

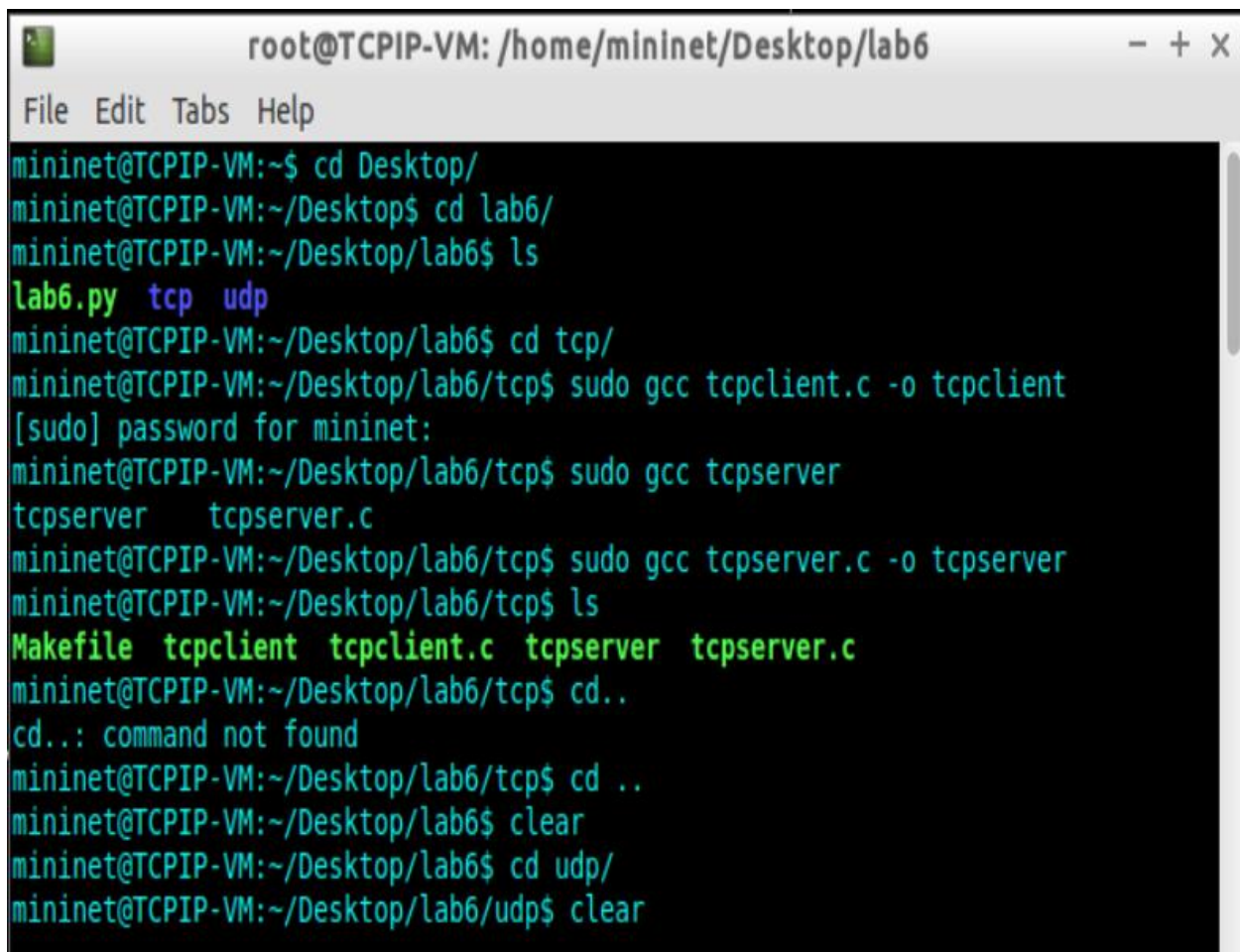
گزارشکار آزمایش ششم (قسمت دوم)

محمد صالح پژند - زینب باقیان - امیر محمد درپوش

سوال 4 :

، خط زیر را به کد اضافه کرده و دوباره فایل پایتون را اجرا می کنیم. با انجام این کار طول صف 1 router به 1000 کاهش می یابد و پهنای باند 1 eth interface را برابر با 5 Mbps می شود.

