



# BANDWIDTH

MANAGER WITH MIKROTIK





**I AM GROOT**

**HE HELPED ME TO FIND RIGHT PICTURES**

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- MIKROTIK TRAINER
- SPLYNX SOFTWARE
- BGP, OSPF, MPLS
- MUM PRESENTER
- RUSSIAN-CZECH-ENGLISH-SPANISH





**READY ?  
LET'S START !**



# **POLICING AND SHAPING**

**DROP PACKETS OR PUT THEM TO BUCKET ?**

A photograph of two men in suits shaking hands. The man on the left is older, with glasses, wearing a grey suit and a red tie. The man on the right is bald, with glasses, wearing a dark suit and smiling broadly. The background shows an ornate interior with a large vase and other people.

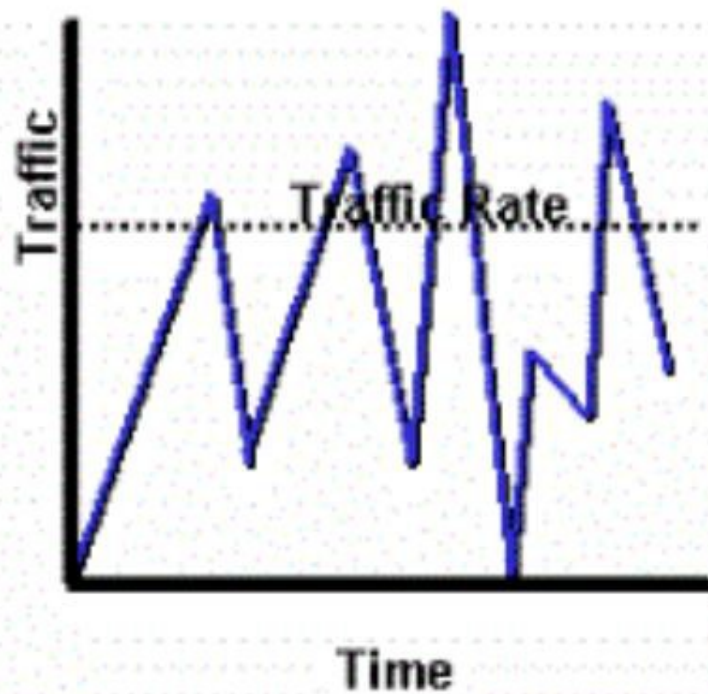
# **POLITICS AND SHAKING**

## **DROP OR PUT TO BUCKET ?**

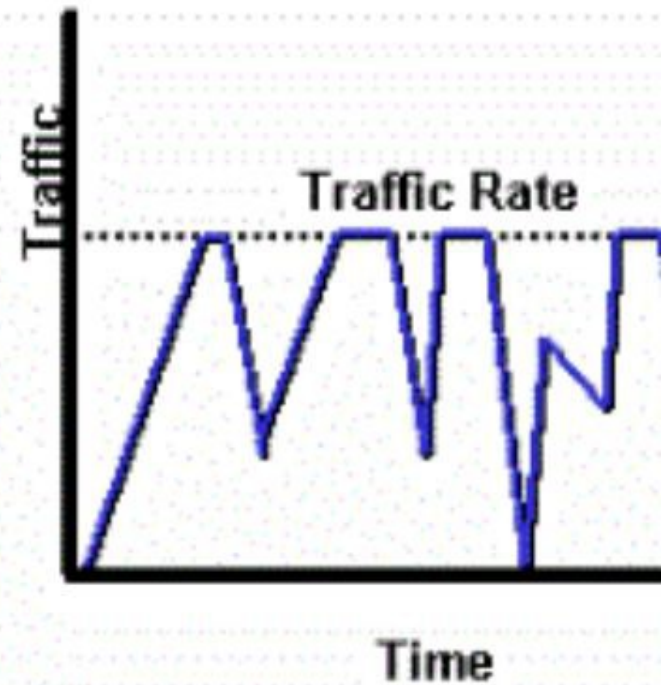




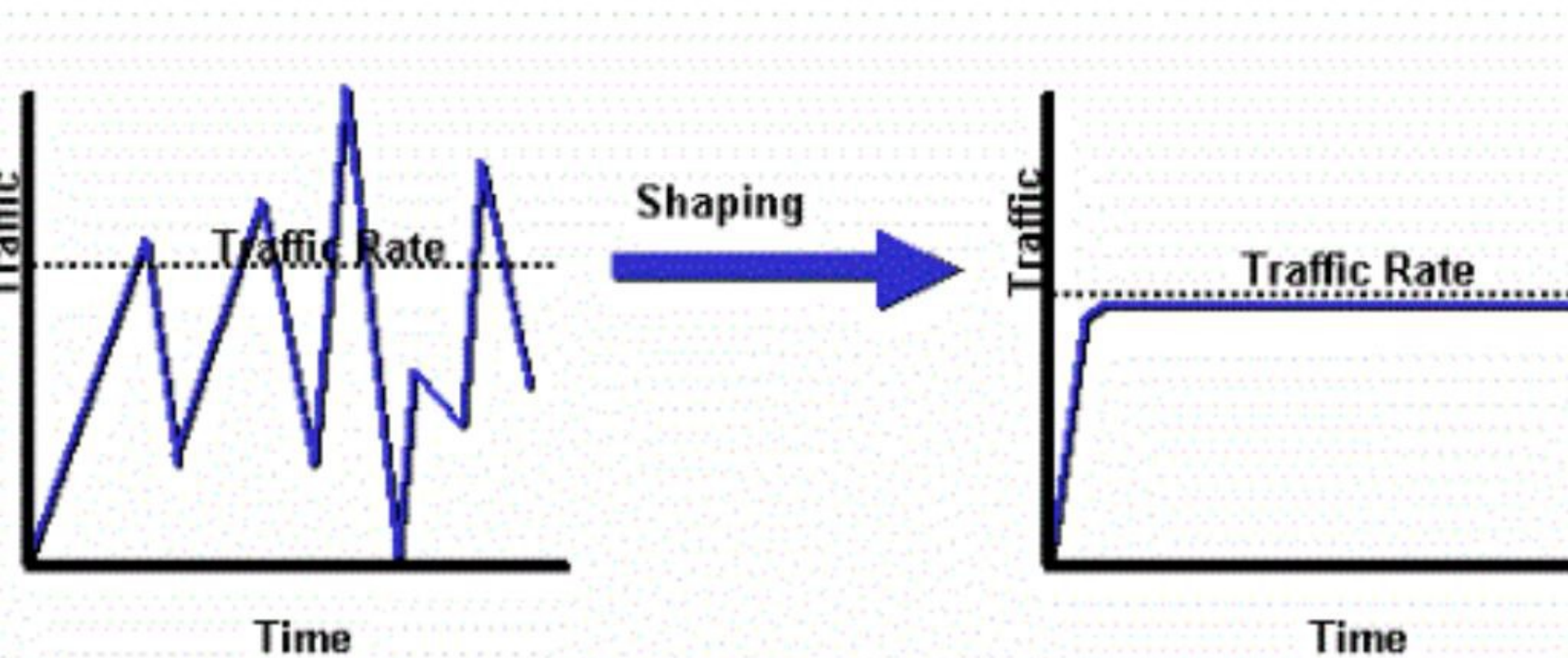
# POLICING



Policing



# SHAPING



# SHAPING

QUEUES, HTB, PCQ



**IT'S ALL ABOUT QUEUES**

- Bridge
- PPP
- Mesh
- IP
- MPLS
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- LCD
- Partition
- Make Supout.rif
- Manual
- New WinBox
- Exit

#	Name	Target	Upload Max Limit	Download Max Limit	Packet Marks	Tot
214	SpLSQ_708-1274	10.25.4.154	360k	460k		
	;;; 000707					
1...	SpLSQ_707-4976	10.25.4.206	360k	460k		
	;;; 000706					
182	SpLSQ_706-1139	10.25.4.128	360k	460k		
