

Настройка пропускной способности глобальной сети с помощью Token Bucket Filter

Абд эль хай мохамад

РУДН, Москва, Российская Федерация

Основной целью работы является знакомство с принципами работы дисциплины очереди Token Bucket Filter, которая формирует входящий/исходящий трафик для ограничения пропускной способности, а также получение навыков моделирования и исследования поведения трафика посредством проведения интерактивного и воспроизводимого экспериментов в Mininet.

Выполнение задачи

```
"host: h1" <@mininet-vm>
```

```
TX packets 1307  bytes 3432624 (3.4 MB)
TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

```
oot@mininet-vm:/home/mininet# iperf3 -c 10.0.0.2
```

```
Connecting to host 10.0.0.2, port 5201
```

```
[ 7] local 10.0.0.1 port 52802 connected to 10.0.0.2 port 5201
```

ID]	Interval		Transfer	Bitrate	Retr	Cwnd
[7]	0.00-1.00	sec	4.62 GBytes	39.6 Gbits/sec	10	6.47 MBytes
[7]	1.00-2.00	sec	4.04 GBytes	34.7 Gbits/sec	0	6.47 MBytes
[7]	2.00-3.00	sec	4.25 GBytes	36.5 Gbits/sec	0	6.53 MBytes
[7]	3.00-4.00	sec	3.86 GBytes	33.2 Gbits/sec	0	6.53 MBytes
[7]	4.00-5.00	sec	3.69 GBytes	31.7 Gbits/sec	1	6.53 MBytes
[7]	5.00-6.00	sec	3.40 GBytes	29.2 Gbits/sec	0	6.53 MBytes
[7]	6.00-7.00	sec	4.08 GBytes	35.0 Gbits/sec	0	6.53 MBytes
[7]	7.00-8.00	sec	4.05 GBytes	34.8 Gbits/sec	0	6.53 MBytes
[7]	8.00-9.00	sec	4.04 GBytes	34.7 Gbits/sec	0	6.53 MBytes
[7]	9.00-10.00	sec	3.96 GBytes	34.1 Gbits/sec	0	6.53 MBytes

ID]	Interval		Transfer	Bitrate	Retr	
[7]	0.00-10.00	sec	40.0 GBytes	34.4 Gbits/sec	11	sender
[7]	0.00-10.00	sec	40.0 GBytes	34.4 Gbits/sec		receiver

```
iperf Done.
```

```
oot@mininet-vm:/home/mininet#
```

```
"host: h1" <@mininet-vm>
```

```
iperf Done.
```

```
root@mininet-vm:/home/mininet# sudo tc qdisc add dev h1-eth0 root tbf rate 10gb
it burst 5000000 limit 15000000
```

```
root@mininet-vm:/home/mininet# iperf3 -c 10.0.0.2
```

```
Connecting to host 10.0.0.2, port 5201
```

```
[ 7] local 10.0.0.1 port 52806 connected to 10.0.0.2 port 5201
```

[ID]	Interval		Transfer	Bitrate	Retr	Cwnd
[7]	0.00-1.00	sec	1.02 GBytes	8.79 Gbits/sec	0	3.24 MBytes
[7]	1.00-2.00	sec	842 MBytes	7.07 Gbits/sec	0	4.79 MBytes
[7]	2.00-3.00	sec	752 MBytes	6.31 Gbits/sec	45	5.28 MBytes
[7]	3.00-4.01	sec	1011 MBytes	8.44 Gbits/sec	0	5.28 MBytes
[7]	4.01-5.00	sec	810 MBytes	6.83 Gbits/sec	0	5.28 MBytes
[7]	5.00-6.00	sec	1.08 GBytes	9.28 Gbits/sec	0	5.28 MBytes
[7]	6.00-7.00	sec	1.04 GBytes	8.96 Gbits/sec	0	5.28 MBytes
[7]	7.00-8.00	sec	968 MBytes	8.12 Gbits/sec	0	5.36 MBytes
[7]	8.00-9.00	sec	852 MBytes	7.15 Gbits/sec	0	5.36 MBytes
[7]	9.00-10.00	sec	864 MBytes	7.25 Gbits/sec	45	5.36 MBytes

[ID]	Interval		Transfer	Bitrate	Retr	
[7]	0.00-10.00	sec	9.10 GBytes	7.82 Gbits/sec	90	sender
[7]	0.00-10.00	sec	9.09 GBytes	7.81 Gbits/sec		receiver

