Dokumentácia k cvičeniu č.8

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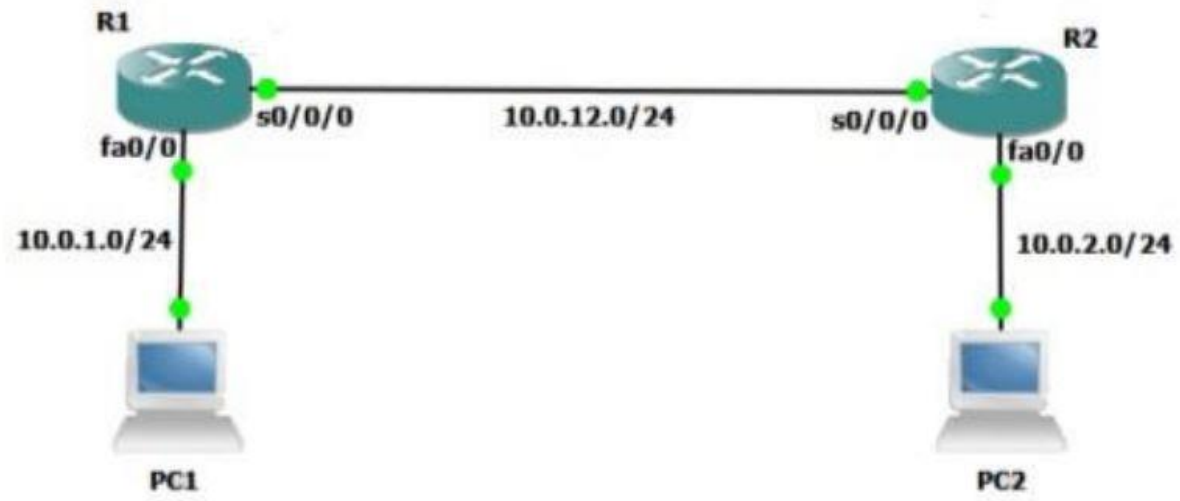
Topológia



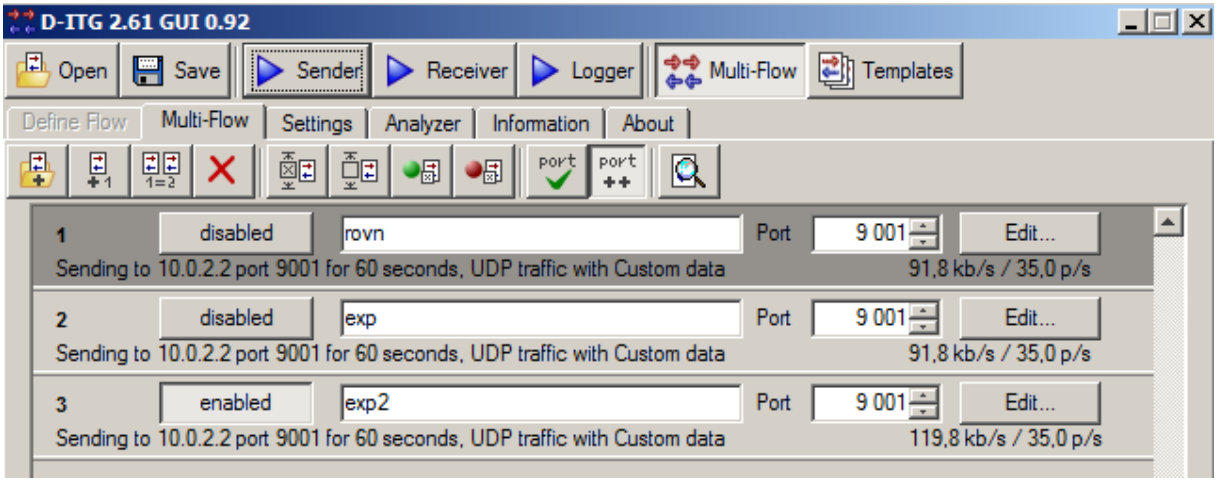
Generovanie tokov

Toky: kolísavý okolo: a.) aj b.) 84 kb/s UDP, c.) 112kbps

o Intenzita: 35 pak/s - náhodné časy príchodov s expon. rozdelením, pričom priemerne bude chodiť 35 pak/s

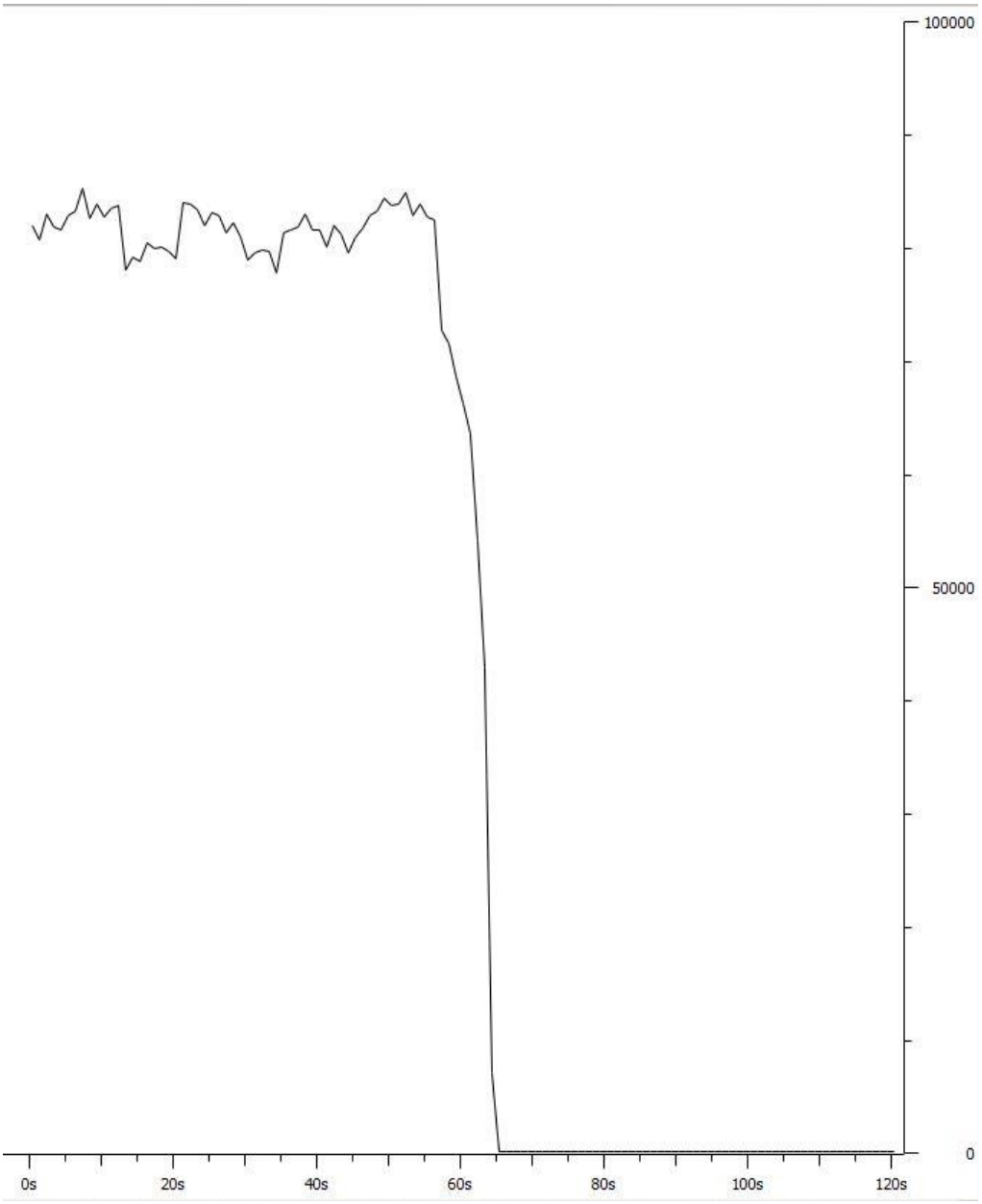
o Veľkosť paketov náhodná - spravte pre každý scenár (viď nižšie) tieto 3 varianty:

* a.) s rovnomerným rozdelením = uniform od 100 do 500 B
* b.) s exponenciálnym rozdelením so strednou veľkosťou paketu 300 B
* c.) s exp. rozdelením so strednou dĺžkou 400 B

