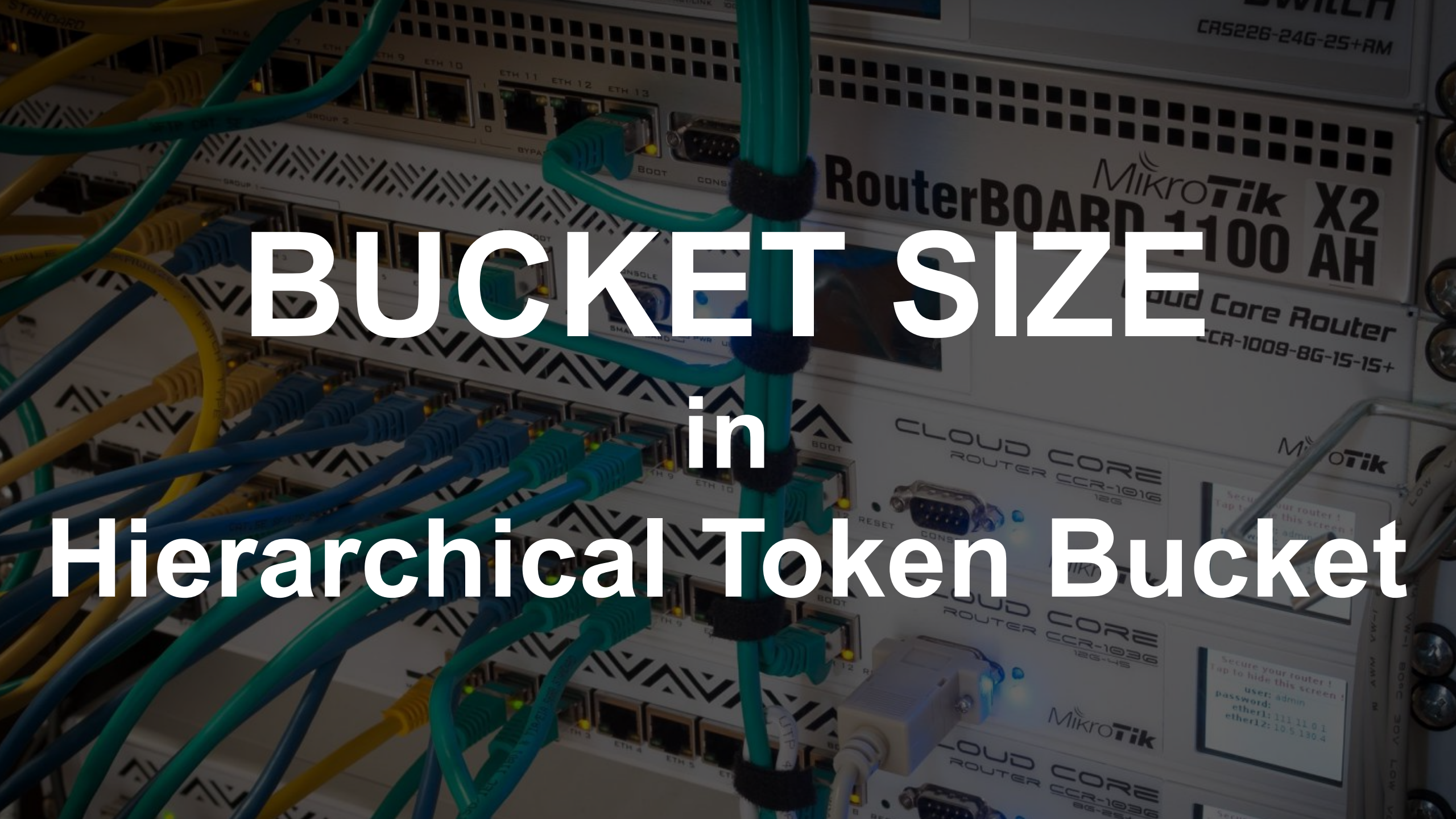


A nighttime photograph of a city street in Yogyakarta, Indonesia. The street is wet and reflects the lights from buildings and street lamps. In the background, there is a prominent white monument with a tiered base and a spire. The sky is dark, and a bright starburst light is visible in the upper right corner. The overall scene is illuminated by warm yellow and white lights, creating a vibrant urban atmosphere.

# MikroTik

**MUM Indonesia 2017**

**Yogyakarta, 27-28 Oct**



**BUCKET SIZE**

in

**Hierarchical Token Bucket**

# Ahmad Rosid Komarudin

## Experience

- SMK IDN Madinatul Ilmi
- ID-Networkers

## Certification

- MTCNA, MTCRE, MTCWE, MTCUME, MTCINE
- Mikrotik Certified Trainer
- Others Certificate



# SMK Negeri 1 Nglegok



# Pesantren IDN



# About ID-Networkers



Rofiq Fauzi, Oky Tria Saputra,  
Ikhwanul Kurnia Rahman, Farras  
Afif Perdana, Untung Wahyudi,  
Ahmad Rosid / ID-Networkers

Rating: ★★★★★ 4.9/5 (1424 votes)

Average student result: 69%

MTCNA, MTCRE, MTCWE, MTCTCE,  
MTCUME, MTCINE, MTCIPv6E

West Jakarta, Indonesia

Tel: +62 21 4024 4024 / 0819 0819 1001

[Write an e-mail](#)

 [info@idn.id](mailto:info@idn.id)

 [www.idn.id](http://www.idn.id)

# About IDNFoundation.org



## MATERI & PENDAFTARAN

### NETWORKING

CISCO, MIKROTIK, UBIQUITI, JUNIPER  
SERTIFIKASI INTERNASIONAL

### PROGRAMMER ANDROID

ANDROID, WEB SERVICES,  
FRONTEND, BACKEND, API  
INTERNET OF THINGS, ARDUINO

### SYSADMIN

WINDOWS SERVER  
LINUX SERVER  
VIRTUALIZATION (VMWARE, HYPER-V)  
CLOUD (OPENSTACK, AWS)

### CCIE

10 NOVEMBER MUSTI UJIAN WRITTEN  
FOKUS BELAJAR LAB

### PERSYARATAN

TIDAK MEROKOK, TIDAK PACARAN  
USIA MAKSIMAL 20 TAHUN  
LULUSAN SMK TKJ (NETWORKING SYSADMIN)  
LULUSAN SMK RPL (ANDROID DEV)  
SANGGUP MENGIKUTI PENDIDIKAN 1 TAHUN  
MENDAPATKAN IJIN OLEH ORANGTUA  
MEMBAWA LAPTOP SENDIRI

### PELAKSANAAN

14 OKTOBER 2017 - 14 OKTOBER 2018  
MAKAN OLEH MASING-MASING SENDIRI  
BIAYA PENDIDIKAN GRATIS  
MENGINAP DISEDIAKAN GRATIS  
TRAINING DISEDIAKAN GRATIS  
MODUL BELAJAR DISEDIAKAN GRATIS  
SANGGUP SHOLAT DIAWAL WAKTU DI MASJID  
SANGGUP MENGIKUTI KAJIAN RUTIN

### PENDAFTARAN

1 SEPTEMBER - 1 OKTOBER  
WWW.IDNFOUNDATION.ORG/DAFTAR  
SELEKSI : 1 SEPT - 1 OKT 2017  
PENGUMUMAN : 4 OKTOBER  
INFORMASI : 087788 567782

## SMP-SMK IDN PESANTREN MADINATUL ILMI JONGGOL JAGOAN IT, PINTER NGAJI

JL. TIMMID MELATI-SODONG, DESA CIBODAS - DESA SINGASARI, KEC. JONGGOL, KAB. BOGOR, JAWA BARAT 16930  
WWW.PESANTREN.IDN.ID - SMS/WA/TELP : 0812 800 40 100 / 0877 88 567 782 - PESANTREN@IDN.ID



## TRAINING NETWORKING GRATIS GURU SMK TKJ

### MATERI :

1. CISCO CCNA
2. MIKROTIK MTCNA + EXAM
3. MIKROTIK MTCRE + EXAM
4. NETWORK MANAGEMENT SYSTEM
5. SUBNETTING COMPETITION
6. SUPERLAB COMPETITION
7. FIREWALK

### PELAKSANAAN :

11-17 NOVEMBER 2017  
PESANTREN IDN JONGGOL  
08.00 - 24.00 WIB  
BAWA MIKROTIK SENDIRI  
BIAYA TRAINING GRATIS  
PENGINAPAN GRATIS  
MAKAN OLEH MASING2

**PENDAFTARAN :**  
[IDNFOUNDATION.ORG/GURU](http://IDNFOUNDATION.ORG/GURU)

[FB.COM/GROUPS/IDNFOUNDATION](https://www.facebook.com/groups/idnfoundation)

[IDNFOUNDATION.ORG](http://IDNFOUNDATION.ORG)

087788 567782

[INFO@IDN.ID](mailto:INFO@IDN.ID)

[IDNFOUNDATION.ORG/GURU](http://IDNFOUNDATION.ORG/GURU)

WA:087788 567782

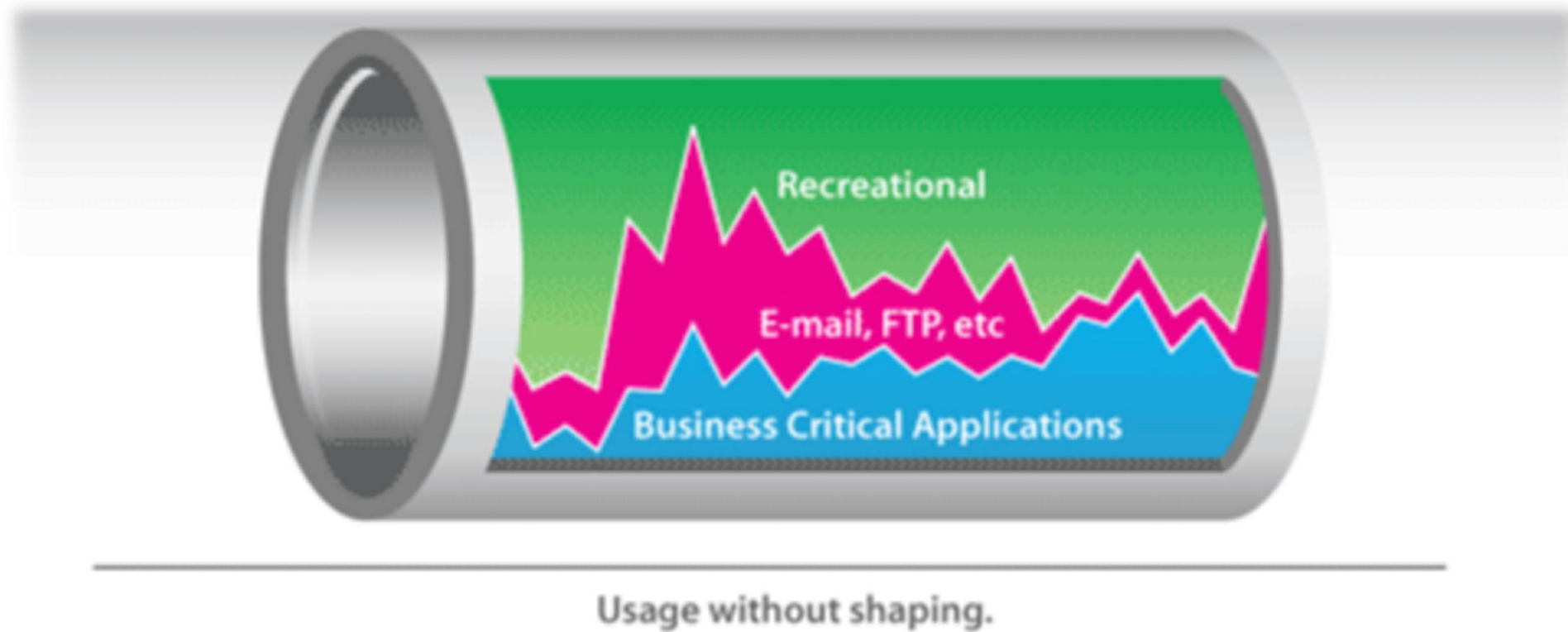
# Objective

- Traffic shaping?
- Hierarchical Token Bucket
- Hierarchical in HTB
- Bucket Size in HTB
- Bucket Size in Hotspot Network
- Bucket Size vs Burst





