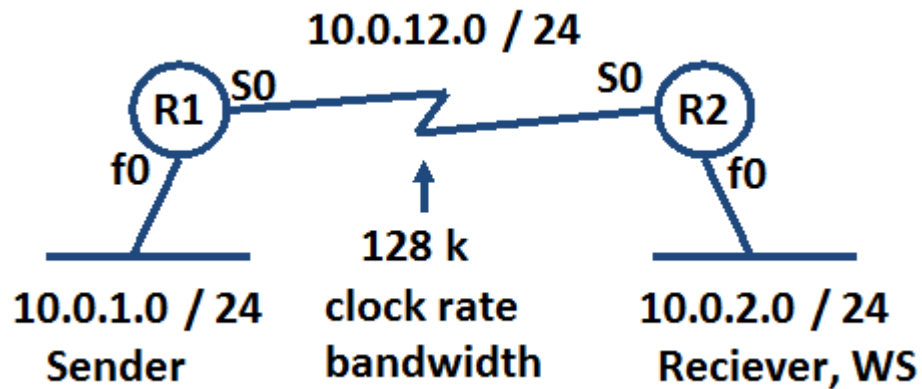


Dokumentácia cvičenie č.2

1. Zadanie



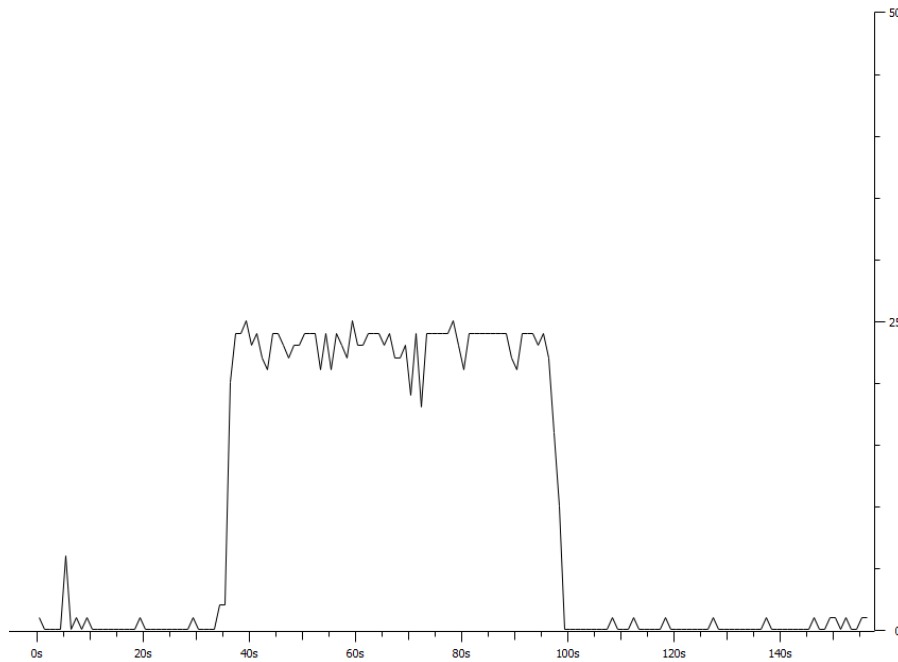
Smerovače sme zapojili podľa schémy uvedenej vyššie. Prepoj medzi nimi sme nastavili na 128kbps (clockrate + bandwidth). DCE kábel do "T" interfejsu (2-port serial WIC - WIC-2T), DTE hoci do "A/S" interfejsu (2-port asynchronous/synchronous WIC (WIC-2A/S)) – získali sme prepoj s rýchlosťou až 8 Mbps, inak by sme mali linku len niekoľko kbps. Nastavili sme statické smerovanie medzi smerovačmi a konektivitu sme overili úspešným pingom a telnetom.

VŠETKY GRAFY ZNÁZORŇUJÚ PAKETY ZA SEKUNDU.

INTERVAL VYSIELANIA BOL 60 SEKÚND.

