

# 计算机网络 TCP 实验

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## T1

297257	128.119.245.12	192.168.1.102	TCP
297341	192.168.1.102	128.119.245.12	HTTP
389471	128.119.245.12	192.168.1.102	TCP
447887	128.119.245.12	192.168.1.102	TCP
455830	128.119.245.12	192.168.1.102	TCP
Transmission Control Protocol, Src Port: 1161, Dst Po			
Source Port: 1161			
Destination Port: 80			

192.168.1.102:1161

## T2

同上图, 128.119.245.12:80

## T3

84	19:...	114.214.215.31	128.119.245.12	HTTP	630
85	19:...	127.0.0.1	127.0.0.53	DNS	8
86	19:...	127.0.0.1	127.0.0.53	DNS	8
87	19:...	114.214.215.31	202.38.64.56	DNS	8
88	19:...	114.214.215.31	202.38.64.56	DNS	8
89	19:...	202.38.64.56	114.214.215.31	DNS	24
Frame 84: 630 bytes on wire (5040 bits), 630 bytes captured (					
Linux cooked capture v1					
Internet Protocol Version 4, Src: 114.214.215.31, Dst: 128.11					
Transmission Control Protocol, Src Port: 36958, Dst Port: 80,					

114.214.215.31:36958

## T4

- 

Info
62 1161 → 80 [SYN] Seq=0 W
62 80 → 1161 [SYN, ACK] Se
54 1161 → 80 [ACK] Seq=1 A

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

```

02 1101 → 80 [SYN] Seq=0 Win=10384 Len=0
62 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=0 Len=0
54 1161 → 80 [ACK] Seq=1 Ack=1 Win=17 Len=0
619 1161 → 80 [PSH, ACK] Seq=1 Ack=1 Win=0 Len=0

```

- 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 |

Reduced (CWR): Not set

:

```

74 1a 50 18  . . . . . P . . . . . 4 . t . P .
65 74 68 65  Dp . . . . . P0 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=1460 |
| 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

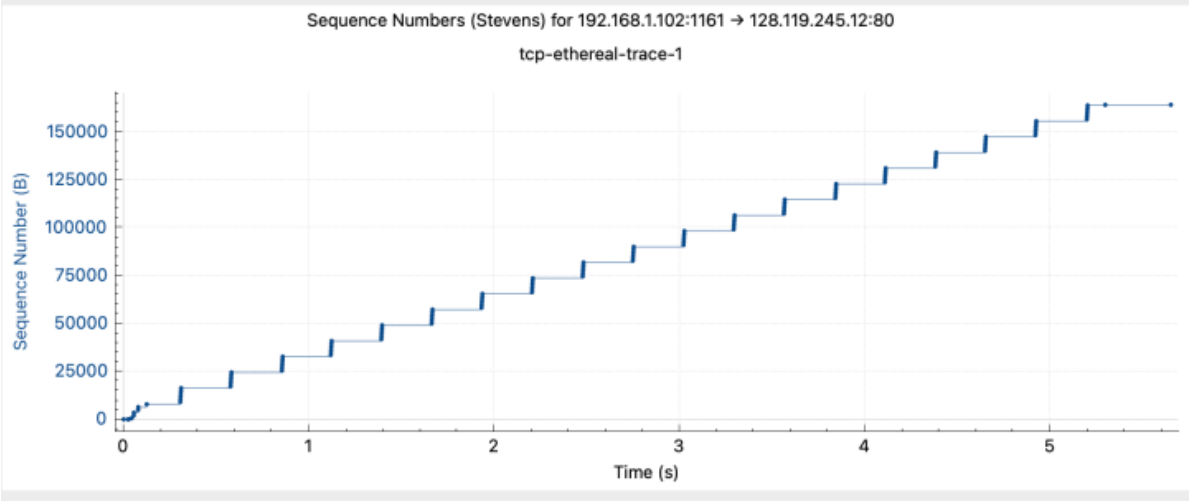
## T9

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

```

, ACK] Seq=73037 Ack=
] Seq=1 Ack=69277 Win
] Seq=1 Ack=72197 Win
] Seq=1 Ack=74549 Win
1 Seq=74549 Ack=1 Win

```

可能会确认了多个，导致是 1460 的倍数

## T12