# Traffic Shaping?



# Traffic Shaping?

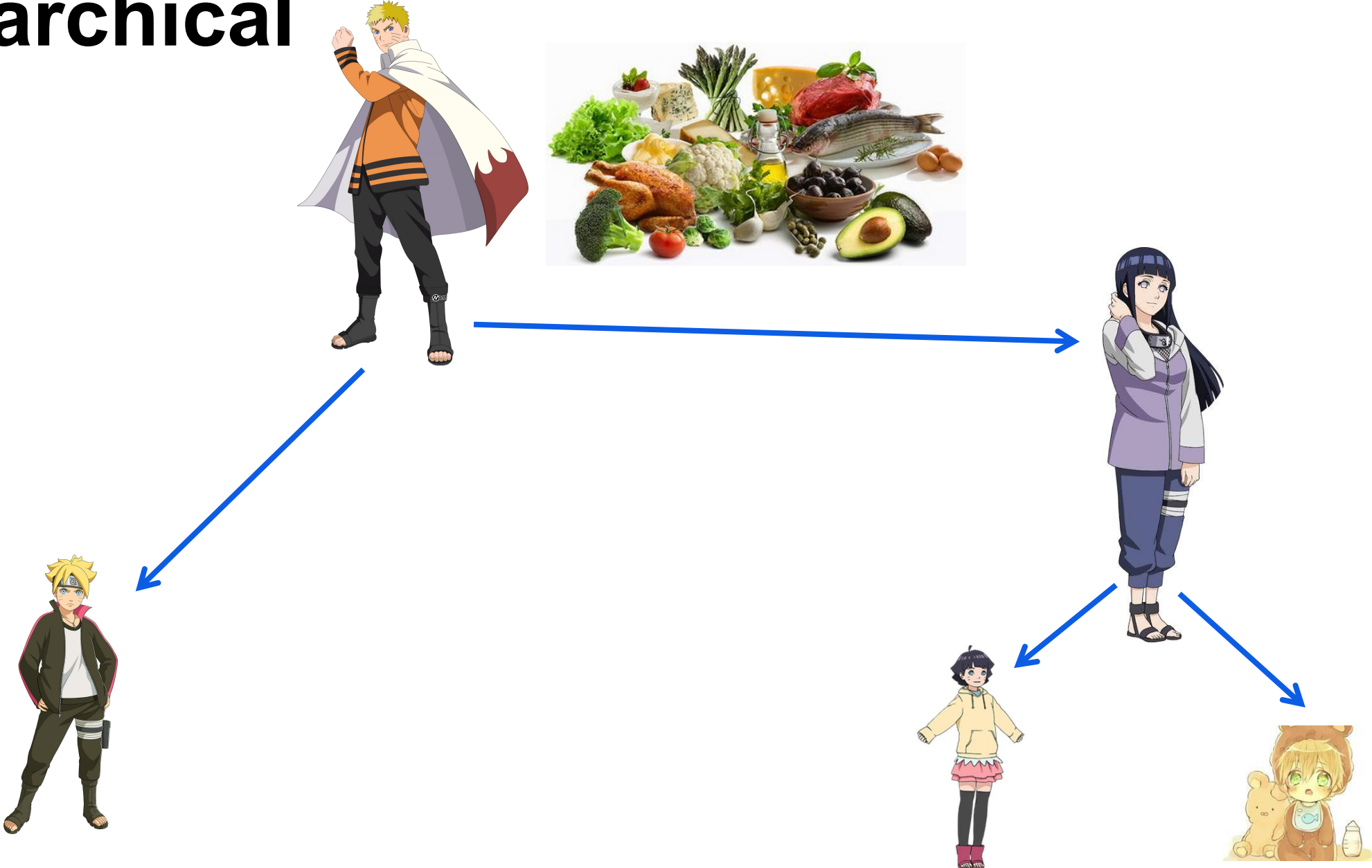


Usage with shaping.

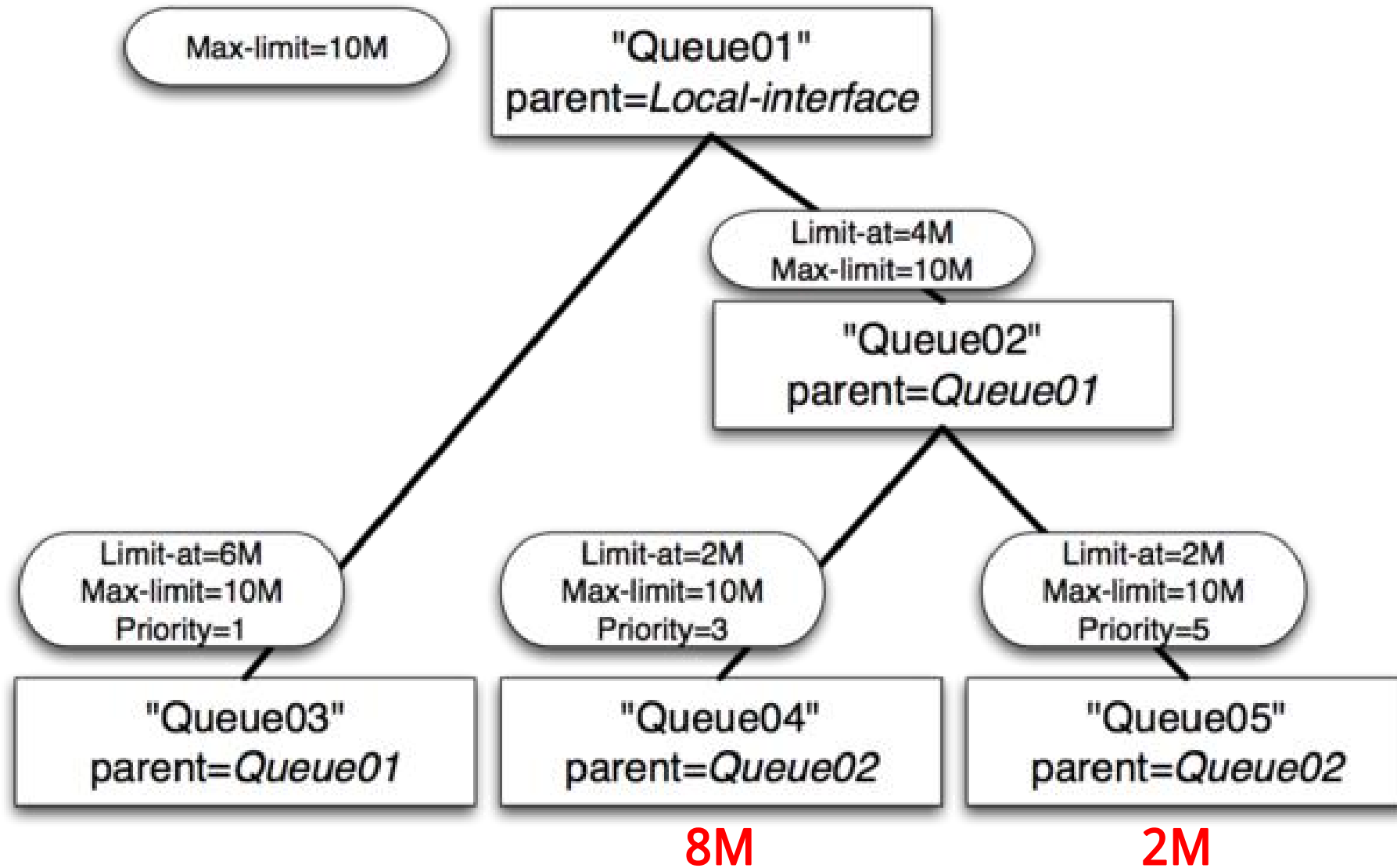
# Hierarchical Token Bucket

- All quality of service implementation in RouterOS is based on Hierarchical Token Bucket
- HTB allows to create hierarchical queue structure and determine relations between parent and child queues and relation between child queues
- Now, HTB allows us to manipulate bucket size parameter