2. TCP 21p/s

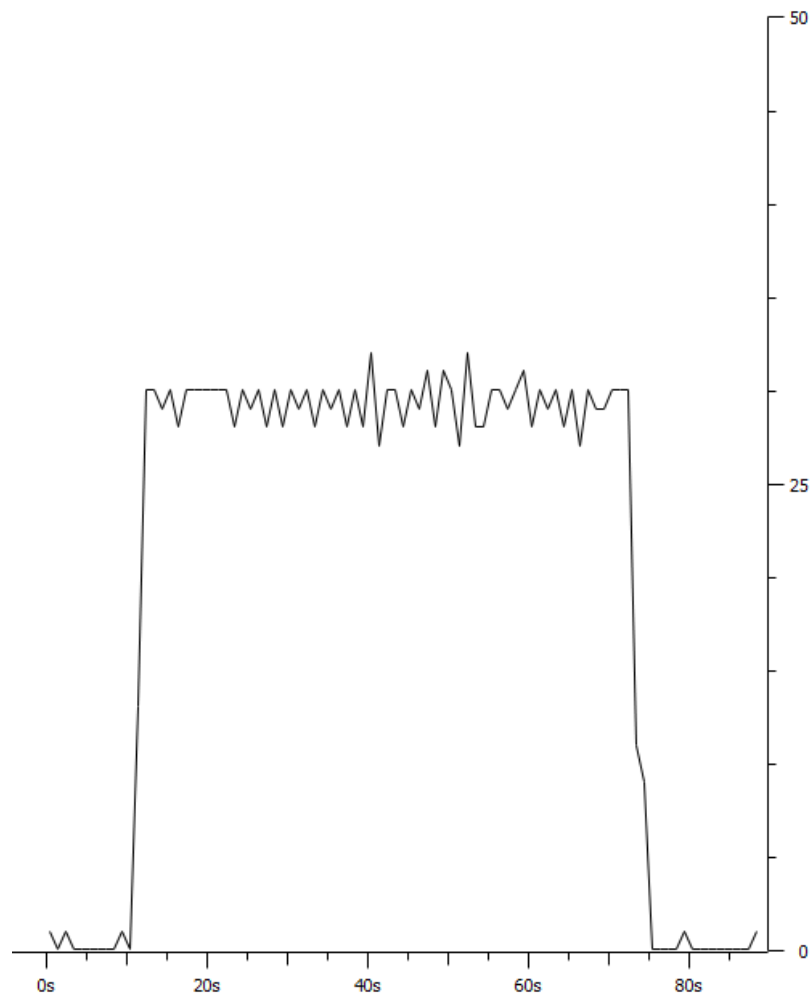
V prvej úlohe sme mali zadanie generovať tok TCP paketov o rýchlosti 21 paketov za sekundu s veľkosťou 512B.



Display					
Display filter:		tcp.port eq 5001			
Ignored packets:		0 (0,000%)			
Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	1321	1282	97,048%	0	0,000%
Between first and last packet	108,193 sec	62,204 sec			
Avg. packets/sec	12,210	20,610			
Avg. packet size	543 bytes	557 bytes			
Bytes	717805	714390	99,524%	0	0.000%
Avg. bytes/sec	6634,513	11484,690			
Avg. MBit/sec	0,053	0,092			

3. TCP 42p/s

V druhej úlohe sme mali zadanie generovať tok TCP paketov o rýchlosti 42paketrov za sekundu s veľkosťou 512B. Ako vidíme na grafe, linka nestíha a preposiela v priemere niečo okolo 30 paketov za sekundu.



