Dokumentácia k cvičeniu č.9 : MLP s LFI

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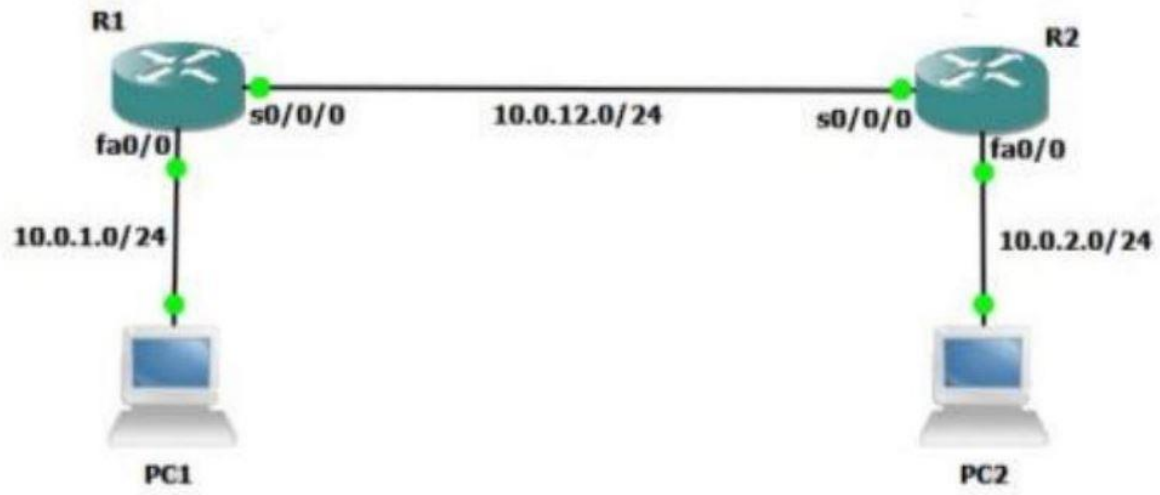
Topológia

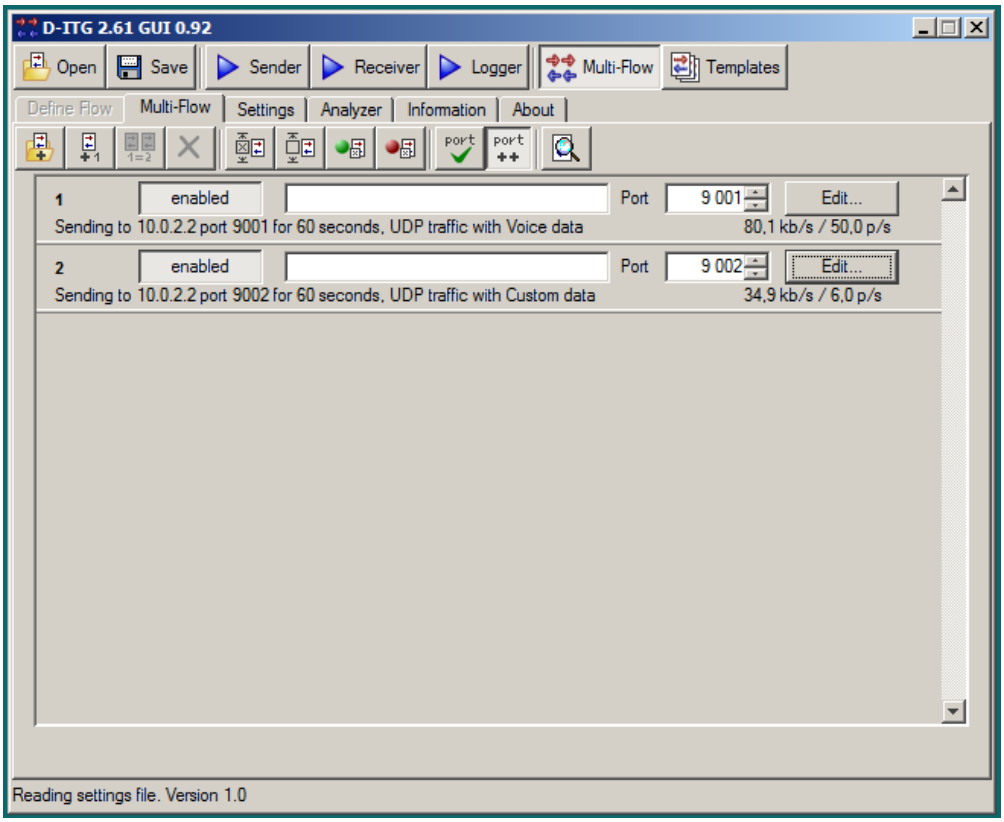
Topológia bola totožná s tými z predchádzajúcich cvičení.



Toky

Prvý generovaný tok bol typu Voice s intenzitou 50 paketov/s s telom veľkosti 160B (spolu s hlavičkami 218B). Použitý kodek G.711 2 samples per packet

Druhý generovaný tok bol náhodný exponencionálny dátový tok s intenzitou 6 paketov/s a veľkosťou 700B.



