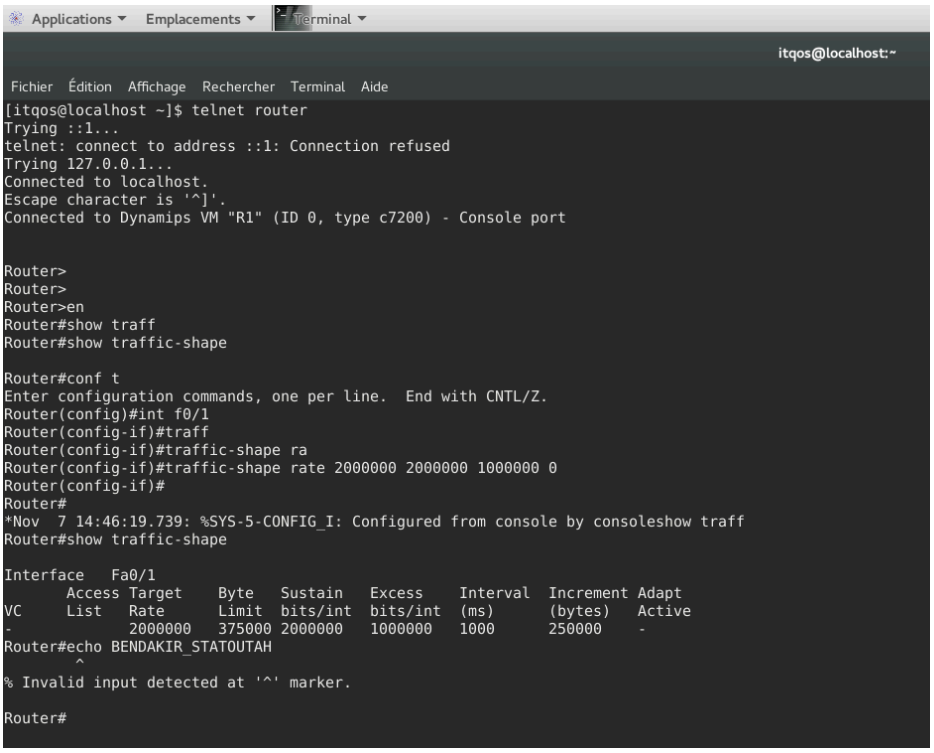
Compte Rendu ITQoS TME3

Part 1

Test 1:

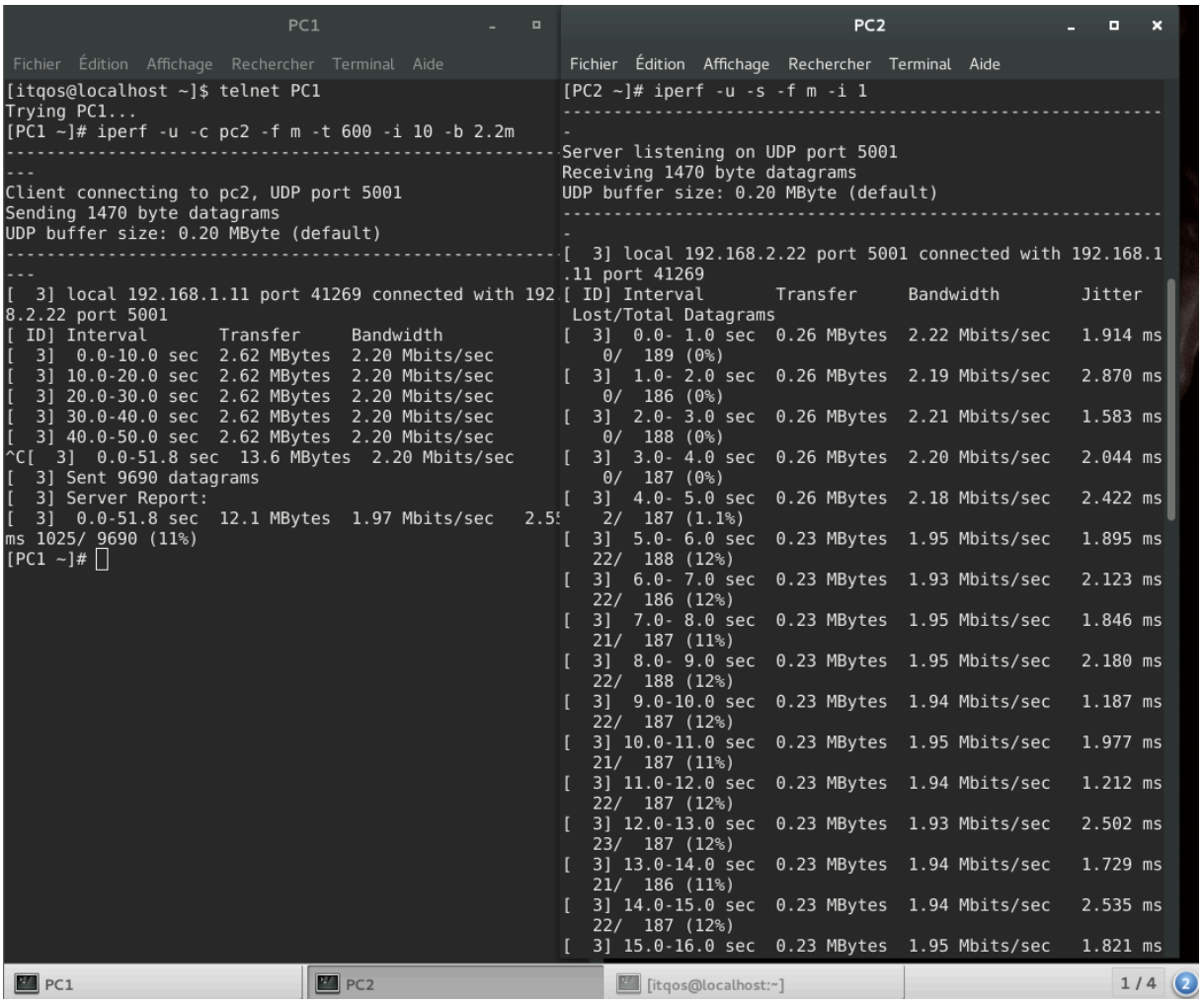


Response 1:

- Testing traffic with 2.2Mbit/s:

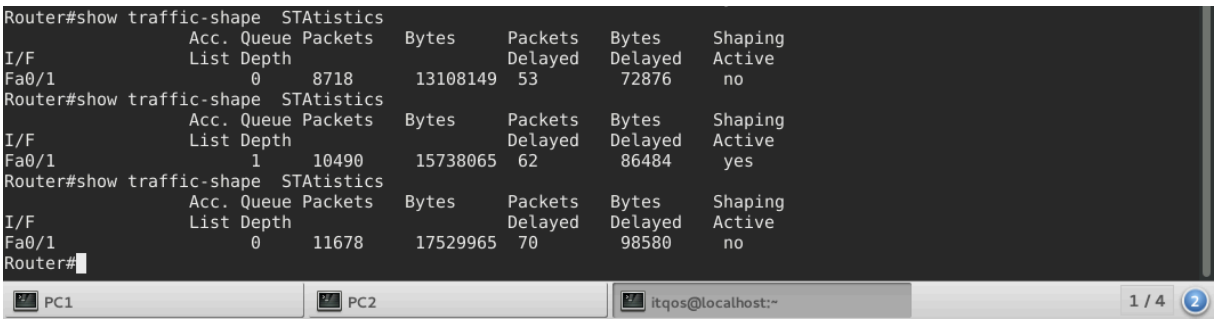
We can see that the traffic is being shaped and limited to a rate lower than 2Mbit/s (**~1.95Mbit/s**) on the side of PC2, indicating that the router is performing traffic shaping, which we can see when we run "**traffic-shape statistics**" during the transmission (Shaping Active: **yes**).

