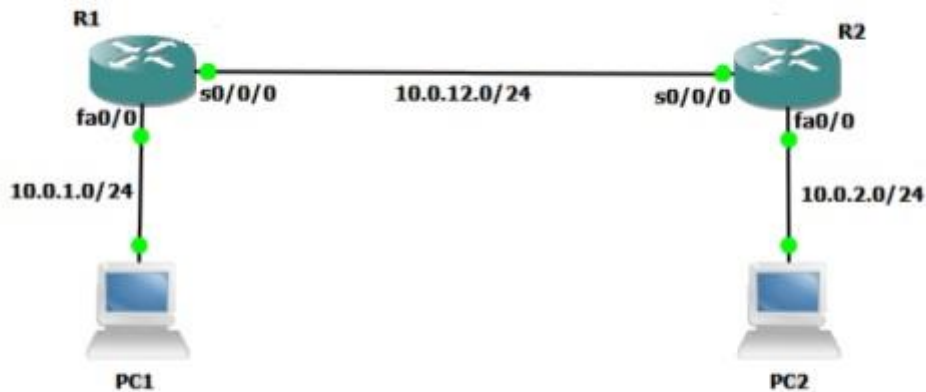


Dokumentácia cvičenie č.5

Topológia

V našej topológii sme použili 2 smerovače prepojené sériovým rozhraním a 2 koncové zariadenia, z ktorých jeden bol Linux host (PC1).



Úloha č.1

V tejto úlohe sme mali pozorovať zmenu hardvérového frontu smerovačov pri zmenách parametrov *bandwidth* a *tx-ring-limit*. Pri zmene parametru *bandwidth* sa zmena hardvérového frontu nezmenila.

Pôvodné nastavenie

```
tx_limited = 0(128), errata19 count1 - 0, count2 - 0
```

Po zmene parametru *bandwidth* na hodnotu 10000

```
tx limited = 0(128), errata19 count1 - 0, count2 - 0
```

Pri zmene parametru *tx-ring-limit* na hodnotu 8 sme zaznamenali zmenu.

```
interface Serial0/0/0
 bandwidth 128
 ip address 10.0.12.1 255.255.255.0
 tx-ring-limit 8
 tx-queue-limit 8
 clock rate 128000
```

```
tx_limited = 0(8), errata19 count1 - 0, count2 - 0
```

Úloha č.2

V tejto úlohe bolo potrebné zapnúť WFQ a sledovať zmeny na sériovom porte. Zmenili sa hardvérové fronty.

```
tx_limited = 1(2), errata19 count1 - 0, count2 - 0
```

```

R1(config-if)#do sh int s0/0/0
Serial0/0/0 is up, line protocol is up
  Hardware is GT96K Serial
  Internet address is 10.0.12.1/24
  MTU 1500 bytes, BW 128 Kbit/sec, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  CRC checking enabled
  Last input 00:00:04, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: Class-based queueing
  Output queue: 0/1000/0 (size/max total/drops)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    437 packets input, 31762 bytes, 0 no buffer
    Received 405 broadcasts (0 IP multicasts)
    0 runs, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    445 packets output, 32407 bytes, 0 underruns
    0 output errors, 0 collisions, 4 interface resets
    0 unknown protocol drops
    0 output buffer failures, 0 output buffers swapped out
    1 carrier transitions
  DCD=up DSR=up DTR=up RTS=up CTS=up

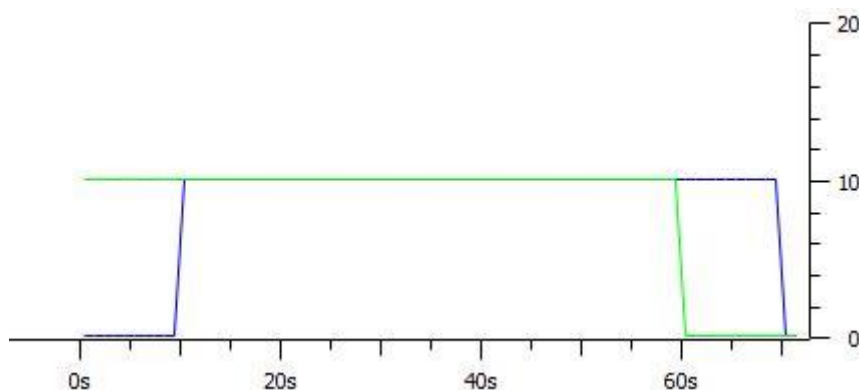
```

Úloha č.3

V tejto úlohe bolo potrebné otestovať fronty typu FIFO, PQ, WFQ a ich straty a oneskorenie a porovnať ich.

