Fast Path, Fast Track and ISP Network Design

sysarts.net
Telefon: 0216 606 3 169
E-Mail: himmet.turkan@sysarts.net
Youtube: MikroTik Türkiye
Facebook: /mikrotikturkiye

İstanbul, Turkey- 2018

Himmet Türkan

MTCNA, MTCTCE, MTCRE

MikroTik Consultant

System & Network Architecture

SysArts

https://tr-tr.facebook.com/mikrotikturkiye/

MikroTik Türkiye
@mikrotikturkiye

- Ana Sayfa
- Gönderiler
- Videolar
- Fotoğraflar
- Hakkında
- Topluluk
- Bilgiler ve Reklamlar

Sayfa Oluştur

Beğen · Paylaş · Düzenlemeler Öner · ···

Mesaj Gönder

MikroTik Türkiye, 19 yeni fotoğraf ekledi.
12 Eylül, 12:03 ·

MikroTİk external LTE Antenna montajı. Kullanılan ürünler;
https://mikrotik.com/product/ACUFL
https://mikrotik.com/product/smasma
https://mikrotik.com/product/mant_lte_5o
https://mikrotik.com/product/wap_lte_kit... Devamını Gör

Beğen · Yorum Yap

Nihat Karabulut, Sinan Doğu, MikroTik Türkiye ve 5 diğer kişi bunu beğendi

Kişiler

538 beğenme

Dr. Mutaf International Clinic Inc.
Sağlık/Güzellik

HDH İnşaat & Makina
İnşaat Şirketi

Arduino Clone TR
Elektronik

Cevdet Dogan Işık
Müzik Grubu

Diğerlerini Gör

Bu Sayfanın Beğendiği Sayfalar

Türkçe · English (UK) · Kurdî (Kurmancî) · العربية · Español · +

Gizlilik · Koşullar · Reklamlar · Ad Choices · Çerezler · Diğer
Facebook © 2018

www.youtube.com/channel/UCnhH6GWR1XBG2fTWS4pnhUQ/videos

mikrotik türkiye

MikroTik Türkiye

440 subscribers

SUBSCRIBE

HOME | VIDEOS | PLAYLISTS | CHANNELS | DISCUSSION | ABOUT

Uploads PLAY ALL

SORT BY

MikroTik Nv2 QoS 2

69 views • 3 weeks ago

MikroTik Nv2 QoS 1

80 views • 3 weeks ago

MikroTik Ders4 ECMP load balancing

1.5K views • 1 year ago

Mac Telnet İle PPPoE Client Tanimlama

1.4K views • 2 years ago

Mikrotik Sxt Lite 5 Cpe Olarak Kurulumu

3.7K views • 2 years ago

MikroTik Aile Filtresi Nasıl Yapılır ?

1.3K views • 2 years ago

MikroTik Ders 3 (Access Point Kurulumu ve Bridge)

7.6K views • 2 years ago

MikroTik Ders 2 (Ip Addresleme, DHCP Server v...

4.7K views • 2 years ago

MikroTik Ders 1 (MikroTik Giriş ve PPPoe Client...

7.4K views • 2 years ago

Interframe Spacing

Does the interface rate affect transmission times?

- Ethernet cables do not transmit data continuously, data is transmitted periodically.
- Interframe spacing is the waiting time between two ports of Ethernet ports.
- Waiting time between two Frames determines Interface Rate

  9.6 µs for 10 Mbit/s Ethernet

  0.96 µs for 100 Mbit/s Ethernet

  96 ns for Gigabit Ethernet

  9.6 ns for 10 Gigabit Ethernet

1 second =1,000 ms
1 ms = 1,000 µs mikrosaniye

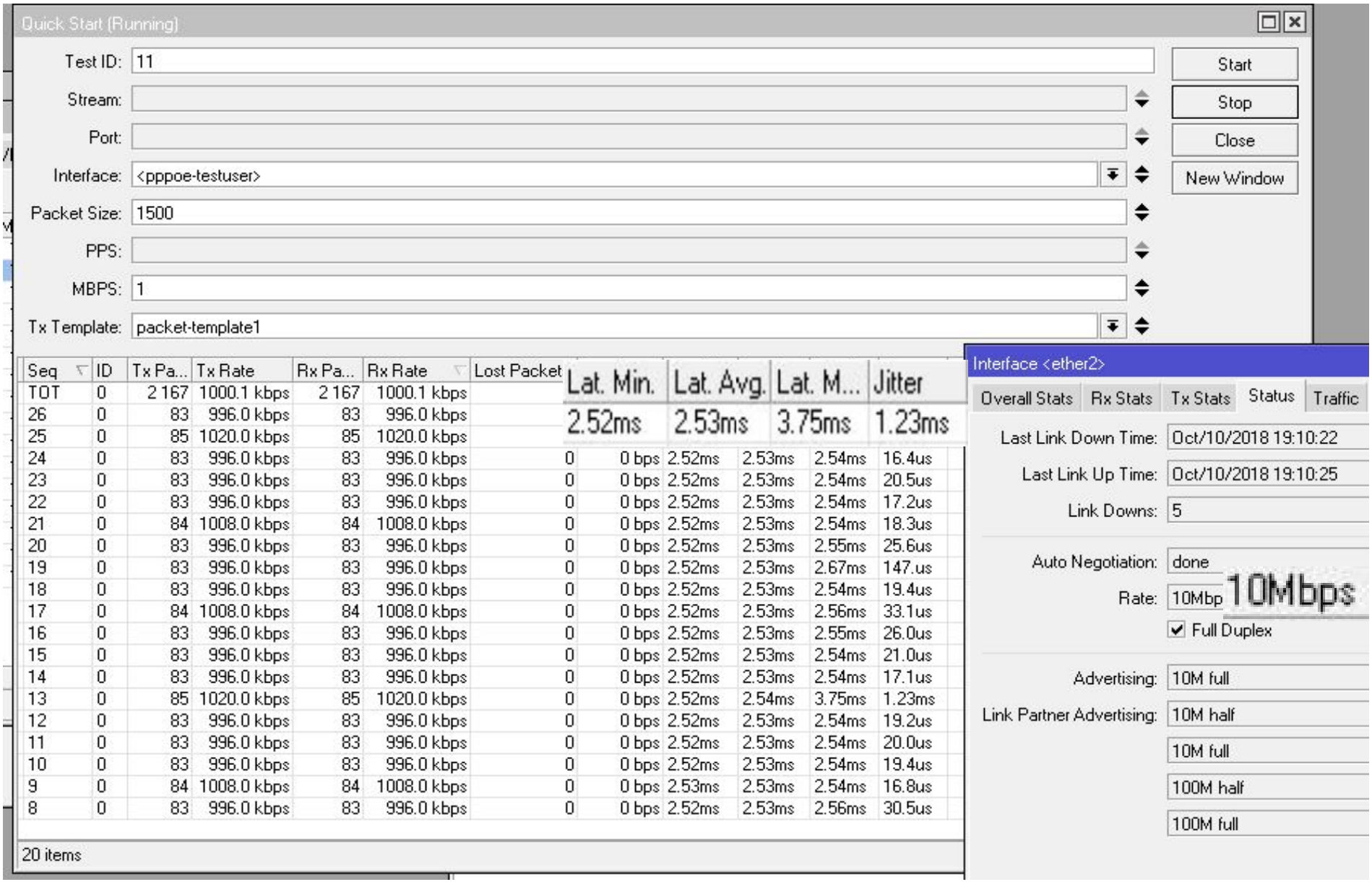
SysArts

https://en.wikipedia.org/wiki/Interpacket_gap

Interframe Spacing

Interframe Spacing

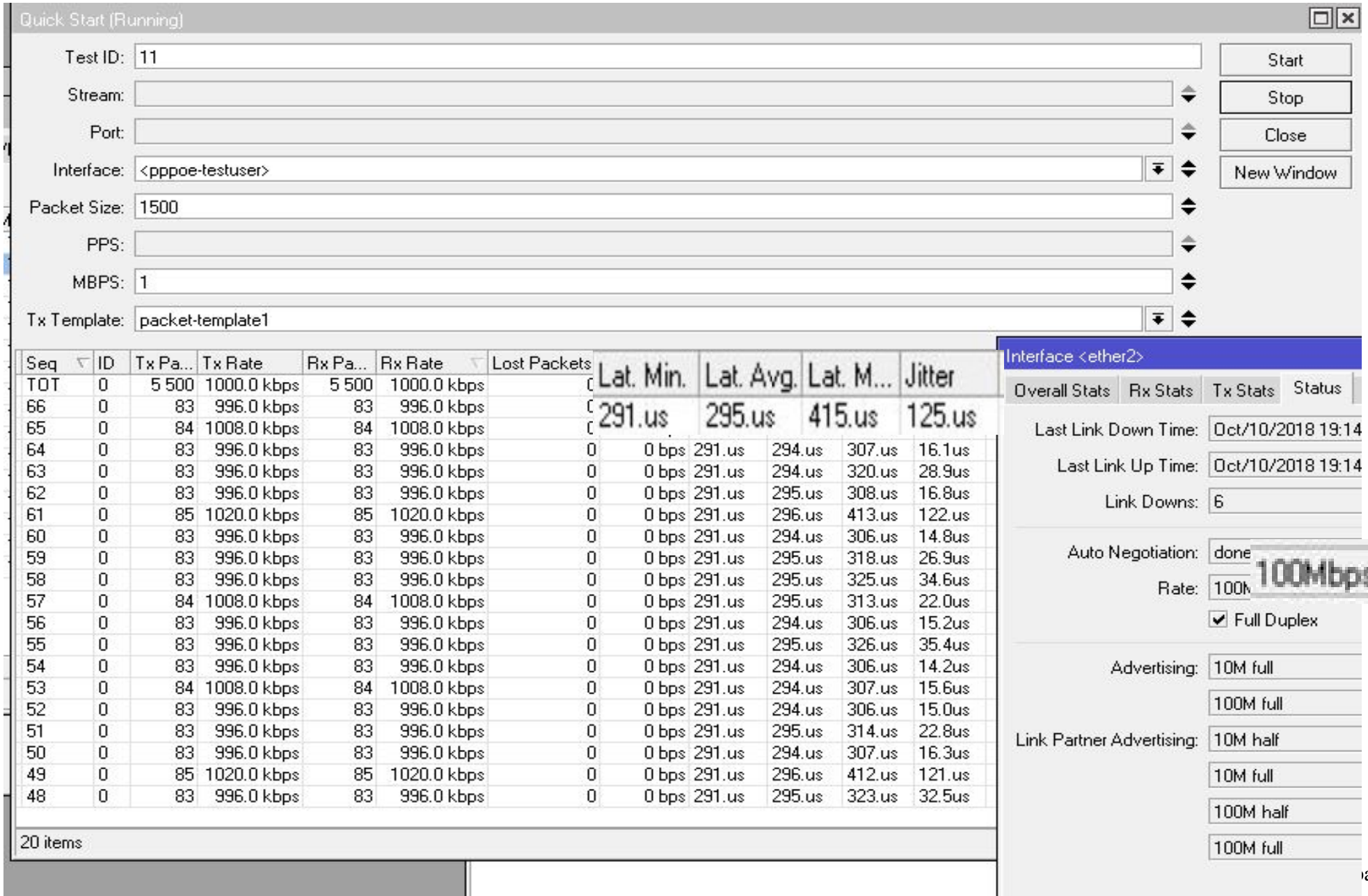
Interface Rate =10Mbps



https://en.wikipedia.org/wiki/Interpacket_gap

Interframe Spacing

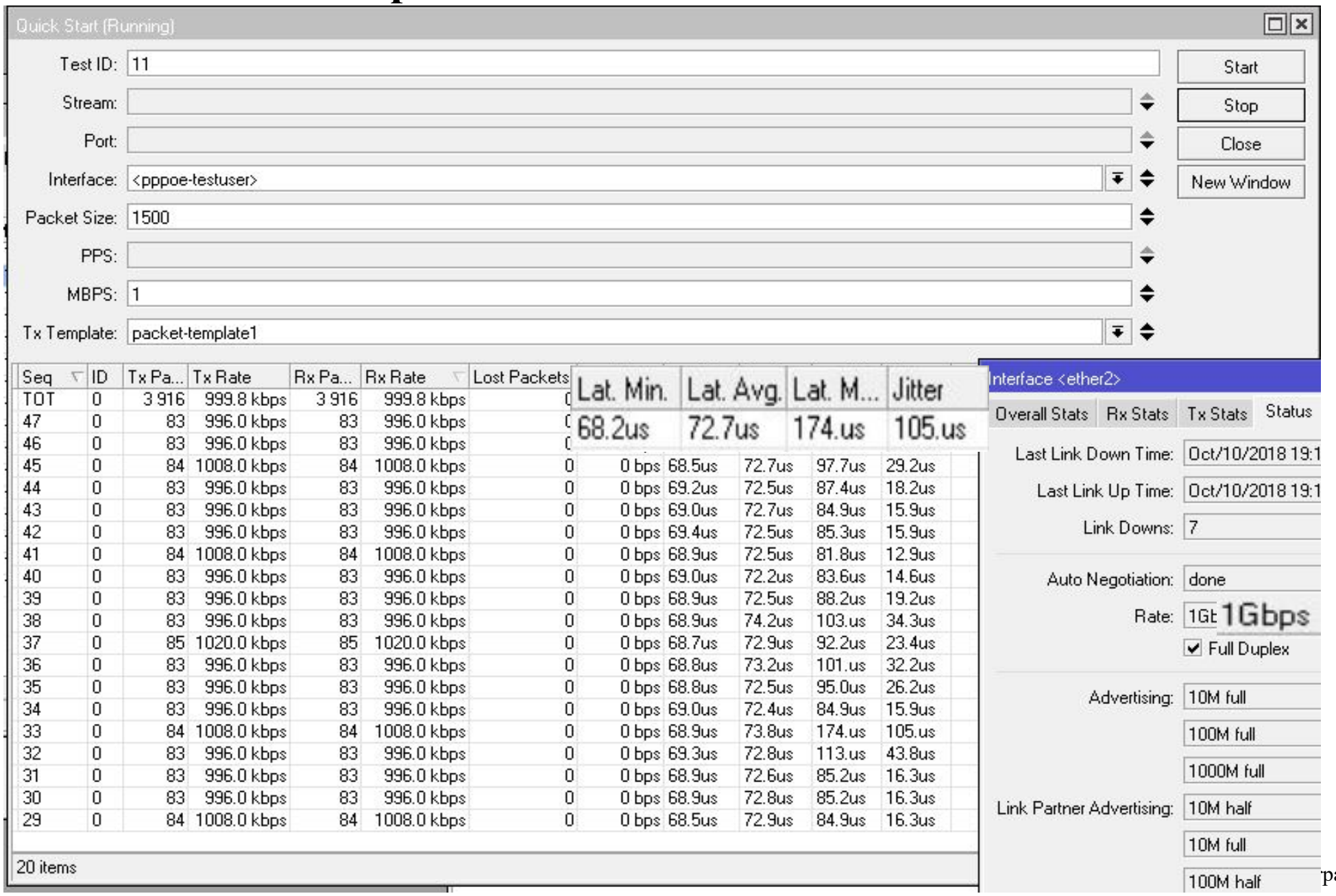
Interface Rate =100Mbps



packet_gap

Interframe Spacing

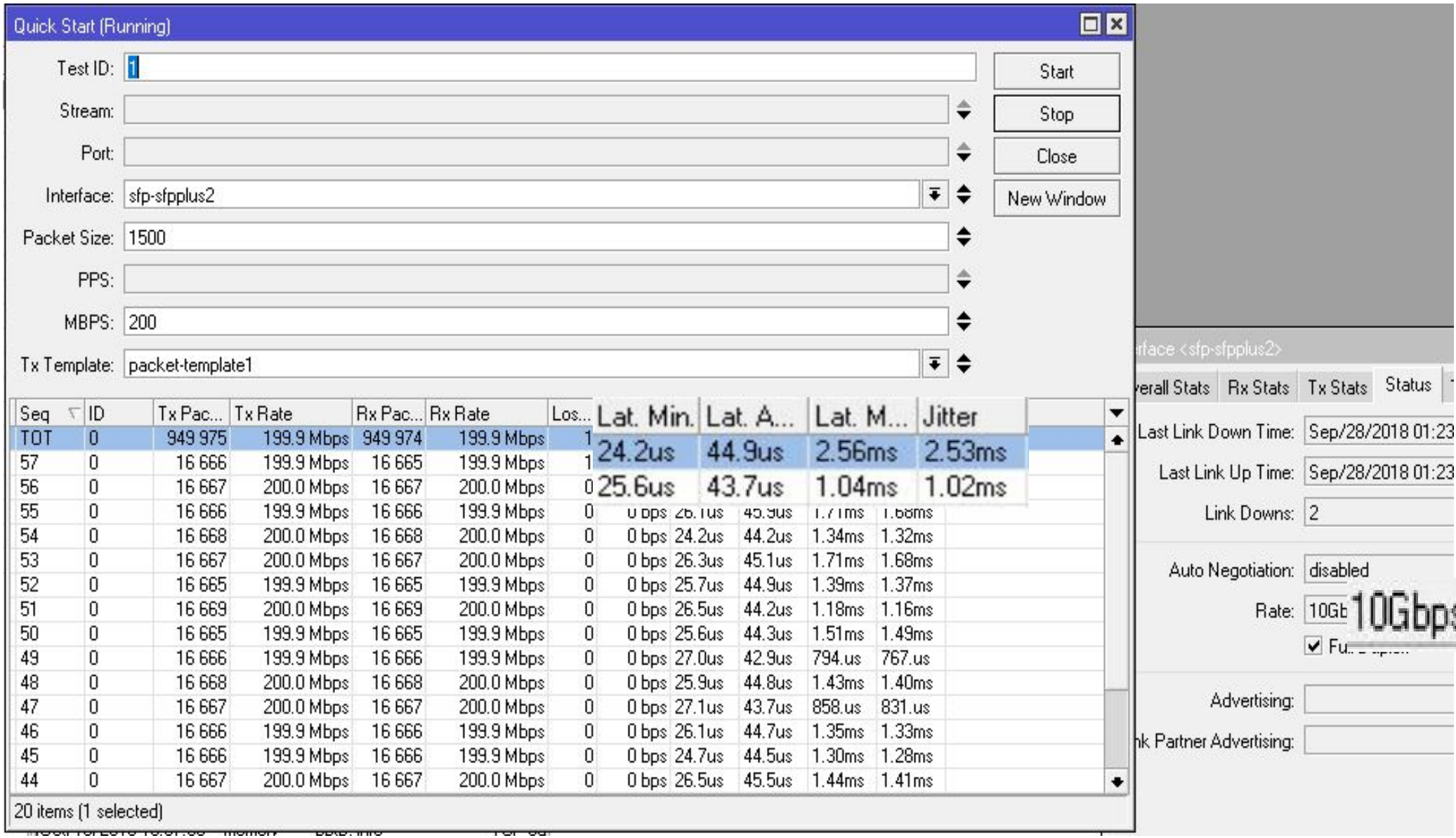
Interface Rate =1Gbps



packet_gap

Interframe Spacing

Interface Rate =10Gbps



https://en.wikipedia.org/wiki/Interpacket_gap

Interframe Spacing

	Minimum	Average	Maximum	Traffic	Performance
10Mbit	2.52ms	2.53ms	3.75ms	1mbps	X
100Mbit	291us	295us	415us	1mbps	8.6x
1Gbit	68.2us	72.7us	174us	1mbps	4.2x
10Gbit	24us	44.9us	X	1mbps	2.8x

1 second =1,000 ms
1 ms = 1,000 µs

https://en.wikipedia.org/wiki/Interpacket_gap

Fast Path

Slow Path

SysArts

Slow Path

SysArts

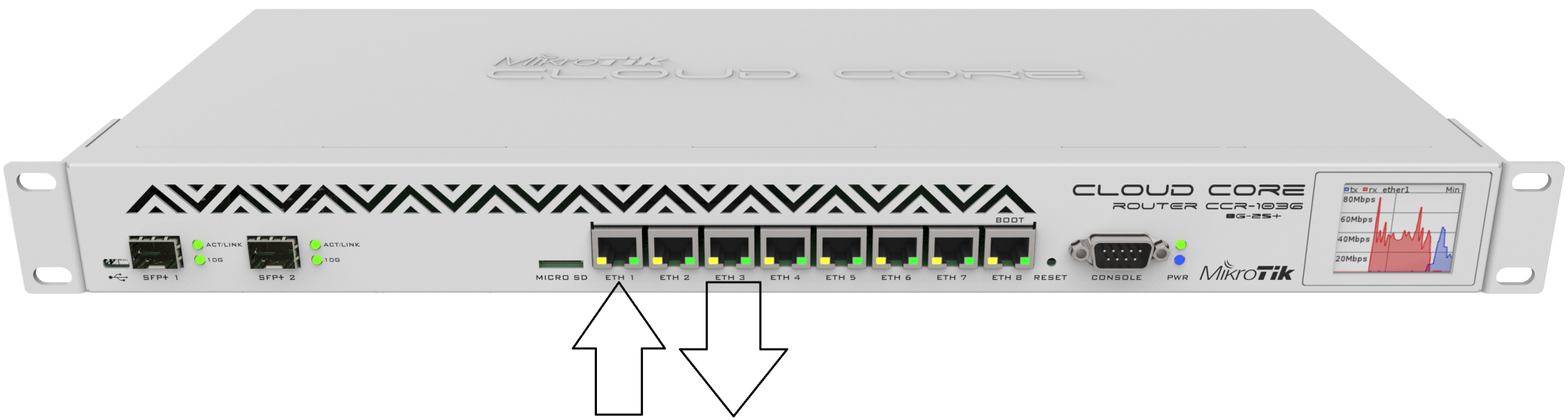
Slow Path

SysArts

Slow Path

- Slow Path RouterOS is the normal behavior.
- RouterOS checks individual packages along the way.
- In some cases this process may be extended.
- Slow Path consumes more resources than Fast Path.