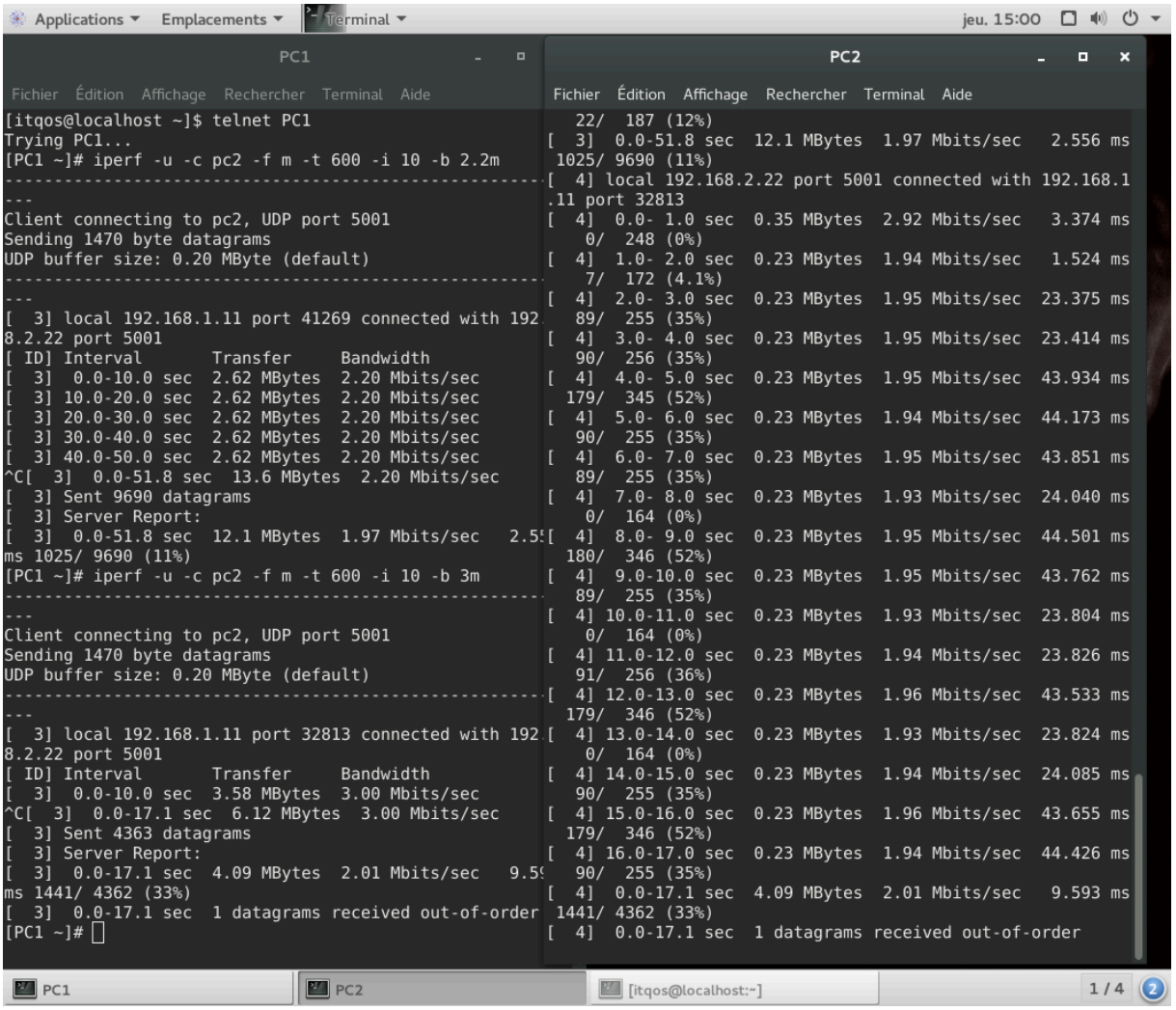
```
Router#show traffic-shape  STAtistics
                 Acc. Queue Packets   Bytes     Packets   Bytes     Shaping
I/F              List Depth                     Delayed   Delayed   Active
Fa0/1                 0     16        1542      0         0         no
Router#show traffic-shape  STAtistics
                 Acc. Queue Packets   Bytes     Packets   Bytes     Shaping
I/F              List Depth                     Delayed   Delayed   Active
Fa0/1                 0     3494      5217882   19        25824     yes
Router#show traffic-shape  STAtistics
                 Acc. Queue Packets   Bytes     Packets   Bytes     Shaping
I/F              List Depth                     Delayed   Delayed   Active
Fa0/1                 0     8718      13108149  53        72876     no
Router#
```



- Testing traffic with 3Mbit/s:

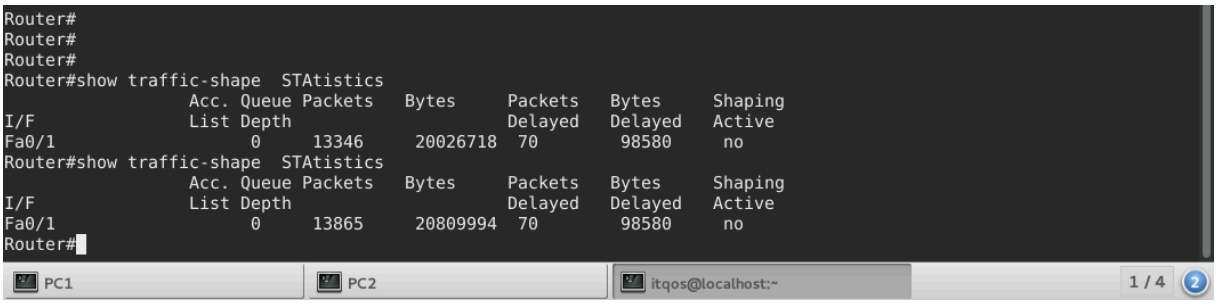
We can see that the traffic is being shaped and limited to a rate lower than 3Mbit/s (**~1.95Mbit/s**) on the side of PC2, indicating that the router is performing traffic shaping, which we can see when we run "**traffic-shape statistics**" during the transmission (Shaping Active: **yes**).

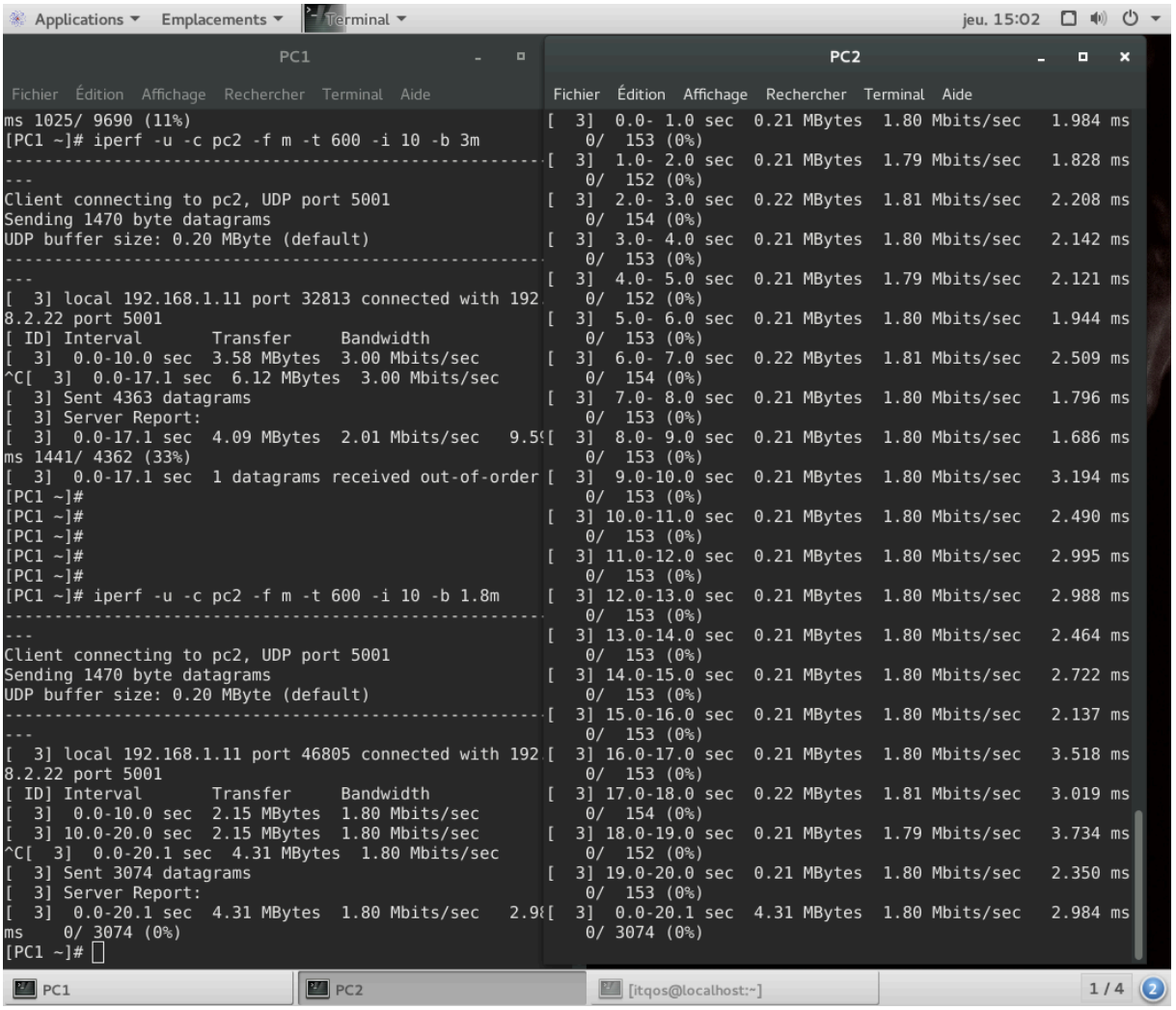




- Testing traffic with 1.8Mbit/s:

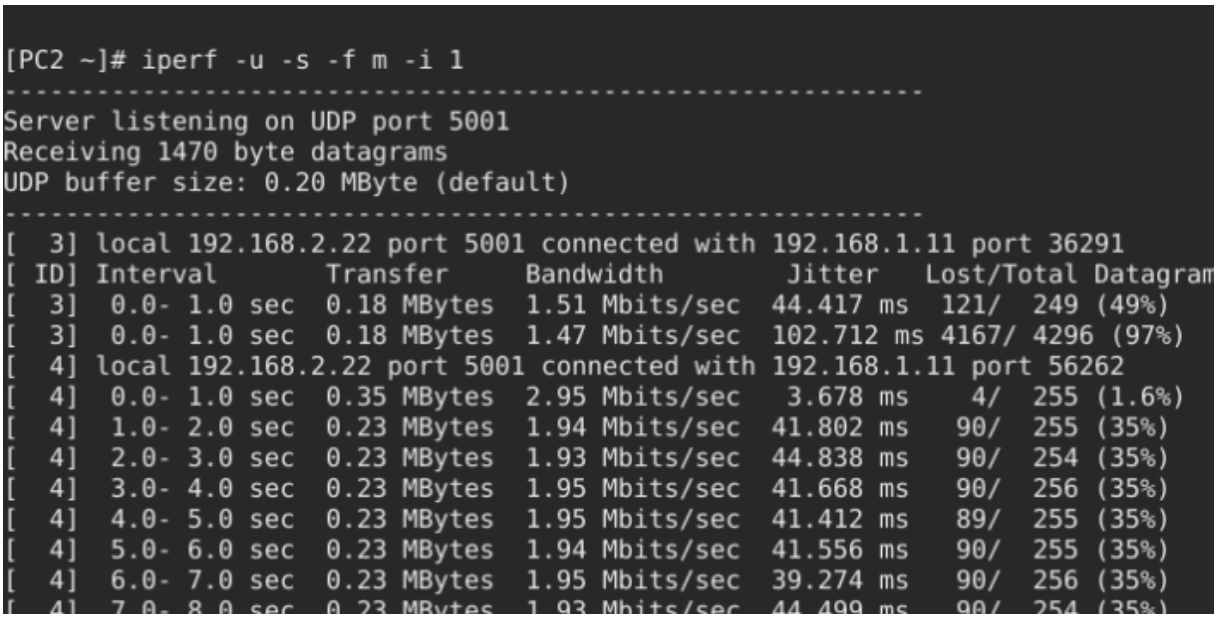
We can see that the traffic is not being in this case, because the traffic rate (1.8Mbit/s) is lower than that of the token rate (2Mbit/s), which is why when we run "**traffic-shape statistics**" during the transmission, the Shaping Active is still **No**.





Response 2:

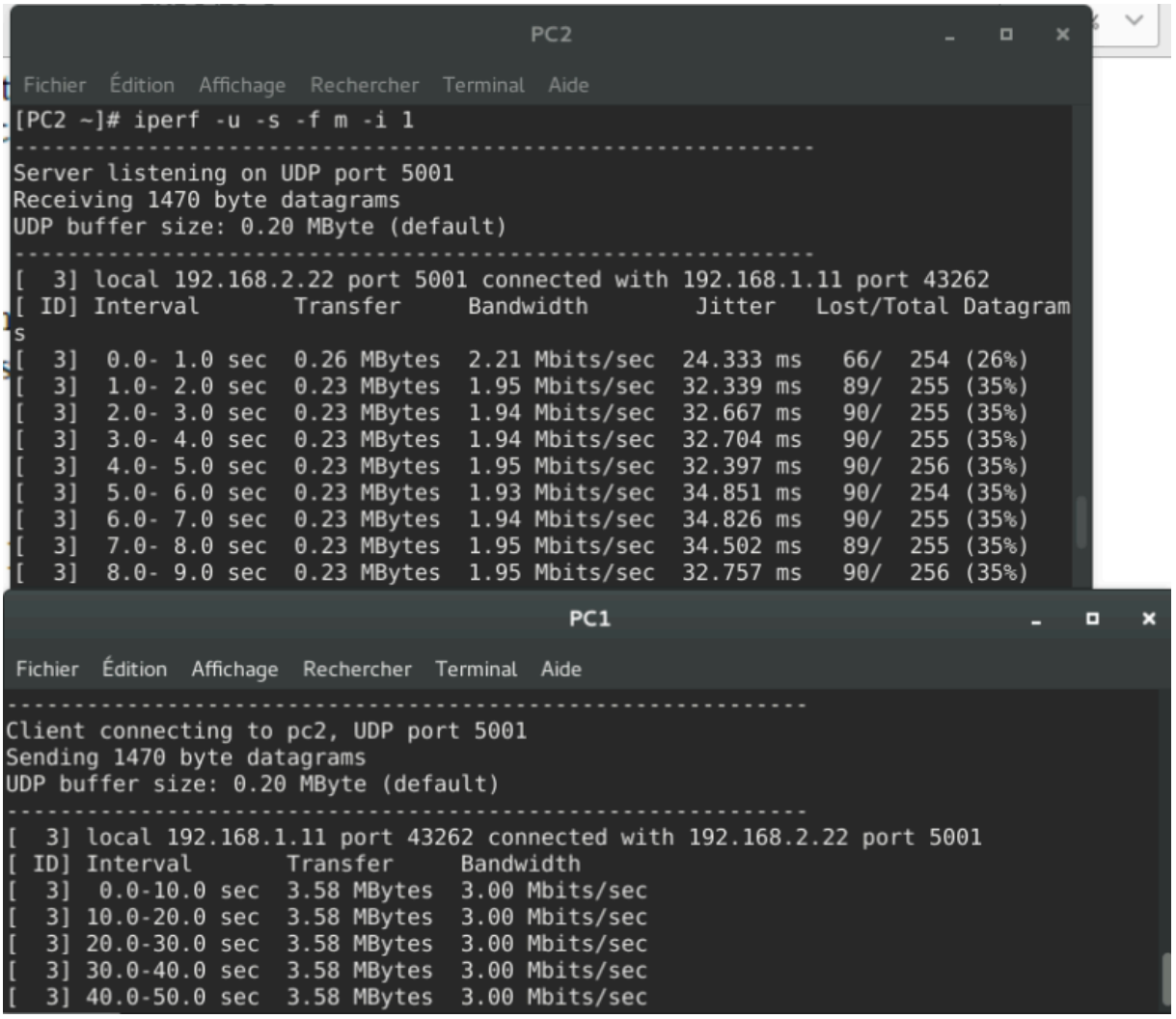
Yes, there are lost packets, as we can see by the output of the iperf command (Lost/Total Datagrams column). When we performed transfer of 3Mbit/s, it starts by a weak lost percentage (1.6%) then increases to its max percentage (35%).

