
12	0.124085	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0

1.将文件传输到gaia.cs.umass.edu的客户端ip地址为192.168.1.102，端口号为1161

2.gaia.cs.umass.edu的IP地址是128.119.245.12，端口号为80

- **3.**

No.	Time	Source	Destination	Protocol	Length	Info
381	12.970158	128.119.245.12	202.141.190.132	TCP	60	80 → 64146 [ACK] Seq=1 Ack=18268 Win=65792 Len=0
382	12.970158	128.119.245.12	202.141.190.132	TCP	60	80 → 64146 [ACK] Seq=1 Ack=24108 Win=77440 Len=0
383	12.970158	128.119.245.12	202.141.190.132	TCP	60	80 → 64146 [ACK] Seq=1 Ack=34328 Win=97920 Len=0
384	12.970158	128.119.245.12	202.141.190.132	TCP	60	80 → 64146 [ACK] Seq=1 Ack=31408 Win=92032 Len=0
385	12.970226	202.141.190.132	128.119.245.12	TCP	1514	64146 → 80 [ACK] Seq=47468 Ack=1 Win=131328 Len=1460 [TCP segment of a reassembl…
386	12.970226	202.141.190.132	128.119.245.12	TCP	1514	64146 → 80 [PSH, ACK] Seq=48928 Ack=1 Win=131328 Len=1460 [TCP segment of a reas…
387	12.970226	202.141.190.132	128.119.245.12	TCP	1514	64146 → 80 [ACK] Seq=50388 Ack=1 Win=131328 Len=1460 [TCP segment of a reassembl…
388	12.970226	202.141.190.132	128.119.245.12	TCP	1514	64146 → 80 [ACK] Seq=51848 Ack=1 Win=131328 Len=1460 [TCP segment of a reassembl…
389	12.970226	202.141.190.132	128.119.245.12	TCP	1514	64146 → 80 [ACK] Seq=53308 Ack=1 Win=131328 Len=1460 [TCP segment of a reassembl…
390	12.970226	202.141.190.132	128.119.245.12	TCP	1514	64146 → 80 [ACK] Seq=54768 Ack=1 Win=131328 Len=1460 [TCP segment of a reassembl…
391	12.970226	202.141.190.132	128.119.245.12	TCP	1514	64146 → 80 [ACK] Seq=56228 Ack=1 Win=131328 Len=1460 [TCP segment of a reassembl…
392	12.970226	202.141.190.132	128.119.245.12	TCP	1514	64146 → 80 [ACK] Seq=57688 Ack=1 Win=131328 Len=1460 [TCP segment of a reassembl…
393	12.970226	202.141.190.132	128.119.245.12	TCP	1514	64146 → 80 [ACK] Seq=59148 Ack=1 Win=131328 Len=1460 [TCP segment of a reassembl…

本机客户端ip地址为202.141.190.132，端口号为64146

- **4.and5.**

330	12.344860	202.141.190.132	128.119.245.12	TCP	66	64148 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM
331	12.364554	128.119.245.12	202.141.190.132	TCP	66	80 → 64146 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM WS=128

```
> Flags: 0x002 (SYN)
```

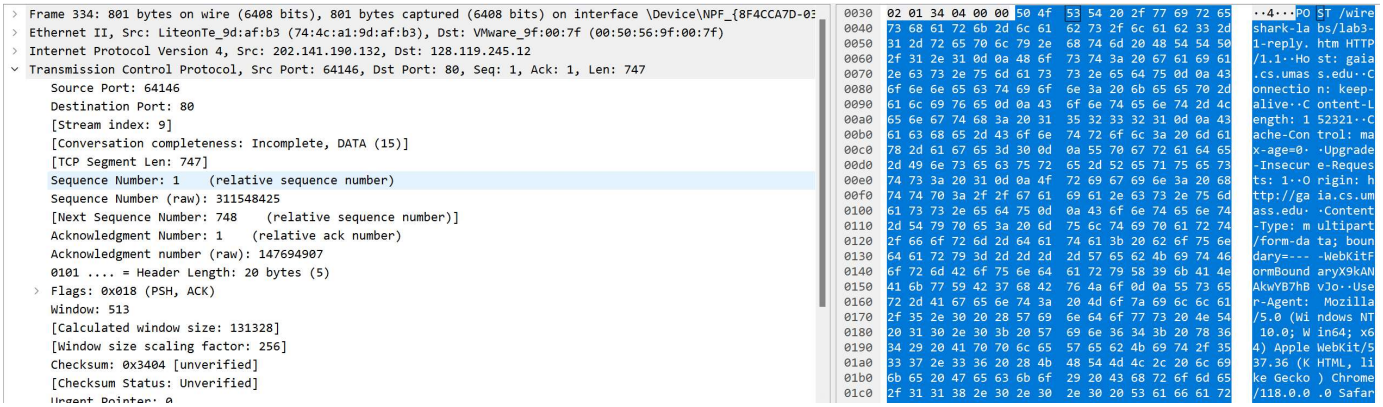
4.TCP SYN段序号为0（由seq=0可得），在flags标识SYN段

```
Acknowledgment Number: 1    (relative ack number)
```

```
Flags: 0x012 (SYN, ACK)
    000. .... .... = Reserved: Not set
    ...0 .... .... = Accurate ECN: Not set
    .... 0... .... = Congestion Window Reduced: 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·]
```