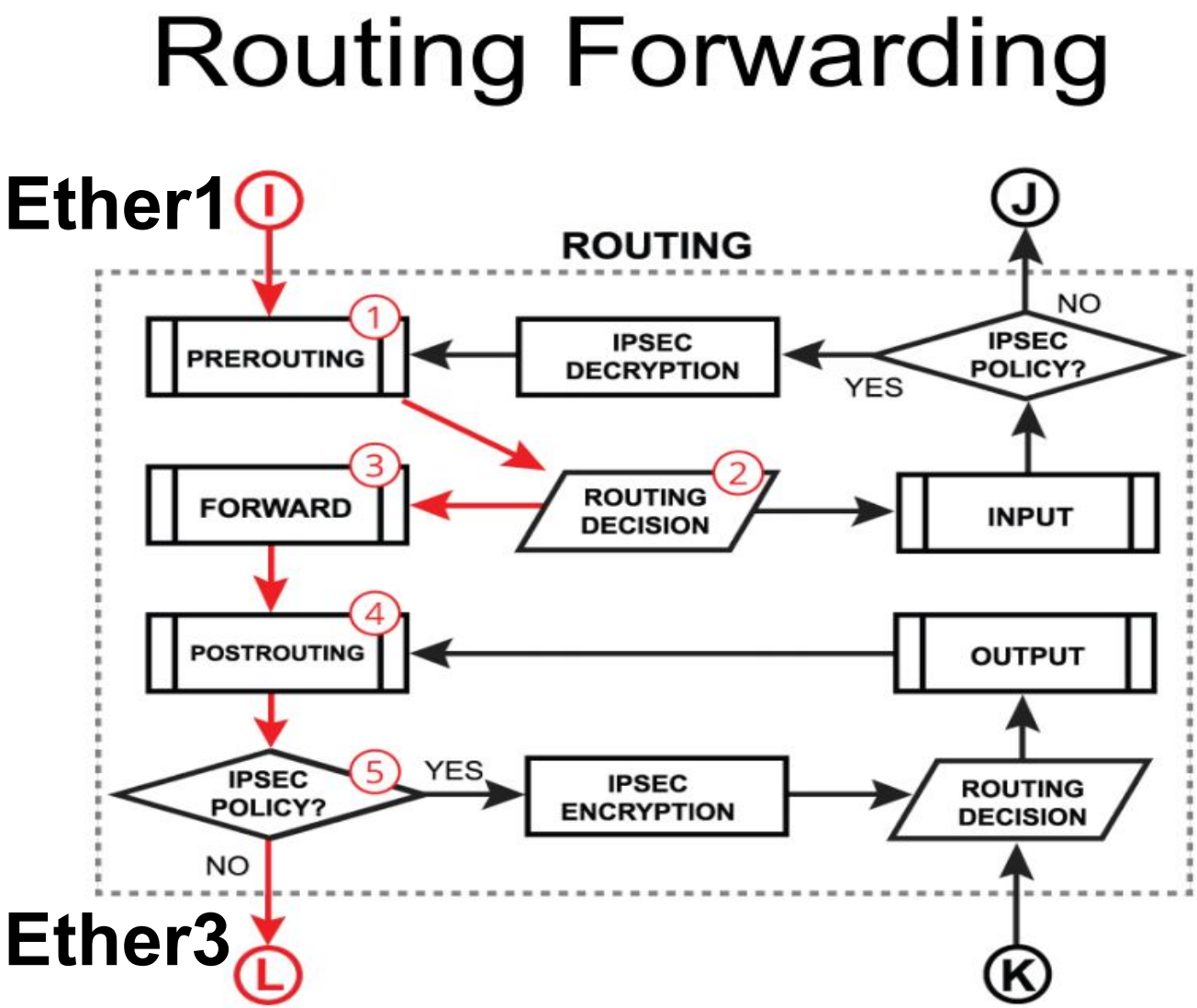
Slow Path



- The Routera Package will enter through Ether1 and exit through Ether3.
- Ether1 can be considered Internet, Ether3 user (customer).
- When the user starts browsing the web page, what stages does the package go through in the router?

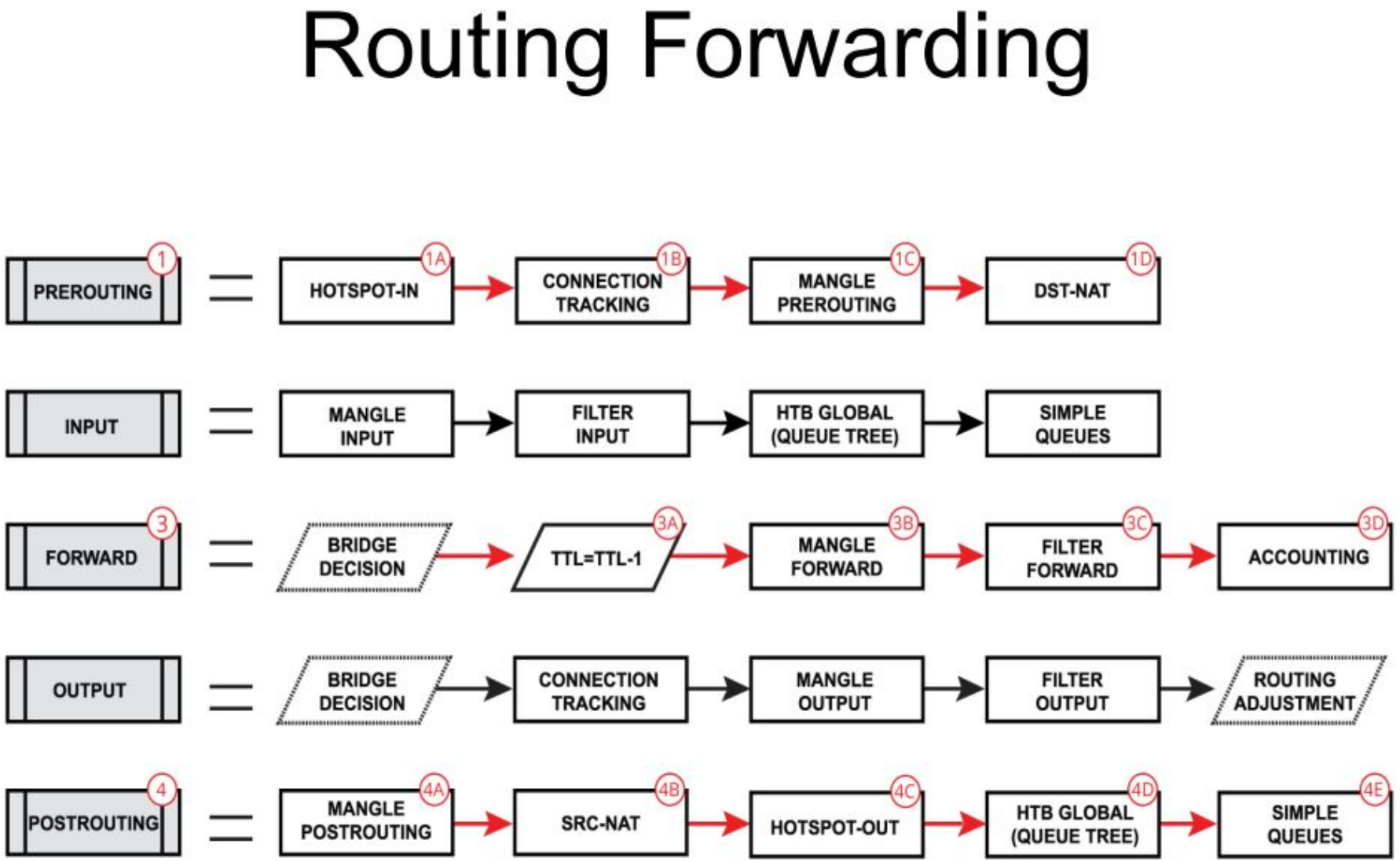
SysArts

Slow Path



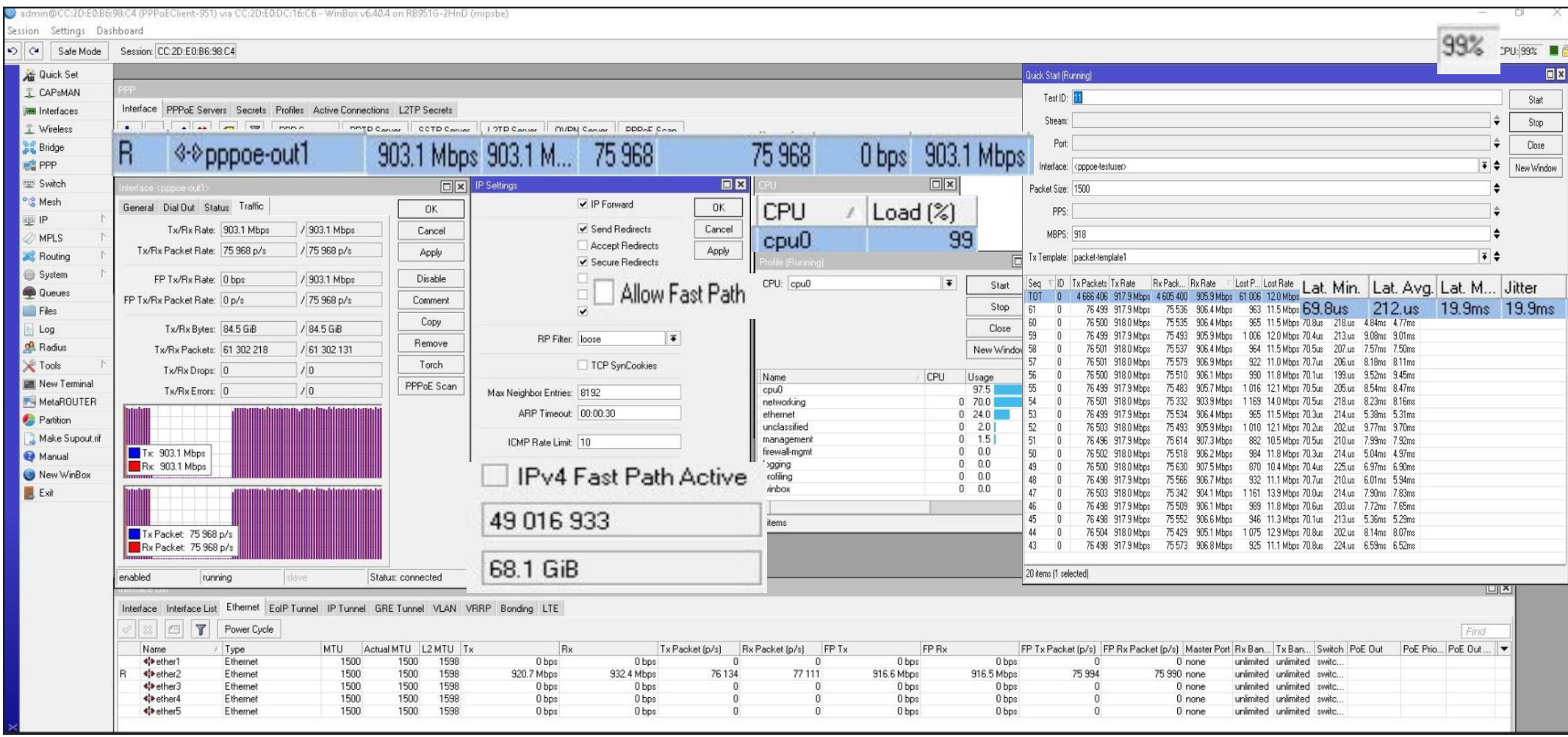
SysArts

Slow Path



SysArts

Slow Path



SysArts

Fast Path & Fast Track

SysArts

Fast Path & Fast Track

SysArts

Fast Path & Fast Track

SysArts

Fast Path & Fast Track

Fast Path

- Fast Path is a feature of the Linux kernel. RouterOS uses the Linux kernel.
- It interferes directly to the Fast Path Router Interfaces and shortens the packet flow and leads the package directly to the output.
- Implemented MikroTik Fast Path with 6.29.
- **Fast Path requirements;**
  - Interface driver support
  - Must be enabled on the Fast Path Router
  - No special configuration

Fast Path

What are Fast Path Supporting Devices?

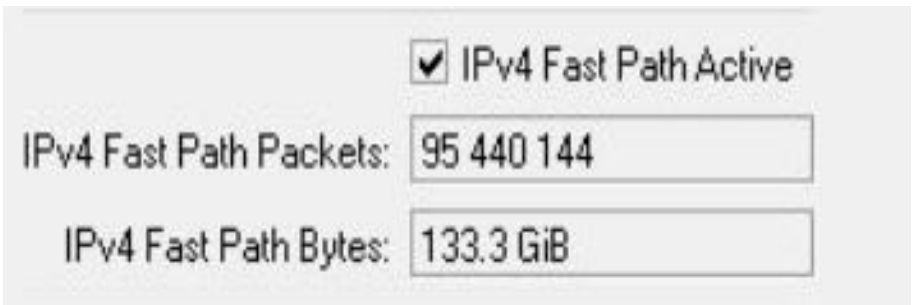
All products in MicroTik or Interfaceler may not support Fast Path. Products supporting Fast Path;

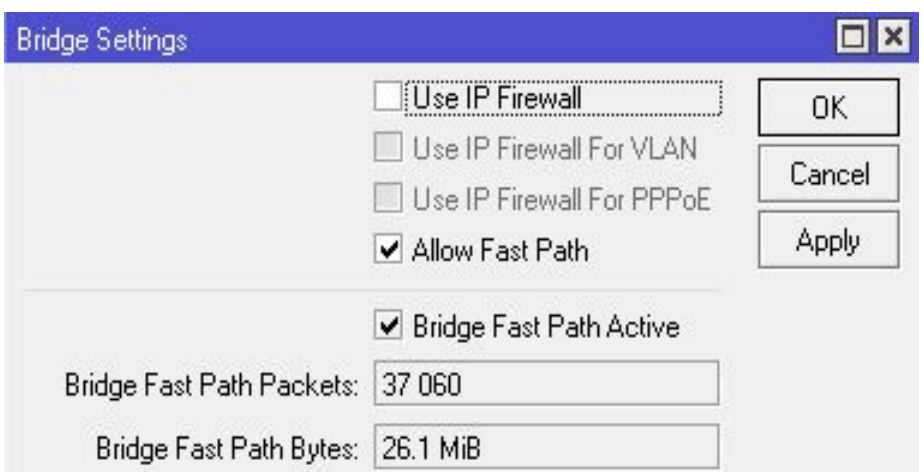
- CCR, CRS, RB7xx, RB9xx, hEX, hAP, wAP,cAP, mAP, SXT, Metal, Groove, DynaDish, OmniTIK series - all ports
- RB1100 series – ether1-11 (RB 1100x4 ALL port)
- RB6xx series and RB800 - ether1,2
- RB1000, RB3011, RB2011 - all ports
- Tüm Wireless Interfaceleri (6.37)

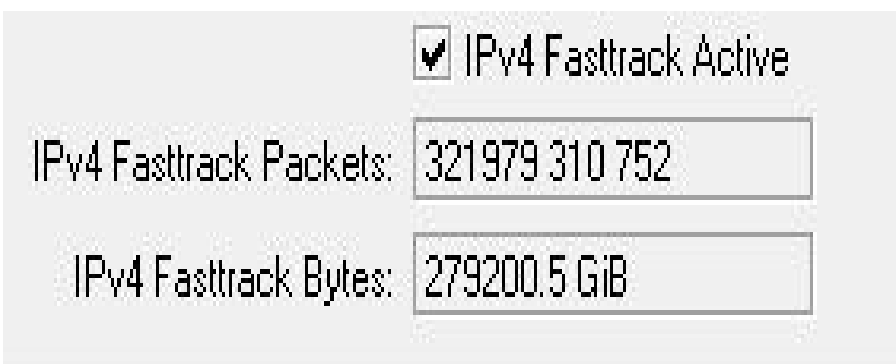
Fast Path

Fast Path Handlers

- Ipv4
- Bridge
- Ipv4 Fast Track







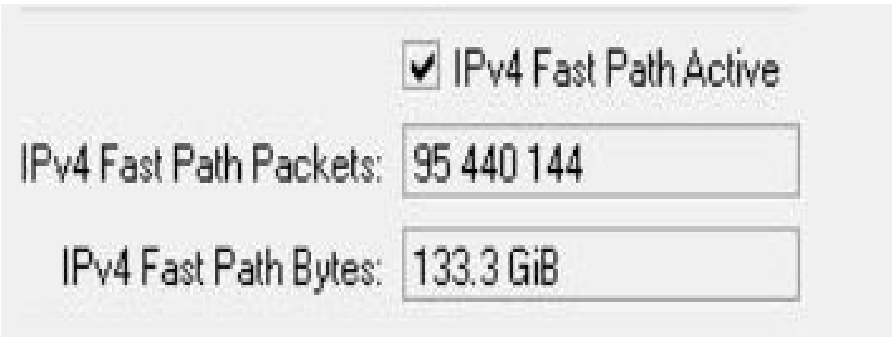
SysArts

Fast Path

Ipv4 Fast Path

The IPv4 Fast Path runs automatically when the following conditions are met.

