

# SmartEye



Nicky Verslycken

QoS for streaming and live internet calls



- **Theory**
  - **What is QoS**
  - **Why using QoS**
  - **How to implement QoS**
- **Practice**
  - **Router basic configuration ROS V6 or V7**
  - **Firewall**
  - **Queue**
- **Testing**
- **Play time / questions & answers**
- **Quiz**

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### Communication channel

You can chat in the group and get general information in the Discord channel I created for this 1 hour course.

Name: NV-TTT

URL: [t.ly/ezONZ](https://t.ly/ezONZ)





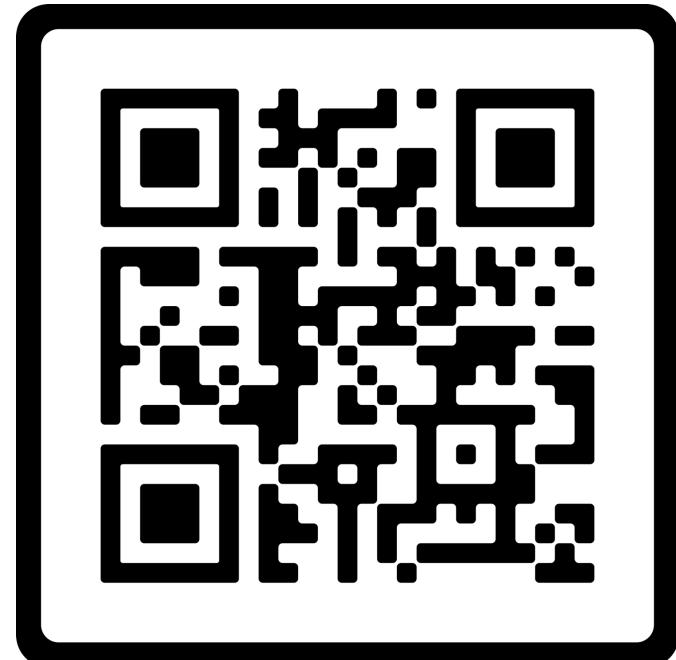
### Script and document repository

On Github I created a repository with all the scripts and documents you need in this 1h course.

*(You can find this info also in the Discord channel)*

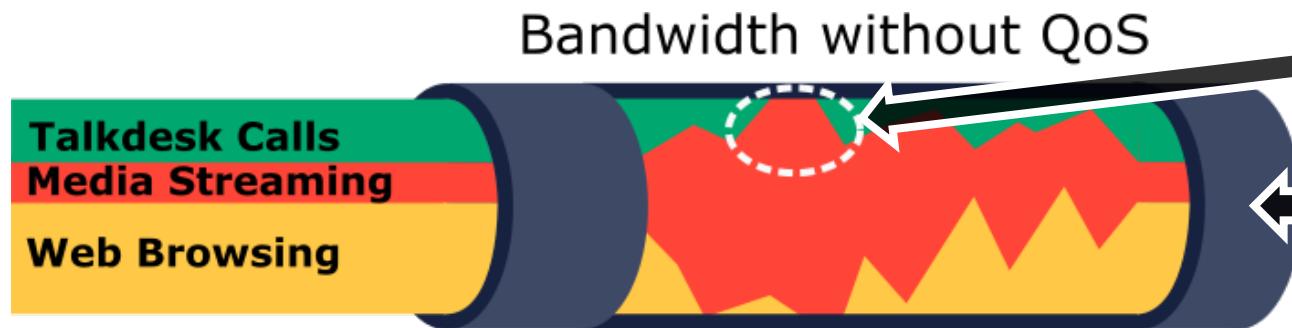
Name: **MKT-TTT-QoS**

URL: <https://t.ly/SjXs>



## Theory – What is QoS

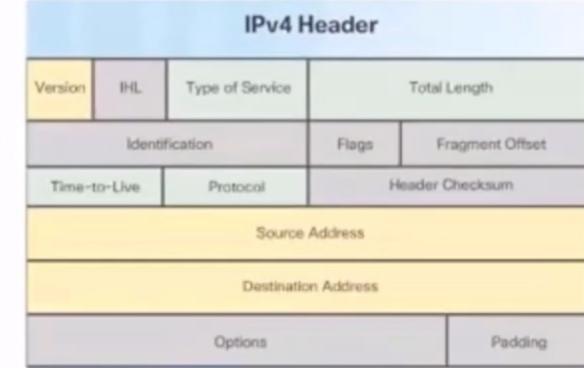
**QoS stands for Quality of Service, and it refers to the ability to provide a guaranteed level of service quality to network traffic.**



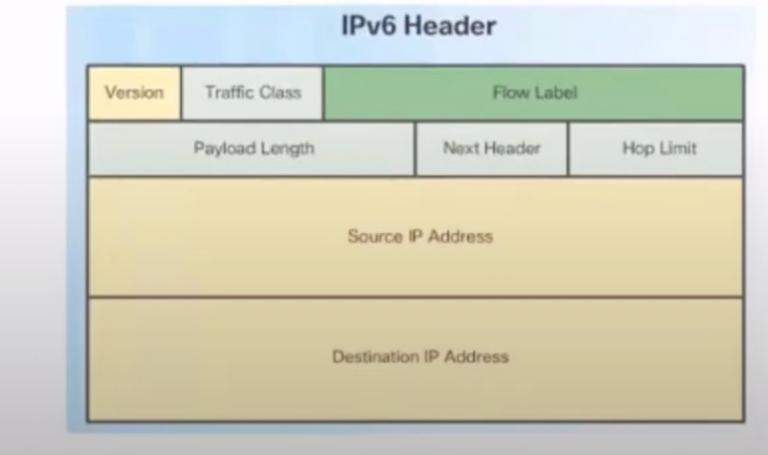


## IP packet headers

In the IPv4 header the Prioritization will be stored in the “Type of Service field”.