FIFO

V prvom rade sme intenzitu tokov nastavili pod kapacitu linky. Výsledky boli nasledujúce.

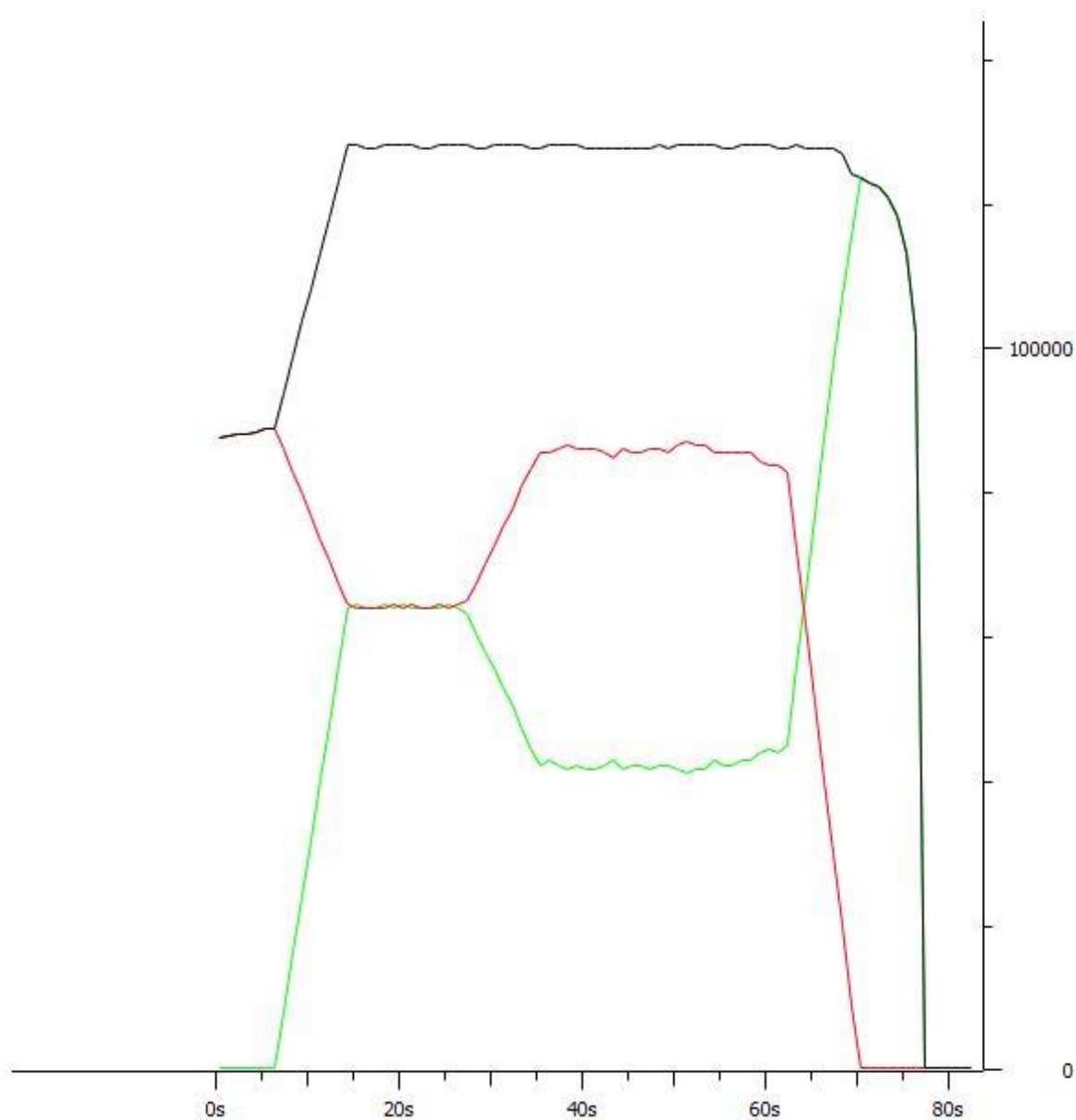


***** TOTAL RESULTS *****

Number of flows	=	4
Total time	=	250.721000 s
Total packets	=	2400
Minimum delay	=	-128.088000 s
Maximum delay	=	-125.292000 s
Average delay	=	-126.853423 s
Average jitter	=	0.035875 s

Delay standard deviation	=	1.083296 s
Bytes received	=	1228800
Average bitrate	=	39.208523 Kbit/s
Average packet rate	=	9.572393 pkt/s
Packets dropped	=	0 (0.00 %)
Average loss-burst size	=	0 pkt
Error lines	=	0

V druhom prípade sme toky nastavili tak, aby súhrnný tok bol nad kapacitou linky a výsledky boli nasledujúce.

