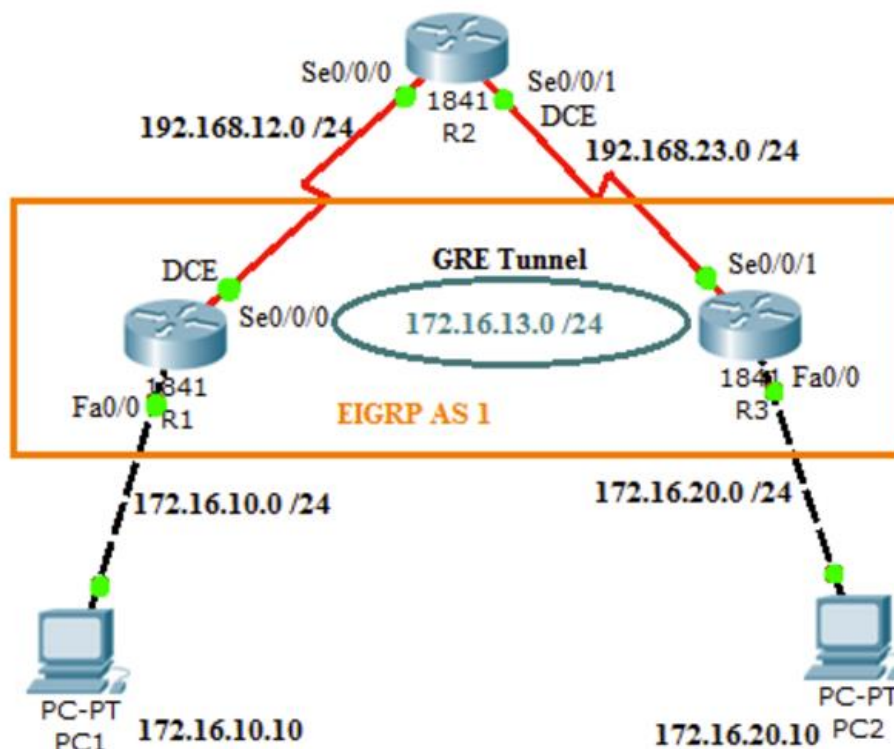


# Experimenty MLP s LFI

## Topológia:



## Generované toky:

Generovali sme 3 UDP toky cez D-ITG:

### 1) hlasový tok:

- konštantný, intenzita 50 pak/s;
- veľkosti paketov: konšt., 160B telo (s hlavičkami 218B)
- využite možnosť v D-ITG vybrať application
- Voice s kodekom G.711 (2 samples per packet)

### 2) dátový tok:

- konštantný, veľkosť paketu 1500B
- intenzita toku 1p/s
- Intenzita toku 3p/s
- Intenzita toku 5p/s

### 3) Gaming tok:

- Prednastavený z D-ITG

Vždy budeme spúšťať všetky tri toky naraz a budeme používať 3 scenáre:

- 1). Súčet tokov bude dosahovať približne 75 % z kapacity linky
- 2). Súčet tokov bude dosahovať približne 100 % z kapacity linky
- 3). Súčet tokov bude dosahovať približne 125 % z kapacity linky

## **Popis tokov:**

### **1.Tok Konštantný hlasový tok, kodek G.711**

- intenzita 50 p/s
- veľkosť paketu 200B

### **2.tok Gaming tok**

### **3.tok Náhodný dátový tok**

- intenzita 1 p/s, 3p/s, 5p/s
- veľkosť 1500B

## **Základná konfigurácia**

### **Potrebné WFQ na sériovom rozhraní R1**

```
policy-map WFQ
class class-default
fair-queue
int s0/0/0
service-policy output WFQ
```

### **Značkovanie**

Pakety toku 1 dostanú značku EF

Pakety toku 2 dostanú značku AF11

Pakety toku 3 budú ako best-effort

```
class-map match-all EF
match access-group 101
class-map match-all BF
match access-group 103
class-map match-all AF11
match access-group 102
!
policy-map Značkovanie
class EF
set ip dscp ef
class AF11
set ip dscp af11
class BF
set ip dscp default
policy-map WFQ
class class-default
fair-queue
```

### **Statické smerovanie**

R1

```
ip route 172.16.20.0 255.255.255.0 Tunnel0
ip route 192.168.23.0 255.255.255.0 Serial0/0/0
```