In the IPv6 header will it be stored in the Traffic Class.





## Prioritization

giving higher priority to certain types of traffic over others.

Value	Description
7	Reserved
6	Reserved
5	Voice bearer (voice traffic)
4	Videoconferencing
3	Call Signaling
2	High-Priority Data
1	Medium-Priority Data
0	Best-Effort Data



### Example Prioritization

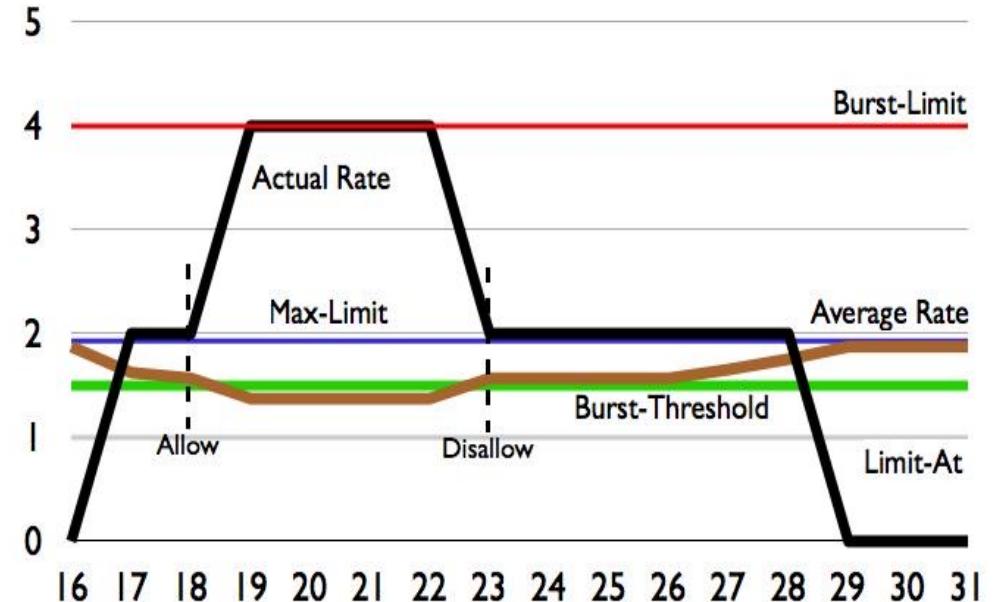
In Mikrotik we will use a numeric value from 1 to 8 where 1 has the highest priority.

1	VoIP & Video conferencing traffic
2	Gaming traffic
3	Video streaming & Remote desktop traffic
4	Web browsing traffic & Email traffic
5	File download & Instant messaging traffic
6	P2P traffic
7	Backup traffic
8	All other traffic

## Theory – What is QoS – key terms



- **Limit At:** guaranteed amount of bandwidth.
- **Max-limit:** the maximum the que can use considering the “Limit At”, priority and available bandwidth.
- **Burst:** A temporary higher speed that can be reached, calculated on burst-limit (amount of data), burst-time, burst-threshold (allows burst depending on average data rate)

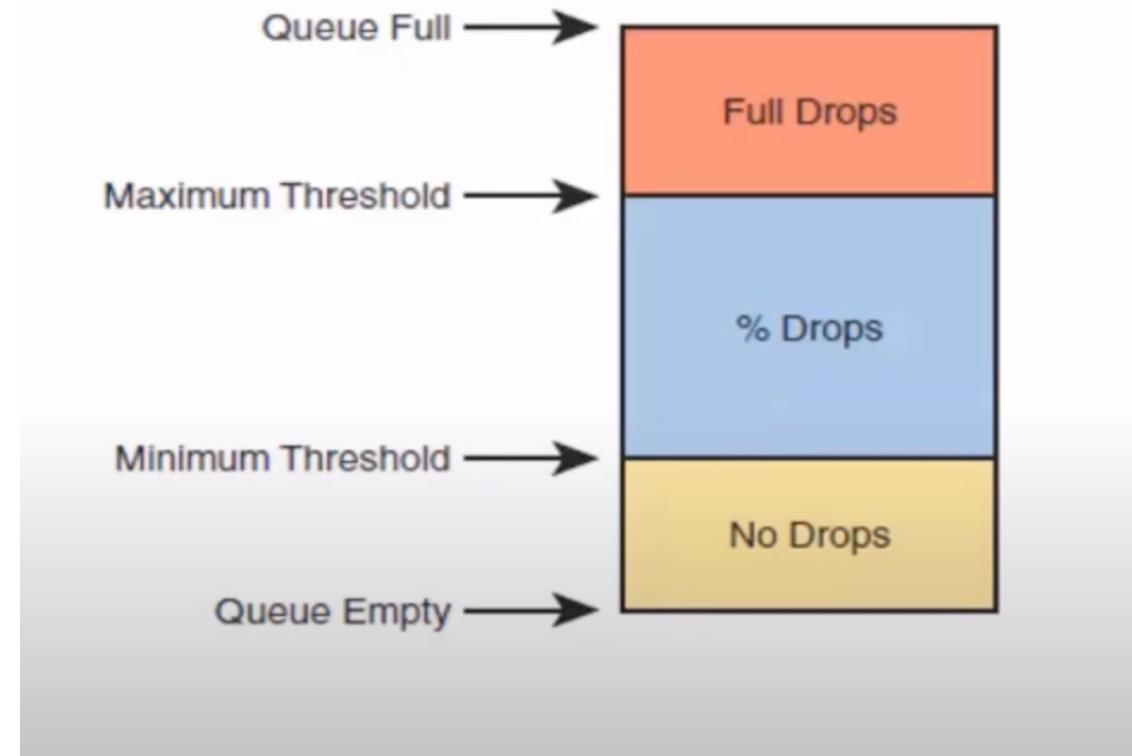


## QoS for streaming and live internet calls

### Theory – What is QoS – key terms

#### Packet drops

Depending which threshold is reached packets will be dropped.