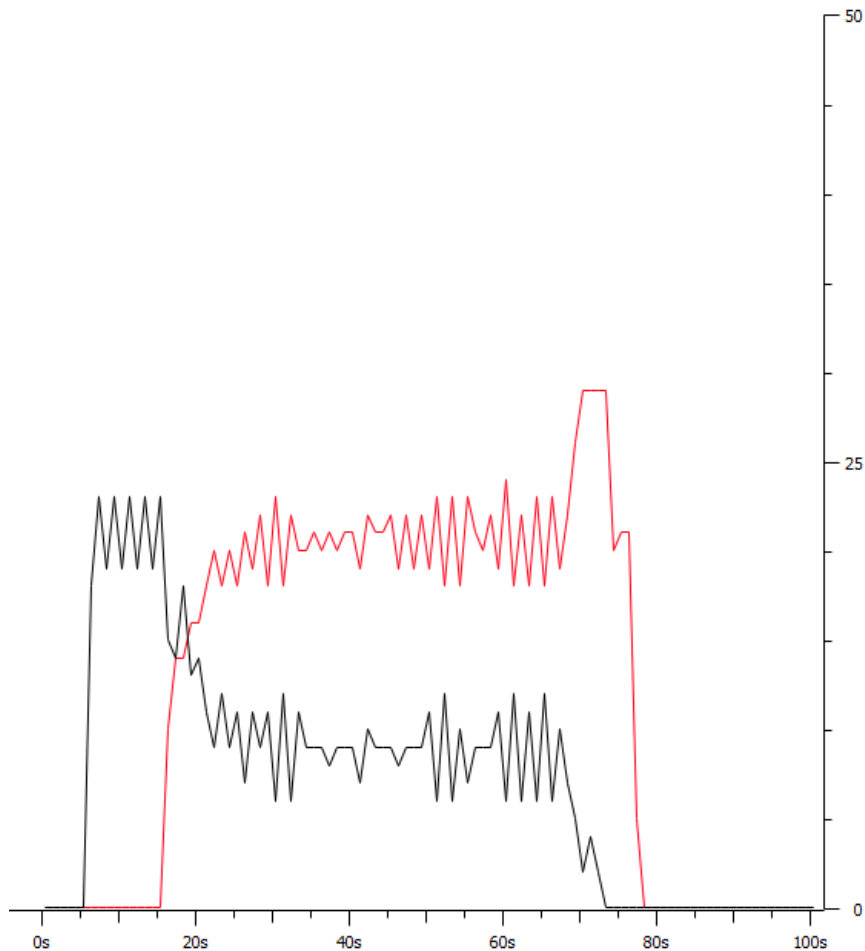
Display

Display filter: tcp.port eq 5001
Ignored packets: 0 (0,000%)

Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	1840	1804	98,043%	0	0,000%
Between first and last packet	99,708 sec	62,503 sec			
Avg. packets/sec	18,454	28,862			
Avg. packet size	554 bytes	564 bytes			
Bytes	1020159	1017010	99,691%	0	0.000%
Avg. bytes/sec	10231,508	16271,297			
Avg. MBit/sec	0,082	0,130			

4. TCP/UDP 21p/s

V tretej úlohe sme mali vygenerovať aj TCP aj UDP tok. UDP tok sme pustili s odstupom 10 sekúnd. Ako vidieť z grafu, UDP tok je “agresívnejší” a ubije TCP tok a zoberie väčšinu šírky pásma.