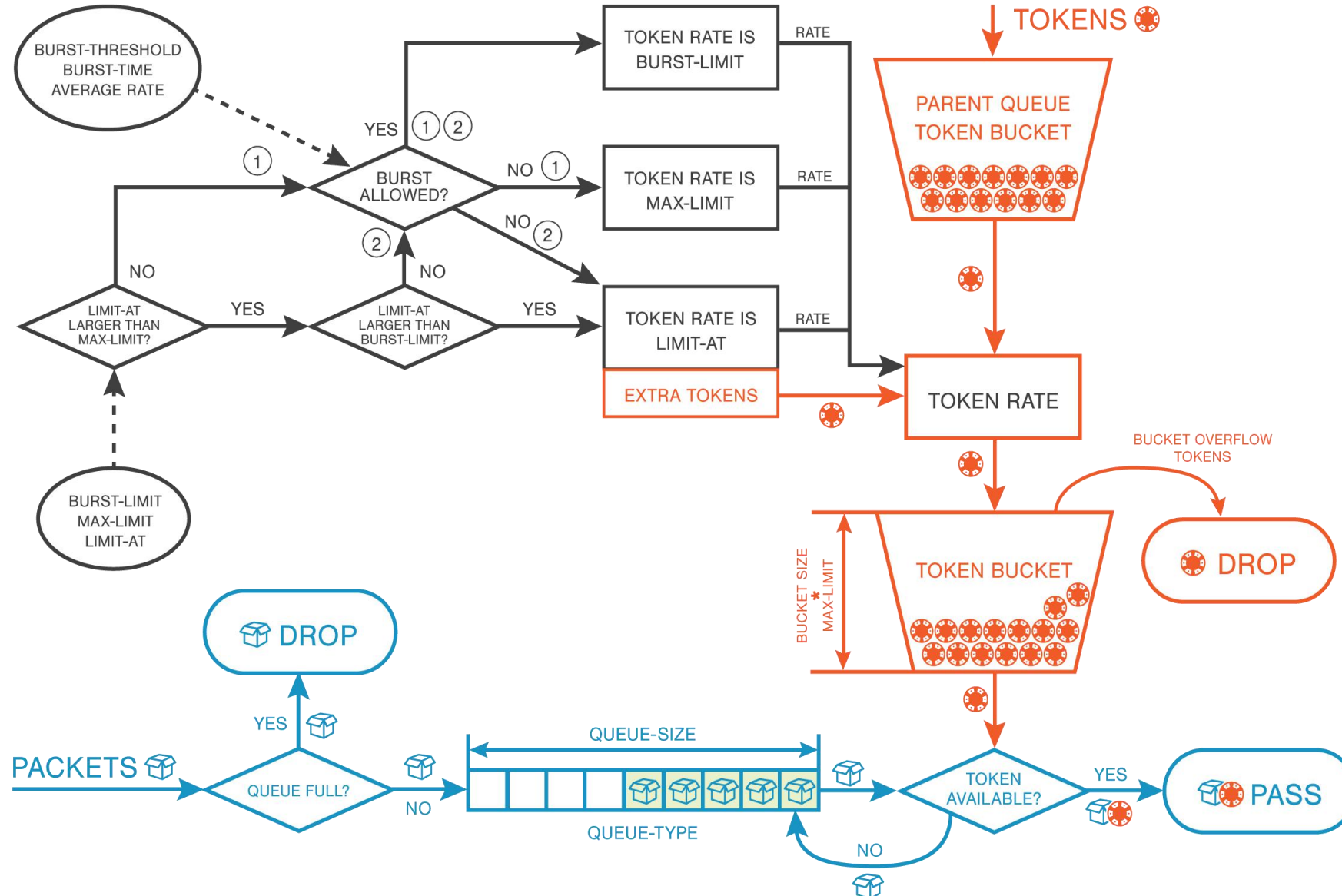
# Hierarchical



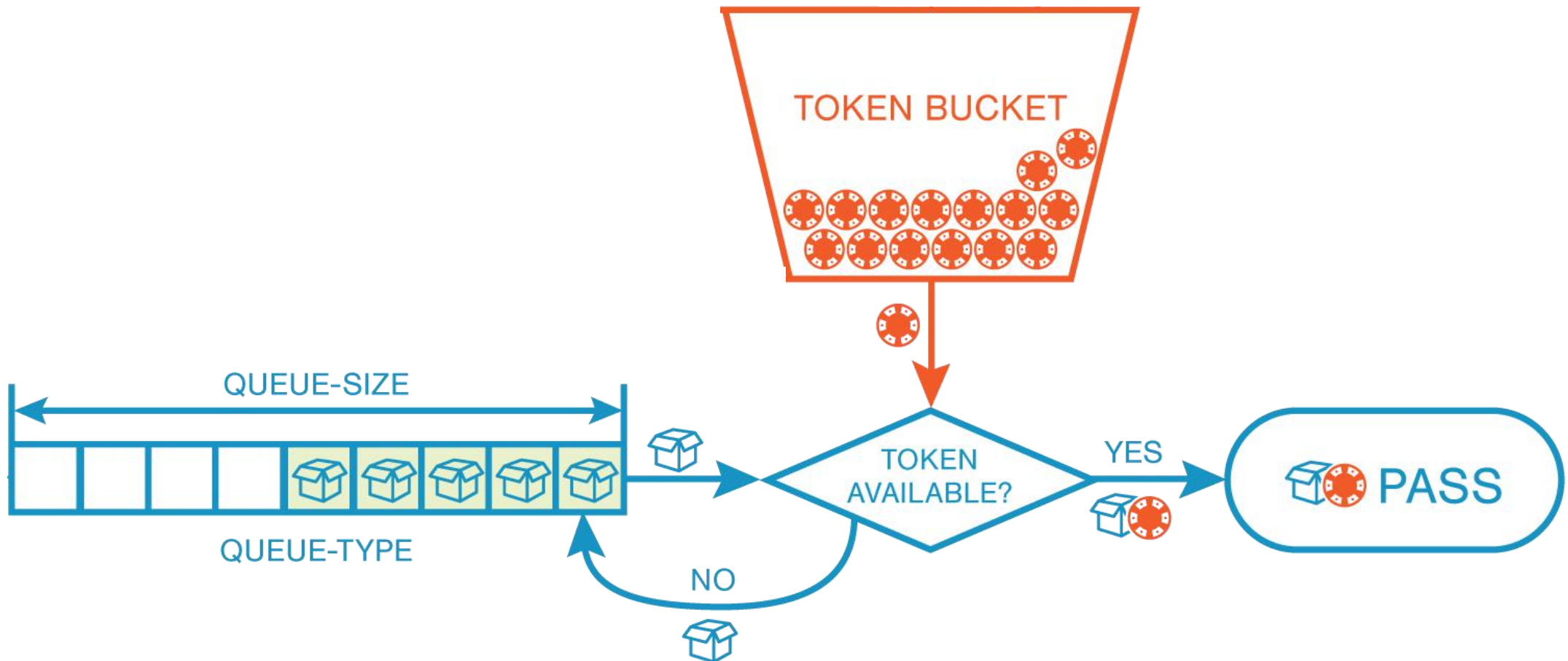
# Hierarchical



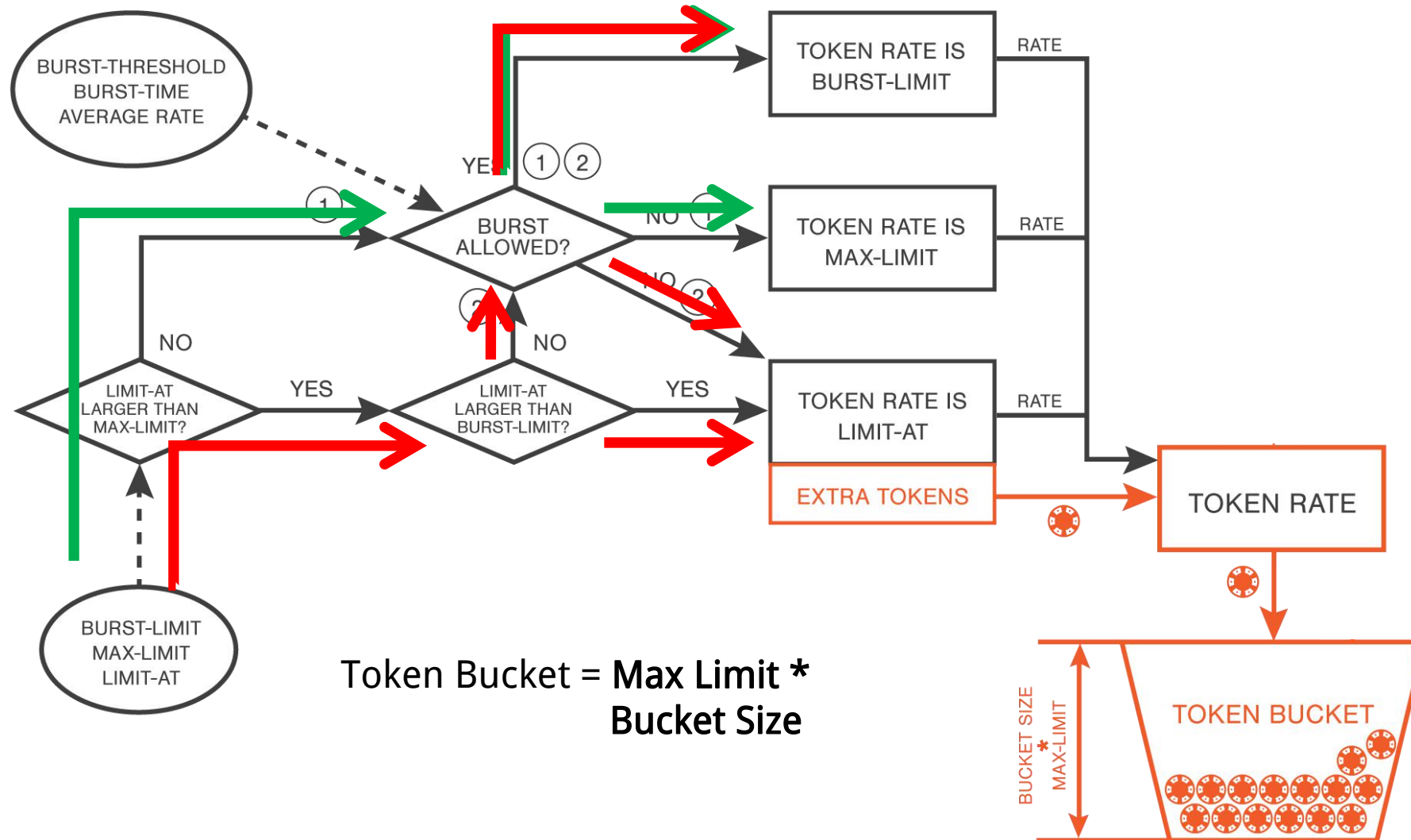
# Token Bucket Algorithm



# Token Bucket Algorithm



# Token Bucket Capacity



$$\text{Token Bucket} = \text{Max Limit} * \text{Bucket Size}$$



# Bucket size

New Simple Queue

General Advanced Statistics Traffic Total Total Statistics

Packet Marks: no-mark

	Target Upload	Target Download	
Limit At:	unlimited	unlimited	bits/s
Priority:	8	8	
Bucket Size:	0.100	0.100	ratio
Queue Type:	default-small	default-small	
Parent:	none		

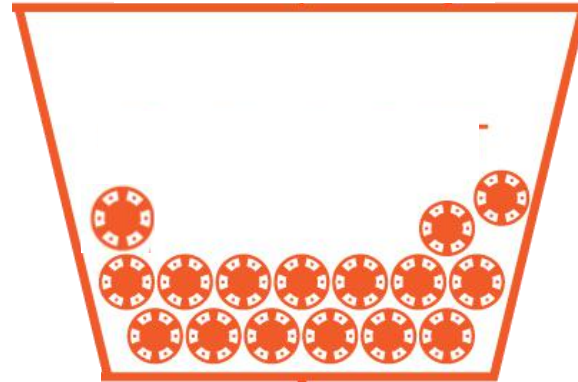
Applies to  
RouterOS:  
v6.35+



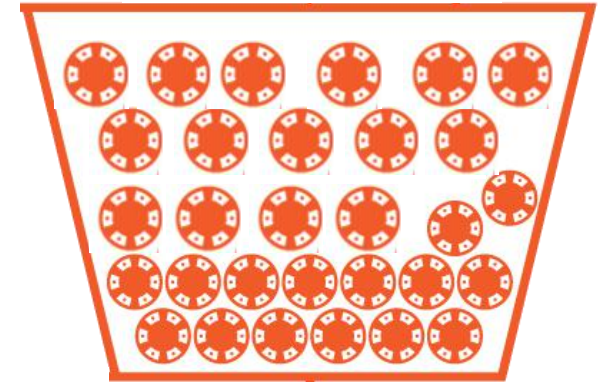
# The Rule



Packet not sent



Normal Traffic



Get additional bandwidth

# Example Case

- max-limit=512K , bucket-size=10
- bucket capacity = 5M (512K \* 10)
- 5Mb without limitation
- client use 1Mbps -> get 10 second
- client use 2Mbps -> get 4 second