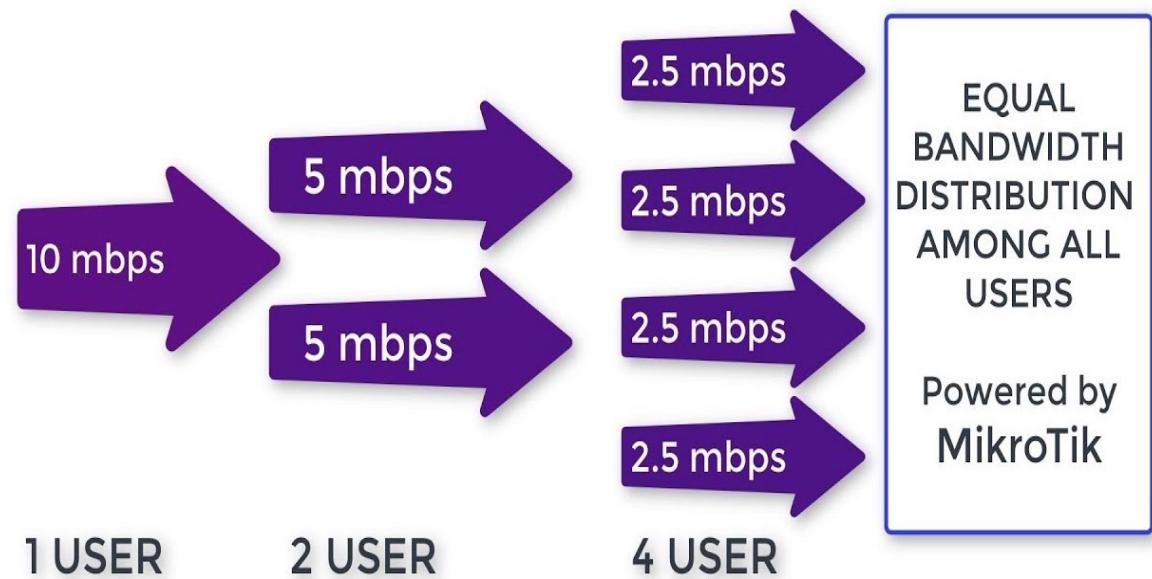
## Theory – What is QoS – key terms

### Mikrotik PCQ

PCQ = Per Connection Queuing

dynamically equalize or shape traffic for multiple users

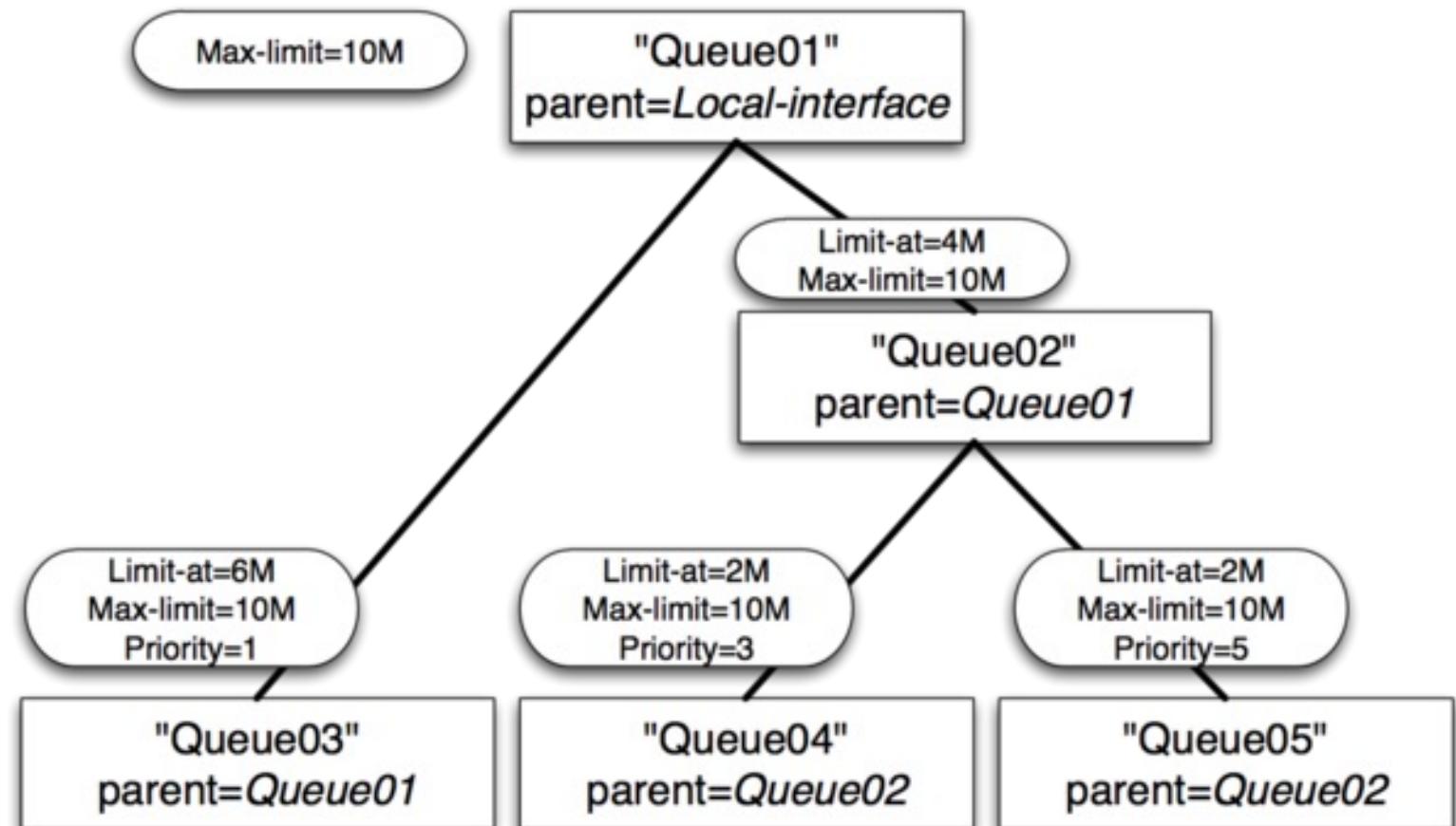
### PER CONNECTION QUEUE (PCQ)