R2

```
ip route 192.168.12.0 255.255.255.0 Serial0/0/0
ip route 192.168.23.0 255.255.255.0 FastEthernet0/0
```

R3

```
ip route 172.16.10.0 255.255.255.0 Tunnel0  
ip route 192.168.12.0 255.255.255.0 FastEthernet0/0
```

### **GRE Tunnel**

R1

```
interface Tunnel0  
ip address 172.16.13.1 255.255.255.0  
tunnel source Serial0/0/0  
tunnel destination 192.168.23.3
```

R3

```
interface Tunnel0  
ip address 172.16.13.3 255.255.255.0  
tunnel source FastEthernet0/0  
tunnel destination 192.168.12.1
```

### **Port mirroring**

Na SW medzi R2 a R3

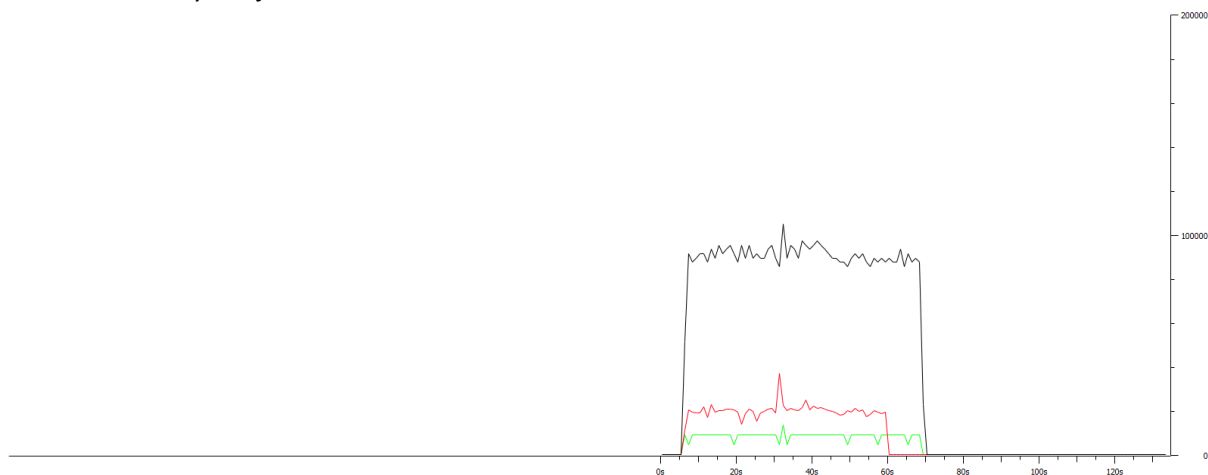
```
monitor session 1 source interface Gi0/1  
monitor session 1 destination interface Fa0/1
```

### Úloha 1:

- Bez značkovania paketov na vstupe
- Bez použitia QoS pre-classify

#### **1. Scenár**

- Súčtový tok je 75%



---

\*\*\*\*\* TOTAL RESULTS \*\*\*\*\*

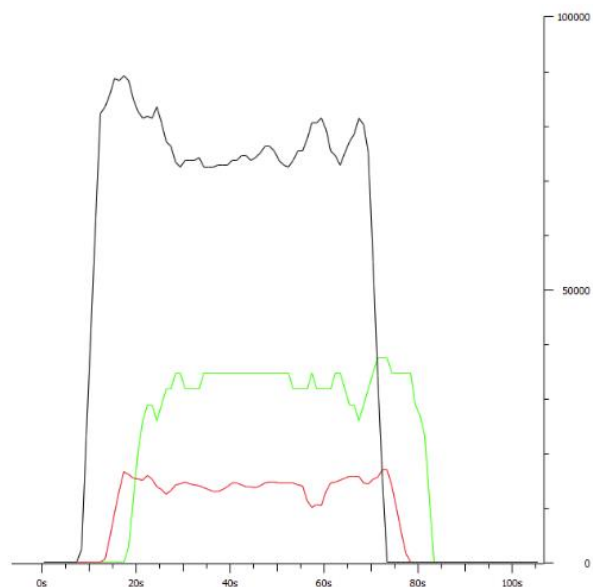
---

Number of flows	=	3
Total time	=	61.465000 s
Total packets	=	4307
Minimum delay	=	-71.834000 s
Maximum delay	=	-70.342000 s
Average delay	=	-71.107117 s
<b>Average jitter</b>	<b>=</b>	<b>0.005796 s</b>
Delay standard deviation	=	0.439867 s
Bytes received	=	627654
Average bitrate	=	81.692540 Kbit/s
Average packet rate	=	70.072399 pkt/s
<b>Packets dropped</b>	<b>=</b>	<b>0 (0.00 %)</b>
Average loss-burst size	=	0 pkt
Error lines	=	0

