
# RouterOs Firewall

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TRAINER #TR0368

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# Massimo Nuvoli (maxnuv)

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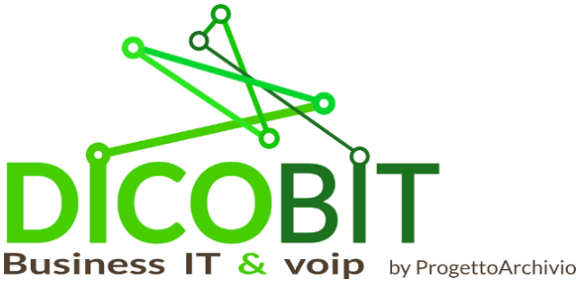
System Engineer
System Architect

Please, call me Max!

# First of all..

- at the last Europe MUM..

  my talk was about Switching
  and there was a request

  Please add “hardware spanning tree”

  and from 6.38...

# Switch Hardware Spanning Tree

- Make a switch (as usual)
- Add the master port to a bridge
- Then from the bridge menu IF STP is on then the STP is active on hardware
- Slave ports are shown on the bridge to show the STP status

Look documentation:

https://wiki.mikrotik.com/wiki/Manual:Switch_Chip_Features#Spanning_Tree_Protocol

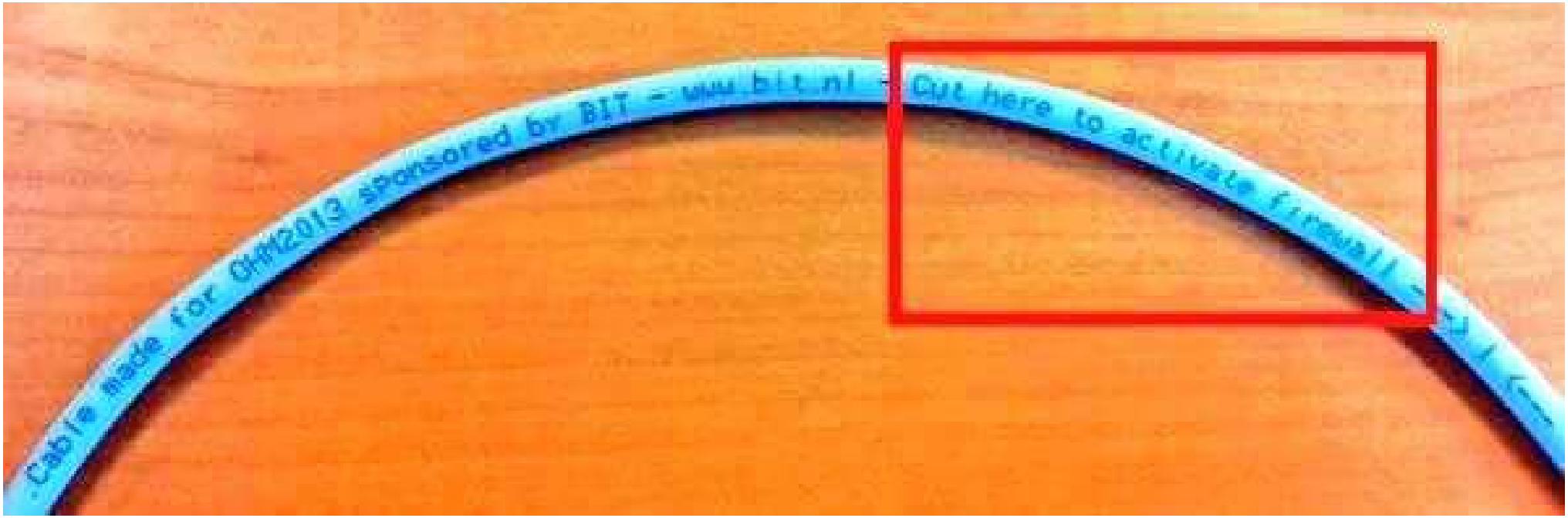
# Today goals

- Know about firewall design in RouterOs
- Know where is, and what to do with
- Changes of the firewall in the last year
- Two examples

# What is a “firewall?”

- Try to isolate the “less protected” outside area from the “more protected” inside area
- It's security device, but own only a firewall is not enough to be protected
- Security is a process, and firewall is only one part of
- The less secure item is between the keyboard and the chair

# Cut here to activate firewall :-)



# Where is “the firewall”

- L2 firewall

  Bridge → Filter

  Switch → Rule or Access List and other
- L3 (and up) firewall IPv4

  IP → Firewall and IP → Web Proxy
- L3 firewall IPv6

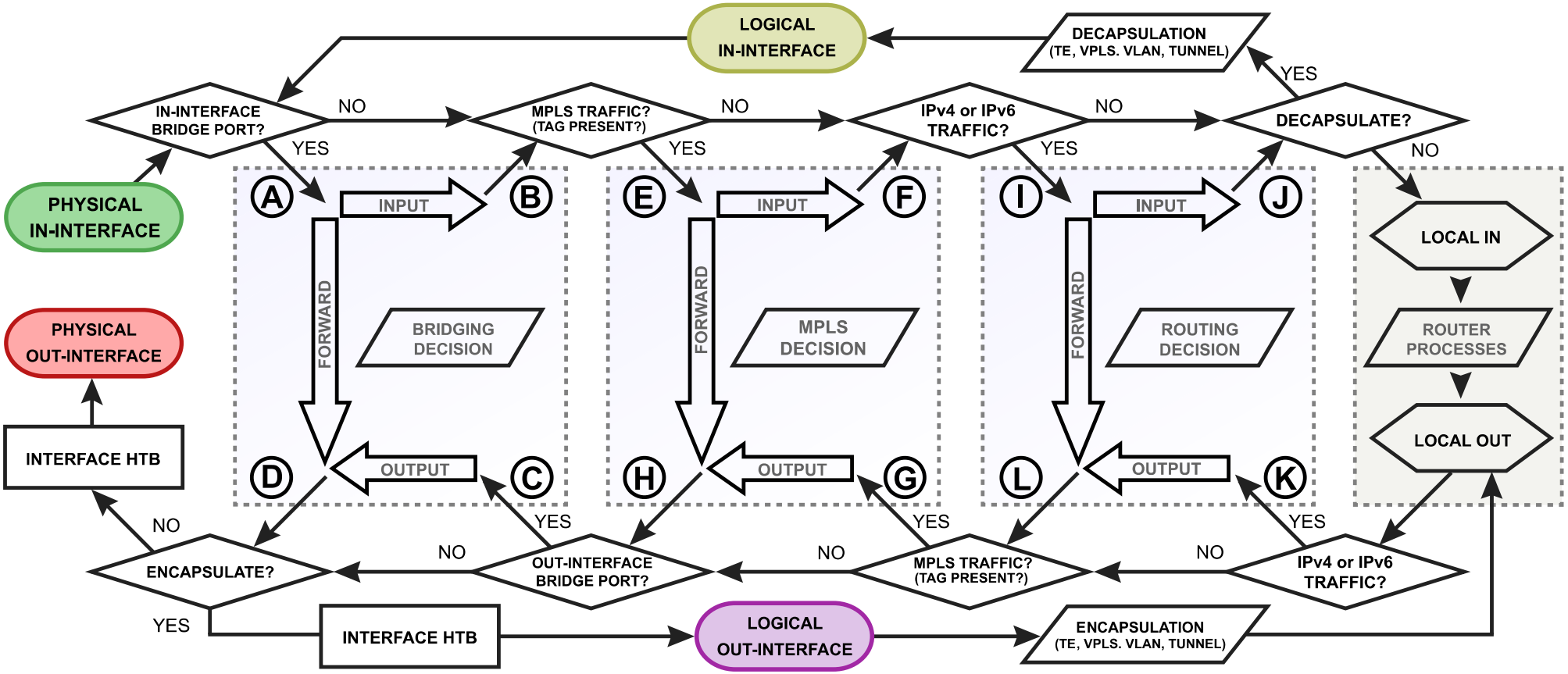
  IPv6 → Firewall

# L2 firewall

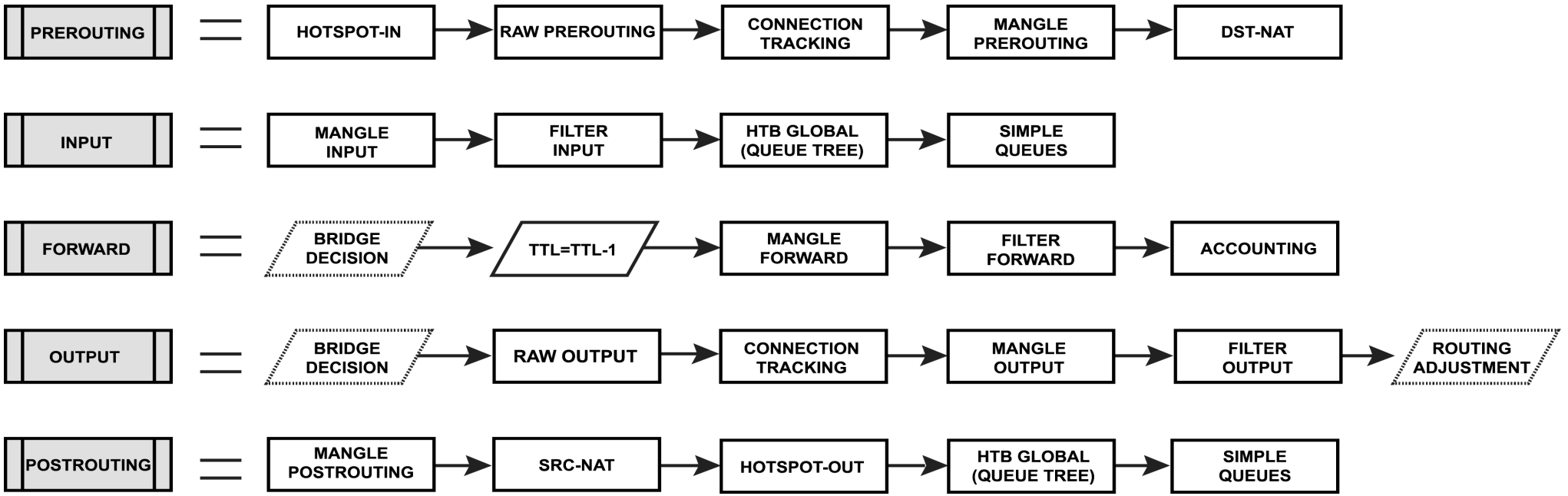
Take the fight at L2, but not only MAC ADDRESS...

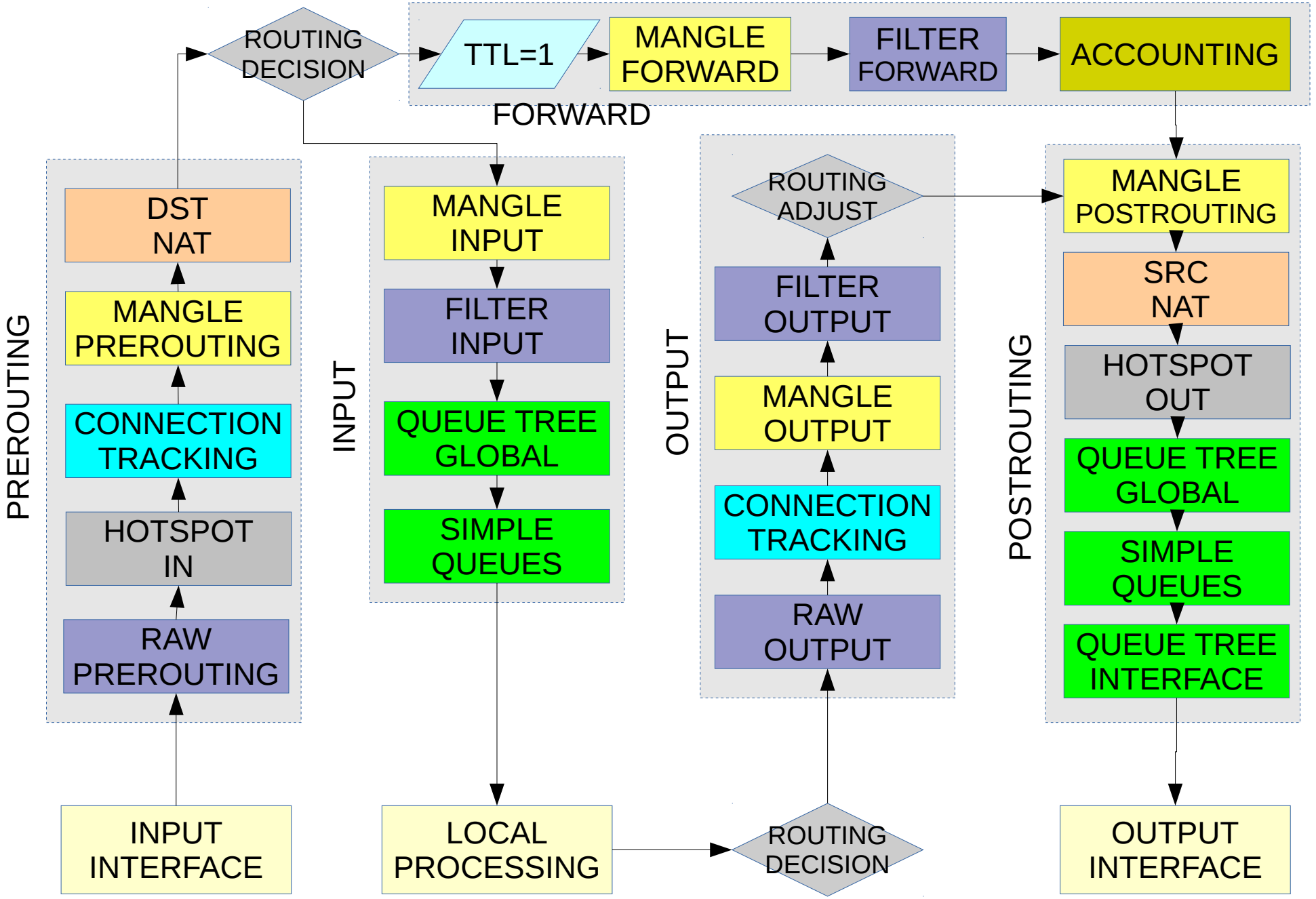
- On switch chipset with ACL (hardware)
- On bridge interface with ACL (software)