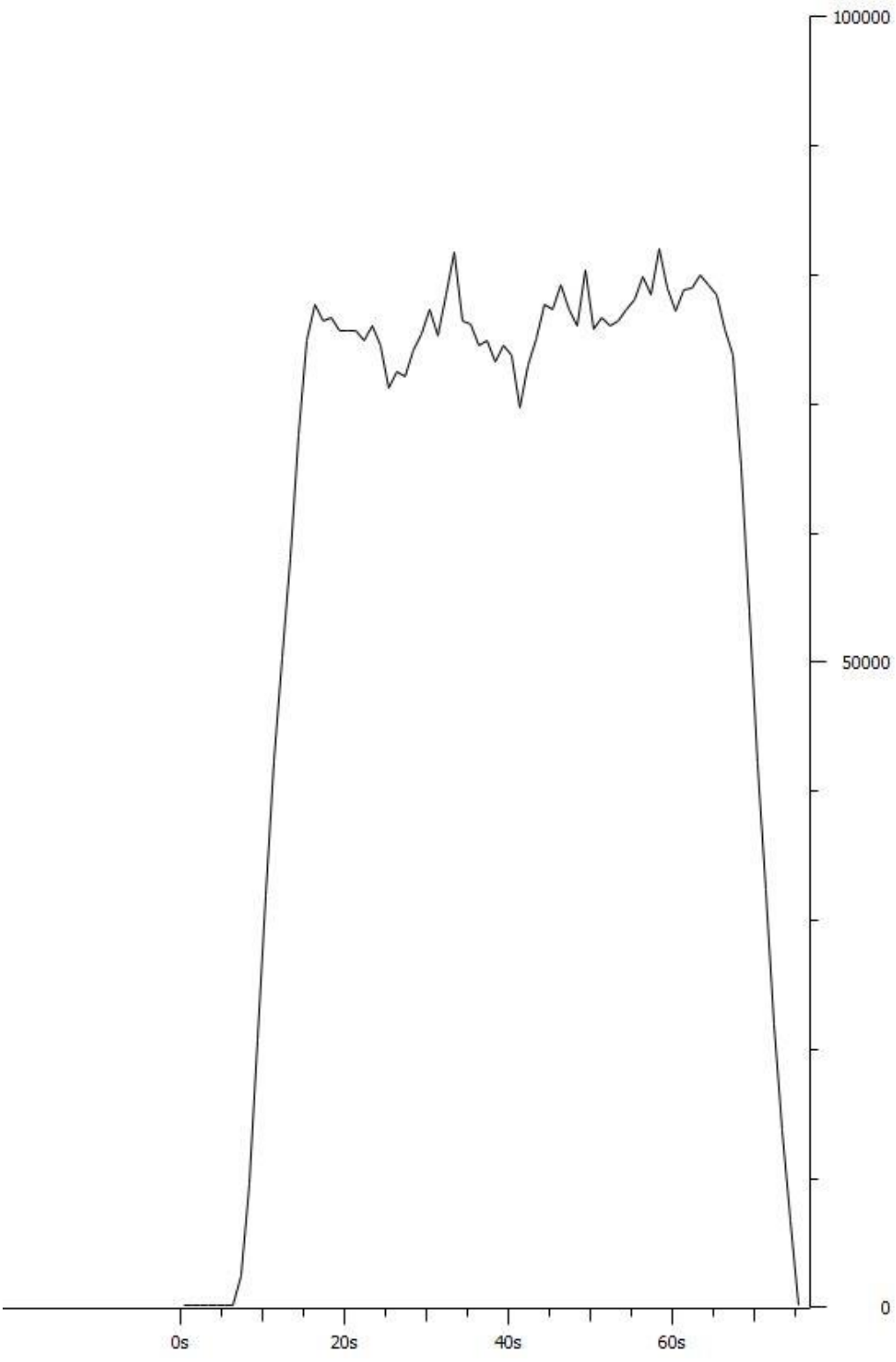


Policing - Single rate two color (jednoduchý token bucket)

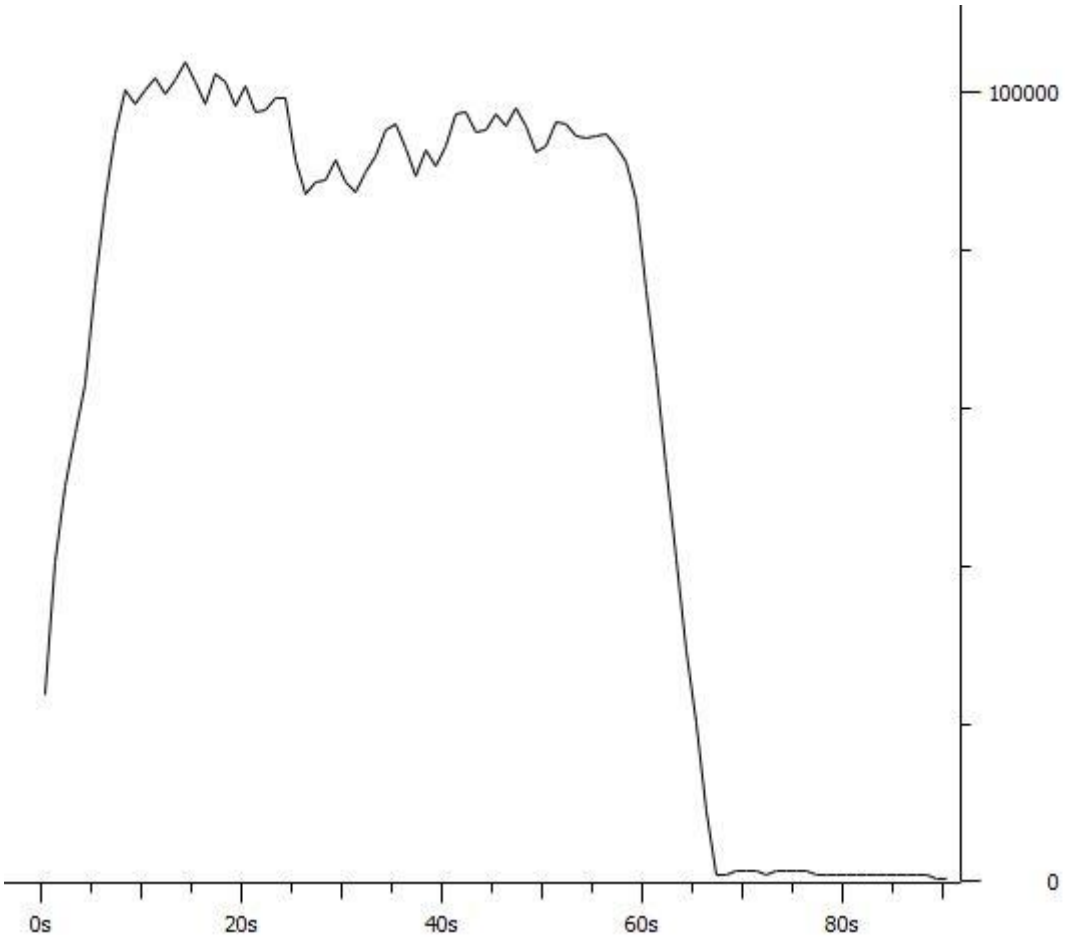
Vytvorenie triedy s následnou policy do ktorej pôjde všetok generovaný tok. V prvom prípade sa všetok tok označkuje DSCP hodnotou 2 a pakety nad hodnotu 84kbps zahodí.