	;;; 000704					
220	SpLSQ_704-1321	10.25.4.165	360k	460k		
	;;; 000703					
246	SpLSQ_703-1476	10.25.4.208	360k	460k		
	;;; 000702					
181	SpLSQ_702-1132	10.25.4.126	360k	460k		
	;;; 000701					
1...	SpLSQ_701-5743	10.25.4.83	360k	460k		
	;;; 000700					
197	SpLSQ_700-1214	10.25.4.142	360k	460k		
	;;; 000699					
1...	SpLSQ_699-5051	10.25.4.199	360k	460k		
	;;; 000698					
1...	SpLSQ_698-5146	10.25.4.130	360k	460k		
	;;; 000697					
233	SpLSQ_697-1390	10.25.4.183	360k	460k		
	;;; 000696					
221	SpLSQ_696-1341	10.25.4.169	360k	460k		
	;;; 000695					
245	SpLSQ_695-1474	10.25.4.207	360k	460k		
	;;; 000694					
1...	SpLSQ_694-5148	10.25.4.43	360k	460k		
	;;; 000693					
1...	SpLSQ_693-5364	10.25.4.185	360k	460k		
	;;; 000692					
1...	SpLSQ_692-5705	10.25.4.189	360k	460k		
	;;; 000691					
236	SpLSQ_691-1416	10.25.4.187	360k	460k		
	;;; 000690					



# WHAT TO MANAGE

- **LIMIT CUSTOMER'S SPEED**
- **ALLOCATE BANDWIDTH TO APPLICATIONS**
- **PRIORITISATION FOR CERTAIN TYPE OF TRAFFIC**

# MIKROTIK SHAPING



**1. QUEUE TREE**

**2. QT: PCQ+ADDRESS LIST**

**3. SIMPLE QUEUE**

**4. SIMPLE QUEUE +  
PARENTS**

A small, brown, tree-like creature with a smiling face and large eyes, standing in a light-colored pot. The creature has a thick, gnarled trunk and thin, branch-like arms. The background is white.