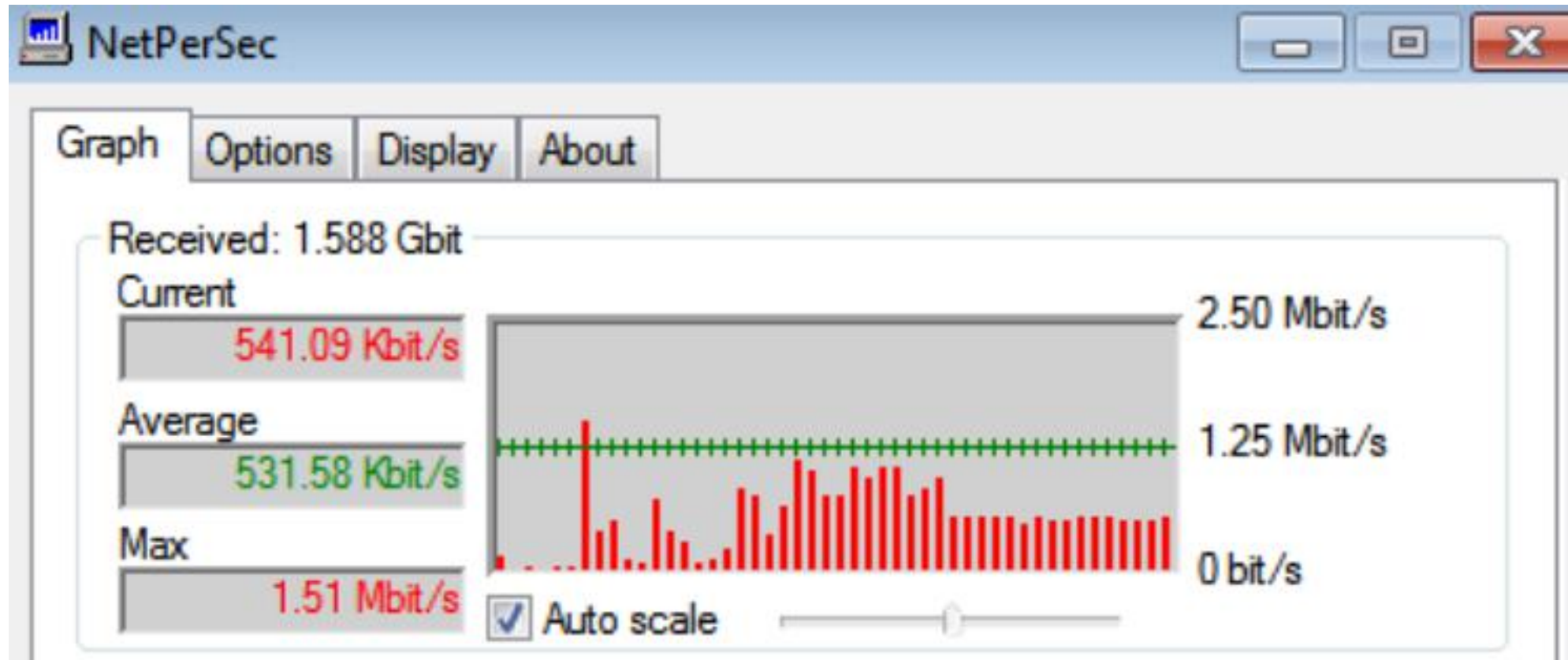
# Kalkulasi bucket capacity

- max-limit = 512K
- bucket capacity = 5M
- Trafic yang digunakan 1Mbps

Detik ke-	Max-limit	bucket	sisanya bucket
1	512K	512K	4.5M
2	512K	512K	4M
3	512K	512K	3.5M
4	512K	512K	3M
5	512K	512K	2.5M
6	512K	512K	2M
7	512K	512K	1.5M
8	512K	512K	1Mb
9	512K	512K	512K
10	512K	512K	0
11	512K		

# POC

- Client menggunakan 1 Mb



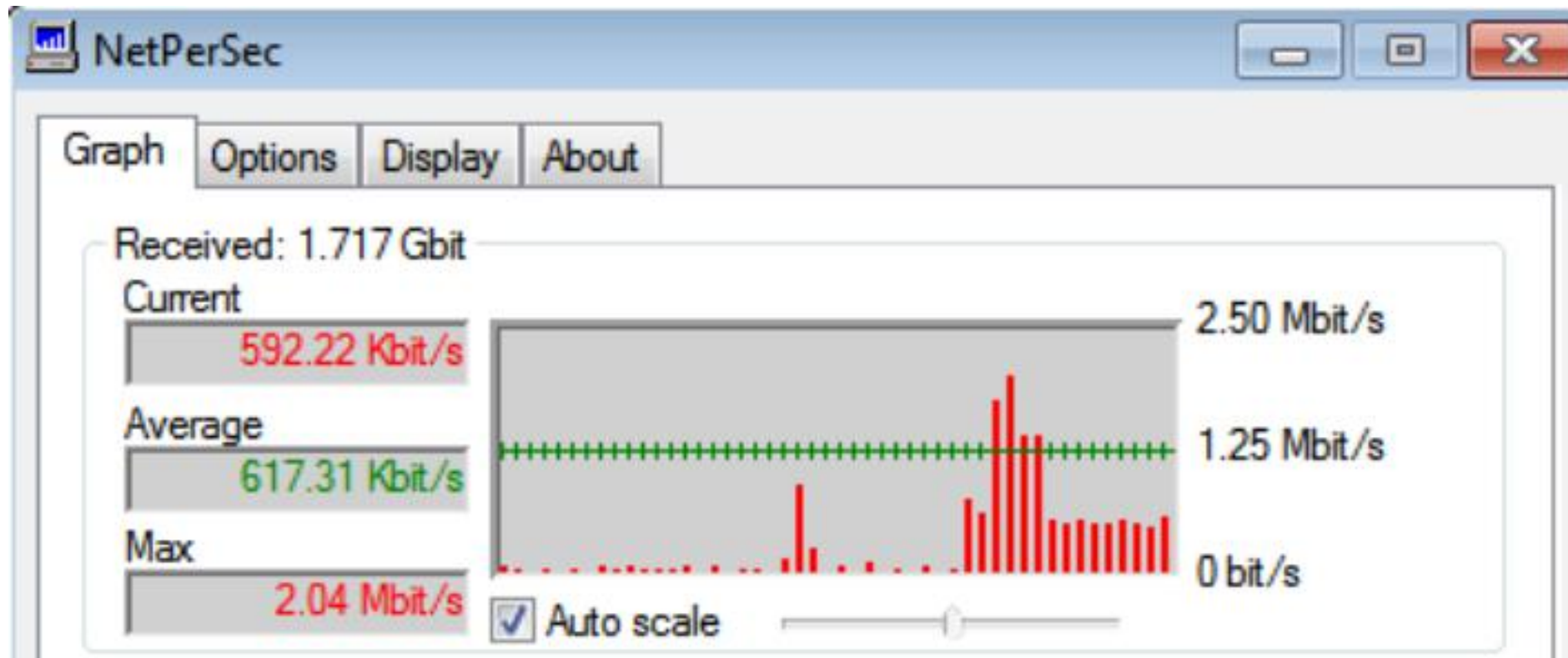
# Kalkulasi bucket capacity

- max-limit = 512K
- bucket capacity = 5M
- Trafic yang digunakan 2Mbps

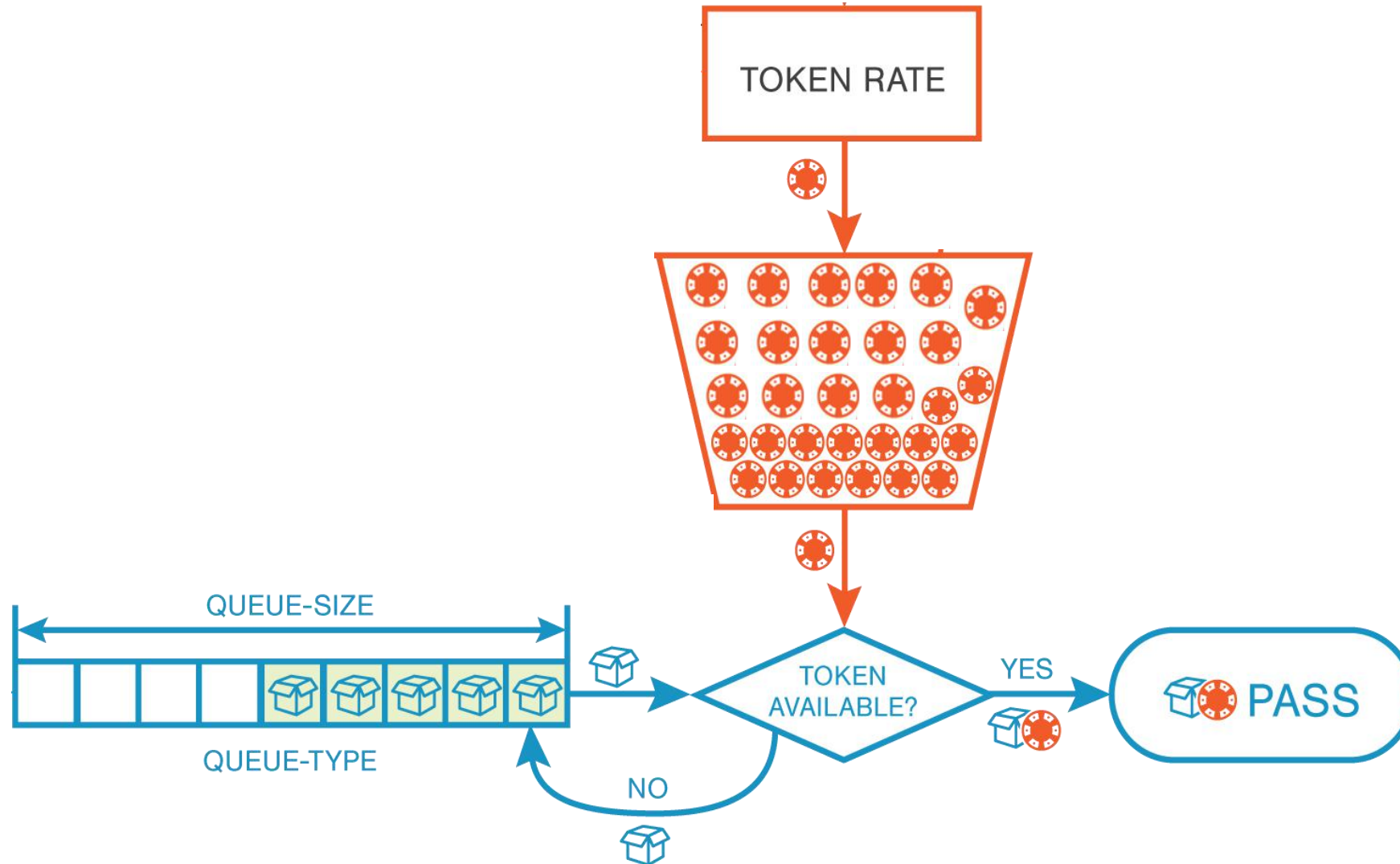
Detik ke-	Max-limit	bucket	sisanya bucket
1	512K	1.5M	3.5M
2	512K	1.5M	2M
3	512K	1.5M	512K
4	512K	512K	0
5	512K		

