# Лабораторная работа N°6

по дисциплине Моделирование сетей передачи данных

```
T "host: h1"@mininet-vm
                                                                                 X Switch: s1" (root)@mininet-vm
root@mininet-vm:/home/mininet# ifconfig
                                                                                             RX packets 0 bytes 0 (0.0 B)
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
                                                                                             RX errors 0 dropped 0 overruns 0 frame 0
       inet 10.0.0.1 netmask 255.0.0.0 broadcast 10.255.255.255
                                                                                             TX packets 0 bytes 0 (0.0 B)
        ether 36:66:ed:a0:69:74 txqueuelen 1000 (Ethernet)
                                                                                             TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
       RX packets 0 bytes 0 (0.0 B)
       RX errors 0 dropped 0 overruns 0 frame 0
                                                                                     s2-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
       TX packets 0 bytes 0 (0.0 B)
                                                                                             ether ca:fb:29:07:ef:33 txqueuelen 1000 (Ethernet)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
                                                                                             RX packets 0 bytes 0 (0.0 B)
                                                                                             RX errors 0 dropped 0 overruns 0 frame 0
lo: flags=73<UP.LOOPBACK.RUNNING> mtu 65536
                                                                                             TX packets 0 bytes 0 (0.0 B)
       inet 127.0.0.1 netmask 255.0.0.0
                                                                                             TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
       loop txqueuelen 1000 (Local Loopback)
       RX packets 1484 bytes 314232 (314.2 KB)
                                                                                     s2-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
       RX errors 0 dropped 0 overruns 0 frame 0
                                                                                             ether a6:9d:0a:b0:fe:6f txqueuelen 1000 (Ethernet)
       TX packets 1484 bytes 314232 (314.2 KB)
                                                                                             RX packets 0 bytes 0 (0.0 B)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
                                                                                             RX errors 0 dropped 0 overruns 0 frame 0
                                                                                             TX packets 0 bytes 0 (0.0 B)
root@mininet-vm:/home/mininet#
                                                                                             TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
                                                                                     root@mininet-vm:/home/mininet#
                                                                          - □ X * "switch: s2" (root)@mininet-vm
T "host: h2"@mininet-vm
root@mininet-vm:/home/mininet# ifconfig
                                                                                             ether b2:de:a5:59:ec:5f txqueuelen 1000 (Ethernet)
h2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
                                                                                             RX packets 0 bytes 0 (0.0 B)
       inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
                                                                                             RX errors 0 dropped 0 overruns 0 frame 0
       ether 42:b1:05:8a:06:e3 txquegelen 1000 (Ethernet)
                                                                                             TX packets 0 bytes 0 (0.0 B)
       RX packets 0 bytes 0 (0.0 B)
                                                                                             TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
       RX errors 0 dropped 0 overruns 0 frame 0
       TX packets 0 bytes 0 (0.0 B)
                                                                                     s2-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
                                                                                             ether ca:fb:29:07:ef:33 txqueuelen 1000 (Ethernet)
                                                                                             RX packets 0 bytes 0 (0.0 B)
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
                                                                                             RX errors 0 dropped 0 overruns 0 frame 0
       inet 127.0.0.1 netmask 255.0.0.0
                                                                                             TX packets 0 bytes 0 (0.0 B)
       loop txqueuelen 1000 (Local Loopback)
                                                                                             TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
       RX packets 1758 bytes 336840 (336.8 KB)
                                                                                     s2-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAS
       RX errors 0 dropped 0 overruns 0 frame 0