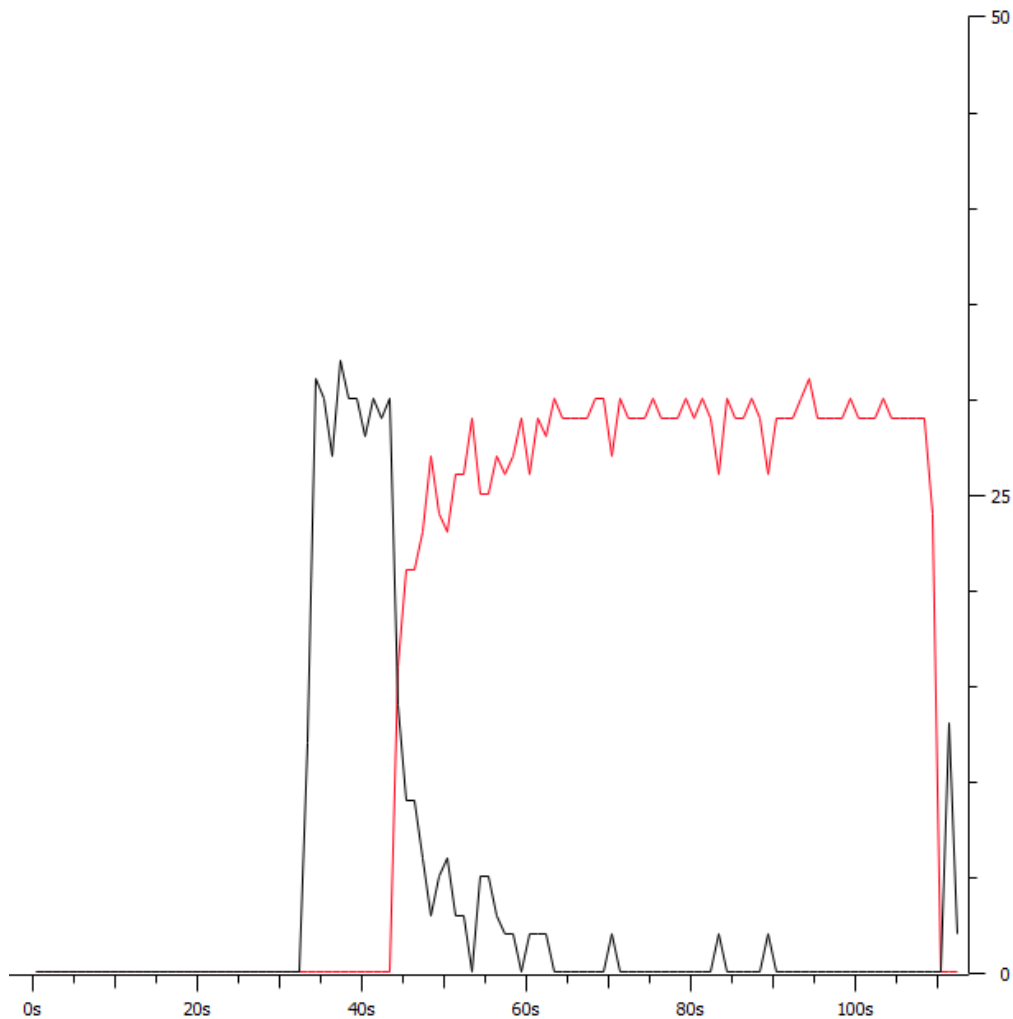
Display

Display filter: none
Ignored packets: 0 (0,000%)

Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	2047	2047	100.000%	0	0,000%
Between first and last packet	148,794 sec				
Avg. packets/sec	13,757				
Avg. packet size	537 bytes				
Bytes	1098806	1098806	100.000%	0	0.000%
Avg. bytes/sec	7384,736				
Avg. MBit/sec	0,059				

5. TCP/UDP 42p/s bez policy

Úloha bola rovnaká ako v predchádzajúcej kapitole, ale generovali sme tok s rýchlosťou 42 paketov za sekundu. Ako vidieť, UDP tok zabral celú šírku pásma a TCP tok takmer neprechádzal linkou.



Display

Display filter: none
Ignored packets: 0 (0,000%)

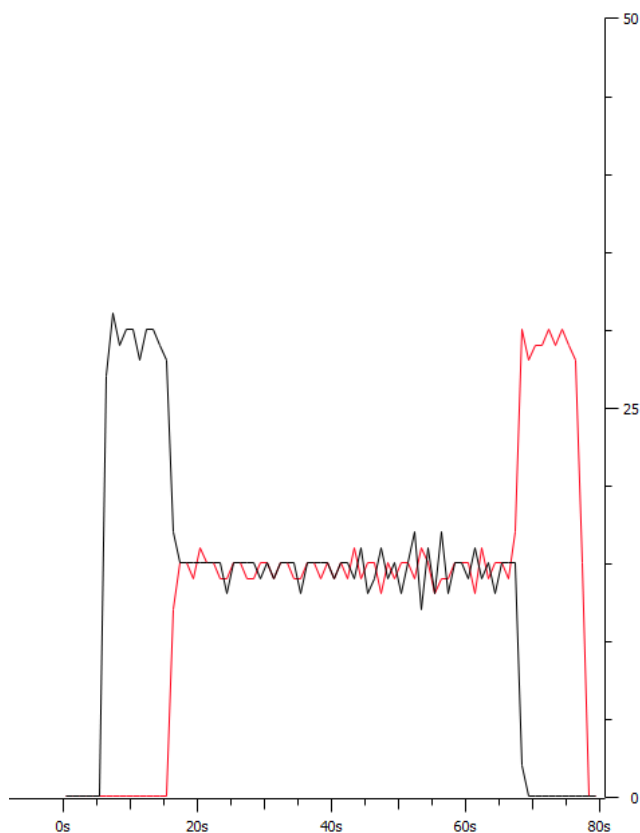
Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	2315	2315	100.000%	0	0,000%
Between first and last packet	195,060 sec				
Avg. packets/sec	11,868				
Avg. packet size	543 bytes				
Bytes	1257052	1257052	100.000%	0	0.000%
Avg. bytes/sec	6444,452				
Avg. MBit/sec	0,052				

6. TCP/UDP 42p/s s policy

V tejto úlohe sme zmenili politiku vysielania paketov z FIFO na WFQ. To sme dosiahli sériou príkazov :

```
Router(config)# policy-map politika1
Router(config-pmap)# class class-default
Router(config-pmap-c)# fair-queue ! vypne FIFO a zapne WFQ
Router(config)# int s0
Router(config-if)# service-policy output politika1
```

Ako vidieť, posielanie TCP a UDP tokov sa rozložilo rovnomerne a obe linkou prechádzali.



