QoS in RouterOS v6.x

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About Me

- Graduate in electronic engineering
- Mikrtotik certified and consultant and trainer
- Working telecommunication since 2001
- RIPE member
- ISP CEO and designer
- Specialized in Routing, QoS, WAN access, wireless

For an ISP what is QoS about?

- QoS is about Bandwidth management
- QoS is about enabling certain type of services
- QoS is about guarantee certain level of services
- QoS is about well manage what we have
- QoS is about keeping customers happy!

Identifying the problem(s)

Identifying the problem(s)

- Basically we can split the problem in two parts:
  - Limit the available bandwidth per user (or per type of contract subscribed)
  - Make sure that certain types of services will be provided with priority respect to others

Knowing the tools:

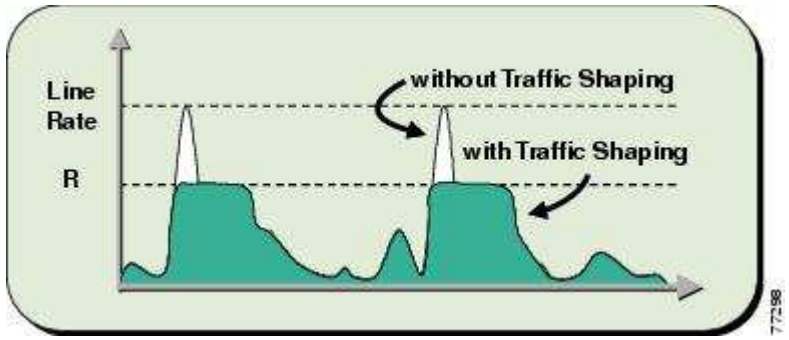
Fundamentals

- Traffic control is done on the outbound interface (we have no control on how much traffic is being sent to us)
- Rate limit is done by dropping some low priority packets so we have capacity for higher priority packets
- We need to know how much bandwidth is available
- WE ARE NOT REORDERING PACKETS, packets will leave the router in the exact sequence as they are received (provided that we are forwarding them)

Fundamentals

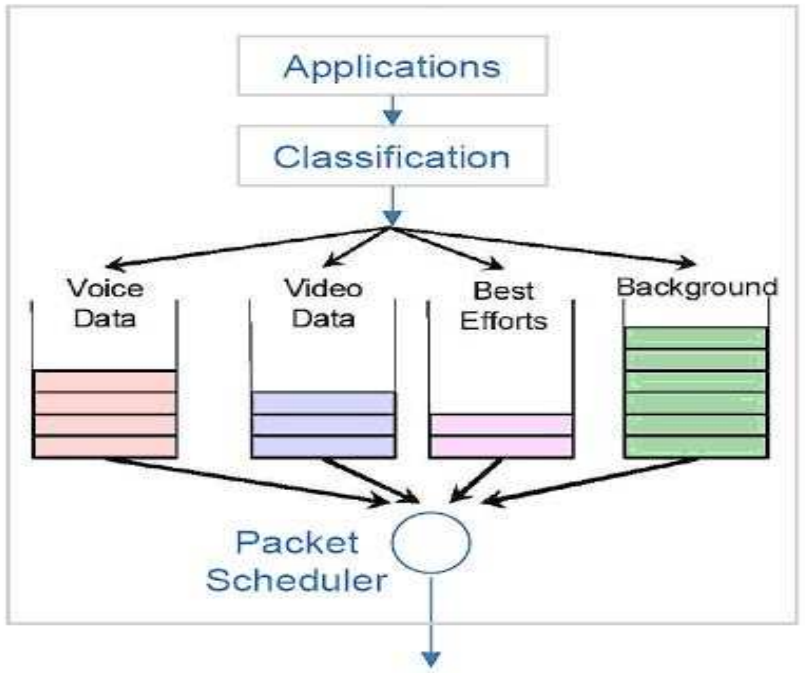
Traffic Shaping

- Limits the transmit rate of traffic to a certain value by temporary buffering exceeding packets:



Traffic Priority

- Classify traffic based on application.