# 1. CUTE TREE



# 1. QUEUE TREE

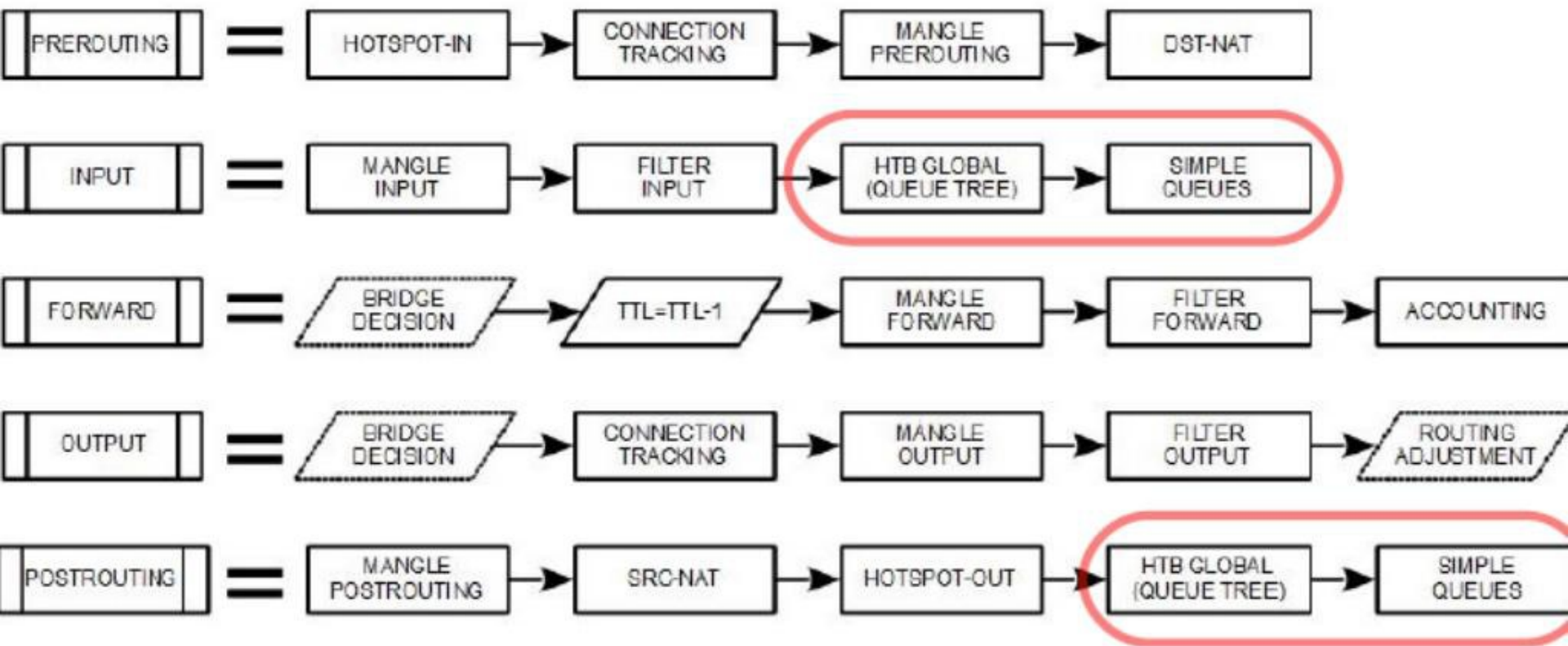


# 1. QUEUE TREE

- NEED TO MANGLE ALL (SLOW)
- TREE WITH MULTIPLE LEVELS
- CAN BE USED FOR TRAFIC TYPE PRIORITISATION (DOUBLE QOS)
- HTB GLOBAL IS USED FOR QUEUES