# POC

- Client menggunakan 2 Mb



# When the bucket full?

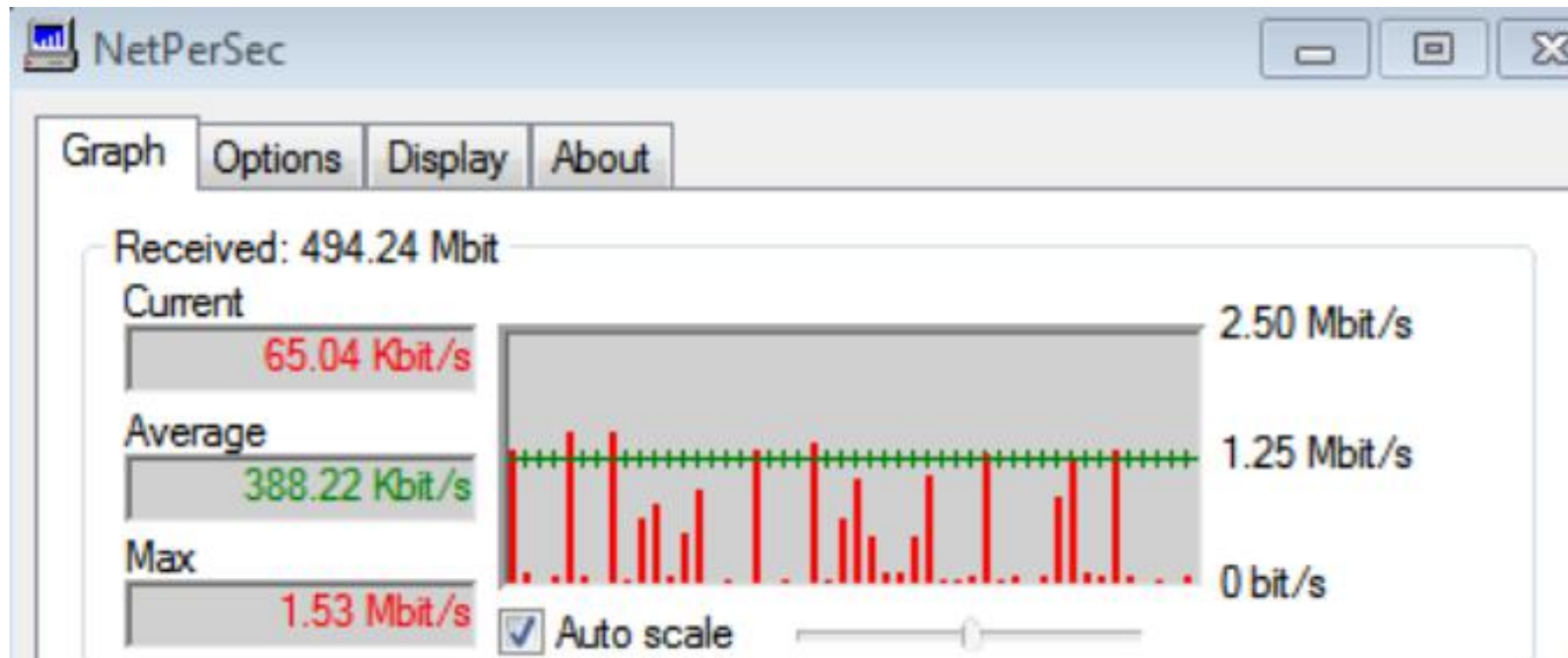




# EXAMPLE CASE

# How data work?

- Without queue



# Try to create queue

Simple Queue <queue3>

General | Advanced | Statistics | Traffic | Total | Total Statistics

Name:

Target:

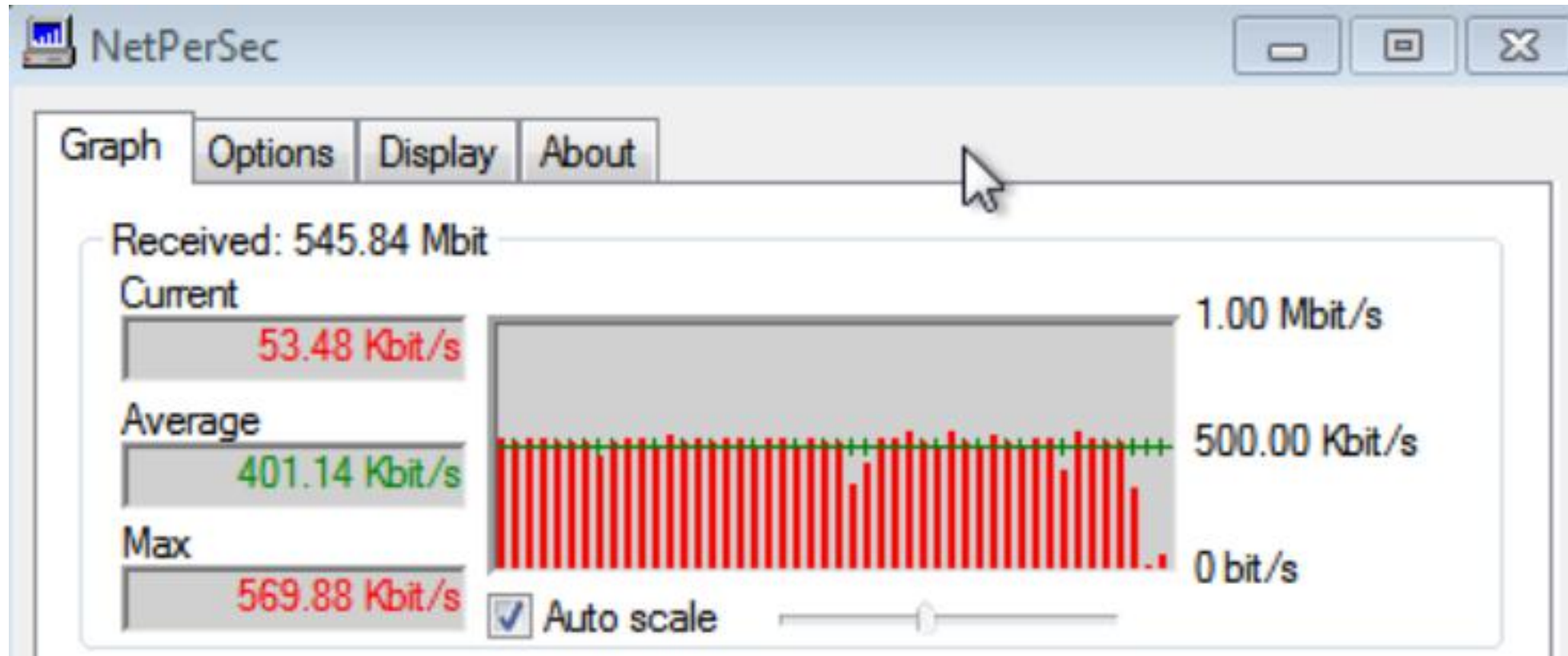
Dst.:

---

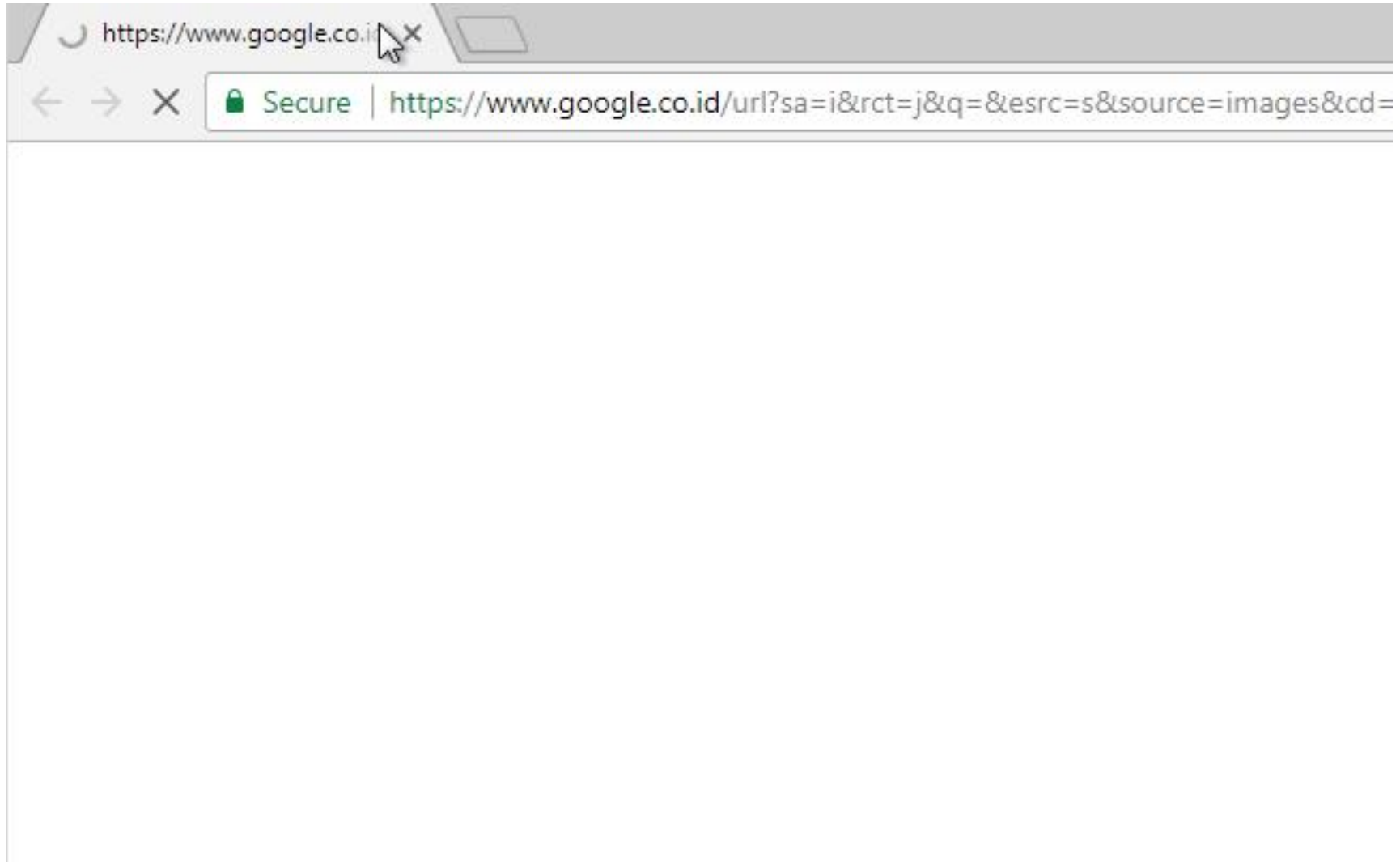
Target Upload                      Target Download