Identifying the solution

Identifying the solution

- We need **two** QoS facilities:
  - First to classify the traffic:
    - Let flow the high priority packets
    - Drop low priority packets if they are coming too fast
  - Second to shape the traffic:
    - Avoid one user to monopolize the available bandwidth
    - Sell different services with different bandwidth rates

Identifying the solution

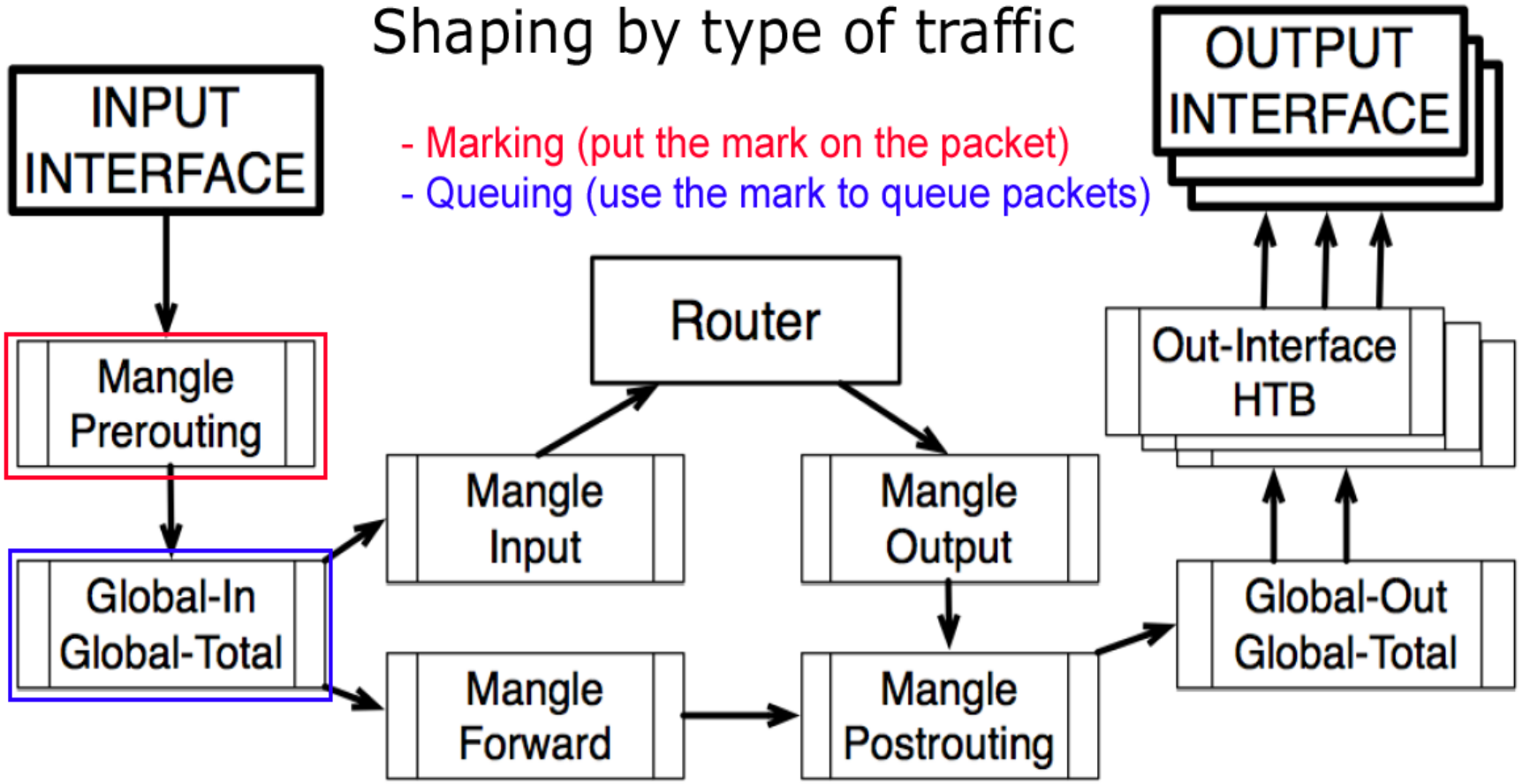
we can either:

- Use two RouterOs boxes
  - Less Hardware requirements
  - Very simple setup
- Setup double QoS on a single RouterOs box
  - Power budget (solar panel etc..)
  - Thermal budget
  - Money budget
  - Avoid a point of failure
  - Just because we can!