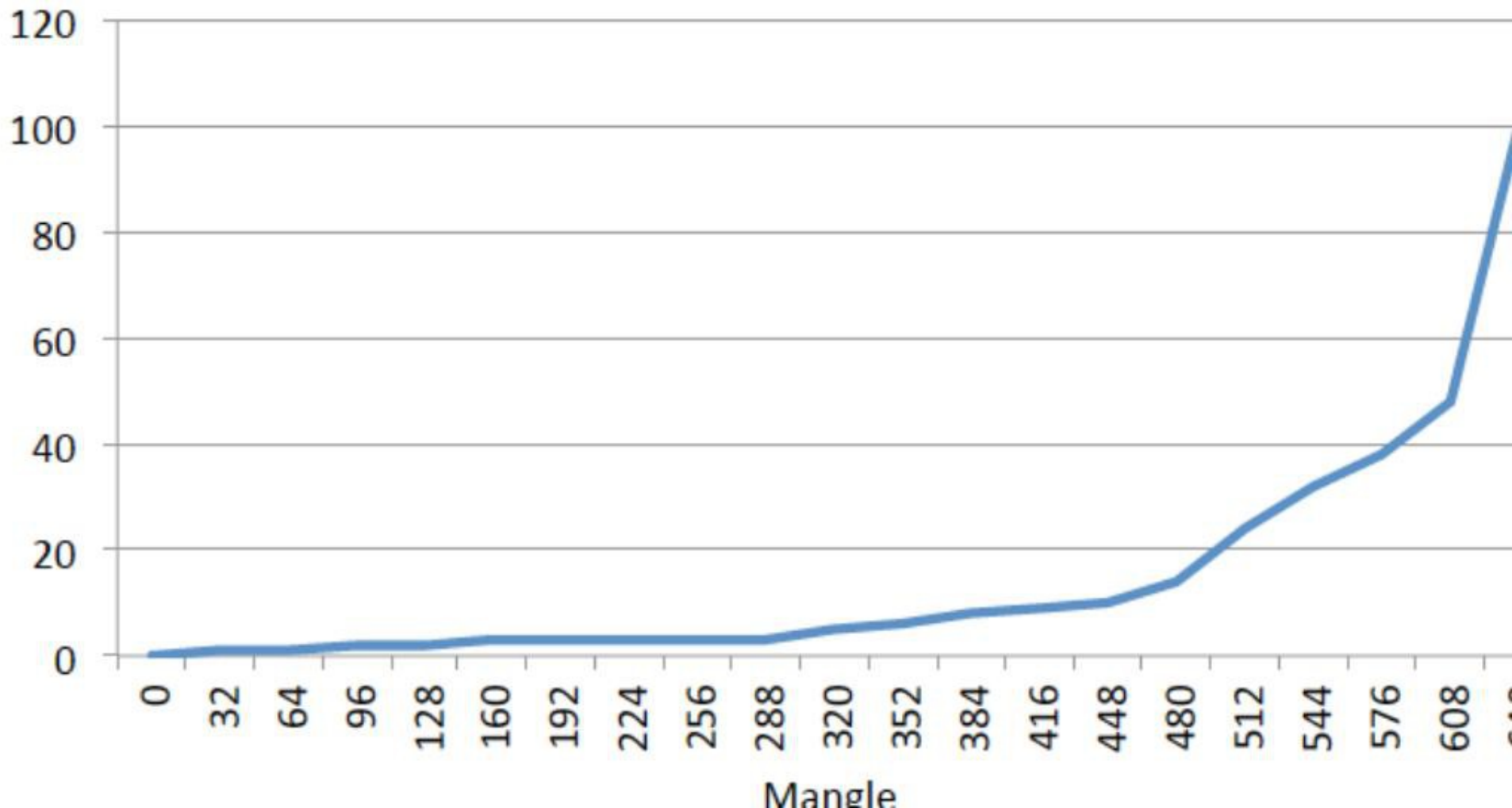
# HTB in RouterOS v6



# Graphs

## CPU Load

CPU Load



# 640 mangles → 100% CPU load

Memory: 3551.8 MB Uptime: 19:04:5 CPU: 100% Hide Passwords

face List

Name	Tx	Rx	Tx Pac...	Rx Pac...	Tx Dro...
ether6	178.0 Mbps	176.2 Mbps	40 451	40 022	
ether1	176.2 Mbps	178.1 Mbps	40 023	40 453	
bridge-re...	713.3 kbps	36.6 kbps	68	76	
ether12	666.0 kbps	55.4 kbps	65	90	
ether11	15.5 kbps	31.3 kbps	27	3	
ether10	13.0 kbps	22.3 kbps	26	4	
ether2	0 bps	0 bps	0	0	
ether3	0 bps	0 bps	0	0	
ether4	0 bps	0 bps	0	0	
ether5	0 bps	0 bps	0	0	
ether7	0 bps	0 bps	0	0	
ether8	0 bps	0 bps	0	0	
ether9	0 bps	0 bps	0	0	
sfpl	0 bps	0 bps	0	0	
sfp2	0 bps	0 bps	0	0	
sfpc	0 bps	0 bps	0	0	

Queue List

Name	Parent	Packet...	Limit At (...)	Max Limit...	Avg. R...	Queued Bytes
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0
queue-ds...	global	packet...		20M	0 bps	0

CPU

CPU	Load ...	IRQ (%)
cpu0	100	99
cpu1	100	99
cpu2	100	100
cpu3	100	96
cpu4	100	100
cpu5	100	100
cpu6	100	100
cpu7	100	100
cpu8	100	100
cpu9	100	100
cpu10	100	100
cpu11	100	100
cpu12	100	99
cpu13	100	100
cpu14	100	100
cpu15	100	100
cpu16	100	100
cpu17	100	100
cpu18	100	100
cpu19	100	100
cpu20	100	99
cpu21	100	100
cpu22	100	100
cpu23	100	99
cpu24	100	100
cpu25	100	100
cpu26	100	100
cpu27	100	100
cpu28	100	100
cpu29	100	100
cpu30	100	95
cpu31	100	99
cpu32	100	100
cpu33	100	100
cpu34	100	97
cpu35	100	100

Rules

Action	Chain	Src. Address	Dst. Address	Prot...	Src. Port	Dst. Port	In. Int...	Out...
ma...	preouting		172.16.0.68					
ma...	preouting	172.16.0.67						
ma...	preouting		172.16.0.67					
ma...	preouting	172.16.0.66						
ma...	preouting		172.16.0.66					
ma...	preouting	172.16.0.65						
ma...	preouting		172.16.0.65					
ma...	preouting	172.16.0.64						
ma...	preouting		172.16.0.64					
ma...	preouting	172.16.0.63						
ma...	preouting		172.16.0.63					
ma...	preouting	172.16.0.62						
ma...	preouting		172.16.0.62					
ma...	preouting	172.16.0.61						
ma...	preouting		172.16.0.61					
ma...	preouting	172.16.0.60						
ma...	preouting		172.16.0.60					

Profile (Running)

Name	Usage
bridging	0.0
firewall	95.4
flash	0.0
idle	0.0
management	0.1
networking	3.8
profiling	0.3
routing	0.0
undclassified	0.0
winbox	0.0

A promotional image for the movie Guardians of the Galaxy. Rocket Raccoon is on the left, holding his signature blaster. Groot is on the right, with his mouth wide open in a shout. The background is a blurred cityscape.

## 2. PCQ + ADDRESS LIST

ENHANCED QUEUE TREE

## **2. PCQ + ADDRESS LIST**

- **LESS MANGLES**
- **INTERNAL PCQ SUB QUEUES**
- **FAST ON X86 WITH POWERFUL CORES**
- **USED A LOT IN ROUTER OS 5.X**
- **FOR CCR NOT A GOOD OPTION**

## **2. PCQ, MIKROTIK SAYS :**

- **"CURRENTLY (ROUTEROS V6.11) ONLY ONE CPU CORE CAN TAKE PACKETS OUT FROM ONE HTB TREE"**
- **"WE ARE WORKING ON POSSIBLE UPDATE OF HTB ALGORITHM, OR INTRODUCING COMPLETELY NEW METHOD INSTEAD OF HTB"**
- **USE INTERFACE HTB AS MUCH AS POSSIBLE TO OFFLOAD TRAFFIC FROM HTB "GLOBAL" OR USE SIMPLE QUEUES**



A full-body image of Drax the Destroyer from the movie Guardians of the Galaxy. He is a muscular, bald man with extensive orange and red tribal-style tattoos covering his face and torso. He is wearing blue tactical pants with a black belt. He stands with his arms crossed against a plain white background.

# 3. SIMPLE QUEUE

# 3. SIMPLE QUEUE



- **STILL SEQUENTIAL IN 6.X**
- **MATCHING ALGORITHM UPDATED**
- **VERY FAST IN CCR AND 6.X**
- **MULTIPLE CORE SUPPORT**
- **CAN BE USED WITH RADIUS**

# 3. SIMPLE QUEUE RADIUS

- RADIUS ATTRIBUTES
- ALLOWS TO CHANGE SPEEDS ON FLY (COA SUPPORT)
- ALLOWS CAP AND FUP IMPLEMENTATION



# 3. SIMPLE QUEUE RADIUS

	Download MB	Upload MB	Online time	Reset
--	-------------	-----------	-------------	-------

Day	1762.1	178.71	06:50:16	↻
-----	--------	--------	----------	---

Week	1920.86	193	08:03:29	↻
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Month	1920.86	193	08:03:29	↻
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Traffic

2.11 GB

Used

2.11 GB

/ 1 GB

(+200 MB CAP)