Obrázok 1 : Rovnomerný 84kbps



Obrázok 2 : Exponenciálny 84 kbps

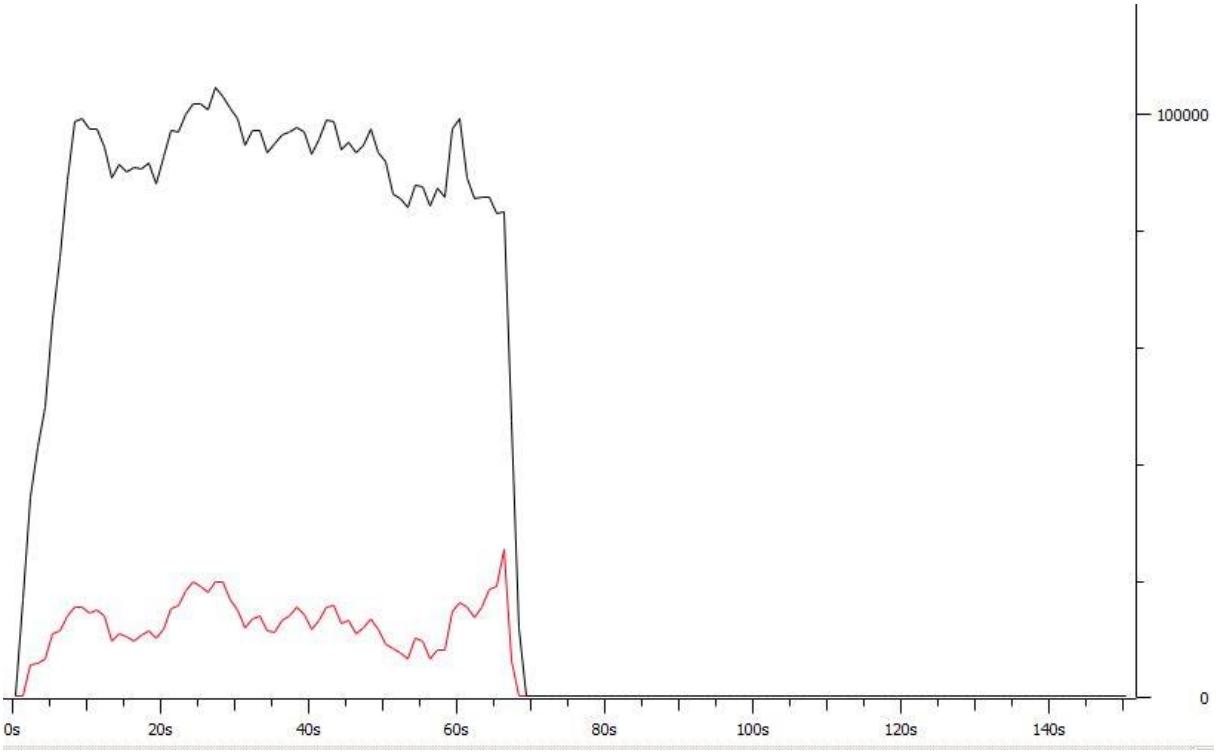


Obrázok 3 : Exponenciálny 112 kbps

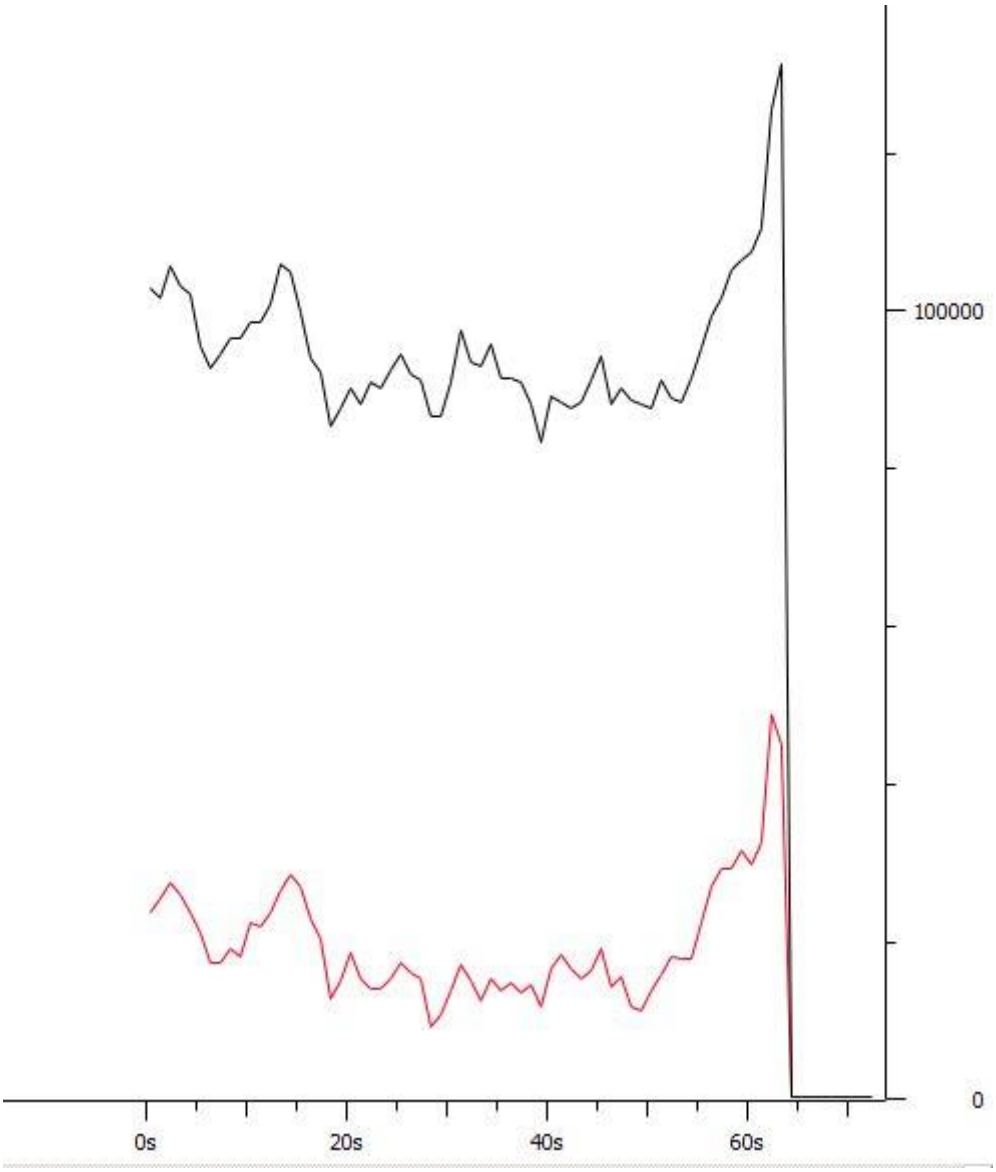
```
R1#sh policy-map int fa0/0
 FastEthernet0/0

  Service-policy input: zn

    Class-map: tok1 (match-all)
      2128 packets, 731802 bytes
      5 minute offered rate 0000 bps, drop rate 0000 bps
      Match: access-group 101
      QoS Set
        dscp 2
          Packets marked 2128
      police:
          cir 84000 bps, bc 2625 bytes
        conformed 1838 packets, 613636 bytes; actions:
          transmit
        exceeded 290 packets, 118166 bytes; actions:
          drop
        conformed 0000 bps, exceeded 0000 bps

    Class-map: class-default (match-any)
      9 packets, 567 bytes
      5 minute offered rate 0000 bps, drop rate 0000 bps
      Match: any
```

bc = 2625 B * 8 = 21000 b
Tc = Bc / CIR = 21000 / 84000 = 0,25 s
1 / Tc = 1 / 0,25 = 4 doplnení/s

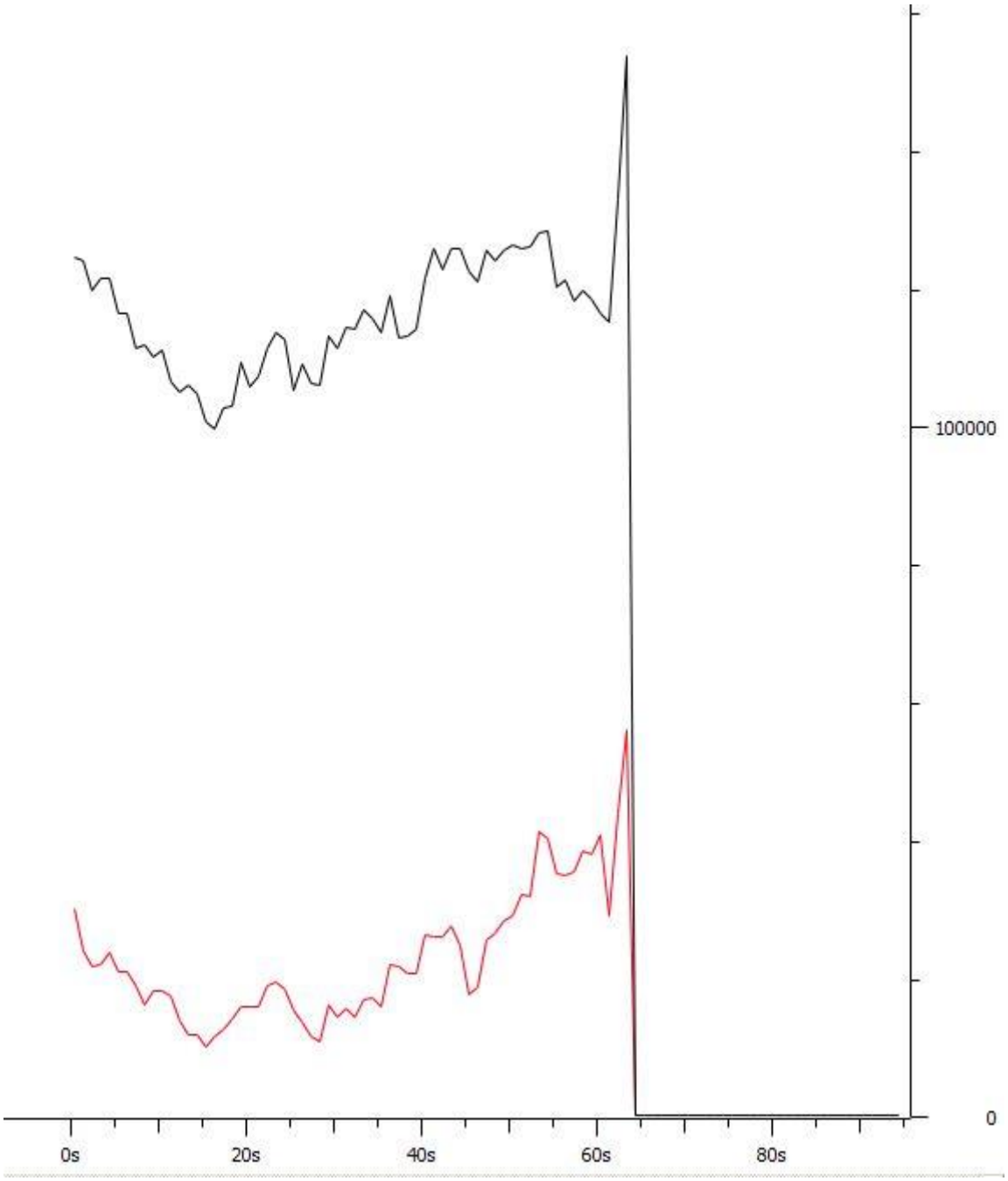
V druhom variante pakety nezahodí, ale preznačkuje ich na *af12.* Červený tok znázorňuje tok preznačkovaný na af12.