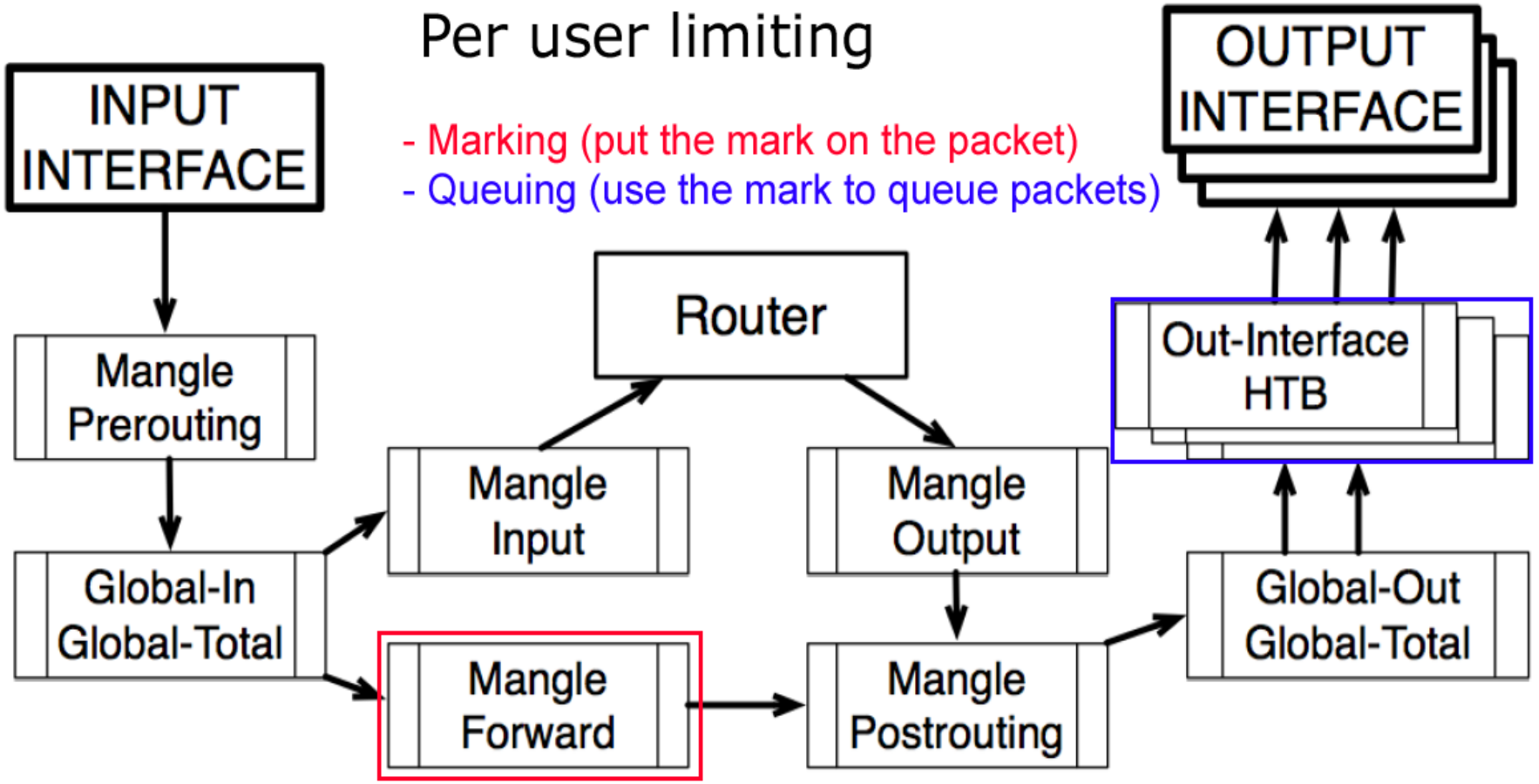
How to do it

Disclaimer: This is one way of doing it
(there are more)

Double QoS(RouterOs V5.x)



Double QoS(RouterOs V5.x)



Double QoS(RouterOs V5.x)