```
iperf Done.
```

```
root@mininet-vm:/home/mininet#
```

Выполнение задачи

```
"host: h1" <@mininet-vm>
v ^ x

iperf Done.
root@mininet-vm:/home/mininet# sudo tc qdisc del dev h1-eth0 root
root@mininet-vm:/home/mininet# iperf3 -c 10.0.0.2
Connecting to host 10.0.0.2, port 5201
[ 7] local 10.0.0.1 port 52810 connected to 10.0.0.2 port 5201
[ ID] Interval      Transfer    Bitrate      Retr   Cwnd
[ 7]  0.00-1.00    sec  1.00 GBytes  8.61 Gbits/sec    0   4.45 MBytes
[ 7]  1.00-2.00    sec  1.02 GBytes  8.79 Gbits/sec   90   3.80 MBytes
[ 7]  2.00-3.00    sec   988 MBytes  8.28 Gbits/sec   90   3.03 MBytes
[ 7]  3.00-4.00    sec  1.04 GBytes  8.98 Gbits/sec   45   3.13 MBytes
[ 7]  4.00-5.00    sec  1.07 GBytes  9.18 Gbits/sec    0   3.14 MBytes
[ 7]  5.00-6.00    sec   804 MBytes  6.74 Gbits/sec   45   3.14 MBytes
[ 7]  6.00-7.00    sec   830 MBytes  6.96 Gbits/sec    0   3.15 MBytes
[ 7]  7.00-8.00    sec   729 MBytes  6.11 Gbits/sec  226   2.38 MBytes
[ 7]  8.00-9.00    sec   818 MBytes  6.86 Gbits/sec    0   1.75 MBytes
[ 7]  9.00-10.00   sec   890 MBytes  7.46 Gbits/sec    0   1.83 MBytes

- - - - -
[ ID] Interval      Transfer    Bitrate      Retr
[ 7]  0.00-10.00   sec  9.08 GBytes  7.80 Gbits/sec  496
[ 7]  0.00-10.00   sec  9.07 GBytes  7.79 Gbits/sec

sender
receiver

iperf Done.
root@mininet-vm:/home/mininet# █
```

```
"host: h1" <@mininet-vm>
v ^ x

--- 10.0.0.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3024ms
rtt min/avg/max/mdev = 10.134/44.561/89.555/34.313 ms
root@mininet-vm:/home/mininet# iperf3 -c 10.0.0.2
Connecting to host 10.0.0.2, port 5201
[ 7] local 10.0.0.1 port 52814 connected to 10.0.0.2 port 5201
[ ID] Interval      Transfer    Bitrate      Retr   Cwnd
[ 7]  0.00-1.00    sec  91.6 MBytes  767 Mbits/sec  1080   1.75 MBytes
[ 7]  1.00-2.00    sec  96.2 MBytes  807 Mbits/sec   45   1.83 MBytes
[ 7]  2.00-3.05    sec  82.5 MBytes  661 Mbits/sec   29   1.39 MBytes
[ 7]  3.05-4.00    sec  37.5 MBytes  331 Mbits/sec    0   1.51 MBytes
[ 7]  4.00-5.00    sec  57.5 MBytes  483 Mbits/sec    0   1.61 MBytes
[ 7]  5.00-6.00    sec  75.0 MBytes  629 Mbits/sec    0   1.70 MBytes
[ 7]  6.00-7.00    sec  88.8 MBytes  744 Mbits/sec    0   1.75 MBytes
[ 7]  7.00-8.00    sec  86.2 MBytes  724 Mbits/sec    0   1.79 MBytes
[ 7]  8.00-9.00    sec  53.8 MBytes  451 Mbits/sec    0   1.82 MBytes
[ 7]  9.00-10.00   sec   174 MBytes  1.46 Gbits/sec    0   1.84 MBytes