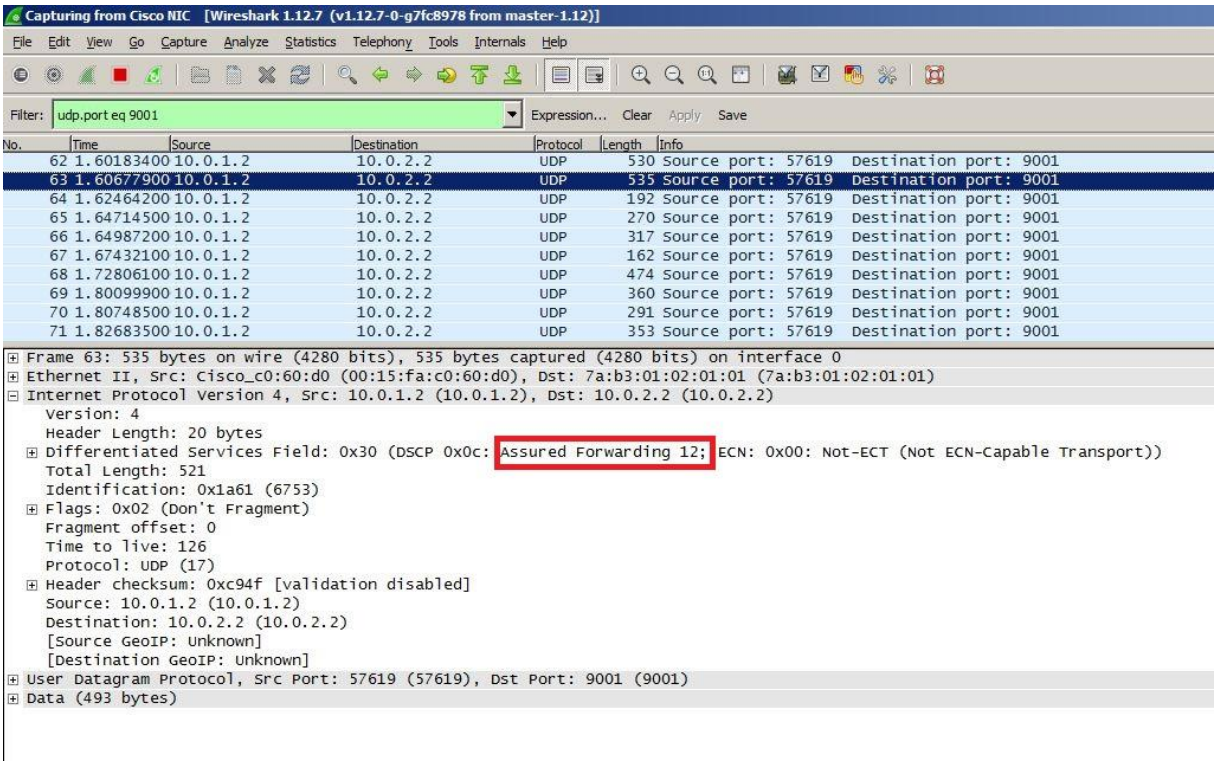
Obrázok 4 : Rovnomerný 84kbps



Obrázok 5 : Exponenciálny 84kbps



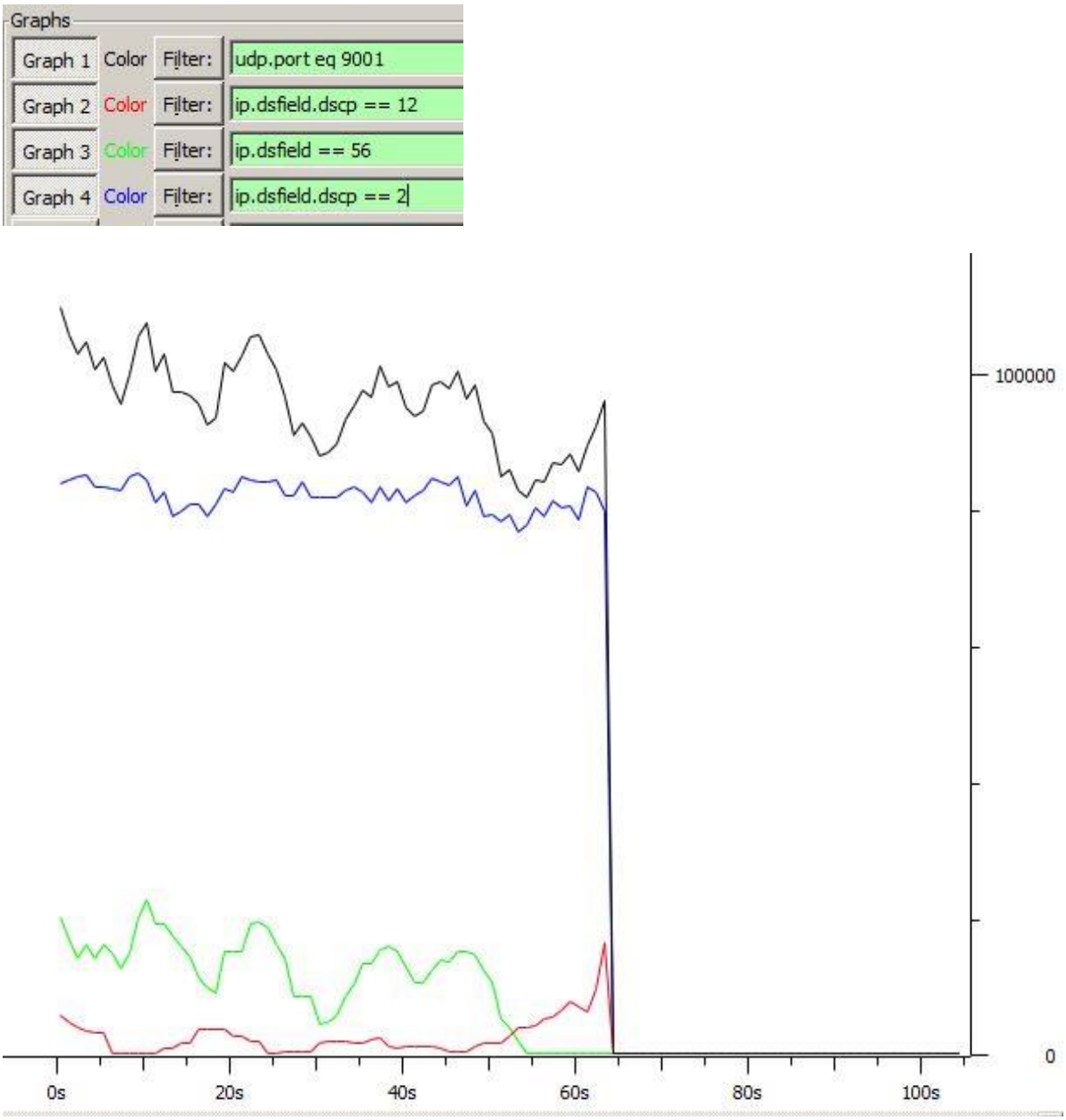
Obrázok 6 : Exponenciálny 112kbps



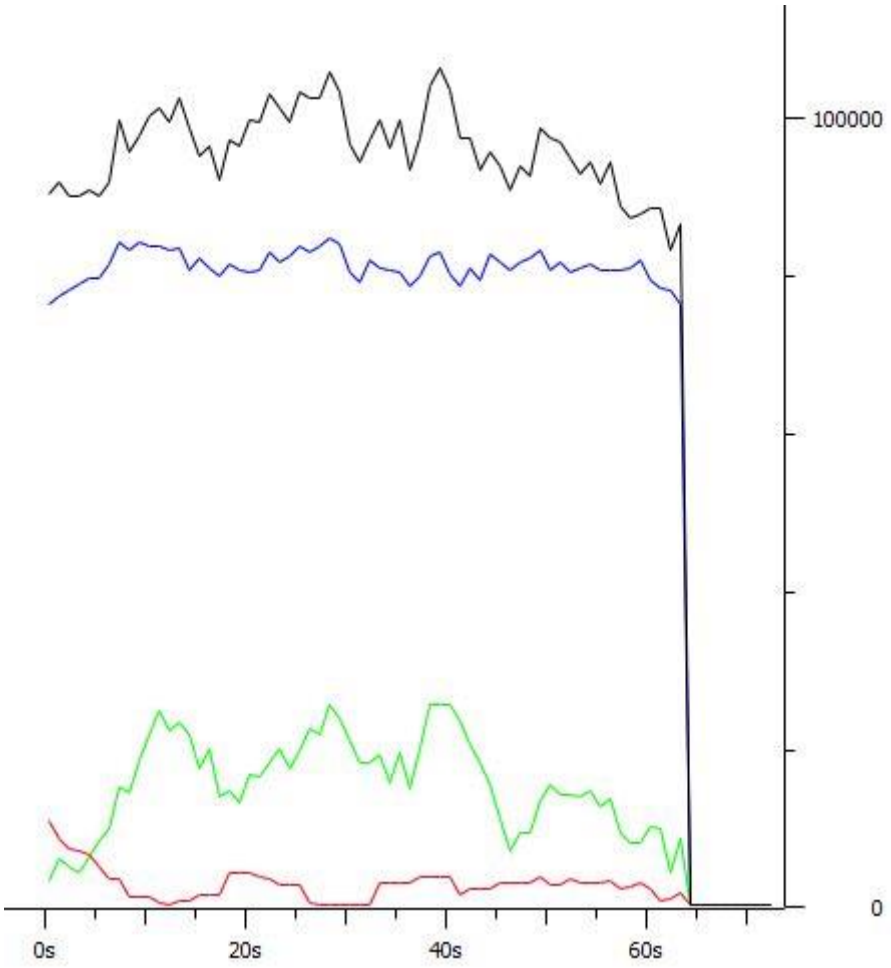
Policing - Single Rate Three Color Marker (srTCM)

V tomto scenári funguje dvojitý token bucket. Pritekajúce tokeny, ktoré sa nezmestia do prvého vedra, ktorého veľkosť je Bc = comform burst, sa budú ukladať do druhého vedra veľkosti Be = excess burst. Toky, ktoré sa nezmestia do prvého bucketu sa preznačkujú na af12 a ktoré sa nezmestia ani do druhého bucketu sa preznačia na af13.

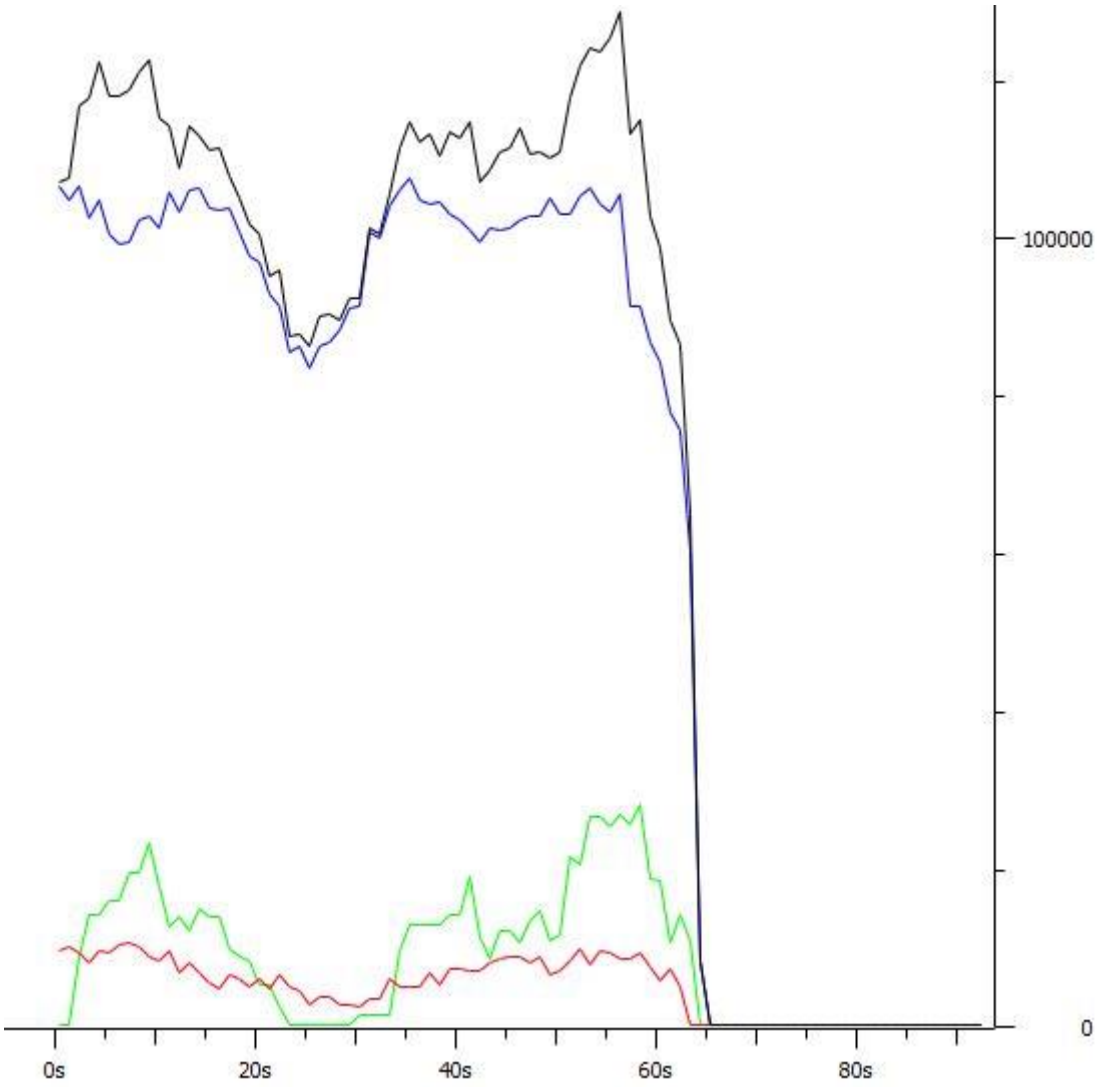
```
R1(config-pmap-c-police)#do sh policy-map int fa0/0
 FastEthernet0/0

  Service-policy input: zn

    Class-map: tok1 (match-all)
      34087 packets, 12450517 bytes
      5 minute offered rate 25000 bps, drop rate 0000 bps
      Match: access-group 101
      QoS Set
        dscp 2
          Packets marked 34087
      police:
          cir 112000 bps, bc 3000 bytes, be 3000 bytes
        conformed 30346 packets, 10057305 bytes; actions:
          transmit
        exceeded 2389 packets, 1518245 bytes; actions:
          set-dscp-transmit af12
        violated 1352 packets, 874967 bytes; actions:
          set-dscp-transmit af13
        conformed 21000 bps, exceeded 0000 bps, violated 0000 bps

    Class-map: class-default (match-any)
      150 packets, 9460 bytes
      5 minute offered rate 0000 bps, drop rate 0000 bps
      Match: any
```



