

## STEP 1

```
youwei@ubuntu:~/Desktop/STEP1/client$ ./demo 5013
Please Input Sever [IP] [Port] you want to connect:
127.0.0.2 5012
starting three-way handshake.....
Send to 127.0.0.2:5012
a packet(SYN)(seq = 9384, ack = 0)
Received from 127.0.0.2:5012
a packet(SYN/ACK)(seq = 9384, ack = 0)
Send to 127.0.0.2:5012
a packet(ACK)(seq = 9385, ack = 9385)

complete the three-way handshake.....
.....  
size : 123431
0
youwei@ubuntu:~/Desktop/STEP1/client$
```

```
youwei@ubuntu:~/Desktop/STEP1$ ./demo 5012
server IP 127.0.0.2
server port 5012
client IP 0.0.0.0
client_port 0
listening.....
starting three-way handshake.....
Received
from 127.0.0.1:5013
a packet(SYN)(seq = 9384, ack = 0)
server_IP 127.0.0.2
server_port 5012
client_IP 127.0.0.1
client_port 5013

Send to 127.0.0.1:5013
a packet(SYN/ACK)(seq = 9384, ack = 0)
Received from 127.0.0.1:5013
a packet(ACK)(seq = 9385, ack = 9385)

complete the three-way handshake.....
.....  
start to send file1 to client, the file size is 123431 byte
start to send file1 to 127.0.0.1:5012123431
123431 data transmission is complete...
youwei@ubuntu:~/Desktop/STEP1$
```

## STEP 2

```
youwei@ubuntu:~/Desktop/STEP222/STEP2/c1$ ./c 6001
Please Input Sever [IP] [Port] you want to connect:
youwei@ubuntu:~/Desktop/STEP222/STEP2/c2$ ./c 6002
Please Input Sever [IP] [Port] you want to connect:
youwei@ubuntu:~/Desktop/STEP222/STEP2/c3$ ./c 6003
Please Input Sever [IP] [Port] you want to connect:
youwei@ubuntu:~/Desktop/STEP222/STEP2/c4$ ./c 6004
Please Input Sever [IP] [Port] you want to connect:
```

```
youwei@ubuntu:~/Desktop/STEP222/STEP2/client$ ./c 6001
server IP -127.0.1.2
server_port -5005
client_IP -0.0.0.0
client_port -0
fork here
parent end
-----  
youwei@ubuntu:~/Desktop/STEP222/STEP2$ fork here
listening.....
fork here
listening.....
starting three-way handshake.....
.....  
starting three-way handshake.....
Received Waitinnnnng ----- 3 -----
fork here
Received Waitinnnnng ----- 2 -----
listening.....
starting three-way handshake.....
.....  
Received Waitinnnnng ----- 1 -----
fork here
listening.....
starting three-way handshake.....
.....  
Received Waitinnnnng ----- 0 -----
youwei@ubuntu:~/Desktop/STEP222/STEP2$
```

Ubuntu 64-bit - VMware Workstation 15 Player

Player | 窗口 | 终端机 | 桌面 | 搜索 | 星期五 07:53

youwei@ubuntu:~/Desktop/STEP222/STEP2/c1\$ ./c 6001  
Please Input Sever [IP] [Port] you want to connect:  
127.0.1.2 5001  
starting three-way handshake.....  
  
Send to 127.0.1.2:5001  
a packet(SYN)(seq = 9384, ack = 0)  
Received from 127.0.1.2:5001  
  
youwei@ubuntu:~/Desktop/STEP222/STEP2/c2\$ ./c 6002  
Please Input Sever [IP] [Port] you want to connect:  
127.0.1.2 5002  
starting three-way handshake.....  
  
Send to 127.0.1.2:5002  
a packet(SYN)(seq = 9384, ack = 0)  
  
youwei@ubuntu:~/Desktop/STEP222/STEP2/c3\$ ./c 6003  
Please Input Sever [IP] [Port] you want to connect:  
127.0.1.2 5003  
starting three-way handshake.....  
  
Send to 127.0.1.2:5003  
a packet(SYN)(seq = 9384, ack = 0)  
  
youwei@ubuntu:~/Desktop/STEP222/STEP2/c4\$ ./c 6004  
Please Input Sever [IP] [Port] you want to connect:  
127.0.1.2 5004  
starting three-way handshake.....  
  
