



Mikrotik User Meeting

Bali, 24-25 Oktober 2019





Implementasi Queue With Firewall Mangle at Mikrotik RouterOS

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Perkenalan 😊



Pelajar di SMKN 1 Bojonegoro

Belajar MikroTik mulai Desember 2018

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MikroTik User Meeting 2019
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Tentang SMKN 1 Bojonegoro



Latar Belakang

Presentasi kali ini akan menjelaskan tentang implementasi management bandwidth menggunakan Queue dengan Firwall Mangle untuk jaringan Hotspot di SMKN 1 Bojonegoro

Kebutuhan anak Milenial



Browsing



Gaming



Media Sosial



Streaming

Tujuan

- Management bandwidth lebih Tertata
- Pengalokasian bandwidth lebih terkontrol
- Mengurangi terjadinya Kepadatan antrian pada suatu Jaringan
- Memprioritaskan Paket Data yang Lebih Penting

Apa Itu Queue??

Queue=Antrian

Salah Satu fitur Mikrotik yang berfungsi sebagai Bandwith Management.

Mengimplementasikan Sistem Antrian dan akan di Proses dengan berbagai macam metode.

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Mengenal Firewall Mangle

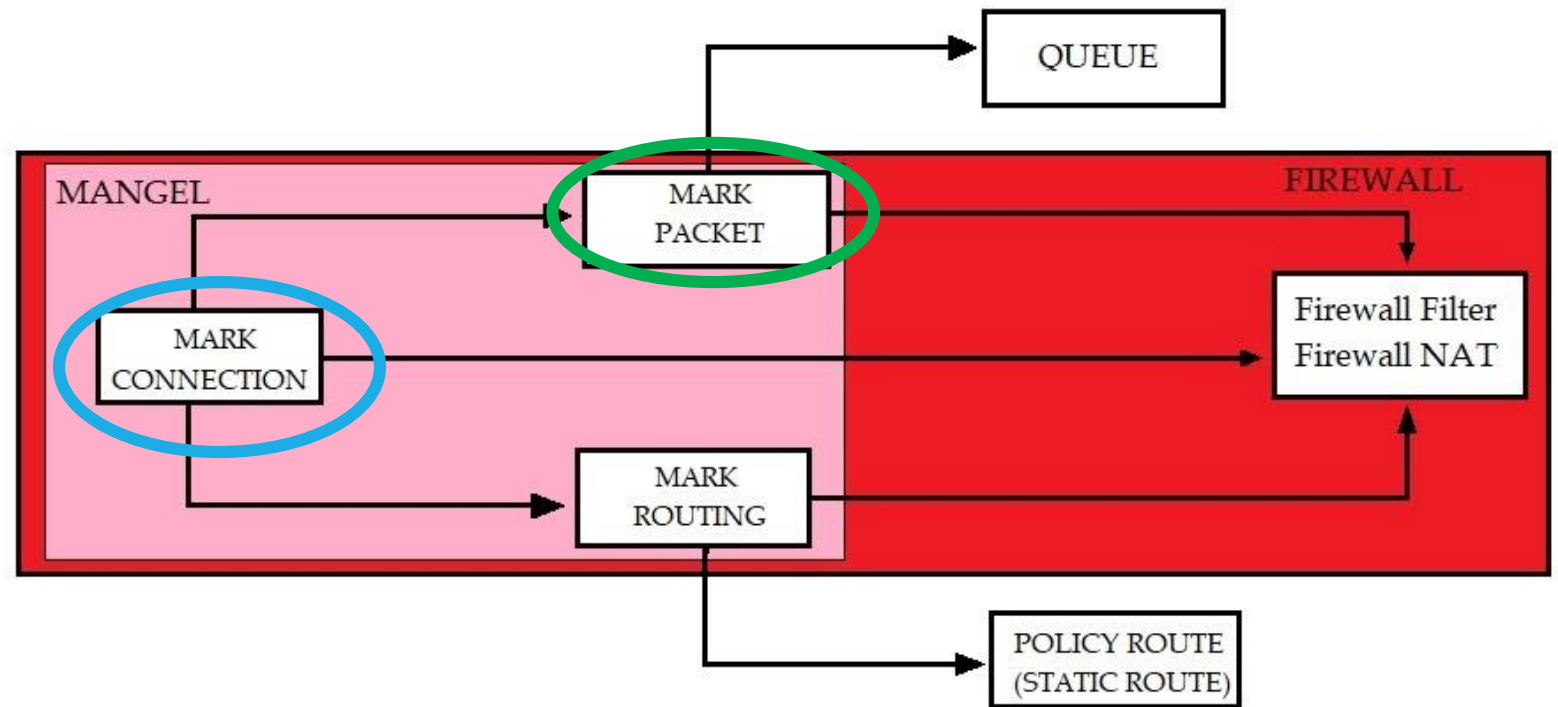
- Firewall Mangle adalah salah satu fitur di Mikrotik yang berfungsi untuk Marking/Penandaan Paket data tertentu, dan Paket data yang telah di tandai dapat di manfaatkan di fitur fitur mikrotik Lainnya.
- Paket data yang telah di marking hanya dapat di gunakan oleh router yang Melakukan Marking.