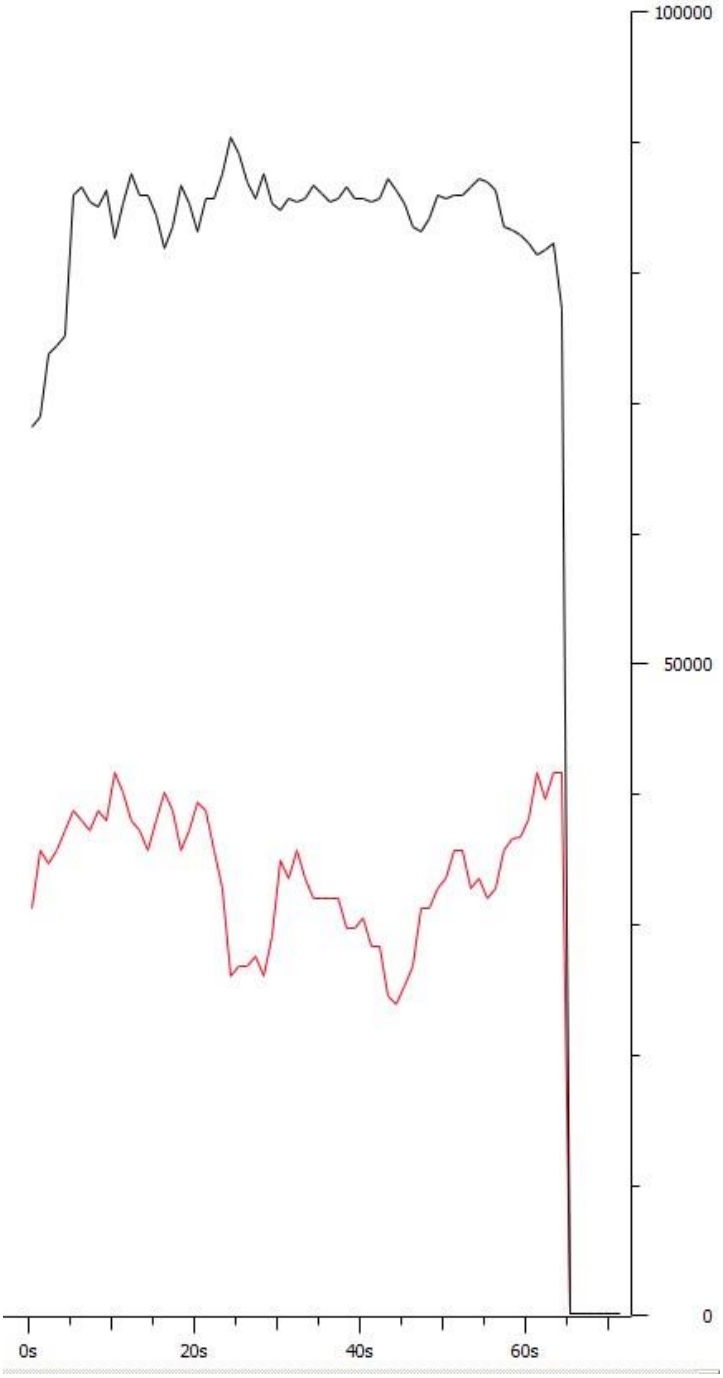
Nastavenie Wiresharku

Čierny tok – VOIP
Červený tok - dáta

Úloha č.1

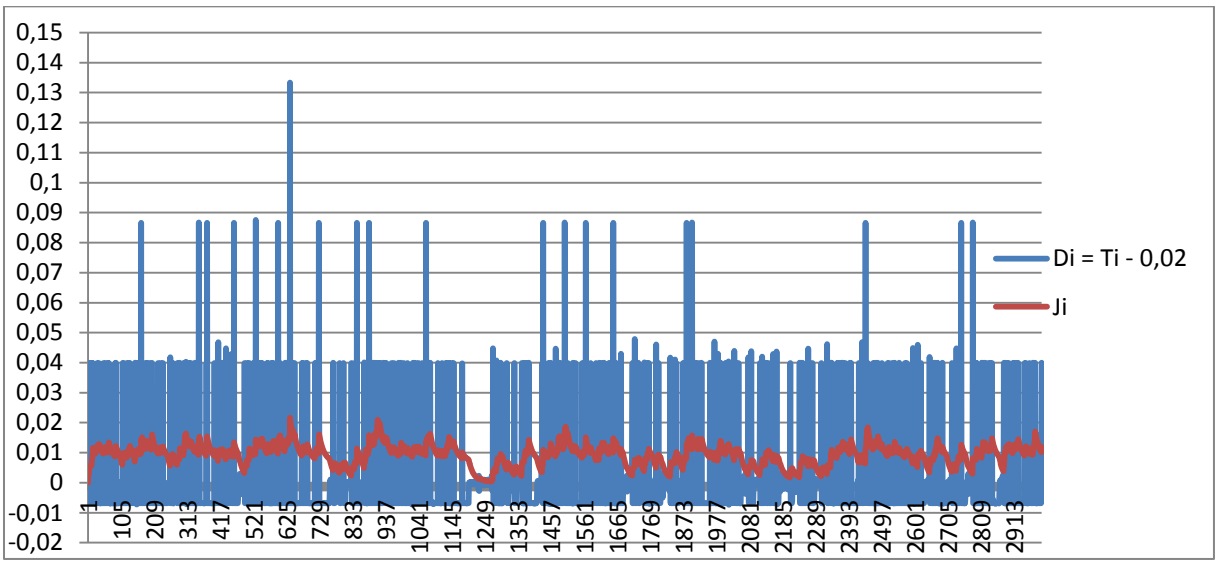
Enkapsulácia PPP

V prvom scenári na sériovej linke zapneme iba enkapsuláciu PPP, keďže defaultne je nastavená na HDLC. To nastavíme príkazom *encapsulation ppp* na sériovom rozhraní smerovača.