Send to 127.0.1.2:5004  
a packet(SYN)(seq = 9384, ack = 0)

[13/132] [14/142] [14/148] [14/148]

complete the three-way handshake.....  
start to send file1 to client, the file size is 123431 byte  
start to send file1 to 127.0.0.1:5002123431  
123431 input:  
data transmission is complete...  
child end  
from 127.0.0.1:6003  
a packet(SYN)(seq = 9384, ack = 0)  
-----  
- server\_IP - 127.0.1.2  
- server\_port - 5003  
- client\_IP - 127.0.0.1  
- client\_port - 6003  
-----  
  
Send to 127.0.0.1:6003  
a packet(SYN/ACK)(seq = 9384, ack = 0)  
Received from 127.0.0.1:6003  
a packet(ACK)(seq = 9385, ack = 9385)  
-----  
- server\_IP - 127.0.1.2  
- server\_port - 5003  
- client\_IP - 127.0.0.1  
- client\_port - 6003  
-----  
  
complete the three-way handshake.....  
start to send file1 to client, the file size is 123431 byte

ubuntu" 07:53 12-6月-26

C:\Users\USER\Desktop\ (113) 深入面试 | LINE | 捕施者\_Kelly同學 | Ubuntu 64-bit - V... | 文件1 - Word

Ubuntu 64-bit - VMware Workstation 15 Player

Player | 窗口 | 终端机 | 桌面 | 搜索 | 星期五 07:51

youwei@ubuntu:~/Desktop/STEP1/client

size : 123431  
0  
youwei@ubuntu:~/Desktop/STEP222/STEP2/c1\$

size : 123431  
0  
youwei@ubuntu:~/Desktop/STEP222/STEP2/c2\$

size : 123431  
0  
youwei@ubuntu:~/Desktop/STEP222/STEP2/c3\$

size : 123431  
0  
youwei@ubuntu:~/Desktop/STEP222/STEP2/c4\$

[21/205]

2 new \_ change the port to 5003  
-----  
- server\_IP - 127.0.1.2  
- server\_port - 5003  
- client\_IP - 0.0.0.0  
- client\_port - 0  
-----  
fork here  
parent end  
-----  
- server\_IP - 127.0.1.2  
- server\_port - 5004  
- client\_IP - 0.0.0.0  
- client\_port - 0  
-----  
3 new \_ change the port to 5004  
-----  
- server\_IP - 127.0.1.2  
- server\_port - 5004  
- client\_IP - 0.0.0.0  
- client\_port - 0  
-----  
fork here  
parent end  
-----  
- server\_IP - 127.0.1.2  
- server\_port - 5005  
- client\_IP - 0.0.0.0  
- client\_port - 0  
-----

ubuntu" 07:51 12-6月-26

C:\Users\USER\Desktop\ (113) 深入面试 | LINE | 捕施者\_Kelly同學 | Ubuntu 64-bit - V... | 文件1 - Word

## STEP 3

Ubuntu 64-bit - VMware Workstation 15 Player

```

youwei@ubuntu:~/Desktop/STEP3/client1$ ./c_demo 5013
=====Parameter=====
The RTT delay = 200 ms
The threshold = 65535 bytes
The MSS = 1024 bytes
The buffer size = 32768 bytes
Client's IP is 127.0.0.1
Client is listening on port 5013
=====
Please Input Sever [IP] [Port] you want to connect:
127.0.0.2 5012

```

youwei@ubuntu:~/Desktop/STEP3\$ ./s\_demo 5012

```

server IP 127.0.0.2
server port 5012
client IP 0.0.0.0
client port 0
listening.....

```

[2] 0:./c\_demo\*

Ubuntu 64-bit - VMware Workstation 15 Player

```

youwei@ubuntu:~/Desktop/STEP3/client1$ ./c_demo 5013
=====Parameter=====
The RTT delay = 200 ms
The threshold = 65535 bytes
The MSS = 1024 bytes
The buffer size = 32768 bytes
Client's IP is 127.0.0.1
Client is listening on port 5013
=====
Please Input Sever [IP] [Port] you want to connect:
127.0.0.2 5012
IP OK
connect success
starting three-way handshake.....
Send a packet(SYN)(seq = 9487, ack = 0) to 127.0.0.2:5012
Received a packet(SYN/ACK)(seq = 9384, ack = 9488) from 127.0.0.2:5012
Send a packet(ACK)(seq = 9488, ack = 9385) to 127.0.0.2:5012
complete the three-way handshake.....
Receive a file from 127.0.0.2 : 5012
Received a packet(seq = 9385, ack = 0) from 127.0.0.2:5012
Send a packet(ACK)(seq = 9489, ack = 9386) to 127.0.0.2:5012
Received a packet(seq = 9386, ack = 0) from 127.0.0.2:5012
Send a packet(ACK)(seq = 9490, ack = 9387) to 127.0.0.2:5012
Received a packet(seq = 9387, ack = 0) from 127.0.0.2:5012
Send a packet(ACK)(seq = 9491, ack = 9388) to 127.0.0.2:5012
Received a packet(seq = 9389, ack = 0) from 127.0.0.2:5012
---Packet Loss-----
youwei@ubuntu:~/Desktop/STEP3/client1$
```