Penggunaan Firewall Mangle

- Ada 3 Jenis Marking yang dapat digunakan di Mikrotik
Yaitu:

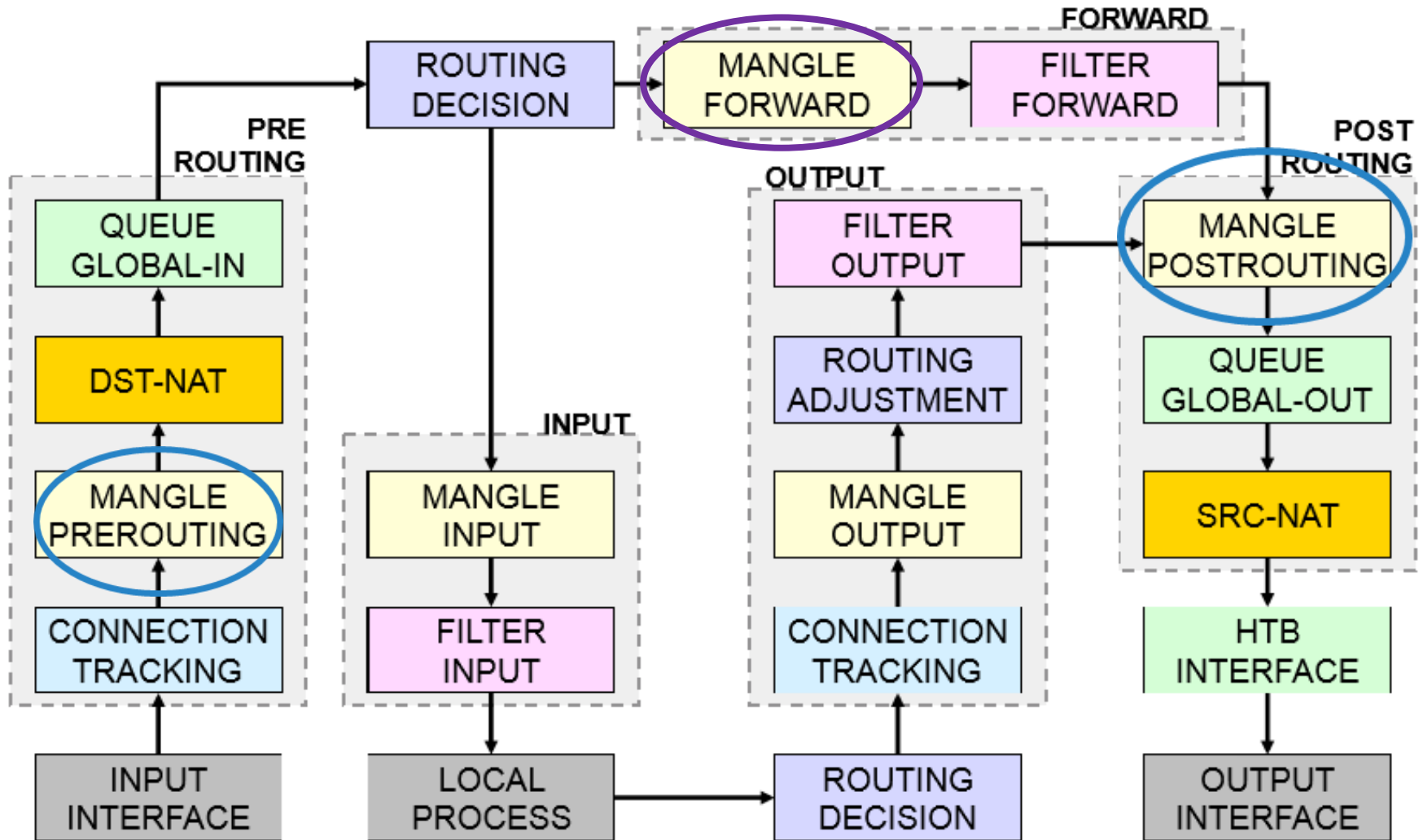
- Connection Mark
- Packet Mark
- Route Mark