link_r1sw2.intf1.config(bw=5, max_queue_size=1000, enable_ecn=False)



```
root@TCPIP-VM: /home/mininet/Desktop/lab6
File Edit Tabs Help
mininet@TCPIP-VM:~$ cd Desktop/
mininet@TCPIP-VM:~/Desktop$ cd lab6/
mininet@TCPIP-VM:~/Desktop/lab6$ ls
lab6.py tcp udp
mininet@TCPIP-VM:~/Desktop/lab6$ cd tcp/
mininet@TCPIP-VM:~/Desktop/lab6/tcp$ sudo gcc tcpclient.c -o tcpclient
[sudo] password for mininet:
mininet@TCPIP-VM:~/Desktop/lab6/tcp$ sudo gcc tcpserver
tcpserver tcpserver.c
mininet@TCPIP-VM:~/Desktop/lab6/tcp$ sudo gcc tcpserver.c -o tcpserver
mininet@TCPIP-VM:~/Desktop/lab6/tcp$ ls
Makefile tcpclient tcpclient.c tcpserver tcpserver.c
mininet@TCPIP-VM:~/Desktop/lab6/tcp$ cd..
cd...: command not found
mininet@TCPIP-VM:~/Desktop/lab6/tcp$ cd ..
mininet@TCPIP-VM:~/Desktop/lab6$ clear
mininet@TCPIP-VM:~/Desktop/lab6$ cd udp/
mininet@TCPIP-VM:~/Desktop/lab6/udp$ clear
```

```
root@TCPIP-VM: /home/mininet/Desktop/lab6 - + x
File Edit Tabs Help
mininet@TCPIP-VM:~/Desktop/lab6/udp$ sudo gcc udpclient.c -o udpclient
mininet@TCPIP-VM:~/Desktop/lab6/udp$ sudo gcc udpserver.c -o udpserver
mininet@TCPIP-VM:~/Desktop/lab6/udp$ cd ..
mininet@TCPIP-VM:~/Desktop/lab6$ clear
```

```
root@TCPIP-VM: /home/mininet/Desktop/lab6 - + x
File Edit Tabs Help
mininet@TCPIP-VM:~/Desktop/lab6$ chmod +x tcp/tcpclient tcp/tcpserver udp/udpcli
ent udp/udpserver
chmod: changing permissions of 'tcp/tcpclient': Operation not permitted
chmod: changing permissions of 'tcp/tcpserver': Operation not permitted
chmod: changing permissions of 'udp/udpclient': Operation not permitted
chmod: changing permissions of 'udp/udpserver': Operation not permitted
mininet@TCPIP-VM:~/Desktop/lab6$ sudo chmod +x tcp/tcpclient tcp/tcpserver udp/u
dpclient udp/udpserver
mininet@TCPIP-VM:~/Desktop/lab6$ cat /proc/sys/net/ipv4/tcp_congestion_control
cubic
mininet@TCPIP-VM:~/Desktop/lab6$ sudo su
root@TCPIP-VM:/home/mininet/Desktop/lab6# echo reno >/proc/s
sched_debug    self/          stat           sysrq-trigger
schedstat      slabinfo      swaps          sysvipc/
scsi/          softirqs      sys/
root@TCPIP-VM:/home/mininet/Desktop/lab6# echo reno >/proc/sys/net/ipv4/tcp_cong
estion_control
root@TCPIP-VM:/home/mininet/Desktop/lab6# cat /proc/sys/net/ipv4/tcp_congestion
_reno
reno
root@TCPIP-VM:/home/mininet/Desktop/lab6# clear
```

```
root@TCPIP-VM: /home/mininet/Desktop/lab6
File Edit Tabs Help

** Adding Switches
** Creating Links
** Modifying Link Parameters
(3.00Mbit) *** Configuring hosts
h1 h2 h3 r1
*** Starting controller
*** Starting 2 switches
sw1 sw2
*** Configuring hosts
** Executing custom commands
** Enabling xterm for hosts only
** Running CLI
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3 r1
h2 -> h1 h3 r1
h3 -> h1 h2 r1
r1 -> h1 h2 h3
*** Results: 0% dropped (12/12 received)
mininet> _
```