youwei@ubuntu:~/Desktop/STEP3\$ ./s\_demo 5012

```

Received a packet(seq = 9385, ack = 0) to 127.0.0.1:5013
Already send 1 byte...
Received a packet(ACK)(seq = 9489, ack = 9386) from 127.0.0.1:
5013
Now ACK : 9385 ,ackNum 9386
cwnd = 2, rwnd = 32768, threshold = 65536
cwnd = 2, rwnd = 32768, threshold = 65536
Poission num : 6
Send a packet(seq = 9386, ack = 0) to 127.0.0.1:5013
Already send 3 byte...
Received a packet(ACK)(seq = 9490, ack = 9387) from 127.0.0.1:
5013
Now ACK : 9386 ,ackNum 9387
cwnd = 4, rwnd = 32768, threshold = 65536
cwnd = 4, rwnd = 32768, threshold = 65536
Poission num : 6
Send a packet(seq = 9387, ack = 0) to 127.0.0.1:5013
Already send 7 byte...
Received a packet(ACK)(seq = 9491, ack = 9388) from 127.0.0.1:
5013
Now ACK : 9387 ,ackNum 9388
cwnd = 8, rwnd = 32768, threshold = 65536
cwnd = 8, rwnd = 32768, threshold = 65536
Poission num : 6
-----Loss Packet at here: -----
cwnd = 8, rwnd = 32768, threshold = 65536
Poission num : 6
Send a packet(seq = 9389, ack = 0) to 127.0.0.1:5013
Already send 15 byte...

```

[2] 0:bash\*

STEP 4

Ubuntu 64-bit - VMware Workstation 15 Player

```

youwei@ubuntu:~/Desktop/STEP4/C$ ./c_demo 5013
=====Parameter=====
The RTT delay = 15 ms
The threshold = 65536 bytes
The MSS = 1024 bytes
The buffer size = 52428 bytes
Client's IP is 127.0.0.1
Client is listening on port 5013
=====
Please Input Sever [IP] [Port] you want to connect:

```

星期五 07:59 \* youwei@ubuntu: ~/Desktop/STEP4/client

```

youwei@ubuntu:~/Desktop/STEP4$ ls
1.txt C packet.h s1_ff.cpp s_demo server.cpp V1.mp4
youwei@ubuntu:~/Desktop/STEP4$ ./s_demo 5012
=====Original=====
server IP 127.0.0.2
server_port 5012
client_IP 0.0.0.0
client_port 0
=====
listening.....

```

[2] 0 ./c\_demo\*

"ubuntu" 07:59 12-6月-2020

Ubuntu 64-bit - VMware Workstation 15 Player

```

S Send a packet(ACK)(seq = 5059, ack = 9439) to 127.0.0.2:5012
R Received a packet(seq = 9439, ack = 0) from 127.0.0.2:5012
R Received a packet(seq = 9440, ack = 0) from 127.0.0.2:5012
R Sent a packet(ACK)(seq = 5060, ack = 9441) to 127.0.0.2:5012
R Received a packet(seq = 9441, ack = 0) from 127.0.0.2:5012
R Received a packet(seq = 9442, ack = 0) from 127.0.0.2:5012
R Sent a packet(ACK)(seq = 5061, ack = 9443) to 127.0.0.2:5012
R Received a packet(seq = 9443, ack = 0) from 127.0.0.2:5012
R Received a packet(seq = 9444, ack = 0) from 127.0.0.2:5012
S Sent a packet(ACK)(seq = 5062, ack = 9445) to 127.0.0.2:5012
R Received a packet(seq = 9445, ack = 0) from 127.0.0.2:5012
R Received a packet(seq = 9446, ack = 0) from 127.0.0.2:5012
S Send a packet(ACK)(seq = 5063, ack = 9447) to 127.0.0.2:5012
R Received a packet(seq = 9447, ack = 0) from 127.0.0.2:5012
R Received a packet(seq = 9448, ack = 0) from 127.0.0.2:5012
S Sent a packet(ACK)(seq = 5064, ack = 9449) to 127.0.0.2:5012
R Received a packet(seq = 9449, ack = 0) from 127.0.0.2:5012
R Received a packet(seq = 9450, ack = 0) from 127.0.0.2:5012
S Sent a packet(ACK)(seq = 5065, ack = 9451) to 127.0.0.2:5012
R Received a packet(seq = 9451, ack = 0) from 127.0.0.2:5012
R Received a packet(seq = 9452, ack = 0) from 127.0.0.2:5012
S Send a packet(ACK)(seq = 5066, ack = 9453) to 127.0.0.2:5012
R Received a packet(seq = 9453, ack = 0) from 127.0.0.2:5012
R Received a packet(seq = 9454, ack = 0) from 127.0.0.2:5012
S Send a packet(ACK)(seq = 5067, ack = 9455) to 127.0.0.2:5012
R Received a packet(seq = 9455, ack = 0) from 127.0.0.2:5012
R Received a packet(seq = 9456, ack = 0) from 127.0.0.2:5012
S Send a packet(ACK)(seq = 5068, ack = 9457) to 127.0.0.2:5012
R Received a packet(FIN)(seq = 9457, ack = 0) from 127.0.0.2:5012
2
data transmission is complete...
youwei@ubuntu:~/Desktop/STEP4/C$
```

