计算机网络 TCP 实验

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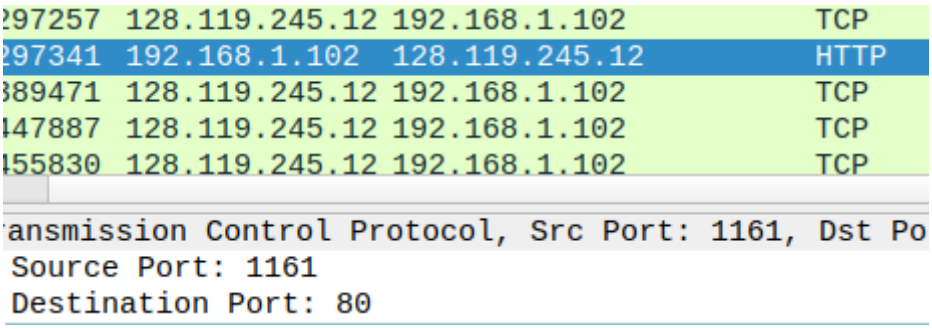
T1

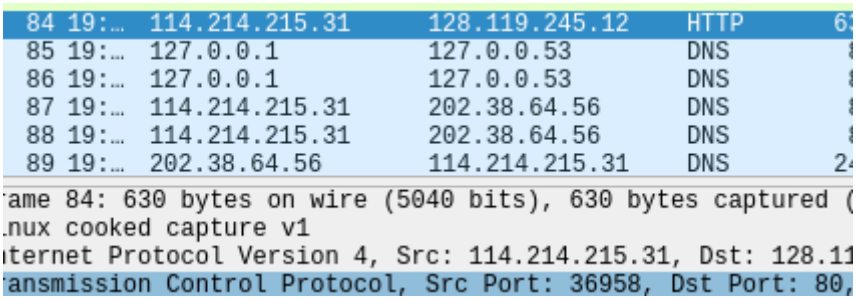


`192.168.1.102:1161`

T2

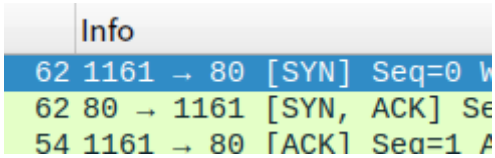
同上图，`128.119.245.12:80`

T3



`114.214.215.31:36958`

T4

- 

  可见为 0

-

```
Flags: 0x002 (SYN)
    000. .... .... = Reserved: Not set
    ...0 .... .... = Nonce: Not set
    .... 0... .... = Congestion Window Reduced (CWR): Not set
    .... .0.. .... = ECN-Echo: Not set
    .... ..0. .... = Urgent: Not set
    .... ...0 .... = Acknowledgment: Not set
    .... .... 0... = Push: Not set
    .... .... .0.. = Reset: Not set
  ▸ .... .... ..1. = Syn: Set
    .... .... ...0 = Fin: Not set
    [TCP Flags: ··········S·]
```

```
00  00 06 25 da af 73 00 20  e0 8a 70 1a 08 00 45 00    ··%··s·  ··p···E·
10  00 30 1e 1d 40 00 80 06  a5 18 c0 a8 01 66 80 77    ·0··@···  ·····f·w
20  f5 0c 04 89 00 50 0d d6  01 f4 00 00 00 00 70 02    ·····P··  ······p·
30  40 00 f6 e9 00 00 02 04  05 b4 01 01 04 02         @·······  ··········
```

Flags 位

T5

```
62 1161 → 80 [SYN] Seq=0 Win=16384 Le
62 80 → 1161 [SYN, ACK] Seq=0 Ack=1 W
54 1161 → 80 [ACK] Seq=1 Ack=1 Win=17
619 1161 → 80 [PSH, ACK] Seq=1 Ack=1 W
```

- Seq = 0, ACK = 1
- 收到了序号为 0 的报文，ACK 是当前期望的报文 1
-
```
..0. .... = Urgent: Not set
...1 .... = Acknowledgment: Set
.... 0... = Push: Not set
.... .0.. = Reset: Not set
.... ..1. = Syn: Set
0 = Fin: Not set
```

Acknowledgment 和 Syn 均为 1

T6

```
 619 1161 → 80 [PSH, ACK] Seq=1 Ack=1 Win=17520 Len=565
1514 1161 → 80 [PSH, ACK] Seq=566 Ack=1 Win=17520 Len=1460
  60 80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0
1514 1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460
1514 1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460
  60 80 → 1161 [ACK] Seq=1 Ack=2026 Win=8760 Len=0
1514 1161 → 80 [ACK] Seq=4946 Ack=1 Win=17520 Len=1460
```

```
educed (CWR): Not set
```

```
 74 1a 50 18    ·····P·· ··4·t·P·
 65 74 68 65   Dp····PO ST /ethe
 62 33 2d 31   real-lab s/lab3-1
```

Seq = 1

T7

	Time	Source	Destination	Protocol	Length	Info
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