یک سرور tcp روی h 3 و یک کالینت tcp روی h 1 اجرا می کنیم. مقدار نرخ h 1 به حدود 3500 kbps می رسد و همچنین مقدار rtt نیز تقریباً 3400 ms خواهد بود. همچنین مقدار پنجره ازدحام از 10 شروع شده و به صورت نمایی افزایش می یابد.

```
host: h3
root@TCPIP-VM:/home/mininet/Desktop/lab6# cd tcp
root@TCPIP-VM:/home/mininet/Desktop/lab6/tcp# ./tcpserver 10000
Handling client 10.10.0.1
with child process: 3440
```

```
host: h1
root@TCPIP-VM:/home/mininet/Desktop/lab6# cd tcp/
root@TCPIP-VM:/home/mininet/Desktop/lab6/tcp# ./tcpclient 10.10.1.3 10000 1000
0.0: 0.0kbps avg ( 0.0[inst], 0.0[mov,avg]) cwnd 10 rtt 4.0ms
0.0: 0.0kbps avg ( 0.0[inst], 0.0[mov,avg]) cwnd 17 rtt 9.5ms
0.1: 0.0kbps avg ( 0.0[inst], 0.0[mov,avg]) cwnd 48 rtt 33.5ms
0.1: 0.0kbps avg ( 0.0[inst], 0.0[mov,avg]) cwnd 68 rtt 48.0ms
0.3: 0.0kbps avg ( 0.0[inst], 0.0[mov,avg]) cwnd 130 rtt144.5ms
0.8: 0.0kbps avg ( 0.0[inst], 0.0[mov,avg]) cwnd 268 rtt417.0ms
1.5: 3660.0kbps avg ( 3660.0[inst], 3660.0[mov,avg]) cwnd 482 rtt764.0ms
2.5: 3472.7kbps avg ( 3201.1[inst], 3201.1[mov,avg]) cwnd 766 rtt1291.0ms
3.0: 3472.7kbps avg ( 3201.1[inst], 3201.1[mov,avg]) cwnd 946 rtt1517.5ms
3.0: 3472.7kbps avg ( 3201.1[inst], 3201.1[mov,avg]) cwnd 948 rtt1519.0ms
4.0: 3841.9kbps avg ( 4444.8[inst], 4444.8[mov,avg]) cwnd 1358 rtt1728.0ms
5.0: 3781.0kbps avg ( 3542.0[inst], 3542.0[mov,avg]) cwnd 1674 rtt2259.0ms
5.0: 3781.0kbps avg ( 3542.0[inst], 3542.0[mov,avg]) cwnd 1676 rtt2265.0ms
6.0: 3627.3kbps avg ( 2865.1[inst], 3474.3[mov,avg]) cwnd 1928 rtt2922.0ms
```

```
host: h1
25.1: 2635.7kbps avg ( 0.0[inst], 2113.0[mov,avg]) cwnd 1393 rtt3321.0ms
27.1: 2441.8kbps avg ( 5.7[inst], 1902.3[mov,avg]) cwnd 1140 rtt3418.0ms
28.1: 2441.8kbps avg ( 5.7[inst], 1902.3[mov,avg]) cwnd 1393 rtt2666.5ms
29.1: 2274.0kbps avg (-0.0[inst], 1712.1[mov,avg]) cwnd 1028 rtt2664.0ms
30.1: 2274.0kbps avg (-0.0[inst], 1712.1[mov,avg]) cwnd 616 rtt2427.5ms
30.1: 2201.1kbps avg (79.2[inst], 1548.8[mov,avg]) cwnd 616 rtt2427.5ms
31.1: 2201.1kbps avg (79.2[inst], 1548.8[mov,avg]) cwnd 498 rtt2429.5ms
31.1: 2130.0kbps avg ( 0.0[inst], 1393.9[mov,avg]) cwnd 498 rtt2429.5ms
32.1: 2063.5kbps avg ( 0.0[inst], 1254.5[mov,avg]) cwnd 498 rtt2429.5ms
33.1: 2001.0kbps avg (-0.0[inst], 1129.1[mov,avg]) cwnd 498 rtt2429.5ms
34.1: 1942.1kbps avg (-0.0[inst], 1016.2[mov,avg]) cwnd 498 rtt2429.5ms
35.1: 1886.5kbps avg (-0.0[inst], 914.5[mov,avg]) cwnd 498 rtt2429.5ms
36.1: 1886.5kbps avg (-0.0[inst], 914.5[mov,avg]) cwnd 1394 rtt352.5ms
36.1: 2982.4kbps avg (41482.9[inst], 4971.4[mov,avg]) cwnd 1394 rtt352.5ms
37.1: 3419.1kbps avg (19197.3[inst], 6394.0[mov,avg]) cwnd 1394 rtt967.0ms
38.1: 3451.7kbps avg (4660.8[inst], 6220.6[mov,avg]) cwnd 1394 rtt1967.0ms
40.1: 3489.5kbps avg (4211.9[inst], 6019.8[mov,avg]) cwnd 1394 rtt3577.0ms
41.1: 3518.2kbps avg (4663.5[inst], 5884.1[mov,avg]) cwnd 1394 rtt3580.0ms
42.1: 3545.8kbps avg (4682.6[inst], 5764.0[mov,avg]) cwnd 1394 rtt3575.5ms
43.1: 3545.8kbps avg (4682.6[inst], 5764.0[mov,avg]) cwnd 1395 rtt3574.0ms
43.1: 3570.1kbps avg (4592.2[inst], 5646.8[mov,avg]) cwnd 1395 rtt3574.0ms
44.1: 3540.7kbps avg (2277.9[inst], 5309.9[mov,avg]) cwnd 1395 rtt3418.0ms
^C
root@TCPIP-VM:/home/mininet/Desktop/lab6/tcp#
```

سوال 5:

در همان خط قبل مقدار `enable_ecn=True` را تغییر می‌دهیم و دوباره فایل پایتون را ران می‌کنیم.

طبق نتایج مقدار نرخ `h1` تقریباً برابر با `3800 kbps` است؛ مقدار `rtt` تقریباً برابر با `57 ms` مشاهده می‌شود.

مقدار پنجره تقریباً `1395` می‌باشد.


```
host: h3
root@TCPIP-VM:/home/mininet/Desktop/lab6# cd tcp/
root@TCPIP-VM:/home/mininet/Desktop/lab6/tcp#
root@TCPIP-VM:/home/mininet/Desktop/lab6/tcp# ./tcpserver 10000
Handling client 10.10.0.1
with child process: 3905
█
```