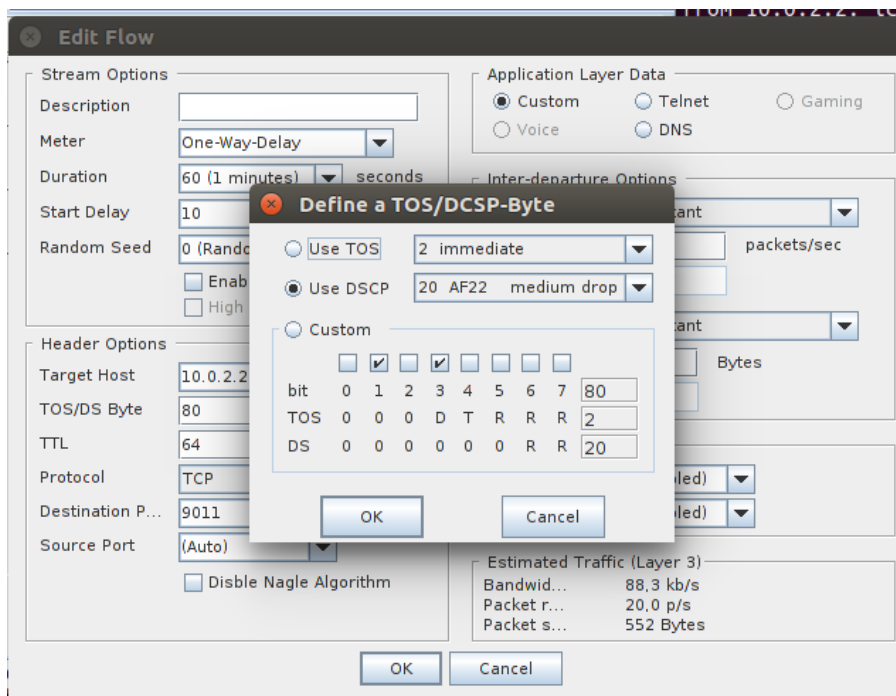
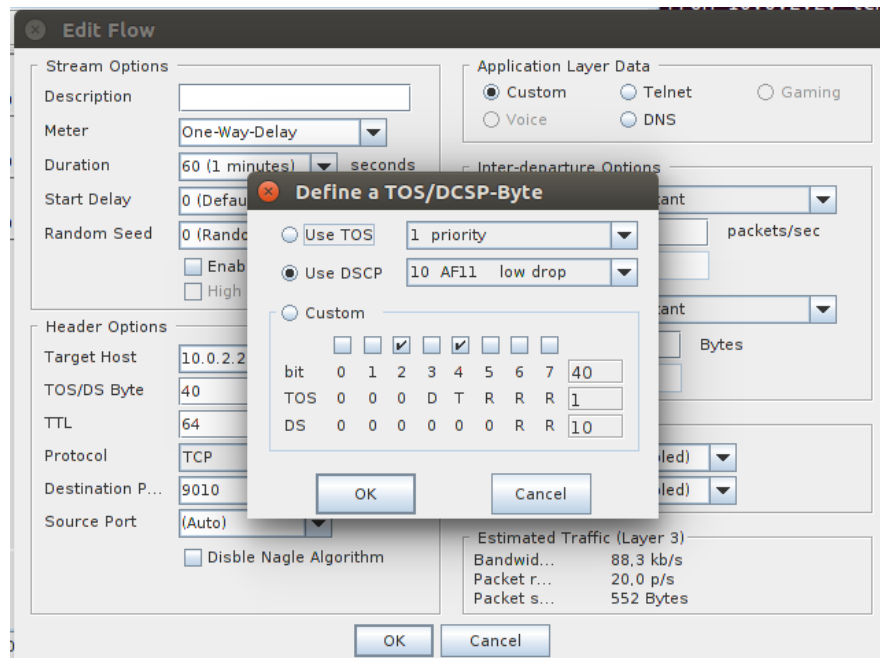
Display