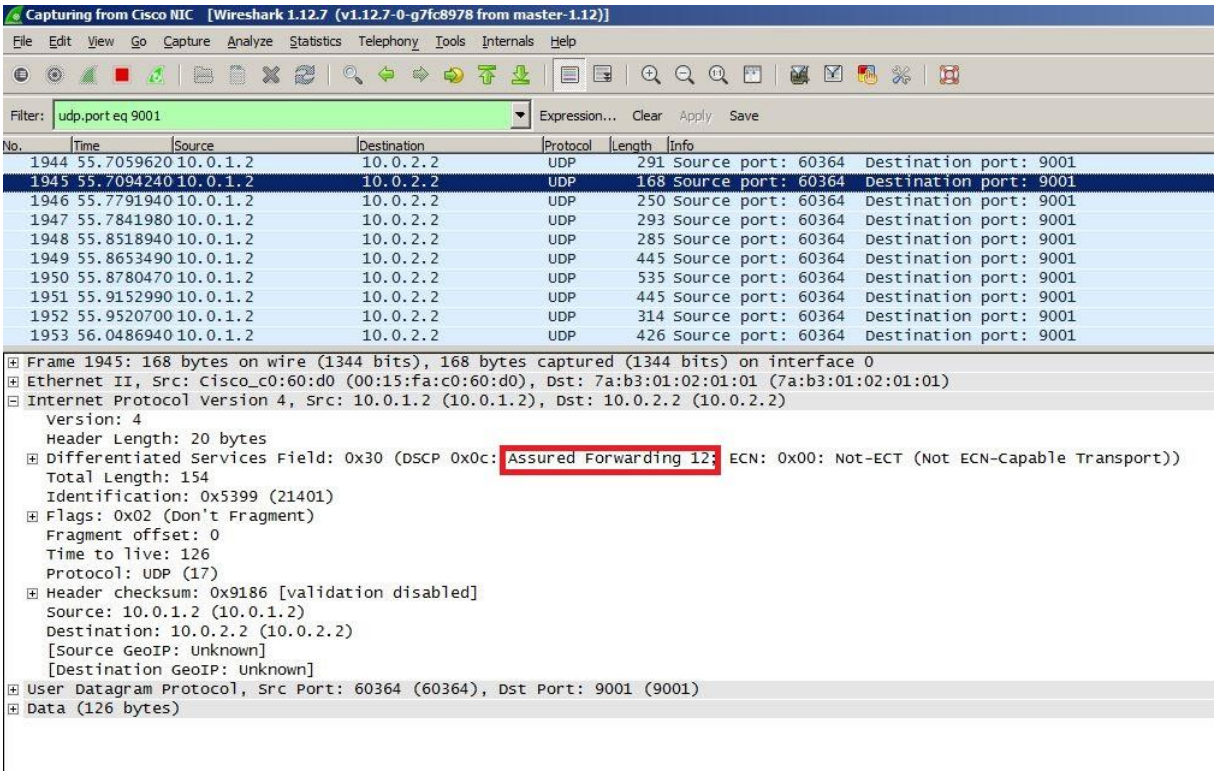
Obrázok 7 : Rovnomerný 84kbps

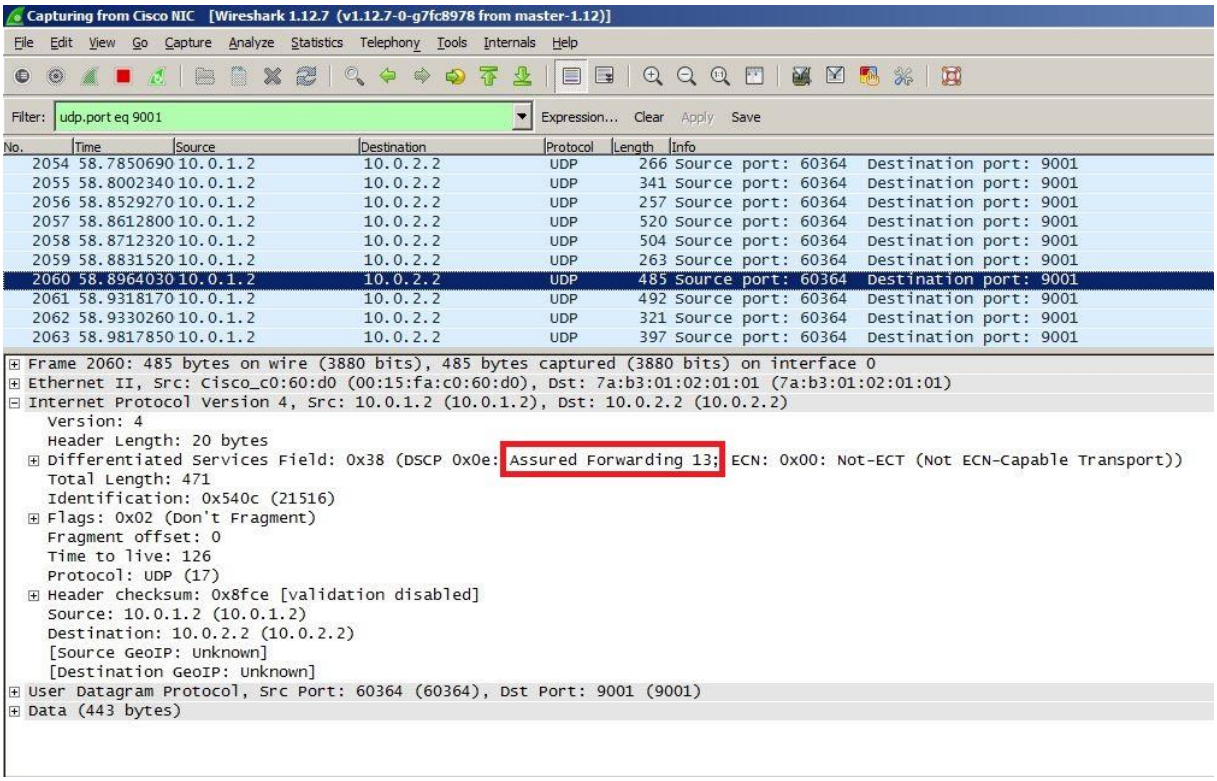


Obrázok 8 : Exponenciálny 84kbps



Obrázok 9 : Exponenciálny 112kbps





Policing - Two Rate Three Color Marker (trTCM)