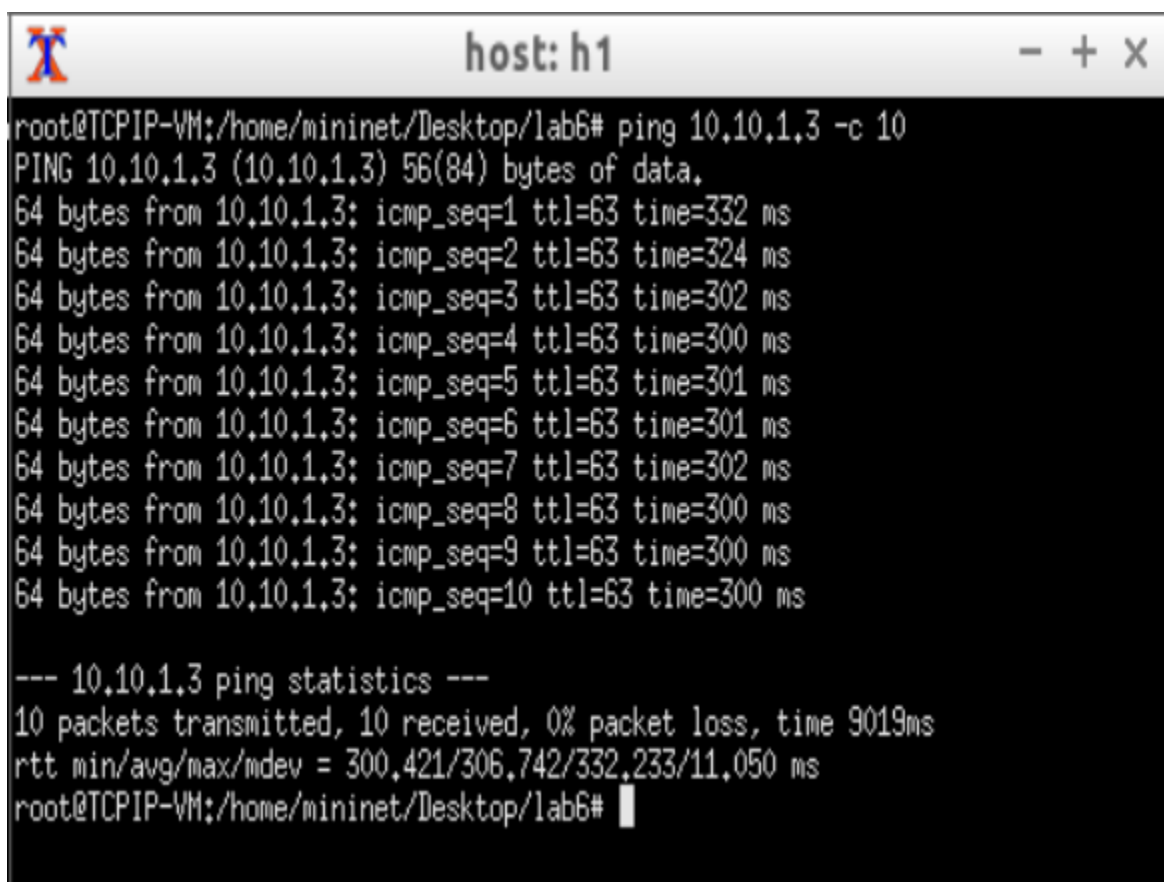
```
host: h1
31.1: 3771.3kbps avg ( 4659.8[inst], 3820.8[mov.avg]) cwnd 20 rtt 44.0ms
31.5: 3771.3kbps avg ( 4659.8[inst], 3820.8[mov.avg]) cwnd 11 rtt 51.5ms
31.7: 3771.3kbps avg ( 4659.8[inst], 3820.8[mov.avg]) cwnd 16 rtt 35.5ms
32.0: 3771.3kbps avg ( 4659.8[inst], 3820.8[mov.avg]) cwnd 19 rtt 44.5ms
32.3: 3802.7kbps avg ( 4649.1[inst], 3903.6[mov.avg]) cwnd 22 rtt 51.0ms
32.6: 3802.7kbps avg ( 4649.1[inst], 3903.6[mov.avg]) cwnd 13 rtt 31.5ms
32.9: 3802.7kbps avg ( 4649.1[inst], 3903.6[mov.avg]) cwnd 17 rtt 40.0ms
33.1: 3802.7kbps avg ( 4649.1[inst], 3903.6[mov.avg]) cwnd 20 rtt 45.0ms
33.4: 3830.9kbps avg ( 4634.9[inst], 3976.8[mov.avg]) cwnd 22 rtt 54.0ms
33.8: 3830.9kbps avg ( 4634.9[inst], 3976.8[mov.avg]) cwnd 14 rtt 39.5ms
34.1: 3830.9kbps avg ( 4634.9[inst], 3976.8[mov.avg]) cwnd 18 rtt 39.5ms
34.3: 3830.9kbps avg ( 4634.9[inst], 3976.8[mov.avg]) cwnd 21 rtt 49.5ms
34.6: 3851.3kbps avg ( 4426.3[inst], 4021.7[mov.avg]) cwnd 13 rtt 33.5ms
34.9: 3851.3kbps avg ( 4426.3[inst], 4021.7[mov.avg]) cwnd 16 rtt 37.5ms
35.2: 3851.3kbps avg ( 4426.3[inst], 4021.7[mov.avg]) cwnd 19 rtt 44.0ms
35.5: 3851.3kbps avg ( 4426.3[inst], 4021.7[mov.avg]) cwnd 22 rtt 52.0ms
35.8: 3870.2kbps avg ( 4421.1[inst], 4061.7[mov.avg]) cwnd 14 rtt 38.0ms
36.1: 3870.2kbps avg ( 4421.1[inst], 4061.7[mov.avg]) cwnd 17 rtt 48.0ms
36.6: 3870.2kbps avg ( 4421.1[inst], 4061.7[mov.avg]) cwnd 20 rtt 59.5ms
36.9: 3862.7kbps avg ( 3618.9[inst], 4017.4[mov.avg]) cwnd 12 rtt 50.5ms
37.2: 3862.7kbps avg ( 3618.9[inst], 4017.4[mov.avg]) cwnd 16 rtt 36.0ms
37.6: 3862.7kbps avg ( 3618.9[inst], 4017.4[mov.avg]) cwnd 19 rtt 57.0ms
^C
root@TCPIP-VM:/home/mininet/Desktop/lab6/tcp# █
```