       TX packets 1758 bytes 336840 (336.8 KB)
                                                                                             ether a6:9d:0a:b0:fe:6f txqueuelen 1000
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
                                                                                             RX packets 0 bytes 0 (0.0 B)
                                                                                             RX errors 0 dropped 0 overruns 0 frame
root@mininet-vm:/home/mininet#
                                                                                             TX packets 0 bytes 0 (0.0 B)
                                                                                             TX errors 0 dropped 0 overruns 0 carrie
                                                                                     root@mininet-vm:/home/mininet#
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root@mininet-vm:/home/mininet# ping -c 4 10.0.0.2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp seg=1 ttl=64 time=1.76 ms
64 bytes from 10.0.0.2: icmp seq=2 ttl=64 time=0.150 ms
64 bytes from 10.0.0.2: icmp seq=3 ttl=64 time=0.038 ms
64 bytes from 10.0.0.2: icmp seg=4 ttl=64 time=0.033 ms
--- 10.0.0.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3053ms
rtt min/avg/max/mdev = 0.033/0.495/1.759/0.731 ms
root@mininet-vm:/home/mininet#
T "host: h2"@mininet-vm
                                                                               root@mininet-vm:/home/mininet# ifconfig
h2-eth0: flags=4163<UP, BROADCAST, RUNNING, MULTICAST> mtu 1500
        inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
        ether 42:b1:05:8a:06:e3 txqueuelen 1000 (Ethernet)
       RX packets 0 bytes 0 (0.0 B)
       RX errors 0 dropped 0 overruns 0 frame 0
       TX packets 0 bytes 0 (0.0 B)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
        inet 127.0.0.1 netmask 255.0.0.0
        loop txqueuelen 1000 (Local Loopback)
        RX packets 1758 bytes 336840 (336.8 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
       TX packets 1758 bytes 336840 (336.8 KB)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
root@mininet-vm:/home/mininet#
```

```
T "host: h1"@mininet-vm
                                                                          - 🗆 ×
Connecting to host 10.0.0.2, port 5201
  7] local 10.0.0.1 port 43792 connected to 10.0.0.2 port 5201
 ID] Interval
                        Transfer
                                     Bitrate
                                                     Retr Cwnd
       0.00-1.00
                   sec 4.65 GBytes 39.9 Gbits/sec
                                                          8.24 MBytes
       1.00-2.00
                   sec 4.95 GBytes 42.5 Gbits/sec
                                                          8.24 MBytes
       2.00-3.00
                   sec 4.70 GBytes 40.4 Gbits/sec
                                                          8.24 MBytes
                                                          8.24 MBytes
       3.00-4.00
                   sec 4.35 GBytes 37.3 Gbits/sec
       4.00-5.00
                   sec 3.74 GBytes 32.1 Gbits/sec
                                                          8.24 MBytes
       5.00-6.00
                   sec 4.02 GBytes 34.5 Gbits/sec
                                                          8.24 MBytes
       6.00-7.00
                   sec 4.22 GBytes 36.2 Gbits/sec
                                                          8.24 MBytes
                   sec 4.32 GBytes 37.1 Gbits/sec
       7.00-8.00
                                                          8.24 MBytes
       8.00-9.00
                   sec 4.47 GBytes 38.3 Gbits/sec
                                                          8.24 MBytes
       9.00-10.00 sec 4.23 GBytes 36.3 Gbits/sec
                                                          8.24 MBvtes
 ID1 Interval
                        Transfer
                                     Bitrate
                                                     Retr
       0.00-10.00 sec 43.6 GBytes 37.5 Gbits/sec
                                                                    sender
       0.00-10.00 sec 43.6 GBytes 37.5 Gbits/sec
                                                                    receiver
iperf Done.
root@mininet-vm:/home/mininet#
T "host: h2"@mininet-vm
Accepted connection from 10.0.0.1, port 43790
[ 7] local 10.0.0.2 port 5201 connected to 10.0.0.1 port 43792
[ ID] Interval
                        Transfer
                                     Bitrate
                   sec 4.64 GBvtes 39.8 Gbits/sec
       0.00-1.00
       1.00-2.00
                   sec 4.95 GBvtes 42.5 Gbits/sec
       2.00-3.00
                   sec 4.71 GBytes 40.4 Gbits/sec
       3.00-4.00
                   sec 4.35 GBvtes 37.4 Gbits/sec
       4.00-5.00
                   sec 3.75 GBytes 32.2 Gbits/sec
       5.00-6.00
                   sec 4.01 GBytes 34.4 Gbits/sec
       6.00-7.00
                   sec 4.21 GBytes 36.2 Gbits/sec
       7.00-8.00
                   sec 4.32 GBytes 37.1 Gbits/sec
       8.00-9.00
                   sec 4.46 GBytes 38.3 Gbits/sec
       9.00-10.00 sec 4.23 GBytes 36.3 Gbits/sec
      10.00-10.00
                  sec 11.9 MBytes 77.7 Gbits/sec
[ ID] Interval
                        Transfer
                                     Bitrate
       0.00-10.00 sec 43.6 GBytes 37.5 Gbits/sec
                                                                    receiver
Server listening on 5201
```

iperf Done.