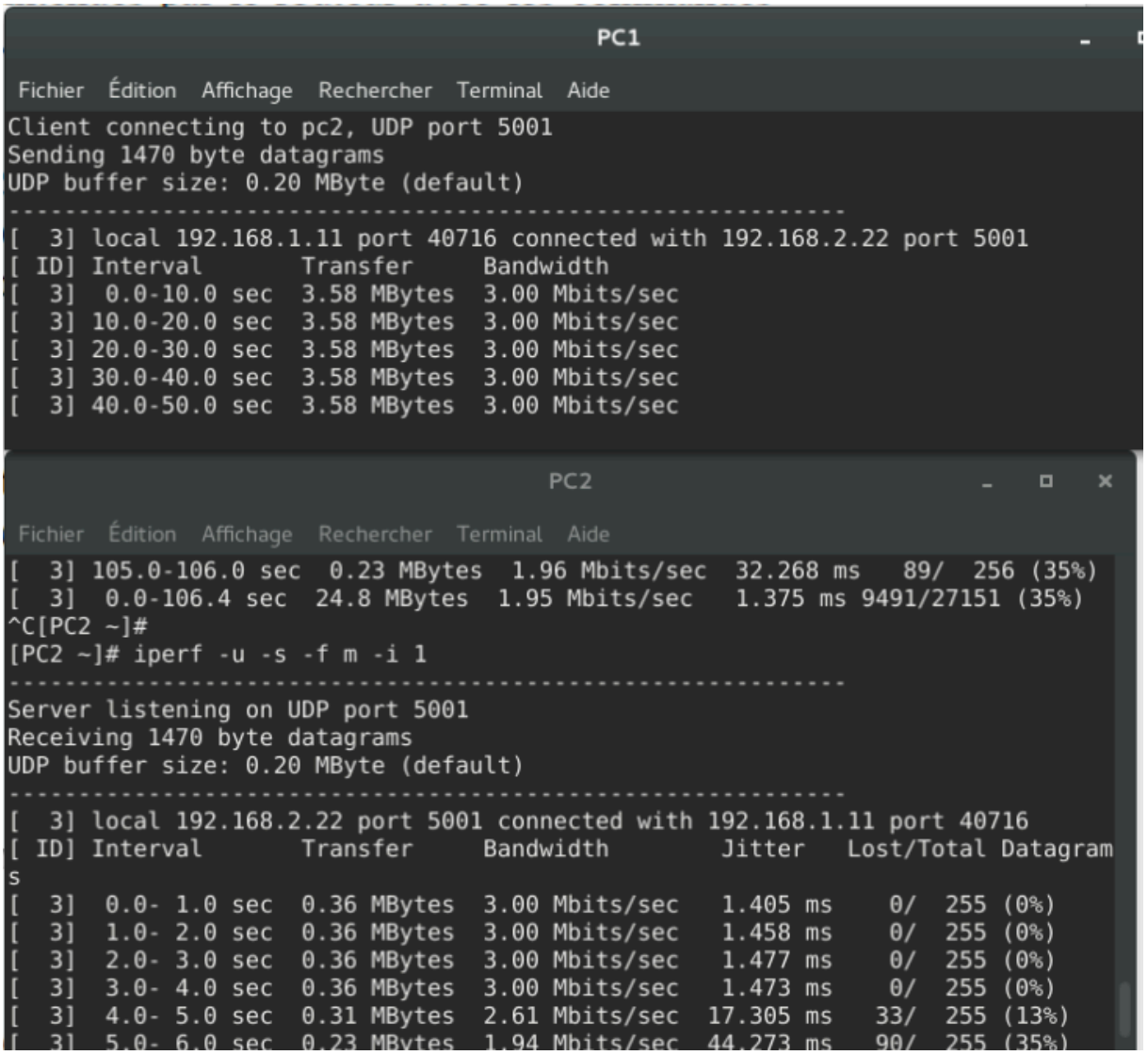


```
[PC2 ~]# iperf -u -s -f m -i 1
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 0.20 MByte (default)
------------------------------------------------------------
[  3] local 192.168.2.22 port 5001 connected with 192.168.1.11 port 36291
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total Datagram
[  3]  0.0- 1.0 sec  0.18 MBytes  1.51 Mbits/sec  44.417 ms  121/  249 (49%)
[  3]  0.0- 1.0 sec  0.18 MBytes  1.47 Mbits/sec  102.712 ms 4167/ 4296 (97%)
[  4] local 192.168.2.22 port 5001 connected with 192.168.1.11 port 56262
[  4]  0.0- 1.0 sec  0.35 MBytes  2.95 Mbits/sec   3.678 ms    4/  255 (1.6%)
[  4]  1.0- 2.0 sec  0.23 MBytes  1.94 Mbits/sec  41.802 ms   90/  255 (35%)
[  4]  2.0- 3.0 sec  0.23 MBytes  1.93 Mbits/sec  44.838 ms   90/  254 (35%)
[  4]  3.0- 4.0 sec  0.23 MBytes  1.95 Mbits/sec  41.668 ms   90/  256 (35%)
[  4]  4.0- 5.0 sec  0.23 MBytes  1.95 Mbits/sec  41.412 ms   89/  255 (35%)
[  4]  5.0- 6.0 sec  0.23 MBytes  1.94 Mbits/sec  41.556 ms   90/  255 (35%)
[  4]  6.0- 7.0 sec  0.23 MBytes  1.95 Mbits/sec  39.274 ms   90/  256 (35%)
[  4]  7.0- 8.0 sec  0.23 MBytes  1.93 Mbits/sec  44.499 ms   90/  254 (35%)
```

Test 2:

Response 3:





We can see that **Be** is the bucket size that is consumed at the beginning of the transmission by the “excess packets”. This is visible in all the cases where the transmission rate is superior to 2Mbit/s.
For example, in the case of sending 3Mbit/s when having **Be = 0.2Mbit**, the first statistical interval shows a bandwidth of **2.21Mbit/s**, then the following ones show a 2Mbit/s bandwidth with maximum packet loss percentage (35%), indicating that the bucket is empty and the transmission is now consuming the tokens as they are generated.
Same thing happens when **Be = 5Mbit**, where the first 5 seconds of transfer consume the tokens in the bucket (by having the actual transfer bandwidth of **3Mbit/s**) then the bandwidth drops to **2Mbit/s**.

Response 4:

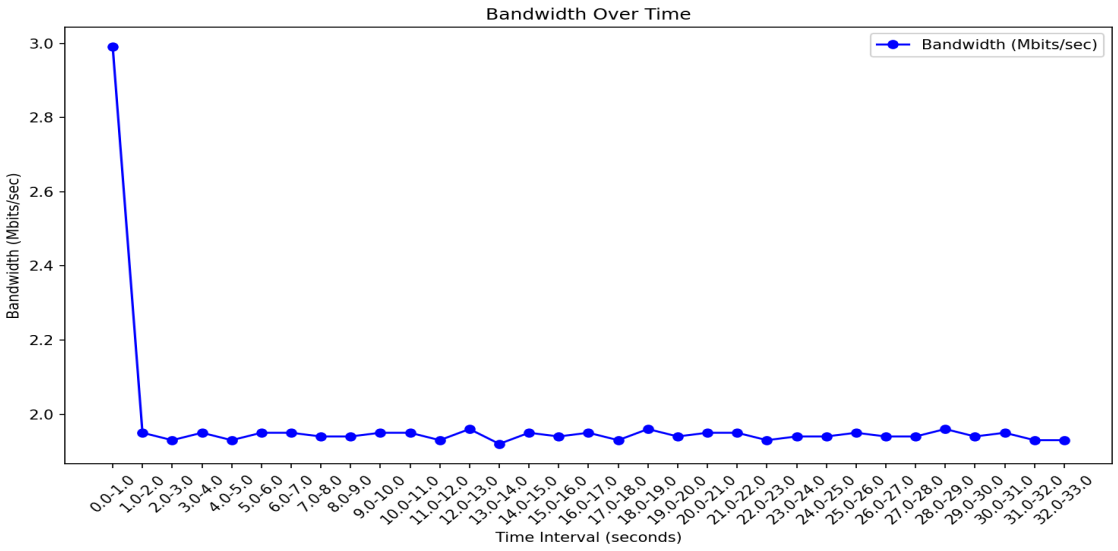
PC1

```
Fichier  Édition  Affichage  Rechercher  Terminal  Aide
[PC1 ~]# iperf -u -c pc2 -f m -t 600 -i 10 -b 3m
------------------------------------------------------------
Client connecting to pc2, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size: 0.20 MByte (default)
------------------------------------------------------------
[  3] local 192.168.1.11 port 48981 connected with 192.168.2.22 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  3.58 MBytes  3.00 Mbits/sec
[  3] 10.0-20.0 sec  3.58 MBytes  3.00 Mbits/sec
[  3] 20.0-30.0 sec  3.58 MBytes  3.00 Mbits/sec
s
```

PC2

```
Fichier  Édition  Affichage  Rechercher  Terminal  Aide
[PC2 ~]# iperf -u -s -f m -i 1
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 0.20 MByte (default)
------------------------------------------------------------
[  3] local 192.168.2.22 port 5001 connected with 192.168.1.11 port 48981
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total Datagram
s
[  3]  0.0- 1.0 sec  0.36 MBytes  2.99 Mbits/sec   2.092 ms    1/  255 (0.39%)
[  3]  1.0- 2.0 sec  0.23 MBytes  1.95 Mbits/sec  32.114 ms   89/  255 (35%)
[  3]  2.0- 3.0 sec  0.23 MBytes  1.93 Mbits/sec  34.832 ms   90/  254 (35%)
[  3]  3.0- 4.0 sec  0.23 MBytes  1.95 Mbits/sec  34.414 ms   90/  256 (35%)
[  3]  4.0- 5.0 sec  0.23 MBytes  1.93 Mbits/sec  36.873 ms   90/  254 (35%)
[  3]  5.0- 6.0 sec  0.23 MBytes  1.95 Mbits/sec  34.760 ms   90/  256 (35%)
[  3]  6.0- 7.0 sec  0.23 MBytes  1.95 Mbits/sec  34.188 ms   89/  255 (35%)
[  3]  7.0- 8.0 sec  0.23 MBytes  1.94 Mbits/sec  34.908 ms   90/  255 (35%)
[  3]  8.0- 9.0 sec  0.23 MBytes  1.94 Mbits/sec  34.865 ms   90/  255 (35%)
```