- - - - -
[ ID] Interval      Transfer    Bitrate      Retr
[ 7]  0.00-10.00   sec  843 MBytes  707 Mbits/sec  1154
[ 7]  0.00-10.02   sec  832 MBytes  697 Mbits/sec

sender
receiver

iperf Done.
root@mininet-vm:/home/mininet# █
```

Выполнение задачи

```
mininet@mininet-vm:~/work/lab_tbf$ cat Makefile
all: ping.dat

ping.dat:
    sudo python lab06_TBF.py
    sudo chown mininet:mininet log.dat

clean:
    -rm -f *.dat
mininet@mininet-vm:~/work/lab_tbf$
```

1

```
mininet@mininet-vm:~/work/lab_tbf$ nvim Makefile
mininet@mininet-vm:~/work/lab_tbf$ make
sudo python lab06_TBF.py
*** Adding controller
*** Adding hosts
*** Adding switch
*** Creating links
*** Starting network
*** Configuring hosts
h1 h2
*** Starting controller
c0
*** Starting 2 switches
s1 s2 ...
*** Waiting for switches to connect
s1 s2
*** Set delay
*** s1 : ('sudo tc qdisc add dev s1-eth2 root handle 1: netem delay 10ms',)
*** s1 : ('sudo tc qdisc add dev s1-eth2 parent 1: handle 2: tbf rate 2gbit burst 1000000 limit 2000000',)
*** h2 : ('iperf3 -s &',)
*** h1 : ('iperf3 -c 10.0.0.2 >> log.dat',)
*** Stopping network*** Stopping 1 controllers
c0
*** Stopping 3 links
...
*** Stopping 2 switches
s1 s2
*** Stopping 2 hosts
h1 h2
*** Done
sudo chown mininet:mininet log.dat
```

2

```
mininet@mininet-vm:~/work/lab_tbf$ cat log.dat
Connecting to host 10.0.0.2, port 5201
[ 5] local 10.0.0.1 port 45390 connected to 10.0.0.2 port 5201
[ ID] Interval          Transfer      Bitrate      Retr  Cwnd
[ 5]  0.00-1.00 sec      24.3 MBytes  204 Mbits/sec    0   971 KBytes
[ 5]  1.00-2.00 sec      215 MBytes  1.80 Gbits/sec  585   3.09 MBytes
[ 5]  2.00-3.00 sec      229 MBytes  1.92 Gbits/sec    0   3.33 MBytes
[ 5]  3.00-4.00 sec      228 MBytes  1.91 Gbits/sec  180   2.47 MBytes
[ 5]  4.00-5.00 sec      228 MBytes  1.91 Gbits/sec    0   2.60 MBytes
[ 5]  5.00-6.00 sec      229 MBytes  1.92 Gbits/sec    0   2.70 MBytes
[ 5]  6.00-7.00 sec      228 MBytes  1.91 Gbits/sec    0   2.78 MBytes
[ 5]  7.00-8.00 sec      198 MBytes  1.66 Gbits/sec  720   1.98 MBytes
[ 5]  8.00-9.00 sec      172 MBytes  1.45 Gbits/sec    0   2.10 MBytes
[ 5]  9.00-10.00 sec     202 MBytes  1.70 Gbits/sec    0   2.20 MBytes

- - - - -
[ ID] Interval          Transfer      Bitrate      Retr
[ 5]  0.00-10.00 sec     1.91 GBytes  1.64 Gbits/sec  1485      sender
[ 5]  0.00-10.03 sec     1.90 GBytes  1.62 Gbits/sec              receiver

iperf Done.
```

3

Спасибо За Внимание