"ubuntu" 07:59 12-6月-2020

Ubuntu 64-bit - VMware Workstation 15 Player

```

S Send a packet(seq = 9446, ack = 0) to 127.0.0.1:5013
R Received a packet(ACK)(seq = 5063, ack = 9447) from 127.0.0.1:5013
S Send a packet(seq = 9447, ack = 0) to 127.0.0.1:5013
S Received a packet(ACK)(seq = 9448, ack = 0) to 127.0.0.1:5013
R Already send 47102 byte...
S Received a packet(ACK)(seq = 5064, ack = 9449) from 127.0.0.1:5013
S Send a packet(seq = 9449, ack = 0) to 127.0.0.1:5013
S Received a packet(ACK)(seq = 9450, ack = 0) to 127.0.0.1:5013
R Already send 49150 byte...
S Received a packet(ACK)(seq = 5065, ack = 9451) from 127.0.0.1:5013
S Send a packet(seq = 9451, ack = 0) to 127.0.0.1:5013
S Received a packet(ACK)(seq = 5066, ack = 9453) from 127.0.0.1:5013
R Already send 51198 byte...
S Send a packet(seq = 9453, ack = 0) to 127.0.0.1:5013
S Received a packet(ACK)(seq = 5067, ack = 9455) from 127.0.0.1:5013
R Already send 53246 byte...
S Send a packet(seq = 9455, ack = 0) to 127.0.0.1:5013
S Received a packet(ACK)(seq = 5068, ack = 9457) from 127.0.0.1:5013
R Already send 55162 byte...
S Send a packet(FIN)(seq = 9457, ack = 0) to 127.0.0.1:5013
data transmission is complete...
youwei@ubuntu:~/Desktop/STEP4$
```