The average rate is **CIR=bc=2Mbit/s**, while the peak flow is **bc+be=3Mbit/s**



Response 5:

Response 6:

1. **r = bc / T**
2. **p = (bc + be) / T**
3. **p = r * (bc + be) / bc**

Response 7:

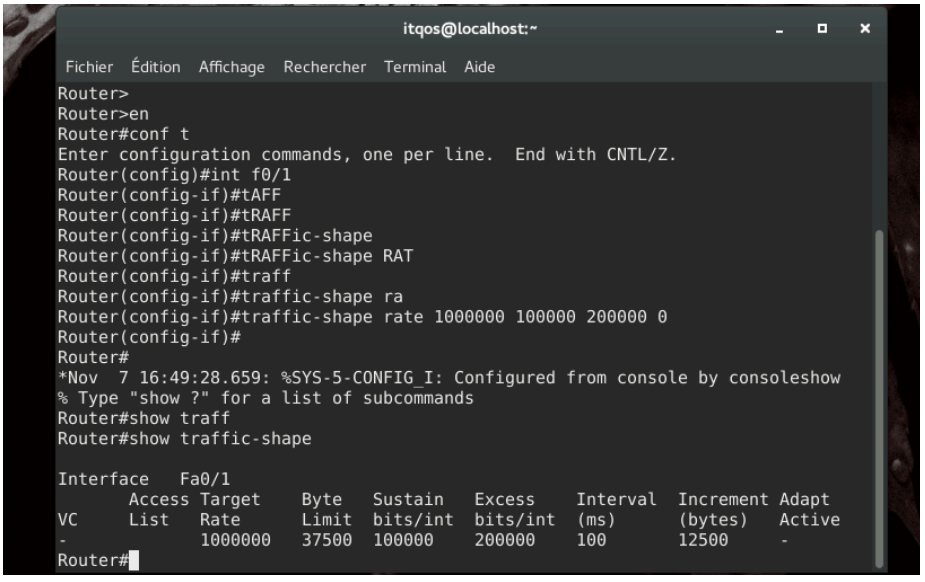
After simplifications, we find that **MBD = T**.

Response 8:

After simplifications, we find that **MBS = bc+be**.

Test 3:

Response 9:



After some calculations, we find that:

- **CIR = r = 1000000 Bit/s**
- **bc = r * T = 100000 Bit**
- **be = p * t - bc = 200000 Bit**
- **T = MBD = 0.1 s**

Our configuration is correct because, when we run "**show traffic-shape**", it shows the **Interval = 100ms.**

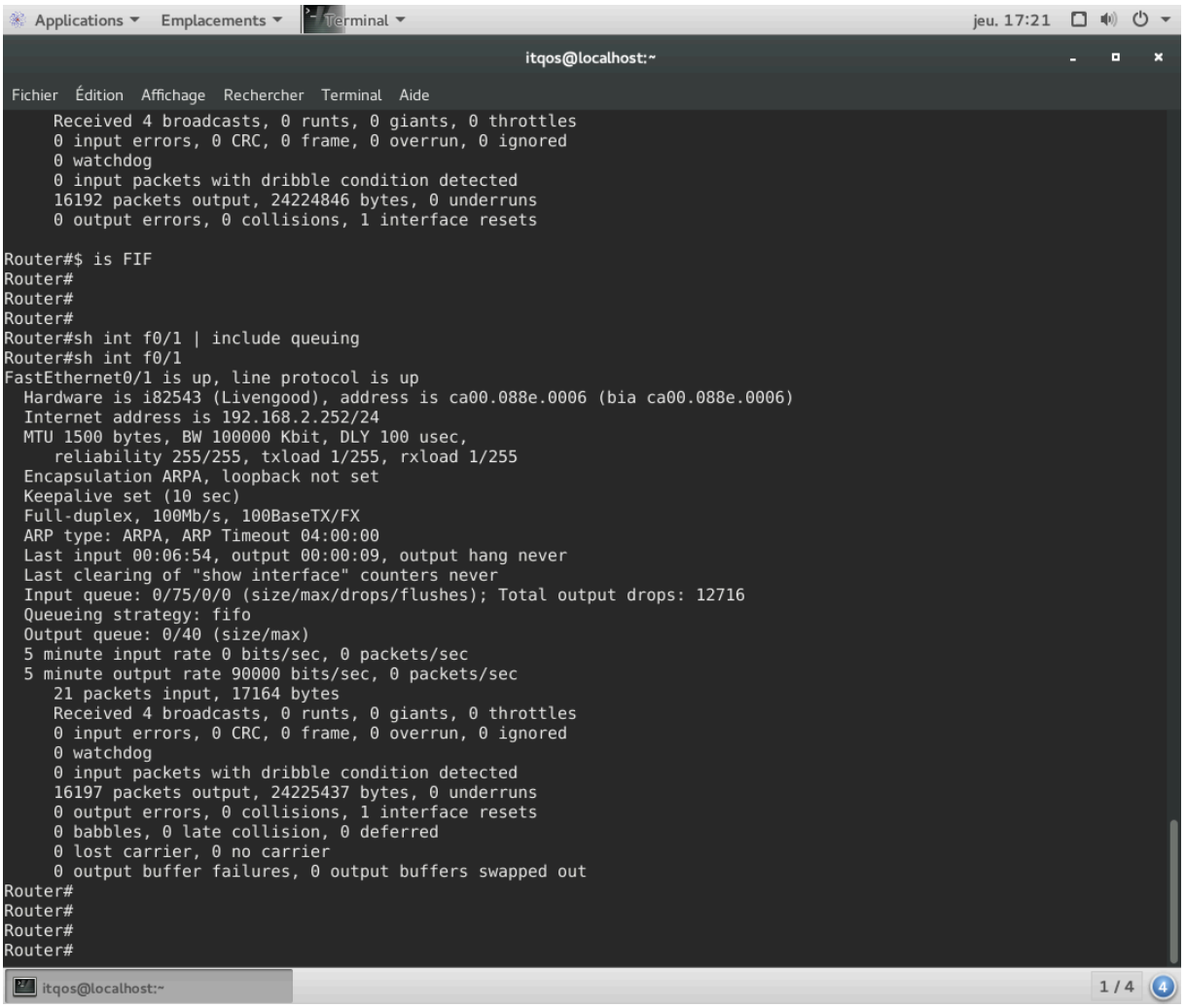
Test 4:

Response 10:

The utility of changing the buffer size is to enable more efficient packet management during **temporary overloads**, providing tolerance for traffic spikes. A larger buffer helps prevent packet loss in case of congestion.

Part 2

Test 1:



Response 1:

The scheduling mechanism used is **FIFO** (First In, First Out). This is indicated by the line: **Queueing strategy: FIFO**

Response 2:

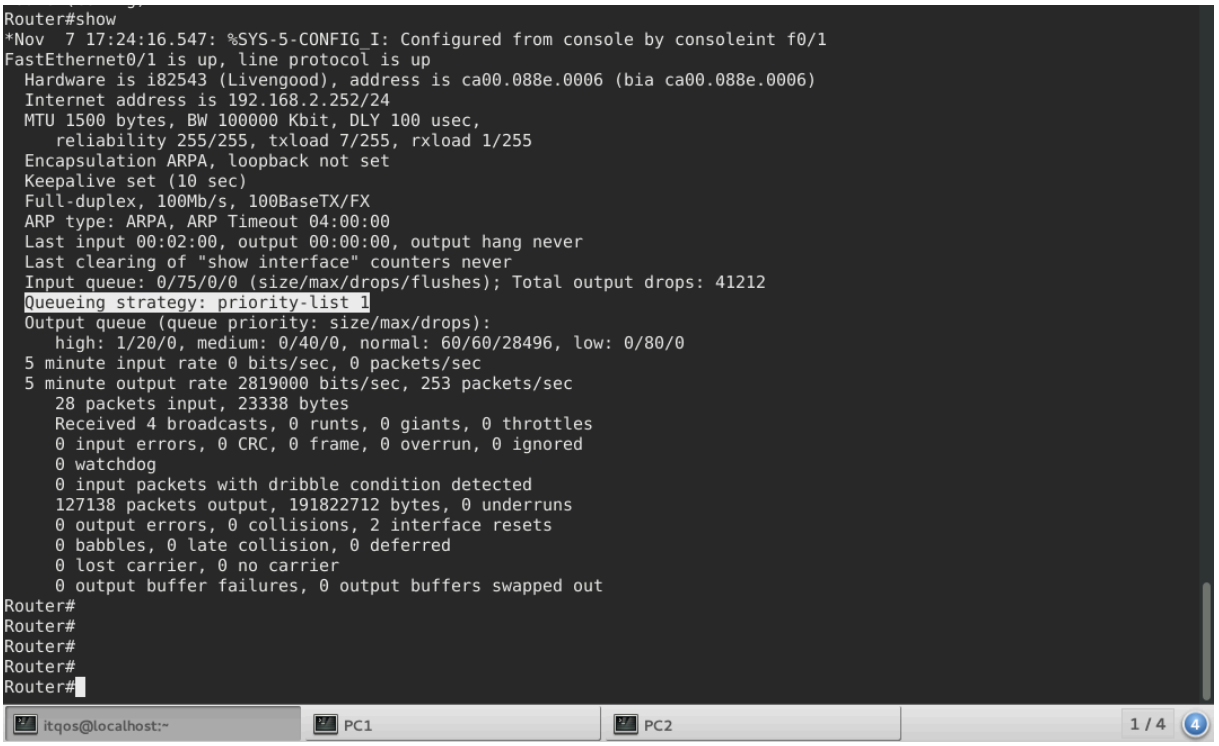
There is **one** output queue associated with the interface, and the maximum size of this output queue is **40 packets**. This is specified in the line: **Output queue: 0/40 (size/max).**

Test 2:

Response 3:

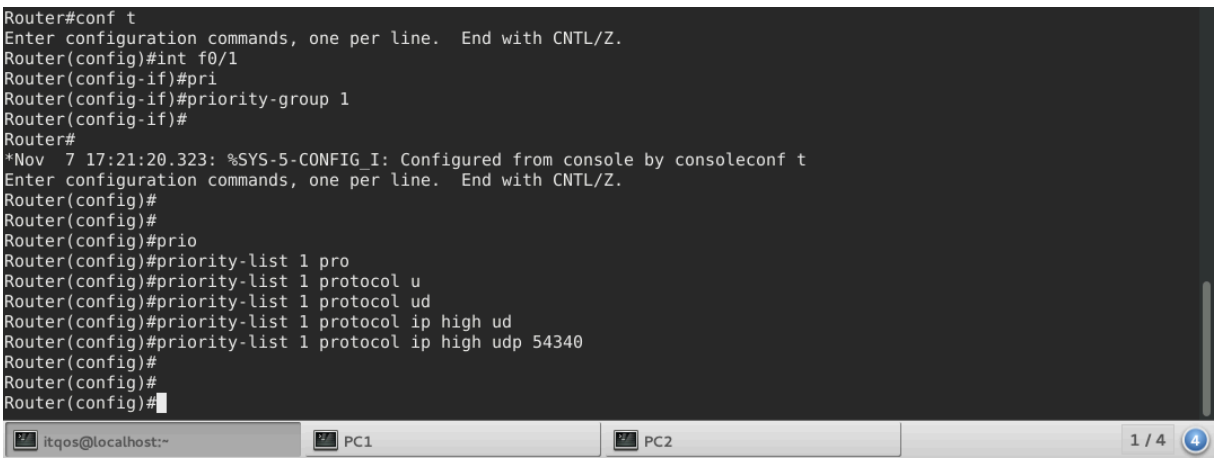
3 - the queuing strategy used by the interface f0/1 is a priority-list like in the screenshot

4-we have 4 logical queues high , medium, normal and low



When we open the second window of the PC1 it starts to lose packets

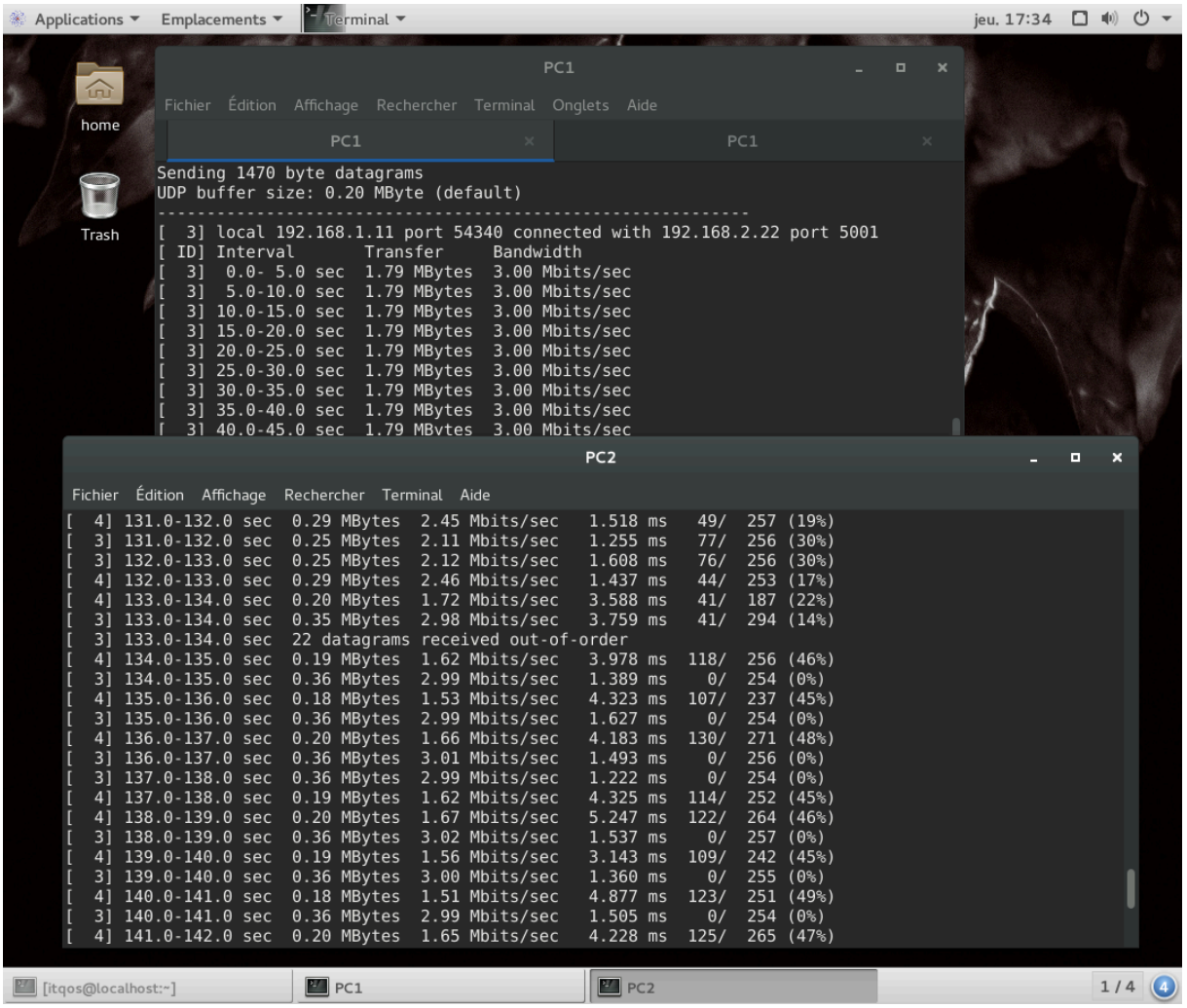
5-we notice also that the pc that has priority has better speed than the other pc