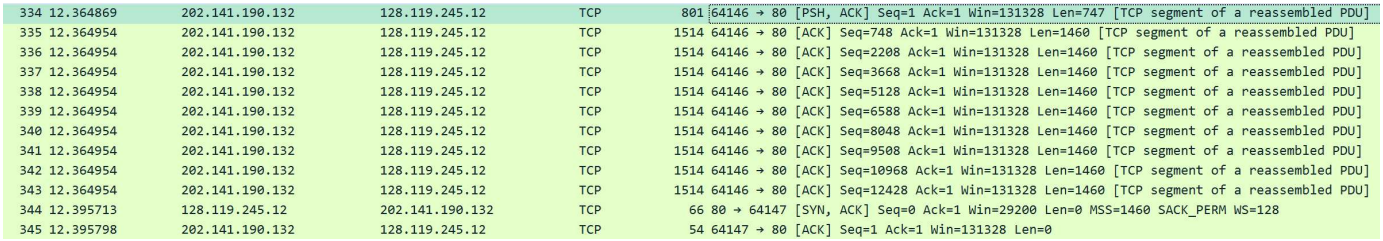
5.SYN,ACK段序列号为0（由seq=0可得），ACK为1，flags标识该段

- **6.**



post存在于PSH,ACK段，其序列号为1（seq=1）

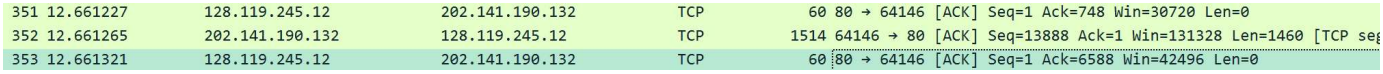
- **7.**



前6个段的序列号为1 748 2208 3668 5128 6588，

分段1在12.364869s发送，

剩下五个分段在12.364954s并发发送



收到了两个ACK分别为748和6588，分别为第二段和第六段的序列号，即第一段和第五段返回的ACK，收到的时间分别为12.661227s和12.661321s，

依据时间差计算得到第一段和第五段的RTT分别为0.296358s和0.296367s

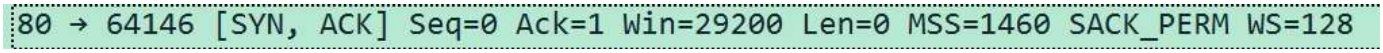
第一段的EstimatedRTT1 = SampleRTT1 = 0.296358s