root@mininet-vm:/home/mininet# sudo tc qdisc add dev h1-eth0 root tbf rate 10gbit bur st 5000000 limit 15000000 root@mininet-vm:/home/mininet# 

\*\*Thost h2"@mininet-vm\*\*

[ 7] local 10.0.0.2 port 5201 connected to 10.0.0.1 port 43792

[ ID] Interval Transfer Bitrate

```
X "host: h1"@mininet-vm
                                                                                  X "switch: s1" (root)@mininet-vm
Connecting to host 10.0.0.2, port 5201
                                                                                              RX packets 0 bytes 0 (0.0
 71 local 10.0.0.1 port 43796 connected to 10.0.0.2 port 5201
                                                                                              RX errors 0 dropped 0 ove
                        Transfer
 ID1 Interval
                                     Bitrate
                                                     Retr Cwnd
                                                                                              TX packets 0 bytes 0 (0.0
                   sec 1.12 GBytes 9.64 Gbits/sec
                                                                                              TX errors 0 dropped 0 over
       0.00-1.00
                                                          1.37 MBytes
       1.00-2.00
                   sec 1.12 GBvtes 9.58 Gbits/sec
                                                       0 2.96 MBvtes
       2.00-3.00
                   sec 1.11 GBytes 9.56 Gbits/sec
                                                       0 2.96 MBytes
                                                                                      s2-eth1: flags=4163<UP,BROADCAST,RL
       3.00-4.00
                   sec 1.11 GBytes 9.56 Gbits/sec
                                                          2.96 MBytes
                                                                                              ether ca:fb:29:07:ef:33 tx
        4.00-5.00
                   sec 1.11 GBytes 9.56 Gbits/sec
                                                          2.96 MBytes
                                                                                              RX packets 0 bytes 0 (0.0
       5.00-6.00
                   sec 1.11 GBytes 9.56 Gbits/sec
                                                                                              RX errors 0 dropped 0 ove
                                                          2.96 MBytes
       6.00-7.00
                   sec 1.11 GBytes 9.57 Gbits/sec
                                                       0 2.96 MBytes
                                                                                              TX packets 0 bytes 0 (0.0
                                                                                              TX errors 0 dropped 0 over
       7.00-8.00
                   sec 1.11 GBytes 9.56 Gbits/sec
                                                          2.96 MBytes
       8.00-9.00
                   sec 1.11 GBvtes 9.56 Gbits/sec
                                                          2.96 MBytes
       9.00-10.00
                   sec 1.11 GBytes 9.53 Gbits/sec
                                                          3.58 MBytes
                                                                                      s2-eth2: flags=4163<UP,BROADCAST,RL
                                                                                              ether a6:9d:0a:b0:fe:6f tx
 ID1 Interval
                        Transfer
                                     Bitrate
                                                                                              RX packets 0 bytes 0 (0.0
                                                     Retr
       0.00-10.00 sec 11.1 GBytes 9.57 Gbits/sec
                                                       0
                                                                     sender
                                                                                              RX errors 0 dropped 0 ove
       0.00-10.01 sec 11.1 GBytes 9.56 Gbits/sec
                                                                     receiver
                                                                                              TX packets 0 bytes 0 (0.0
                                                                                              TX errors 0 dropped 0 over
iperf Done.