```

60 80 → 1161 [ACK] Seq=1 Ack=164041 Win=62780 Len=0
60 80 → 1161 [ACK] Seq=1 Ack=164091 Win=62780 Len=0
784 80 → 1161 [PSH, ACK] Seq=1 Ack=164091 Win=62780 Len=7:
174 M-SEARCH * HTTP/1.1
175 M-SEARCH * HTTP/1.1
54 1161 → 80 [ACK] Seq=164091 Ack=731 Win=16790 Len=0
174 M-SEARCH * HTTP/1.1
175 M-SEARCH * HTTP/1.1

```

传输 164090 字节，

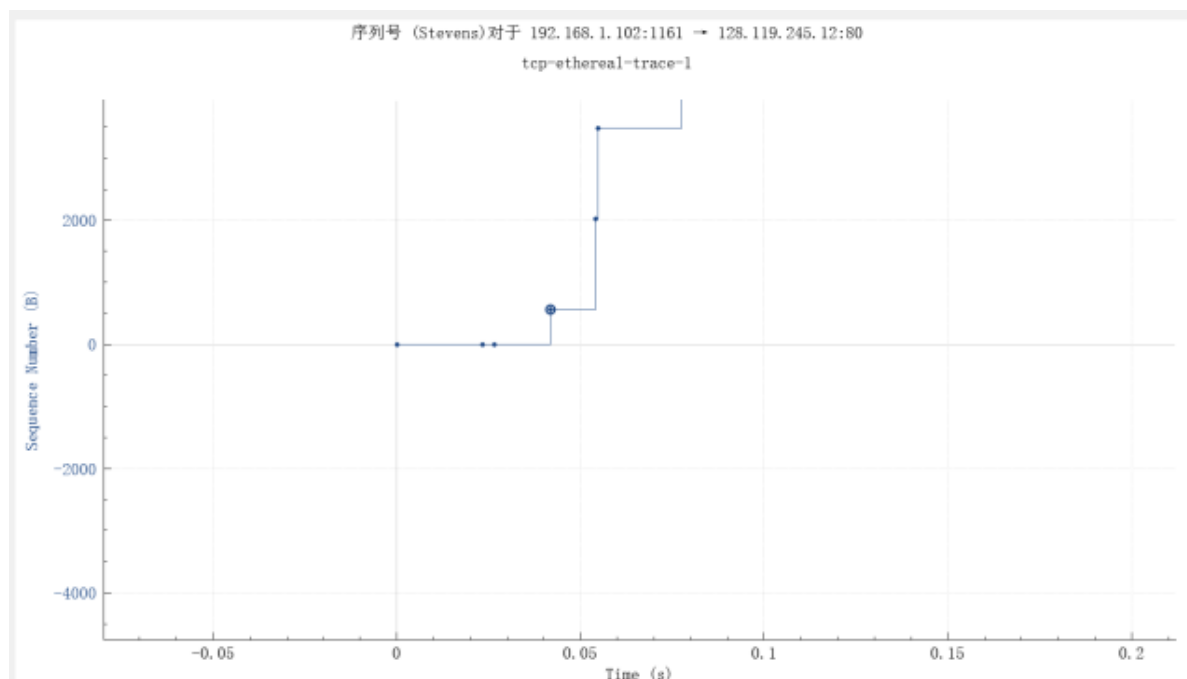
| #   | Time     | Source         | Destination    | Protocol | Length | Info                                       |
|-----|----------|----------------|----------------|----------|--------|--------------------------------------------|
| 199 | 5.297341 | 192.168.1.102  | 128.119.245.12 | TCP      | 104    | 1161 → 80 [PSH, ACK] Seq=164041 Ack=1 Win= |
| 200 | 5.389471 | 128.119.245.12 | 192.168.1.102  | TCP      | 60     | 80 → 1161 [ACK] Seq=1 Ack=162309 Win=62780 |
| 201 | 5.447887 | 128.119.245.12 | 192.168.1.102  | TCP      | 60     | 80 → 1161 [ACK] Seq=1 Ack=164041 Win=62780 |
| 202 | 5.455830 | 128.119.245.12 | 192.168.1.102  | TCP      | 60     | 80 → 1161 [ACK] Seq=1 Ack=164091 Win=62780 |
| 203 | 5.461175 | 128.119.245.12 | 192.168.1.102  | TCP      | 784    | 80 → 1161 [PSH, ACK] Seq=1 Ack=164091 Win= |
| 204 | 5.598090 | 192.168.1.100  | 192.168.1.1    | SSDP     | 174    | M-SEARCH * HTTP/1.1                        |
| 205 | 5.599082 | 192.168.1.100  | 192.168.1.1    | SSDP     | 175    | M-SEARCH * HTTP/1.1                        |
| 206 | 5.651141 | 192.168.1.102  | 128.119.245.12 | TCP      | 54     | 1161 → 80 [ACK] Seq=164091 Ack=731 Win=167 |
| 207 | 6.101044 | 192.168.1.100  | 192.168.1.1    | SSDP     | 174    | M-SEARCH * HTTP/1.1                        |

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：

$$5.455830 - 0.026477 = 5.429353s$$

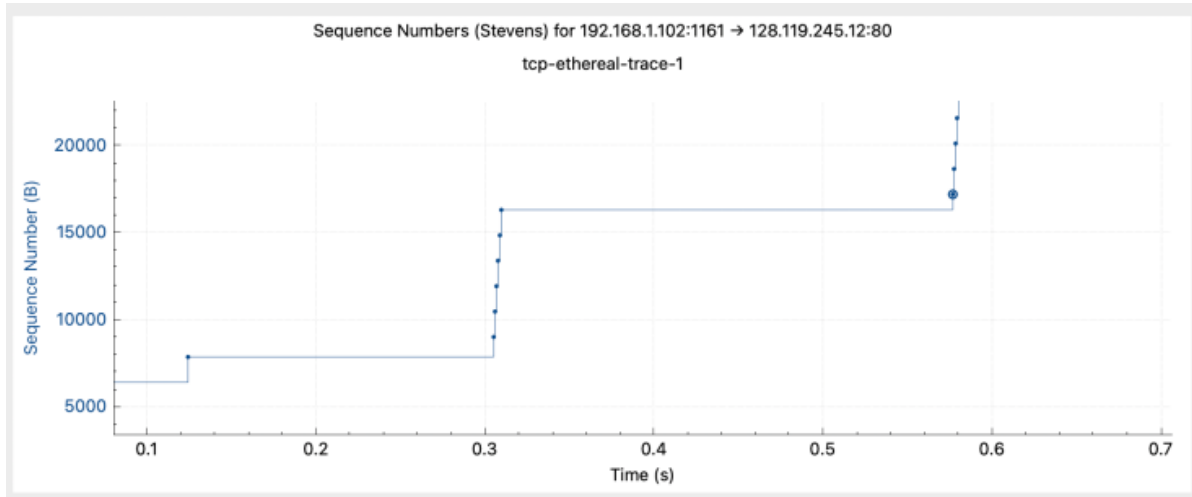
所以吞吐量  $30.223kBps$

## 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