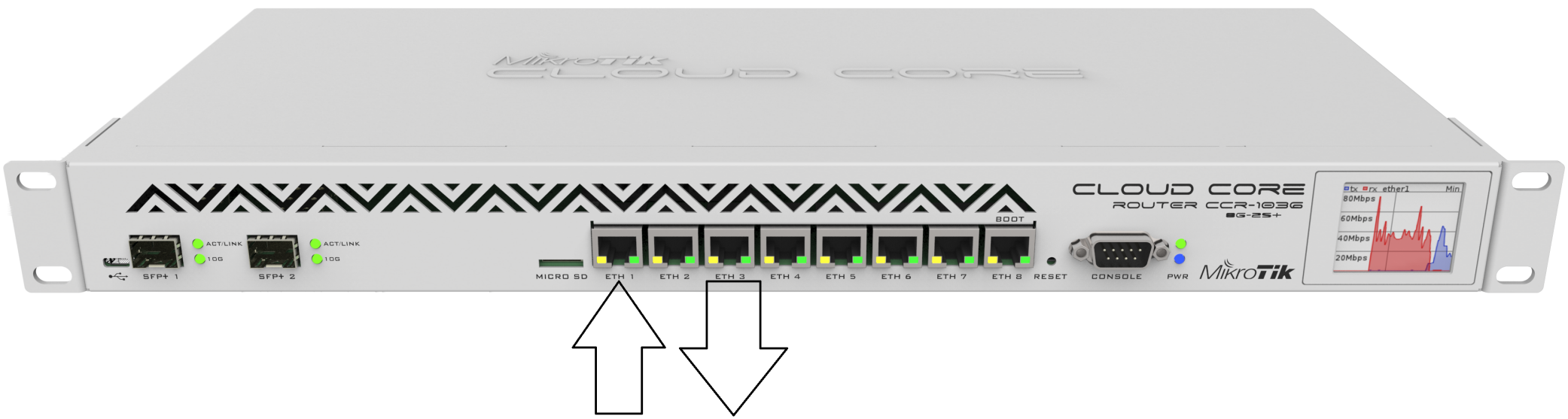
- Firewall rules and no address lis
- Simple Queue, Queue Trees ve Parent=global not used.
- Mesh, metarouter, sniffer, torch ve Traffic Generator not used.
- Connection Tracking not used.
- (/ip accounting enabled=no);
- VRFs are not set (/ip route vrf is empty);
- Hotspot is not used (/ip hotspot has no interfaces);
- IpSec policies are not configured (ROS v6.8);
- Tool Mac-Scan, ip-scan=no
- Ip Route enabled=yes



SysArts

Fast Path

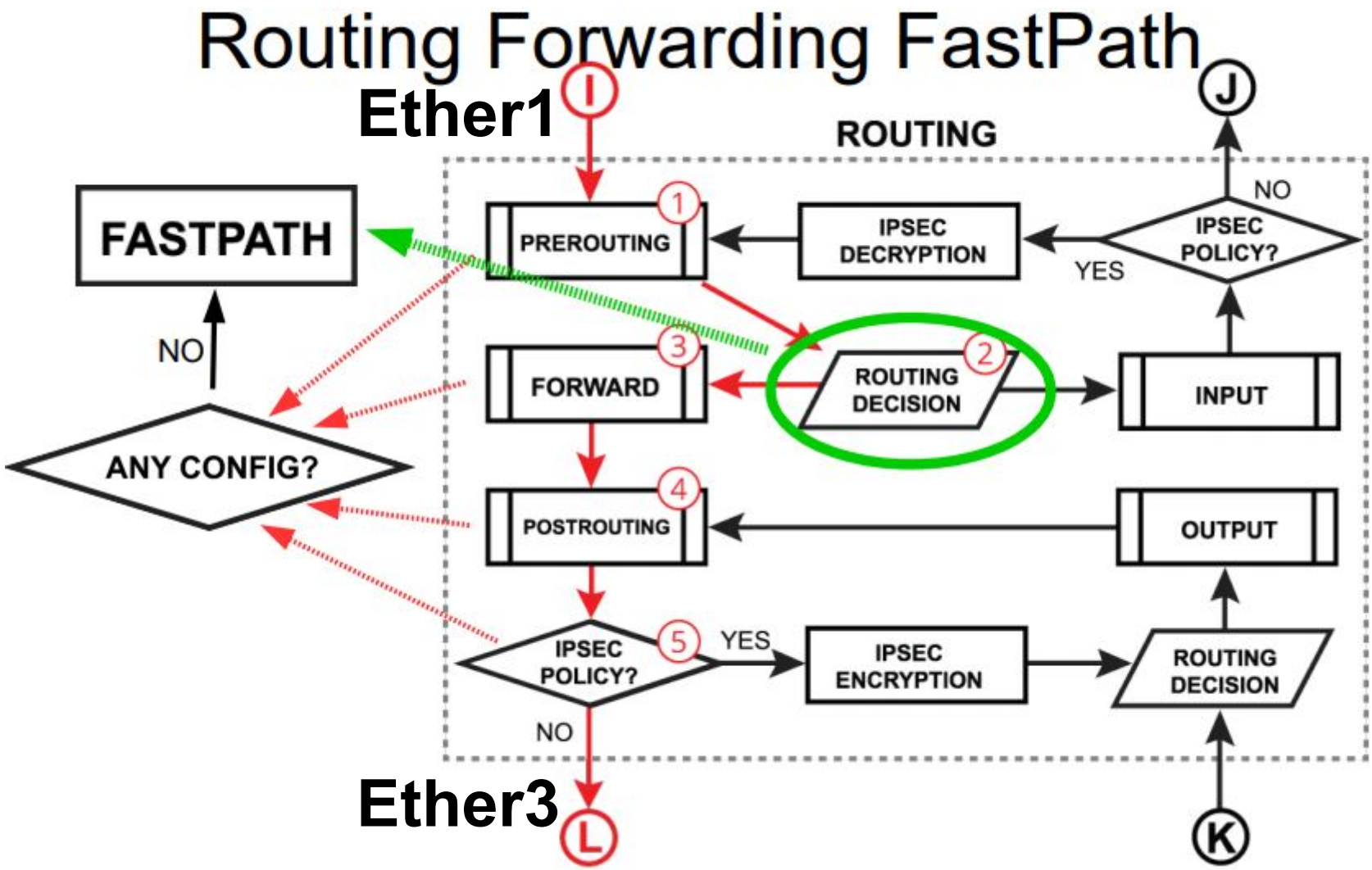
Ipv4 Fast Path



- The Routera Package will enter through Ether1 and exit through Ether3.
- Ether1 can be considered Internet, Ether3 user (customer).
- When the user starts browsing the web page, what stages does the package go through in the router?

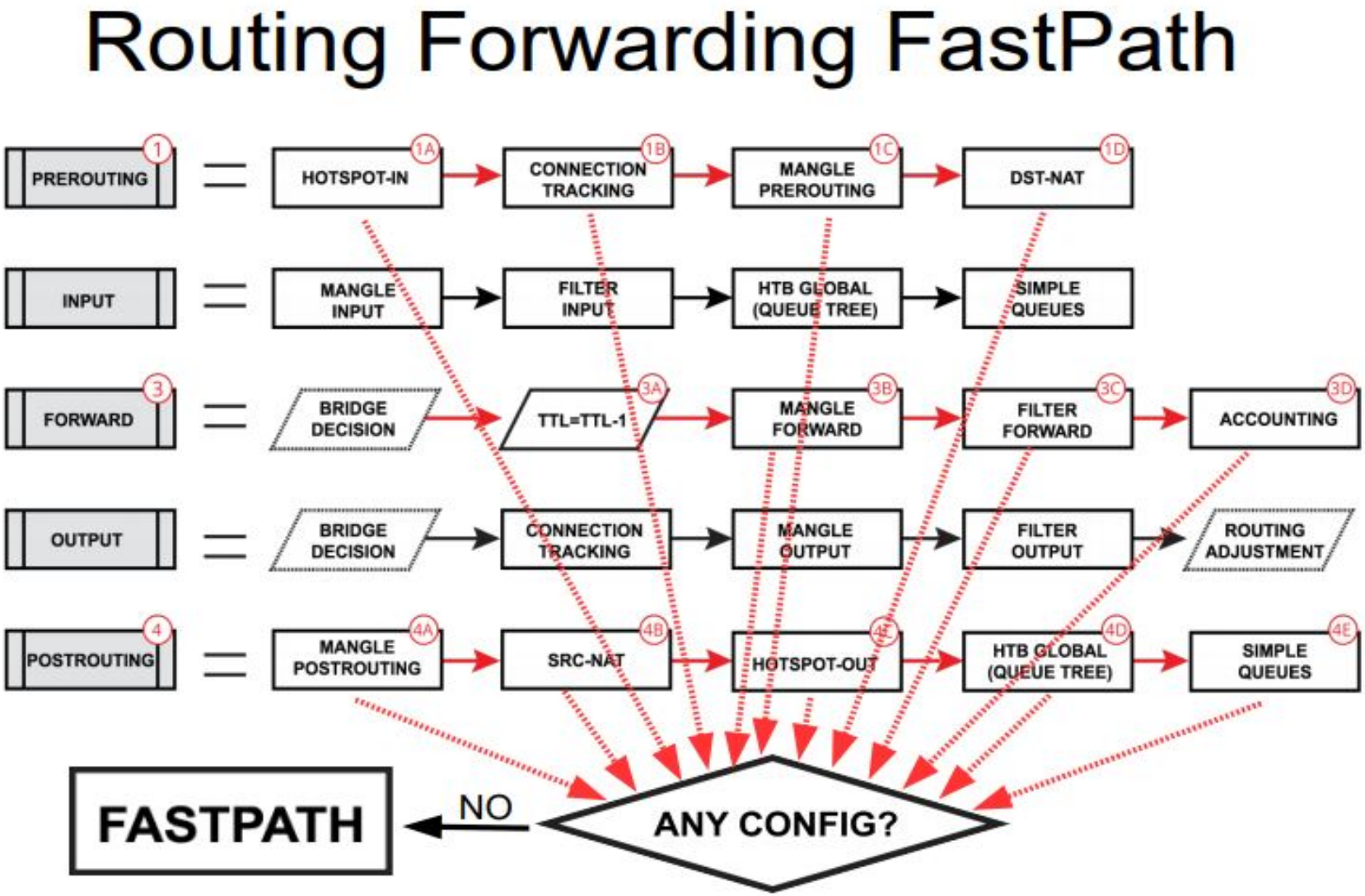
SysArts

Fast Path



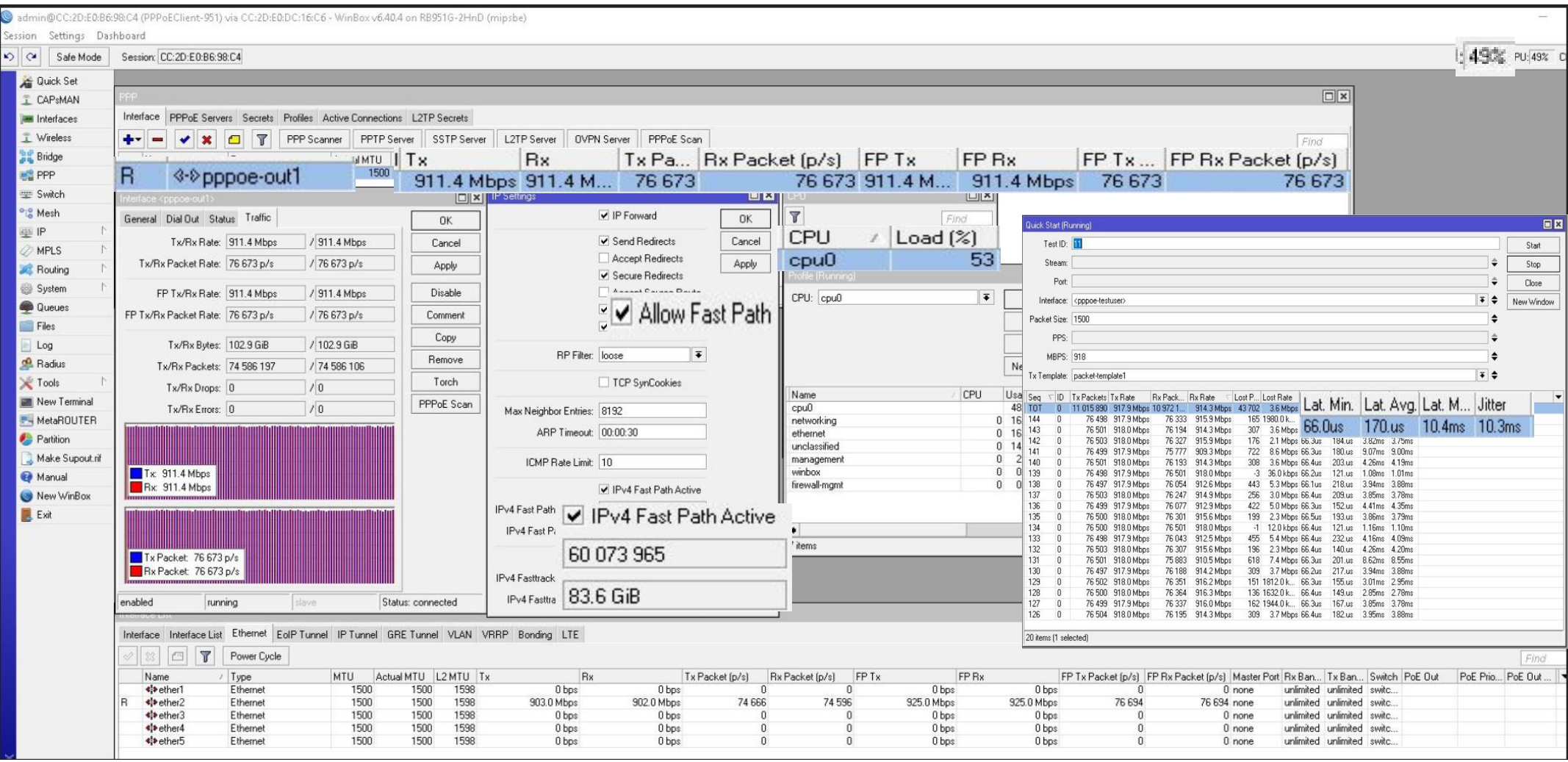
SysArts

Fast Path



SysArts

Fast Path



SysArts

Ipv4 Fast Path & Slow Path Versus

	Lost Rate	Minimum	Average	Maximum	Traffic	CPU
Slow Path	%0.76	69.8us	212.us	19.9ms	Tx 903Mbps Rx 903Mbps	%99
Fast Path	%0.39	66.0us	170.us	10.4ms	TX 911Mbps RX 911Mbps	% 49
Performance	**%95**	**%5**	**%25**	**%91**	**X**	%51

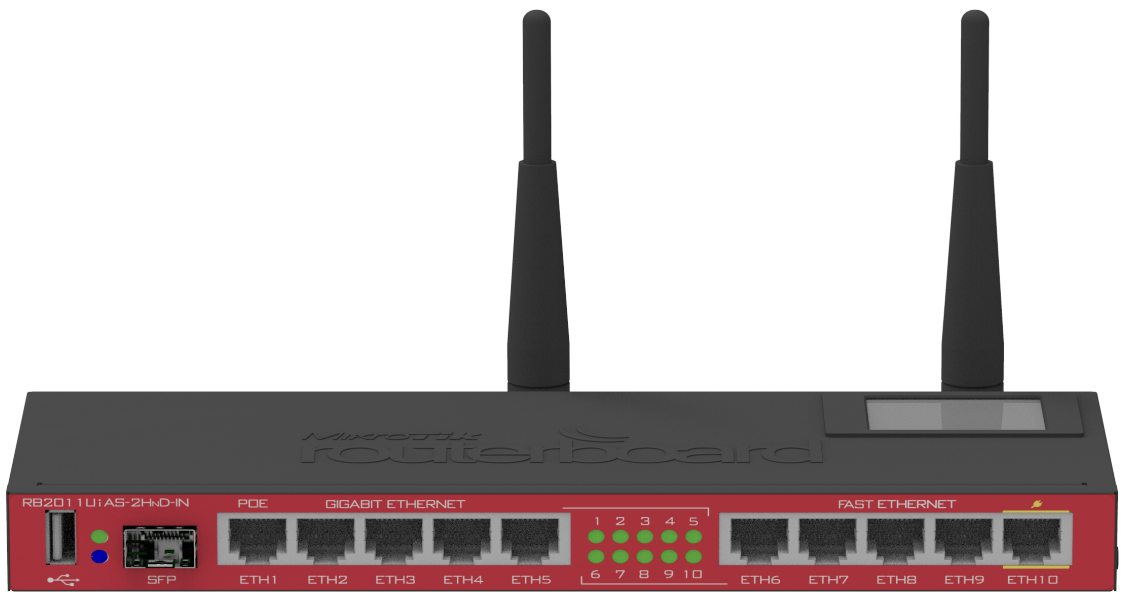
SysArts

Fast Path

RB2011 Capasity & Performance Test($129)

Products using the same Chipset as RB2011;

- OmniTIK (L4)
- Omnitik PoE(L5)
- SXT SA5(L4)
- SXT 2(L4)
- SXT Lite5(L3)
- DISC Lite5(L3)
- LDF 5(L3)
- CRS125-24G-1S-2HnD-IN (L5)
- CRS109-8G-1S-2HnD-IN(L5)
- RB2011 (L4)
- RB2011UiAS-2HnD-IN(L5)



Level number	0 (Trial mode)	1 (Free Demo)	3 (WISP CPE)	4 (WISP)	5 (WISP)	6 (Controller)
PPPoE tunnels	24h trial	1	200	200	500	unlimited

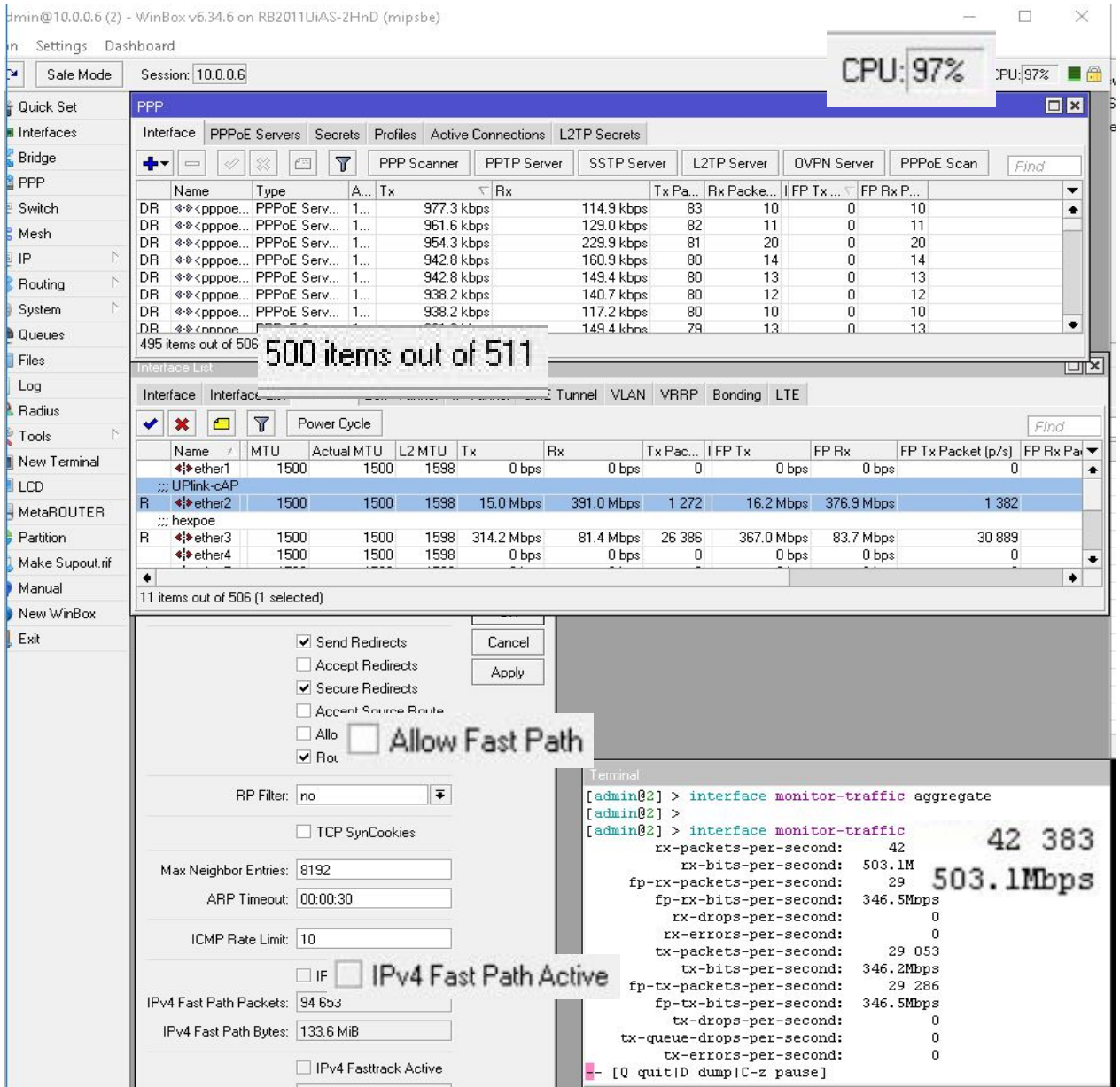
SysArts

Fast Path

RB2011 Capasity & Performance Test($129)