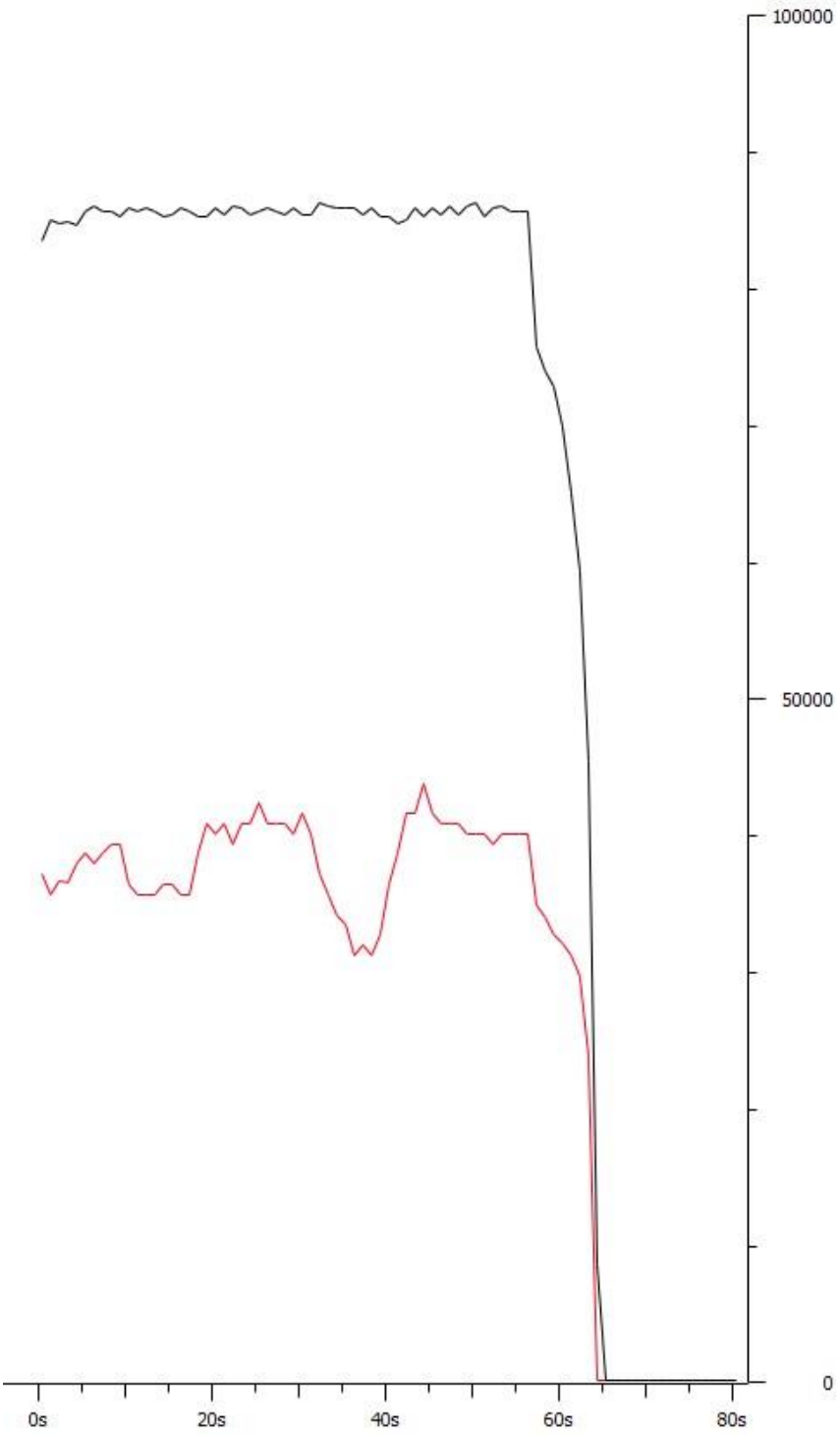
```
Flow number: 1
From 10.0.1.2:52376
To    10.0.2.2:9001
------------------------------------------------------------
Total time                =     60.123000 s
Total packets             =          3000
Minimum delay             =   -145.371000 s
Maximum delay             =   -144.911000 s
Average delay             =   -145.285050 s
Average jitter            =      0.009405 s
Delay standard deviation  =      0.093022 s
Bytes received            =        516000
Average bitrate           =     68.659249 Kbit/s
Average packet rate       =     49.897710 pkt/s
Packets dropped           =             0 (0.00 %)
Average loss-burst size   =      0.000000 pkt
------------------------------------------------------------
------------------------------------------------------------
Flow number: 2
From 10.0.1.2:52377
To    10.0.2.2:9002
------------------------------------------------------------
Total time                =     60.062000 s
Total packets             =           344
Minimum delay             =   -145.338000 s
Maximum delay             =   -144.907000 s
Average delay             =   -145.246235 s
Average jitter            =      0.029854 s
Delay standard deviation  =      0.091955 s
Bytes received            =        240800
Average bitrate           =     32.073524 Kbit/s
Average packet rate       =      5.727415 pkt/s
Packets dropped           =             0 (0.00 %)
Average loss-burst size   =      0.000000 pkt
------------------------------------------------------------
```