"ubuntu" 07:59 12-6月-2020

## STEP 5

```

Ubuntu 64-bit - VMware Workstation 15 Player
Player ▾ | 檔案(F) 編輯(E) 檢視(V) 單選(S) 終端機(T) 求助(H)
檔案 終端機
你wei@ubuntu:~/Desktop/STEP5slowandcon/client1$ ./c 5012 [53/403]
=====Parameter=====
The RTT delay = 200 ms
The threshold = 65535 bytes
The MSS = 1024 bytes
The buffer size = 32768 bytes
Client's IP is 127.0.0.1
Client is listening on port 5012
=====
Please Input Sever [IP] [Port] you want to connect:
127.0.0.1 5013
IP OK
connect success
starting three-way handshake.....
Send a packet(ACK)(seq = 8818, ack = 0) to 127.0.0.1:5013
Received a packet(SYN/ACK)(seq = 629, ack = 8819) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8819, ack = 630) to 127.0.0.1:5013
complete the three-way handshake.....
Receive a file from 127.0.0.1 : 5013
Received a packet(seq = 630, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 631, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8820, ack = 632) to 127.0.0.1:5013
Received a packet(seq = 632, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 633, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8821, ack = 634) to 127.0.0.1:5013
Received a packet(seq = 634, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 635, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8822, ack = 636) to 127.0.0.1:5013
Received a packet(seq = 636, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 637, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8823, ack = 638) to 127.0.0.1:5013
Received a packet(seq = 638, ack = 0) from 127.0.0.1:5013
"ubuntu" 08:03 12-6月-20
[2] 0: [linux]

Windows 任务栏: C:\Users\USER\Desktop\STEP5slowandcon\client1 (113) 莫人首選 | LINE 傳媒_... Ubuntu 64-bit - V... 文件1 - Word 上午 12:09 2020/6/13

Ubuntu 64-bit - VMware Workstation 15 Player
Player ▾ | 檔案(F) 編輯(E) 檢視(V) 單選(S) 終端機(T) 求助(H)
檔案 終端機
你wei@ubuntu:~/Desktop/STEP5slowandcon$ ./s 5013 [136/810]
=====
file is creat...
=====
Parameter=====
The RTT delay = 200 ms
The threshold = 65535 bytes
The MSS = 1024 bytes
The buffer size = 32768 bytes
Server's IP is 127.0.0.1
Server is listening on port 5013
=====
listening.....
Received a packet(SYN)(seq = 8818, ack = 0) from 127.0.0.1:5012
starting three-way handshake.....
Send a packet(SYN/ACK)(seq = 629, ack = 8819) to 127.0.0.1:5012
Received a packet(ACK)(seq = 8819, ack = 630) from 127.0.0.1:5012
complete the three-way handshake.....
=====
start to send file 1.txt to 127.0.0.1:5013 the file size is 33240 byte
s
=====
Slow start *****
cwnd = 1, rwnd = 32768, threshold = 8192
Send a packet(seq = 630, ack = 0) to 127.0.0.1:5012
Already send 1 byte...
cwnd = 2, rwnd = 32768, threshold = 8192
Send a packet(seq = 631, ack = 0) to 127.0.0.1:5012
Already send 3 byte...
Received a packet(ACK)(seq = 8820, ack = 632) from 127.0.0.1:5012
012
cwnd = 4, rwnd = 32768, threshold = 8192
Send a packet(seq = 632, ack = 0) to 127.0.0.1:5012
Already send 7 byte...
cwnd = 8, rwnd = 32768, threshold = 8192
"ubuntu" 08:03 12-6月-20
[2] 0: [linux]

Windows 任务栏: C:\Users\USER\Desktop\STEP5slowandcon\client1 (113) 莫人首選 | LINE 傳媒_... Ubuntu 64-bit - V... 文件1 - Word 上午 12:09 2020/6/13

你wei@ubuntu:~/Desktop/STEP5slowandcon$ ./c 5012 [0/403]
=====
Received a packet(seq = 653, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8831, ack = 654) to 127.0.0.1:5013
Received a packet(seq = 654, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 655, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8832, ack = 656) to 127.0.0.1:5013
Received a packet(seq = 656, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 657, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8833, ack = 658) to 127.0.0.1:5013
Received a packet(seq = 658, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 659, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8834, ack = 660) to 127.0.0.1:5013
Received a packet(seq = 660, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 661, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8835, ack = 662) to 127.0.0.1:5013
Received a packet(seq = 662, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 663, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8836, ack = 664) to 127.0.0.1:5013
Received a packet(seq = 664, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 665, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8837, ack = 666) to 127.0.0.1:5013
Received a packet(seq = 666, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 667, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8838, ack = 668) to 127.0.0.1:5013
Received a packet(seq = 668, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 669, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8839, ack = 670) to 127.0.0.1:5013
Received a packet(seq = 670, ack = 0) from 127.0.0.1:5013
Received a packet(seq = 671, ack = 0) from 127.0.0.1:5013
Send a packet(ACK)(seq = 8840, ack = 672) to 127.0.0.1:5013
Received a packet(FIN)(seq = 672, ack = 0) from 127.0.0.1:5013
data transmission is complete...
"ubuntu" 08:02 12-6月-20
[2] 0: [linux]

Windows 任务栏: C:\Users\USER\Desktop\STEP5slowandcon\client1 (113) 莫人首選 | LINE 傳媒_... Ubuntu 64-bit - V... 文件1 - Word 上午 12:08 2020/6/13