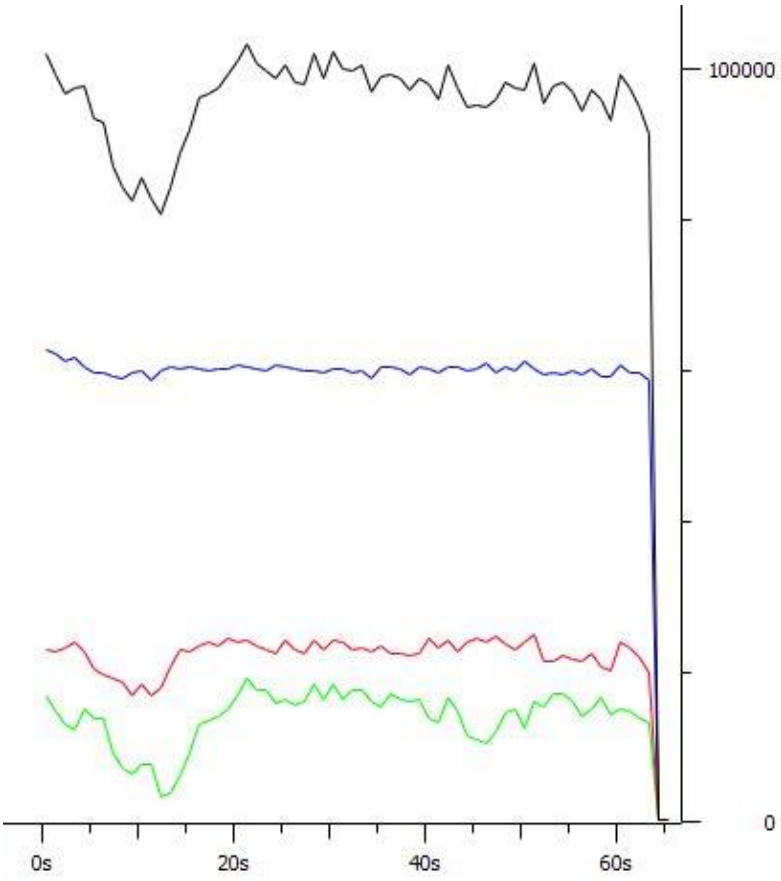
Teraz chceme obmedziť tok na maximálnu ustálenú úroveň PIR=84kbps, ale pritom identifikovať jeho časť na ustálenej úrovni CIR=60kbps (CIR – ustálená rýchlosť na konformnej úrovni = conform = rýchlosť akou sa bude plniť prvé vedro, PIR – ustálená rýchlosť na maximálnej povolenej úrovni = peak = rýchlosť akou sa bude plniť druhé vedro). Každé vedro sa plní svojou rýchlosťou. Odoberanie

tokenov pre paket, ktorý príde vo chvíli, že sa preň nájde dostatok tokenov v jednom aj druhom vedre, sa deje z jedného aj druhého vedra a paket sa prepošle.

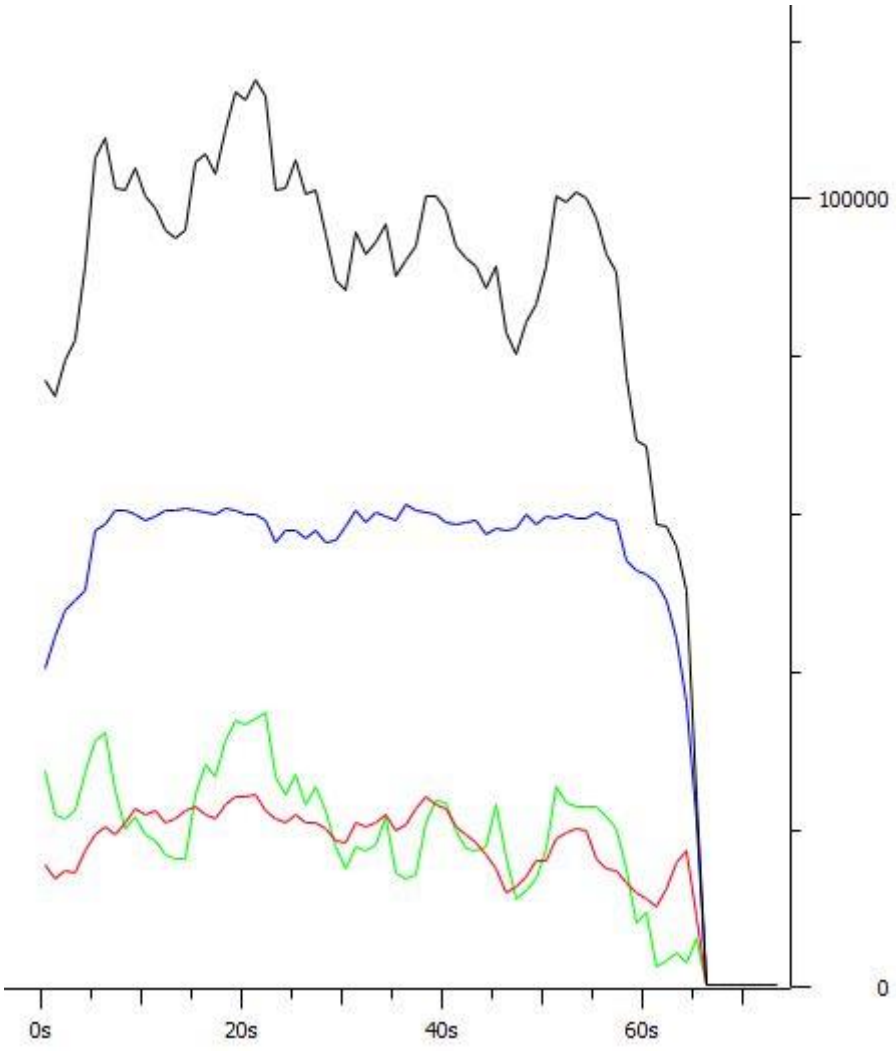
```
R1(config-pmap-c-police)#do sh policy-map int fa0/0
 FastEthernet0/0

  Service-policy input: zn

    Class-map: tok1 (match-all)
      36196 packets, 13348486 bytes
      5 minute offered rate 21000 bps, drop rate 0000 bps
      Match: access-group 101
      QoS Set
        dscp 2
          Packets marked 36196
      police:
          cir 60000 bps, bc 1875 bytes
          pir 84000 bps, be 2625 bytes
        conformed 32296 packets, 10813381 bytes; actions:
          transmit
        exceeded 2460 packets, 1570297 bytes; actions:
          set-dscp-transmit af12
        violated 1440 packets, 964808 bytes; actions:
          set-dscp-transmit af13
        conformed 18000 bps, exceeded 0000 bps, violated 0000 bps

    Class-map: class-default (match-any)
      159 packets, 10027 bytes
      5 minute offered rate 0000 bps, drop rate 0000 bps
      Match: any
```

Tc = Bc / CIR = 1875 * 8 / 60000 = 0,25 sek

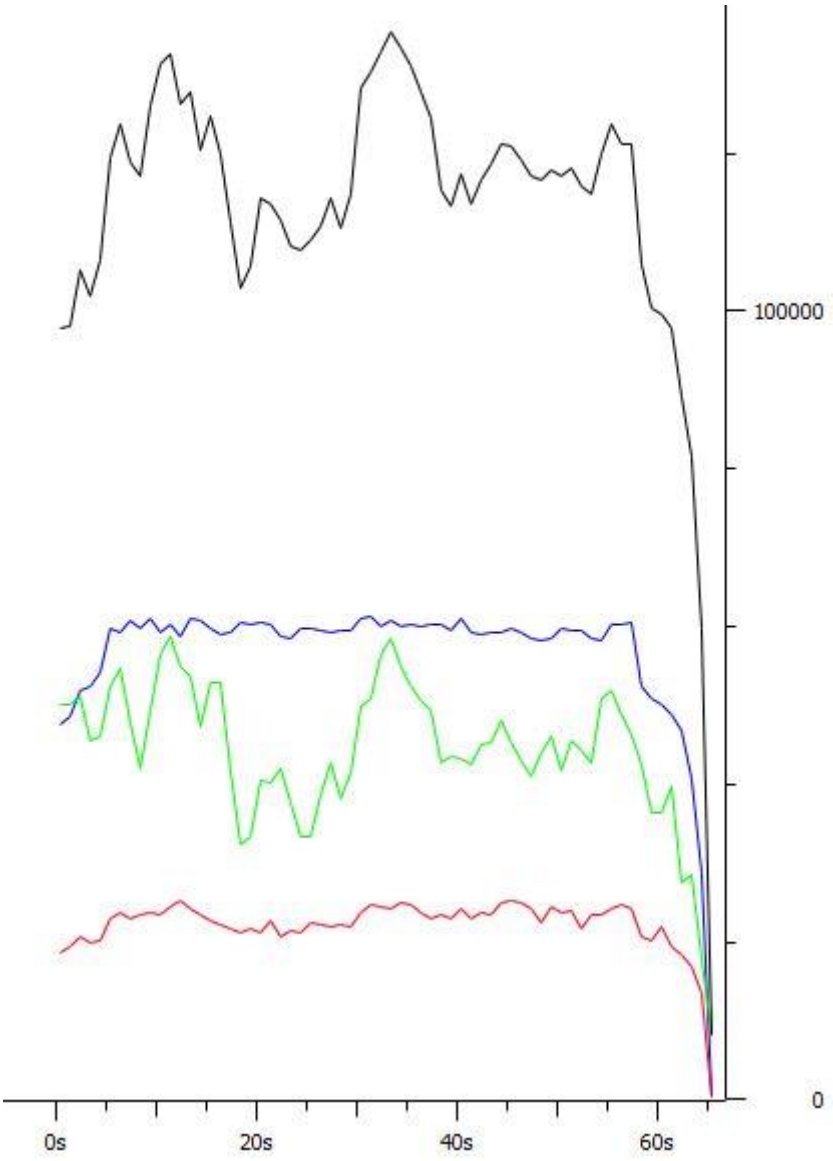
Tc = Be / PIR = 2625 * 8 / 84000 = 0,25 sek