### Queue List

Simple Queues | Interface Queues | Queue Tree | Queue Types

Find

#	Name	Target	Upload Max Limit	Download Max Limit	Packet Marks	Total Max Limit (b...
;;; 221092						
1...	SpL5Q_3949-5068	10.25.5.86	720k	920k		
;;; 221091						
1...	SpL5Q_3945-4972	10.25.5.85	720k	920k		
;;; 245634						
1...	SpL5Q_3944-4930	10.26.0.10	720k	920k		
;;; 003937						
996	SpL5Q_3938-4906	10.25.6.144	720k	920k		
;;; 251631						
1...	SpL5Q_3926-5401	10.25.1.159	920k	1520k		
;;; 003924						
984	SpL5Q_3924-4828	10.25.5.84	720k	920k		
;;; 251630						
983	SpL5Q_3923-4827	10.25.1.97	720k	920k		
;;; 251629						
981	SpL5Q_3922-4824	10.25.1.90	720k	920k		
;;; 265858						
973	SpL5Q_3920-4815	10.25.6.14	720k	920k		
;;; 003919						
1...	SpL5Q_3919-4983	10.25.5.50	720k	920k		
;;; 003917						
1...	SpL5Q_3917-5043	10.26.0.212	2048k	2048k		
;;; 002302						
1...	SpL5Q_3913-5501	10.25.1.206	1024k	1024k		
;;; 003911						
1...	SpL5Q_3911-4962	10.26.0.211	920k	1520k		
;;; 003908						
958	SpL5Q_3908-4753	10.25.7.177	360k	460k		
;;; 003907						
956	SpL5Q_3907-4750	10.25.7.176	360k	460k		
;;; 003903						
948	SpL5Q_3904-4733	10.26.0.207	360k	460k		
;;; 003901						
939	SpL5Q_3901-4570	10.26.0.210	360k	460k		
;;; 251628						
934	SpL5Q_3898-4561	10.25.1.103	720k	920k		

2251 items (1 selected)

0 B queued

0 packets queued

## Profile (Running)

Name	Usage	Bar
idle	64.9	
firewall	17.0	
queuing	10.5	
networking	3.2	
traffic-accounting	0.9	
management	0.8	
ethernet	0.5	
bridging	0.4	
ppp	0.3	
profiling	0.2	
radius	0.2	
routing	0.2	
unclassified	0.2	
firewall-mgmt	0.0	
logging	0.0	
winbox	0.0	

# 300 MBPS, 2K QUEUES

## Resources

Free Memory: 15.0 GiB

Total Memory: 15.9 GiB

CPU: tilegx

CPU Count: 36

CPU Frequency: 1200 MHz

CPU Load: 12 %

Free HDD Space: 876.4 MiB

Total HDD Size: 1024.0 MiB

# 3. SIMPLE QUEUE

- CCR 1036 IN PRODUCTION :
- 1400 PPPOE SESSIONS/QUEUES
- 1 DOWN/0,5 UP GBPS
- 80-90% CPU USAGE
- RADIUS CREATED QUEUES

# 3. SIMPLE QUEUE

- CCR 1072 IN PRODUCTION :
- UP TO 3000 PPPOE AND QUEUES
- 2,5 DOWN /1,5 UP GBPS
- 80-90% CPU USAGE
- RADIUS CREATED QUEUES



Location:

All

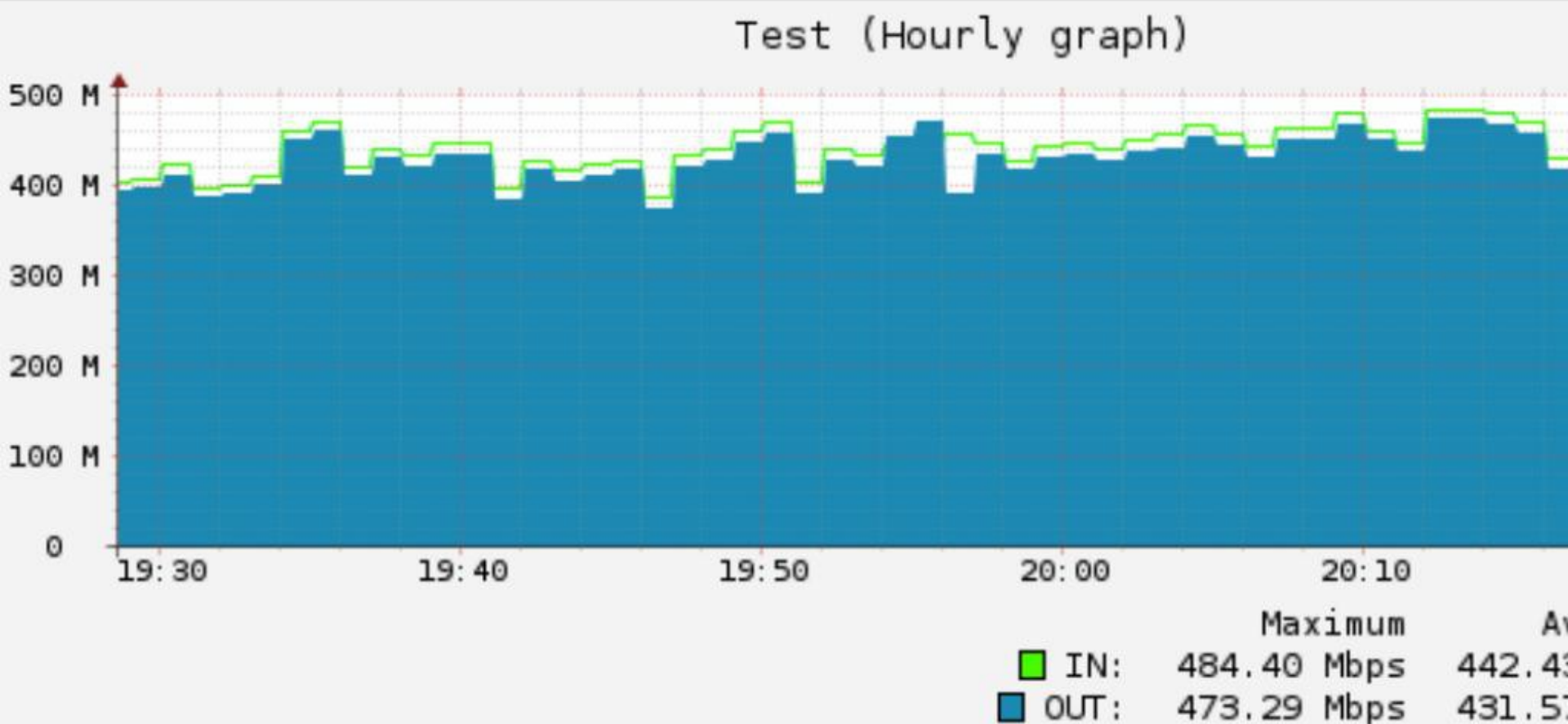
Partn

# 3. SIMPLE QUEUE

Routers

	Producer/Model	Status	Customers online
	1036-8G-2S+-EM	Radius	1101
	1036-8G-2S+-EM	Radius	1066
	1036-8G-2S+-EM	Radius	1065
	1036-8G-2S+-EM	Radius	1059
	1036-8G-2S+-EM	Radius	986
	CCR1072-1G-8S+	Radius	0

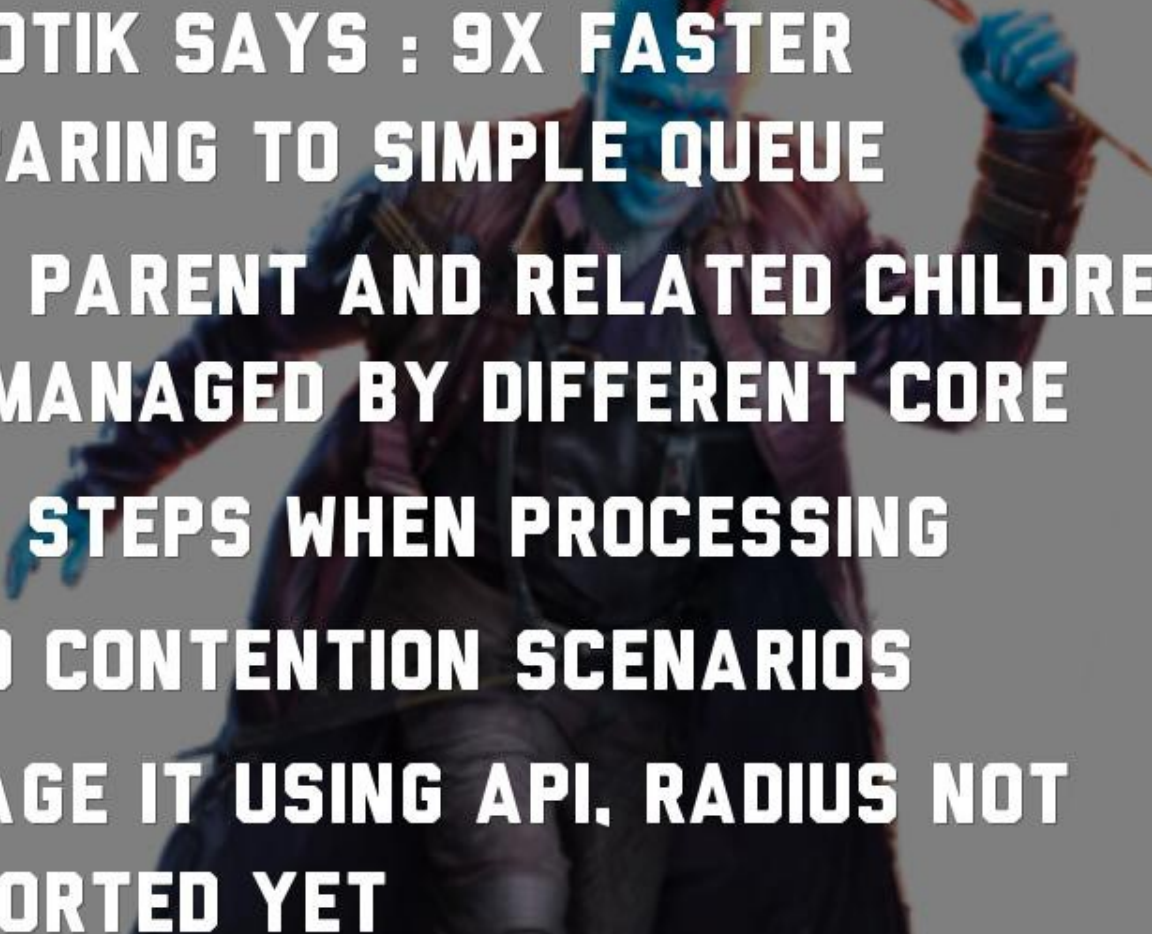
# 3. SIMPLE QUEUE





**4. SIMPLE QUEUE WITH PARENT  
FASTEST SHAPING ON CCR**

## 4. SIMPLE QUEUE WITH PARENT

- MIKROTIK SAYS : 9X FASTER  
COMPARING TO SIMPLE QUEUE
  - EACH PARENT AND RELATED CHILDREN  
ARE MANAGED BY DIFFERENT CORE
  - LESS STEPS WHEN PROCESSING
  - BUILD CONTENTION SCENARIOS
  - MANAGE IT USING API, RADIUS NOT  
SUPPORTED YET
- 