---

## 2. Scenár

- Súčtový tok je 100%



---

\*\*\*\*\* TOTAL RESULTS \*\*\*\*\*

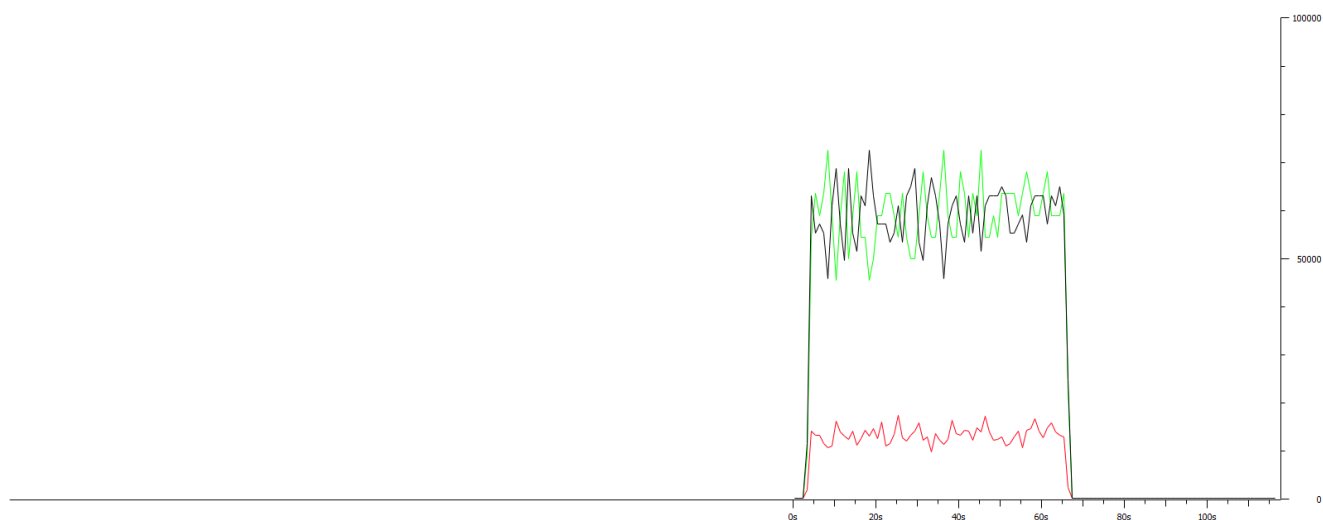
---

Number of flows	=	3
Total time	=	70.235000 s
Total packets	=	4207
Minimum delay	=	-264.935000 s
Maximum delay	=	-263.091000 s
Average delay	=	-263.697360 s
<b>Average jitter</b>	<b>=</b>	<b>0.016396 s</b>
Delay standard deviation	=	0.335792 s
Bytes received	=	773655
Average bitrate	=	88.121877 Kbit/s
Average packet rate	=	59.898911 pkt/s
<b>Packets dropped</b>	<b>=</b>	<b>377 (8.22 %)</b>
Average loss-burst size	=	1.597458 pkt
Error lines	=	0

---

### 3. Scenár

- Súčtový tok je 125%



---

\*\*\*\*\* TOTAL RESULTS \*\*\*\*\*

---

Number of flows	=	3
Total time	=	29.850000 s
Total packets	=	1211
Minimum delay	=	-39.841000 s
Maximum delay	=	-38.944000 s
Average delay	=	-263.697360 s
<b>Average jitter</b>	<b>=</b>	<b>0.036741 s</b>
Delay standard deviation	=	0.228907 s
Bytes received	=	329511
Average bitrate	=	88.311156 Kbit/s
Average packet rate	=	40.569514 pkt/ s
<b>Packets dropped</b>	<b>=</b>	<b>1364 (52.97 %)</b>
Average loss-burst size	=	2.744467 pkt
Error lines	=	0