JITTER



Enkapsulácia PPP + prioritizácia VoIP paketov

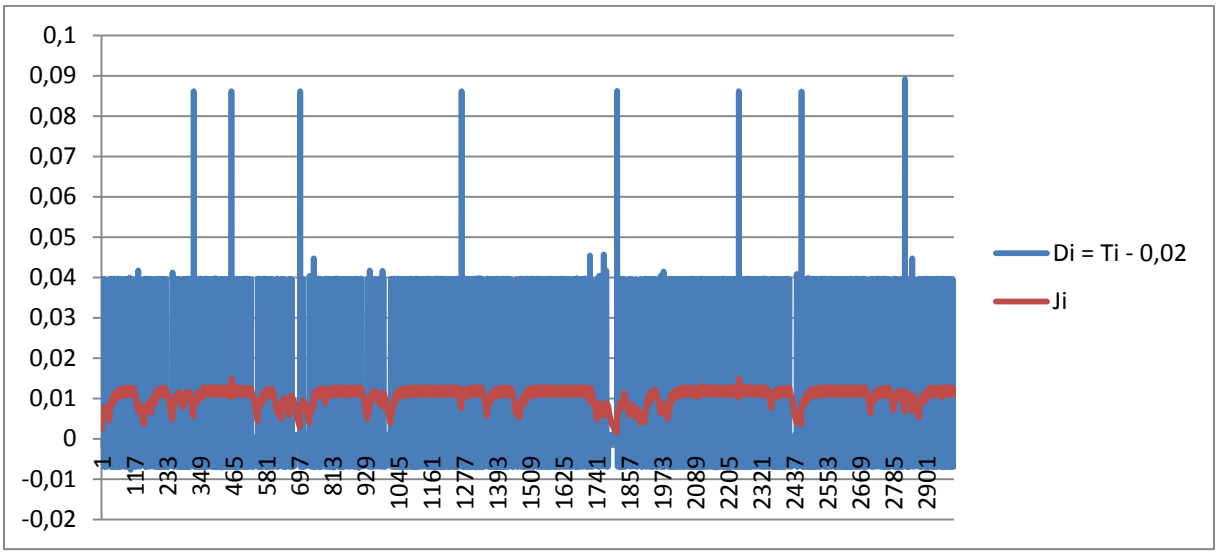
V druhom scenári sme okrem enkapsulácie ppp zapli taktiež prioritizáciu VoIP paketov. Vytvorili sme si ACL do ktorého spadala všetka VoIP prevádzka, ten sme následne matchli vo vytvorenej triede voip. Vytvorili sme politiku prio, v ktorej sme nastavili prioritu 90 pre túto hlasovú prevádzku a následne sme ju nasadili na sériovom porte vo výstupnom (output) smere.



```
R1(config-if)#do sh policy-map prio
  Policy Map prio
    Class voip
      priority 90 (kbps)
R1(config-if)#
```

```
-------------------------------------------------------------
Flow number: 1
From 10.0.1.2:56451
To    10.0.2.2:9001
-------------------------------------------------------------
Total time                =     60.017000 s
Total packets             =          3000
Minimum delay             =    -30.217000 s
Maximum delay             =    -30.112000 s
Average delay             =    -30.175974 s
Average jitter            =      0.010364 s
Delay standard deviation  =      0.021900 s
Bytes received            =        516000
Average bitrate           =     68.780512 Kbit/s
Average packet rate       =     49.985837 pkt/s
Packets dropped           =             0 (0.00 %)
Average loss-burst size   =      0.000000 pkt
-------------------------------------------------------------
-------------------------------------------------------------
Flow number: 2
From 10.0.1.2:56452
To    10.0.2.2:9002
-------------------------------------------------------------
Total time                =     59.905000 s
Total packets             =           389
Minimum delay             =    -30.185000 s
Maximum delay             =    -29.298000 s
Average delay             =    -29.926201 s
Average jitter            =      0.082126 s
Delay standard deviation  =      0.232484 s
Bytes received            =        272300
Average bitrate           =     36.364243 Kbit/s
Average packet rate       =      6.493615 pkt/s
Packets dropped           =             0 (0.00 %)
Average loss-burst size   =      0.000000 pkt
-------------------------------------------------------------
```