Trafik Statistics

Lat. Min.	Lat. Avg.	Lat. Max.	Jitter
94.5us	596.us	16.9ms	16.8ms
94.6us	555.us	11.3ms	11.2ms
96.0us	885.us	13.5ms	13.4ms
94.5us	430.us	10.2ms	10.1ms
94.2us	804.us	18.1ms	18.0ms
94.0us	659.us	10.1ms	9.98ms
95.5us	477.us	19.7ms	19.6ms
95.6us	416.us	10.8ms	10.7ms
97.6us	1.15ms	10.3ms	10.2ms
95.0us	343.us	11.7ms	11.6ms
94.1us	448.us	12.3ms	12.2ms
94.9us	587.us	19.6ms	19.5ms
95.1us	519.us	10.0ms	9.91ms
94.5us	533.us	18.2ms	18.1ms
95.6us	475.us	16.8ms	16.7ms
95.0us	830.us	11.2ms	11.1ms
94.0us	443.us	17.8ms	17.7ms
97.1us	431.us	9.98ms	9.88ms
97.1us	691.us	10.2ms	10.1ms
91.4us	660.us	30.0ms	29.9ms



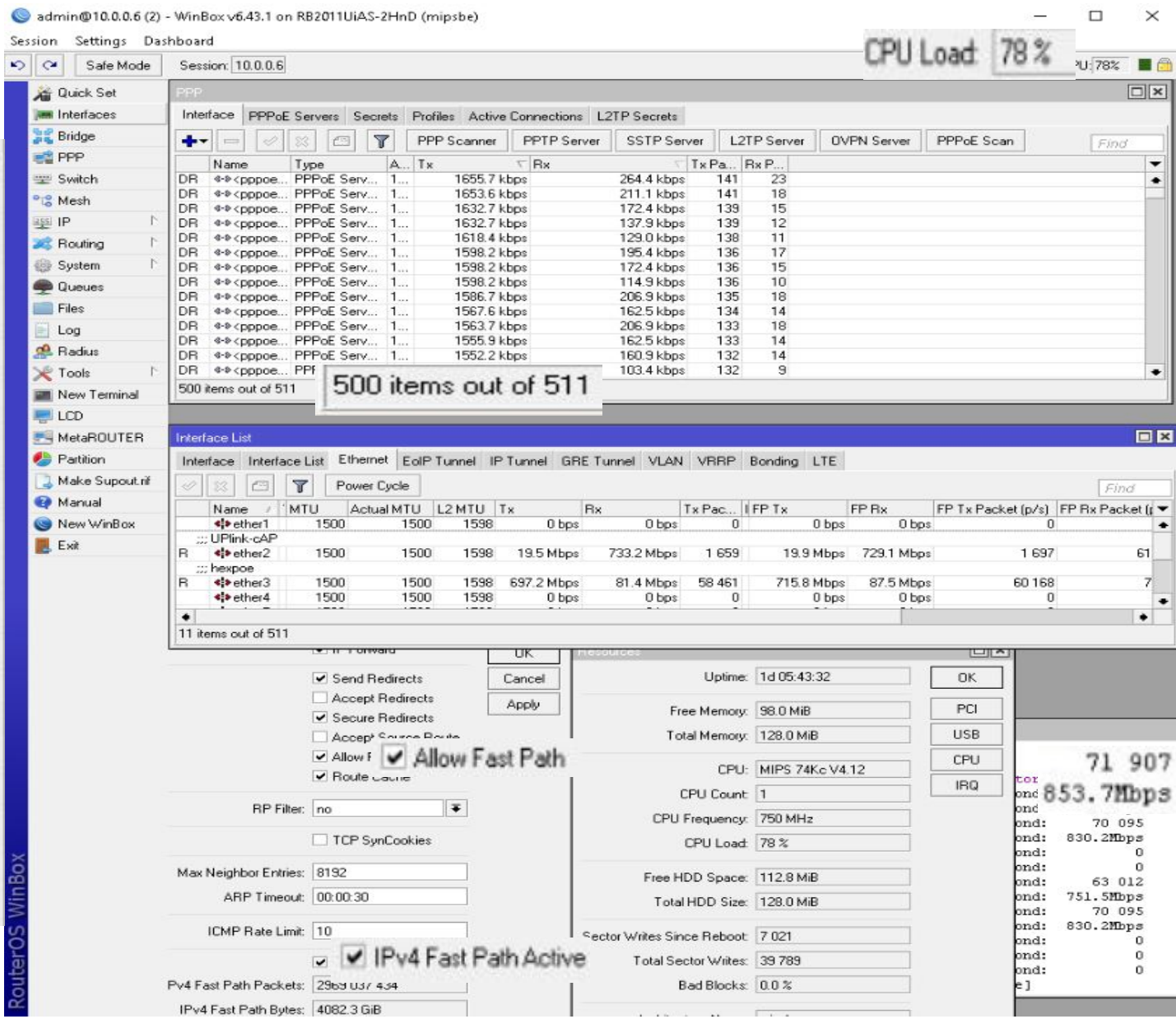
Fast Path

RB2011 Capasity & Performance

Test($129)

Trafik statistics

Lat. Min.	Lat. Avg.	Lat. Max.	Jitter
85.6us	520.us	17.4ms	17.3ms
84.9us	302.us	11.1ms	11.0ms
87.6us	521.us	14.4ms	14.4ms
86.2us	323.us	10.7ms	10.6ms
87.2us	464.us	11.2ms	11.1ms
86.5us	424.us	20.9ms	20.8ms
84.8us	314.us	9.73ms	9.65ms
85.9us	521.us	10.7ms	10.6ms
86.0us	450.us	20.4ms	20.3ms
84.9us	207.us	4.96ms	4.88ms
86.8us	505.us	10.8ms	10.8ms
89.1us	474.us	19.9ms	19.8ms
84.9us	186.us	7.77ms	7.68ms
86.0us	581.us	10.6ms	10.5ms
86.1us	396.us	20.8ms	20.7ms
85.8us	194.us	7.58ms	7.49ms
86.7us	482.us	15.0ms	14.9ms
84.0us	614.us	17.2ms	17.2ms
85.8us	300.us	14.3ms	14.2ms
82.1us	428.us	22.7ms	22.6ms



SysArts

Ipv4 Fast Path & Slow Path Versus

MikroTik RB2011

	Minimum	Average	Maximum	Traffic	CPU	
Slow Path	91.4us	660.us	30ms	501Mbps	%97	
Fast Path	82.us	428.us	22.7ms	853Mbps	%78	
	%14	**%54**	**%32**	**%70**	**%24**	

SysArts

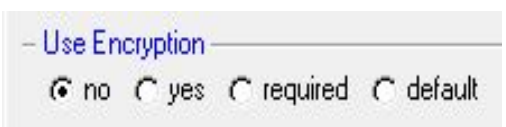
Fast Path

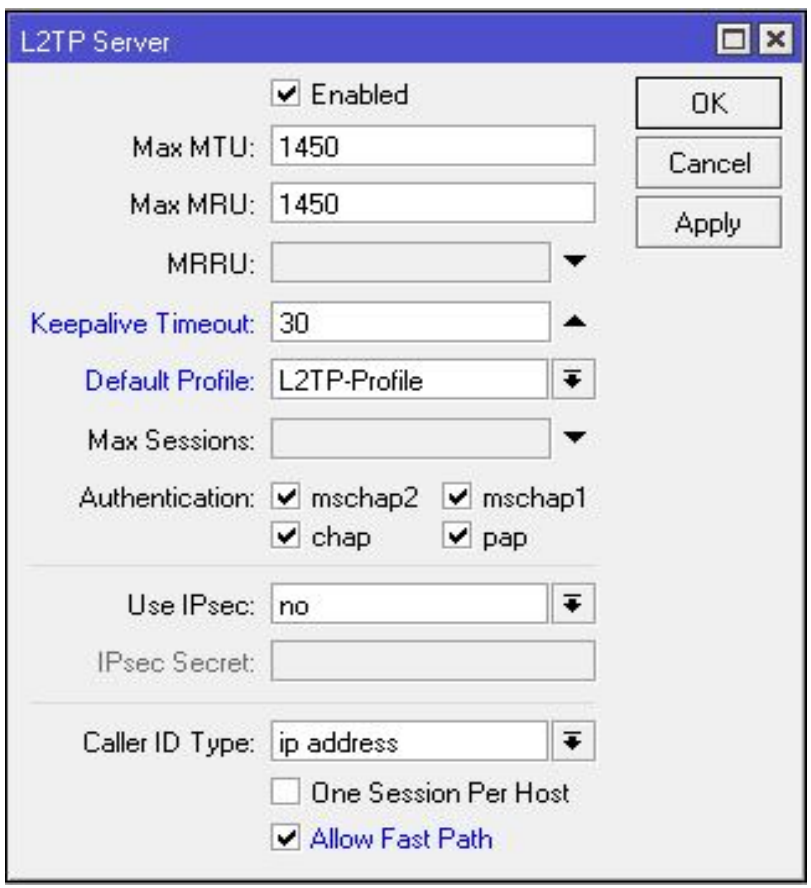
Virtual Interface Fast Path

Ethernet, Wireless, Bridge, PPPoE, VLAN, VRRP and Bonding Interface Fast Path uses automatically if it is available to use Fast Path.

L2TP, EoIP, IPIP, GRE Tunnel Manual Starting Fast Path!

- 1- Use IPsec no
- 2- Allow Fast Path=yes.
- 3- No Packet Fragmentation
- 4- Selected profile should not be encryption.





SysArts

Fast Track

Fast Path + Connection Tracking = Fast Track

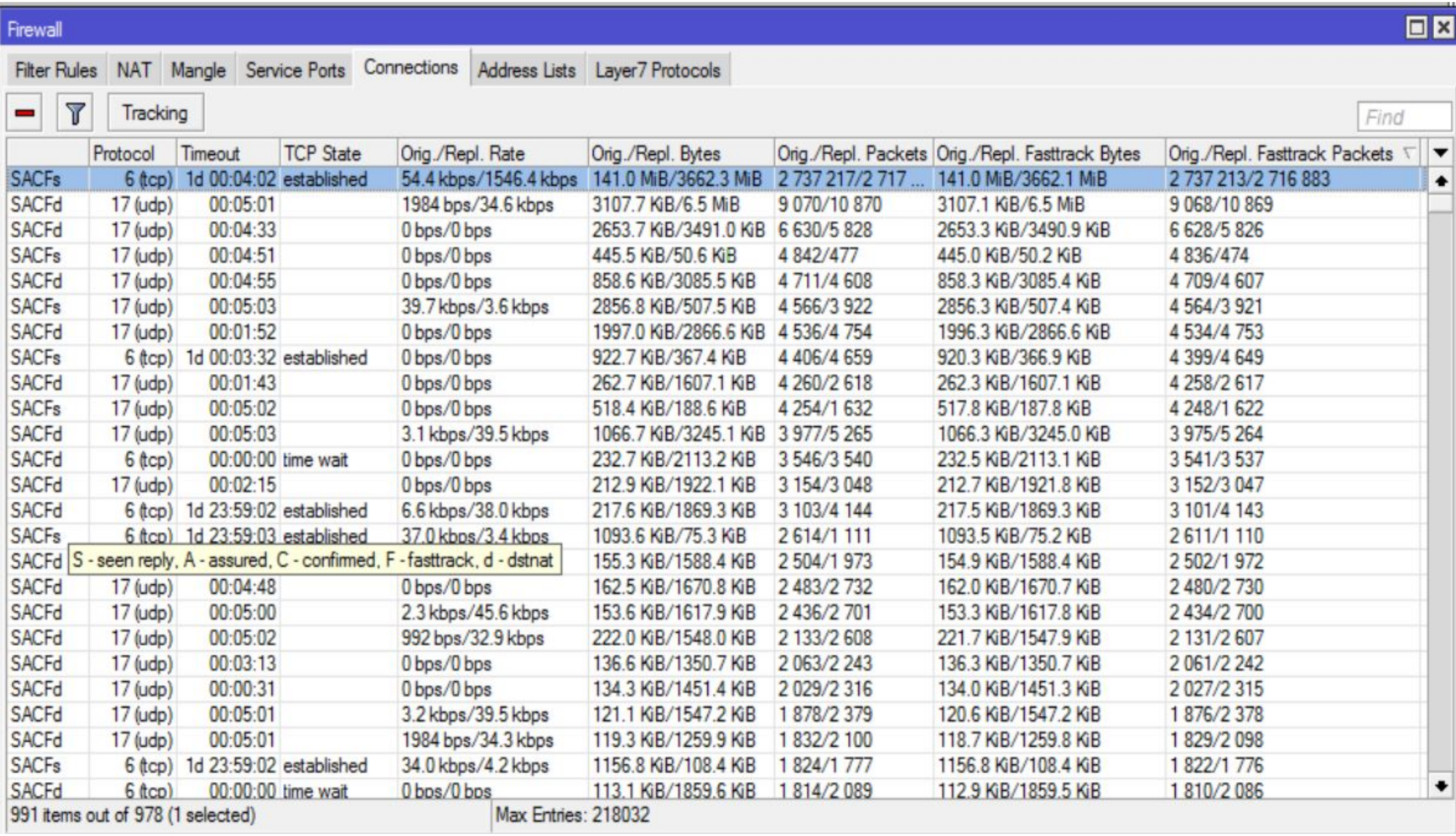
- The MikroTik Fast Path and Conntrack's work together gave the name Fast Track.
- Fast Track Fast Path extentions
- Only Ipv4 TCP/UDP (Total Traffic %99)
- FastTrack management is left to network admin
- FastTrack can be used on devices with Fast Path support.
- After the first packet of the connection passing through the router is marked as Fast Track, the other packages of the connection are FastTrack. A single connection can exceed 10,000 packets.

Fast Track

Fast Track Performance effects; (What MikroTik said?)

- Firewall CPU Consumerdrops 20/1
- Router Performance 5x improve
- FastTrack, Full NAT(SRC ve DSTNAT) support!!!

Fast Track



	Protocol	Timeout	TCP State	Orig./Repl. Rate	Orig./Repl. Bytes	Orig./Repl. Packets	Orig./Repl. Fasttrack Bytes	Orig./Repl. Fasttrack Packets
SACFs	6 (tcp)	1d 00:04:02	established	54.4 kbps/1546.4 kbps	141.0 MiB/3662.3 MiB	2 737 217/2 717 ...	141.0 MiB/3662.1 MiB	2 737 213/2 716 883
SACFd	17 (udp)	00:05:01		1984 bps/34.6 kbps	3107.7 KiB/6.5 MiB	9 070/10 870	3107.1 KiB/6.5 MiB	9 068/10 869
SACFd	17 (udp)	00:04:33		0 bps/0 bps	2653.7 KiB/3491.0 KiB	6 630/5 828	2653.3 KiB/3490.9 KiB	6 628/5 826
SACFs	17 (udp)	00:04:51		0 bps/0 bps	445.5 KiB/50.6 KiB	4 842/477	445.0 KiB/50.2 KiB	4 836/474
SACFd	17 (udp)	00:04:55		0 bps/0 bps	858.6 KiB/3085.5 KiB	4 711/4 608	858.3 KiB/3085.4 KiB	4 709/4 607
SACFs	17 (udp)	00:05:03		39.7 kbps/3.6 kbps	2856.8 KiB/507.5 KiB	4 566/3 922	2856.3 KiB/507.4 KiB	4 564/3 921
SACFd	17 (udp)	00:01:52		0 bps/0 bps	1997.0 KiB/2866.6 KiB	4 536/4 754	1996.3 KiB/2866.6 KiB	4 534/4 753
SACFs	6 (tcp)	1d 00:03:32	established	0 bps/0 bps	922.7 KiB/367.4 KiB	4 406/4 659	920.3 KiB/366.9 KiB	4 399/4 649
SACFd	17 (udp)	00:01:43		0 bps/0 bps	262.7 KiB/1607.1 KiB	4 260/2 618	262.3 KiB/1607.1 KiB	4 258/2 617
SACFs	17 (udp)	00:05:02		0 bps/0 bps	518.4 KiB/188.6 KiB	4 254/1 632	517.8 KiB/187.8 KiB	4 248/1 622
SACFd	17 (udp)	00:05:03		3.1 kbps/39.5 kbps	1066.7 KiB/3245.1 KiB	3 977/5 265	1066.3 KiB/3245.0 KiB	3 975/5 264
SACFd	6 (tcp)	00:00:00	time wait	0 bps/0 bps	232.7 KiB/2113.2 KiB	3 546/3 540	232.5 KiB/2113.1 KiB	3 541/3 537
SACFd	17 (udp)	00:02:15		0 bps/0 bps	212.9 KiB/1922.1 KiB	3 154/3 048	212.7 KiB/1921.8 KiB	3 152/3 047
SACFd	6 (tcp)	1d 23:59:02	established	6.6 kbps/38.0 kbps	217.6 KiB/1869.3 KiB	3 103/4 144	217.5 KiB/1869.3 KiB	3 101/4 143
SACFs	6 (tcp)	1d 23:59:03	established	37.0 kbps/3.4 kbps	1093.6 KiB/75.3 KiB	2 614/1 111	1093.5 KiB/75.2 KiB	2 611/1 110
SACFd					155.3 KiB/1588.4 KiB	2 504/1 973	154.9 KiB/1588.4 KiB	2 502/1 972
SACFd	17 (udp)	00:04:48		0 bps/0 bps	162.5 KiB/1670.8 KiB	2 483/2 732	162.0 KiB/1670.7 KiB	2 480/2 730
SACFd	17 (udp)	00:05:00		2.3 kbps/45.6 kbps	153.6 KiB/1617.9 KiB	2 436/2 701	153.3 KiB/1617.8 KiB	2 434/2 700
SACFd	17 (udp)	00:05:02		992 bps/32.9 kbps	222.0 KiB/1548.0 KiB	2 133/2 608	221.7 KiB/1547.9 KiB	2 131/2 607
SACFd	17 (udp)	00:03:13		0 bps/0 bps	136.6 KiB/1350.7 KiB	2 063/2 243	136.3 KiB/1350.7 KiB	2 061/2 242
SACFd	17 (udp)	00:00:31		0 bps/0 bps	134.3 KiB/1451.4 KiB	2 029/2 316	134.0 KiB/1451.3 KiB	2 027/2 315
SACFd	17 (udp)	00:05:01		3.2 kbps/39.5 kbps	121.1 KiB/1547.2 KiB	1 878/2 379	120.6 KiB/1547.2 KiB	1 876/2 378
SACFd	17 (udp)	00:05:01		1984 bps/34.3 kbps	119.3 KiB/1259.9 KiB	1 832/2 100	118.7 KiB/1259.8 KiB	1 829/2 098
SACFs	6 (tcp)	1d 23:59:02	established	34.0 kbps/4.2 kbps	1156.8 KiB/108.4 KiB	1 824/1 777	1156.8 KiB/108.4 KiB	1 822/1 776
SACFd	6 (tcp)	00:00:00	time wait	0 bps/0 bps	113.1 KiB/1859.6 KiB	1 814/2 089	112.9 KiB/1859.5 KiB	1 810/2 086