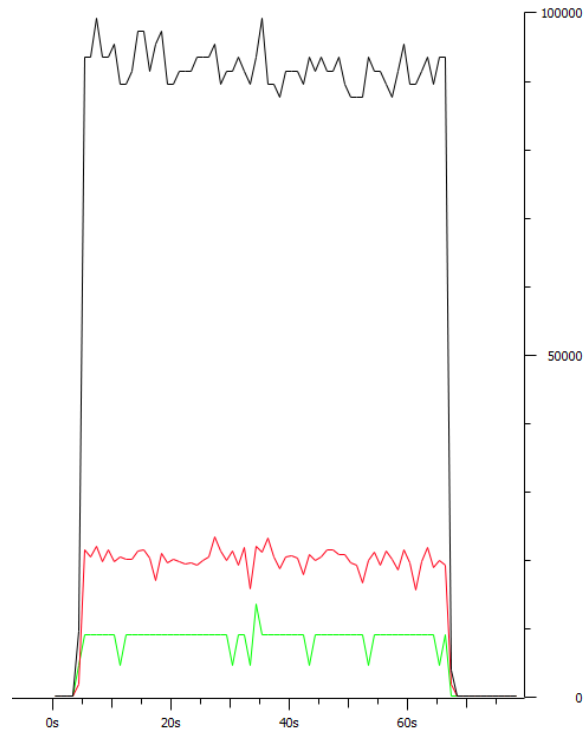
---

## Úloha 2:

- Značkovanie paketov na vstupe
- Bez použitia QoS pre-classify

### **1. Scenár**

- Súčtový tok je 75%,



---

\*\*\*\*\* TOTAL RESULTS \*\*\*\*\*

---

Number of flows	=	3
Total time	=	72.587000 s
Total packets	=	4400
Minimum delay	=	283.569000 s
Maximum delay	=	292.764000 s
Average delay	=	288.166537 s
<b>Average jitter</b>	<b>=</b>	<b>0.041019 s</b>
Delay standard deviation	=	1.494578 s
Bytes received	=	621889
Average bitrate	=	79.491140 Kbit/s
Average packet rate	=	70.302139 pkt/s
<b>Packets dropped</b>	<b>=</b>	<b>0 (0.00 %)</b>
Average loss-burst size	=	0 pkt
Error lines	=	0

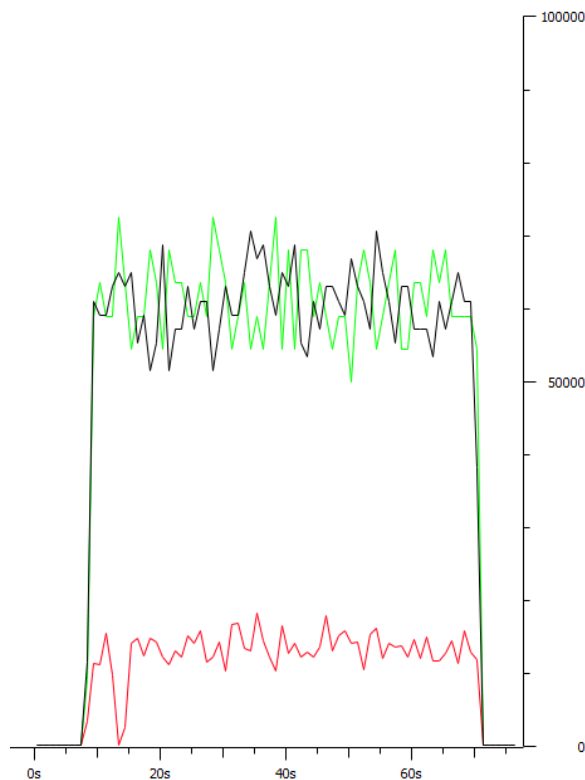
---

```
4606 70.687834000 172.16.10.10 172.16.20.10 UDP 238 Source port: 54356 Destination port: 9002
Frame 4606: 238 bytes on wire (1904 bits), 238 bytes captured (1904 bits) on interface 0
Ethernet II, Src: Cisco_76:76:59 (00:15:f9:76:76:59), Dst: Cisco_f8:d9:69 (00:19:06:f8:d9:69)
Internet Protocol Version 4, Src: 192.168.12.1 (192.168.12.1), Dst: 192.168.23.3 (192.168.23.3)
  Version: 4
  Header Length: 20 bytes
  Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00: Not-ECT (Not ECN-Capable Transport))
  Total Length: 224
  Identification: 0x2446 (9286)
  Flags: 0x00
  Fragment offset: 0
  Time to live: 254
  Protocol: Generic Routing Encapsulation (47)
  Header checksum: 0xf29b [validation disabled]
  Source: 192.168.12.1 (192.168.12.1)
  Destination: 192.168.23.3 (192.168.23.3)
  [Source GeoIP: unknown]
  [Destination GeoIP: unknown]
Generic Routing Encapsulation (IP)
  Flags and Version: 0x0000
  Protocol type: IP (0x0800)
Internet Protocol Version 4, Src: 172.16.10.10 (172.16.10.10), Dst: 172.16.20.10 (172.16.20.10)
  Version: 4
  Header Length: 20 bytes
  Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00: Not-ECT (Not ECN-Capable Transport))
  1011 10.. = Differentiated Services Codepoint: Expedited Forwarding (0x2e)
  .... 00 = Explicit Congestion Notification: Not-ECT (Not ECN-Capable Transport) (0x00)
  Total Length: 200
  Identification: 0x2491 (9361)
  Flags: 0x02 (Don't Fragment)
  Fragment offset: 0
  Time to live: 127
  Protocol: UDP (17)
  Header checksum: 0x5fa7 [validation disabled]
  Source: 172.16.10.10 (172.16.10.10)
  Destination: 172.16.20.10 (172.16.20.10)
  [Source GeoIP: unknown]
  [Destination GeoIP: unknown]
User Datagram Protocol, Src Port: 54356 (54356), Dst Port: 9002 (9002)
Data (172 bytes)

0030 5f a7 ac 10 0a 0a ac 10 14 0a d4 54 23 2a 00 b4 .....T#*
0040 01 90 00 00 00 01 00 00 0b b0 00 00 84 b6 00 0f ..F....L.c/be
0050 13 60 bc 72 b4 f5 c4 e1 ef c8 4c 1b 63 5e 62 65 ..F....L.c/be
0060 24 64 6f fa 6a d2 ef 6e 1c cd a7 27 37 07 cf d9 $do...n...7...
0070 ae ab 0f 3e a3 c4 b4 66 28 10 fd f7 9c a4 71 9c ...>...f (...).q<
0080 14 e2 02 20 1e d1 1b 10 03 04 2c 05 20 e4 f0 52 ..n
```