we noticed when we start two of the PC1s the loss of packet starts on both PCs

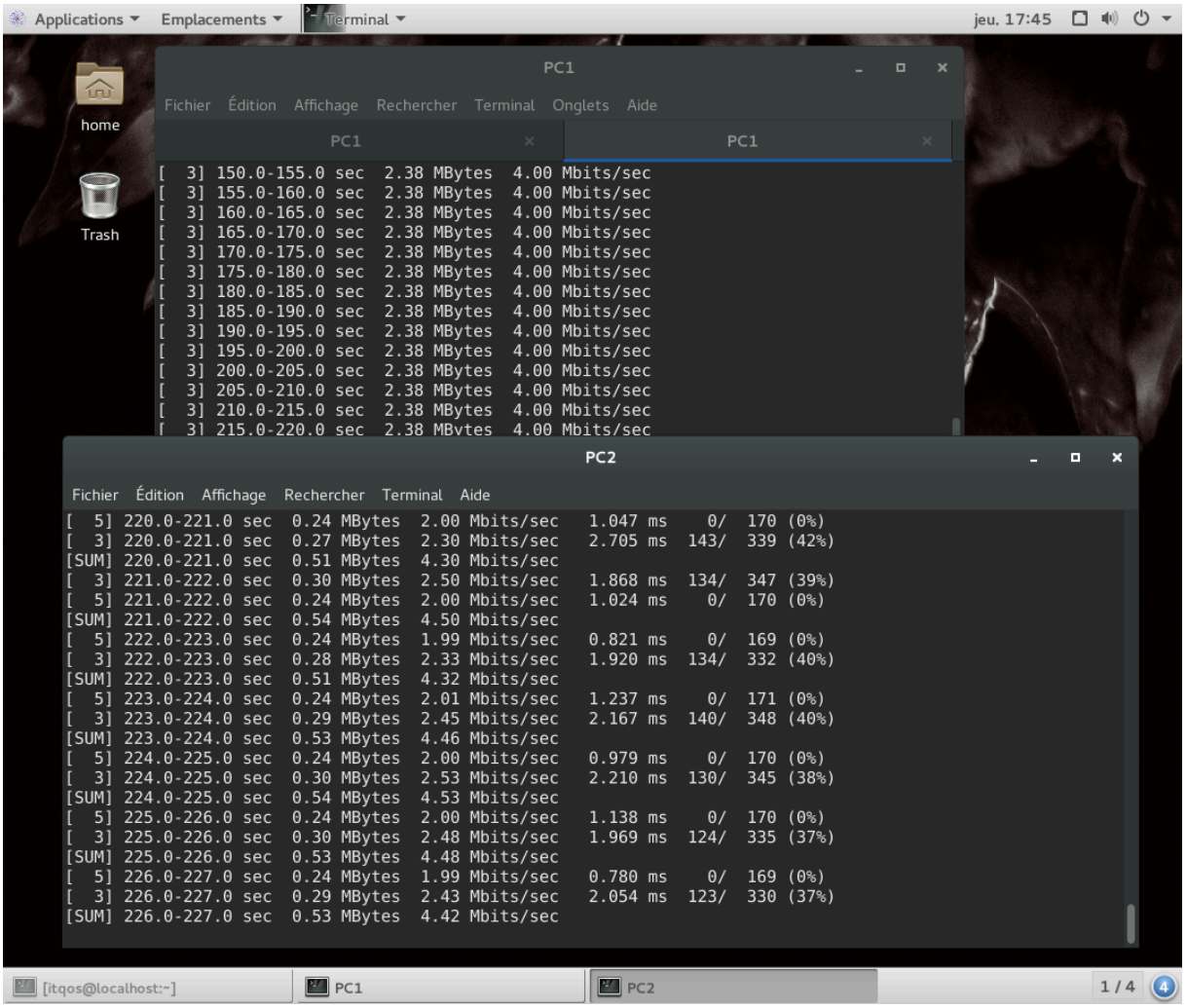
But when we do priority-list 1 on one of the two pc we notice that the ^pc that have priority did not lose packet

6- When we Exceed 5m we face the problem of “famine”



Test 3:

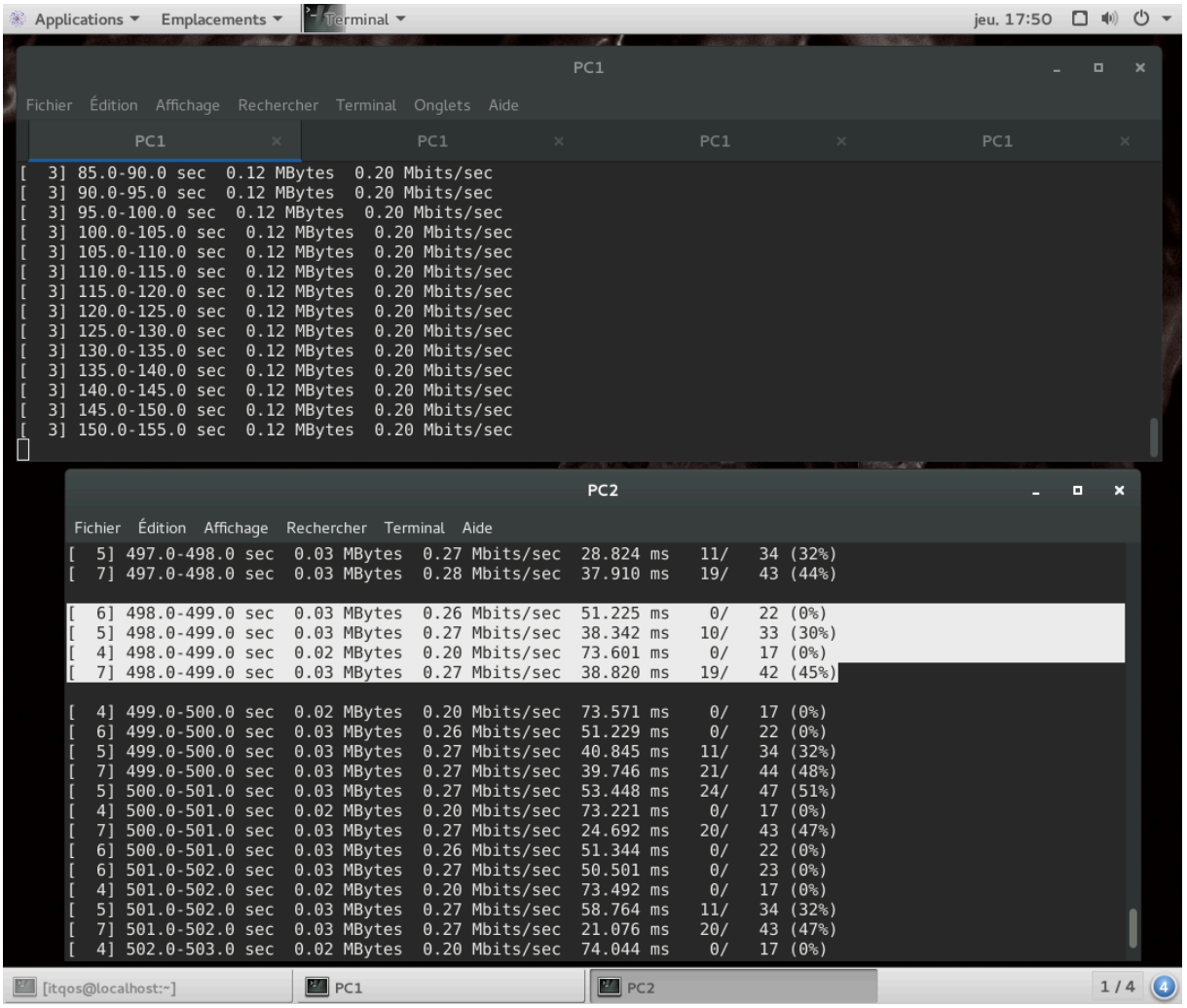
```
Router(config-if)#fa?
fair-queue  fallback-pool

Router(config-if)#fa
Router(config-if)#fair
Router(config-if)#fair-queue ?
  <1-4096>  Congestive Discard Threshold
  <cr>

Router(config-if)#fair-queue
Router(config-if)#
```