Max Limit:     bits/s

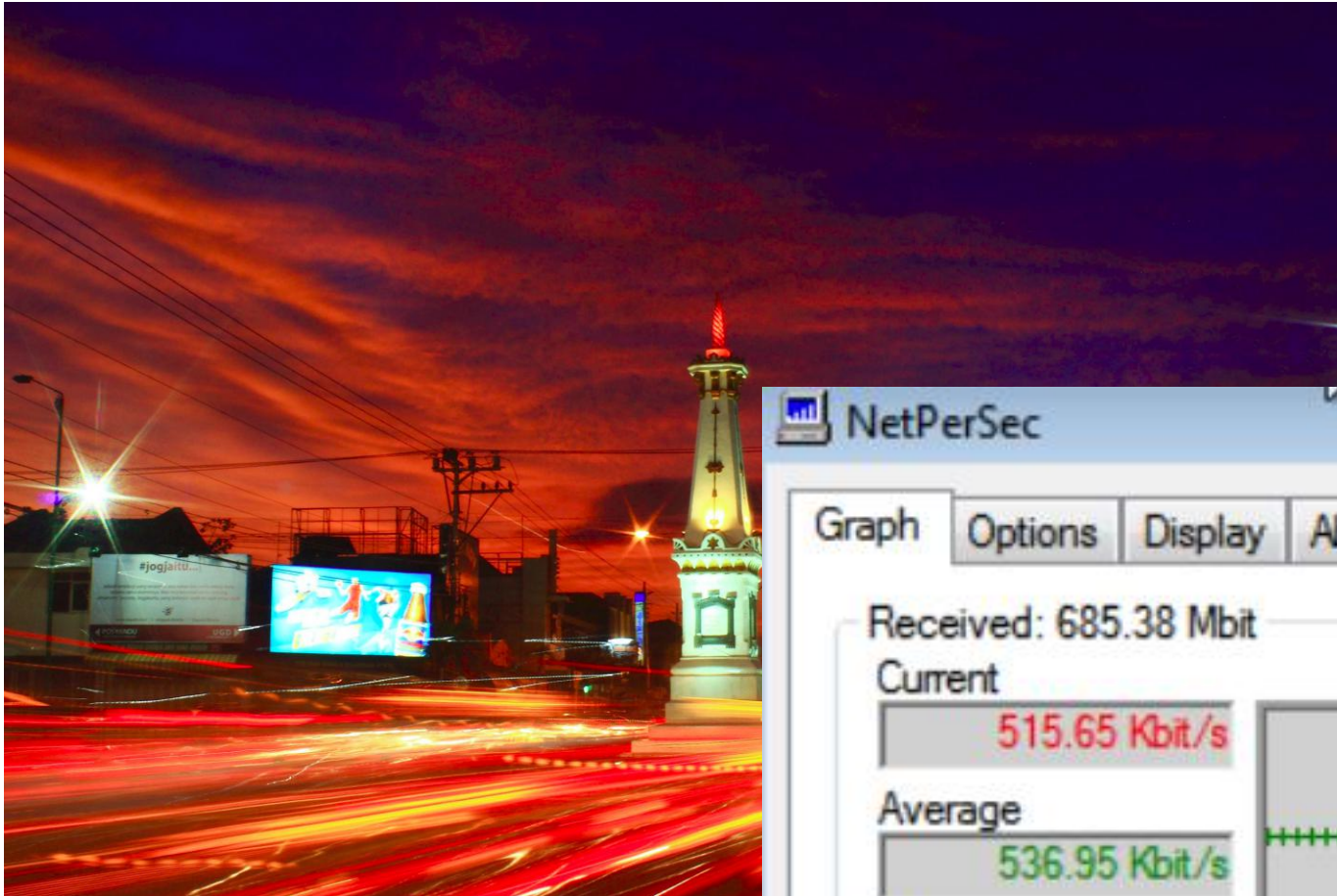
# Traffic with queue



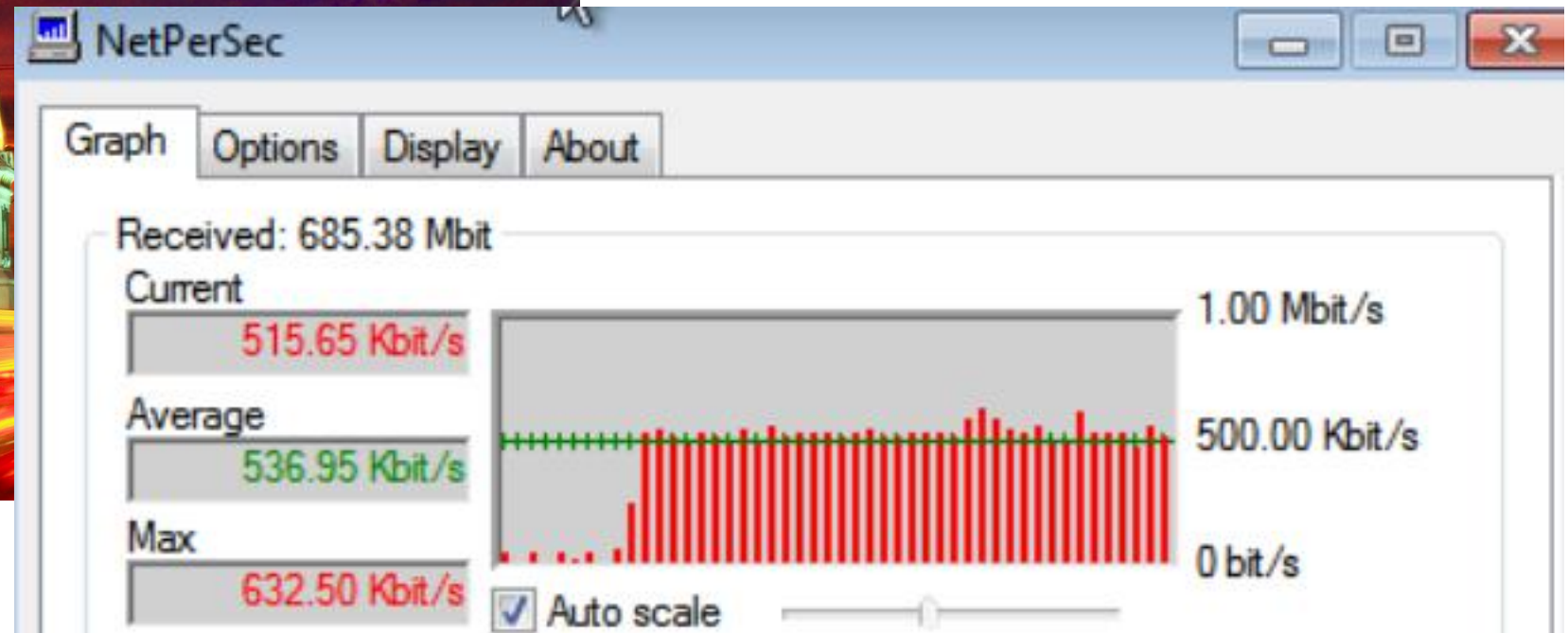
# Try to open google



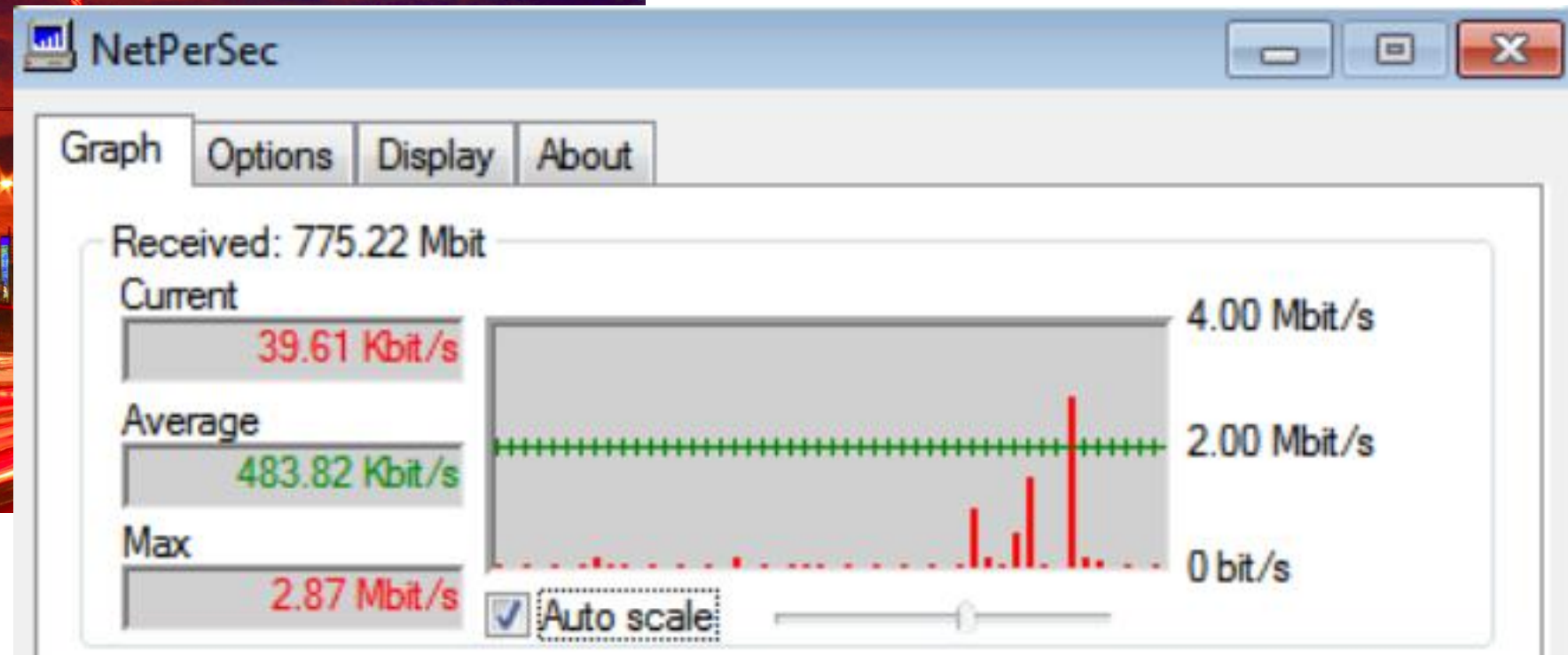
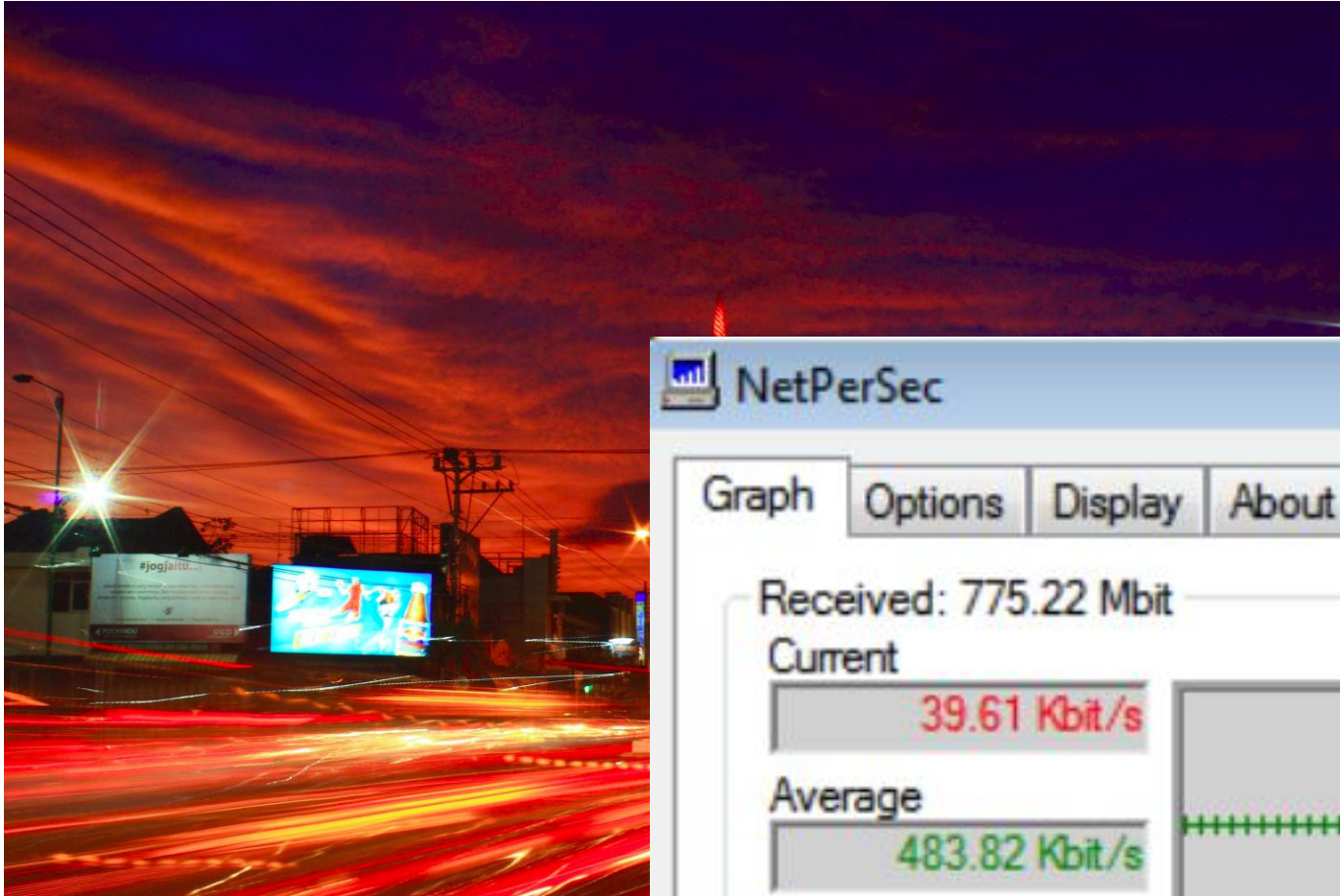
# Open a picture