## 2. Scenár

- Súčtový tok je 100%,



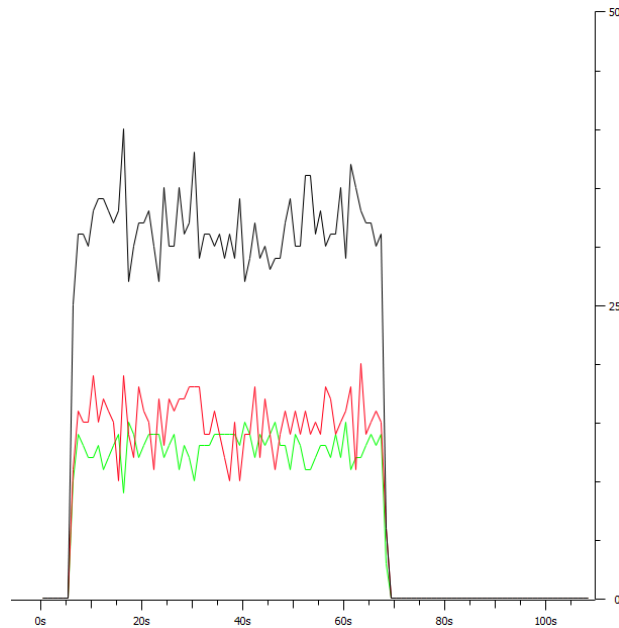


\*\*\*\*\* TOTAL RESULTS \*\*\*\*\*

Minimum delay	=	-71.641000 s
Maximum delay	=	-68.528000 s
Average delay	=	-70.182153 s
<b>Average jitter</b>	<b>=</b>	<b>0.010447 s</b>
<b>Packets dropped</b>	<b>=</b>	<b>1858 (12.85 %)</b>