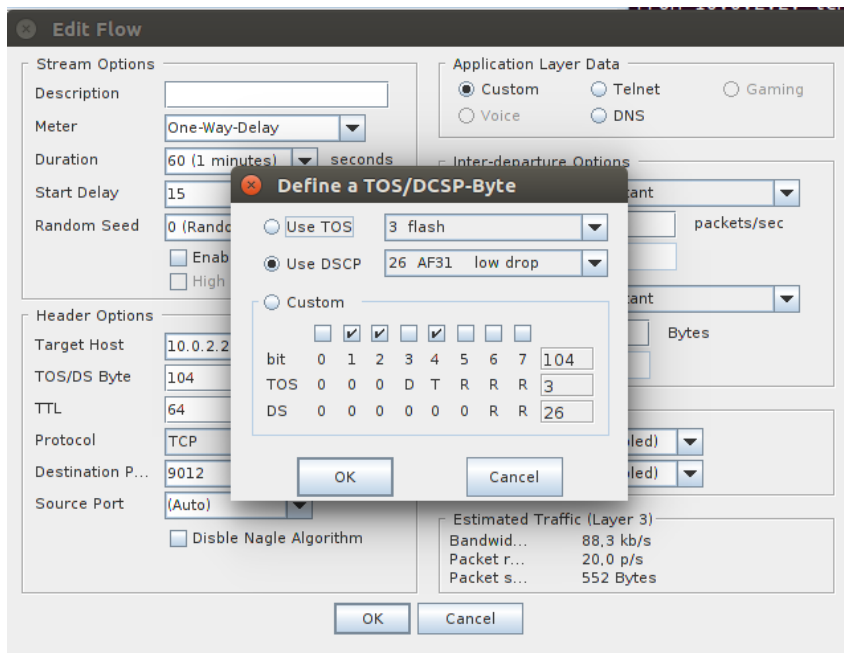
Display filter: none
Ignored packets: 0 (0,000%)

Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	2144	2144	100.000%	0	0,000%
Between first and last packet 157,364 sec					
Avg. packets/sec	13,624				
Avg. packet size	547 bytes				
Bytes	1173717	1173717	100.000%	0	0.000%
Avg. bytes/sec	7458,601				
Avg. MBit/sec	0,060				