# RouterOs Packet Flow 1



# RouterOs Packet Flow 2




ROUTING DECISION
TTL=1
MANGLE FORWARD
FILTER FORWARD
ACCOUNTING
FORWARD
PREROUTING
DST NAT
MANGLE PREROUTING
CONNECTION TRACKING
HOTSPOT IN
RAW PREROUTING
INPUT
MANGLE INPUT
FILTER INPUT
QUEUE TREE GLOBAL
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OUTPUT
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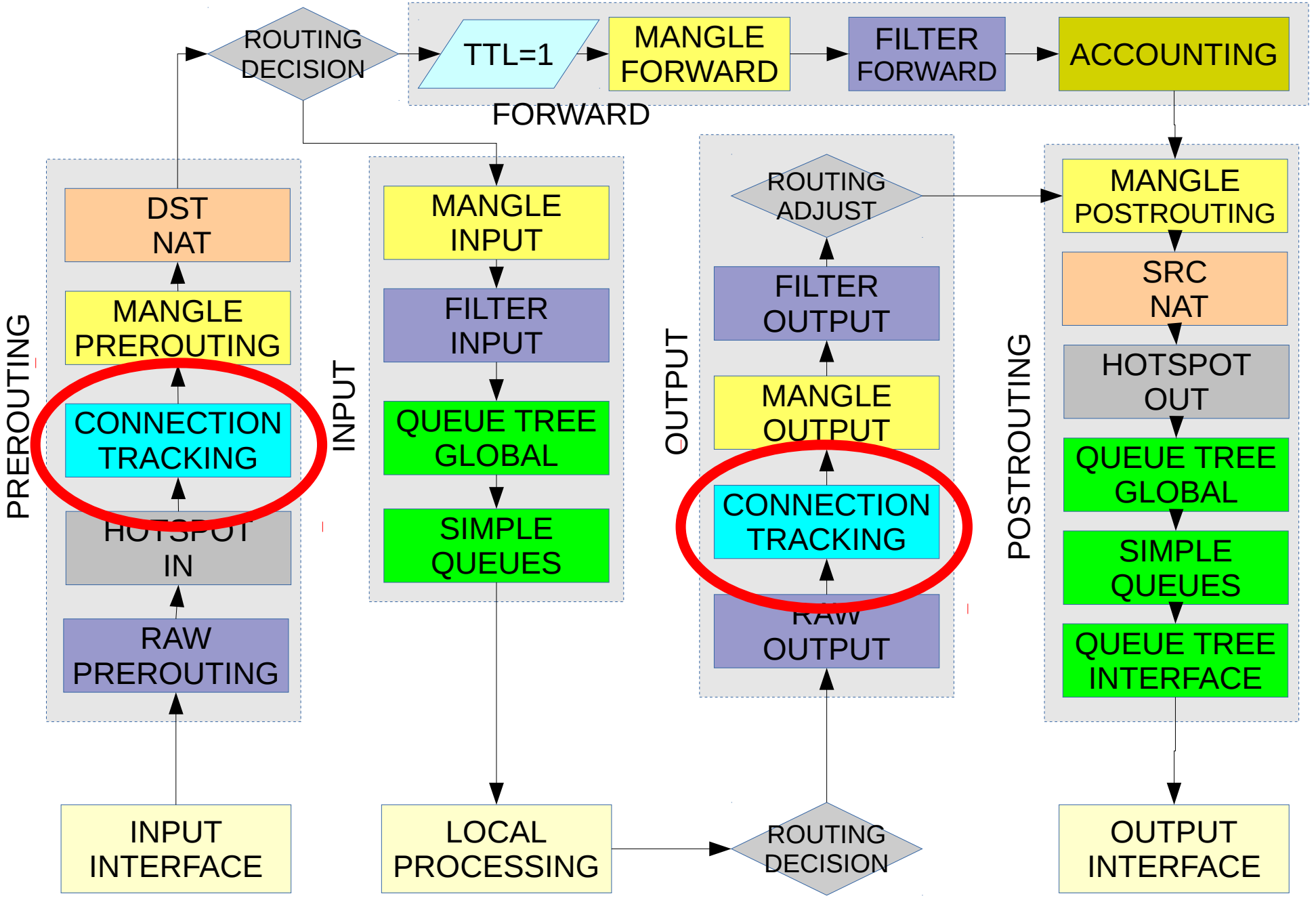
OUTPUT INTERFACE

# Connection Tracking

- RouterOs can “detect” the status of a connection (TCP/UDP) and try to give us a more powerful way to check packets
- Connection state can be “new” “established” “related” but also “unknown” or “invalid”
- Particular protocols (eg SIP and FTP) needs “connection helpers” to track complex connections

```
/ip firewall connection
```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# L3 firewall IPv4 and IPv6

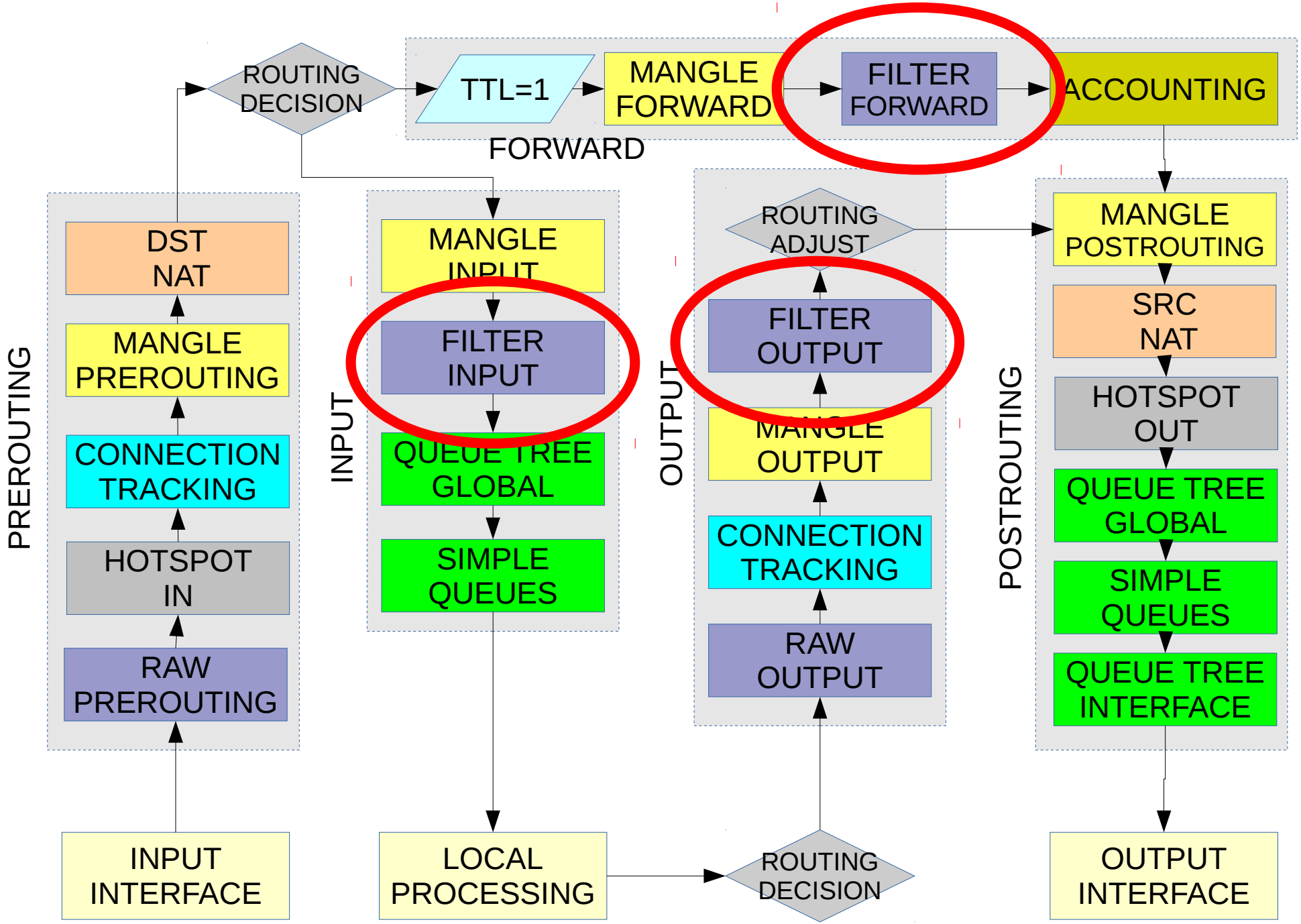
- Packet flow show “where firewall act”
- Each “position” is a “default chain”
- A “chain” is a set of sequential rules, the order IS important
- Check and action are different in each flow position
- You can jump and also return back on a chain

# Filter table

Filter chains can be used to allow and deny connections

- Input
- Output
- Forward

```
/ip firewall filter
/ipv6 firewall filter
```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# Default filter table

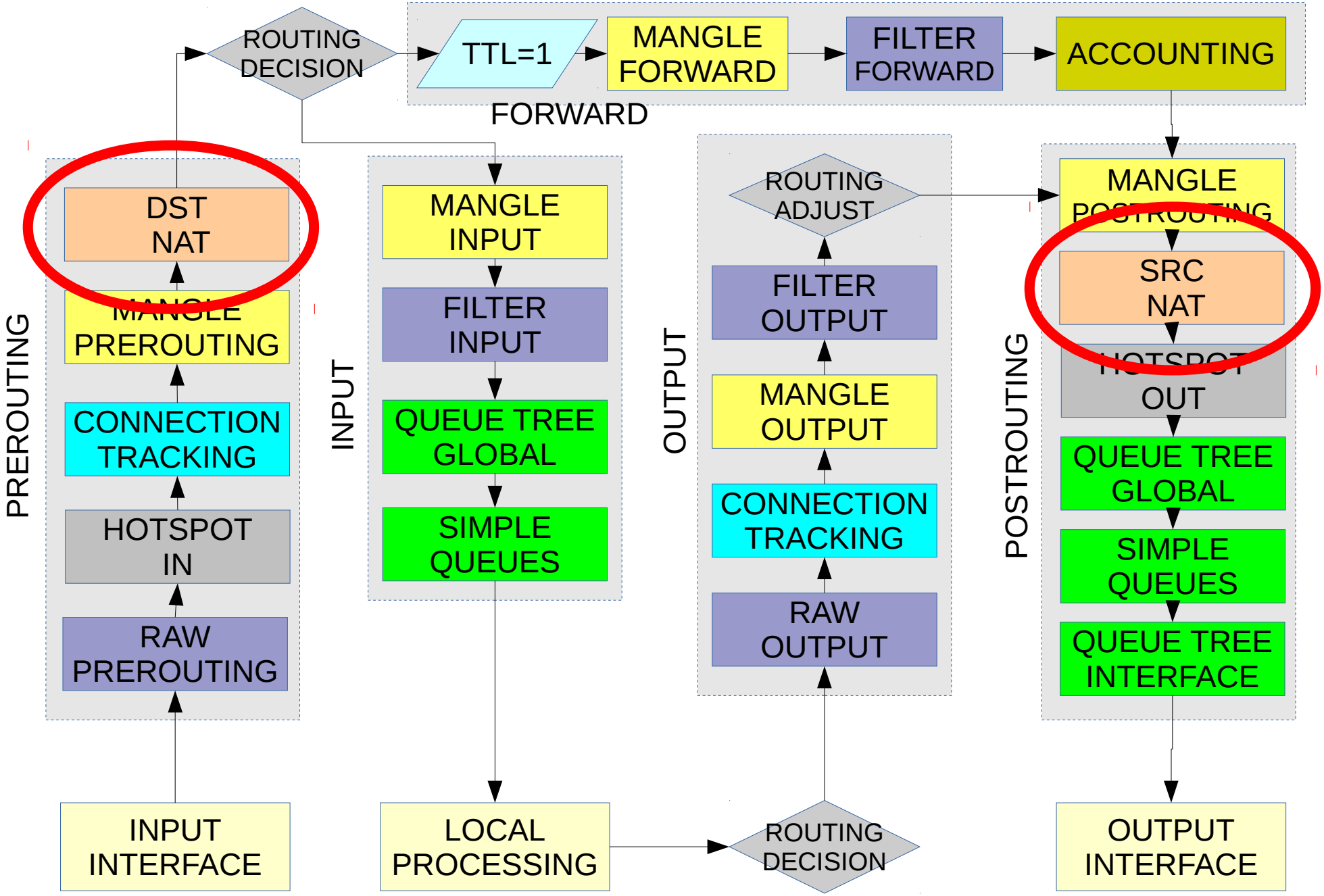
- With connection tracking:
  - accept established/related connections
  - drop invalid connections
  - after we have only “new” connections so no need to check the connection state
  - other rules