### 3. Scenár

- Súčtový tok je 125%,



\*\*\*\*\* TOTAL RESULTS \*\*\*\*\*

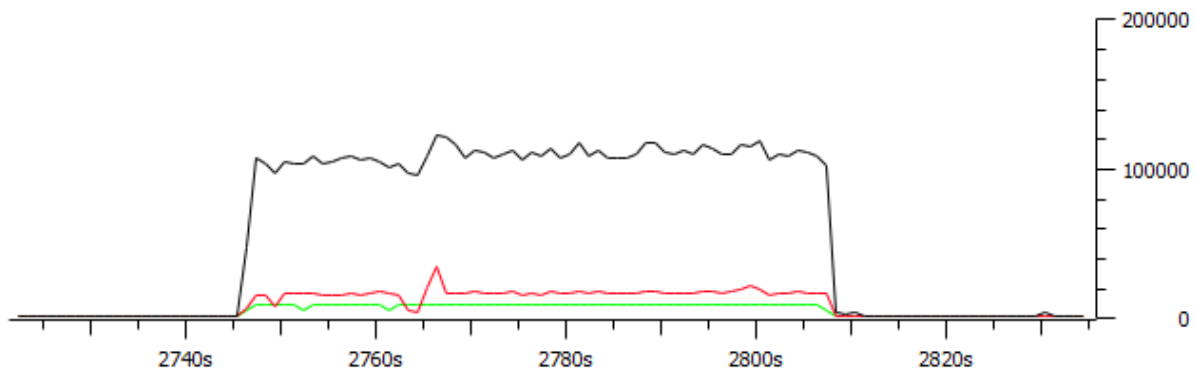
Number of flows	=	3
Total time	=	62.530000 s
Total packets	=	3718
Minimum delay	=	-71.450000 s
Maximum delay	=	-68.875000 s
Average delay	=	-70.021046 s
<b>Average jitter</b>	<b>=</b>	<b>0.018767 s</b>
Delay standard deviation	=	0.697949 s
Bytes received	=	786783
Average bitrate	=	100.659907 Kbit/s
Average packet rate	=	59.459459 pkt/s
<b>Packets dropped</b>	<b>=</b>	<b>1917 (34.02 %)</b>
Average loss-burst size	=	1.429530 pkt
Error lines	=	0

### Úloha 3:

- Bez značkovania paketov na vstupe
  - o značkovanie sa do GRE tunela prenáša, nemusíme teda značkovat'
- S použitím QoS pre-classify