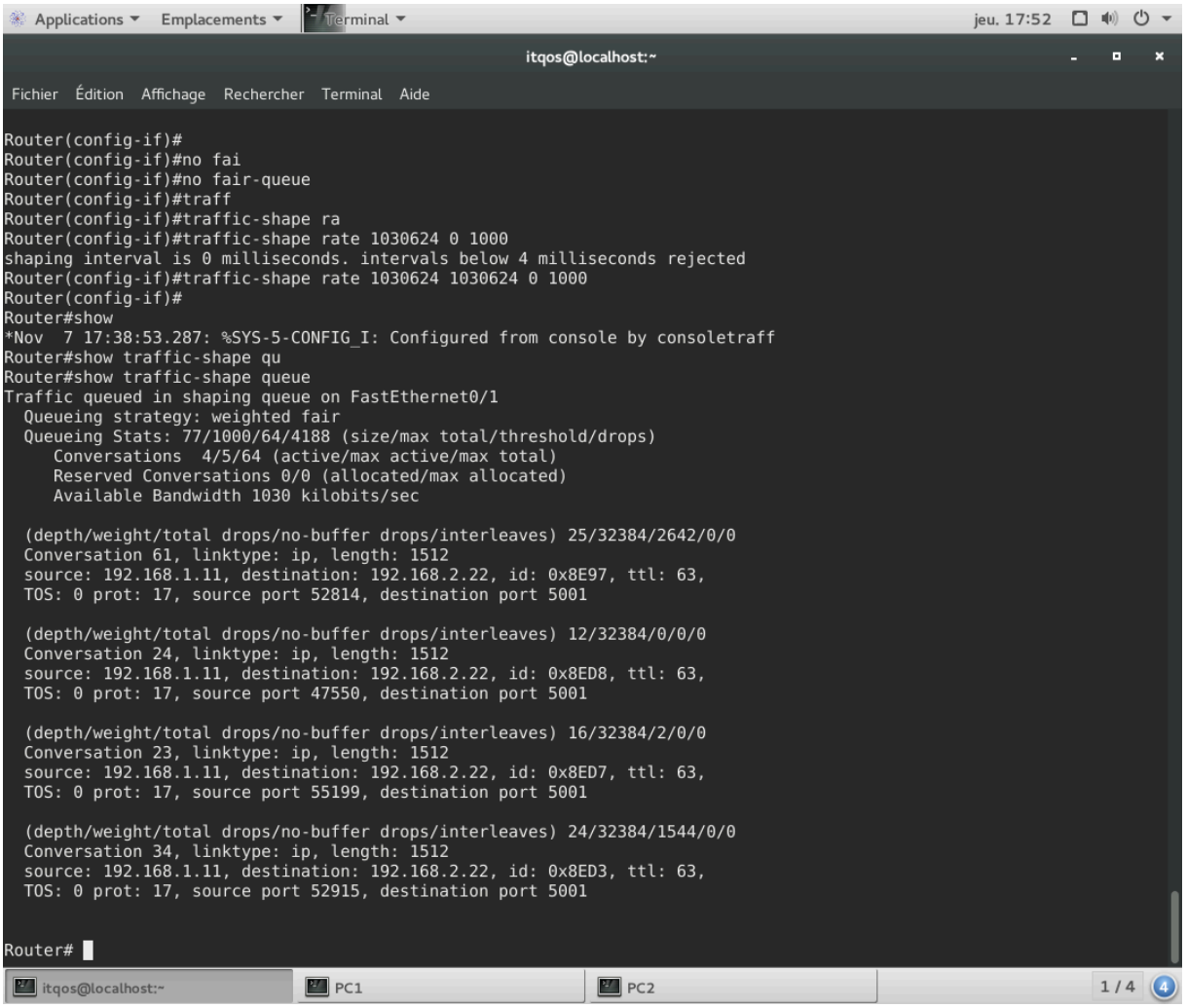


Response 7 + 8:

Because we applied fair queuing, the router will distribute the bandwith equalty between the two traffics despite their rate. In this case, the bandwidth = 5Mbit/s which means each traffic receives 2.5Mbit/s in bandwidth. But since the first traffic only demands 2Mbit/s, the router will attribute the extra 0.5Mbit/s to the second traffic, whch explains why the first traffic doesn’t have any packet loss and the second traffic has a rate close to 2.5Mbit/s which means that some packets are lost (38%).

Test 4:


Applications
Emplacements
Terminal
jeu. 17:50
PC1
Fichier Édition Affichage Rechercher Terminal Onglets Aide
PC1
PC1
PC1
PC1
[3] 85.0-90.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 90.0-95.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 95.0-100.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 100.0-105.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 105.0-110.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 110.0-115.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 115.0-120.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 120.0-125.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 125.0-130.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 130.0-135.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 135.0-140.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 140.0-145.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 145.0-150.0 sec 0.12 MBytes 0.20 Mbits/sec
[3] 150.0-155.0 sec 0.12 MBytes 0.20 Mbits/sec
PC2
Fichier Édition Affichage Rechercher Terminal Aide
[5] 497.0-498.0 sec 0.03 MBytes 0.27 Mbits/sec 28.824 ms 11/ 34 (32%)
[7] 497.0-498.0 sec 0.03 MBytes 0.28 Mbits/sec 37.910 ms 19/ 43 (44%)
[6] 498.0-499.0 sec 0.03 MBytes 0.26 Mbits/sec 51.225 ms 0/ 22 (0%)
[5] 498.0-499.0 sec 0.03 MBytes 0.27 Mbits/sec 38.342 ms 10/ 33 (30%)
[4] 498.0-499.0 sec 0.02 MBytes 0.20 Mbits/sec 73.601 ms 0/ 17 (0%)
[7] 498.0-499.0 sec 0.03 MBytes 0.27 Mbits/sec 38.820 ms 19/ 42 (45%)
[4] 499.0-500.0 sec 0.02 MBytes 0.20 Mbits/sec 73.571 ms 0/ 17 (0%)
[6] 499.0-500.0 sec 0.03 MBytes 0.26 Mbits/sec 51.229 ms 0/ 22 (0%)
[5] 499.0-500.0 sec 0.03 MBytes 0.27 Mbits/sec 40.845 ms 11/ 34 (32%)
[7] 499.0-500.0 sec 0.03 MBytes 0.27 Mbits/sec 39.746 ms 21/ 44 (48%)
[5] 500.0-501.0 sec 0.03 MBytes 0.27 Mbits/sec 53.448 ms 24/ 47 (51%)
[4] 500.0-501.0 sec 0.02 MBytes 0.20 Mbits/sec 73.221 ms 0/ 17 (0%)
[7] 500.0-501.0 sec 0.03 MBytes 0.27 Mbits/sec 24.692 ms 20/ 43 (47%)
[6] 500.0-501.0 sec 0.03 MBytes 0.26 Mbits/sec 51.344 ms 0/ 22 (0%)
[6] 501.0-502.0 sec 0.03 MBytes 0.27 Mbits/sec 50.501 ms 0/ 23 (0%)
[4] 501.0-502.0 sec 0.02 MBytes 0.20 Mbits/sec 73.492 ms 0/ 17 (0%)
[5] 501.0-502.0 sec 0.03 MBytes 0.27 Mbits/sec 58.764 ms 11/ 34 (32%)
[7] 501.0-502.0 sec 0.03 MBytes 0.27 Mbits/sec 21.076 ms 20/ 43 (47%)
[4] 502.0-503.0 sec 0.02 MBytes 0.20 Mbits/sec 74.044 ms 0/ 17 (0%)
[itqos@localhost:~]
PC1
PC2
1 / 4


Applications
Emplacements
Terminal
jeu. 17:52
itqos@localhost:~
Fichier Édition Affichage Rechercher Terminal Aide
Router(config-if)#
Router(config-if)#no fai
Router(config-if)#no fair-queue
Router(config-if)#traff
Router(config-if)#traffic-shape ra
Router(config-if)#traffic-shape rate 1030624 0 1000
shaping interval is 0 milliseconds. intervals below 4 milliseconds rejected
Router(config-if)#traffic-shape rate 1030624 1030624 0 1000
Router(config-if)#
Router#show
*Nov 7 17:38:53.287: %SYS-5-CONFIG_I: Configured from console by consoletraff
Router#show traffic-shape qu
Router#show traffic-shape queue
Traffic queued in shaping queue on FastEthernet0/1
Queueing strategy: weighted fair
Queueing Stats: 77/1000/64/4188 (size/max total/threshold/drops)
Conversations 4/5/64 (active/max active/max total)
Reserved Conversations 0/0 (allocated/max allocated)
Available Bandwidth 1030 kilobits/sec
(depth/weight/total drops/no-buffer drops/interleaves) 25/32384/2642/0/0
Conversation 61, linktype: ip, length: 1512
source: 192.168.1.11, destination: 192.168.2.22, id: 0x8E97, ttl: 63,
TOS: 0 prot: 17, source port 52814, destination port 5001
(depth/weight/total drops/no-buffer drops/interleaves) 12/32384/0/0/0
Conversation 24, linktype: ip, length: 1512
source: 192.168.1.11, destination: 192.168.2.22, id: 0x8ED8, ttl: 63,
TOS: 0 prot: 17, source port 47550, destination port 5001
(depth/weight/total drops/no-buffer drops/interleaves) 16/32384/2/0/0
Conversation 23, linktype: ip, length: 1512
source: 192.168.1.11, destination: 192.168.2.22, id: 0x8ED7, ttl: 63,
TOS: 0 prot: 17, source port 55199, destination port 5001
(depth/weight/total drops/no-buffer drops/interleaves) 24/32384/1544/0/0
Conversation 34, linktype: ip, length: 1512
source: 192.168.1.11, destination: 192.168.2.22, id: 0x8ED3, ttl: 63,
TOS: 0 prot: 17, source port 52915, destination port 5001
Router#
itqos@localhost:~
PC1
PC2
1 / 4