# Nat table

In the nat chains we can change address and port of connections, only in IPv4

- src nat
- dst nat

```
/ip firewall nat
```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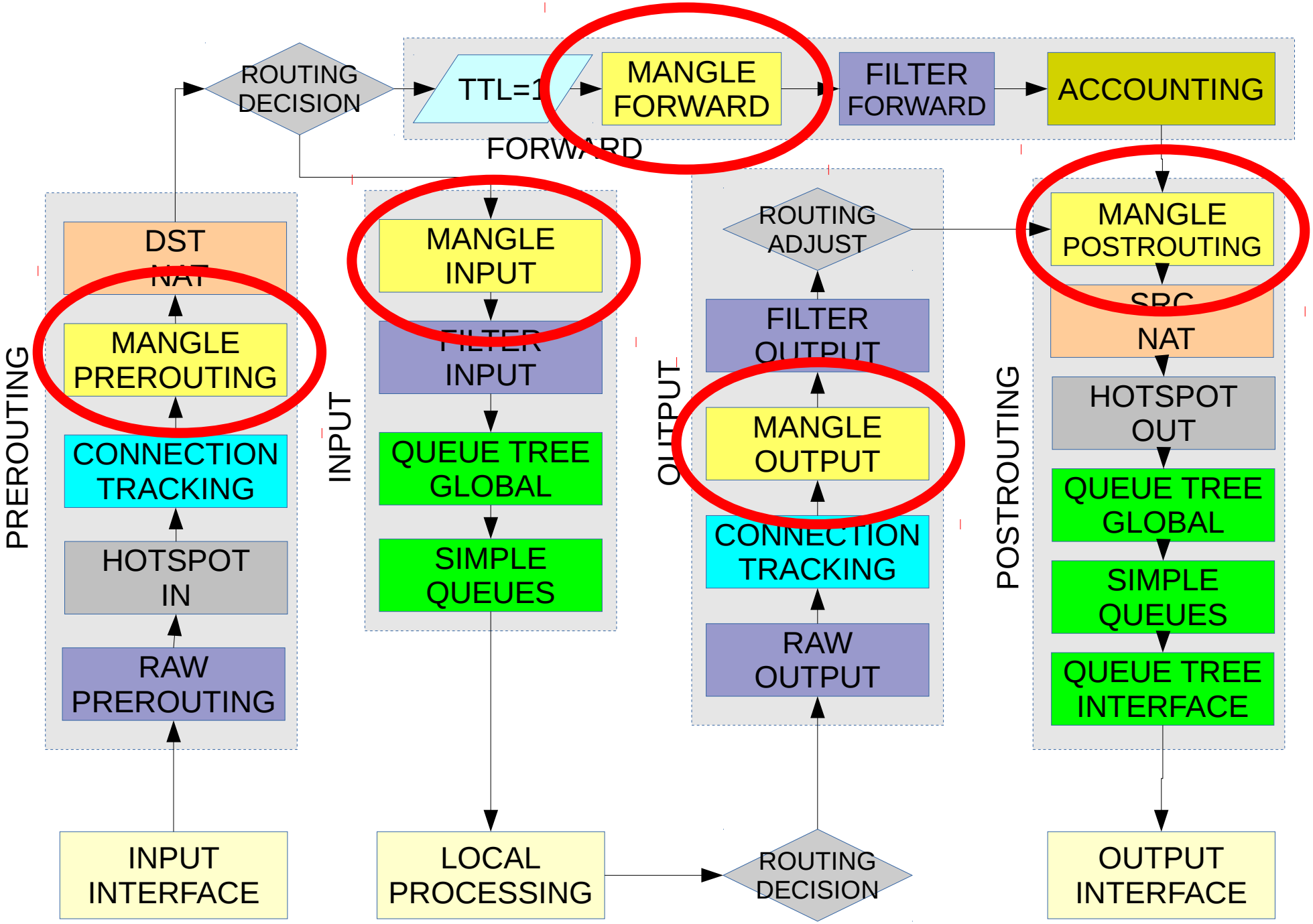
# Mangle table

The mangle chain is useful to manage all other detail of a connection (e.g. ttl or qos)

- input
- output
- forward
- prerouting
- Postrouting

```
/ip firewall mangle
/ipv6 firewall mangle
```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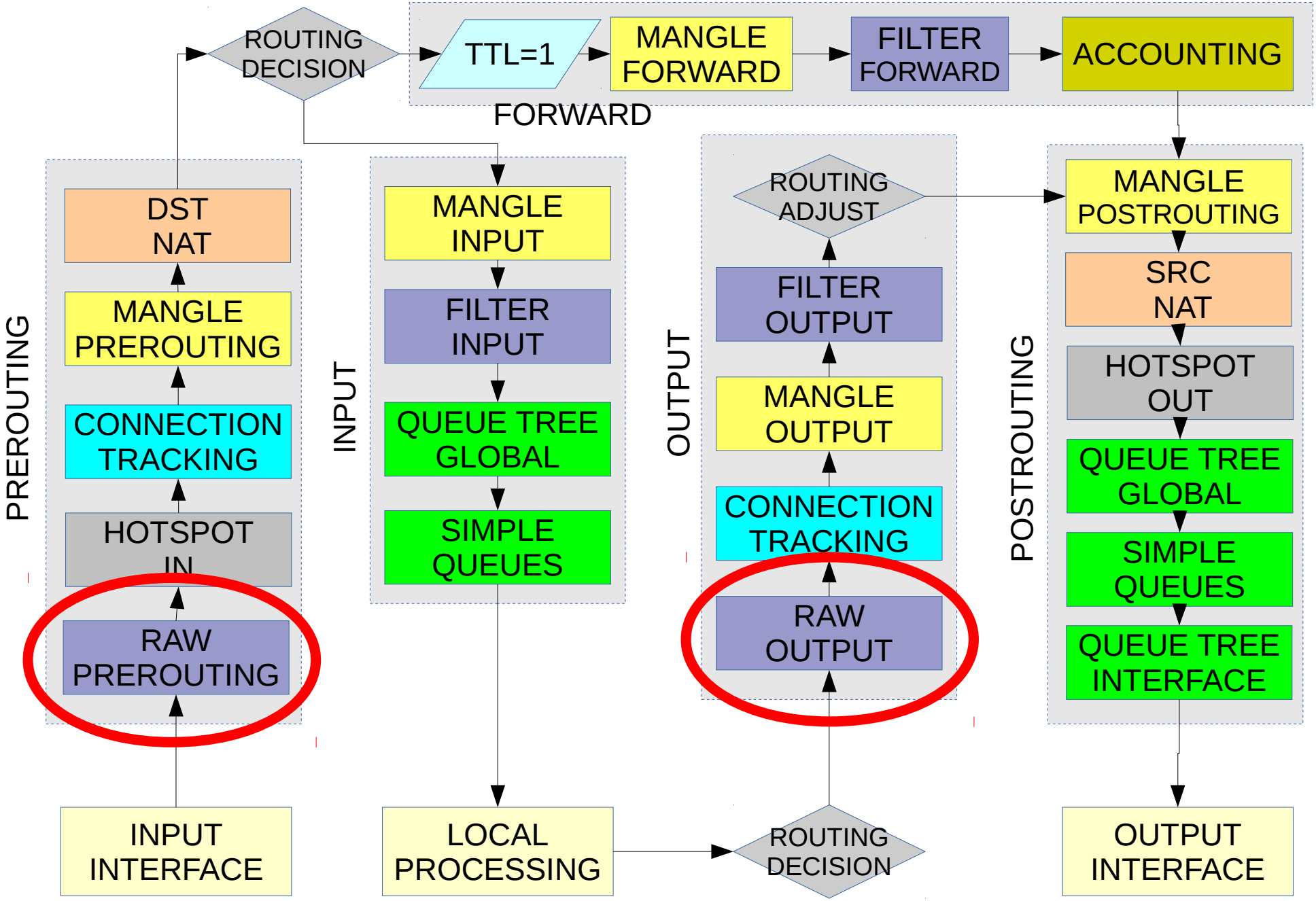
# New from 6.36 raw table

- only two chains
- INPUT
- OUTPUT

```
/ip firewall raw
/ipv6 firewall raw
```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# How to do it better

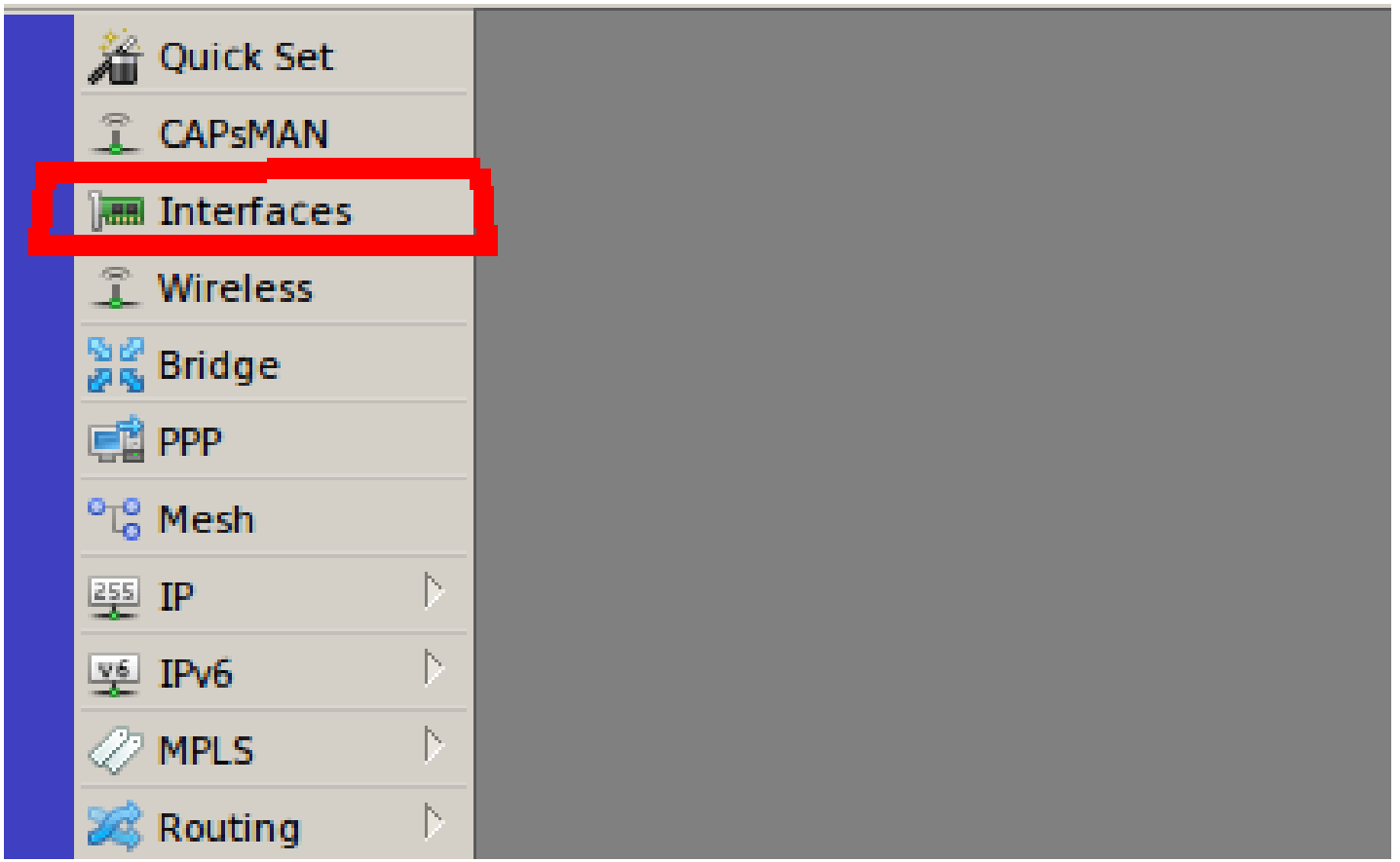
- use “interface list” and “address list”
- use “jump” and “return”
- define new chains
- define less rules as possible

later we see...