JITTER



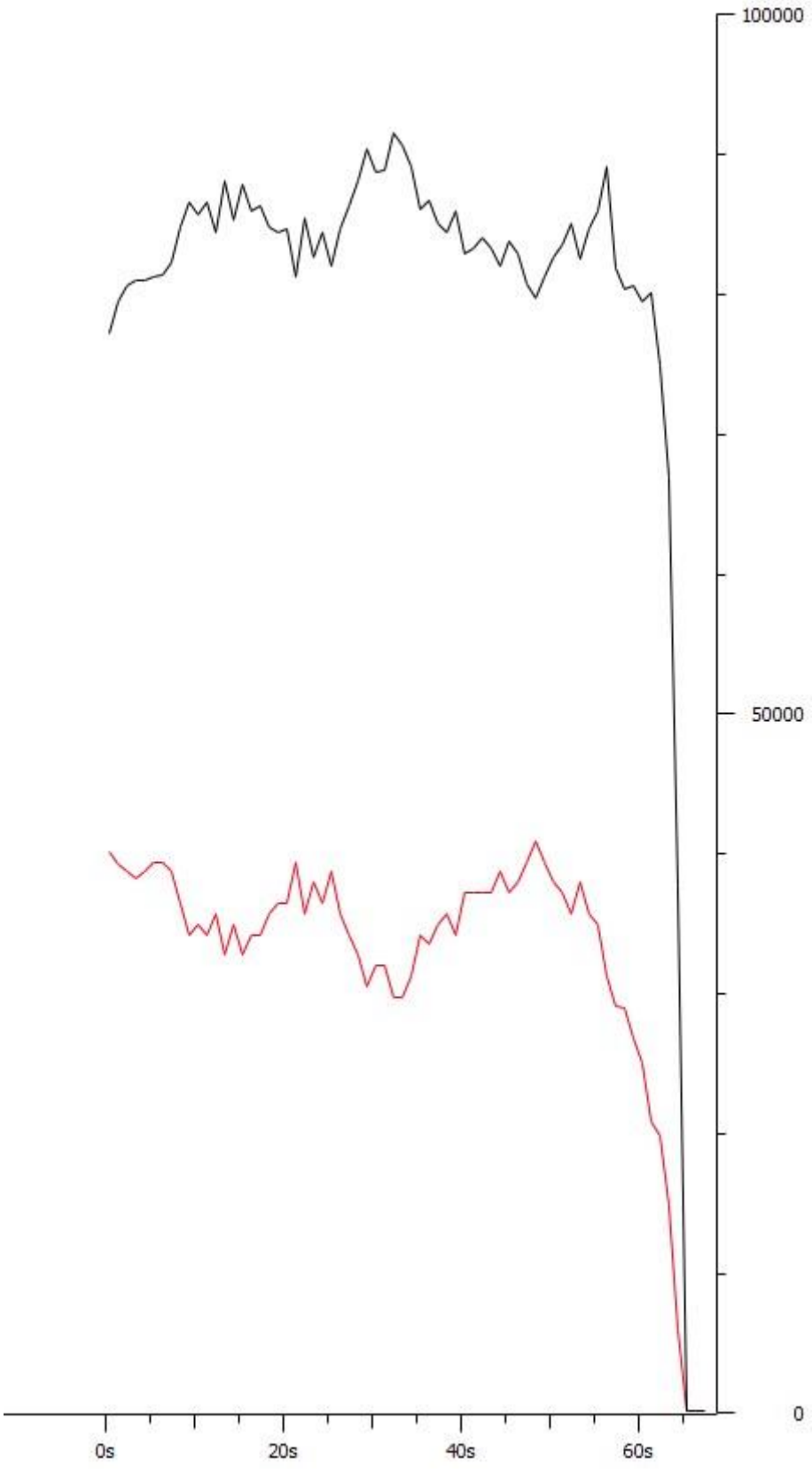
Enkapsulácia PPP + prioritizácia VoIP + LFI na 1 linke

V treťom scenári k predchádzajúcim konfiguráciám pridáme tiež LFI. Keďže tento mechanizmus nieje podporovaný na samotnom sériovom porte, vytvorili sme si *multilink interface*, na ktorom sa konfigurovali tieto zmeny a následne do tohto interfacu bol pridaný sériový port.

KONFIGURÁCIA

Interface multilink1
Ip address 10.0.2.1 255.255.255.0
Ppp multilink
Ppp multilink interleave
Ppp multilink fragment size 200
Ppp multilink group 1
Service-policy output prio

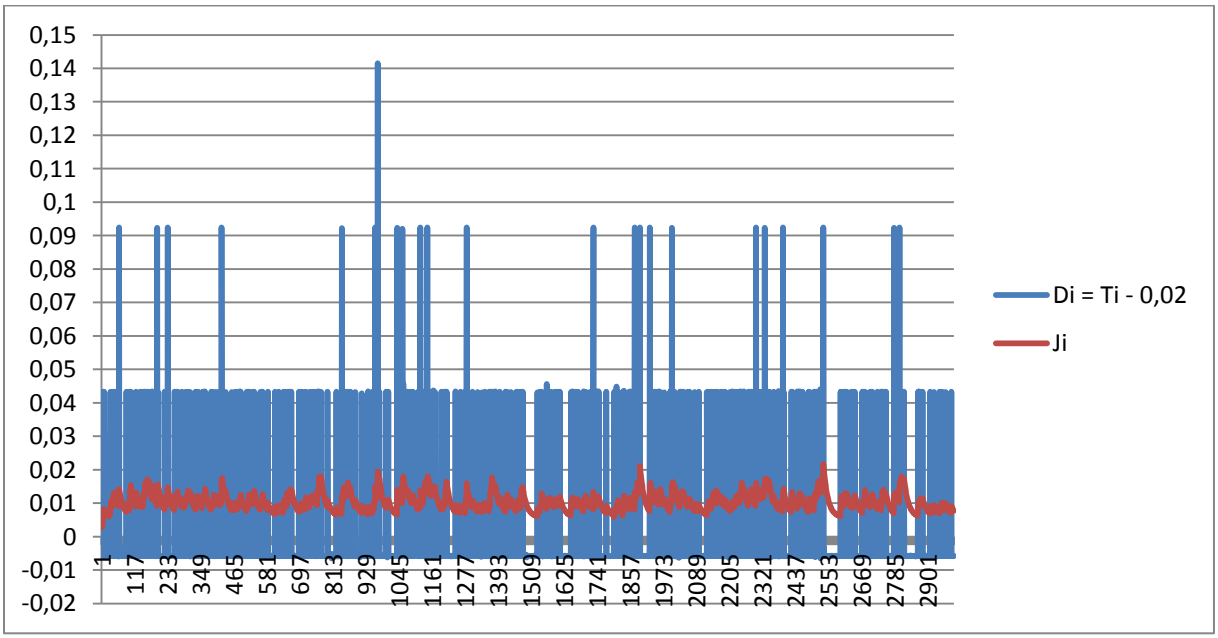
Interface s0/0/0
Encapsulation ppp
Ppp multilink
Ppp multilink group 1
//ip adresa sa sama zmazala