## Theory – What is QoS – key terms

### Queue tree

Hierarchical queue  
to limit bandwidth  
per target

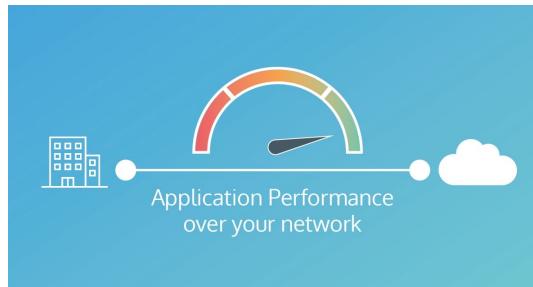
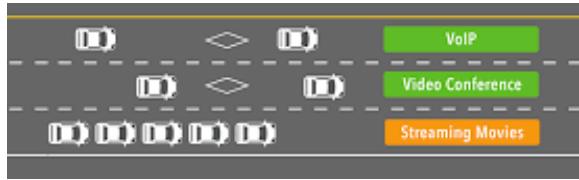


## Theory – Why using QoS



You should use QoS in your network to ensure that critical traffic receives priority and is delivered reliably, even during times of network congestion.

### Prioritization of traffic



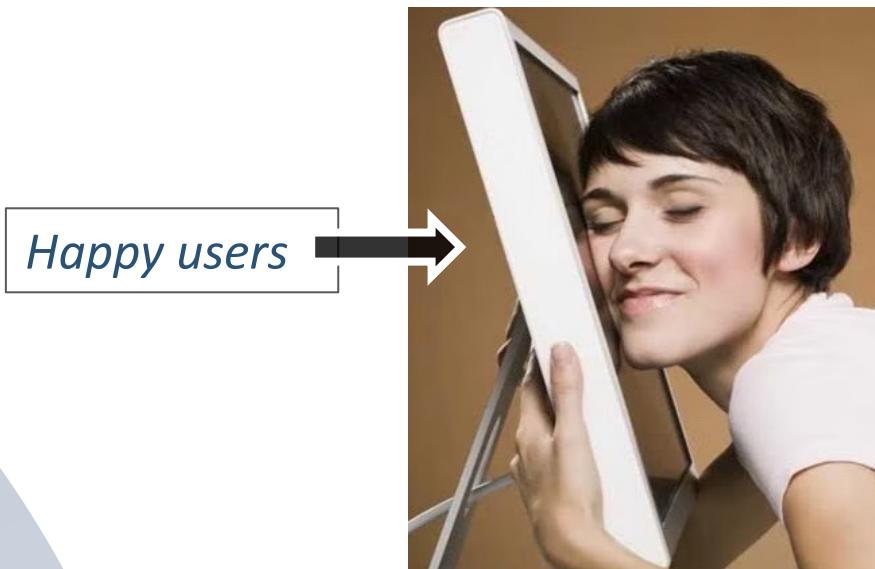