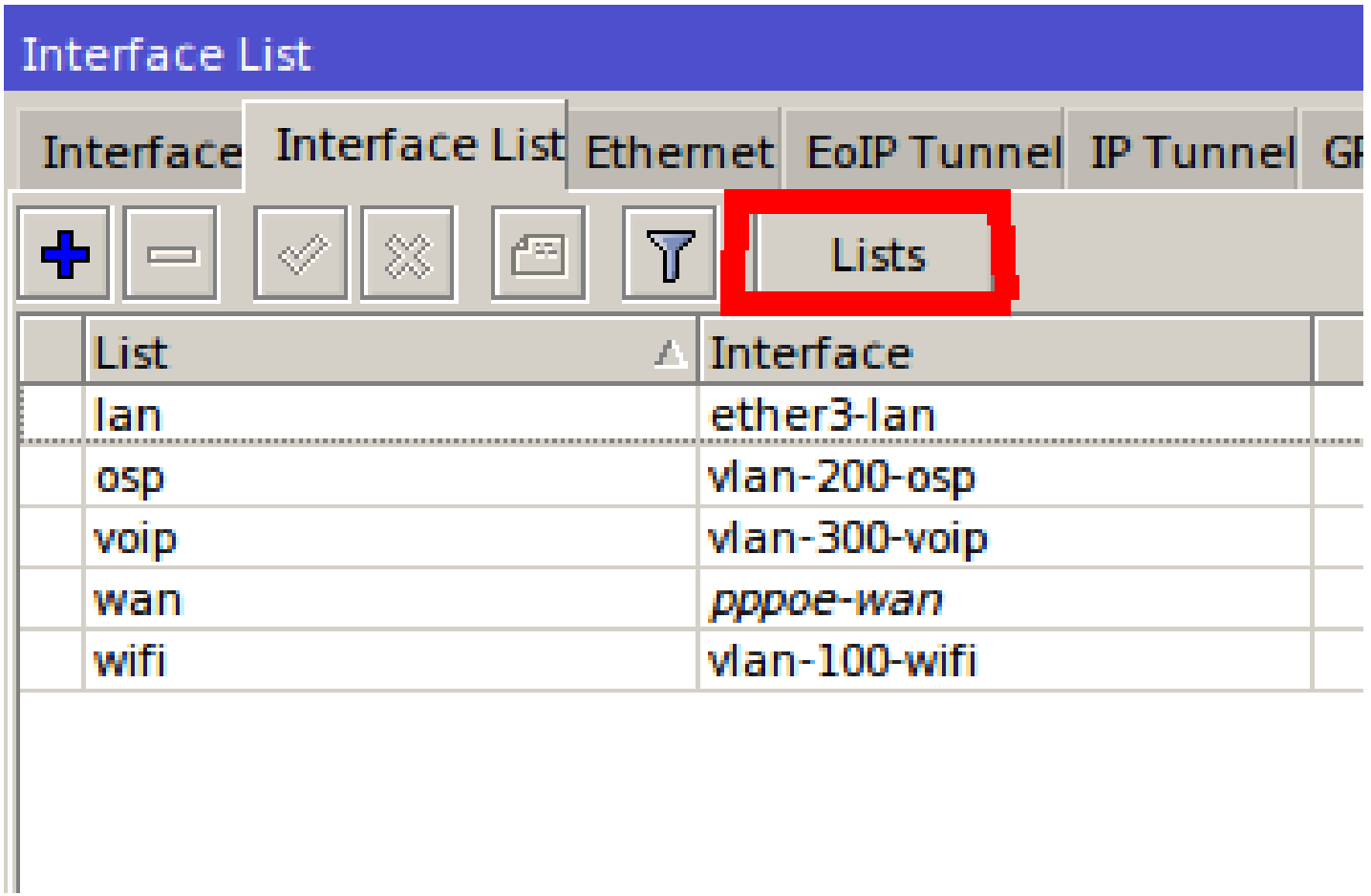
# New! “Interface Lists”

- Define a group of interfaces
- `/interface list`
- useful to simplify configuration

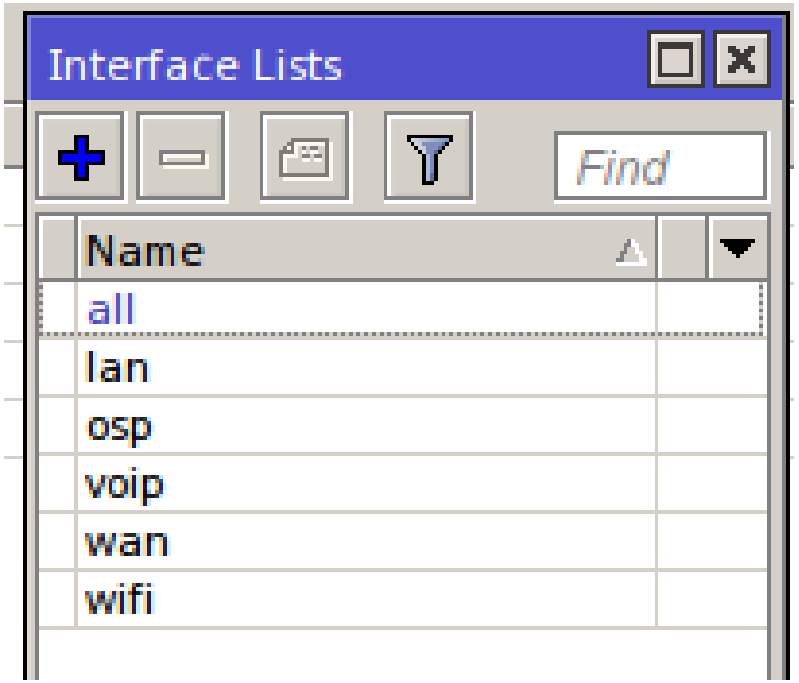
# Interface lists



# Interface lists



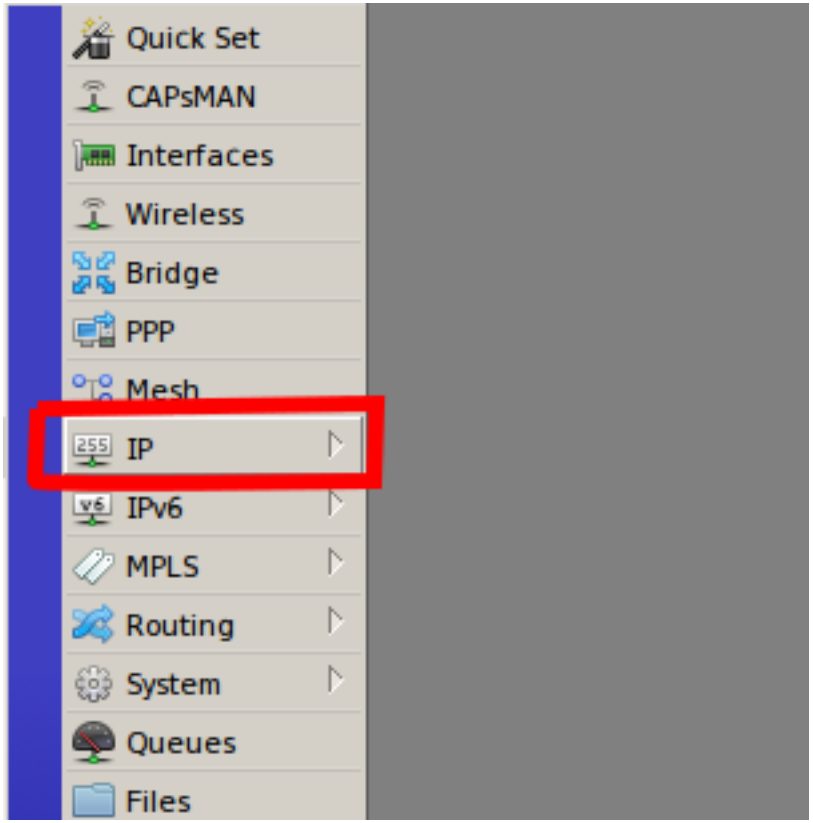
# Interface lists



# Address Lists

- Define group of addresses
- I think MANDATORY for IPv6!!
- As “action” address can be added to address lists dynamically, also with time-out
- New from 6.36 dns names can be used in address lists!

# Firewall IPv4



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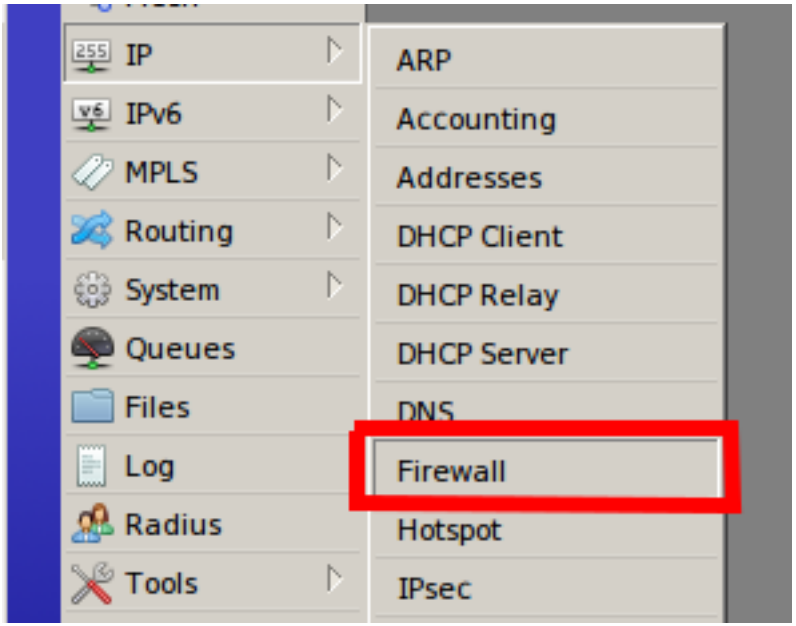

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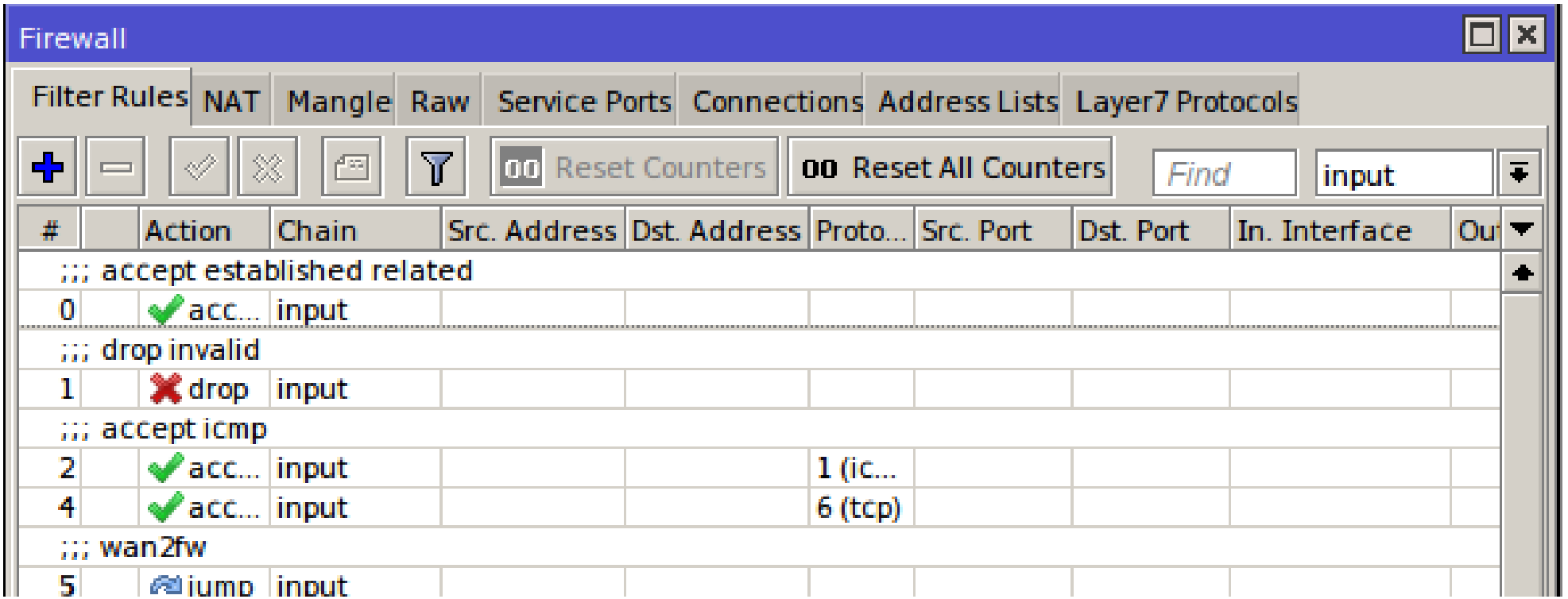