```

## STEP 6

```

Ubuntu 64-bit - VMware Workstation 15 Player
Player ▾ | 檔案(F) 編輯(E) 檢視(V) 常規(S) 終端機(T) 求助(H)
檔案 終端機
youwei@ubuntu:~/Desktop/STEP6Tao/client$ ./client 5013 [153/494] youwei@ubuntu:~/Desktop/STEP6Tao$ ./s 5012 [162/1012]
星期五 08:05 *
youwei@ubuntu:~/Desktop/STEP6Tao/client
=====Parameter=====
The RTT delay = 15 ms
The threshold = 65536 bytes
The MSS = 1024 bytes
The buffer size = 32768 bytes
Client's IP is 127.0.0.1
Client is listening on port 5013
=====
Please Input Sever [IP] [Port] you want to connect:
127.0.0.1 5012
IP OK
connect success
starting three-way handshake.....
Send a packet(SYN)(seq = 4298, ack = 0) to 127.0.0.1:5012
Received a packet(SYN/ACK)(seq = 719, ack = 4299) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4299, ack = 720) to 127.0.0.1:5012
complete the three-way handshake.....
Receive a file from 127.0.0.1 : 5012
Received a packet(seq = 720, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4300, ack = 721) to 127.0.0.1:5012
Received a packet(seq = 721, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4301, ack = 722) to 127.0.0.1:5012
Received a packet(seq = 722, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4302, ack = 723) to 127.0.0.1:5012
Received a packet(seq = 723, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4303, ack = 724) to 127.0.0.1:5012
Received a packet(seq = 724, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4304, ack = 725) to 127.0.0.1:5012
Received a packet(seq = 725, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4305, ack = 726) to 127.0.0.1:5012
Received a packet(seq = 726, ack = 0) from 127.0.0.1:5012
=====
start to send file 1.txt to 127.0.0.1:5012 the file size is 10240 by$es
=====
*****Slow start*****
cwnd = 1, rwnd = 32768, threshold = 8192
Send a packet(seq = 720, ack = 0) to 127.0.0.1:5013
Already send 1 byte...
Received a packet(ACK)(seq = 4300, ack = 721) from 127.0.0.1:5013
-----
ACK 720next ACK721
cwnd = 2, rwnd = 32768, threshold = 8192
Send a packet(seq = 721, ack = 0) to 127.0.0.1:5013
Already send 3 byte...
Received a packet(ACK)(seq = 4301, ack = 722) from 127.0.0.1:5013
-----
ACK 721next ACK722
"ubuntu" 08:05 12-6月-2020/6/13 上午 12:11 2020/6/13

Ubuntu 64-bit - VMware Workstation 15 Player
Player ▾ | 檔案(F) 編輯(E) 檢視(V) 常規(S) 終端機(T) 求助(H)
檔案 終端機
youwei@ubuntu:~/Desktop/STEP6Tao/client
星期五 08:05 *
youwei@ubuntu:~/Desktop/STEP6Tao/client
Send a packet(ACK)(seq = 4306, ack = 727) to 127.0.0.1:[21/494] ----- ACK 733next ACK733
Received a packet(seq = 727, ack = 0) from 127.0.0.1:5012 Send a packet(seq = 735, ack = 0) to 127.0.0.1:5013
Send a packet(ACK)(seq = 4307, ack = 728) to 127.0.0.1:5012 Already send 6143 byte...
Received a packet(seq = 728, ack = 0) from 127.0.0.1:5012 Received a packet(ACK)(seq = 4314, ack = 733) from 127.0.0.1:5013
Send a packet(ACK)(seq = 4308, ack = 729) to 127.0.0.1:5012 -----
ACK 733next ACK733
Send a packet(seq = 729, ack = 0) from 127.0.0.1:5012 Send a packet(seq = 736, ack = 0) to 127.0.0.1:5013
Send a packet(ACK)(seq = 4309, ack = 730) to 127.0.0.1:5012 Already send 7167 byte...
Received a packet(seq = 730, ack = 0) from 127.0.0.1:5012 Received a packet(ACK)(seq = 4315, ack = 733) from 127.0.0.1:5013
Send a packet(ACK)(seq = 4310, ack = 731) to 127.0.0.1:5012 -----
ACK 733next ACK733
Send a packet(ACK)(seq = 4311, ack = 732) to 127.0.0.1:5012 ----- Duplicate333
Received a packet(seq = 732, ack = 0) from 127.0.0.1:5012 Send a packet(seq = 733, ack = 0) to 127.0.0.1:5013
Send a packet(ACK)(seq = 4312, ack = 733) to 127.0.0.1:5012 Already send 8191 byte...
Received a packet(seq = 733, ack = 0) from 127.0.0.1:5012 Received a packet(ACK)(seq = 4316, ack = 737) from 127.0.0.1:5013
Fast Recovery!!!!!
Send a packet(ACK)(seq = 4313, ack = 733) to 127.0.0.1:5012 -----
ACK 737next ACK738
Received a packet(seq = 735, ack = 0) from 127.0.0.1:5012 Send a packet(seq = 737, ack = 0) to 127.0.0.1:5013
Fast Recovery!!!!!
Send a packet(ACK)(seq = 4314, ack = 733) to 127.0.0.1:5012 Already send 8192 byte...
Received a packet(seq = 736, ack = 0) from 127.0.0.1:5012 Received a packet(ACK)(seq = 4317, ack = 738) from 127.0.0.1:5013
Fast Recovery!!!!!
Send a packet(ACK)(seq = 4315, ack = 733) to 127.0.0.1:5012 -----
ACK 738next ACK739
Data Recovery!!!!!
Send a packet(ACK)(seq = 4316, ack = 737) to 127.0.0.1:5012 Send a packet(seq = 738, ack = 0) to 127.0.0.1:5013
Received a packet(seq = 737, ack = 0) from 127.0.0.1:5012 Already send 8194 byte...
Send a packet(ACK)(seq = 4317, ack = 738) to 127.0.0.1:5012 Received a packet(ACK)(seq = 4318, ack = 739) from 127.0.0.1:5013
Received a packet(seq = 738, ack = 0) from 127.0.0.1:5012 -----
ACK 738next ACK739
Send a packet(ACK)(seq = 4318, ack = 739) to 127.0.0.1:5012 Send a packet(seq = 739, ack = 0) to 127.0.0.1:5013
Received a packet(seq = 739, ack = 0) from 127.0.0.1:5012 Already send 8198 byte...
Send a packet(ACK)(seq = 4319, ack = 740) to 127.0.0.1:5012 Received a packet(ACK)(seq = 4319, ack = 740) from 127.0.0.1:5013
Received a packet(seq = 740, ack = 0) from 127.0.0.1:5012
"ubuntu" 08:05 12-6月-2020/6/13 上午 12:11 2020/6/13