第五段的EstimatedRTT5 = 0.875 * EstimatedRTT1 + 0.125 * SampleRTT5 = 0.296359s

- **8.**

由题7图可知第一段为747bytes，剩下都为1460bytes

- **9.**



the minimum amount of available buffer space 是 29200bytes（win）

由题八答可知最大为1460bytes不超过29200bytes所以没有限制

- **10.**

```
341 12.364954   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=9508 Ack=1 Win=131328 Len=1460 [
342 12.364954   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=10968 Ack=1 Win=131328 Len=1460
343 12.364954   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=12428 Ack=1 Win=131328 Len=1460
344 12.395713   128.119.245.12    202.141.190.132   TCP     66 80 → 64147 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS
345 12.395798   202.141.190.132   128.119.245.12    TCP     54 64147 → 80 [ACK] Seq=1 Ack=1 Win=131328 Len=0
346 12.402099   128.119.245.12    202.141.190.132   TCP     60 80 → 64137 [FIN, ACK] Seq=778 Ack=153070 Win=244608 L
347 12.402123   202.141.190.132   128.119.245.12    TCP     54 [TCP Dup ACK 96#1] 64137 → 80 [ACK] Seq=153070 Ack=1
349 12.642135   128.119.245.12    202.141.190.132   TCP     66 80 → 64148 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS
350 12.642230   202.141.190.132   128.119.245.12    TCP     54 64148 → 80 [ACK] Seq=1 Ack=1 Win=131328 Len=0
351 12.661227   128.119.245.12    202.141.190.132   TCP     60 80 → 64146 [ACK] Seq=1 Ack=748 Win=30720 Len=0
352 12.661265   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=13888 Ack=1 Win=131328 Len=1460
353 12.661321   128.119.245.12    202.141.190.132   TCP     60 80 → 64146 [ACK] Seq=1 Ack=6588 Win=42496 Len=0
354 12.661321   128.119.245.12    202.141.190.132   TCP     60 80 → 64146 [ACK] Seq=1 Ack=13888 Win=57088 Len=0
355 12.661360   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=15348 Ack=1 Win=131328 Len=1460
356 12.661360   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [PSH, ACK] Seq=16808 Ack=1 Win=131328 Len=
357 12.661360   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=18268 Ack=1 Win=131328 Len=1460
358 12.661360   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=19728 Ack=1 Win=131328 Len=1460
359 12.661360   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=21188 Ack=1 Win=131328 Len=1460
360 12.661360   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=22648 Ack=1 Win=131328 Len=1460
361 12.661360   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=24108 Ack=1 Win=131328 Len=1460
362 12.661360   202.141.190.132   128.119.245.12    TCP   1514 64146 → 80 [ACK] Seq=25568 Ack=1 Win=131328 Len=1460
```

由标记的内容可知seq是在不断增大的（由12.364954s到12.661265s到12.661360s时，seq仍然在一直增大），因此没有重传

- **11.**

```
66 80 → 64146 [ACK] Seq=1 Ack=64988 Win=162176 Len=0 SLE=82508 SRE=83255
66 80 → 64146 [ACK] Seq=1 Ack=66448 Win=165120 Len=0 SLE=82508 SRE=83255
66 80 → 64146 [ACK] Seq=1 Ack=72288 Win=176768 Len=0 SLE=82508 SRE=83255
66 80 → 64146 [ACK] Seq=1 Ack=79588 Win=178432 Len=0 SLE=82508 SRE=83255
60 80 → 64146 [ACK] Seq=1 Ack=83255 Win=181632 Len=0
60 80 → 64146 [ACK] Seq=1 Ack=90555 Win=179584 Len=0
60 80 → 64146 [ACK] Seq=1 Ack=97855 Win=179584 Len=0
```