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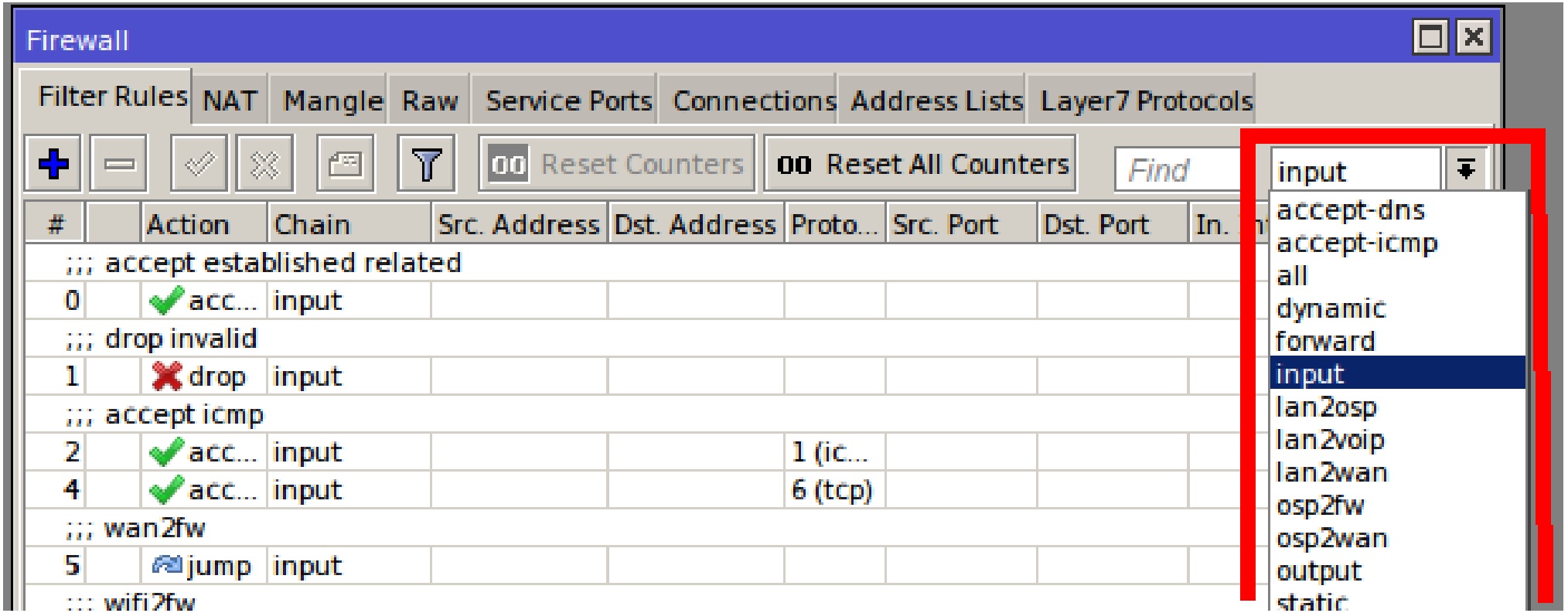
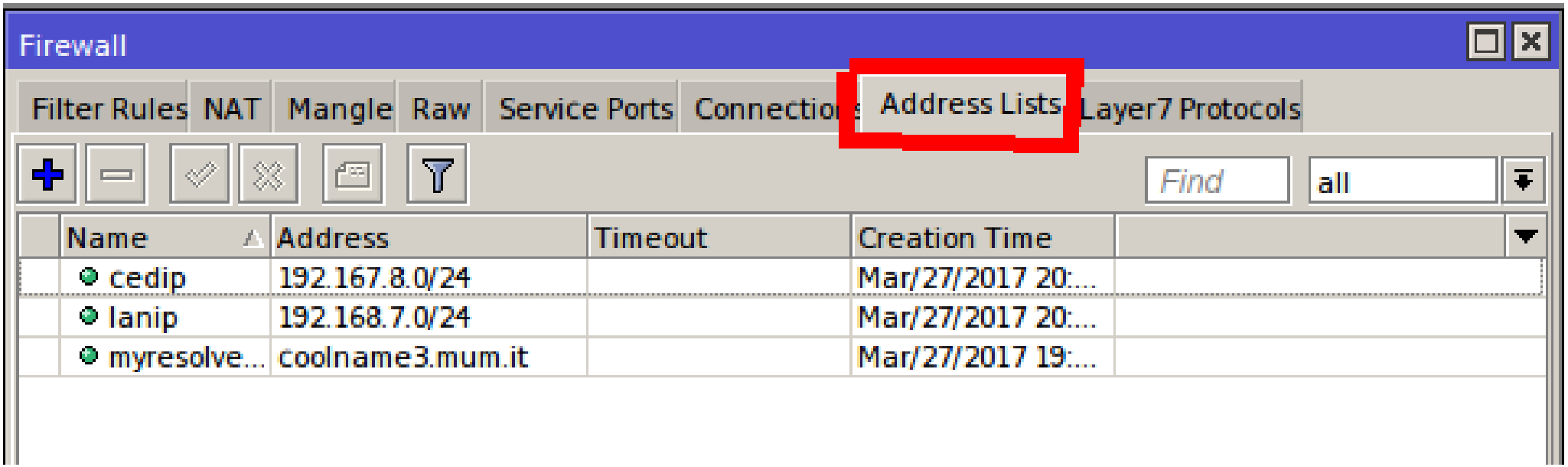


# New! “Address Lists”



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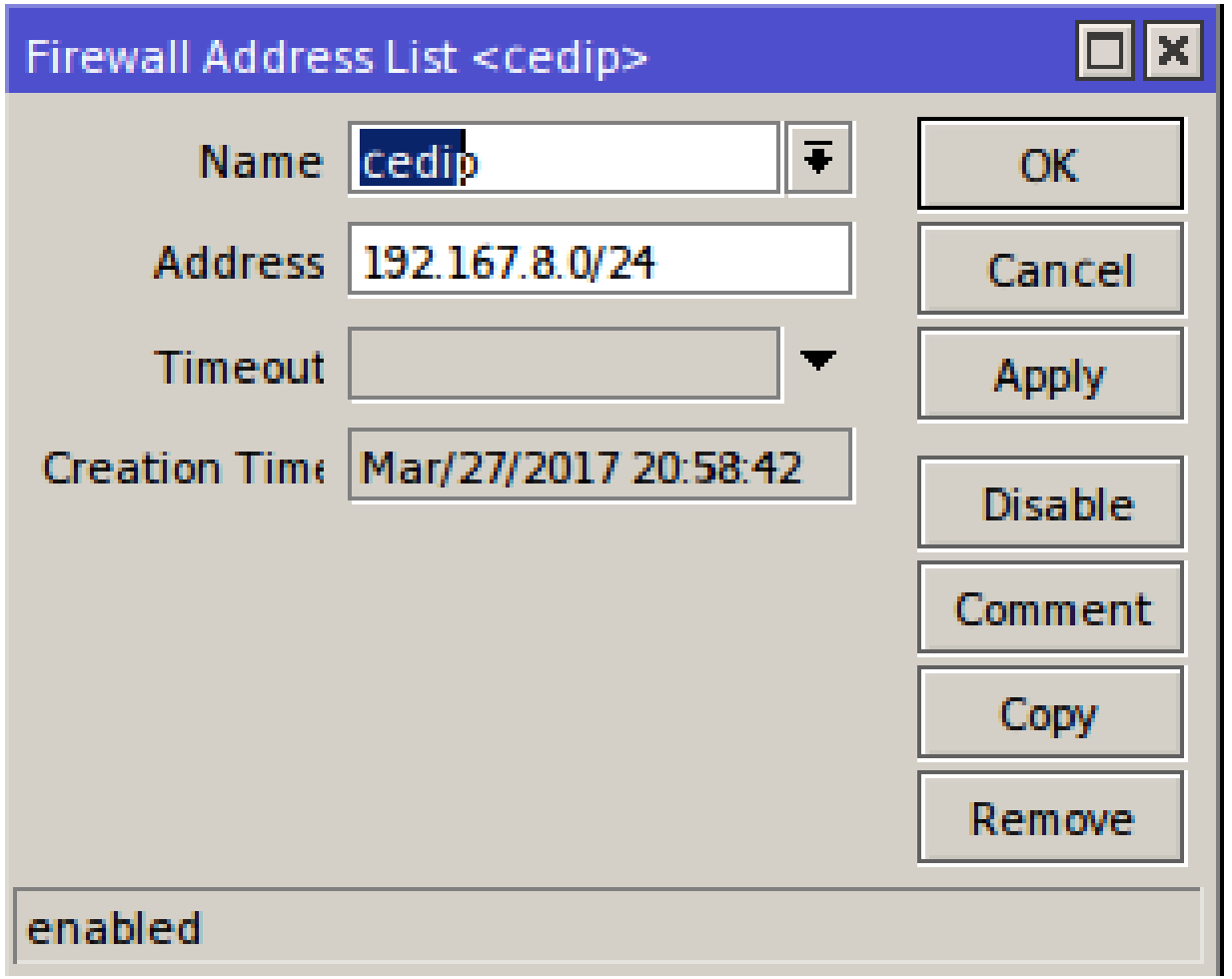