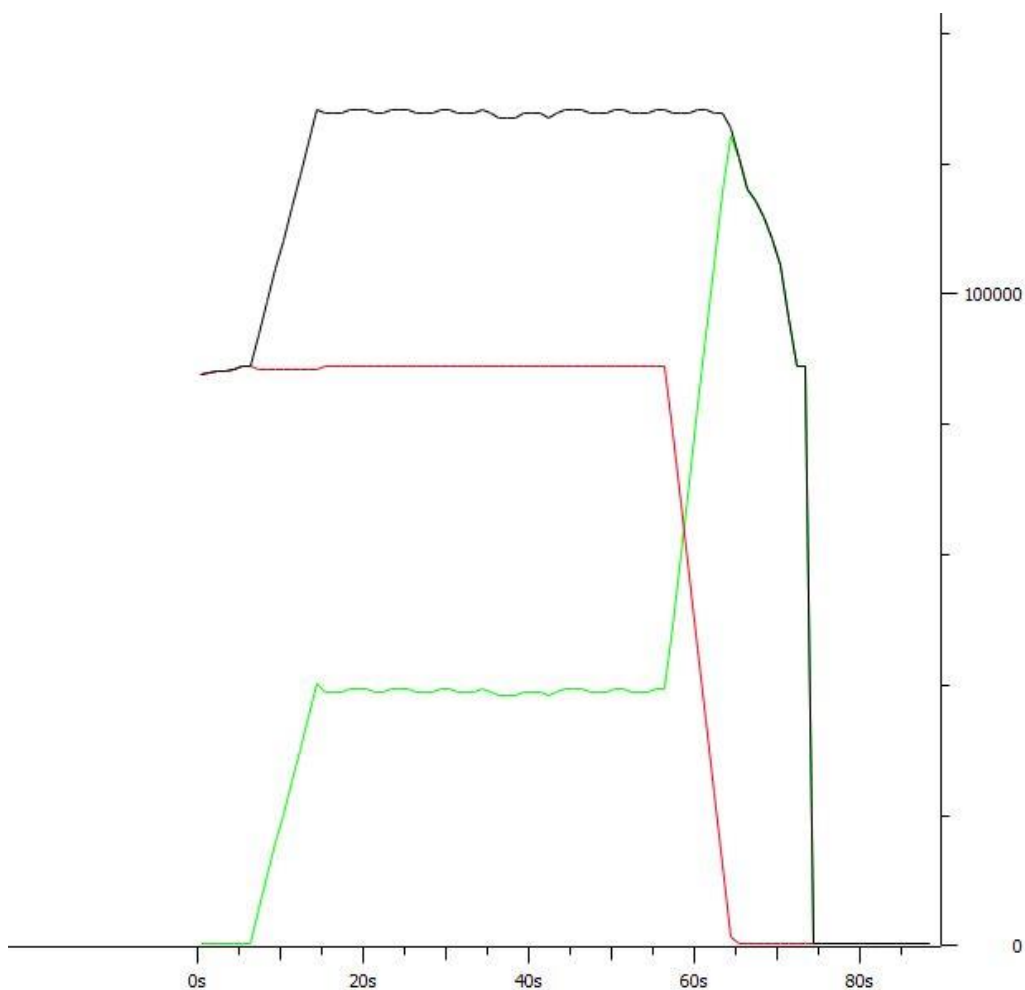


***** TOTAL RESULTS *****

Number of flows	=	2
Total time	=	72.714000 s
Total packets	=	2008
Minimum delay	=	-161.362000 s
Maximum delay	=	-151.000000 s
Average delay	=	-154.521695 s
Average jitter	=	0.068237 s
Delay standard deviation	=	2.950479 s
Bytes received	=	1028096
Average bitrate	=	113.111203 Kbit/s
Average packet rate	=	27.615040 pkt/s
Packets dropped	=	392 (16.33 %)
Average loss-burst size	=	1.184290 pkt
Error lines	=	0

PQ

Pri zapnutom frontovom režime PQ boli výsledky nasledujúce.