Better network performance

### Cost savings

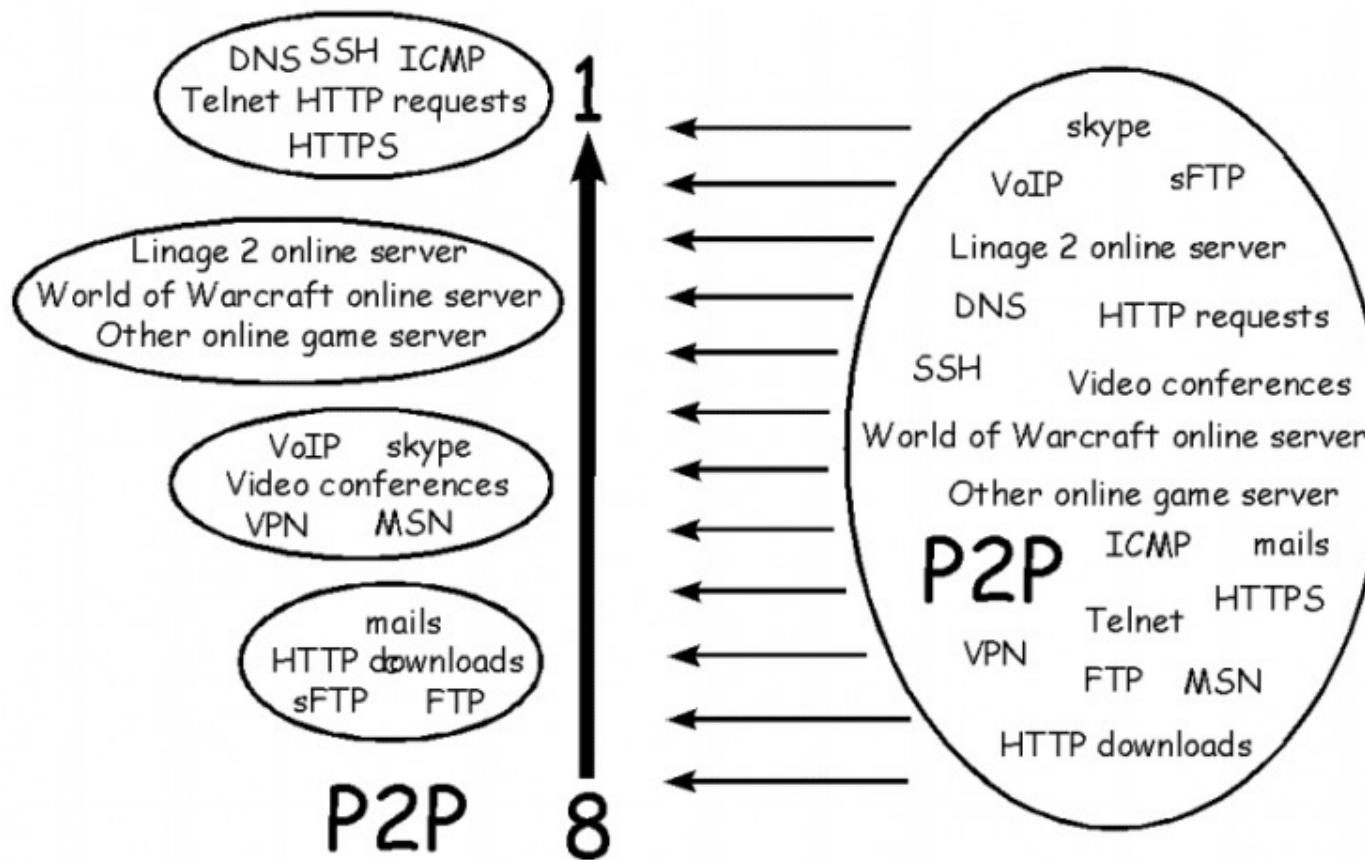


Enhanced user experience

The result of QoS create a better experience of the network what makes people happier overall.



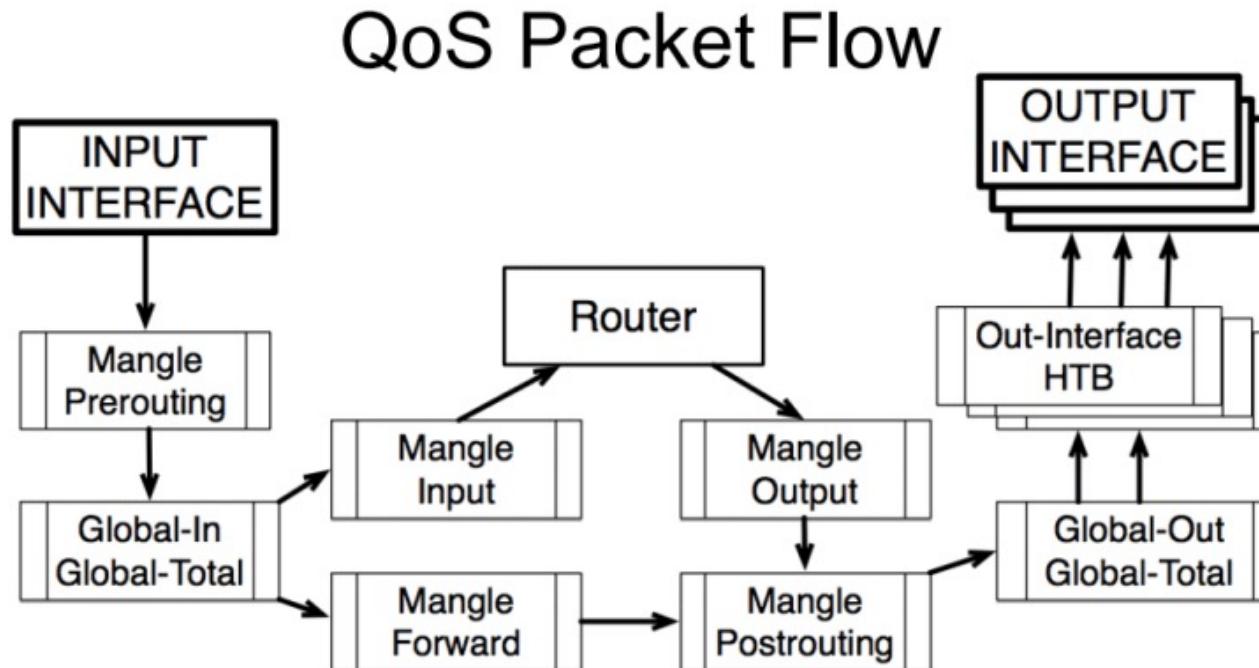
## Prioritization Plan



### Step 1:

Study your network traffic  
and decide what prioritizing  
and bandwidth you want to  
give to what traffic