SysArts

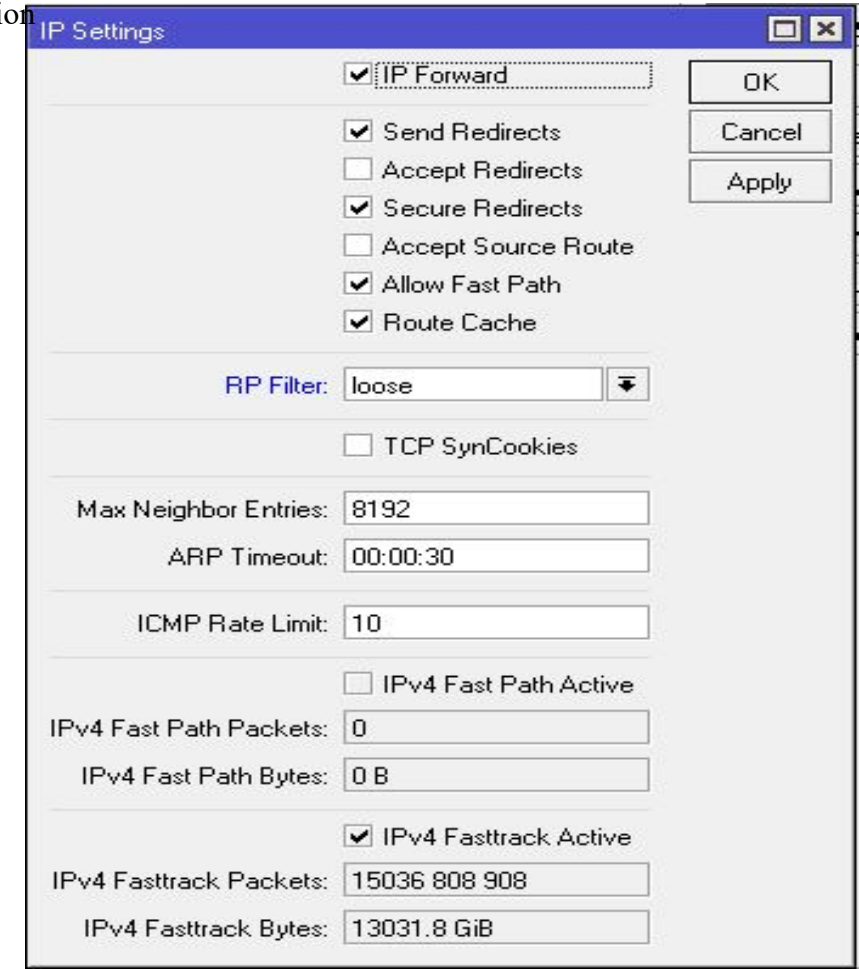
Fast Track

How to enable Fast Track?

#		Action	Chain	Sr...	D...	Connection State	Bytes	Packets
;;; special dummy rule to show fasttrack counters								
0	D	passthrough	forward				14392.8 GiB	16600 932 859
6		fasttrack connection	forward			established related	191.3 GiB	674 431 993
7		accept	forward			established related	373.0 MiB	1 209 431

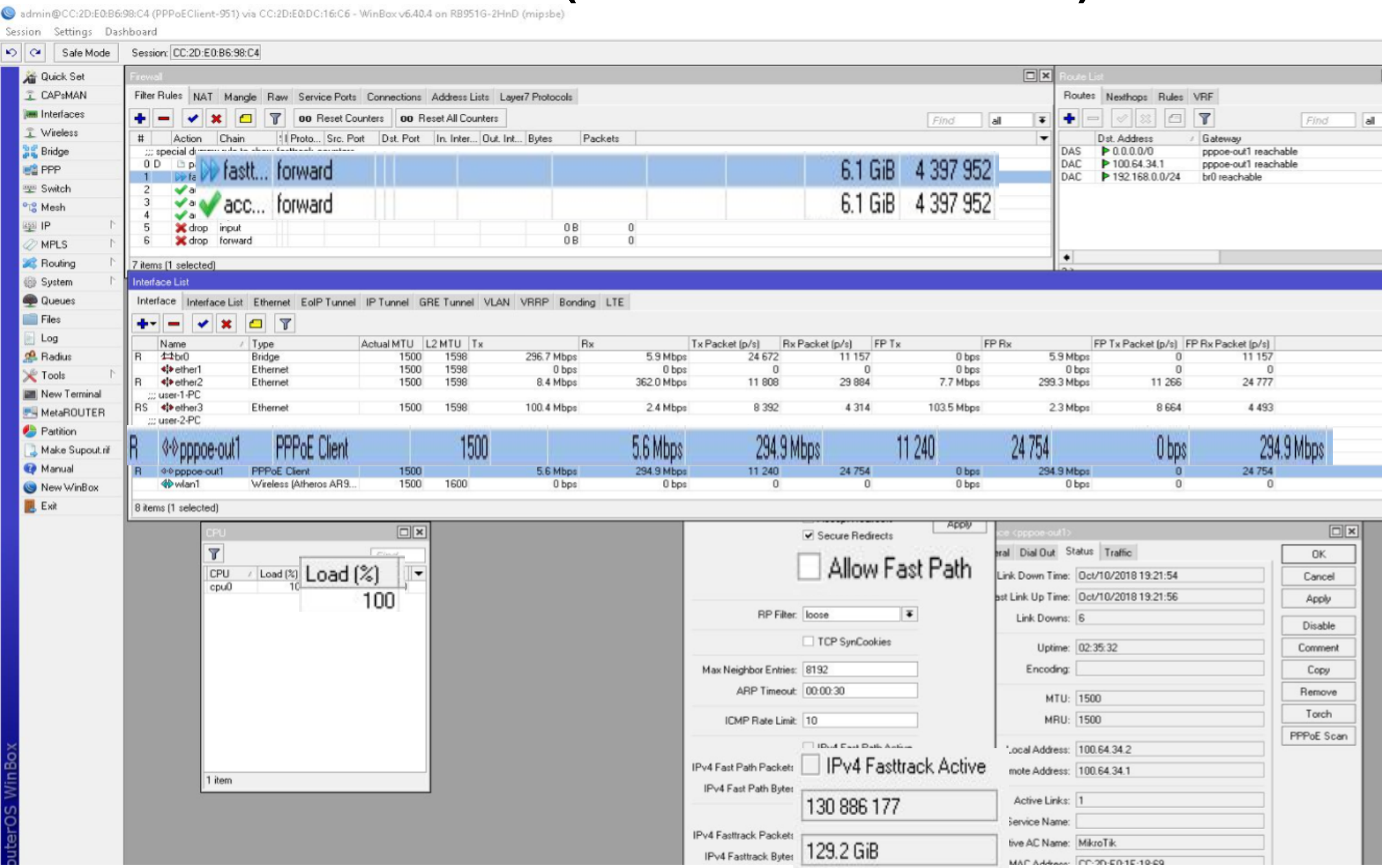
```
/ip firewall filter add chain=forward connection-state=established,related action=fasttrack-connection
/ip firewall filter add chain=forward connection-state=established,related action=accept
```

- Fast Track does not work depending on conditions such as Fast path.
- Fast Track automatically fulfills the requirements when you enable Fast Track.

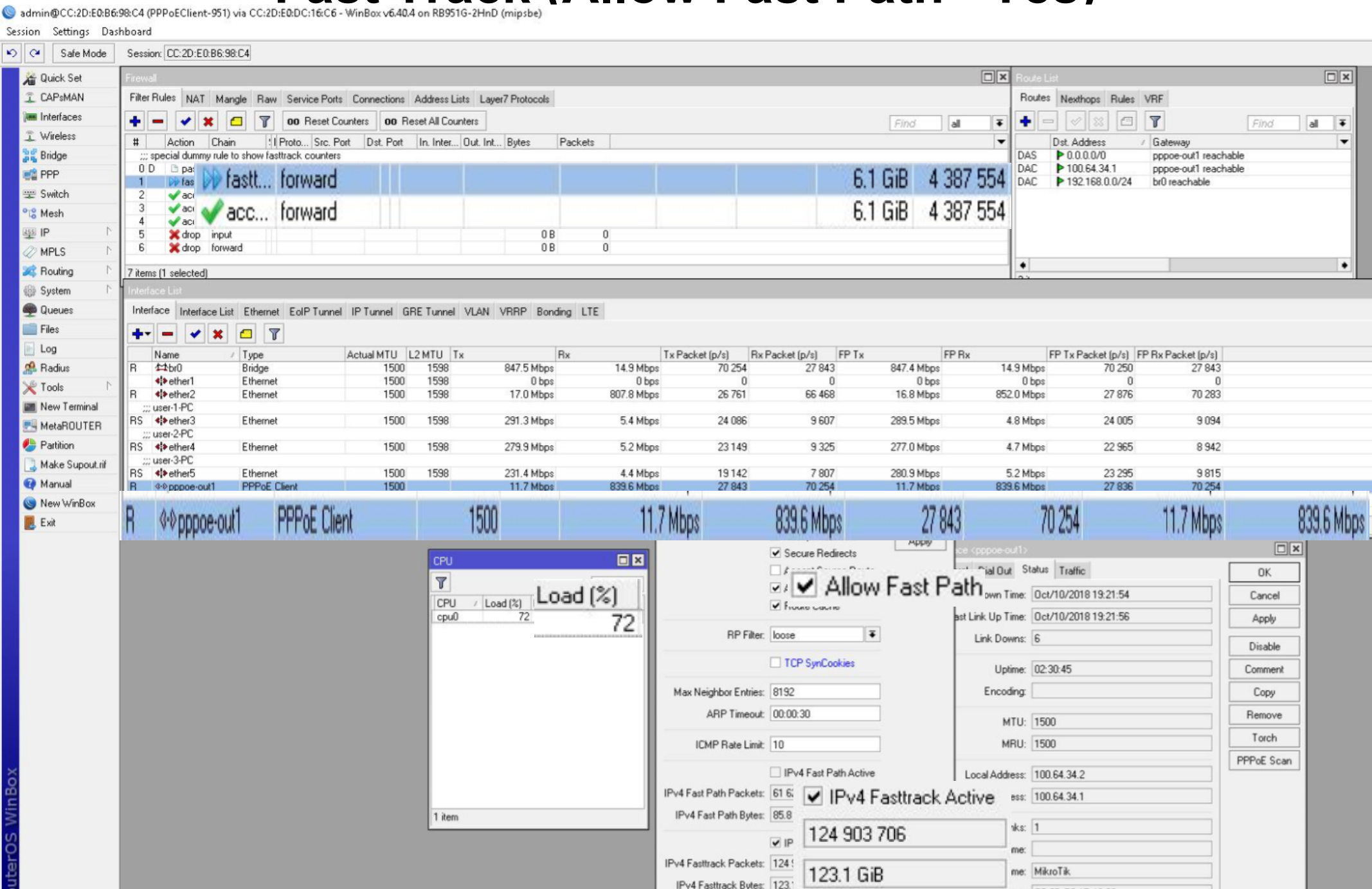


SysArts

Fast Track (Allow Fast Path =No)



Fast Track (Allow Fast Path =Yes)



Fast Track

FastTrack off

Seq	ID	Tx Packets	Tx Rate	Rx Pack...	Rx Rate	Lost P...	Lost Rate	Lat. Min.	Lat. Avg.	Lat. M...	Jitter
TOT	0	7 333	999.9 kbps	7 286	993.5 kbps	47	6.4 kbps	92.3us	1.23ms	21.8ms	21.7ms
88	0	83	996.0 kbps	82	984.0 kbps	1	12.0 kbps	95.3us	916.us	8.64ms	8.55ms
87	0	84	1008.0 kbps	83	996.0 kbps	1	12.0 kbps	93.3us	934.us	11.1ms	11.0ms
86	0	83	996.0 kbps	82	984.0 kbps	1	12.0 kbps	98.9us	1.37ms	13.5ms	13.4ms
85	0	83	996.0 kbps	81	972.0 kbps	2	24.0 kbps	92.3us	1.37ms	9.15ms	9.06ms
84	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	102.us	1.24ms	10.2ms	10.1ms
83	0	84	1008.0 kbps	83	996.0 kbps	1	12.0 kbps	109.us	1.21ms	7.38ms	7.27ms
82	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	105.us	1.22ms	10.9ms	10.8ms
81	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	99.1us	1.21ms	9.15ms	9.05ms
80	0	83	996.0 kbps	82	984.0 kbps	1	12.0 kbps	98.5us	1.08ms	9.82ms	9.72ms
79	0	85	1020.0 kbps	84	1008.0 kbps	1	12.0 kbps	95.7us	1.40ms	20.2ms	20.1ms
78	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	99.5us	1.08ms	9.26ms	9.16ms
77	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	100.us	1.38ms	13.5ms	13.4ms
76	0	83	996.0 kbps	82	984.0 kbps	1	12.0 kbps	284.us	1.43ms	11.5ms	11.2ms
75	0	83	996.0 kbps	82	984.0 kbps	1	12.0 kbps	96.0us	1.37ms	12.5ms	12.4ms
74	0	84	1008.0 kbps	84	1008.0 kbps	0	0 bps	101.us	1.23ms	8.65ms	8.55ms
73	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	300.us	1.47ms	15.0ms	14.7ms
72	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	102.us	1.18ms	9.90ms	9.80ms

20 items

FastTrack on

Seq	ID	Tx Packets	Tx Rate	Rx Pack...	Rx Rate	Lost P...	Lost Rate	Lat. Min.	Lat. Avg.	Lat. M...	Jitter
TOT	0	2 666	999.7 kbps	2 663	998.6 kbps	3	1125 bps	111.us	921.us	12.8ms	12.7ms
32	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	118.us	761.us	9.45ms	9.33ms
31	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	118.us	876.us	11.3ms	11.1ms
30	0	84	1008.0 kbps	84	1008.0 kbps	0	0 bps	121.us	1.04ms	11.9ms	11.8ms
29	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	129.us	979.us	12.7ms	12.6ms
28	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	122.us	1.06ms	10.8ms	10.7ms
27	0	84	1008.0 kbps	84	1008.0 kbps	0	0 bps	116.us	974.us	12.0ms	11.9ms
26	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	118.us	812.us	9.22ms	9.10ms
25	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	146.us	965.us	10.9ms	10.7ms
24	0	84	1008.0 kbps	84	1008.0 kbps	0	0 bps	114.us	964.us	12.4ms	12.3ms
23	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	114.us	853.us	10.4ms	10.2ms
22	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	112.us	920.us	11.5ms	11.4ms
21	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	111.us	972.us	12.0ms	11.9ms
20	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	121.us	831.us	10.3ms	10.2ms
19	0	84	1008.0 kbps	84	1008.0 kbps	0	0 bps	117.us	970.us	11.6ms	11.5ms
18	0	84	1008.0 kbps	84	1008.0 kbps	0	0 bps	116.us	960.us	12.2ms	12.1ms
17	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	115.us	830.us	10.7ms	10.6ms
16	0	83	996.0 kbps	83	996.0 kbps	0	0 bps	116.us	933.us	10.9ms	10.8ms

20 items

SysArts

Fast Track

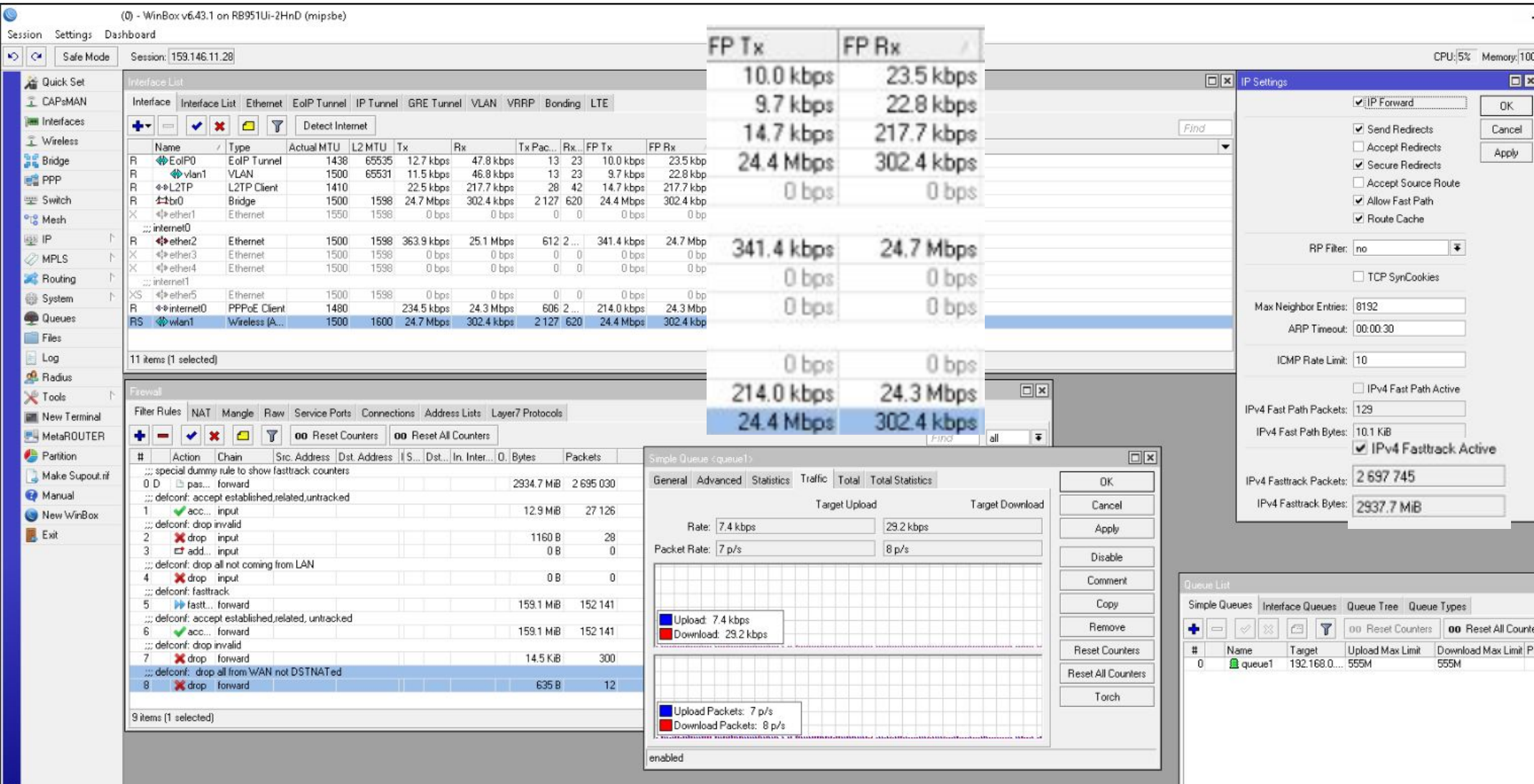
Fast Track Versus;

	Traffic	Lost Rate	Average	Maximum	CPU
Fast Track No	294Mbps	%0.06	1.23ms	21.8	%100
Fast Track Yes	839Mbps	%0.001	921.us	12.8ms	% 72
Performans	**3X**	**60X**	**%33**	**%70**	%28

SysArts

Fast Path & Fast Track

ALL Interface Fast Path active
Ipv4 Fast Track Active
Firewall Filter and Nat used!