pic size = 1200x674  
need 39 seconds to access 1 picture



# Open a picture (without queue)



# Modify bucket size

Simple Queue <queue3>

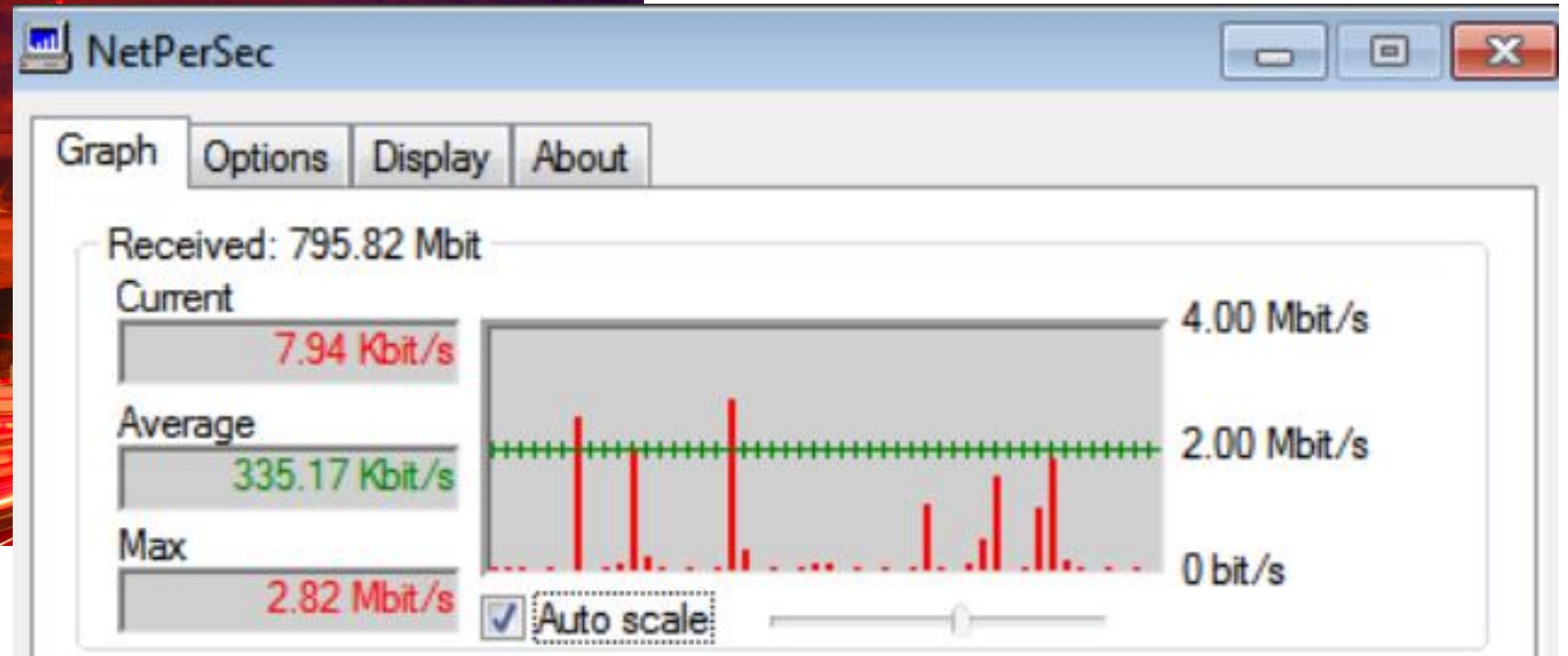
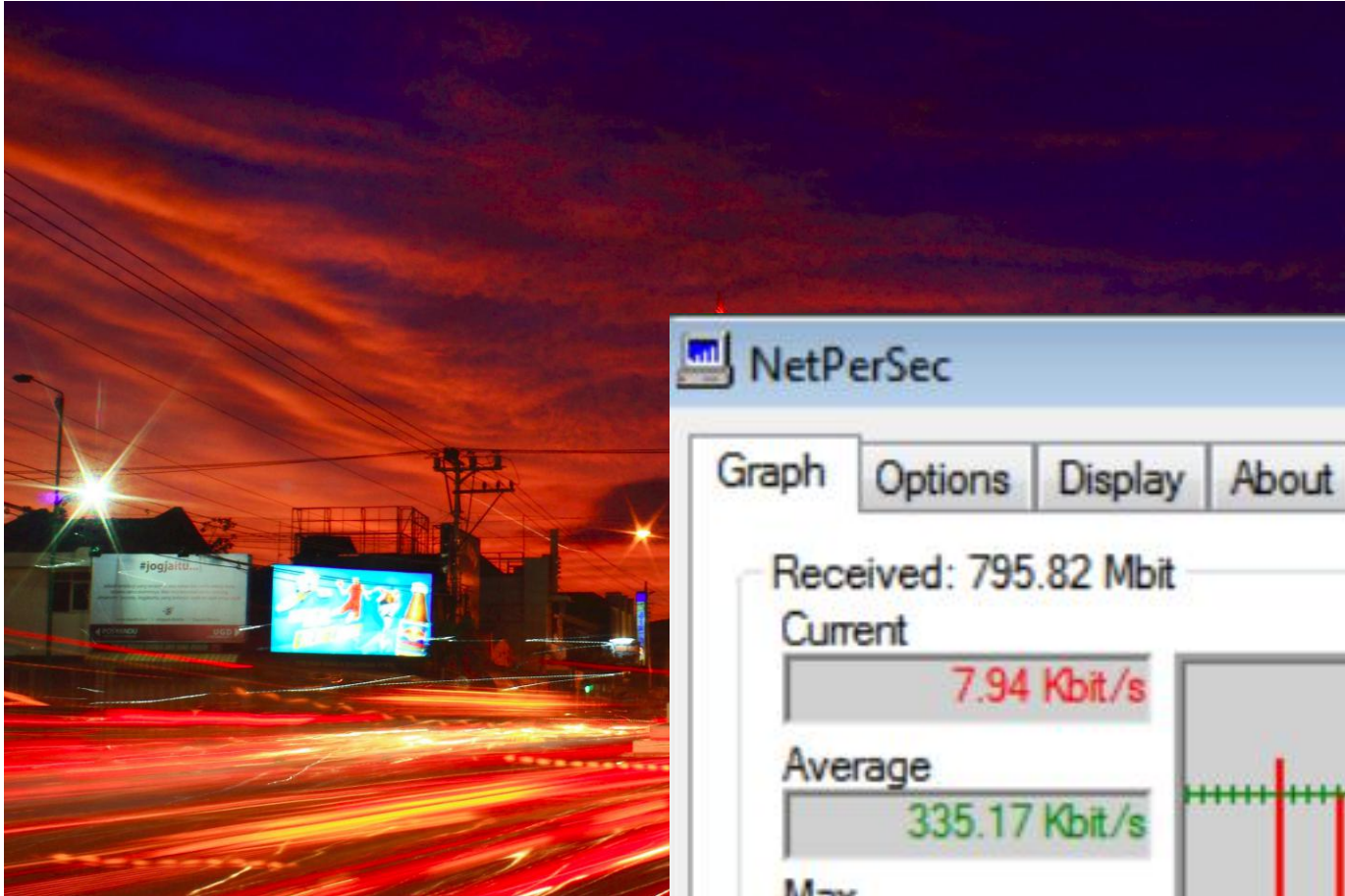
General Advanced Statistics Traffic Total Total Statistics

Packet Marks:

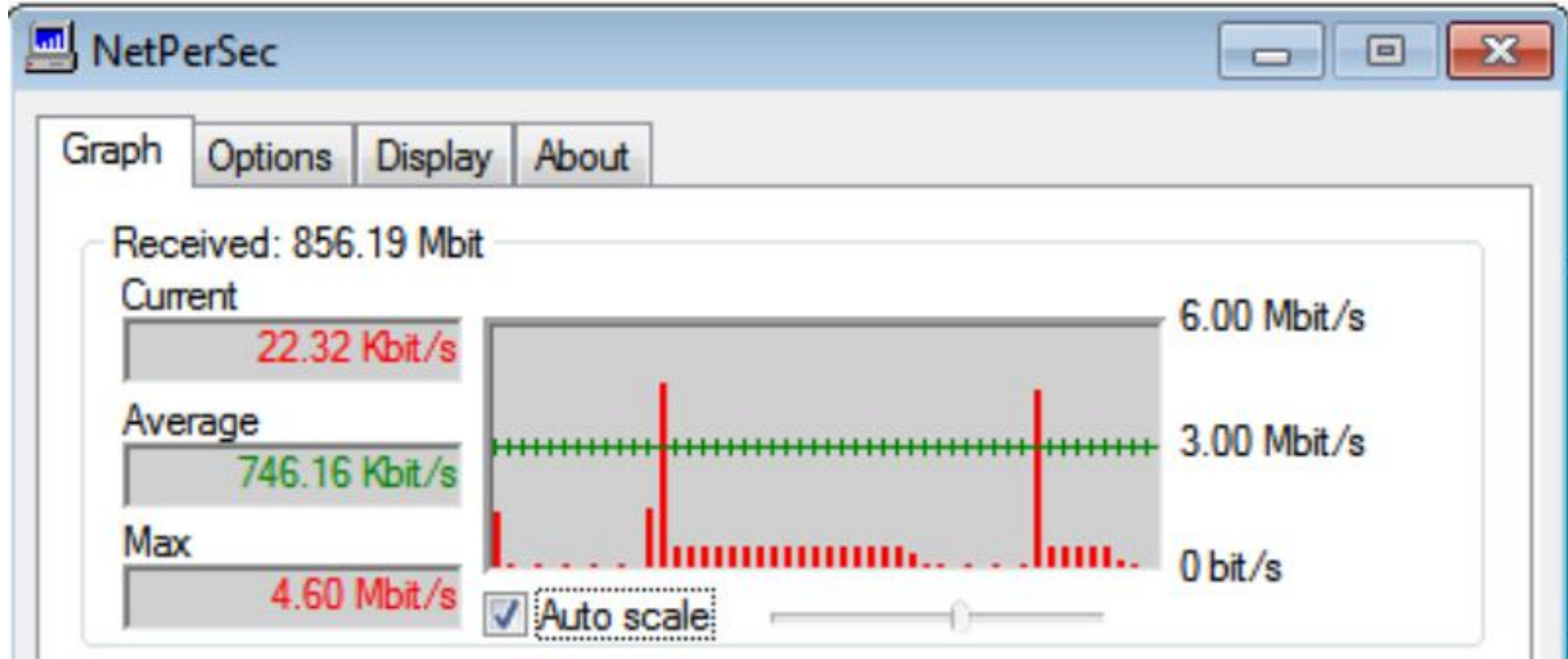
	Target Upload	Target Download	
Limit At:	<input type="text" value="unlimited"/>	<input type="text" value="unlimited"/>	bits/s
Priority:	<input type="text" value="8"/>	<input type="text" value="8"/>	
Bucket Size:	<input type="text" value="10.000"/>	<input type="text" value="10.000"/>	ratio
Queue Type:	<input type="text" value="default-small"/>	<input type="text" value="default-small"/>	
Parent:	<input type="text" value="none"/>		



# Open a picture



# This is how to bucket size work



# **BUCKET SIZE in HOTSPOT NETWORK**

# Dynamic Queue

New Hotspot User Profile

General Queue Advertise Scripts

Name: user1-profile

Address Pool: none

Session Timeout: [ ]

Idle Timeout: none

Keepalive Timeout: 00:02:00

Status Autorefresh: 00:01:00

Shared Users: 1

Rate Limit (rx/bx): 512K/512K

Add MAC Cookie

MAC Cookie Timeout: 3d 00:00:00

OK  
Cancel  
Apply  
Copy  
Remove

Simple Queue <hs-<hotspot1>>

General Advanced Statistics Traffic Total ...

Packet Marks: [ ]

	Target Upload	Target Download
Limit At:	unlimited	unlimited
Priority:	8	8
Bucket Size:	0.100	0.100
Queue Type:	hotspot-default	hotspot-default
Parent:	none	

# Burst

`rate-limit` (*string*; Default: "")

Rate limitation in form of **rx-rate[/tx-rate] [rx-burst-rate[/tx-burst-rate] [rx-burst-threshold[/tx-burst-threshold] [rx-burst-time[/tx-burst-time]]]] [priority] [rx-rate-min[/tx-rate-min]]** from the point of view of the router (so "rx" is client upload, and "tx" is client download). All rates should be numbers with optional 'k' (1,000s) or 'M' (1,000,000s). If tx-rate is not specified, rx-rate is as tx-rate too. Same goes for tx-burst-rate and tx-burst-threshold and tx-burst-time. If both rx-burst-threshold and tx-burst-threshold are not specified (but burst-rate is specified), rx-rate and tx-rate is used as burst thresholds. If both rx-burst-time and tx-burst-time are not specified, 1s is used as default. rx-rate-min and tx-rate min are the values of limit-at properties

Rate limitation in form of **rx-rate[/tx-rate] [rx-burst-rate[/tx-burst-rate] [rx-burst-threshold[/tx-burst-threshold] [rx-burst-time[/tx-burst-time]]]] [priority] [rx-rate-min[/tx-rate-min]]** from the point of view of the router (so "rx" is client upload, and "tx" is client download).

- Character
- AutoBackToTitle.cs
- ClickToStart.cs
- Explosion.cs
- Explosive.cs
- Fire.cs
- FloorSection.cs
- GameControl.cs
- GameGUI.cs
- Hose.cs
- MapIcons.cs
- MessageGUI.cs
- MoveBetweenPoints
- Player.cs
- Priority Particle Add.
- PriorityAlphaParticle
- SceneChanger.cs
- SmokeParticles.cs
- WaterHoseParticles
- WaterSplash.cs

```
50 vignette.blur = (1-health) * 7 + smokeEffect * 10 + health * 10;
51 vignette.blurDistance = (1-health) * 7 + smokeEffect * 10;
52 vignette.chromaticAberration = heatEffect * 10;
53 }
54
55
56 void OnTriggerStay(Collider c)
57 {
58     var fire = c.GetComponent<Fire>();
59     if (fire && fire.alive)
60     {
61         float dist = 1-(((transform.position - fire.transform.position).magnitude));
62         NearHeat(dist);
63     }
64
65     var smoke = c.GetComponent<SmokeParticleLevel>();
66     if (smoke && smoke.GetComponent<ParticleAttachment>().attached)
67     {
68         float dist = 1-(((transform.position - smoke.transform.position).magnitude));
69         NearSmoke(dist);
70     }
71 }
72
73
74 void OnCollisionEnter(Collision c)
75 {
76     healthBox = c.gameObject.GetComponent<HealthBox>();
```

# Manipulate Bucket Size

Hotspot User Profile <user1-profile>

General Queue Advertise Scripts

Name:

Address Pool:  ▾

Session Timeout:  ▾

Idle Timeout:  ▾ ▲

Keepalive Timeout:  ▲

Status Autorefresh:

Shared Users:  ▲

Rate Limit (rx/bx):  ▾

Hotspot User Profile <user1-profile>

General Queue Advertise Scripts

On Login:

```
:global ip [/ip hotspot active get [find user="user1"]  
value-name=address];  
/queue simple add target="$ip/32" max-  
limit=512K/512K bucket-size=10/10
```

On Logout:

```
/queue simple remove [find target="$ip/32"]
```

# The Script

- **On Login**

```
:global ip [/ip hotspot active get [find user="user1"]  
value-name=address];  
/queue simple add target="$ip/32" max-limit=512K/512K  
bucket-size=10/10
```

- **On Logout**

```
/queue simple remove [find target="$ip/32"]
```



# The Result

Simple Queue <queue4>

General Advanced **Statistics** Traffic Total Total Statistics

Packet Marks:

	Target Upload	Target Download	
Limit At:	<input type="text" value="unlimited"/>	<input type="text" value="unlimited"/>	bits/s
Priority:	<input type="text" value="8"/>	<input type="text" value="8"/>	
Bucket Size:	<input type="text" value="10.000"/>	<input type="text" value="10.000"/>	ratio
Queue Type:	<input type="text" value="default-small"/>	<input type="text" value="default-small"/>	
Parent:	<input type="text" value="none"/>		

OK  
Cancel  
Apply  
Disable  
Comment  
Copy  
Remove  
Reset Counters  
Reset All Counters  
Torch

# Bucket Size vs Burst



vs



# How Burst Work

- max-limit = 512kbps
- burst-threshold = 384kbps
- burst-limit = 1024kbps
- burst-time = 16s

Detik ke-	Kalkulasi	Data Rate	Actual Rate
1	$(0+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0)/16$	0	1024
2	$(0+0+0+0+0+0+0+0+0+0+0+0+0+0+1024)/16$	64	1024
3	$(0+0+0+0+0+0+0+0+0+0+0+0+0+1024+1024)/16$	128	1024
4	$(0+0+0+0+0+0+0+0+0+0+0+0+1024+1024+1024)/16$	192	1024
5	$(0+0+0+0+0+0+0+0+0+0+1024+1024+1024+1024)/16$	256	1024
6	$(0+0+0+0+0+0+0+0+0+1024+1024+1024+1024+1024)/16$	320	512
7	$(0+0+0+0+0+0+0+0+512+1024+1024+1024+1024+1024)/16$	352	512
8	$(0+0+0+0+0+0+0+512+512+1024+1024+1024+1024+1024)/16$	384	512
9	$(0+0+0+0+0+0+512+512+512+1024+1024+1024+1024+1024)/16$	416	512
10	$(0+0+0+0+0+512+512+512+512+1024+1024+1024+1024+1024)/16$	448	512
11	$(0+0+0+0+512+512+512+512+512+1024+1024+1024+1024+1024)/16$	480	512
12	$(0+0+0+512+512+512+512+512+512+1024+1024+1024+1024+1024)/16$	512	512
13	$(0+0+0+512+512+512+512+512+512+512+1024+1024+1024+1024+1024)/16$	544	512
14	$(0+0+512+512+512+512+512+512+512+512+1024+1024+1024+1024+1024)/16$	576	512
15	$(0+512+512+512+512+512+512+512+512+512+1024+1024+1024+1024+1024)/16$	608	512
16	$(0+512+512+512+512+512+512+512+512+512+1024+1024+1024+1024+1024)/16$	640	512





**[fb.com/ahmadrosidkomarudin](https://www.facebook.com/ahmadrosidkomarudin)  
WA 0856 4650 4140  
[rosid@idn.id](mailto:rosid@idn.id)**