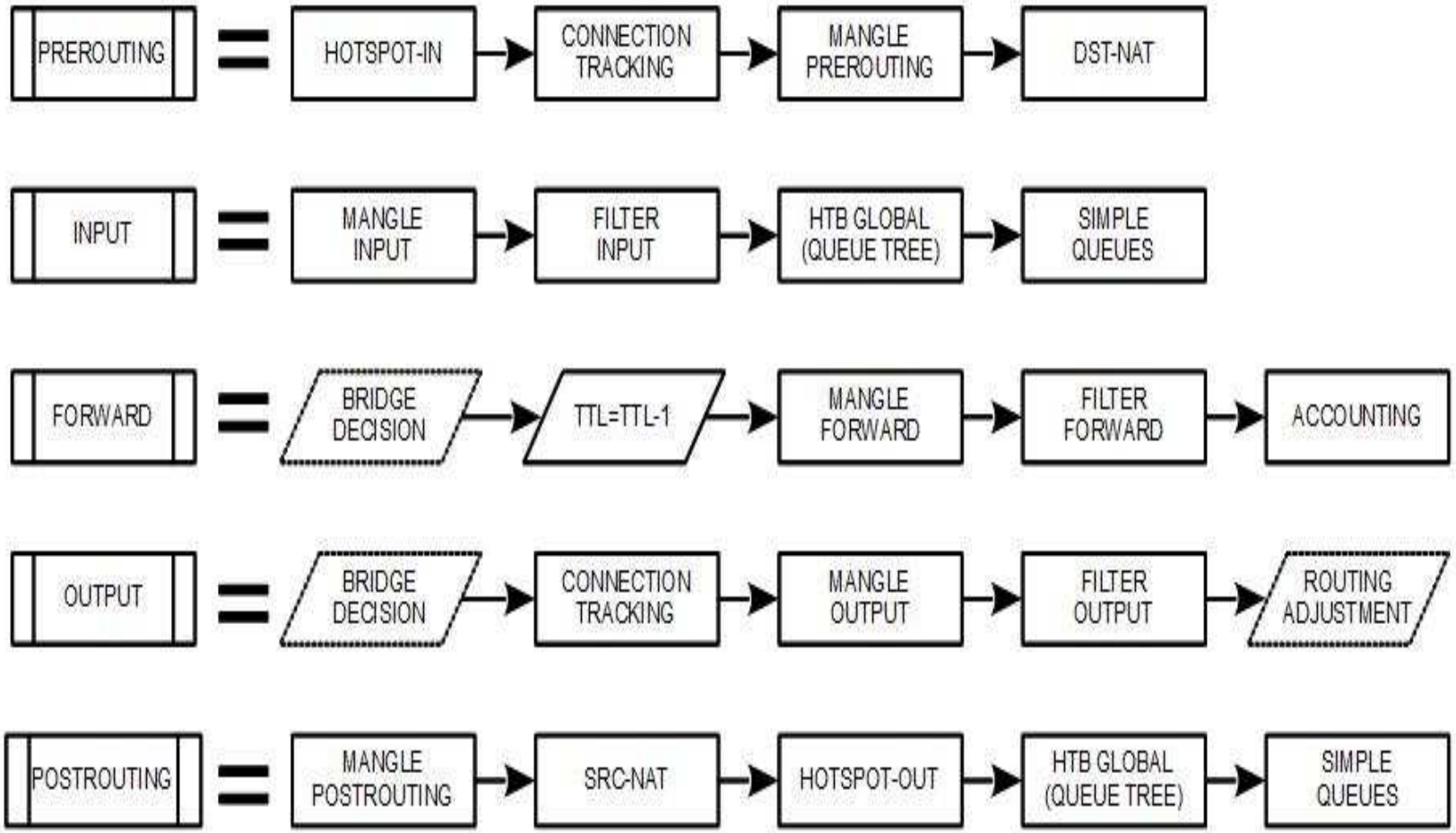
- Basically we will use the mark facility two times -

- Mark traffic by traffic type in mangle chain Prerouting
- Limit traffic by type in Global-in HTB
- Re-Mark traffic by clients in mangle chain Forward
- Limit traffic per client in Interface HTB

changes in RouterOs v6.x

- No more global-in and global-out, replaced by a "global“ located just before simple queues;
- Better simple queues selection algorithm (hashing);
- Simple queues happen in different place at the very end of postrouting and input chains;
- Simple queues have separate priority setting for download/upload/total;
- Simple queues target-addresses and interface parameters are joined into one target parameter, now supports multiple interfaces match for one queue;
- Simple queues dst-address parameter is changed to dst and now supports destination interface matching;

RouterOs v6.x Packetflow



Double QoS(routerOs V6.x)