```

## STEP 7

```

Ubuntu 64-bit - VMware Workstation 15 Player
Player ▾ | 檔案(F) 編輯(E) 檢視(V) 單選(S) 終端機(T) 求助(H)
檔案 終端機
youwei@ubuntu:~/Desktop/STEP7Reno/client$ ./client 5013 [35/574] =====Parameter===== [86/1144]
The RTT delay = 200 ms
The threshold = 65535 bytes
The MSS = 1024 bytes
The buffer size = 32768 bytes
Server's IP is 127.0.0.1
Server is listening on port 5012
=====
Please Input Sever [IP] [Port] you want to connect:
127.0.0.1 5012
IP OK
connect success
starting three-way handshake.....
Send a packet(ACK)(seq = 4662, ack = 0) to 127.0.0.1:5012
Received a packet(SYN/ACK)(seq = 215, ack = 4663) from 127.0.0.1:5013
Send a packet(ACK)(seq = 4663, ack = 216) to 127.0.0.1:5012
complete the three-way handshake.....
Receive a file from 127.0.0.1 : 5012
Received a packet(seq = 216, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4664, ack = 217) to 127.0.0.1:5012
Received a packet(seq = 217, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4665, ack = 218) to 127.0.0.1:5012
Received a packet(seq = 218, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4666, ack = 219) to 127.0.0.1:5012
Received a packet(seq = 219, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4667, ack = 220) to 127.0.0.1:5012
Received a packet(seq = 220, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4668, ack = 221) to 127.0.0.1:5012
Received a packet(seq = 221, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4669, ack = 222) to 127.0.0.1:5012
Received a packet(ACK)(seq = 222, ack = 0) from 127.0.0.1:5012
=====
*****Slow start*****[5013]
cwnd = 1, rwnd = 32768, threshold = 8192
Send a packet(seq = 216, ack = 0) to 127.0.0.1:5013
Already send 1 byte...
Received a packet(ACK)(seq = 4664, ack = 217) from 127.0.0.1:5013
cwnd = 2, rwnd = 32768, threshold = 8192
Send a packet(seq = 217, ack = 0) to 127.0.0.1:5013
Already send 3 byte...
Received a packet(ACK)(seq = 4665, ack = 218) from 127.0.0.1:5013
cwnd = 4, rwnd = 32768, threshold = 8192
Send a packet(seq = 218, ack = 0) to 127.0.0.1:5013
Already send 7 byte...
Received a packet(ACK)(seq = 4666, ack = 219) from 127.0.0.1:5013
=====
"ubuntu" 08:08 12-6月-20
星期五 08:08
youwei@ubuntu:~/Desktop/STEP7Reno/client$ [0/1144]

Ubuntu 64-bit - VMware Workstation 15 Player
Player ▾ | 檔案(F) 編輯(E) 檢視(V) 單選(S) 終端機(T) 求助(H)
檔案 終端機
youwei@ubuntu:~/Desktop/STEP7Reno/client$ 5013 [0/1144]
Received a packet(seq = 224, ack = 0) from 127.0.0.1:5012 [5013]
Send a packet(ACK)(seq = 4672, ack = 225) to 127.0.0.1:5012
Received a packet(seq = 225, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4673, ack = 226) to 127.0.0.1:5012
Received a packet(seq = 226, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4674, ack = 227) to 127.0.0.1:5012
Received a packet(seq = 227, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4675, ack = 228) to 127.0.0.1:5012
Received a packet(seq = 228, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4676, ack = 229) to 127.0.0.1:5012
Received a packet(seq = 229, ack = 0) from 127.0.0.1:5012
Fast Recovery!!!!!
Send a packet(ACK)(seq = 4677, ack = 229) to 127.0.0.1:5012
Received a packet(seq = 231, ack = 0) from 127.0.0.1:5012
Fast Recovery!!!!!
Send a packet(ACK)(seq = 4678, ack = 229) to 127.0.0.1:5012
Received a packet(seq = 232, ack = 0) from 127.0.0.1:5012
Fast Recovery!!!!!
Send a packet(ACK)(seq = 4679, ack = 229) to 127.0.0.1:5012
Received a packet(seq = 233, ack = 0) from 127.0.0.1:5012
Data Recovery!!!!!
Send a packet(ACK)(seq = 4680, ack = 233) to 127.0.0.1:5012
Received a packet(seq = 233, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4681, ack = 234) to 127.0.0.1:5012
Received a packet(seq = 234, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4682, ack = 235) to 127.0.0.1:5012
Received a packet(seq = 235, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4683, ack = 236) to 127.0.0.1:5012
Received a packet(FIN)(seq = 236, ack = 0) from 127.0.0.1:5012
Send a packet(ACK)(seq = 4684, ack = 237) to 127.0.0.1:5012
data transmission is complete...
youwei@ubuntu:~/Desktop/STEP7Reno/client$ [0/1144]
=====
"ubuntu" 08:08 12-6月-20
星期五 08:08
youwei@ubuntu:~/Desktop/STEP7Reno/client$ [0/1144]