100000
50000
0
0s
20s
40s
60s

```
------------------------------------------------------------
Flow number: 1
From 10.0.1.2:58822
To    10.0.2.2:9001
------------------------------------------------------------
Total time                =     60.303000 s
Total packets             =          2995
Minimum delay             =   -145.584000 s
Maximum delay             =   -144.650000 s
Average delay             =   -145.183434 s
Average jitter            =      0.010411 s
Delay standard deviation  =      0.176415 s
Bytes received            =        515140
Average bitrate           =     68.340215 Kbit/s
Average packet rate       =     49.665854 pkt/s
Packets dropped           =             5 (0.17 %)
Average loss-burst size   =      1.000000 pkt
------------------------------------------------------------
------------------------------------------------------------
Flow number: 2
From 10.0.1.2:58823
To    10.0.2.2:9002
------------------------------------------------------------
Total time                =     60.111000 s
Total packets             =           359
Minimum delay             =   -145.550000 s
Maximum delay             =   -144.662000 s
Average delay             =   -145.167869 s
Average jitter            =      0.037662 s
Delay standard deviation  =      0.176083 s
Bytes received            =        251300
Average bitrate           =     33.444794 Kbit/s
Average packet rate       =      5.972285 pkt/s
Packets dropped           =             0 (0.00 %)
Average loss-burst size   =      0.000000 pkt
------------------------------------------------------------
```

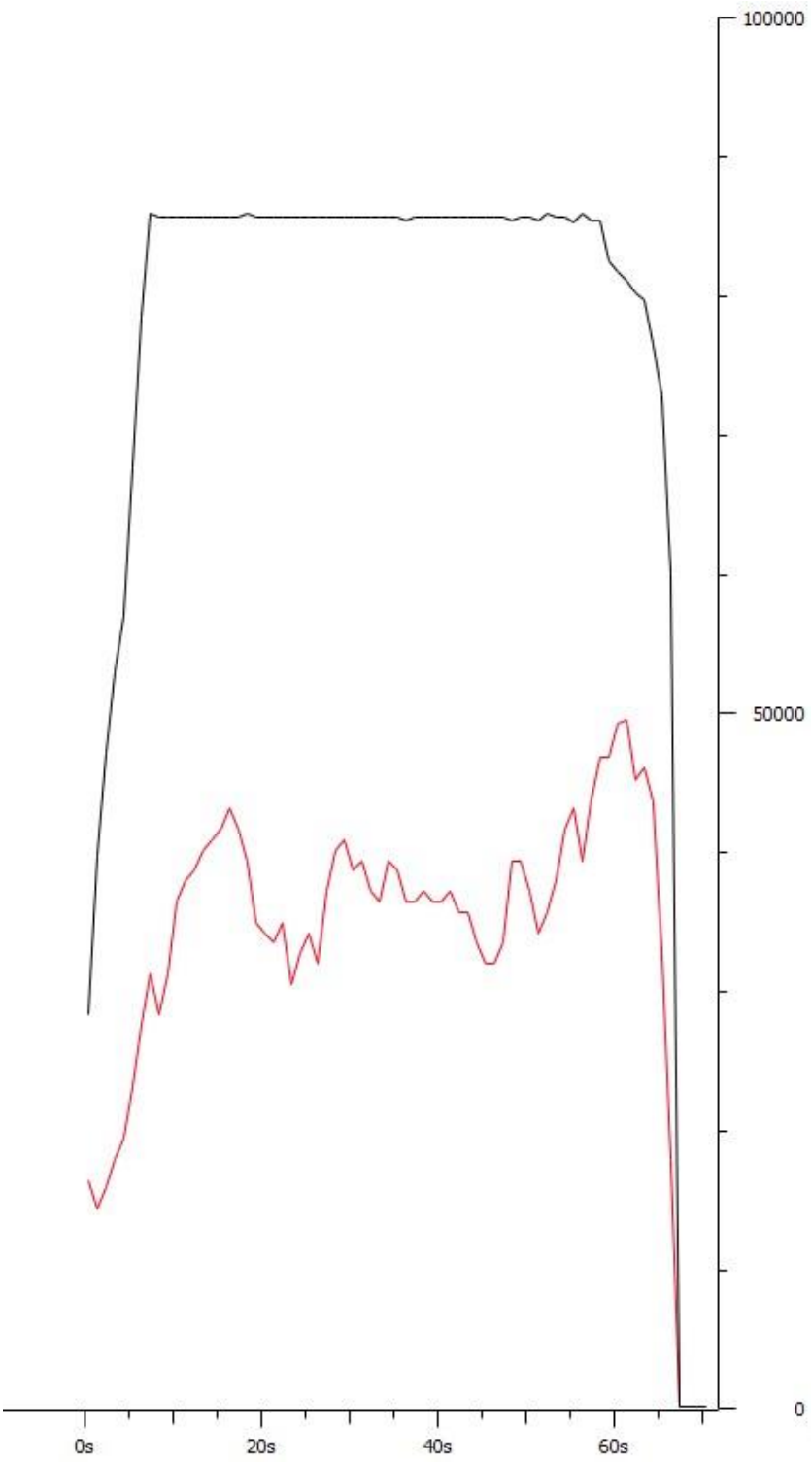
```
R1#sh ip int brie
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            10.0.1.1        YES manual up                    up
FastEthernet0/1            unassigned      YES unset  administratively down down
Serial0/0/0                unassigned      YES manual up                    up
Serial0/0/1                unassigned      YES unset  up                    up
Serial0/3/0                unassigned      YES unset  administratively down down
Serial0/3/1                unassigned      YES unset  administratively down down
FastEthernet0/2/0          unassigned      YES unset  up                    down
FastEthernet0/2/1          unassigned      YES unset  up                    down
FastEthernet0/2/2          unassigned      YES unset  up                    down
FastEthernet0/2/3          unassigned      YES unset  up                    down
wlan-controller1/0         unassigned      YES unset  administratively down down
Multilink1                 10.0.12.1       YES manual up                    up
Vlan1                      unassigned      YES unset  up                    down
R1#
```

```
R1#sh policy-map interface multilink 1
 Multilink1

  Service-policy output: prio

    queue stats for all priority classes:
      Queueing
      queue limit 64 packets
      (queue depth/total drops/no-buffer drops) 0/0/0
      (pkts output/bytes output) 0/0

    Class-map: voip (match-all)
      0 packets, 0 bytes
      5 minute offered rate 0000 bps, drop rate 0000 bps
      Match: access-group 101
      Priority: 90 kbps, burst bytes 2250, b/w exceed drops: 0


    Class-map: class-default (match-any)
      0 packets, 0 bytes
      5 minute offered rate 0000 bps, drop rate 0000 bps
      Match: any

      queue limit 64 packets
      (queue depth/total drops/no-buffer drops) 0/0/0
      (pkts output/bytes output) 0/0
R1#
```