root@mininet-vm:/home/mininet#
                                                                                      root@mininet-vm:/home/mininet#
* "host: h2"@mininet-vm
                                                                                      x "switch: s2" (root)@mininet-vm
Accepted connection from 10.0.0.1, port 43794
                                                                                              ether b2:de:a5:59:ec:5f tx
  7] local 10.0.0.2 port 5201 connected to 10.0.0.1 port 43796
                                                                                              RX packets 0 bytes 0 (0.0
 ID1 Interval
                        Transfer
                                     Bitrate
                                                                                              RX errors 0 dropped 0 ove
       0.00-1.00
                   sec 1.12 GBytes 9.59 Gbits/sec
                                                                                              TX packets 0 bytes 0 (0.0
       1.00-2.00
                   sec 1.11 GBvtes 9.54 Gbits/sec
                                                                                              TX errors 0 dropped 0 over
       2.00-3.00
                   sec 1.11 GBytes 9.56 Gbits/sec
       3.00-4.00
                   sec 1.11 GBvtes 9.56 Gbits/sec
                                                                                      s2-eth1: flags=4163<UP.BROADCAST.RL
  71
       4.00-5.00
                   sec 1.11 GBvtes 9.56 Gbits/sec
                                                                                              ether ca:fb:29:07:ef:33 tx
       5.00-6.00
                   sec 1.11 GBytes 9.56 Gbits/sec
                                                                                              RX packets 0 bytes 0 (0.0
       6.00-7.00
                   sec 1.11 GBytes 9.56 Gbits/sec
                                                                                              RX errors 0 dropped 0 ove
       7.00-8.00
                   sec 1.11 GBytes 9.56 Gbits/sec
                                                                                              TX packets 0 bytes 0 (0.0
       8.00-9.00
                   sec 1.11 GBytes I 9.56 Gbits/sec
                                                                                              TX errors 0 dropped 0 over
       9.00-10.00 sec 1.11 GBytes 9.54 Gbits/sec
                                                                                      s2-eth2: flags=4163<UP,BROADCAST,RL
  7] 10.00-10.01 sec 573 KBytes 658 Mbits/sec
                                                                                              ether a6:9d:0a:b0:fe:6f tx
                                                                                              RX packets 0 bytes 0 (0.0
 ID] Interval
                        Transfer
                                     Bitrate
       0.00-10.01 sec 11.1 GBvtes 9.56 Gbits/sec
                                                                     receiver
                                                                                              RX errors 0 dropped 0 ove
                                                                                              TX packets 0 bytes 0 (0.0
Server listening on 5201
                                                                                              TX errors 0 dropped 0 over
```

root@mininet-vm:/home/mininet#

```
T "host: h1"@mininet-vm
                                                                        - □ X X "switch: s1" (root)@mininet-vm
Connecting to host 10.0.0.2, port 5201
                                                                                          TX packets 0 bytes 0 (0.0 B)
 7] local 10.0.0.1 port 43800 connected to 10.0.0.2 port 5201
                                                                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
 ID] Interval
                       Transfer Bitrate
  7] 0.00-1.00
                 sec 1.12 GBytes 9.65 Gbits/sec 0 1.60 MBytes
                                                                                  s2-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      1.00-2.00
                  sec 1.11 GBytes 9.56 Gbits/sec
                                                                                          ether ca:fb:29:07:ef:33 txqueuelen 1000 (Ethernet)
                                                   0 1.67 MBytes
      2.00-3.00
                  sec 1.11 GBytes 9.57 Gbits/sec 0 1.76 MBytes
                                                                                          RX packets 0 bytes 0 (0.0 B)
      3.00-4.00
                  sec 1.11 GBytes 9.56 Gbits/sec 0 1.76 MBytes
                                                                                          RX errors 0 dropped 0 overruns 0 frame 0
      4.00-5.00
                  sec 1.11 GBytes 9.57 Gbits/sec
                                                   0 1.93 MBytes
                                                                                          TX packets 0 bytes 0 (0.0 B)
  7]
                  sec 1.11 GBytes 9.56 Gbits/sec
                                                                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
      5.00-6.00
                                                    0 1.93 MBvtes
  71
       6.00-7.00
                  sec 1.11 GBytes 9.56 Gbits/sec
                                                   0 1.93 MBvtes
      7.00-8.00
                  sec 1.11 GBytes 9.56 Gbits/sec
                                                   0 1.93 MBvtes
                                                                                  s2-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
                  sec 1.11 GBytes 9.56 Gbits/sec
                                                    0 1.93 MBytes
                                                                                          ether a6:9d:0a:b0:fe:6f txqueuelen 1000 (Ethernet)
      9.00-10.00 sec 1.11 GBvtes 9.56 Gbits/sec
                                                    0 2.97 MBvtes
                                                                                          RX packets 0 bytes 0 (0.0 B)
                                                                                          RX errors 0 dropped 0 overruns 0 frame 0
[ ID] Interval
                       Transfer Bitrate
                                                                                          TX packets 0 bytes 0 (0.0 B)
     0.00-10.00 sec 11.1 GBvtes 9.57 Gbits/sec
                                                                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
                                                                  sender
[ 7] 0.00-10.00 sec 11.1 GBytes 9.56 Gbits/sec
                                                                  receiver
                                                                                   root@mininet-vm:/home/mininet# sudo tc gdisc add dev s1-eth2 root tbf rate 10gbit bur
                                                                                  st 5000000 limit 15000000
iperf Done.