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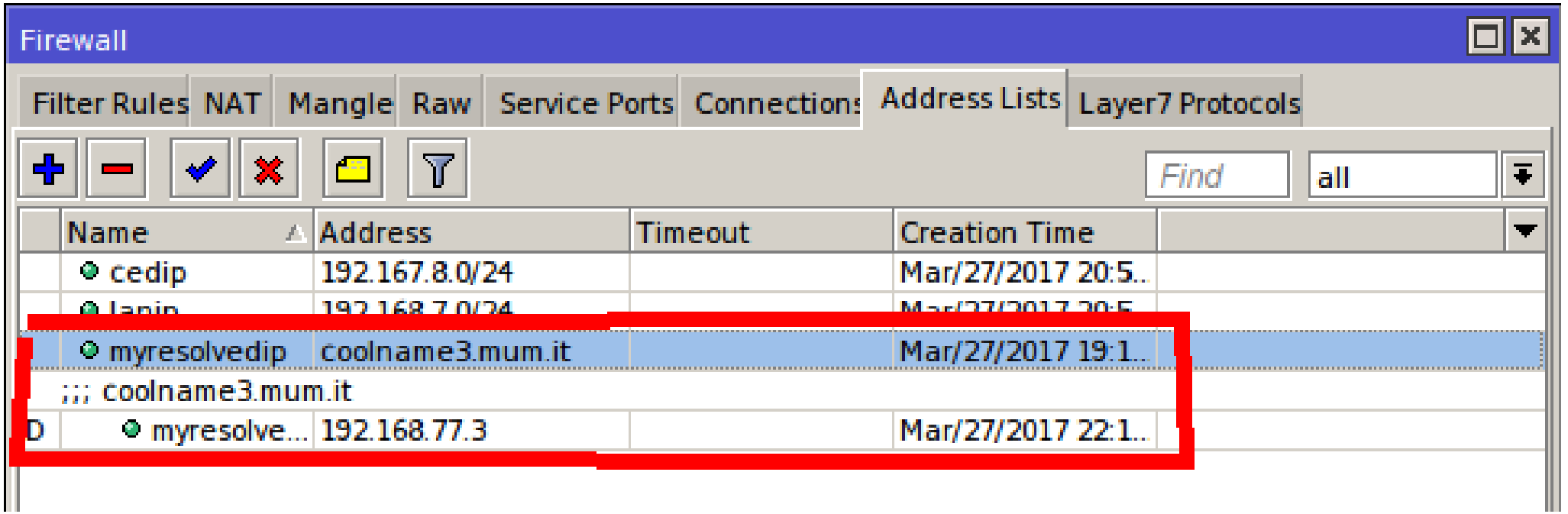
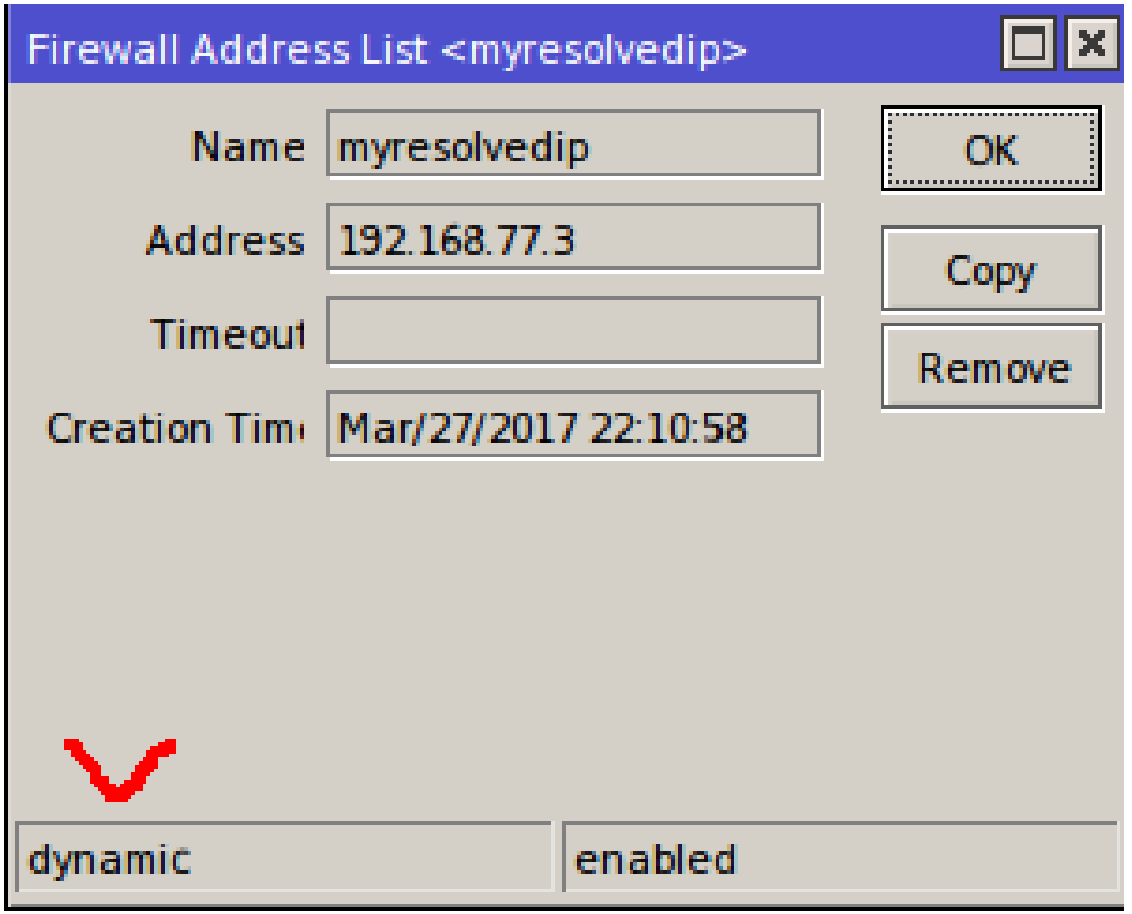
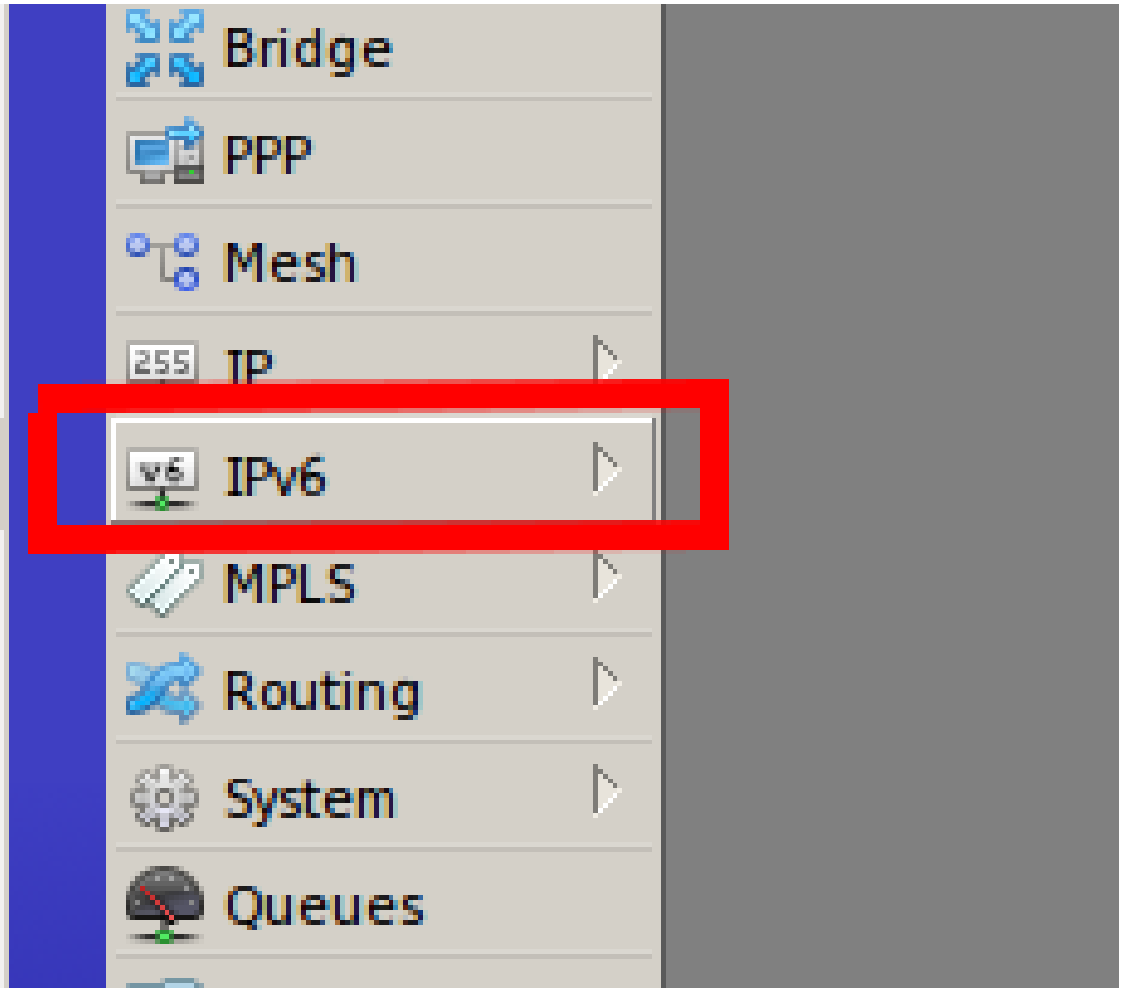


# New! “Address Lists”



# Firewall IPv6



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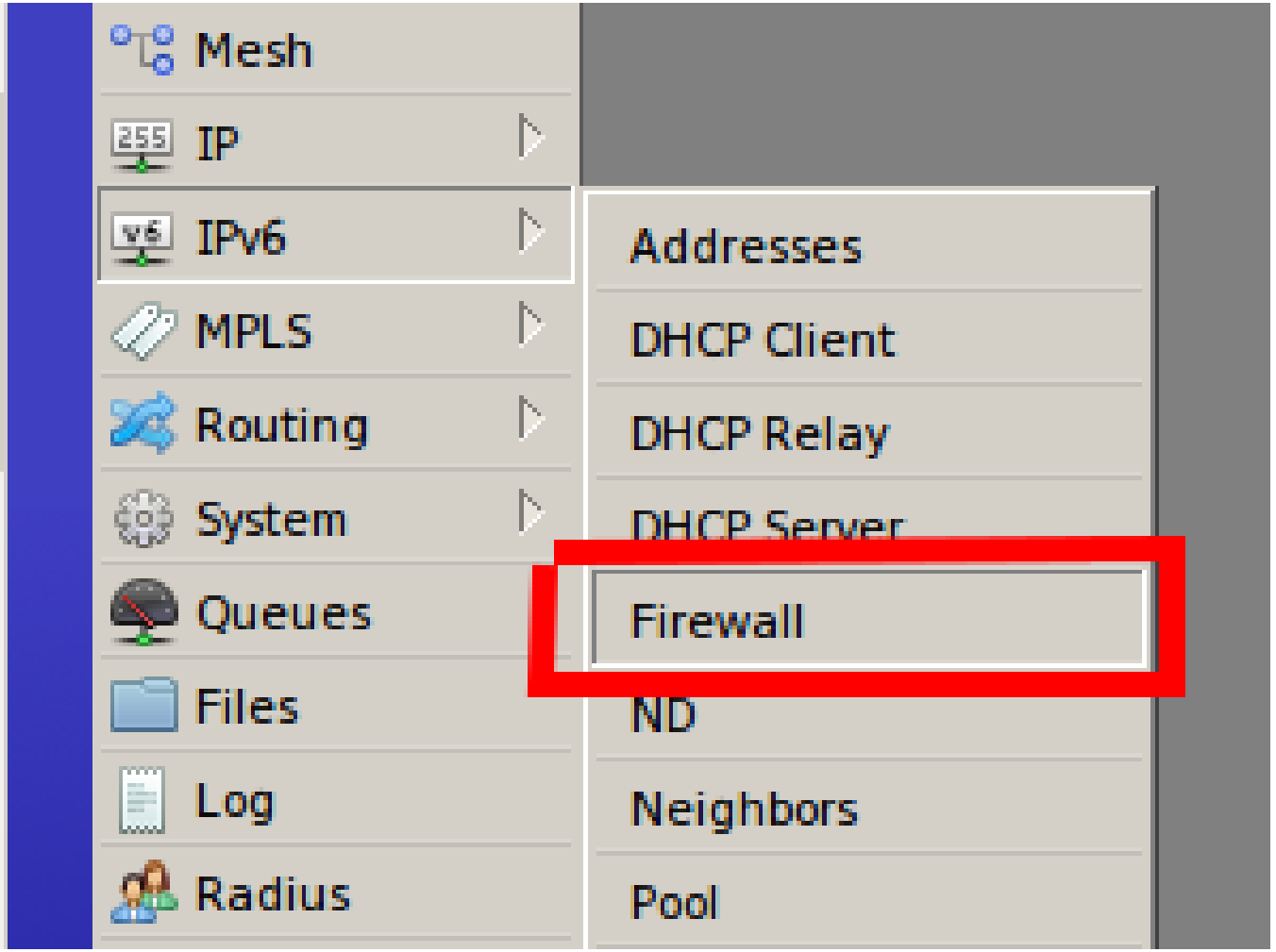