上面有需要的大部分信息

RTT 时间可以在这里查看：

```
▸ [Timestamps]
▾ [SEQ/ACK analysis]
    [This is an ACK to the segment in frame: 5]
    [The RTT to ACK the segment was: 0.035557000 seconds]
    [iRTT: 0.023265000 seconds]
```

下面列表，并计算 EstimatedRTT

序号	RTT(ms)	EstimatedRTT
1	27.46	27.46
566	35.557	28.472
2026	70.059	33.670
3486	114.428	43.765
4946	139.894	55.781
6406	189.645	72.514

T8

由上图 Len 的值即可得：

```
565 1460 1460 1460 1460 1460
```

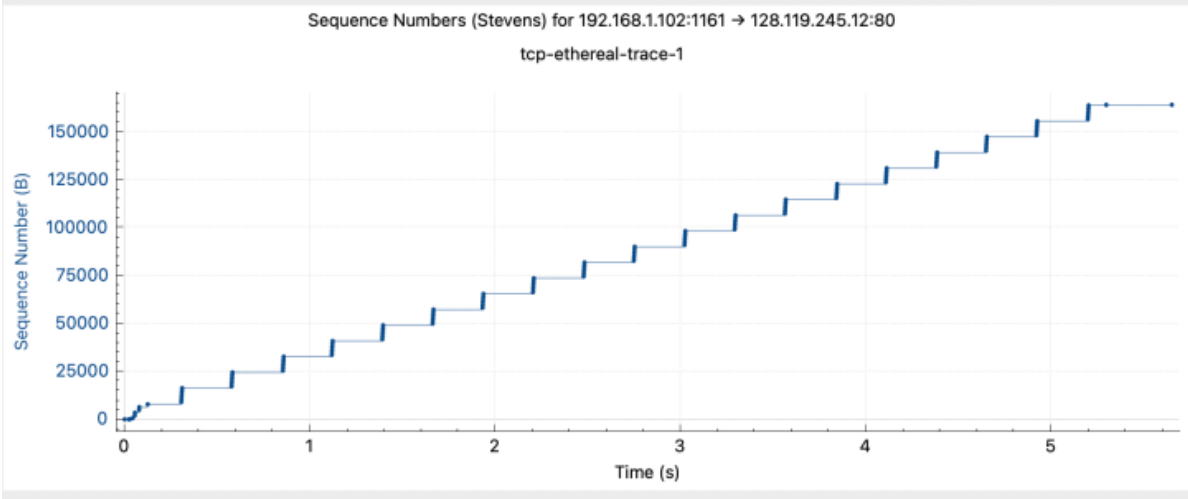
T9

为初始值 5840