## Theory – How to implement QoS

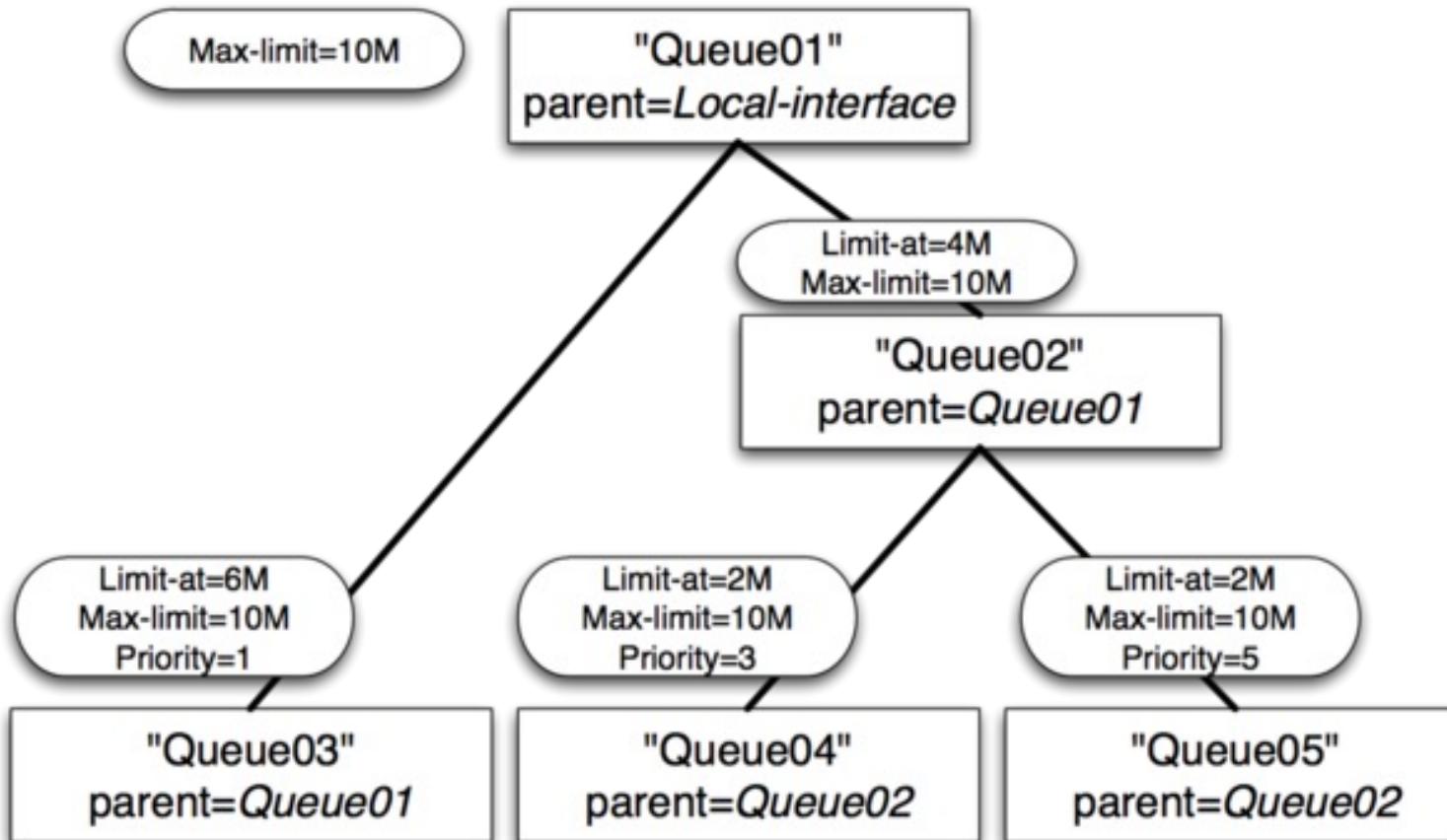


### Step 2:

Create the necessary firewall rules:

- Address list
- Mangle rules
- Filter rules
- L7 Protocols

## Theory – How to implement QoS



### Step 3:

Configure Queue:

- Que type
- Queue tree
- Simple Queue

## QoS for streaming and live internet calls

### Usage explanation

#### Recommended bandwidth for Youtube as example

Type	Video Bitrate, Standard Frame Rate (24, 25, 30)	Video Bitrate, High Frame Rate (48, 50, 60)
8K	100 - 200 Mbps	150 to 300 Mbps
2160p (4K)	44–56 Mbps	66–85 Mbps
1440p (2K)	20 Mbps	30 Mbps
1080p	10 Mbps	15 Mbps
720p	6.5 Mbps	9.5 Mbps
480p	2.5 Mbps	4 Mbps
360p	1 Mbps	1.5 Mbps



1. Connect to your Mikrotik device by MAC
2. Reset your router to default configuration as such that it will work as a router (CPE)
3. Test your internet connectivity
4. Once you have internet connectivity on your computer we will start the lab.

## Usage explanation



```
[admin@TS01] > interface monitor-traffic ether1,bridgel
      name: ether1   bridgel
      rx-packets-per-second: 11 903   3 138
      rx-bits-per-second: 122.1Mbps 2.1Mbps
      fp-rx-packets-per-second: 11 844   3 125
      fp-rx-bits-per-second: 121.1Mbps 2.0Mbps
      rx-drops-per-second: 0       0
      rx-errors-per-second: 0       0
      tx-packets-per-second: 3 126   11 853
      tx-bits-per-second: 2.2Mbps 121.2Mbps
      fp-tx-packets-per-second: 0       0
      fp-tx-bits-per-second: 0bps    0bps
      tx-drops-per-second: 0       0
      tx-queue-drops-per-second: 0       0
      tx-errors-per-second: 0       0
-- [Q quit|D dump|C-z pause]
```

### Monitor your interface speed

/interface monitor-traffic ether1

### Test some speed

Go to <https://t.ly/UpcKv>

*And disable your sound before playing the video ;-)*

*Play the movie and watch the traffic monitor in your Mikrotik terminal.*



Adding the streaming server addresses to the firewall address list of our Mikrotik router

```
/ip firewall address-list  
  
add address=176.58.30.0/24 list=addr1-TV0\  
comment=TVoost-non-live-content-streaming-servers  
  
add address=93.123.38.0/24 list=addr1-TV0\  
comment=TVoost-live-content-streaming-servers  
  
add address=176.58.31.0/24 list=addr1-TV0\  
comment=TVoost-live-content-streaming-servers
```