root@mininet-vm:/home/mininet#
                                                                                  root@mininet-vm:/home/mininet#
                                                                               X "switch: s2" (root)@mininet-vm
Accepted connection from 10.0.0.1, port 43798
                                                                                          ether b2:de:a5:59:ec:5f txqueuelen 1000 (Ethernet)
 71 local 10.0.0.2 port 5201 connected to 10.0.0.1 port 43800
                                                                                          RX packets 0 bytes 0 (0.0 B)
 ID1 Interval
                                                                                          RX errors 0 dropped 0 overruns 0 frame 0
                       Transfer Bitrate
      0.00-1.00
                 sec 1.12 GBvtes 9.60 Gbits/sec
                                                                                          TX packets 0 bytes 0 (0.0 B)
      1.00-2.00
                  sec 1.11 GBytes 9.56 Gbits/sec
                                                                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
                  sec 1.11 GBytes 9.56 Gbits/sec
      2.00-3.00
      3.00-4.00
                  sec 1.11 GBytes 9.57 Gbits/sec
                                                                                  s2-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      4.00-5.00
                  sec 1.11 GBytes 9.56 Gbits/sec
                                                                                          ether ca:fb:29:07:ef:33 txgueuelen 1000 (Ethernet)
                  sec 1.11 GBytes 9.56 Gbits/sec
      5.00-6.00
                                                                                          RX packets 0 bytes 0 (0.0 B)
  71
      6.00-7.00
                  sec 1.11 GBytes 9.56 Gbits/sec
                                                                                          RX errors 0 dropped 0 overruns 0 frame 0
                  sec 1.11 GBytes 9.56 Gbits/sec
  71
      7.00-8.00
                                                                                          TX packets 0 bytes 0 (0.0 B)
      8.00-9.00
                  sec 1.11 GBytes 9.56 Gbits/sec
                                                                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
      9.00-10.00 sec 1.11 GBytes 9.53 Gbits/sec
[ 7] 10.00-10.00 sec 1.43 MBytes 9.15 Gbits/sec
                                                                                  s2-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAS
                                                                                          ether a6:9d:0a:b0:fe:6f txqueuelen 1000
                       Transfer Bitrate
                                                                                          RX packets 0 bytes 0 (0.0 B)
[ 7] 0.00-10.00 sec 11.1 GBytes 9.56 Gbits/sec
                                                                  receiver
                                                                                          RX errors 0 dropped 0 overruns 0 frame
                                                                                          TX packets 0 bytes 0 (0.0 B)
Server listening on 5201
                                                                                          TX errors 0 dropped 0 overruns 0 carrie
                                                                                   root@mininet-vm:/home/mininet#
    О Поиск
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```
I "host: h1"@mininet-vm

☐ X | X "switch: s1" (root)@mininet-vm

Connecting to host 10.0.0.2, port 5201
                                                                                           RX packets 0 bytes 0 (0.0 B)
 7] local 10.0.0.1 port 43804 connected to 10.0.0.2 port 5201
                                                                                           RX errors 0 dropped 0 overruns 0 frame 0
 ID] Interval
                                   Bitrate
                       Transfer
                                                   Retr Cwnd
                                                                                          TX packets 0 bytes 0 (0.0 B)
      0.00-1.00 sec 215 MBytes 1.80 Gbits/sec 180
                                                        3.14 MBytes
                                                                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
       1.00-2.00
                       229 MBytes 1.92 Gbits/sec
                                                    0
                                                       3.37 MBytes
                       228 MBytes 1.91 Gbits/sec
                                                     0 3.56 MBytes
                                                                                   s2-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      3.00-4.00
                        222 MBytes 1.87 Gbits/sec 1215 2.63 MBytes
                                                                                           ether a6:9d:0a:b0:fe:6f txqueuelen 1000 (Ethernet)
      4.00-5.00
                        228 MBytes 1.91 Gbits/sec
                                                     0 2.76 MBytes
                                                                                          RX packets 0 bytes 0 (0.0 B)
       5.00-6.00
                  sec 229 MBytes 1.92 Gbits/sec
                                                    0 2.87 MBytes
                                                                                          RX errors 0 dropped 0 overruns 0 frame 0
                 sec 228 MBvtes 1.91 Gbits/sec
                                                                                          TX packets 0 bytes 0 (0.0 B)
                                                     0 2.95 MBvtes
      7.00-8.00
                 sec 228 MBytes 1.91 Gbits/sec
                                                     0 3.01 MBvtes
                                                                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
      8.00-9.00
                  sec 229 MBvtes 1.92 Gbits/sec
                                                     0 3.05 MBvtes
 71 9.00-10.00 sec 228 MBvtes 1.91 Gbits/sec
                                                    0 3.08 MBvtes
                                                                                   root@mininet-vm:/home/mininet# sudo tc gdisc add dev s1-eth2 root tbf rate 10gbit bur
                                                                                   st 5000000 limit 15000000
[ ID] Interval
                       Transfer
                                                                                   root@mininet-vm:/home/mininet# sudo tc qdisc del dev s1-eth2 root
                                   Bitrate
  7] 0.00-10.00 sec 2.21 GBytes 1.90 Gbits/sec
                                                                   sender
                                                                                   root@mininet-vm:/home/mininet# sudo tc qdisc add dev s1-eth2 root handle 1: netem del
[ 7] 0.00-10.01 sec 2.20 GBytes 1.89 Gbits/sec
                                                                  receiver
                                                                                   root@mininet-vm:/home/mininet# sudo tc qdisc add dev s1-eth2 parent 1: handle 2: tbf
iperf Done.