Obrázok 10 : Rovnomerný 84kbps



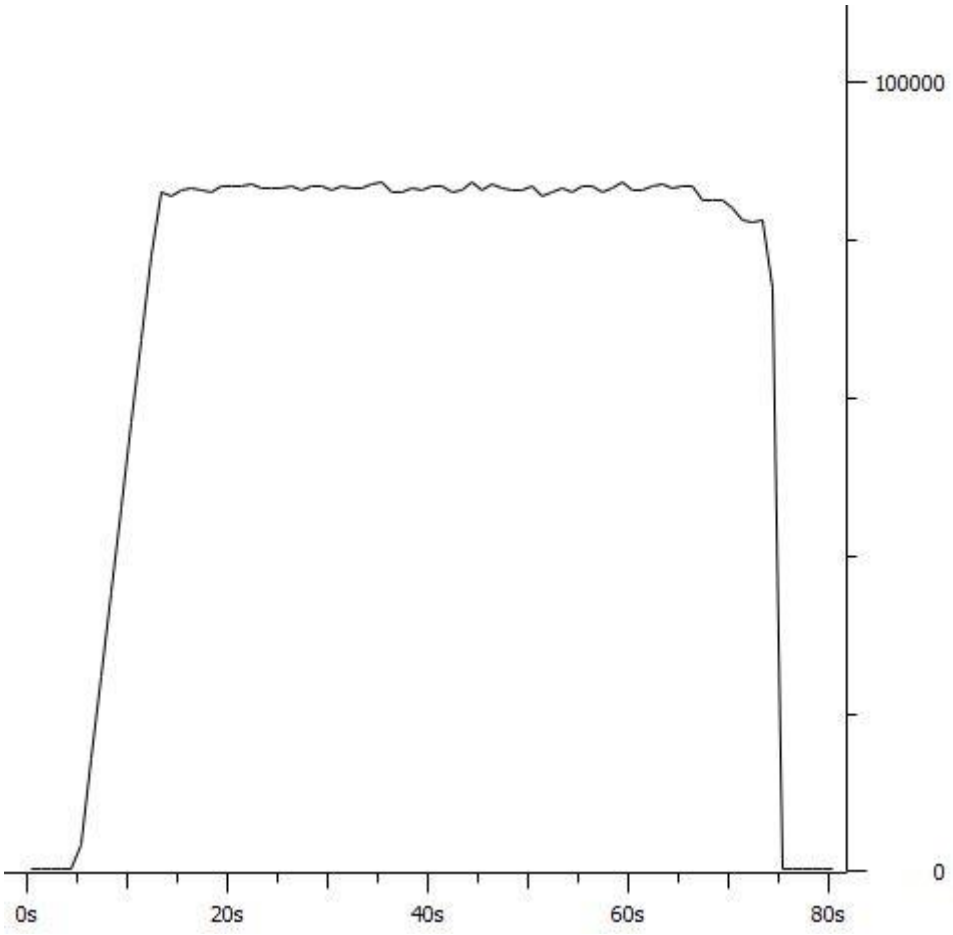
Obrázok 11 : Exponenciálny 84kbps



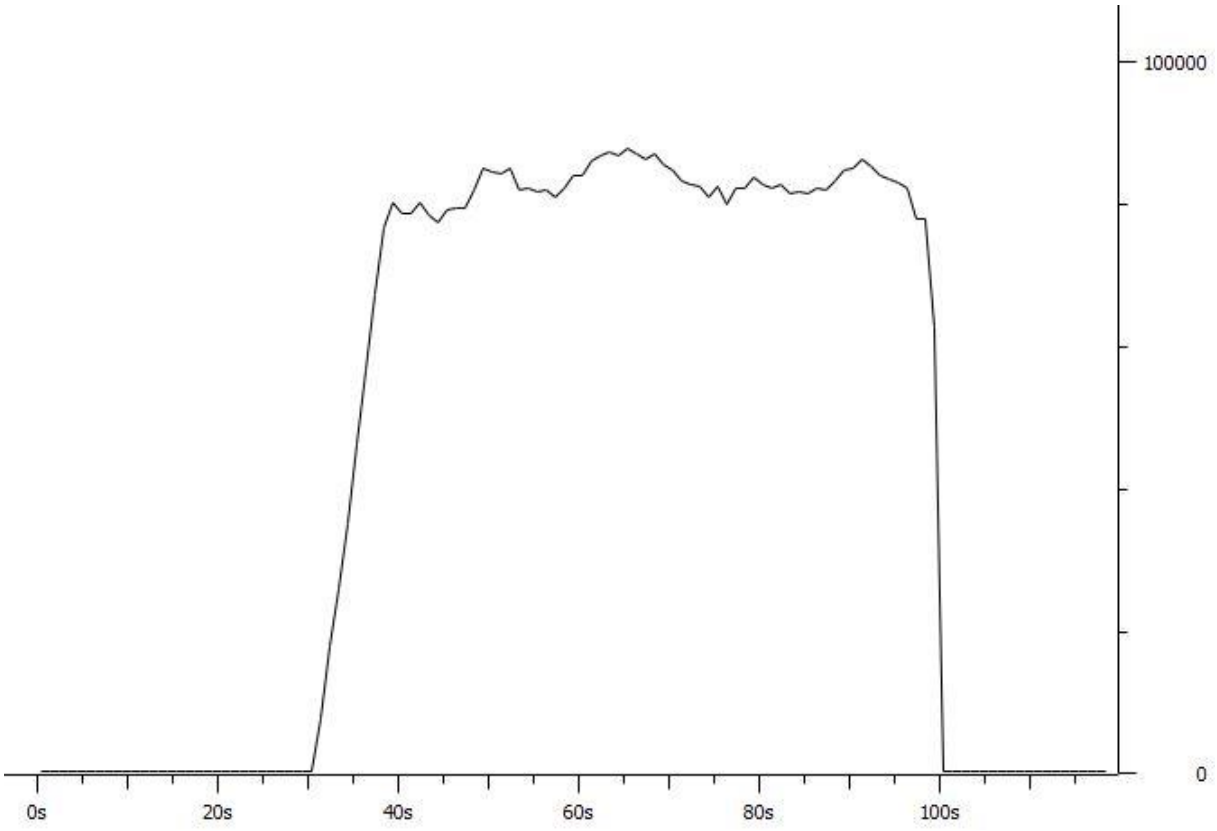
Obrázok 12 : Exponenciálny 112kbps

Shaping – vzhľadom na priemer – average – 84kbps

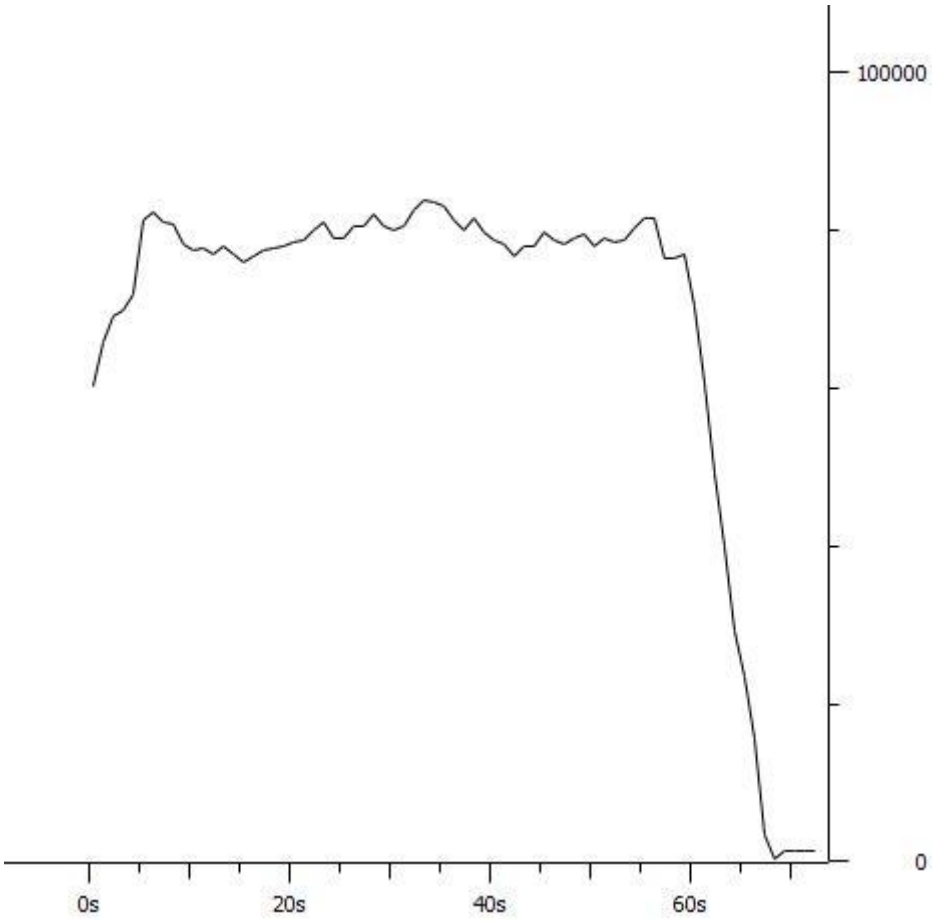
```
R1(config-if)#do sh policy-map int s0/0/0
 Serial0/0/0

  Service-policy output: vystup

    Class-map: class-default (match-any)
      6508 packets, 2209958 bytes
      5 minute offered rate 35000 bps, drop rate 3000 bps
      Match: any
      Queueing
      queue limit 64 packets
      (queue depth/total drops/no-buffer drops) 62/749/0
      (pkts output/bytes output) 5759/1958354
      shape (average) cir 84000, bc 336, be 336
      target shape rate 84000
```