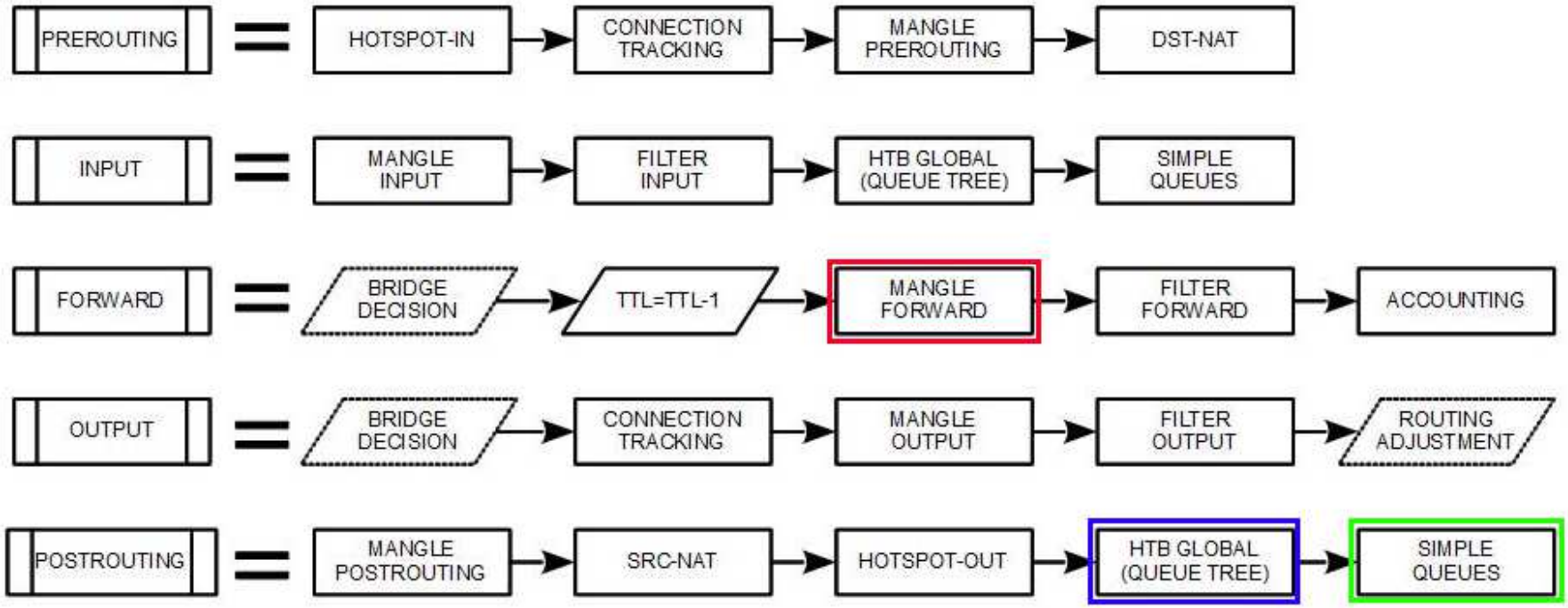
- Because queuing happens at one place we cannot mark, queue, remark and re-queue as in v5.x
- We can use mangle to mark packet by type of service and queue them in queue tree but…
- We need a separate facility to queue packets to achieve per user limitation.
- Ideas?

Simple queues

- Not for only for simple tasks anymore…
- No need to mark can identify traffic based on dst-address, interface, etc…
- Fast… especially on multicore hardware
- Number of simple queue is not relevant anymore
- We can have thousands of them and we can easily create them either dynamically or by scripts.