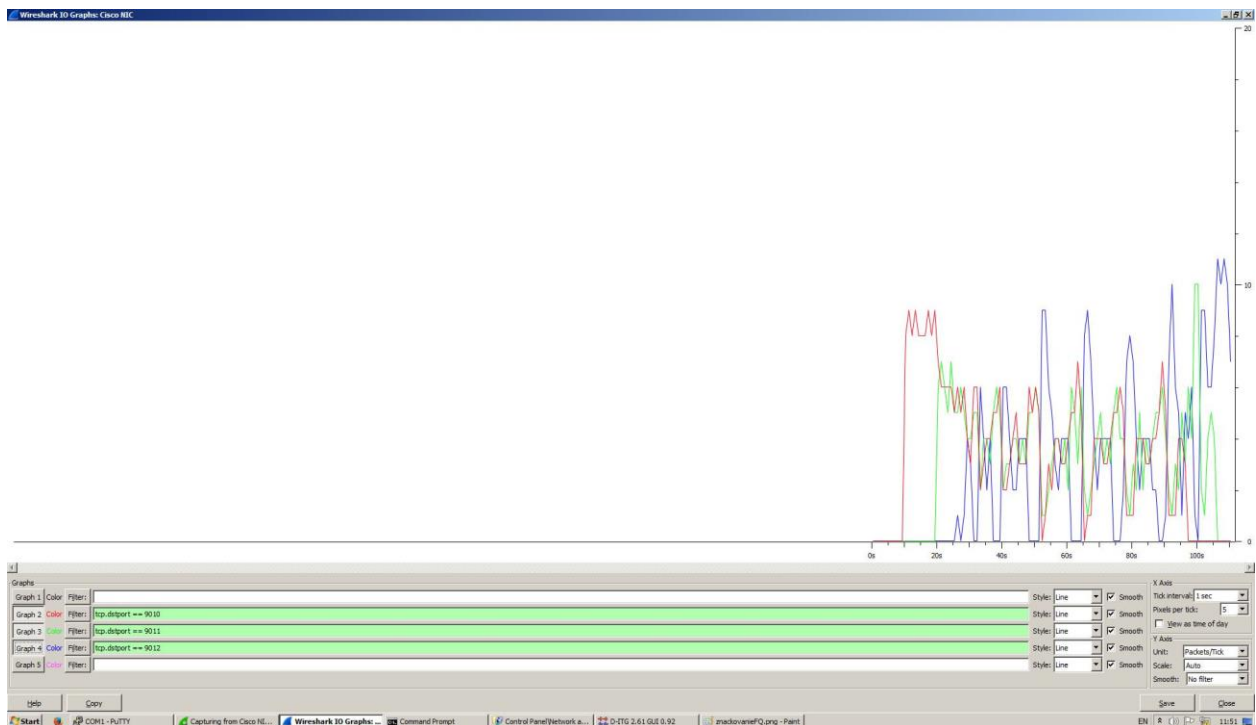
7. Značkovanie

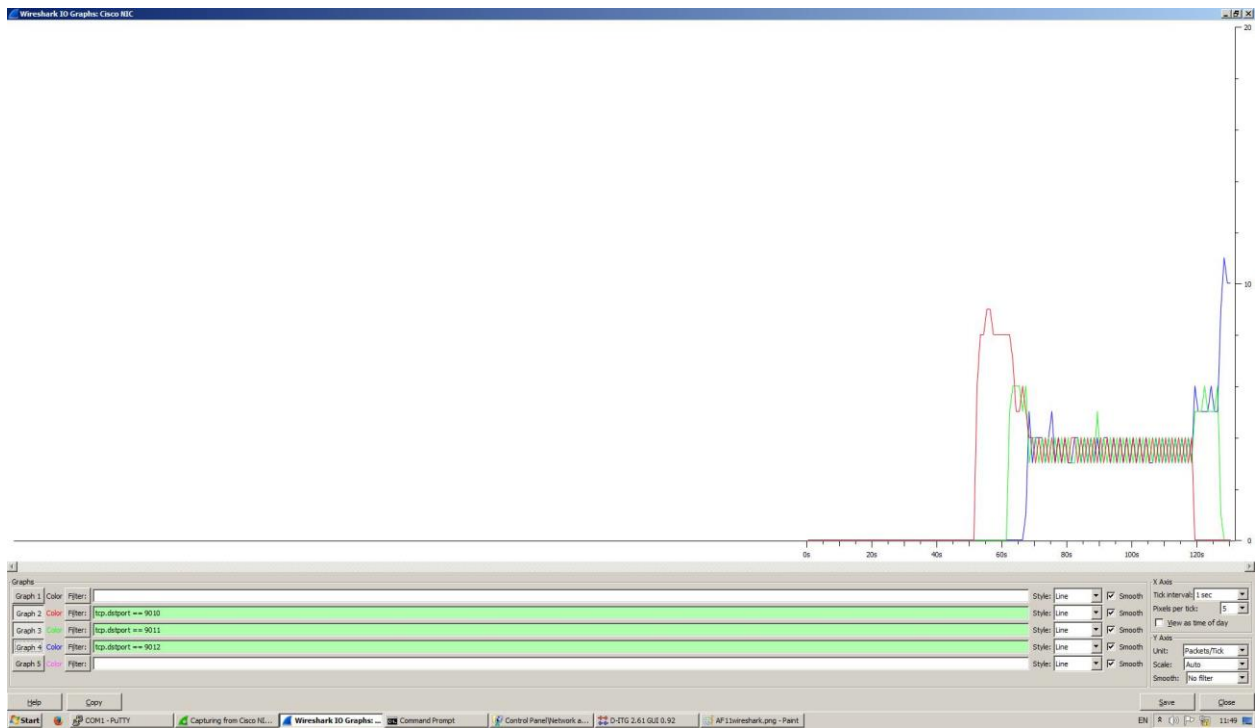
V poslednej úlohe bolo potrebné pakety značovať v DSCP poli. Pod Linuxom sme ich postupne označili AF11,AF22,AF31 a EF





Na prvom grafe môžeme vidieť toky s rôznymi značkami a na druhom grafe aj so zapnutou politikou WFQ.





Vo výpise vo wiresharku môžeme vidieť otagovaný paket, konkrétne v tomto prípade AF11.

Capturing from Cisco NIC [Wireshark 3.12.7 (v1.12.7-0-g76b978 from master-1.12)]