                                                                                   rate 2gbit burst 1000000 limit 2000000
root@mininet-vm:/home/mininet#
                                                                                   root@mininet-vm:/home/mininet#
* "host: h2"@mininet-vm
                                                                                  * "switch: s2" (root)@mininet-vm
Accepted connection from 10.0.0.1, port 43802
                                                                                           ether b2:de:a5:59:ec:5f txqueuelen 1000 (Ethernet)
7] local 10.0.0.2 port 5201 connected to 10.0.0.1 port 43804
                                                                                          RX packets 0 bytes 0 (0.0 B)
 ID1 Interval
                       Transfer
                                 Bitrate
                                                                                          RX errors 0 dropped 0 overruns 0 frame 0
  71 0.00-1.00
                 sec 204 MBytes 1.71 Gbits/sec
                                                                                          TX packets 0 bytes 0 (0.0 B)
      1.00-2.00
                 sec 228 MBytes 1.91 Gbits/sec
                                                                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
      2.00-3.00 sec 228 MBytes 1.91 Gbits/sec
                                                                                   s2-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      3.00-4.00 sec 222 MBytes 1.86 Gbits/sec
      4.00-5.00
                  sec 228 MBytes 1.91 Gbits/sec
                                                                                           ether ca:fb:29:07:ef:33 txqueuelen 1000 (Ethernet)
      5.00-6.00
                 sec 228 MBytes 1.91 Gbits/sec
                                                                                           RX packets 0 bytes 0 (0.0 B)
      6.00-7.00
                 sec 228 MBytes 1.91 Gbits/sec
                                                                                          RX errors 0 dropped 0 overruns 0 frame 0
      7.00-8.00
                 sec
                       228 MBytes 1.91 Gbits/sec
                                                                                          TX packets 0 bytes 0 (0.0 B)
      8.00-9.00
                 sec 228 MBvtes 1.91 Gbits/sec
                                                                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
      9.00-10.00 sec 228 MBvtes 1.91 Gbits/sec
 7] 10.00-10.01 sec 2.92 MBytes 1.84 Gbits/sec
                                                                                   s2-eth2: flags=4163<UP.BROADCAST.RUNNING.MULTICAS
                                                                                           ether a6:9d:0a:b0:fe:6f txgueuelen 1000
[ ID] Interval
                                                                                          RX packets 0 bytes 0 (0.0 B)
                       Transfer
[ 7] 0.00-10.01 sec 2.20 GBytes 1.89 Gbits/sec
                                                                                          RX errors 0 dropped 0 overruns 0 frame
                                                                  receiver
                                                                                          TX packets 0 bytes 0 (0.0 B)
                                                                                          TX errors 0 dropped 0 overruns 0 carrie
Server listening on 5201
                                                                                   root@mininet-vm:/home/mininet#
    Р Поиск
```

#### Вывод

Я познакомился с принципами работы дисциплины очереди Token Bucket Filter, которая формирует входящий/исходящий трафик для ограничения пропускной способности, а также получил навыки моделирования и исследования поведения трафика посредством проведения интерактивного и воспроизводимого экспериментов в Mininet.