We will use these addresses in our firewall mangle rules to mark our connections



Adding the mangle rule that will mark the connections to TVoost based on the Address list

```
/ip firewall mangle  
  
add action=mark-connection chain=prerouting connection-mark=no-mark\  
connection-state=new dst-address-list=addr1-TV0 log=yes\  
log-prefix=cm_tvo new-connection-mark=cm_tvo passthrough=yes\  
comment=Connections-mark_to_TVoo
```

We will use this mangle rule to mark our packets later in the traffic flow



Adding the mangle rule that will mark the connections of all the udp traffic that is not from TVoost

```
/ip firewall mangle  
  
add action=mark-connection chain=prerouting connection-mark=no-mark\  
connection-state=new dst-address-list=!addr1-TV0 log=yes\  
log-prefix=cm_udp new-connection-mark=cm_udp passthrough=yes\  
protocol=udp dst-port=!53 dst-address=!255.255.255.255\  
comment=Connection-mark_for_other_udp_traffic
```

We will use this mangle rule to mark our packets later in the traffic flow



With this mangle rule we will add a mark on the packets of the connections with cm\_tvo

```
/ip firewall mangle  
  
add action=mark-packet chain=prerouting connection-mark=cm_tvo  
log=yes log-prefix=pm_tvo new-packet-mark=pm_tvo passthrough=yes\  
comment=Packet-mark_for_Tvoost
```

We will use this mangle in our Queue tree



With this mangle rule we will mark all the packets with the connection mark cm\_udp

```
/ip firewall mangle  
  
add action=mark-packet chain=prerouting connection-mark=cm_udp  
log=yes log-prefix=pm_udp new-packet-mark=pm_udp passthrough=yes/  
comment=Packet-mark_for_UDP_traffic
```

We will use this mangle in our Queue tree



With this configuration we will add 3 PCQ Queue types to use later in Queue tree

```
/queue type

add kind=pcq name=pcq-tvo pcq-burst-rate=2M pcq-burst-threshold=2M\
pcq-burst-time=1m pcq-classifier=dst-address pcq-rate=512k

add kind=pcq name=pcq-udp pcq-burst-rate=10M pcq-burst-threshold=6M\
pcq-burst-time=1m pcq-classifier=dst-address pcq-rate=6M

add kind=pcq name=pcq-other pcq-burst-rate=10M\
pcq-burst-threshold=5M pcq-burst-time=1m\
pcq-classifier=dst-address pcq-rate=5M
```