Ack差为1460bytes的整数倍

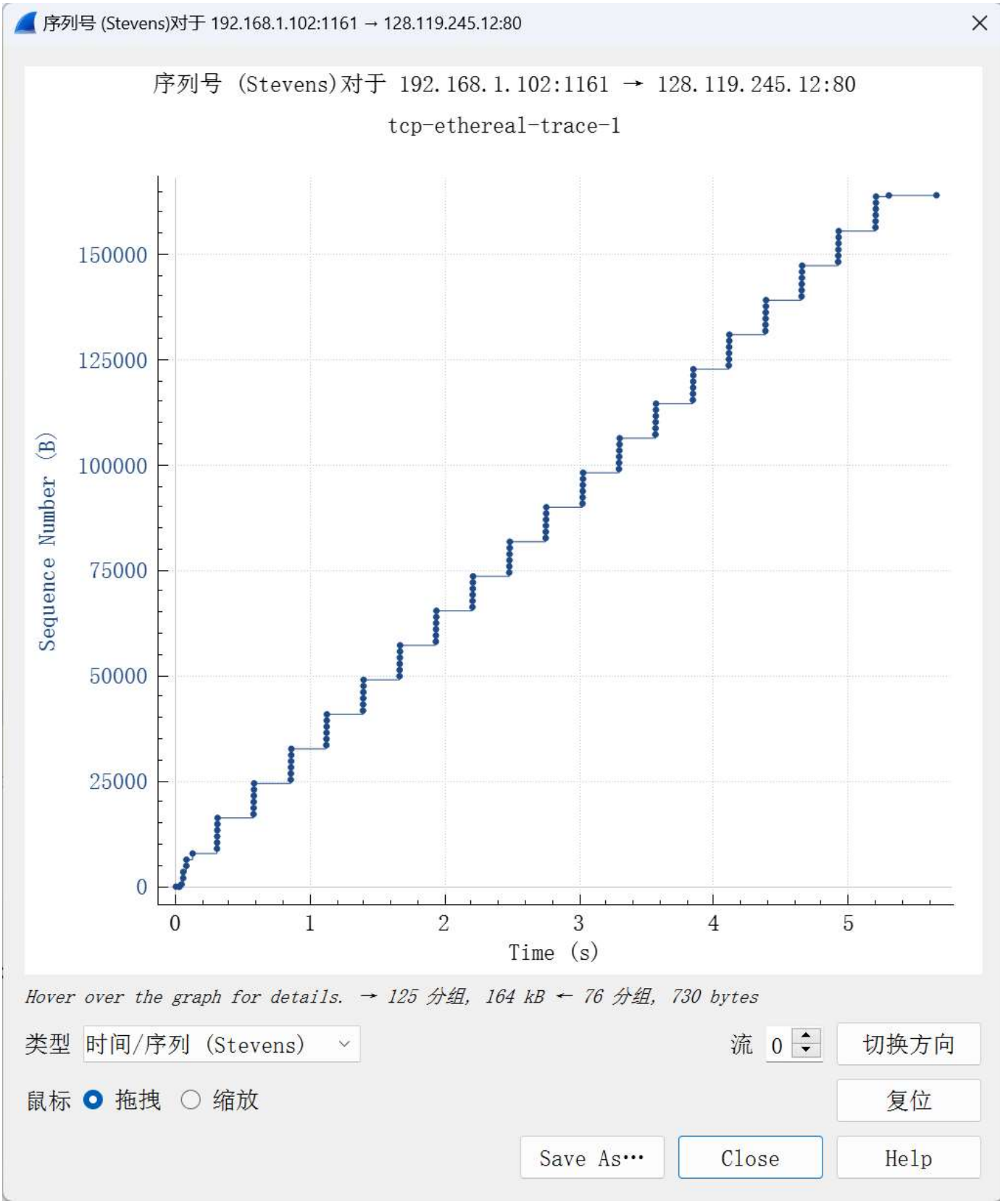
- **12.**

```
331 12.364554   128.119.245.12   202.141.190.132   TCP     66 80 → 64146 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM WS=128
489 13.565270   128.119.245.12   202.141.190.132   TCP     60 80 → 64146 [ACK] Seq=1 Ack=153069 Win=264960 Len=0
```