The big picture

- Service type marking
- Service type queuing
- User limiting queuing

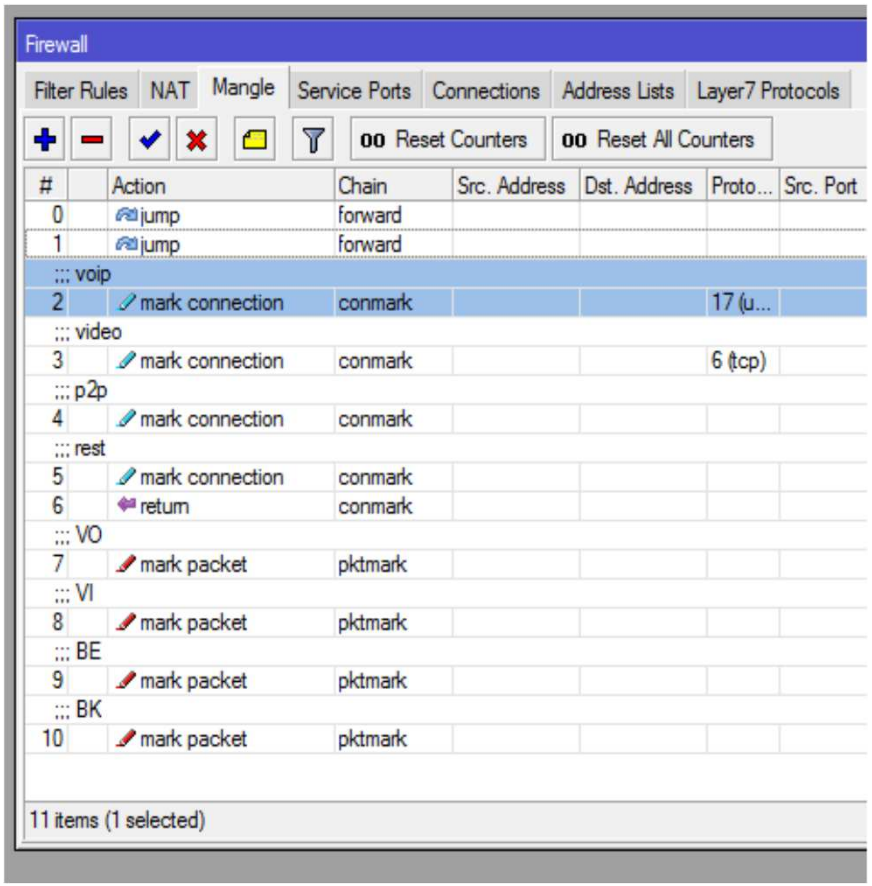


Practical example - simple PPPoE AC

- restrict bandwidth per user
- support voice
- video streaming
- ptp programs

Service type - Packet Marking

- Winbox view



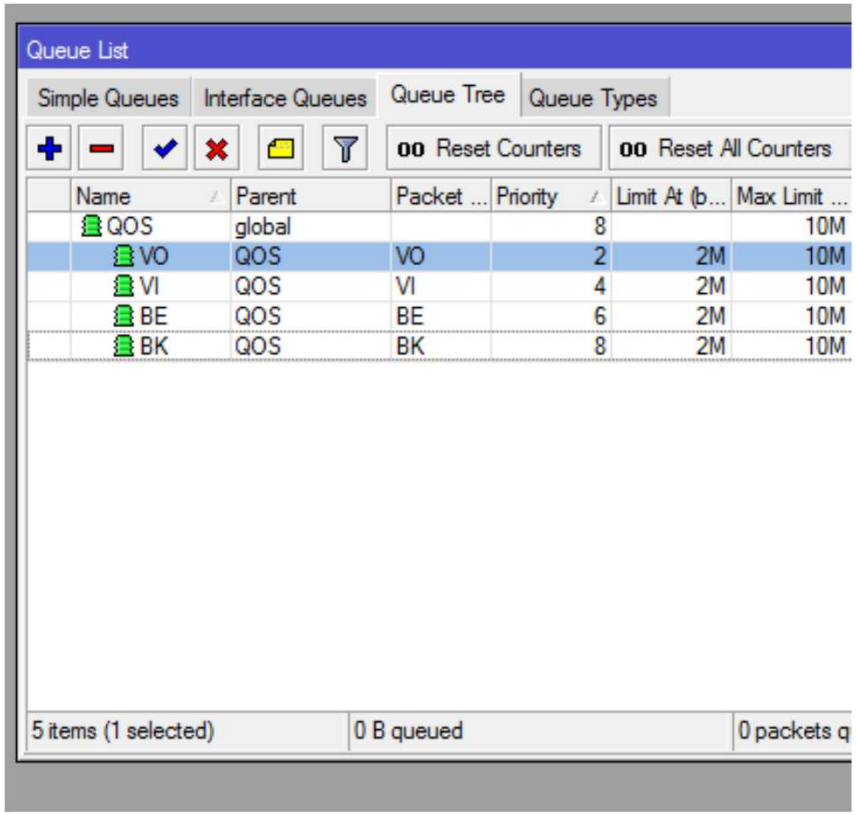
- Jump to a chain where we will put the mark on the connection
- Jump to a chain where we will put the mark on the packet (based on the connection)
- This will reduce overhead for complex matches.

Mangle - Export view

```
/ip firewall mangle
add action=jump chain=forward connection-mark=no-mark jump-target=conmark
add action=jump chain=forward connection-mark=!no-mark jump-target=pktmark
add action=mark-connection chain=conmark comment=voip dst-port=5060-
5061,16000-17000 new-connection-mark=voip-con protocol=udp
add action=mark-connection chain=conmark comment=video dst-address-
list=youtube new-connection-mark=video-con protocol=tcp
add action=mark-connection chain=conmark comment=p2p new-connection-
mark=p2p-con p2p=all-p2p
add action=mark-connection chain=conmark comment=rest connection-mark=no-
mark new-connection-mark=all-con
add action=return chain=conmark
add action=mark-packet chain=pktmark comment=VO connection-mark=voip-con
new-packet-mark=VO
add action=mark-packet chain=pktmark comment=VI connection-mark=video-con
new-packet-mark=VI
add action=mark-packet chain=pktmark comment=BE connection-mark=all-con
new-packet-mark=BE
add action=mark-packet chain=pktmark comment=BK connection-mark=p2p-con
new-packet-mark=BK
```