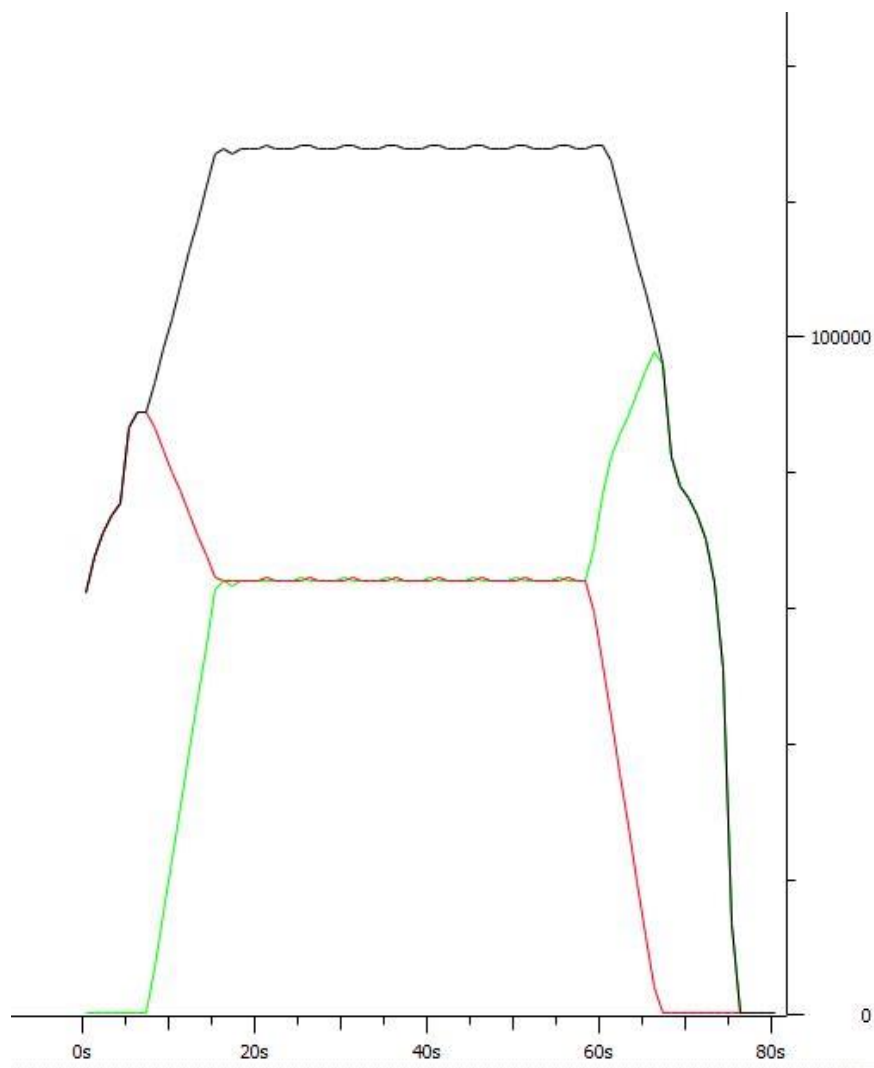


***** TOTAL RESULTS *****

Number of flows	=	2
Total time	=	69.914000 s
Total packets	=	1905
Minimum delay	=	-124.425000 s
Maximum delay	=	-116.998000 s
Average delay	=	-122.654569 s
Average jitter	=	0.076676 s
Delay standard deviation	=	2.878319 s
Bytes received	=	975360
Average bitrate	=	111.606831 Kbit/s
Average packet rate	=	27.247762 pkt/s
Packets dropped	=	495 (20.63 %)
Average loss-burst size	=	1.275773 pkt
Error lines	=	0

WFQ

Pri zapnutom frontovom režime WFQ boli výsledky nasledujúce.



***** TOTAL RESULTS *****

Number of flows	=	8
Total time	=	1306.546000 s
Total packets	=	7580
Minimum delay	=	-127.958000 s
Maximum delay	=	-116.998000 s
Average delay	=	-125.012422 s
Average jitter	=	0.069560 s
Delay standard deviation	=	3.019821 s
Bytes received	=	3880960
Average bitrate	=	23.763174 Kbit/s
Average packet rate	=	5.801556 pkt/s
Packets dropped	=	1996 (20.84 %)
Average loss-burst size	=	1.191642 pkt
Error lines	=	0