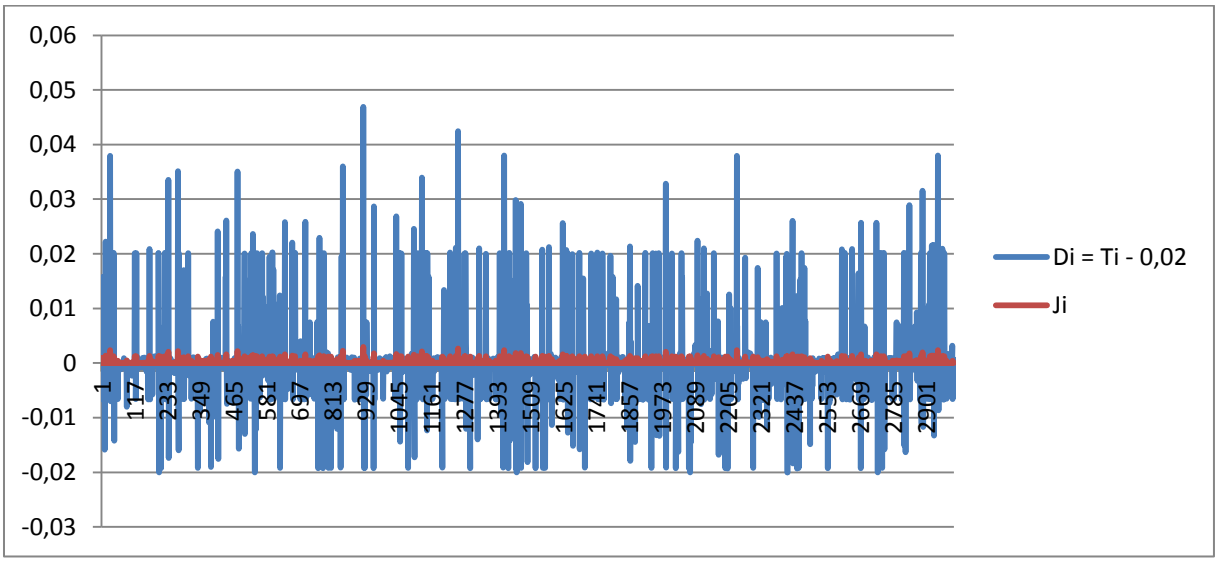


Enkapsulácia PPP + prioritizácia VoIP + LFI na 2 linkách

V poslednom scenári v úlohe 1 sme namiesto 1 sériového portu v multilinku mali aj druhý sériový port, ktorý bolo potrebné zapojiť.



```
------------------------------------------------------------
Flow number: 1
From 10.0.1.2:60209
To    10.0.2.2:9001
------------------------------------------------------------
Total time                =     59.981000 s
Total packets             =          3000
Minimum delay             =   -145.740000 s
Maximum delay             =   -145.692000 s
Average delay             =   -145.734435 s
Average jitter            =      0.004477 s
Delay standard deviation  =      0.008200 s
Bytes received            =        516000
Average bitrate           =     68.821794 Kbit/s
Average packet rate       =     50.015838 pkt/s
Packets dropped           =             0 (0.00 %)
Average loss-burst size   =      0.000000 pkt
------------------------------------------------------------
------------------------------------------------------------
Flow number: 2