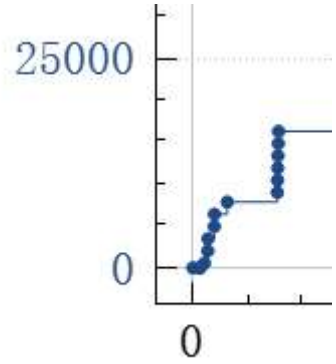
由第一个和最后一个ack信息可以计算得到

$$\frac{153069-1}{13.565270-12.364554}=127.48kb/s$$

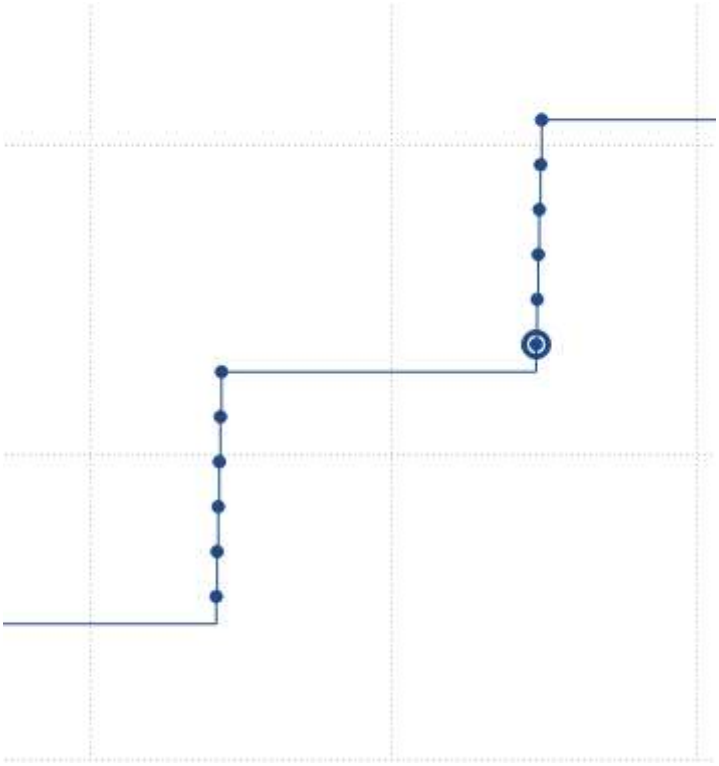
- **13.**


序列号 (Stevens)对于 192.168.1.102:1161 → 128.119.245.12:80
序列号 (Stevens)对于 192.168.1.102:1161 → 128.119.245.12:80
tcp-ethereal-trace-1
Sequence Number (B)
150000
125000
100000
75000
50000
25000
0
0
1
2
3
4
5
Time (s)
Hover over the graph for details. → 125 分组, 164 kB ← 76 分组, 730 bytes
类型 时间/序列 (Stevens)
流 0
切换方向
鼠标 拖拽 缩放
复位
Save As…
Close
Help