# CONTENTION

WITH SIMPLE QUEUE

# **CONTENTION PER PLAN**

- **5 MBPS PLAN 1:5 CONTENTION**
- **DEFINE LIMIT-AT (1024 KBPS)**
- **CENTRAL SHAPING**
- **MAX. 128 IPS UNDER ONE PARENT**




## Queue List

Simple Queues

Interface Queues

Queue Tree

Queue Types

	Name	Target	Upload Max Limit	Download Max Limit	Packet M...
0	SpLSTG_0-6	10.0.1.13, 10.0...	1024k	5M	
	;;; 5meg_user_2				
2	SpLSTQ_21-60	10.0.1.14	1024k	5M	
	;;; 5meg_user_4				
4	SpLSTQ_12-62	10.0.1.29	1024k	5M	
	;;; 5meg_user_3				
3	SpLSTQ_6-61	10.0.1.15	1024k	5M	
	;;; 5meg_user_1				
1	SpLSTQ_5-59	10.0.1.13	1024k	5M	

# **CONTENTION PER SECTOR**

- **DEFINE SECTOR MAX SPEEDS**
- **PUT CUSTOMERS UNDER SECTORS**
- **10 MBPS SECTOR WITH 5 CUSTOMERS**
- **EACH CUSTOMER CAN HAVE DIFFERENT SPEED**



le Queues

Interface Queues

Queue Tree

Queue Types



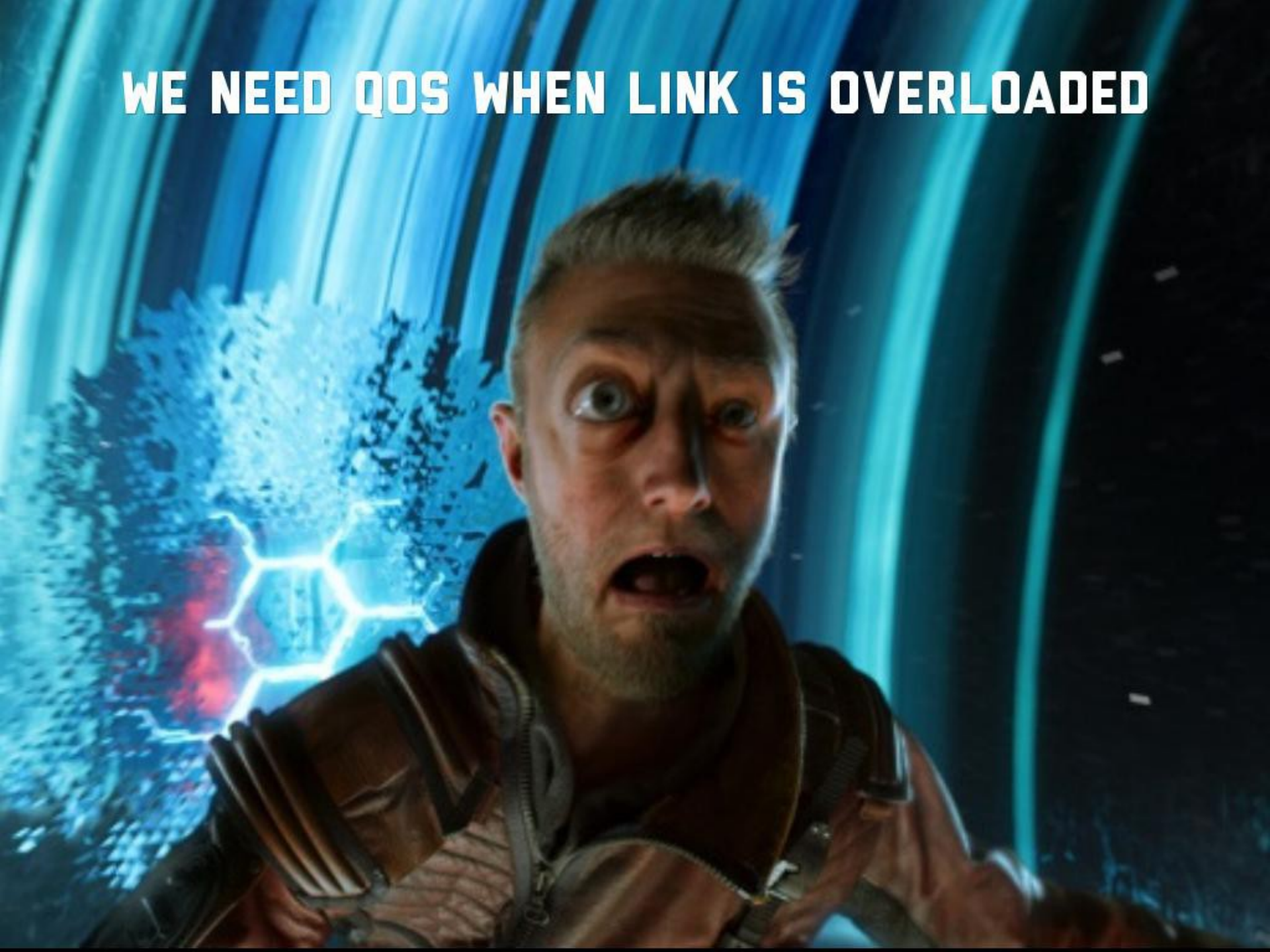
Reset Counters

Reset All Counters

Name	Target	Upload Max Limit	Download Max Limit	Packet M..
SECTOR_10MB				
SECTOR_10MB	10.0.1.13, 10.0...	2M	10M	
2meg_user_2				
5pLSTQ_21-60	10.0.1.14	1024k	2M	
1meg_user_4				
5pLSTQ_12-62	10.0.1.29	1024k	1M	
10meg_user_3				
5pLSTQ_6-61	10.0.1.15	1024k	10M	
4meg_user_1				
5pLSTQ_5-59	10.0.1.13	1024k	4M	