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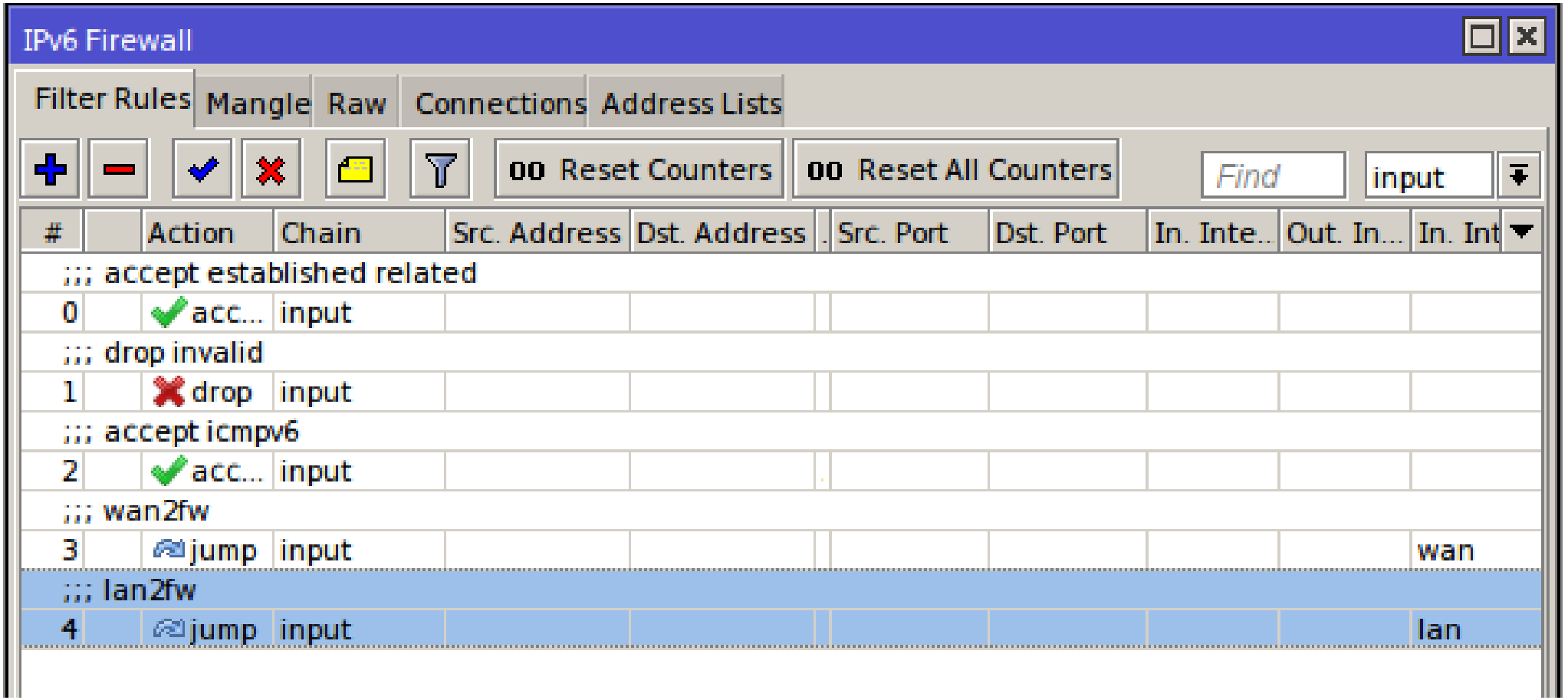

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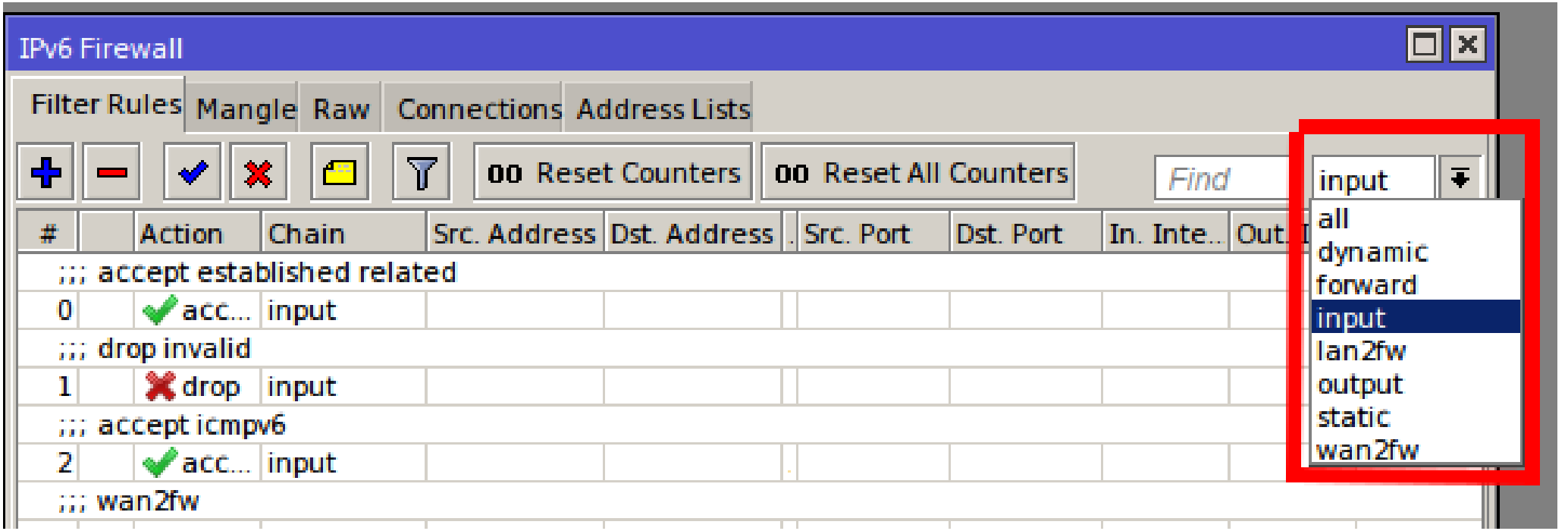
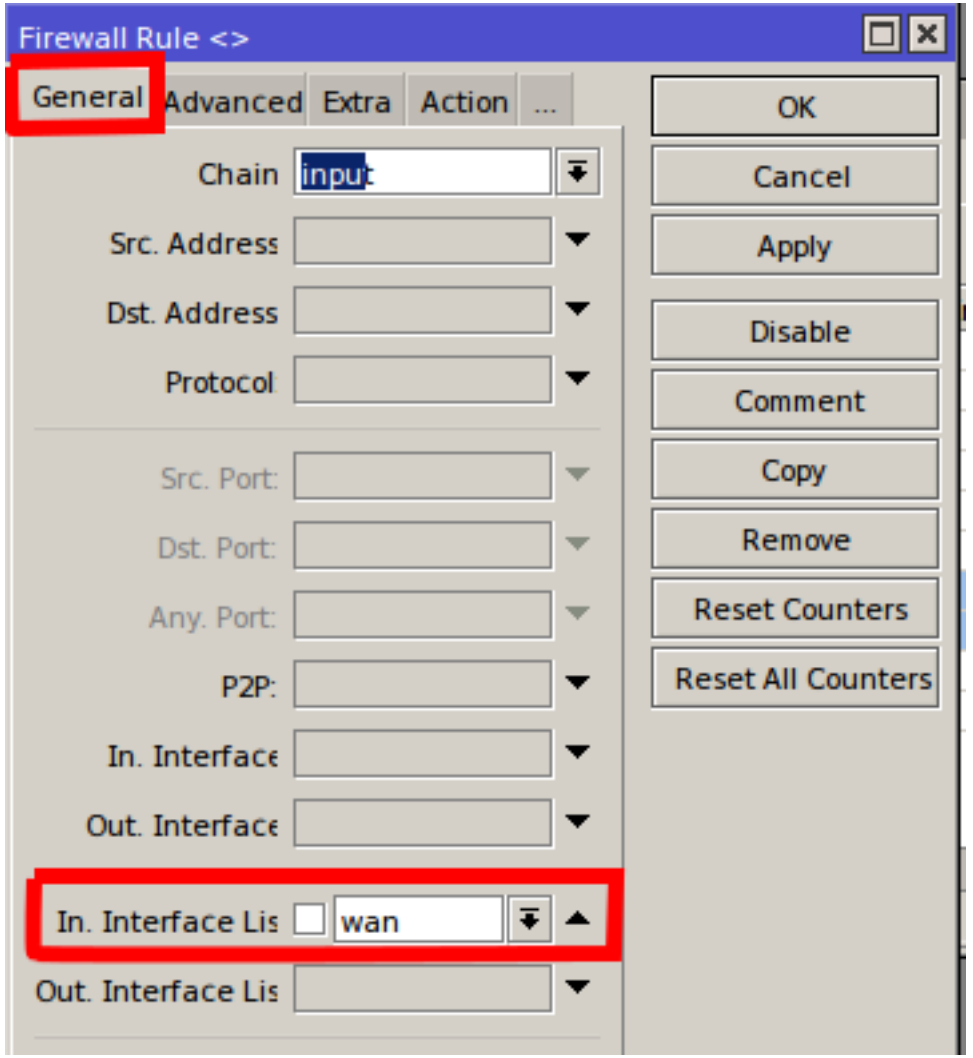


# Where we can use “lists”?

- Today only the “check”, not action

# Interface Lists



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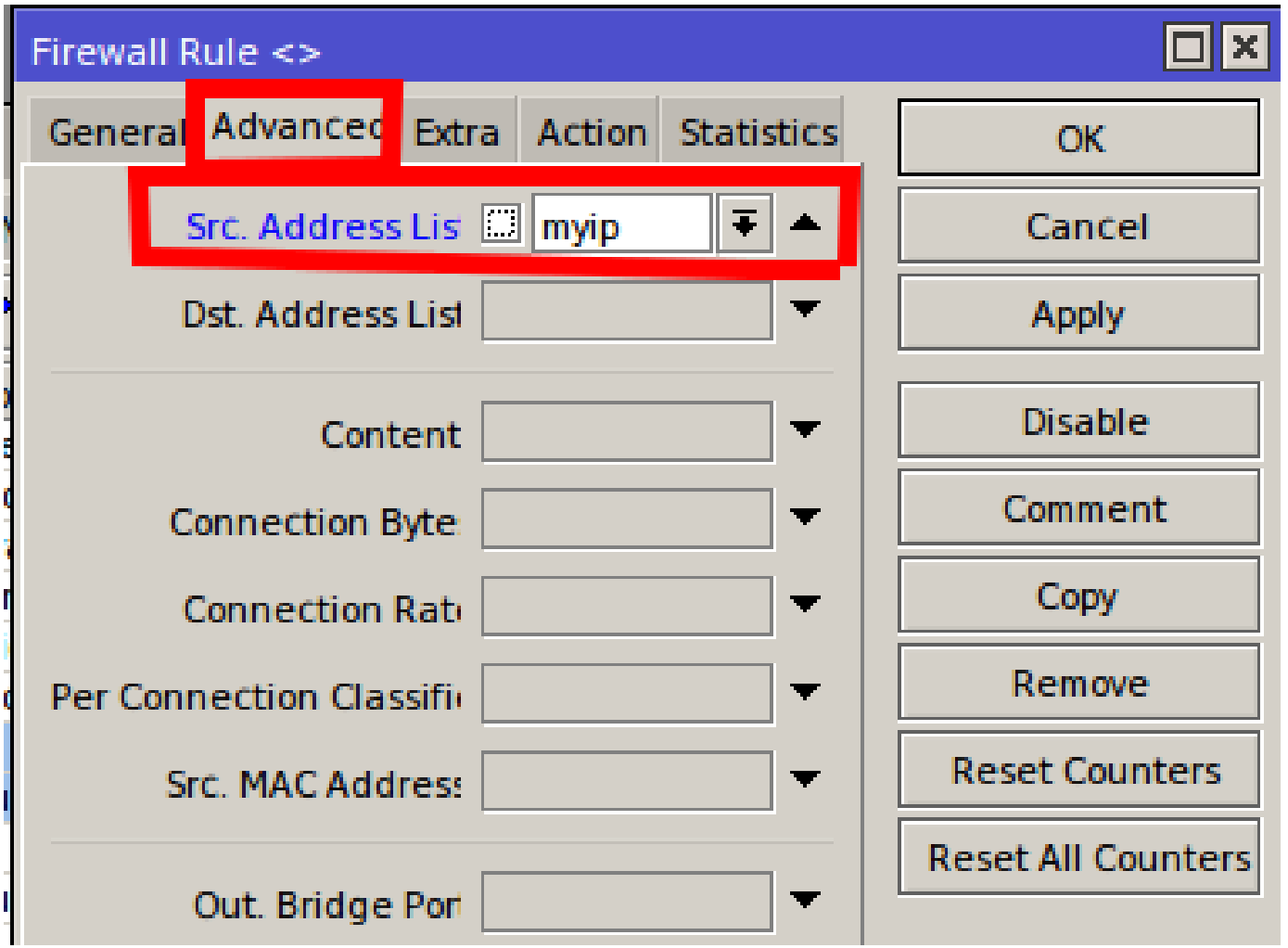
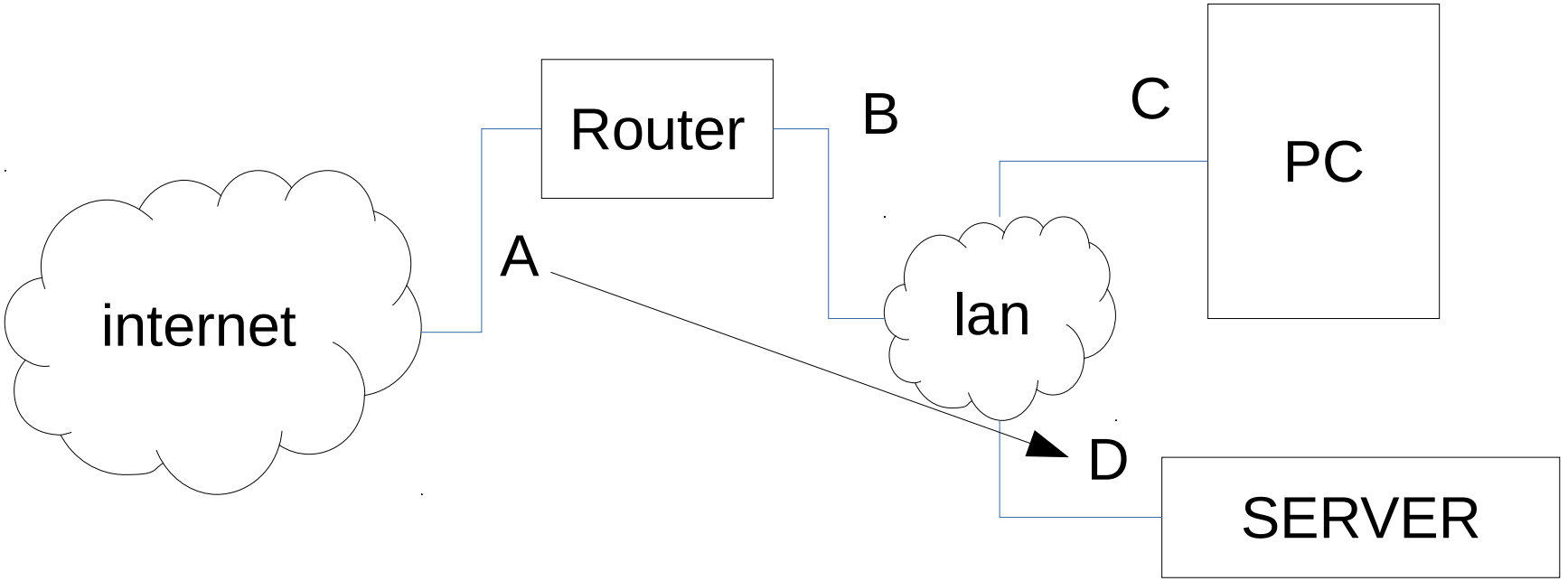