慢启动阶段为


25000
0
0

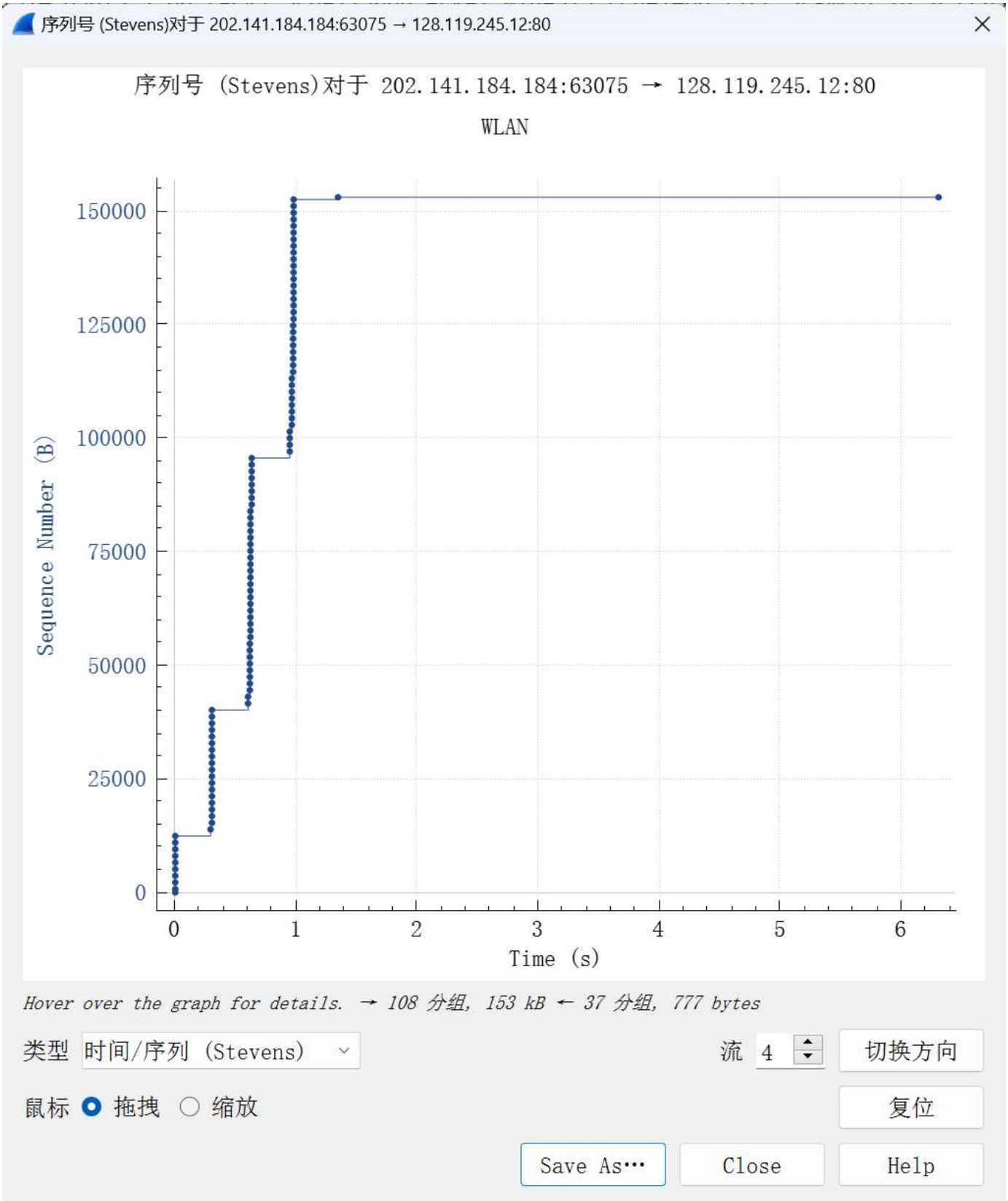
后续都为拥塞避免（类似下图）



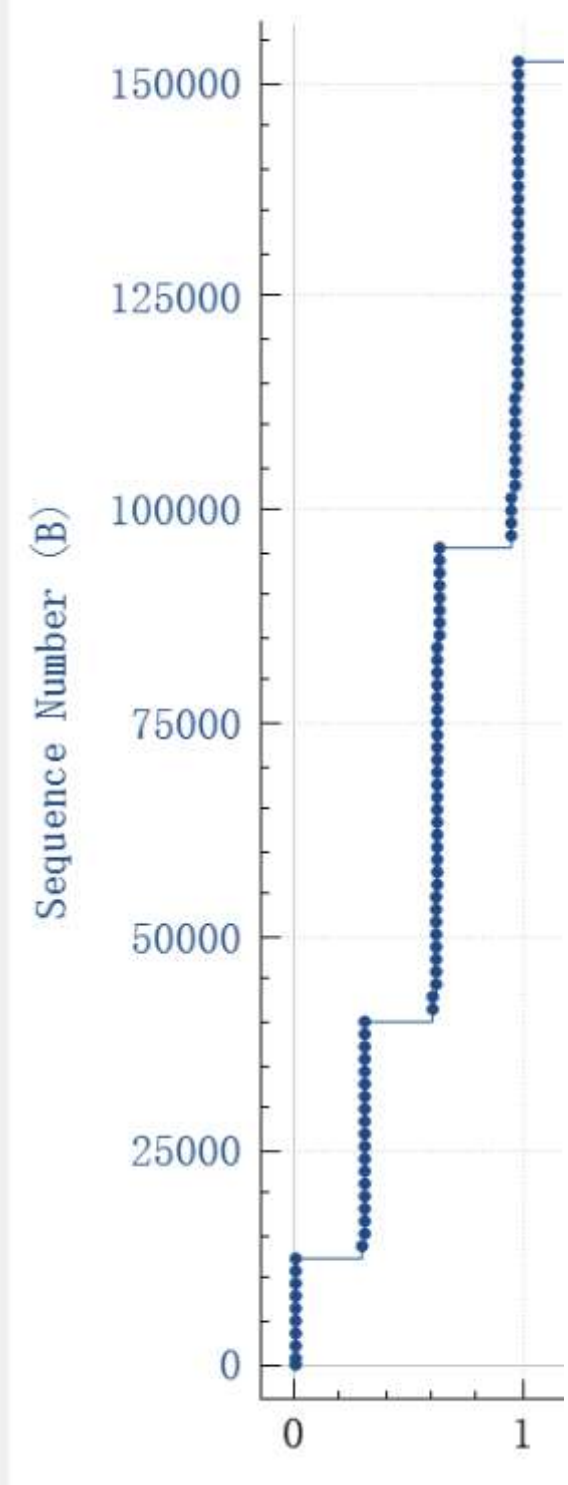
区别为在拥塞避免阶段每隔一个RTT拥塞窗口增加5，而不是1

- **14.**

  （这题是后面重新抓包后做的，可能与之前数据有所偏差）



慢启动阶段为下图，每隔一个RTT，增长约为指数速度增长



后续为拥塞避免阶段

区别为慢启动阶段不是严格的指数速度增长