ISP network Planning, Design And Installation

- Capacity Planning
- Productivity
- Performance
- Cost
- Scalability

https://wiki.mikrotik.com/wiki/Manual:License

ISP network Planning, Design And Installation

Level number	0 (Trial mode)	1 (Free Demo)	3 (WISP CPE)	4 (WISP)	5 (WISP)	6 (Controller)
Price	no key	registration required	volume only	$45	$95	$250
Initial Config Support	-	-	-	15 days	30 days	30 days
Wireless AP	24h trial	-	-	yes	yes	yes
Wireless Client and Bridge	24h trial	-	yes	yes	yes	yes
RIP, OSPF, BGP protocols	24h trial	-	yes(*)	yes	yes	yes
EoIP tunnels	24h trial	1	unlimited	unlimited	unlimited	unlimited
PPPoE tunnels	24h trial	1	200	200	500	unlimited
PPTP tunnels	24h trial	1	200	200	500	unlimited
L2TP tunnels	24h trial	1	200	200	500	unlimited
OVPN tunnels	24h trial	1	200	200	unlimited	unlimited
VLAN interfaces	24h trial	1	unlimited	unlimited	unlimited	unlimited
HotSpot active users	24h trial	1	1	200	500	unlimited
RADIUS client	24h trial	-	yes	yes	yes	yes
Queues	24h trial	1	unlimited	unlimited	unlimited	unlimited
Web proxy	24h trial	-	yes	yes	yes	yes
User manager active sessions	24h trial	1	10	20	50	Unlimited
Number of KVM guests	none	1	Unlimited	Unlimited	Unlimited	Unlimited

https://wiki.mikrotik.com/wiki/Manual:License

ISP network Planning, Design And Installation

https://mikrotik.com/products/group/ethernet-routers

MikroTik

Home About Buy Jobs Hardware Software Support Training Account

Products

out on port 10, 2x1.4GHz CPU, 1GB RAM, RouterOS L5

RB4011iGS+RM NEW

Powerful 10xGigabit port router with a Quad-core 1.4Ghz CPU, 1GB RAM, SFP+ 10Gbps cage and desktop case with rack ears

L5

$199.00

RB1100AHx4

Powerful 1U rackmount router with 13x Gigabit Ethernet port <p>

L6

$299.00

RB1100AHx4 Dude Edition

Powerful 1U rackmount router with 13x Gigabit Ethernet ports, 60GB M.2 drive for Dude database L6

$349.00

CCR1009-7G-1C-PC

7x Gigabit Ethernet, 1x Combo port (SFP or Gigabit Ethernet), 9 cores x 1GHz CPU, 1GB RAM, passive cooling case, RouterOS

L6

$425.00

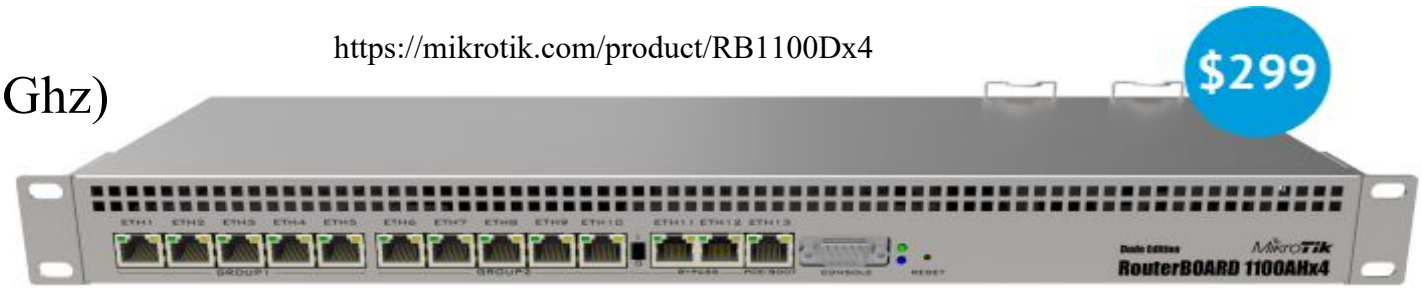
SysArts

ISP network Planning, Design And Installation

RB1100x4 Kapasite & Performans Testi

CPU core 4
CPU 1.4 GHz (Overclock 2Ghz)
Routing FastPath 7.35Gbit
RAM 1 GB
License **level 6**
Ipsec Hardware acceleration 2.2Gbps AES128).

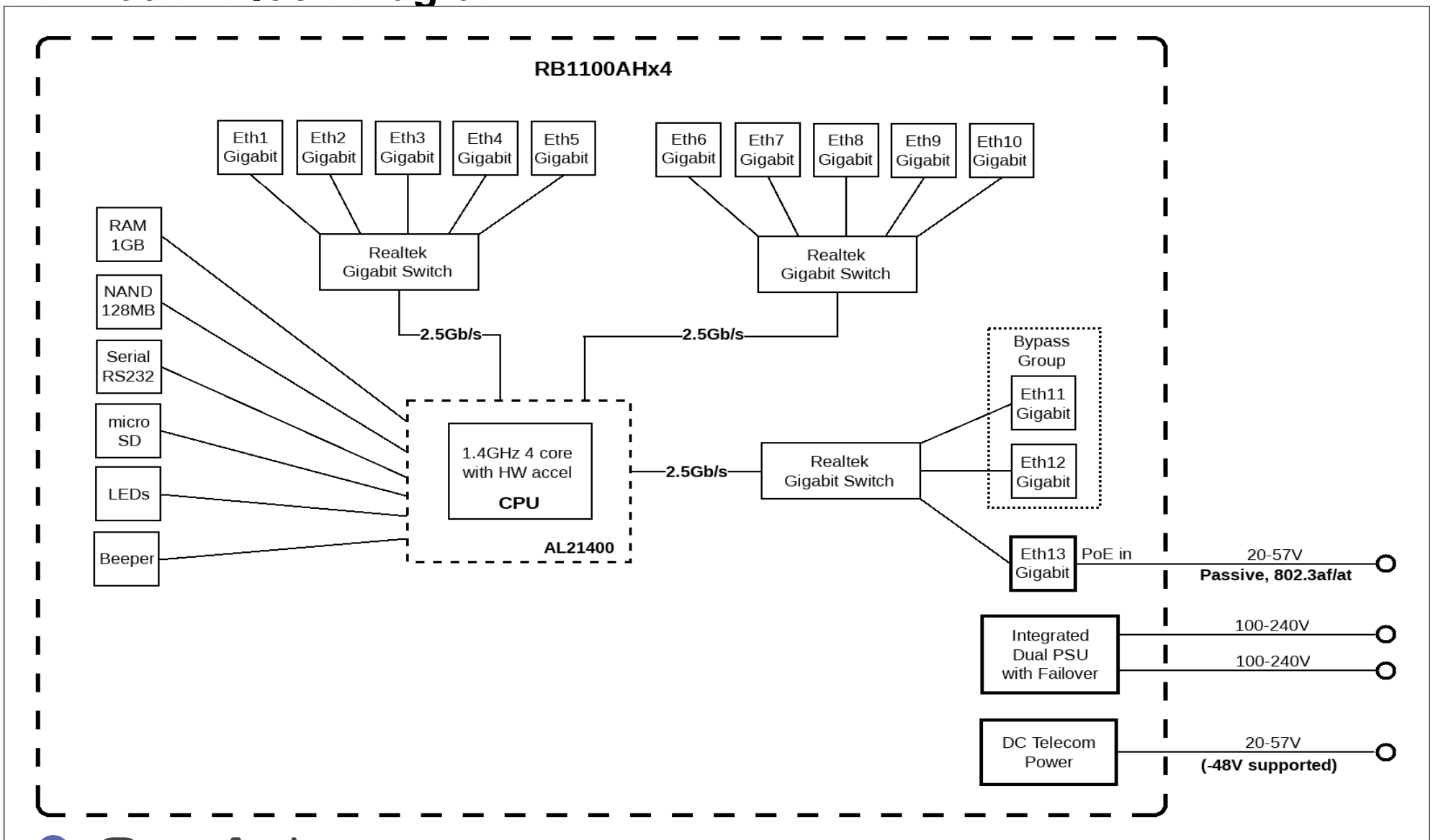
https://mikrotik.com/product/RB1100Dx4



SysArts

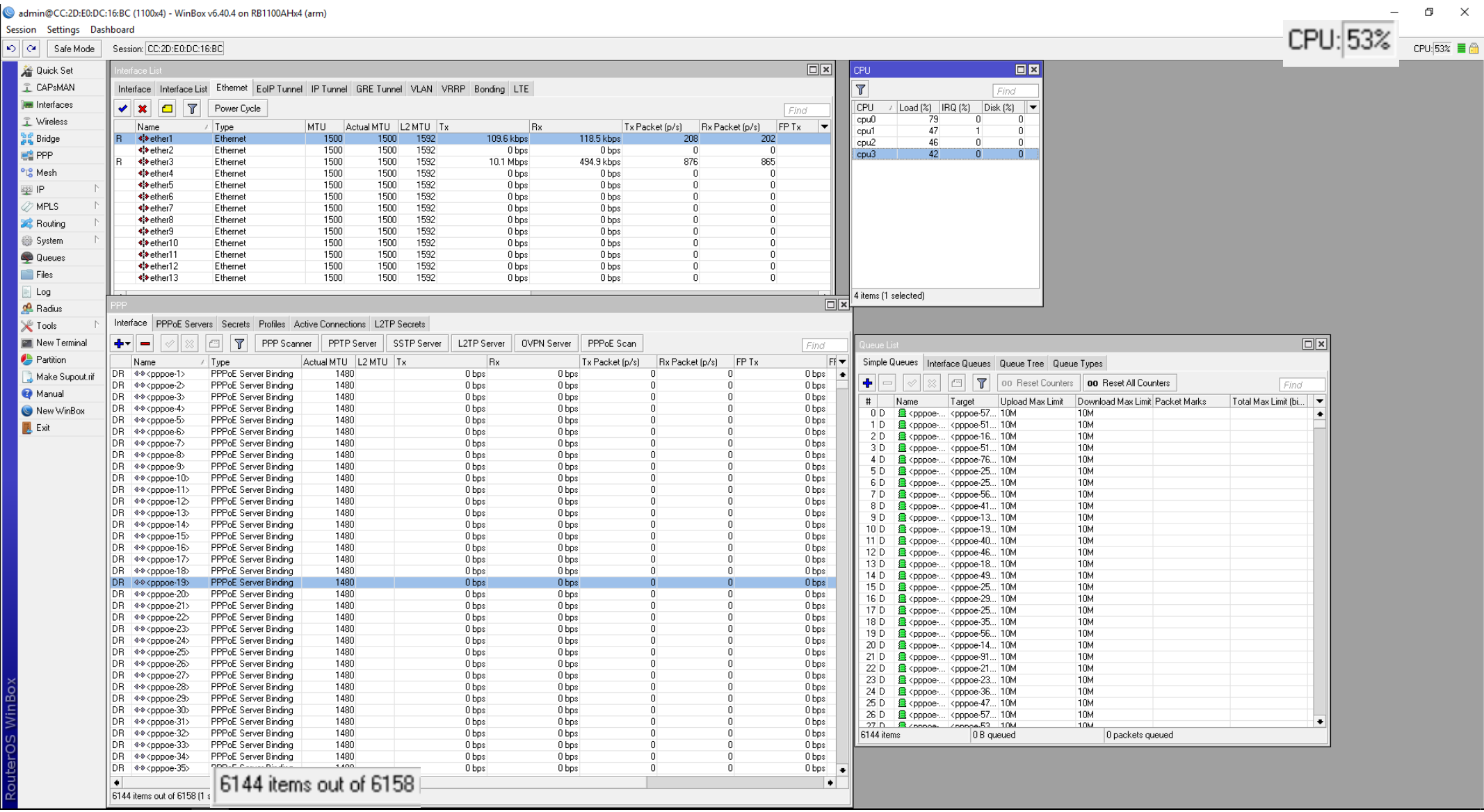
ISP network Planning, Design And Installation

RB1100x4 Block Diagram



https://i.mt.lv/cdn/rb_files/RB1100AHx4v5-180110082518.png

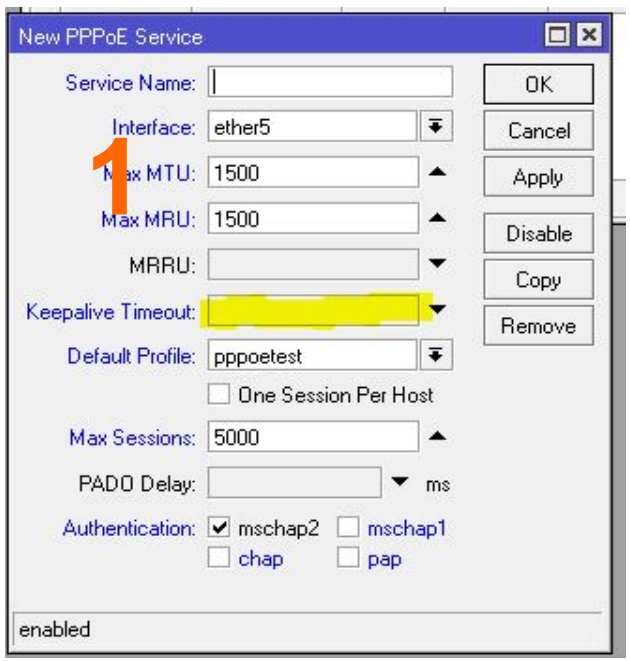
ISP network Planning, Design And Installation



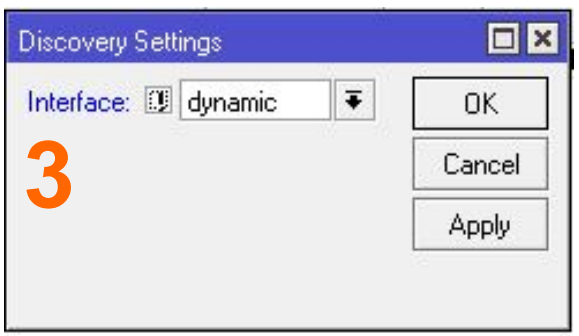
SysArts

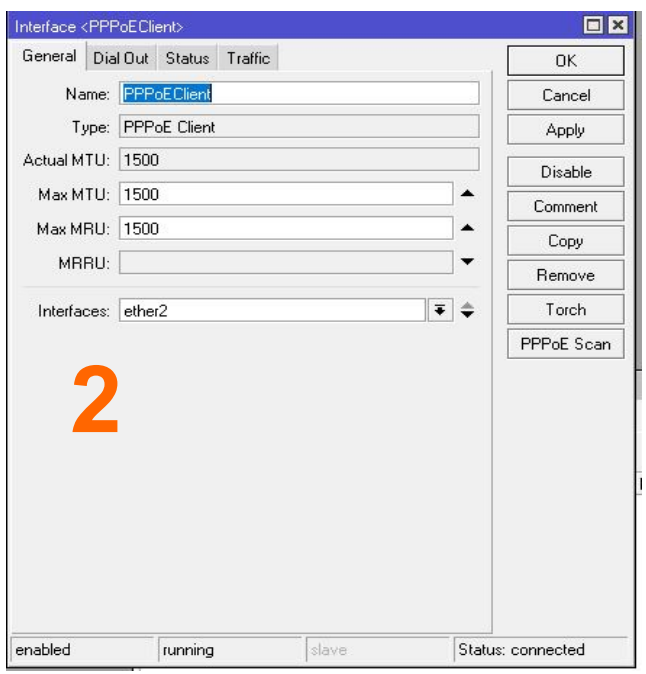
ISP network Planning, Design And Installation

interface pppoe-server server add authentication=mschap2 interface=ether5 keepalive-timeout=disabled max-mtu=1500 max-mru=1500 disabled=no default-profile=pppoetest max-sessions=5000



/ip neighbor discovery-settings set discover-interface-list=!dynamic



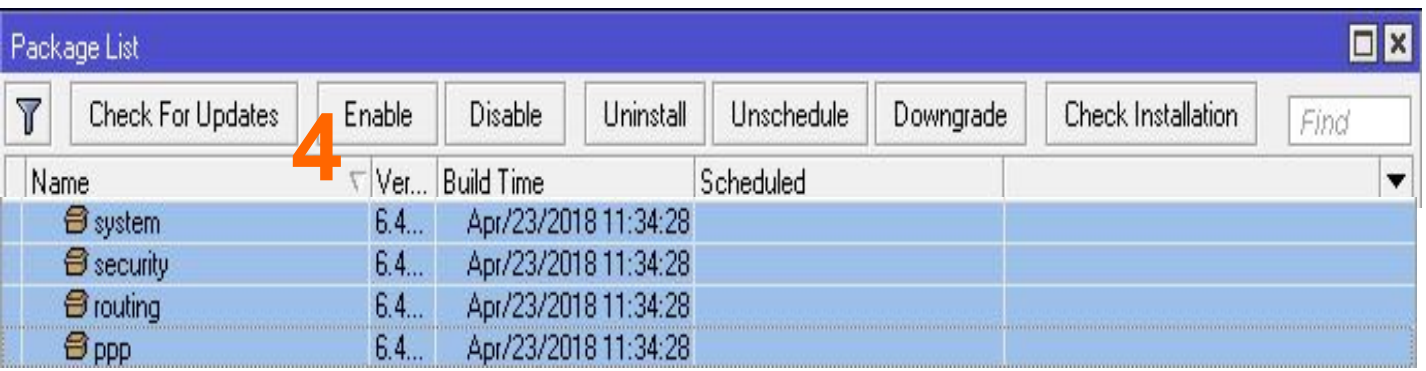


/interface pppoe-client add interface=ether2 disabled=no add-default-route=yes default-route-distance=1 user=testuser password=testpass max-mtu=1500 max-mru=1500 allow=mschap2 name=PPPoEClient profile=default

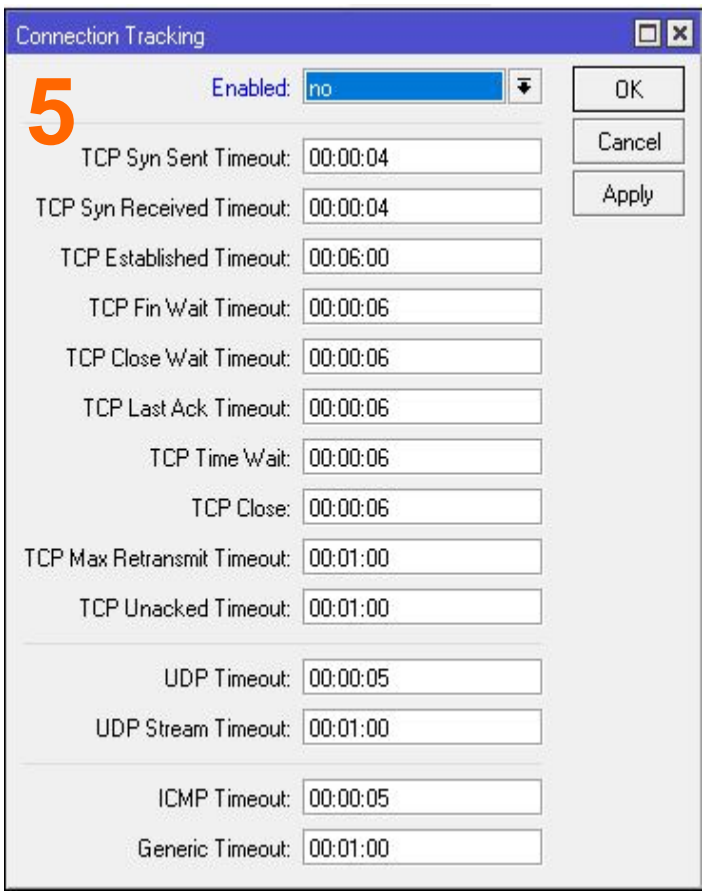
SysArts

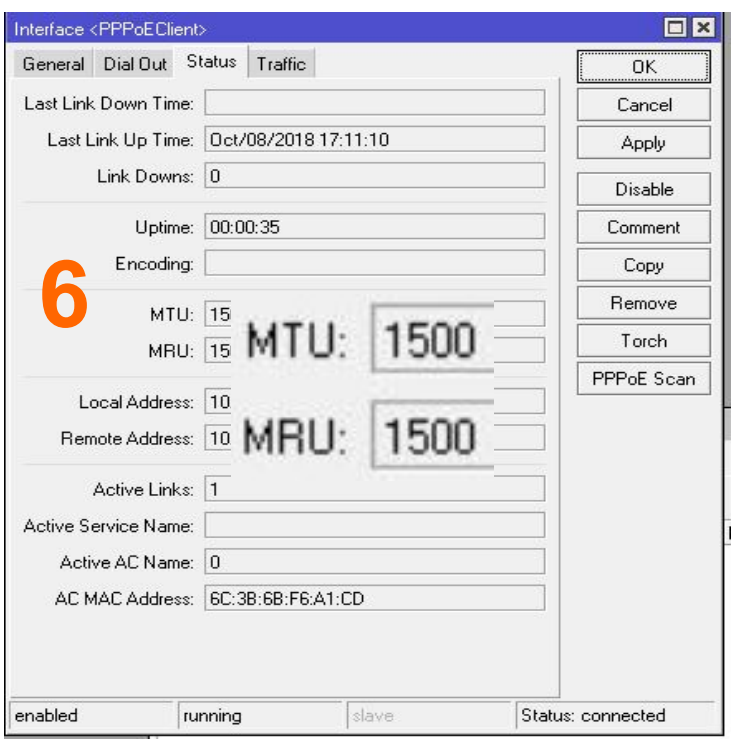
ISP network Planning, Design And Installation

/system package uninstall [find]
/system package unschedule system,ppp,security,routing



/ip firewall connection tracking set enabled=no





SysArts

ISP network Planning, Design And Installation

What have we changed for router performance?