Filter: Top display == 9001

No.	Time	Source	Destination	Protocol	Length	Info
674	106.927717	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=20481 Ack=1 Wm=29312 Len=1448 TSval=439590 TSecr=1326016
676	107.007240	10.0.1.2	10.0.2.2	TCP	1178	52326->9001 [PSH, ACK] Seq=21929 Ack=1 Wm=29312 Len=1112 TSval=439615 TSecr=1326042
677	107.180200	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=23041 Ack=1 Wm=29312 Len=1448 TSval=439653 TSecr=1326042
679	107.259875	10.0.1.2	10.0.2.2	TCP	1178	52326->9001 [ACK] Seq=24489 Ack=1 Wm=29312 Len=1112 TSval=439679 TSecr=1326067
680	107.430406	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=25601 Ack=1 Wm=29312 Len=1448 TSval=439716 TSecr=1326067
682	107.599872	10.0.1.2	10.0.2.2	TCP	1178	52326->9001 [PSH, ACK] Seq=27049 Ack=1 Wm=29312 Len=1112 TSval=439741 TSecr=1326092
683	107.681002	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=28161 Ack=1 Wm=29312 Len=1448 TSval=439778 TSecr=1326092
685	107.727991	10.0.1.2	10.0.2.2	TCP	666	52326->9001 [PSH, ACK] Seq=28600 Ack=1 Wm=29312 Len=600 TSval=439804 TSecr=1326117
686	107.883246	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=30209 Ack=1 Wm=29312 Len=1448 TSval=439829 TSecr=1326117
688	107.962983	10.0.1.2	10.0.2.2	TCP	1178	52326->9001 [PSH, ACK] Seq=31657 Ack=1 Wm=29312 Len=1112 TSval=439854 TSecr=1326137
689	108.114950	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=32769 Ack=1 Wm=29312 Len=1448 TSval=439892 TSecr=1326137
691	108.214905	10.0.1.2	10.0.2.2	TCP	1178	52326->9001 [PSH, ACK] Seq=34217 Ack=1 Wm=29312 Len=1112 TSval=439917 TSecr=1326162
692	108.386245	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=35329 Ack=1 Wm=29312 Len=1448 TSval=439955 TSecr=1326162
694	108.465947	10.0.1.2	10.0.2.2	TCP	1178	52326->9001 [PSH, ACK] Seq=36777 Ack=1 Wm=29312 Len=1112 TSval=439980 TSecr=1326187
695	108.618253	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=37889 Ack=1 Wm=29312 Len=1448 TSval=440018 TSecr=1326187
697	108.717971	10.0.1.2	10.0.2.2	TCP	1178	52326->9001 [PSH, ACK] Seq=39337 Ack=1 Wm=29312 Len=1112 TSval=440043 TSecr=1326213
698	108.890385	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=40449 Ack=1 Wm=29312 Len=1448 TSval=440081 TSecr=1326213
700	109.001119	10.0.1.2	10.0.2.2	TCP	1514	52326->9001 [ACK] Seq=41897 Ack=1 Wm=29312 Len=1448 TSval=440143 TSecr=1326238

Frame 700: 1178 bytes on wire (9424 bits), 1178 bytes captured (9424 bits) on interface 0
Ethernet II, Src: Cisco_10:74:00 (00:14:00:10:74:00), Dst: Fa/b3:01:02:01:04 (Fa/b3:01:02:01:04)
Internet Protocol Version 4, Src: 10.0.1.2 (10.0.1.2), Dst: 10.0.2.2 (10.0.2.2)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x28 (DSCP 0x28: Assured Forwarding 11; ECN: 0x00: Not-ECT (Not ECT-capable Transport))
0010 10... = differentiated services codepoint: Assured Forwarding 11 (0x0a)
... .. 00 = explicit congestion notification: not-ECT (Not ECT-capable Transport) (0x00)
Total Length: 1164
Identification: 0x473d (18237)
Flags: 0x02 (Don't fragment)
Fragment offset: 0
Time to live: 62
Protocol: TCP (6)
Header checksum: 0xda03 (validation disabled)
Source: 10.0.1.2 (10.0.1.2)
Destination: 10.0.2.2 (10.0.2.2)
[Source geoIP: unknown]
[Destination geoIP: unknown]
Transmission Control Protocol, Src Port: 52326 (52326), Dst Port: 9001 (9001), Seq: 41897, Ack: 1, Len: 1112
Source Port: 52326 (52326)
Destination Port: 9001 (9001)
[Stream index: 6]
[TCP segment Len: 1112]
Sequence number: 41897 (relative sequence number)
[Next sequence number: 43009 (relative sequence number)]
Acknowledgment number: 1 (relative ack number)
Header length: 22 bytes
... .. 0000 0001 1000 = Flags: 0x018 (PSH, ACK)
Window size value: 229
[Calculated window size: 29312]
[Window size scaling factor: 128]
Checksum: 0x195f (validation disabled)
Urgent pointer: 0

0000 7a b3 01 02 01 04 00 64 40 10 74 00 08 00 45 28d B...E(
0010 04 8c 47 3d 40 00 3e 06 da 03 da 00 01 02 0a 00 ...Gd... ..
0020 02 02 cc 66 23 7a 8e 97 c0 2f e9 7c 72 80 18 ...Fdz.../f..
0030 00 65 19 3f 00 00 01 01 08 0a 00 06 b7 2a 00 14
0040 3c 9e f0 70 3e 82 0b 42 02 86 64 20 03 9a 19 <P...B...
0050 28 16 a7 a2 15 74 00 09 27 ac 4b 4b a2 12 07n...
0060

Cisco NIC: live capture progress: 64.5% Packets: 826 / Discards: 517 (62.6%)