سوال 6 :

با مقایسه مقادیر دو سوال می توان به این نتیجه رسید که اگر مقدار `ecn_enable` برابر با `True` باشد، برای `eth interface (Router 1` (1، فرستنده قبل از به وجود آمدن ازدحام در شبکه و بعد از آن، متوجه `drop` شدن بسته ها می شود و پنجره ارسال را مطابق با آن تنظیم می کند. به همین دلیل، مقدار `rtt` و `cwnd` به صورت قابل ملاحظه ای کاهش پیدا می کنند؛ اما در صورتیکه مقدار `ecn_enable` برابر با `False` باشد، مقادیر `rtt` و `cwnd` به شدت افزایش می یابند.

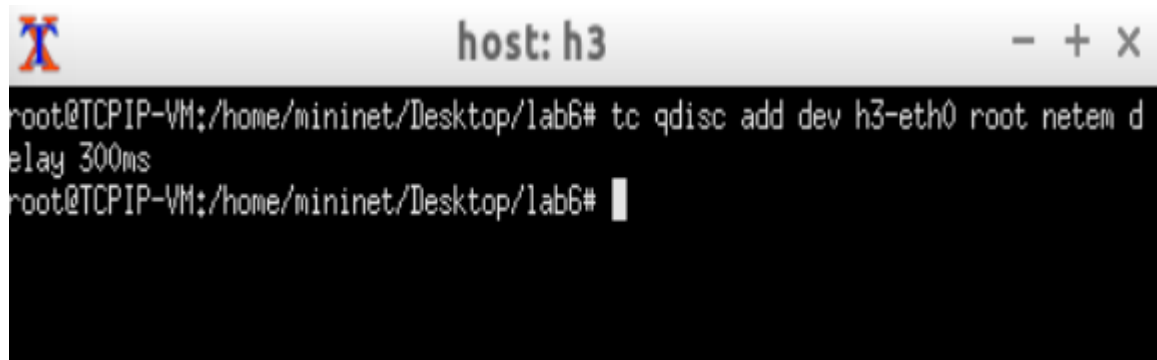
در همان کانفیک قبلی مقدار `bw=3` را ست میکنیم به این شکل:

`link_r1sw2.intf1.config(bw=3, max_queue_size=1000, enable_ecn=True)`



```
host: h1
root@TCPIP-VM:/home/mininet/Desktop/lab6# ping 10.10.1.3 -c 10
PING 10.10.1.3 (10.10.1.3) 56(84) bytes of data:
64 bytes from 10.10.1.3: icmp_seq=1 ttl=63 time=332 ms
64 bytes from 10.10.1.3: icmp_seq=2 ttl=63 time=324 ms
64 bytes from 10.10.1.3: icmp_seq=3 ttl=63 time=302 ms
64 bytes from 10.10.1.3: icmp_seq=4 ttl=63 time=300 ms
64 bytes from 10.10.1.3: icmp_seq=5 ttl=63 time=301 ms
64 bytes from 10.10.1.3: icmp_seq=6 ttl=63 time=301 ms
64 bytes from 10.10.1.3: icmp_seq=7 ttl=63 time=302 ms
64 bytes from 10.10.1.3: icmp_seq=8 ttl=63 time=300 ms
64 bytes from 10.10.1.3: icmp_seq=9 ttl=63 time=300 ms
64 bytes from 10.10.1.3: icmp_seq=10 ttl=63 time=300 ms

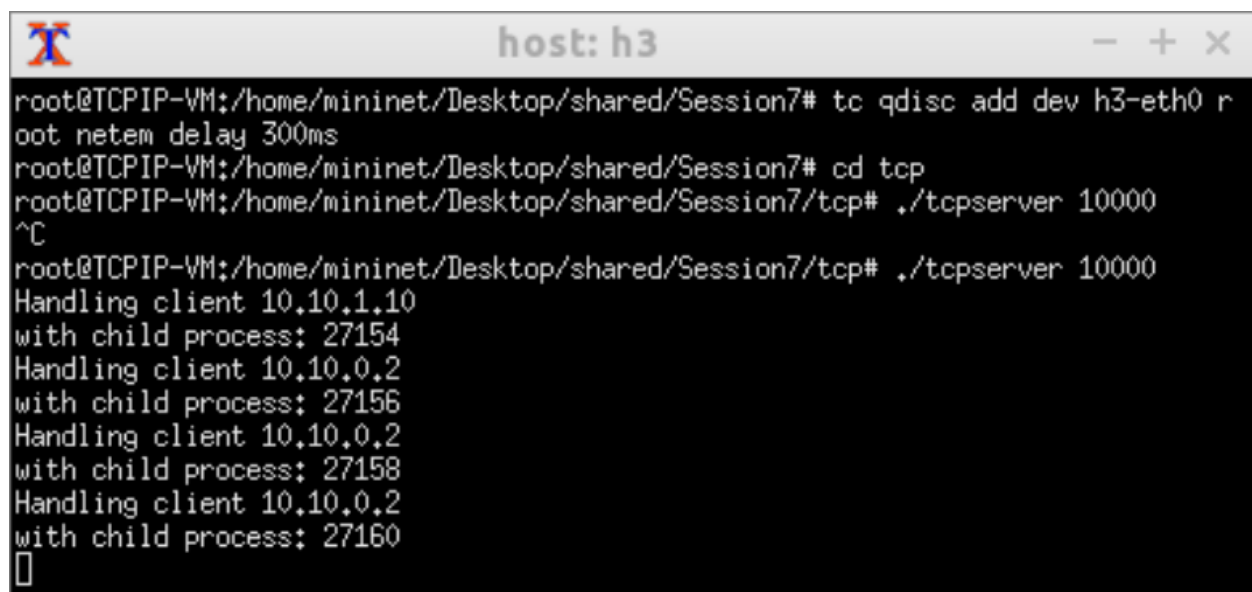
--- 10.10.1.3 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9019ms
rtt min/avg/max/mdev = 300.421/306.742/332.233/11.050 ms
root@TCPIP-VM:/home/mininet/Desktop/lab6#
```



```
root@TCPIP-VM:/home/mininet/Desktop/lab6# tc qdisc add dev h3-eth0 root netem d
elay 300ms
root@TCPIP-VM:/home/mininet/Desktop/lab6#
```