- 1- PPPoE Server MTU, MRU and Keep-alive-timeout setting change.
- 2- PPPoE Client için MTU, MRU ve Keep-alive-timeout setting change.
- 3- IP Neighborsh ayarlarını !=Dynamic
- 4- PPPoE Server only requirement packet installing. Any Other packages unistall.
- 5- PPPoE Server Connection Tracking Setting=No .

SysArts

ISP network Planning, Design And Installation

What happened after the router performance changes?

- PPPoE Server FULL MTU Support (1500) Any to Any package No fragmentation!

  Fragmentation packet no Fast path!!!!
- Keep-Alive-Timeout disabled=yes (PPPoE Concentrator Router only Internet Traffic)
- PPPoE Client FULL MTU Support (1500) and Keep-alive-timeout Disabled=yes

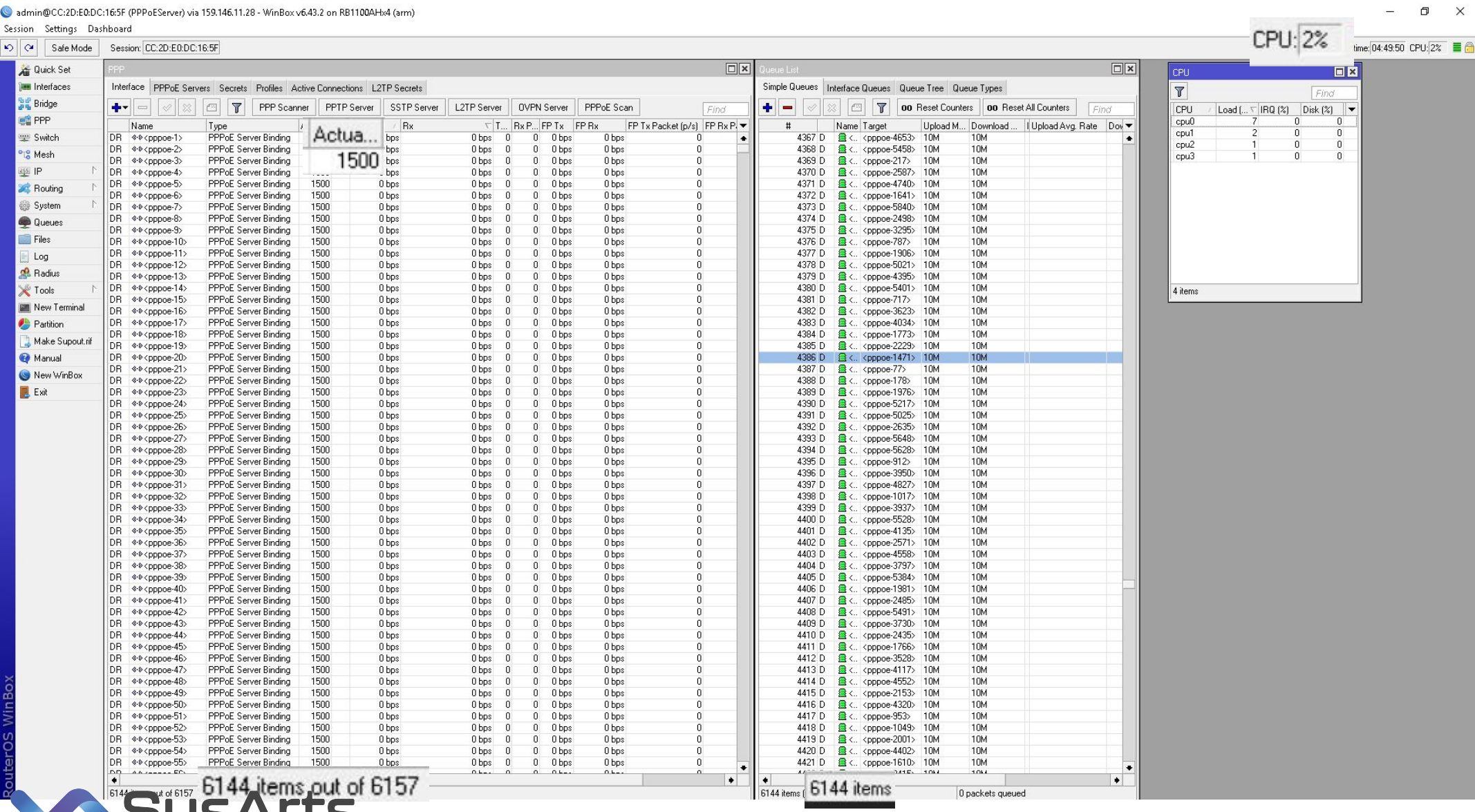
  Keep-alive-timeout on the client will improve performance on the server side!
- PPPoE output MNDP packet drop, Only !=Dynamic packaget Yes.
- We've removed all the packages we don't need to use resources efficiently on PPPoE

  Concentrator
- PPPoE Concentrator set ConnTrack=NO No Nat State and other (mangle,Firewal

  Filter vb disabled=yes)

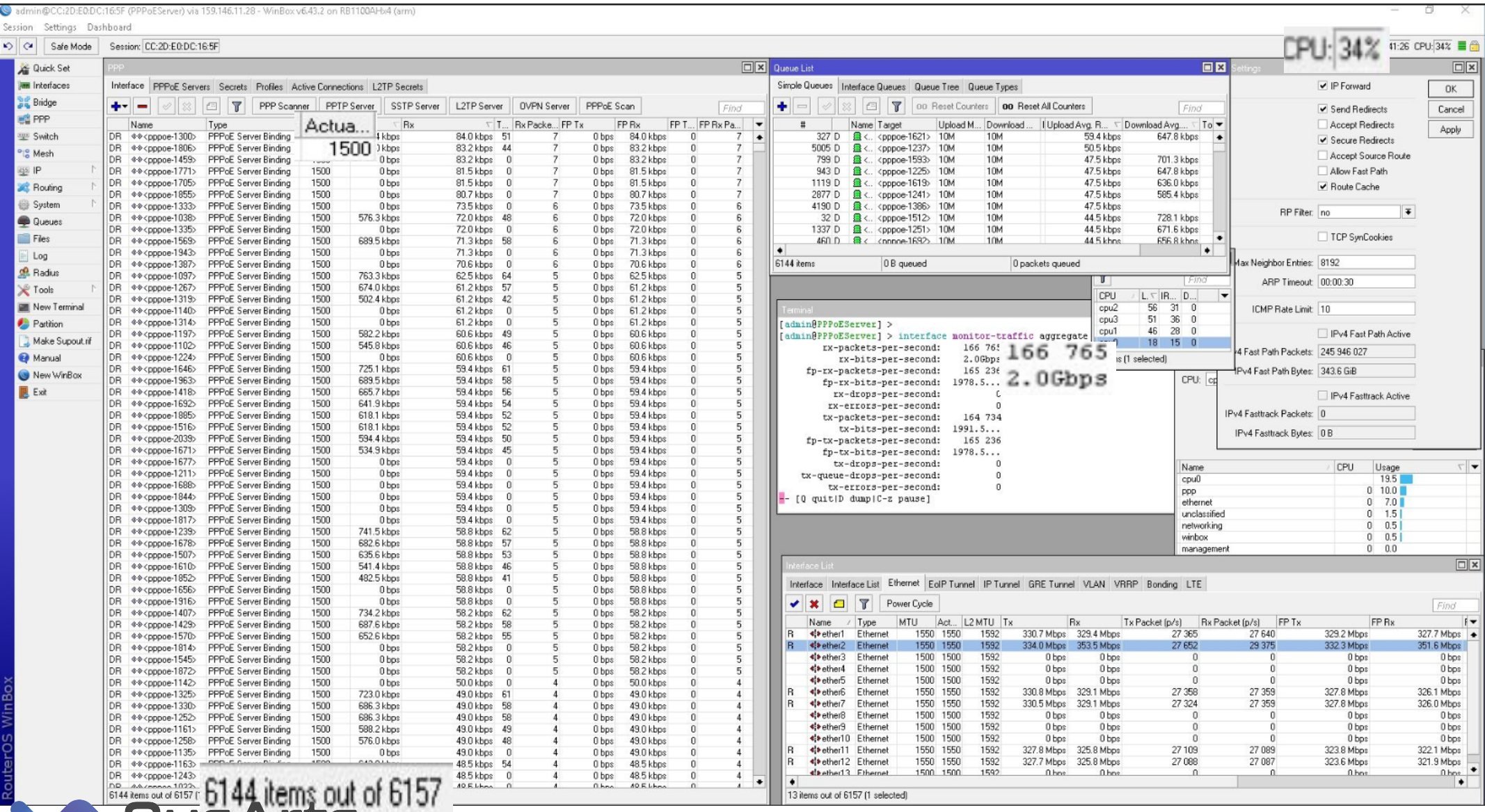
SysArts

ISP network Planning, Design And Installation



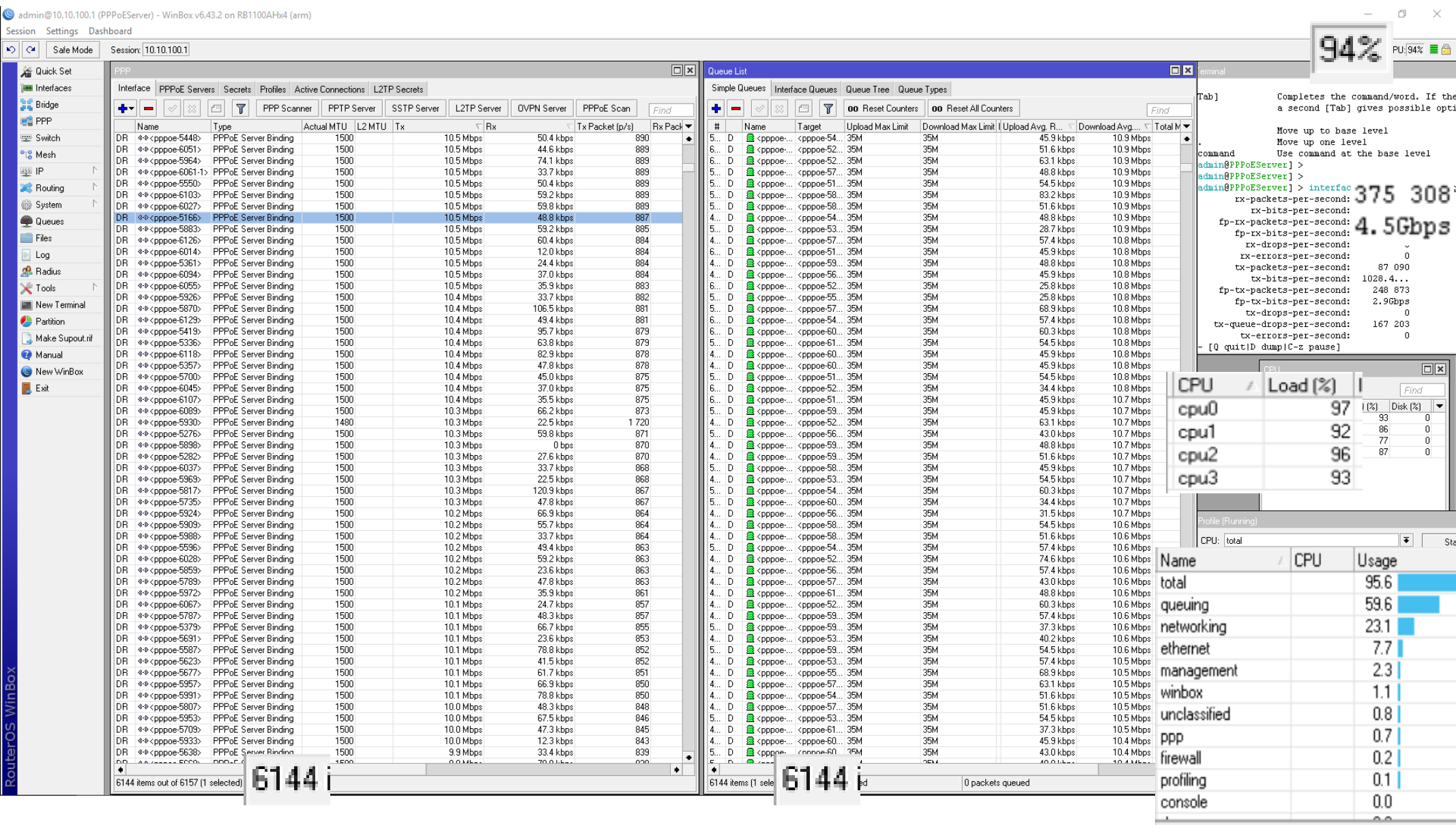
SysArts

ISP network Planning, Design And Installation

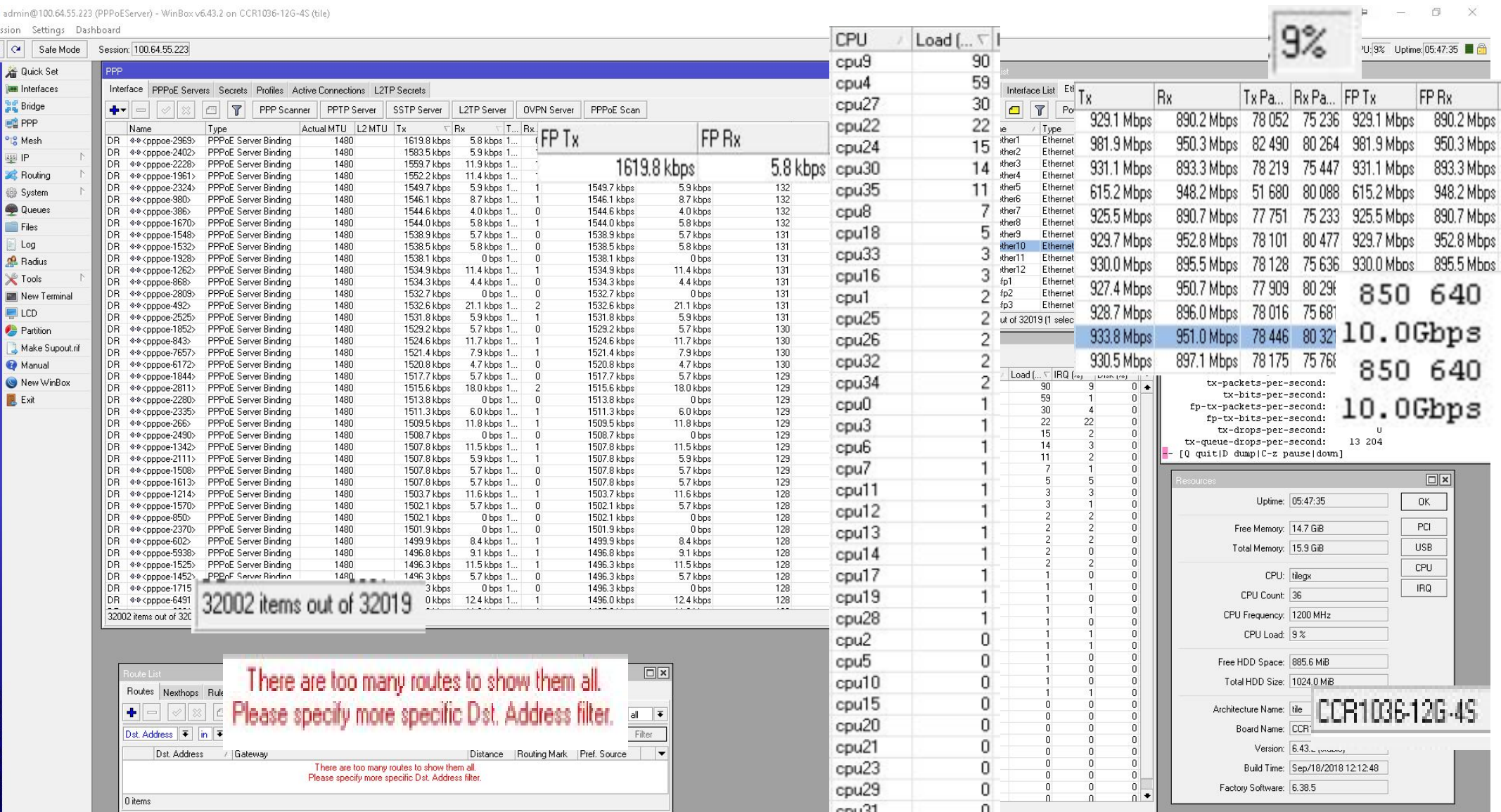


SysArts

ISP network Planning, Design And Installation

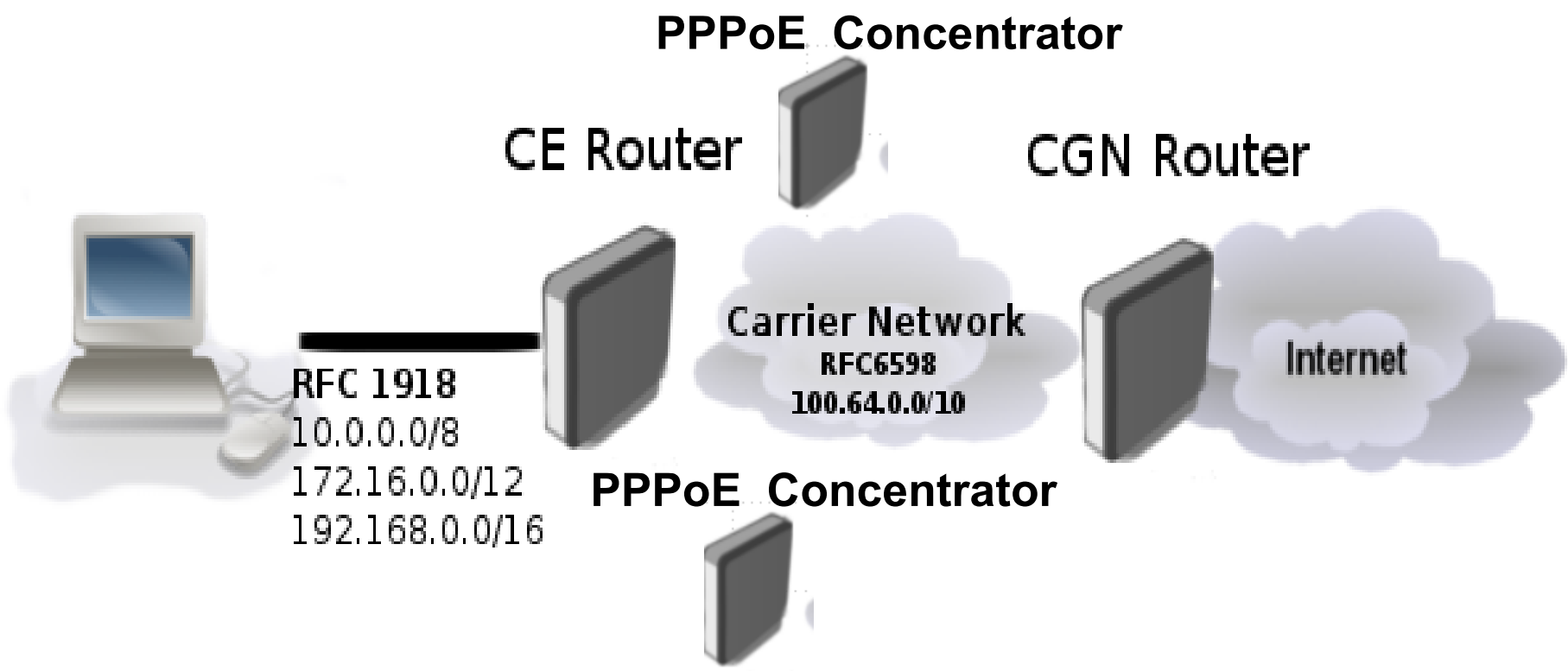


ISP network Planning, Design And Installation



ISP network Planning, Design And Installation

Carrier-Grade NAT (CGNAT) or NAT444



https://wiki.mikrotik.com/wiki/Manual:IP/Firewall/NAT#Carrier-Grade_NAT_.28CGNAT.29_or_NAT444