# And... improved firewall

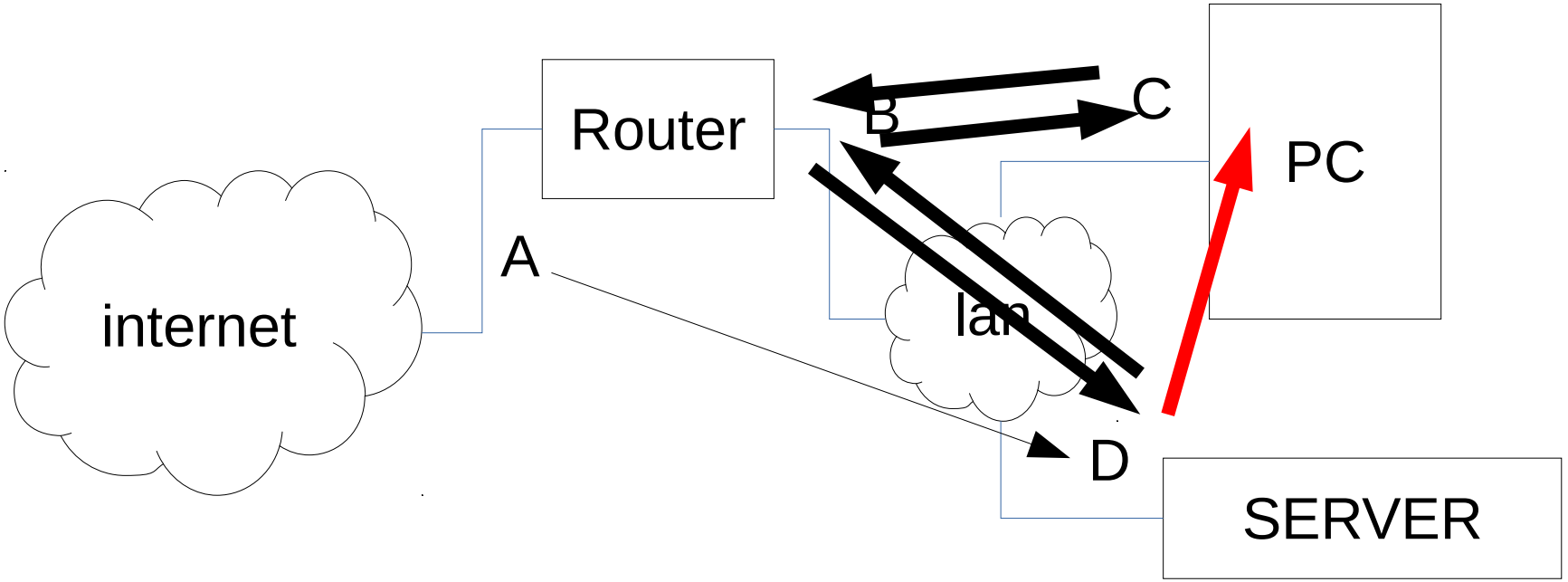
- faster “connection-limit”
- raw filter
- interface list
- address list with dns names
- limit (connections, packets, bits)

  check the wiki... all there..

# Example: routeback



# Example: routeback



# Goal

- PC with private address C need to talk to the server with private address D
- The server is on DNAT from the address A on the wan side of the router
- Use “dns name” of the server

# Routeback!

- First a dnat on the public ip address, and the packet is routed back to the lan
- Then i need a source nat, as the packet must route back to the router and then to the pc
- But... if the public ip address is dynamic?

# Address list!

- Configure the “cloud” option, so we have a dns address name with the public ip address
- Configure one address list with this dns name, then use the address list on the destination nat rule!

# Sample code part 1

```
/ip firewall address-list
add address=coolname3.mum.it list=myresolvedip
/ip firewall filter
add action=accept chain=input comment="accept
established related" connection-state=\
    established,related
add action=drop chain=input comment="drop invalid"
connection-state=invalid
add action=accept chain=input protocol=icmp
add action=drop chain=input comment="drop all from
wan" in-interface=pppoe-wan
```

# Sample code part 2

```
/ip firewall nat
add action=masquerade chain=srcnat comment="normal
masq" out-interface=pppoe-wan
add action=dst-nat chain=dstnat comment="nat to
192.168.7.2" dst-address-list=myresolvedip \
    to-addresses=192.168.7.2
add action=src-nat chain=srcnat comment="routeback
from 192.168.90.0/24 to lan (eq lan to lan)" \
    out-interface=ether3-lan src-
address=192.168.7.0/24 to-addresses=192.168.7.1
```

# A complex firewall

- One wan
- More than one lan
- Define and update frequently all rules
- Avoid to hard code all

# All code here... address list

```
/ip firewall address-list
add address=coolname3.mum.it list=myresolvedip
add address=192.168.7.0/24 list=lanip
add address=192.167.8.0/24 list=cedip
```

# All code here... input chain

```
/ip firewall filter
add action=accept chain=input comment="accept established related" \
connection-state=established,related
add action=drop chain=input comment="drop invalid" connection-state=invalid
add action=accept chain=input comment="accept icmp" protocol=icmp
add action=accept chain=input port=8291 protocol=tcp
add action=jump chain=input comment=wan2fw in-interface-list=wan jump-target=\
    wan2fw
add action=jump chain=input comment=wifi2fw in-interface-list=wifi jump-target=\
    wifi2fw
add action=jump chain=input comment=osp2fw in-interface-list=osp jump-target=\
    osp2fw
add action=jump chain=input comment=voip2fw in-interface-list=voip jump-target=\
    voip2fw
```

# All code here... forward chain 1

```
add action=accept chain=forward comment="accept established related" \
    connection-state=established,related
add action=drop chain=forward comment="drop invalid" \
    connection-state=invalid
add action=jump chain=forward comment="filtro icmp" \
    jump-target=accept-icmp protocol=icmp
add action=jump chain=forward comment="lan (ip) to wan" disabled=yes \
    in-interface-list=lan jump-target=lan out-interface-list=wan \
    src-address-list=lanip
add action=jump chain=forward comment="ced (ip) to wan" disabled=yes \
    in-interface-list=lan jump-target=lan out-interface-list=wan \
    src-address-list=cedip
```

# All code here... forward chain 2

```
add action=jump chain=forward in-interface-list=lan jump-target=lan2wan \
    out-interface-list=wan
add action=jump chain=forward in-interface-list=lan jump-target=lan2voip \
    out-interface-list=voip
add action=jump chain=forward in-interface-list=lan jump-target=lan2osp \
    out-interface-list=osp
add action=jump chain=forward in-interface-list=osp jump-target=osp2wan \
    out-interface-list=wan
add action=jump chain=forward in-interface-list=voip jump-target=voip2wan \
    out-interface-list=wan
add action=jump chain=forward in-interface-list=voip jump-target=voip2lan \
    out-interface-list=lan
add action=jump chain=forward in-interface-list=wan jump-target=wan2lan \
    out-interface-list=lan
```

# All code here... zone to zone

```
add action=drop chain=lan2osp comment="default drop"
add action=drop chain=lan2voip comment="default drop"
add action=drop chain=forward comment="default drop all2all"
add action=drop chain=input comment="drop all2fw" log-prefix=all2fw
add action=drop chain=voip2fw comment="default drop"
add action=drop chain=voip2lan comment="default drop"
add action=drop chain=voip2wan comment="default drop"
add action=drop chain=wan2lan comment="default drop"
add action=jump chain=wifi2fw comment="accept dns" jump-target=accept-dns
add action=drop chain=wifi2fw comment="default drop"
add action=jump chain=lan2wan jump-target=accept-dns
add action=drop chain=lan2wan comment="default drop"
add action=jump chain=wan2fw comment="protect ssh" jump-target=ssh
add action=drop chain=wan2fw comment="drop all from wan"
```

# All code here...
# dns check

```
add action=accept chain=accept-dns dst-port=53
protocol=udp

add action=accept chain=accept-dns dst-port=53
protocol=tcp

add action=return chain=accept-dns
```

# All code here... icmp check

```
add action=accept chain=accept-icmp comment="echo reply" icmp-options=0:0 \
    protocol=icmp
add action=accept chain=accept-icmp comment="net unreachable" icmp-options=3:0 \
    protocol=icmp
add action=accept chain=accept-icmp comment="host unreachable" icmp-options=3:1 \
    protocol=icmp
add action=accept chain=accept-icmp comment=\
    "host unreachable fragmentation required" icmp-options=3:4 protocol=icmp
add action=accept chain=accept-icmp comment="allow source quench" icmp-options=\
    4:0 protocol=icmp
add action=accept chain=accept-icmp comment="allow echo request" icmp-options=\
    8:0 protocol=icmp
add action=accept chain=accept-icmp comment="allow time exceed" icmp-options=\
    11:0 protocol=icmp
add action=accept chain=accept-icmp icmp-options=12:0 protocol=icmp
add action=drop chain=accept-icmp comment="deny all other types"
```

# All code here... ssh protection

```
add action=drop chain=ssh comment="drop ssh brute forcers" dst-
port=22 protocol=tcp src-address-list=badip

add action=add-src-to-address-list address-list=badip address-list-
timeout=1w3d chain=ssh dst-port=22 protocol=tcp src-address-
list=ssh_stage3

add action=add-src-to-address-list address-list=ssh_stage3 address-
list-timeout=1m chain=ssh dst-port=22 protocol=tcp src-address-
list=ssh_stage2

add action=add-src-to-address-list address-list=ssh_stage2 address-
list-timeout=1m chain=ssh dst-port=22 protocol=tcp src-address-
list=ssh_stage1

add action=add-src-to-address-list address-list=ssh_stage1 address-
list-timeout=1m chain=ssh dst-port=22 protocol=tcp

add action=return chain=ssh
```

# All code here... icmp check

```
/ip firewall nat

add action=masquerade chain=srcnat out-
interface=pppoe-wan

/ip firewall raw

add action=drop chain=prerouting comment="drop
bad ip" in-interface-list=wan \

    src-address-list=badip
```

# What you've seen

- Compex firewall
- And configuration can be exported and imported to another routerboard, with NO ERROR
- And all “specific” configuration is on the “interface lists” and “address lists”
- Recycle firewall rules

# This year request

- Complete IPv6 firewall
- Please add some kind of “global” generic constant values like objects
- ip addresses
- ports

# Questions?

# Thank you!

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