From 10.0.1.2:60210
To    10.0.2.2:9002
------------------------------------------------------------
Total time                =     59.867000 s
Total packets             =           378
Minimum delay             =   -145.727000 s
Maximum delay             =   -145.662000 s
Average delay             =   -145.715720 s
Average jitter            =      0.009310 s
Delay standard deviation  =      0.010176 s
Bytes received            =        264600
Average bitrate           =     35.358378 Kbit/s
Average packet rate       =      6.313996 pkt/s
Packets dropped           =             0 (0.00 %)
Average loss-burst size   =      0.000000 pkt
------------------------------------------------------------
```

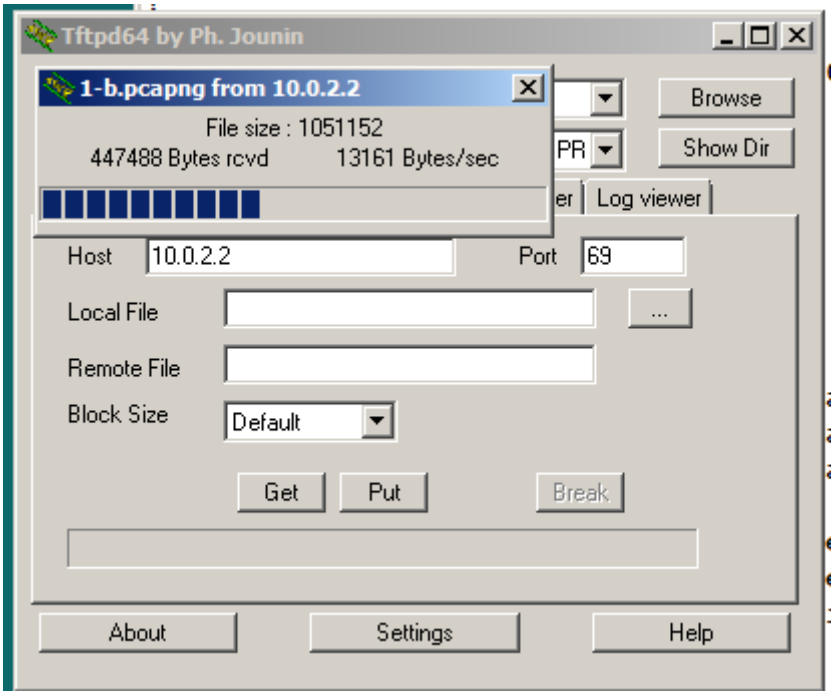


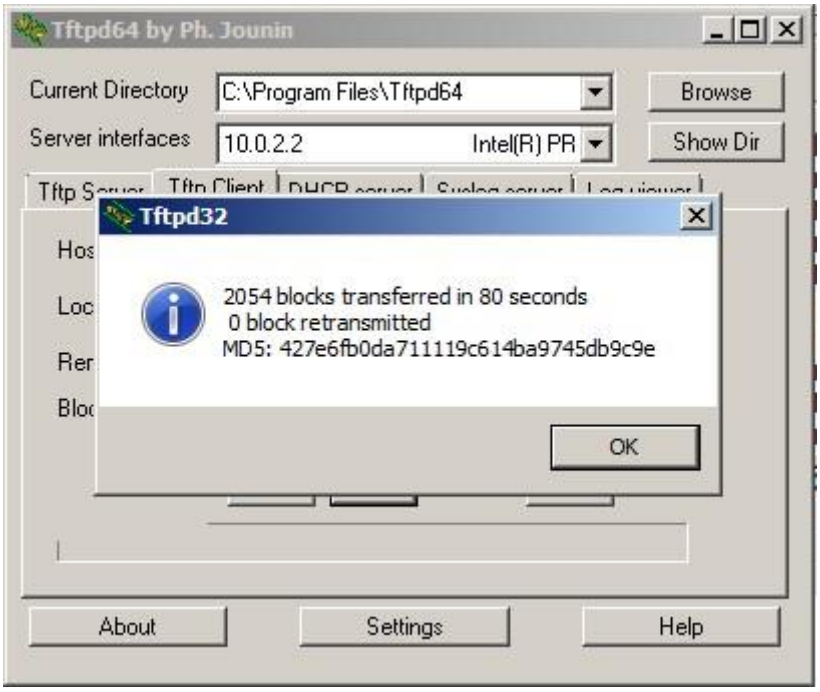
Úloha č. 2

Bolo potrebné preniesť súbor cez TFTP z PC1 na PC2 a odmerať, za aké časy sa tento súbor prenesie. V tomto prípade sme zrušili politiky predtým nastavené a využíval sa len multilink group.

1 linka

V prvom prípade bola zapojená iba 1 sériová linka





2 linky

V tomto prípade boli zapojené 2 sériové linky.