Service type – Queue Tree

- Winbox view



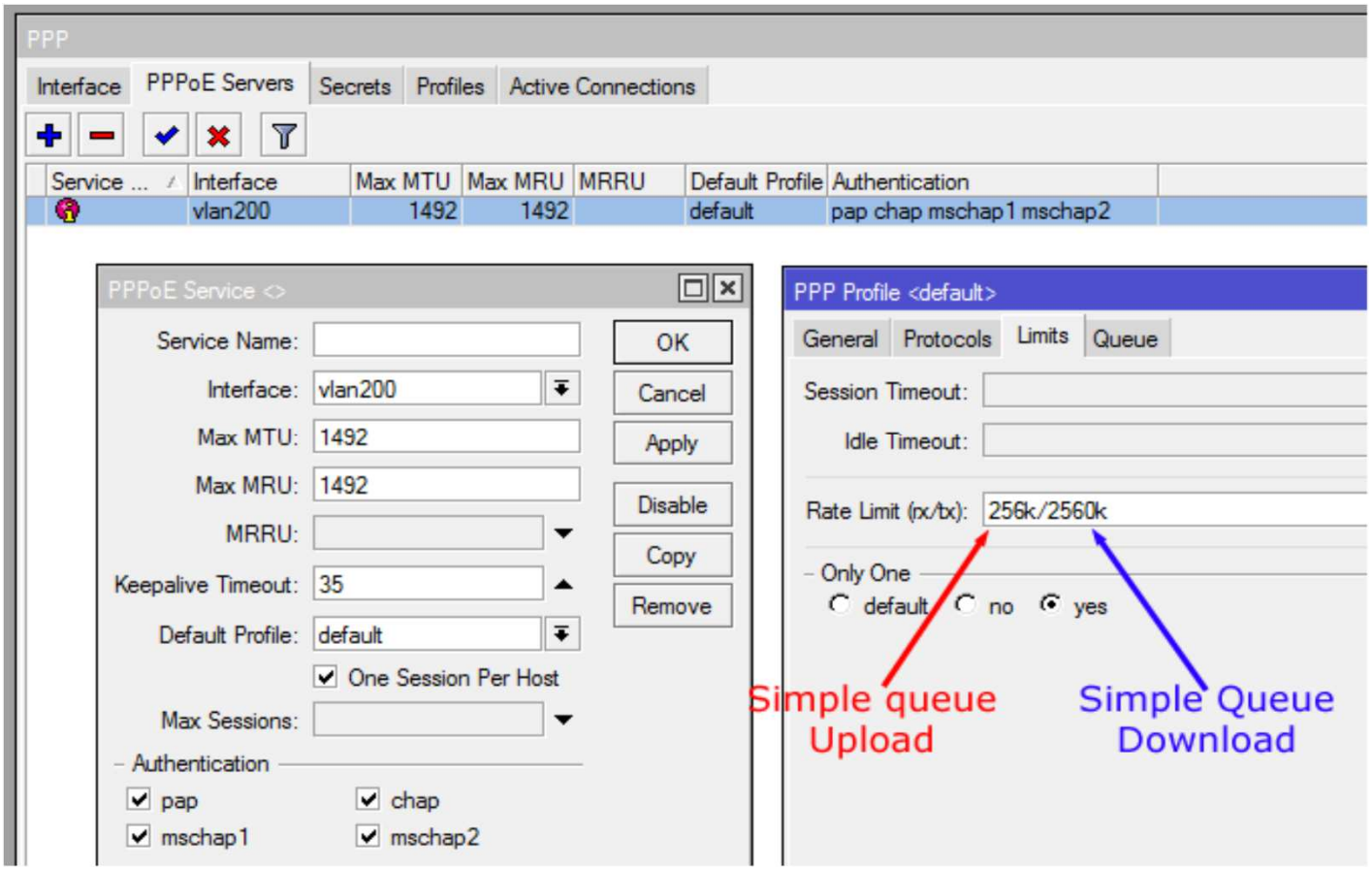
- Parent queue in global for upload and download traffic sets max-limit
- Child classes with higher priority will be able to reach max-limit before class with lower priority.
- Traffic queued based on the packet mark

Queue Tree - Export view

```
/queue tree
add max-limit=10M name=QOS parent=global queue=default
add limit-at=2M max-limit=10M name=BK packet-mark=BK parent=QOS
add limit-at=2M max-limit=10M name=BE packet-mark=BE parent=QOS
priority=6
add limit-at=2M max-limit=10M name=VI packet-mark=VI parent=QOS
priority=4
add limit-at=2M max-limit=10M name=VO packet-mark=VO parent=QOS
priority=2
```