همانطور که مشاهده میشود مقدار rtt از 300ms شروع میشود

سوال 8:



```
root@TCPIP-VM:/home/mininet/Desktop/shared/Session7# tc qdisc add dev h3-eth0 r
oot netem delay 300ms
root@TCPIP-VM:/home/mininet/Desktop/shared/Session7# cd tcp
root@TCPIP-VM:/home/mininet/Desktop/shared/Session7/tcp# ./tcpserver 10000
^C
root@TCPIP-VM:/home/mininet/Desktop/shared/Session7/tcp# ./tcpserver 10000
Handling client 10.10.1.10
with child process: 27154
Handling client 10.10.0.2
with child process: 27156
Handling client 10.10.0.2
with child process: 27158
Handling client 10.10.0.2
with child process: 27160
□
```




Node: h2

- + x

35.6:	602.5kbps	avg	(	610.9[inst],	639.4[mov.avg])	cwnd	20	rtt349.0ms
36.6:	602.5kbps	avg	(	610.9[inst],	639.4[mov.avg])	cwnd	22	rtt356.5ms
37.6:	606.9kbps	avg	(	688.2[inst],	644.3[mov.avg])	cwnd	23	rtt340.5ms
38.5:	606.9kbps	avg	(	688.2[inst],	644.3[mov.avg])	cwnd	24	rtt337.5ms
39.3:	614.4kbps	avg	(	774.8[inst],	657.3[mov.avg])	cwnd	25	rtt348.0ms
40.3:	614.4kbps	avg	(	774.8[inst],	657.3[mov.avg])	cwnd	26	rtt376.0ms
41.1:	620.7kbps	avg	(	760.7[inst],	667.7[mov.avg])	cwnd	27	rtt380.0ms
42.1:	620.7kbps	avg	(	760.7[inst],	667.7[mov.avg])	cwnd	15	rtt317.5ms
42.1:	621.8kbps	avg	(	667.2[inst],	667.6[mov.avg])	cwnd	15	rtt317.5ms
43.1:	621.8kbps	avg	(	667.2[inst],	667.6[mov.avg])	cwnd	17	rtt305.0ms
44.1:	621.1kbps	avg	(	605.7[inst],	661.4[mov.avg])	cwnd	18	rtt305.5ms
45.1:	621.1kbps	avg	(	605.7[inst],	661.4[mov.avg])	cwnd	20	rtt303.5ms
45.1:	621.4kbps	avg	(	633.4[inst],	658.6[mov.avg])	cwnd	20	rtt303.5ms
46.1:	621.4kbps	avg	(	633.4[inst],	658.6[mov.avg])	cwnd	21	rtt323.5ms
46.9:	626.1kbps	avg	(	741.5[inst],	666.9[mov.avg])	cwnd	22	rtt347.5ms
47.9:	626.1kbps	avg	(	741.5[inst],	666.9[mov.avg])	cwnd	24	rtt357.0ms
48.9:	627.5kbps	avg	(	662.9[inst],	666.5[mov.avg])	cwnd	25	rtt380.0ms
49.6:	627.5kbps	avg	(	662.9[inst],	666.5[mov.avg])	cwnd	26	rtt327.0ms
50.3:	636.3kbps	avg	(	932.2[inst],	693.1[mov.avg])	cwnd	27	rtt348.0ms
51.3:	636.3kbps	avg	(	932.2[inst],	693.1[mov.avg])	cwnd	28	rtt358.0ms
52.1:	640.9kbps	avg	(	772.9[inst],	701.1[mov.avg])	cwnd	29	rtt382.5ms
52.8:	640.9kbps	avg	(	772.9[inst],	701.1[mov.avg])	cwnd	30	rtt351.0ms
53.5:	649.3kbps	avg	(	956.0[inst],	726.6[mov.avg])	cwnd	31	rtt354.5ms
54.2:	649.3kbps	avg	(	956.0[inst],	726.6[mov.avg])	cwnd	32	rtt366.0ms