#### 1. Scenár

- Súčtový tok je 75%



---

\*\*\*\*\* TOTAL RESULTS \*\*\*\*\*

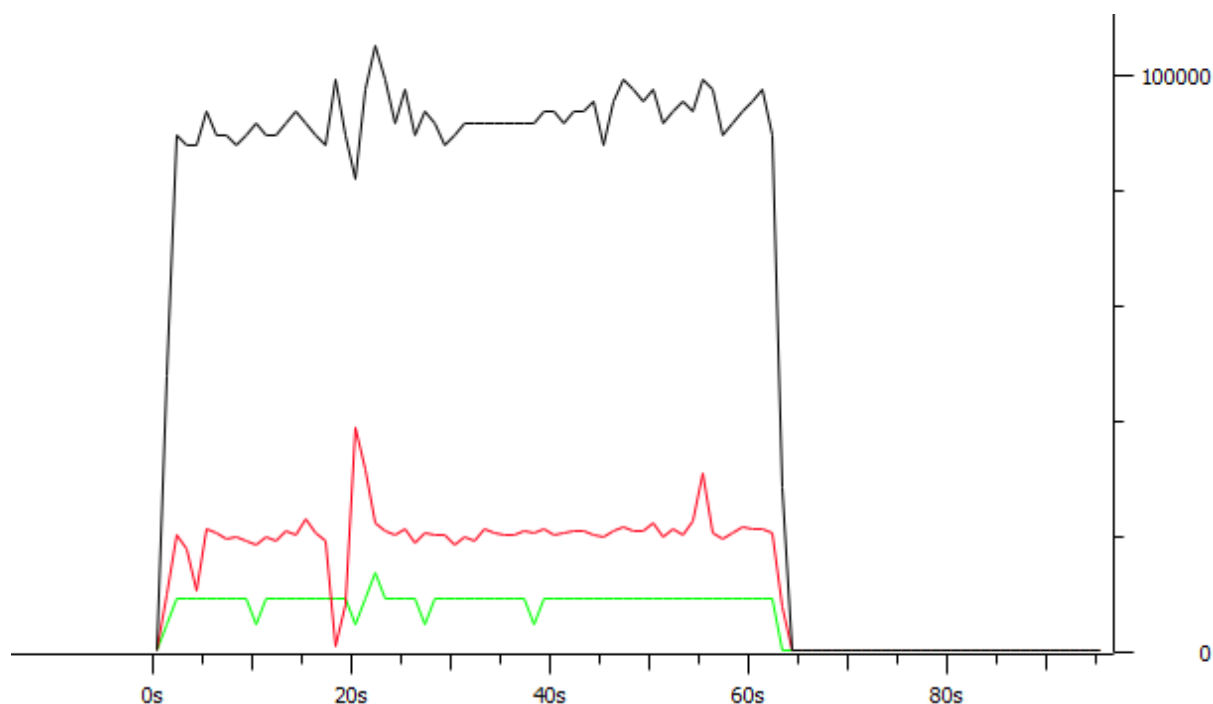
---

Number of flows	=	3
Total time	=	61.275000 s
Total packets	=	4557
Minimum delay	=	-71.624000 s
Maximum delay	=	-70.146000 s
Average delay	=	-70.617270 s
<b>Average jitter</b>	<b>=</b>	<b>0.006331 s</b>
Delay standard deviation	=	0.343078 s
Bytes received	=	638477
Average bitrate	=	83.358890 Kbit/s
Average packet rate	=	74.369645 pkt/s
<b>Packets dropped</b>	<b>=</b>	<b>493 (9.76 %)</b>
Average loss-burst size	=	123.250000 pkt
Error lines	=	0

---

## 2. Scenár

- Súčtový tok je 100%



---

\*\*\*\*\* TOTAL RESULTS \*\*\*\*\*

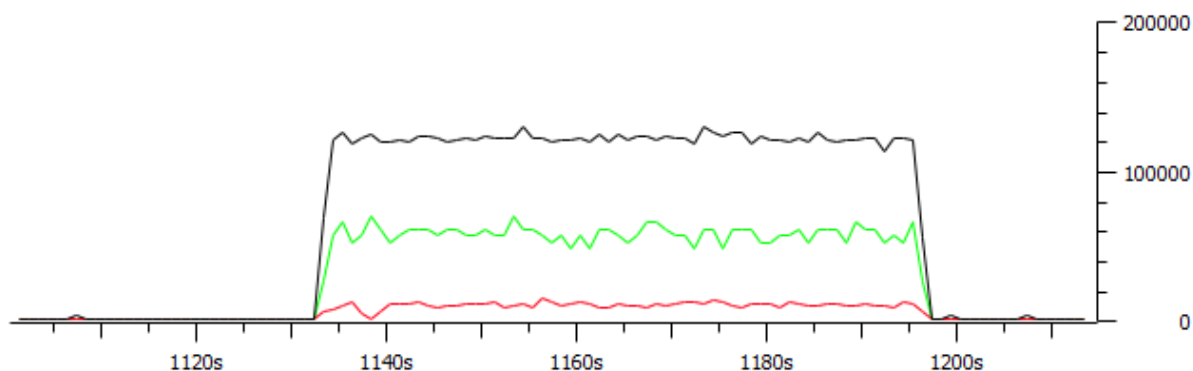
---

Number of flows	=	3
Total time	=	63.708000 s
Total packets	=	4136
Minimum delay	=	11.921000 s
Maximum delay	=	19.468000 s
Average delay	=	17.210229 s
<b>Average jitter</b>	<b>=</b>	<b>0.069938 s</b>
Delay standard deviation	=	1.793478 s
Bytes received	=	731130
Average bitrate	=	91.810134 Kbit/s
Average packet rate	=	64.921203 pkt/s
<b>Packets dropped</b>	<b>=</b>	<b>467 (9.96 %)</b>
Average loss-burst size	=	2.185000 pkt
Error lines	=	0

---

### 3. Scenár

- Súčtový tok je 125%,



---

\*\*\*\*\* TOTAL RESULTS \*\*\*\*\*

---

Number of flows	=	3
Total time	=	61.650000 s
Total packets	=	3989
Minimum delay	=	-71.676000 s
Maximum delay	=	-69.484000 s
Average delay	=	-70.768316 s
<b>Average jitter</b>	<b>=</b>	<b>0.047363 s</b>
Delay standard deviation	=	0.495891 s
Bytes received	=	770116
Average bitrate	=	99.933950 Kbit/s
Average packet rate	=	64.703974 pkt/s
<b>Packets dropped</b>	<b>=</b>	<b>1528 (27.70 %)</b>
Average loss-burst size	=	1.986996 pkt
Error lines	=	0

---