Per user limit – Dynamic Simple Queue

- Winbox view

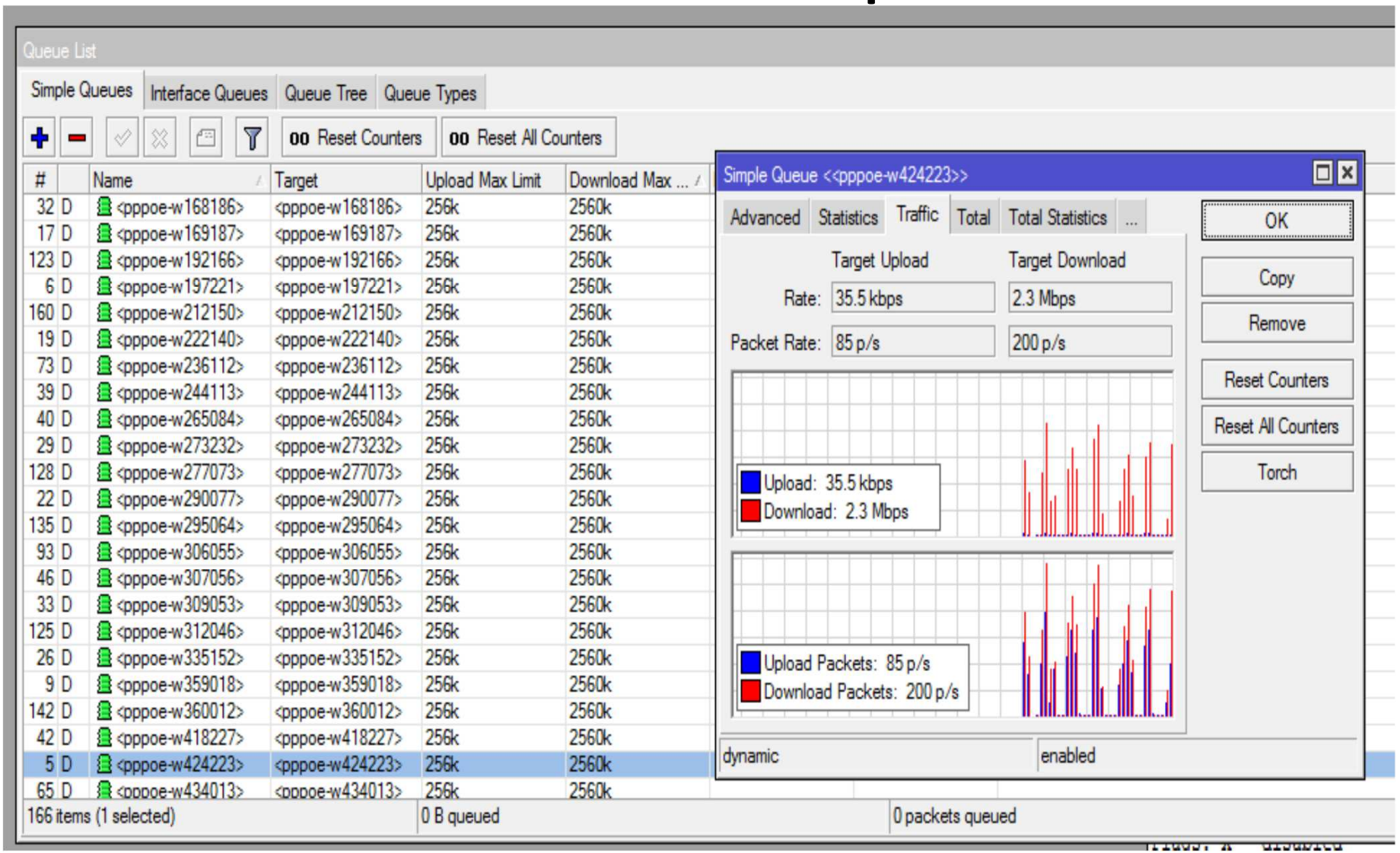


Dynamic Simple Queue – Export view

```
/ppp profile
set 0 dns-server=8.8.8.8,8.8.4.4 local-address=10.0.0.6 only-
one=yes rate-limit="256k/2560k" remote-address=customers use-vj-
compression=no

/interface pppoe-server server
add disabled=no interface=vlan200 keepalive-timeout=35 max-
mru=1492 max-mtu=1492 one-session-per-host=yes
```

Per user limit – Simple Queue



Sources

- QoS Best Practice and RouterOS v6 presentations by Janis Megis
- Mikrotik wiki
- QoS theory

THANK YOU

- Q&A Comments and suggestions
  - Alfredo Giordano (agiordano@warian.net)