host: h2

- + x

```
40.0: 561.9kbps avg ( 543.0[inst], 536.8[mov,avg]) cwnd 23 rtt380.0ms
40.0: 565.3kbps avg ( 701.3[inst], 553.3[mov,avg]) cwnd 23 rtt380.0ms
41.0: 570.9kbps avg ( 791.7[inst], 577.1[mov,avg]) cwnd 24 rtt322.5ms
42.0: 570.9kbps avg ( 791.7[inst], 577.1[mov,avg]) cwnd 25 rtt348.5ms
43.0: 580.6kbps avg ( 780.8[inst], 597.5[mov,avg]) cwnd 27 rtt373.5ms
44.0: 580.6kbps avg ( 780.8[inst], 597.5[mov,avg]) cwnd 28 rtt380.5ms
44.0: 583.4kbps avg ( 701.1[inst], 607.8[mov,avg]) cwnd 28 rtt380.5ms
45.0: 586.5kbps avg ( 723.9[inst], 619.4[mov,avg]) cwnd 15 rtt313.5ms
46.0: 586.5kbps avg ( 723.9[inst], 619.4[mov,avg]) cwnd 17 rtt303.5ms
47.0: 588.0kbps avg ( 622.2[inst], 619.7[mov,avg]) cwnd 18 rtt304.0ms
48.0: 588.0kbps avg ( 622.2[inst], 619.7[mov,avg]) cwnd 20 rtt303.5ms
48.0: 589.0kbps avg ( 633.0[inst], 621.0[mov,avg]) cwnd 20 rtt303.5ms
49.0: 589.0kbps avg ( 633.0[inst], 621.0[mov,avg]) cwnd 21 rtt324.5ms
49.0: 591.2kbps avg ( 700.9[inst], 629.0[mov,avg]) cwnd 21 rtt324.5ms
50.0: 591.2kbps avg ( 700.9[inst], 629.0[mov,avg]) cwnd 23 rtt351.0ms
51.0: 596.9kbps avg ( 736.0[inst], 639.7[mov,avg]) cwnd 24 rtt359.0ms
52.0: 600.7kbps avg ( 791.6[inst], 654.9[mov,avg]) cwnd 25 rtt332.5ms
53.0: 600.7kbps avg ( 791.6[inst], 654.9[mov,avg]) cwnd 27 rtt347.5ms
53.0: 605.6kbps avg ( 859.8[inst], 675.4[mov,avg]) cwnd 27 rtt347.5ms
54.0: 609.4kbps avg ( 814.1[inst], 689.3[mov,avg]) cwnd 28 rtt359.5ms
55.0: 609.4kbps avg ( 814.1[inst], 689.3[mov,avg]) cwnd 29 rtt385.0ms
56.0: 618.8kbps avg ( 871.3[inst], 707.5[mov,avg]) cwnd 31 rtt351.5ms
57.0: 625.8kbps avg ( 1017.7[inst], 738.5[mov,avg]) cwnd 32 rtt364.0ms
58.0: 625.8kbps avg ( 1017.7[inst], 738.5[mov,avg]) cwnd 33 rtt380.5ms
```



Node: h2



41.2:	1288.5kbps	avg	(	655.8[inst],	1220.9[mov,avg])	cwnd	23	rtt380.0ms
42.2:	1261.8kbps	avg	(	724.2[inst],	1171.2[mov,avg])	cwnd	25	rtt353.5ms
43.2:	1252.5kbps	avg	(	859.4[inst],	1140.1[mov,avg])	cwnd	26	rtt305.5ms
44.2:	1252.5kbps	avg	(	859.4[inst],	1140.1[mov,avg])	cwnd	28	rtt304.5ms
44.2:	1245.7kbps	avg	(	950.2[inst],	1121.1[mov,avg])	cwnd	28	rtt304.5ms
45.2:	1245.7kbps	avg	(	950.2[inst],	1121.1[mov,avg])	cwnd	29	rtt303.5ms
46.1:	1238.5kbps	avg	(	1071.8[inst],	1116.2[mov,avg])	cwnd	31	rtt324.0ms
47.1:	1238.5kbps	avg	(	1071.8[inst],	1116.2[mov,avg])	cwnd	32	rtt335.0ms
48.1:	1229.0kbps	avg	(	1004.0[inst],	1104.9[mov,avg])	cwnd	33	rtt357.5ms
49.1:	1229.0kbps	avg	(	1004.0[inst],	1104.9[mov,avg])	cwnd	20	rtt379.5ms
50.1:	1212.9kbps	avg	(	825.8[inst],	1077.0[mov,avg])	cwnd	19	rtt329.0ms
51.1:	1212.9kbps	avg	(	825.8[inst],	1077.0[mov,avg])	cwnd	20	rtt356.5ms
51.1:	1201.5kbps	avg	(	633.5[inst],	1032.7[mov,avg])	cwnd	20	rtt356.5ms
52.1:	1201.5kbps	avg	(	633.5[inst],	1032.7[mov,avg])	cwnd	22	rtt373.5ms
53.1:	1179.7kbps	avg	(	622.4[inst],	991.6[mov,avg])	cwnd	23	rtt352.5ms
54.1:	1179.7kbps	avg	(	622.4[inst],	991.6[mov,avg])	cwnd	24	rtt353.5ms
54.1:	1171.3kbps	avg	(	723.9[inst],	964.9[mov,avg])	cwnd	24	rtt353.5ms
55.1:	1171.3kbps	avg	(	723.9[inst],	964.9[mov,avg])	cwnd	25	rtt378.5ms
55.1:	1164.4kbps	avg	(	791.8[inst],	947.6[mov,avg])	cwnd	25	rtt378.5ms
56.1:	1164.4kbps	avg	(	791.8[inst],	947.6[mov,avg])	cwnd	27	rtt384.5ms
56.1:	1157.0kbps	avg	(	746.6[inst],	927.5[mov,avg])	cwnd	27	rtt384.5ms
57.1:	1157.0kbps	avg	(	746.6[inst],	927.5[mov,avg])	cwnd	28	rtt352.5ms
57.1:	1152.5kbps	avg	(	905.0[inst],	925.2[mov,avg])	cwnd	28	rtt352.5ms
58.1:	1145.6kbps	avg	(	746.6[inst],	907.4[mov,avg])	cwnd	29	rtt375.0ms