With this configuration we will add 3 PCQ Queue types to use later in Queue tree

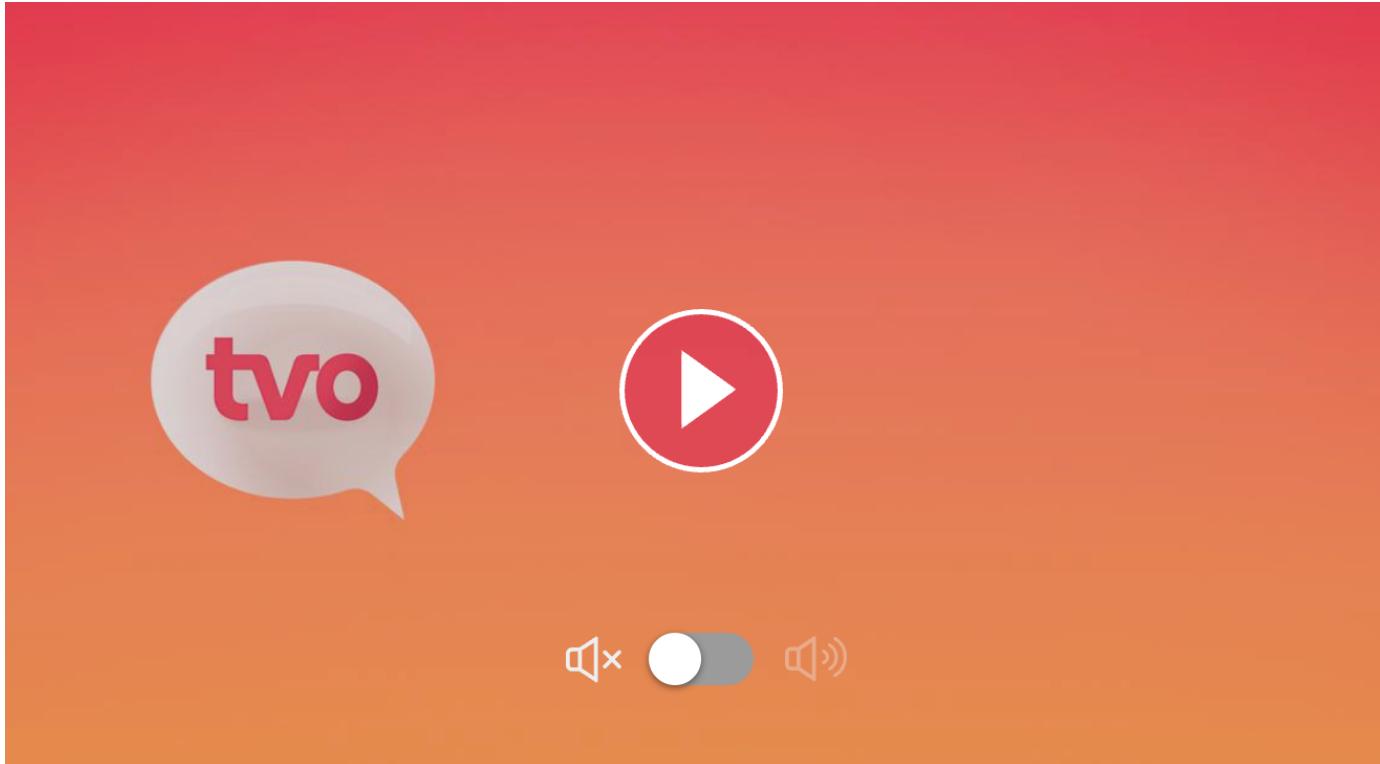
```
/queue type

add kind=pcq name=pcq-tvo pcq-burst-rate=512k\
pcq-burst-threshold=512k pcq-burst-time=1m
pcq-classifier=dst-address pcq-rate=256k

add kind=pcq name=pcq-udp pcq-burst-rate=10M pcq-burst-threshold=6M\
pcq-burst-time=1m pcq-classifier=dst-address pcq-rate=6M

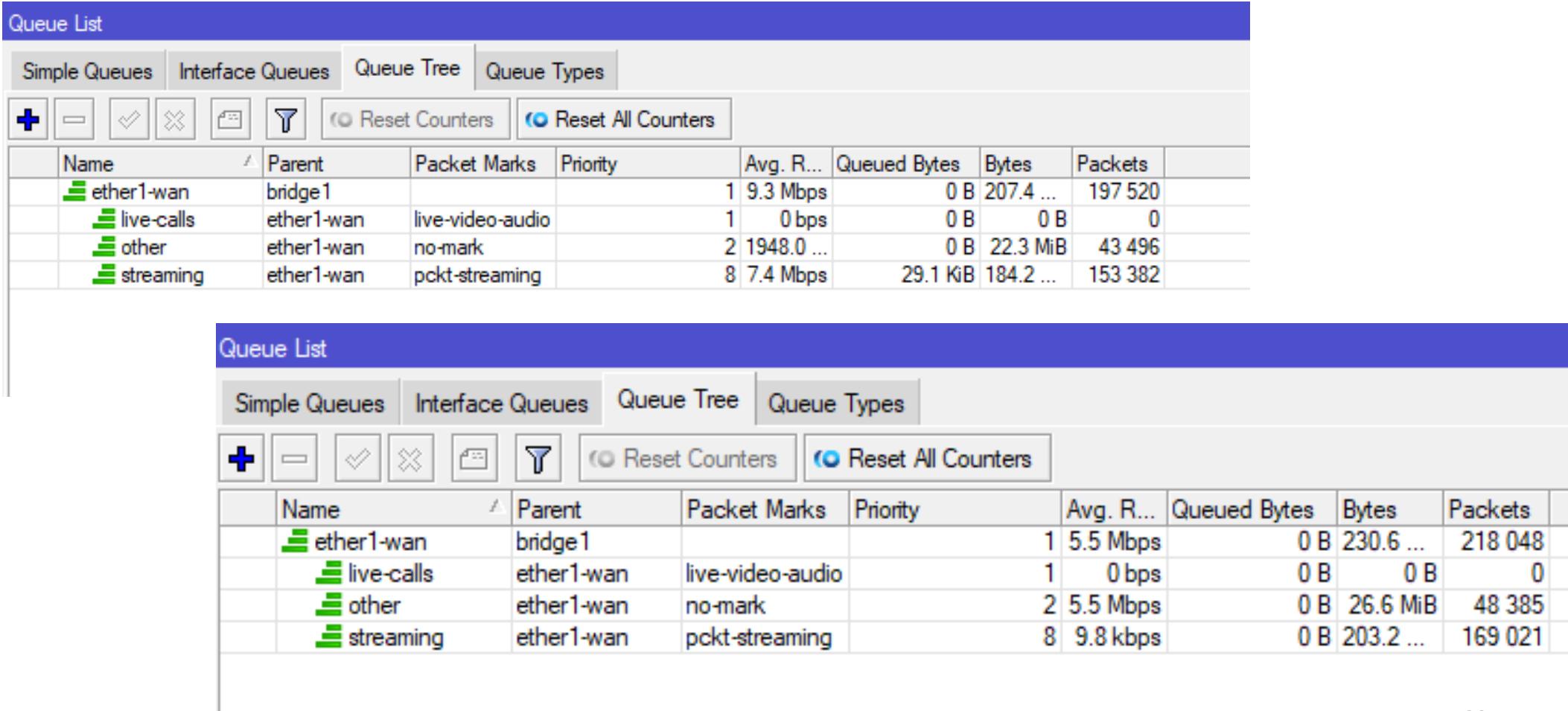
add kind=pcq name=pcq-other pcq-burst-rate=10M\
pcq-burst-threshold=5M pcq-burst-time=1m\
pcq-classifier=dst-address pcq-rate=5M
```

**Test what speed you have to set in the Queue tree QT-tvo  
to have a fluent low-quality livestream**



## QoS for streaming and live internet calls

## Simple queues and queue tree



The image shows two screenshots of the MikroTik Queue List interface side-by-side, illustrating different QoS configurations.

**Queue Tree Configuration:**

Name	Parent	Packet Marks	Priority	Avg. R...	Queued Bytes	Bytes	Packets
ether1-wan	bridge1		1	9.3 Mbps	0 B	207.4 ...	197 520
live-calls	ether1-wan	live-video-audio	1	0 bps	0 B	0 B	0
other	ether1-wan	no-mark	2	1948.0 ...	0 B	22.3 MiB	43 496
streaming	ether1-wan	pckt-streaming	8	7.4 Mbps	29.1 kB	184.2 ...	153 382

**Simple Queues Configuration:**

Name	Parent	Packet Marks	Priority	Avg. R...	Queued Bytes	Bytes	Packets
ether1-wan	bridge1		1	5.5 Mbps	0 B	230.6 ...	218 048
live-calls	ether1-wan	live-video-audio	1	0 bps	0 B	0 B	0
other	ether1-wan	no-mark	2	5.5 Mbps	0 B	26.6 MiB	48 385
streaming	ether1-wan	pckt-streaming	8	9.8 kbps	0 B	203.2 ...	169 021

I have one more task for you ...  
Please fill in my quiz

URL: <https://t.ly/i7s0e>

Thanks for your attention and success!