Obrázok 13 : Rovnomerný 84kbps



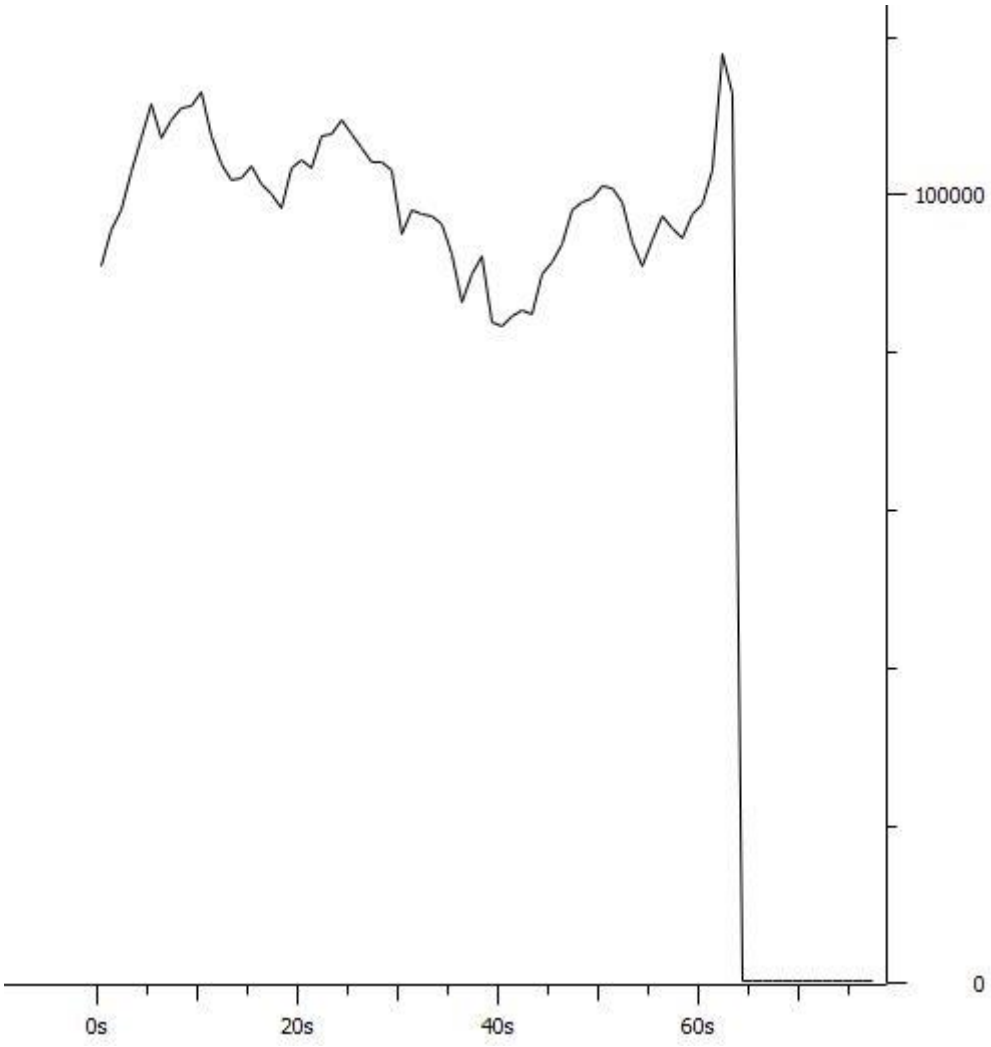
Obrázok 14 : Exponenciálny 84kbps



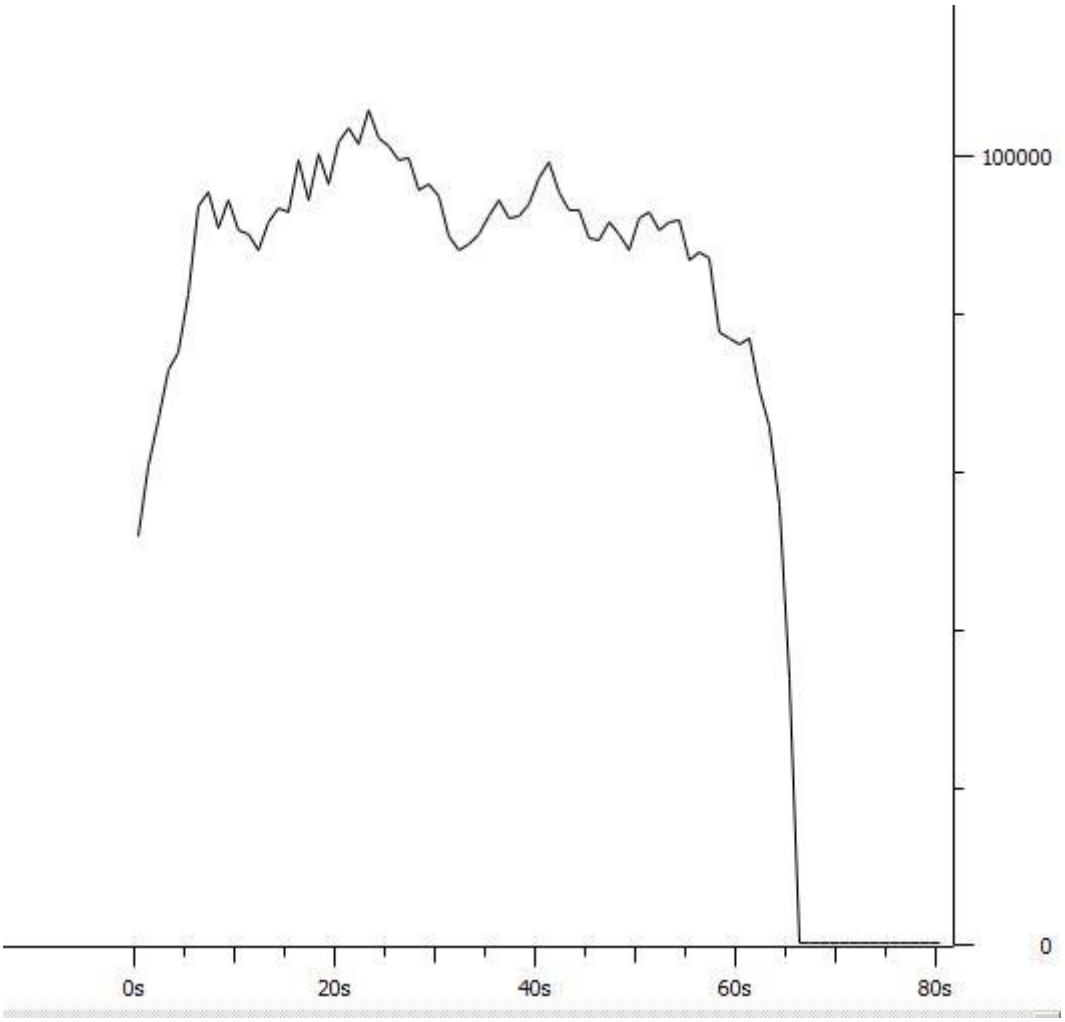
Obrázok 15 : Exponenciálny 112kbps

Shaping – vzhľadom na špičku – peak – 84kbps

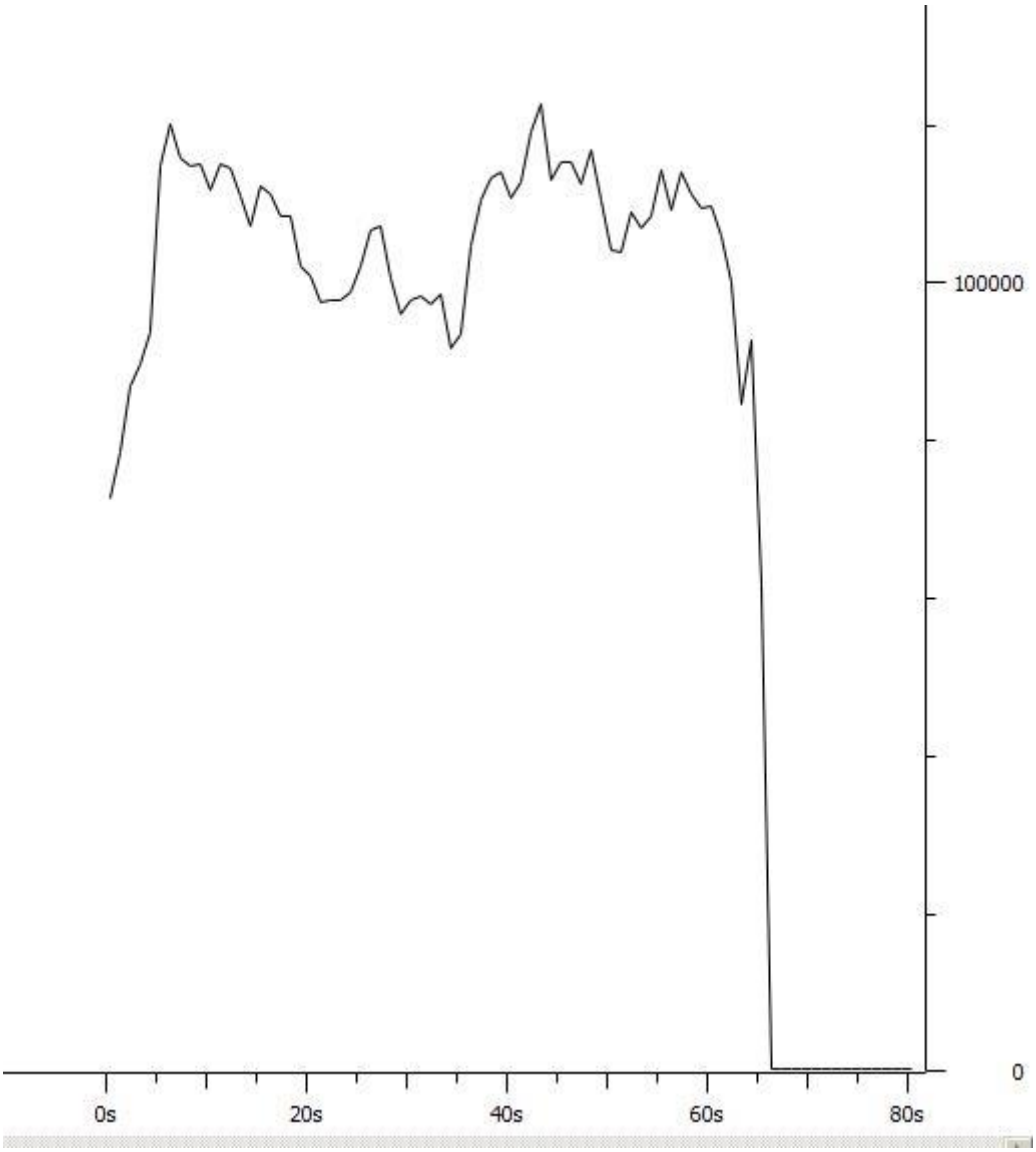
```
R1(config-pmap-c)#do sh policy-map int s0/0/0
 Serial0/0/0

  Service-policy output: vystup

    Class-map: class-default (match-any)
      10074 packets, 3513703 bytes
      5 minute offered rate 26000 bps, drop rate 0000 bps
      Match: any
      Queueing
      queue limit 64 packets
      (queue depth/total drops/no-buffer drops) 0/0/0
      (pkts output/bytes output) 1/24
      shape (peak) cir 84000, bc 336, be 336
      target shape rate 168000
```



Obrázok 16 : Rovnomerný 84kbps



Obrázok 17 : Exponenciálny 84kbps



Obrázok 18 : Exponenciálny 112kbps