host: r1									
37.7:	340.0kbps	avg (	248.8[inst],	297.8[mov,avg])	cwnd	10	rtt	316.0ms	
38.7:	338.8kbps	avg (	316.9[inst],	299.7[mov,avg])	cwnd	11	rtt	306.0ms	
39.7:	342.2kbps	avg (	475.0[inst],	317.3[mov,avg])	cwnd	13	rtt	317.5ms	
40.7:	342.2kbps	avg (	475.0[inst],	317.3[mov,avg])	cwnd	14	rtt	332.0ms	
41.7:	345.3kbps	avg (	407.3[inst],	326.3[mov,avg])	cwnd	15	rtt	353.0ms	
42.7:	348.9kbps	avg (	497.7[inst],	343.4[mov,avg])	cwnd	16	rtt	374.5ms	
43.7:	348.9kbps	avg (	497.7[inst],	343.4[mov,avg])	cwnd	18	rtt	323.0ms	
44.7:	359.1kbps	avg (	577.0[inst],	366.8[mov,avg])	cwnd	19	rtt	348.0ms	
45.7:	364.6kbps	avg (	610.8[inst],	391.2[mov,avg])	cwnd	20	rtt	374.0ms	
46.7:	364.6kbps	avg (	610.8[inst],	391.2[mov,avg])	cwnd	22	rtt	380.0ms	
47.7:	369.7kbps	avg (	486.5[inst],	400.7[mov,avg])	cwnd	6	rtt	319.5ms	
48.7:	366.3kbps	avg (	203.5[inst],	381.0[mov,avg])	cwnd	7	rtt	307.0ms	
49.7:	366.3kbps	avg (	203.5[inst],	381.0[mov,avg])	cwnd	9	rtt	303.5ms	
50.7:	363.9kbps	avg (	305.4[inst],	373.4[mov,avg])	cwnd	10	rtt	307.5ms	
51.7:	363.9kbps	avg (	305.4[inst],	373.4[mov,avg])	cwnd	11	rtt	321.0ms	
52.7:	363.8kbps	avg (	362.1[inst],	372.3[mov,avg])	cwnd	13	rtt	349.0ms	
53.7:	363.8kbps	avg (	361.8[inst],	371.2[mov,avg])	cwnd	14	rtt	356.5ms	
54.7:	363.8kbps	avg (	361.8[inst],	371.2[mov,avg])	cwnd	15	rtt	345.5ms	
55.7:	368.6kbps	avg (	497.9[inst],	383.9[mov,avg])	cwnd	16	rtt	344.5ms	
56.7:	370.1kbps	avg (	452.5[inst],	390.8[mov,avg])	cwnd	18	rtt	356.0ms	
57.7:	370.1kbps	avg (	452.5[inst],	390.8[mov,avg])	cwnd	9	rtt	380.5ms	
58.7:	369.8kbps	avg (	362.1[inst],	387.9[mov,avg])	cwnd	5	rtt	353.0ms	
59.7:	365.9kbps	avg (	135.7[inst],	362.7[mov,avg])	cwnd	6	rtt	357.0ms	
60.7:	362.9kbps	avg (	181.0[inst],	344.5[mov,avg])	cwnd	7	rtt	372.0ms	

سوال 9:

خیر مقدار آنها کمی متفاوت است.

سوال 10:

تغییرات اندازه صف در rl بر روی $goodput$ تاثیر مستقیم میگذارد. در اینجا کاهش rl رابطه مستقیم با $goodput$ دارد و مقدار آن هم کاهش میابد. از طرف دیگر این بر روی rl در اینترنت تاثیر میگذارد و باعث کاهش $goodput$ برای کلاینت میشود.