# QOS WITH SIMPLE QUEUE

**WE NEED QOS WHEN LINK IS OVERLOADED**



# WHERE TO SET QOS ?

- **CORE (MAIN SHAPER)**
- **EDGE (ACCESS POINTS)**
- **CPE**
- **SET ON CPE : IT'S CLOSEST POINT TO ORIGINATION**
- **SET ON CPE : PARENT MAX LIMIT MUST BE SET ALWAYS, ON AP AND CORE THIS IS LIMITING MAX. THROUGHPUT**

# **QOS WITH SIMPLE QUEUE**

- **CAN SPECIFY DST-IP (SIP SERVER)**
- **CAN SET GUARANTEED SPEED (LIMIT-AT)**
- **CAN USE PRIORITY AND PARENT**
- **CAN WORK WITH MARKED PACKETS**

Name: QoS\_SIP\_server

Target: 10.0.1.14

Dst.: 10.5.1.1

Target Upload

Target

Max Limit: 1024k



2M

Burst

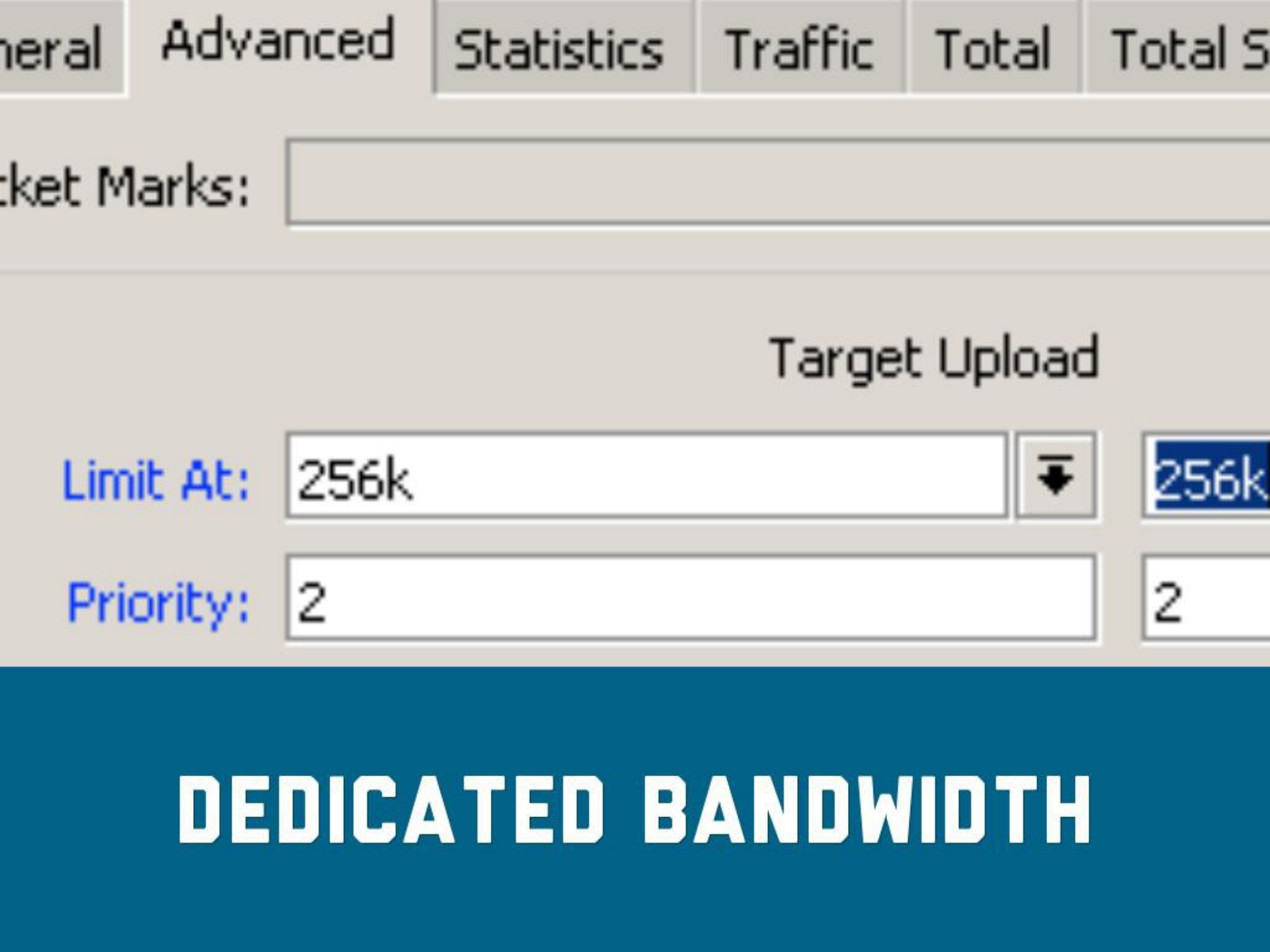
Max Limit:

unlimited



unlimited

# SET DST-IP OF SIP SERVER



General Advanced Statistics Traffic Total Total S

Packet Marks:

Target Upload

Limit At: 256k 256k

Priority: 2 2

# DEDICATED BANDWIDTH

## New Simple Queue

General

Advanced

Statistics

Traffic

Total

Packet Marks:

DNS\_queries

Target Upload

Limit At:

128k



**USE MARKED PACKETS**



# CONTACTS

- [ALEX@SPLYNX.COM](mailto:ALEX@SPLYNX.COM)
- [ISP-SERVIS.COM](http://ISP-SERVIS.COM)
- [SPLYNX.COM](http://SPLYNX.COM)
- FACEBOOK AND TWITTER :  
[ISPFRAMEWORK](https://www.facebook.com/ISPFRAMEWORK)



**THANK YOU**

- **FOR YOUR TIME**
- **MIKROTIK**
- **VALENS RIYADI FOR FEW SLIDES**
- **GROOT FOR PICTURES :-)**