```

## STEP9

```

Ubuntu 64-bit - VMware Workstation 15 Player
Player ▾ | 檔案(F) | 編輯(E) | 檢視(V) | 搜尋(S) | 終端機(T) | 求助(H)
星期五 08:29
youwei@ubuntu:~/Desktop/TEP1/client
[16/643] starting three-way handshake..... [0/1322]
Received Waitinnnnng ----- 3 ----
[16/49] Received Waitinnnnng ----- 0 ----
from 127.0.0.1:5002
a packet(SYN)(seq = 9384, ack = 0)
-----  

- server_IP -127.0.1.2  

- server_port -3000  

- client_IP -127.0.0.1  

- client_port -5002  

-----  

Send to 127.0.1.2:3000
a packet(ACK)(seq = 9385, ack = 1)
starting three-way handshake.....
Send to 127.0.1.2:3003
a packet(seq = 0, ack = 0)
Send to 127.0.1.2:3004
Send to 127.0.1.2:3002
a packet(SYN)(seq = 9384, ack = 0)
Received from 127.0.1.2:3002
Send to 127.0.1.2:3001
a packet(SYN)(seq = 9384, ack = 0)
Received from 127.0.1.2:3001
a packet(SYN/ACK)(seq = 9384, ack = 0)
Received from 127.0.1.2:3002
a packet(ACK)(seq = 9384, ack = 0)
Send to 127.0.1.2:3002
a packet(ACK)(seq = 9385, ack = 9385)
complete the three-way handshake.....
[11/21] [11/28] [12/19] [11/20] [8/24]
Send to 127.0.0.1:5002
a packet(SYN/ACK)(seq = 9384, ack = 0)
Received from 127.0.0.1:5002
a packet(ACK)(seq = 9385, ack = 9385)
-----  

- server_IP -127.0.1.2  

- server_port -3000  

- client_IP -127.0.0.1  

- client_port -5002  

-----  

Send to 127.0.0.1:5002
a packet(SYN/ACK)(seq = 9384, ack = 0)
Received from 127.0.0.1:5002
a packet(ACK)(seq = 9385, ack = 9385)
-----  

- server_IP -127.0.1.2  

- server_port -3000  

- client_IP -127.0.0.1  

- client_port -5002  

-----  

complete the three-way handshake.....
start to send file1 to client, the file size is 123431 byte
start to send file1 to 127.0.0.1:3000123431
123431 input:
data transmission is complete...
child end
"ubuntu" 08:29 12-6月-20
[2] 0:[Linux]

Ubuntu 64-bit - VMware Workstation 15 Player
Player ▾ | 檔案(F) | 編輯(E) | 檢視(V) | 搜尋(S) | 終端機(T) | 求助(H)
星期五 08:26
youwei@ubuntu:~/Desktop/STEP222/STEP2/c1$ [0/1322]
size : 0
youwei@ubuntu:~/Desktop/STEP222/STEP2/c1$ [0]
size : 0
youwei@ubuntu:~/Desktop/STEP222/STEP2/c1$ [0]
size : 0
youwei@ubuntu:~/Desktop/STEP222/STEP2/c2$ [0]
size : 0
youwei@ubuntu:~/Desktop/STEP222/STEP2/c2$ [0]
size : 123431
youwei@ubuntu:~/Desktop/STEP222/STEP2/c3$ [0]
size : 123431
youwei@ubuntu:~/Desktop/STEP222/STEP2/c4$ [0]
size : 123431
youwei@ubuntu:~/Desktop/STEP222/STEP2/c4$ [0]
complete the three-way handshake.....
start to send file1 to client, the file size is 123431 byte
start to send file1 to 127.0.0.1:3000123431
123431 input:
data transmission is complete...
child end
"ubuntu" 08:26 12-6月-20
[2] 0:[hash]

```