未发现，过程中很快就平缓

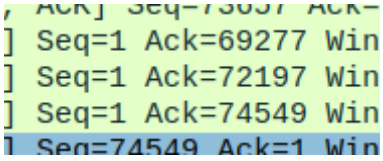
T10

没有重传的报文段



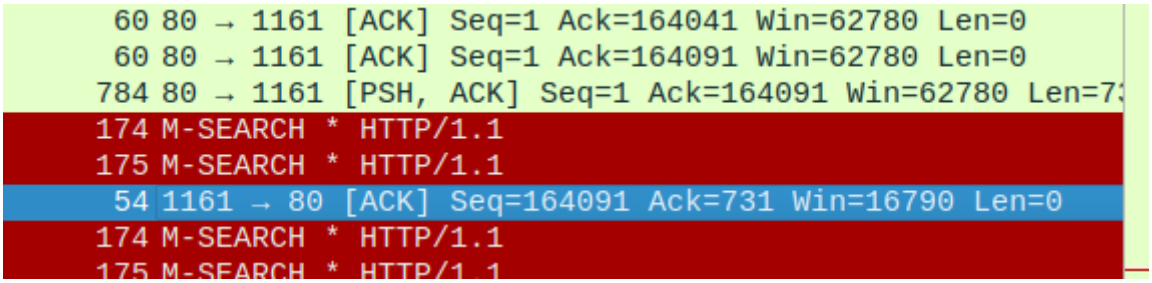
T11

1460 或 2920

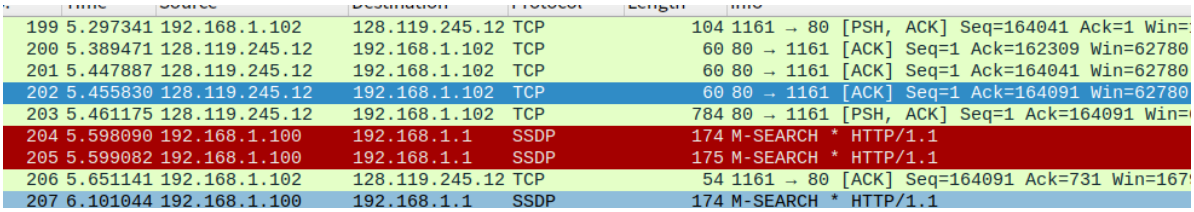


可能会确认了多个，导致是 `1460` 的倍数

T12



传输 `164090` 字节，

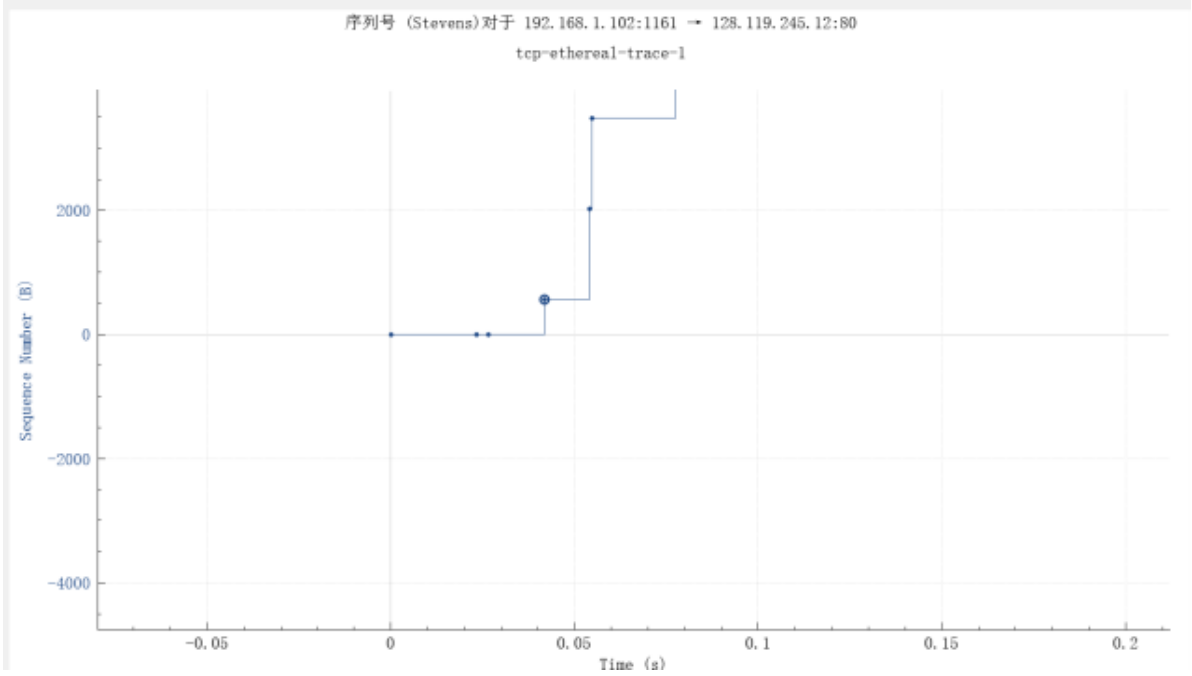


不考虑断开连接，传输在发送方最后收到对应该请求的 ACK 时结束，总用时：

$5.455830 - 0.026477 = 5.429353s$

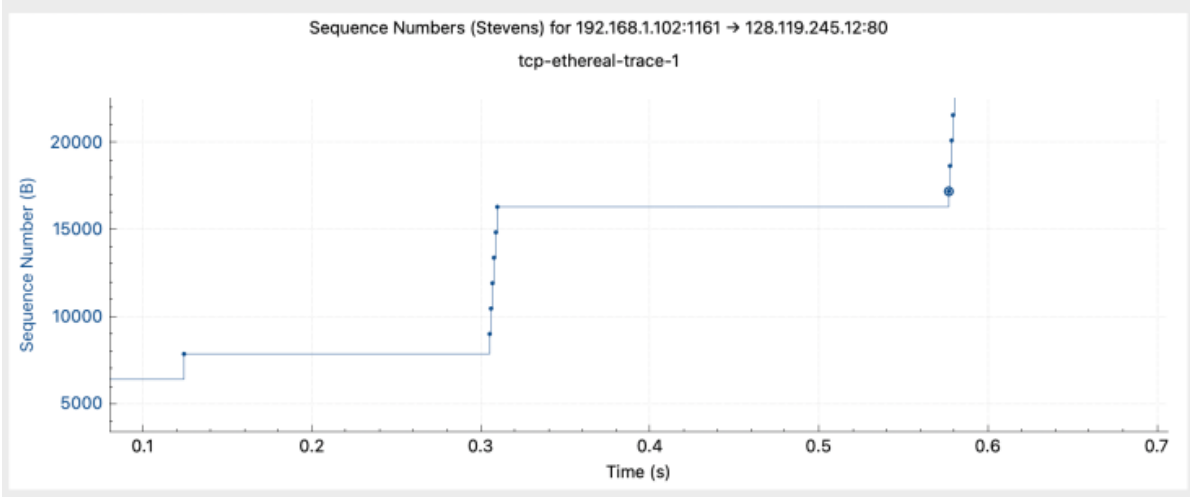
所以吞吐量 $30.223kBps$

T13



如图所示，慢启动始于 Seq 500，结束于 packet 13

13-18 23-30 是拥塞避免阶段



慢启动后，数据发送速率是固定的，而不是线性增加