ISP network Planning, Design And Installation

Carrier-Grade NAT (CGNAT) or NAT444

SysArts

https://wiki.mikrotik.com/wiki/Manual:IP/Firewall/NAT#Carrier-Grade_NAT_.28CGNAT.29_or_NAT444

ISP network Planning, Design And Installation

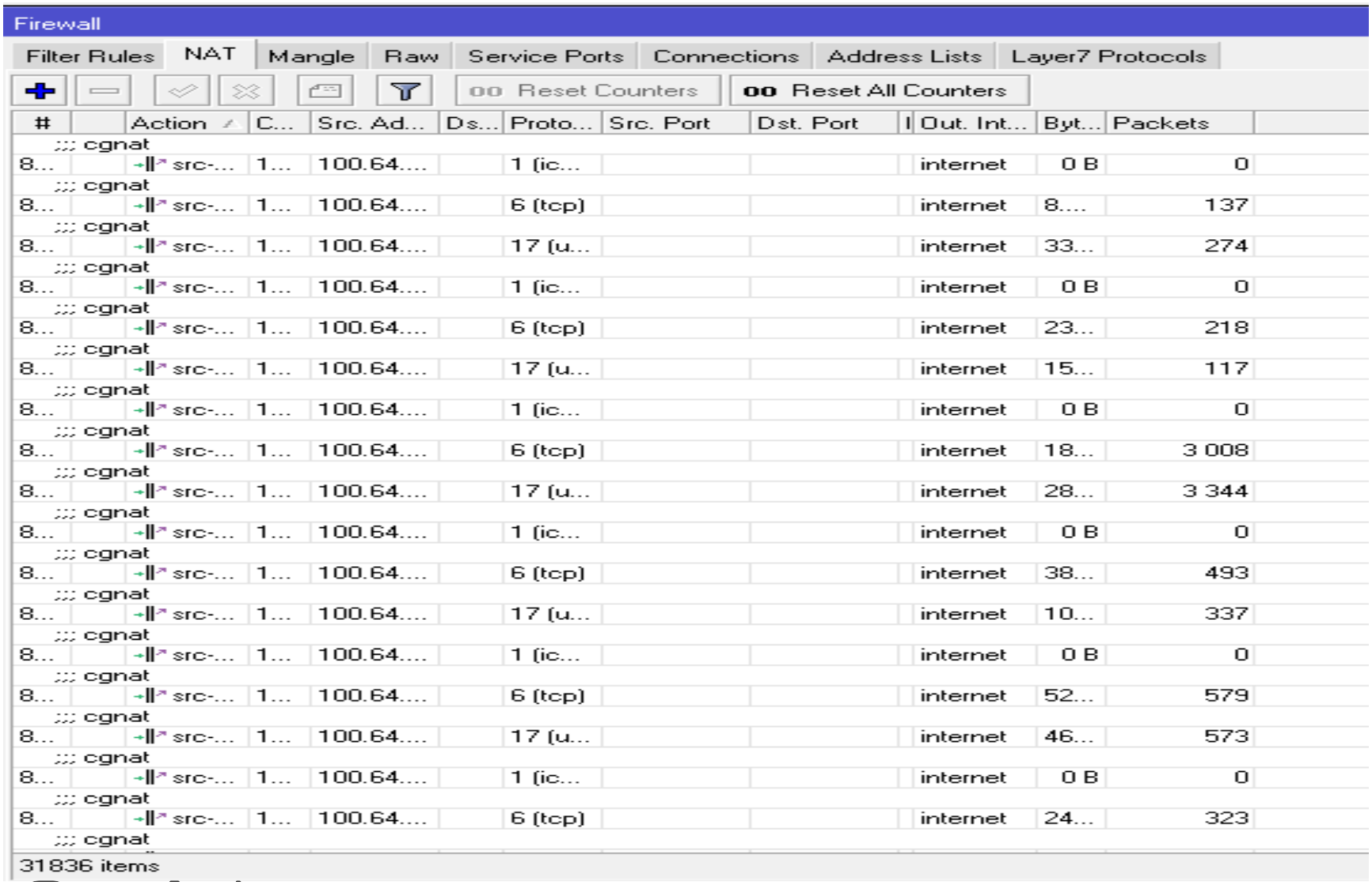
Carrier-Grade NAT (CGNAT) or NAT444

```
[admin@rack1_b18_450] /ip firewall nat> print
Flags: X - disabled, I - invalid, D - dynamic
 0    chain=srcnat action=jump jump-target=xxx src-address=100.64.1.1-100.64.1.6 log=no log-prefix=""

 1    chain=xxx action=jump jump-target=xxx-0 src-address=100.64.1.1-100.64.1.2 log=no log-prefix=""

 2    chain=xxx action=jump jump-target=xxx-1 src-address=100.64.1.3-100.64.1.4 log=no log-prefix=""

 3    chain=xxx action=jump jump-target=xxx-2 src-address=100.64.1.5-100.64.1.6 log=no log-prefix=""

 4    chain=xxx-0 action=src-nat to-addresses=2.2.2.2 to-ports=2000-2099 protocol=tcp src-address=100.64.1.1 log=no log-prefix=""

 5    chain=xxx-0 action=src-nat to-addresses=2.2.2.2 to-ports=2000-2099 protocol=udp src-address=100.64.1.1 log=no log-prefix=""

 6    chain=xxx-0 action=src-nat to-addresses=2.2.2.2 to-ports=2100-2199 protocol=tcp src-address=100.64.1.2 log=no log-prefix=""

 7    chain=xxx-0 action=src-nat to-addresses=2.2.2.2 to-ports=2100-2199 protocol=udp src-address=100.64.1.2 log=no log-prefix=""

 8    chain=xxx-1 action=src-nat to-addresses=2.2.2.2 to-ports=2200-2299 protocol=tcp src-address=100.64.1.3 log=no log-prefix=""

 9    chain=xxx-1 action=src-nat to-addresses=2.2.2.2 to-ports=2200-2299 protocol=udp src-address=100.64.1.3 log=no log-prefix=""

10    chain=xxx-1 action=src-nat to-addresses=2.2.2.2 to-ports=2300-2399 protocol=tcp src-address=100.64.1.4 log=no log-prefix=""

11    chain=xxx-1 action=src-nat to-addresses=2.2.2.2 to-ports=2300-2399 protocol=udp src-address=100.64.1.4 log=no log-prefix=""

12    chain=xxx-2 action=src-nat to-addresses=2.2.2.2 to-ports=2400-2499 protocol=tcp src-address=100.64.1.5 log=no log-prefix=""

13    chain=xxx-2 action=src-nat to-addresses=2.2.2.2 to-ports=2400-2499 protocol=udp src-address=100.64.1.5 log=no log-prefix=""

14    chain=xxx-2 action=src-nat to-addresses=2.2.2.2 to-ports=2500-2599 protocol=tcp src-address=100.64.1.6 log=no log-prefix=""

15    chain=xxx-2 action=src-nat to-addresses=2.2.2.2 to-ports=2500-2599 protocol=udp src-address=100.64.1.6 log=no log-prefix=""
```


https://wiki.mikrotik.com/wiki/Manual:IP/Firewall/NAT#Carrier-Grade_NAT_.28CGNAT.29_or_NAT444

ISP network Planning, Design And Installation

Carrier-Grade NAT (CGNAT) or NAT444

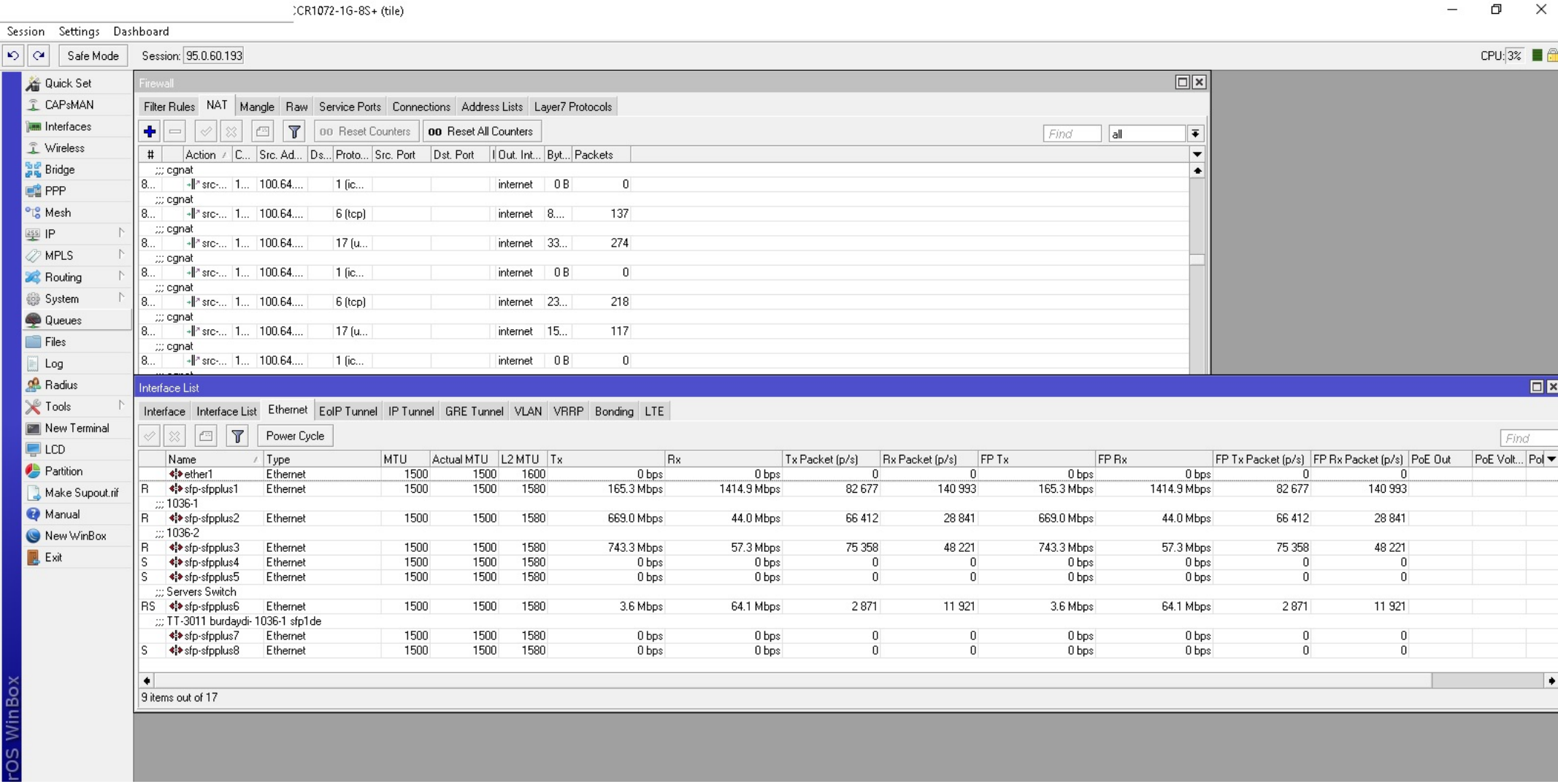


SysArts

https://wiki.mikrotik.com/wiki/Manual:IP/Firewall/NAT#Carrier-Grade_NAT_.28CGNAT.29_or_NAT444

ISP network Planning, Design And Installation

Carrier-Grade NAT (CGNAT) or NAT444



SysArts

https://wiki.mikrotik.com/wiki/Manual:IP/Firewall/NAT#Carrier-Grade_NAT_.28CGNAT.29_or_NAT444

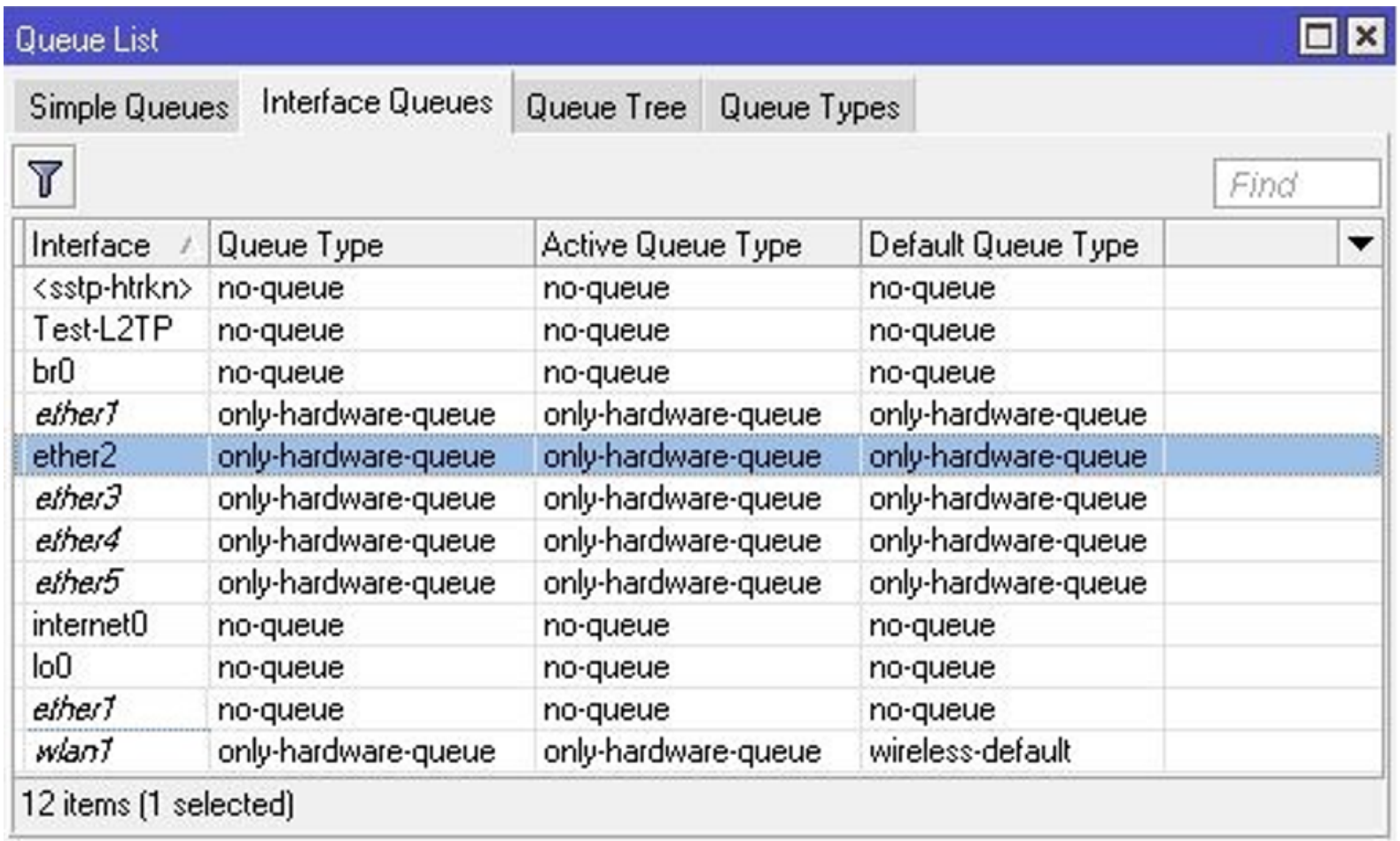
Type and tricks

- network MTU MRU planning and package to prevent fragmentation
- Overall Performance Using Fast Path and Fast Track Increased Average 4X
- Large gain in delay times and packet losses
- Internet Traffic Only on Routers
- User peer Gigabit rate!
- FULL MTU Support and Overcoming MTU-related problems
- Change MSS is using on PPPoE Server! We may no longer need Change MSS.

Fast Path

Guarantee Interface Fast Path

Warranty fast path for Interface Queue Queue Type ="Only-hardware-queue" .



SysArts

Question & answer

Resources;

FastPath Overview (MuM Europe, 2016)

https://mum.mikrotik.com/presentations/EU16/presentation_2901_1456413105.pdf

FastPath Overview (MuM Ukranie, 2015)

https://mum.mikrotik.com/presentations/UA15/presentation_3077_1449654925.pdf

Linux Forwarding Stack Fastpath

https://netdevconf.org/1.2/slides/oct7/03_Linux_Forwarding_Stack_Fastpath.pdf

Open FastPath

https://openfastpath.org/wp-content/uploads/2018/01/OpenFastPath_Overview.pdf

MikroTİk Wiki Fast Path

https://wiki.mikrotik.com/wiki/Manual:Fast_Path

MikroTİk wiki Fast Track

https://wiki.mikrotik.com/wiki/Manual:IP/Fasttrack

MikroTik Newsletter #65

https://download2.mikrotik.com/news/news_65.pdf

Most underused MikroTik hardwareand software featuresOR“The path between fastpath andadvanced features”

https://mum.mikrotik.com/presentations/MX18/presentation_5286_1524556369.pdf

Janis-Megis New Product !

http://www.mikrotik.co.id/download/MOS-ID-2015/Introduction_Janis-Megis.pdf

Wiki MikroTik Scripting

https://wiki.mikrotik.com/wiki/Manual:Scripting

Interframe spacing

https://en.wikipedia.org/wiki/Interpacket_gap

https://www.embedded.com/design/operating-systems/4403058/Accelerating-network-packet-processing-in-Linux

https://www.embedded.com/design/programming-languages-and-tools/4425631/Using-fastpath-software-to-boost-performance-of-Linux-based-home-network-routers

http://netsecinfo.blogspot.com/2010/03/linux-based-fast-path-why-is-this.html

https://slideplayer.com/slide/9469203/

support@mikrotik.com

SysArts