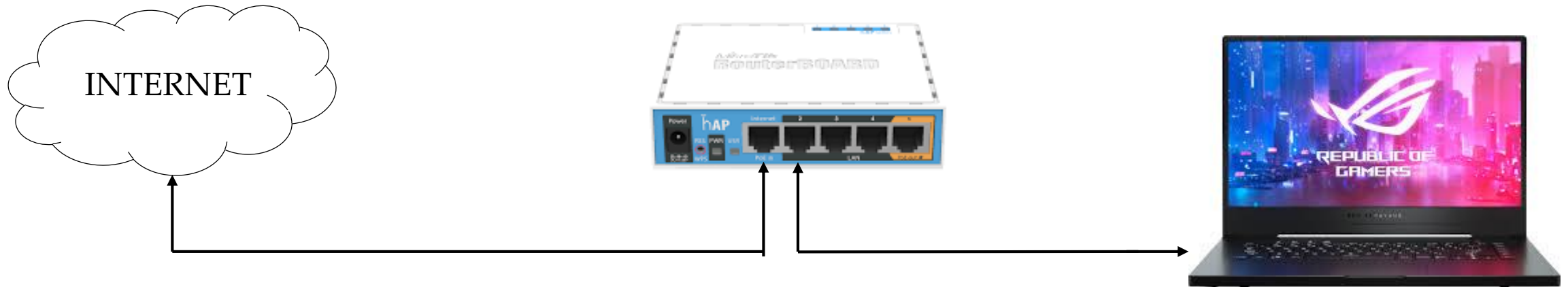
Pemilihan Chain pada Firewall Mangle

- **Prerouting**
- **Input**
- **Forward**
- **Output**
- **Postrouting**

Pemilihan Chain



Topologi



Step Konfigurasi

- Pada Implementasi kali ini ada beberapa fitur yang akan kita Konfigurasi. Yaitu:
 1. Marking browsing, game, Sosmed dan Youtube menggunakan firewall Mangle.
 2. Bandwidth Management
 - a. Konfigurasi PCQ Upload dan Download.
 - b. Konfigurasi Queue Tree untuk Browsing, Game, Sosmed, dan Youtube

Step Konfigurasi

- Tandai Koneksi dan paket dari setiap gamenya terlebih dahulu.
- Melakukan Marking Dapat menggunakan patokan Protokol Transport Dan Port Setiap aplikasi dan game.
- Untuk Mendapatkan Protokol dan Port dari setiap aplikasi dapat menggunakan Tools Torch atau bisa mencari di internet.

Marking untuk koneksi Game

Konfigurasi connection Mark untuk setiap game

Mangle Rule <172.16.0.0/24->10012,17500>

General Advanced Extra Action Statistics

Chain: **forward**

Src. Address: 172.16.0.0/24

Dst. Address:

Protocol: 6 (tcp)

Src. Port:

Dst. Port: 10012,17500

Any. Port:

OK Cancel Apply Disable Comment Copy Remove Reset Counters

Mangle Rule <172.16.0.0/24->10012,17500>

General Advanced **Extra** Action Statistics

Action: **mark connection**

☐ Log

Log Prefix:

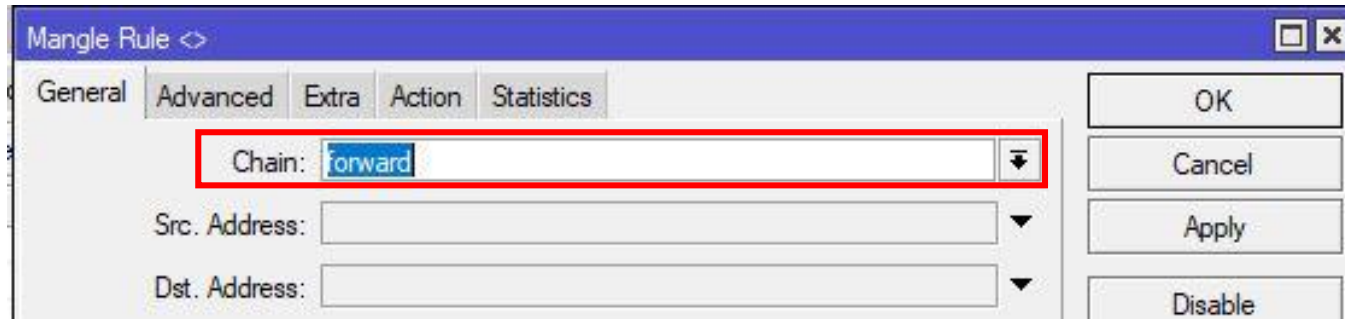
New Connection Mark: Koneksi Game

☒ Passthrough

OK Cancel Apply Disable Comment Copy

Marking untuk paket Game

Konfigurasi Packet mark untuk Game



Mangle Rule <>

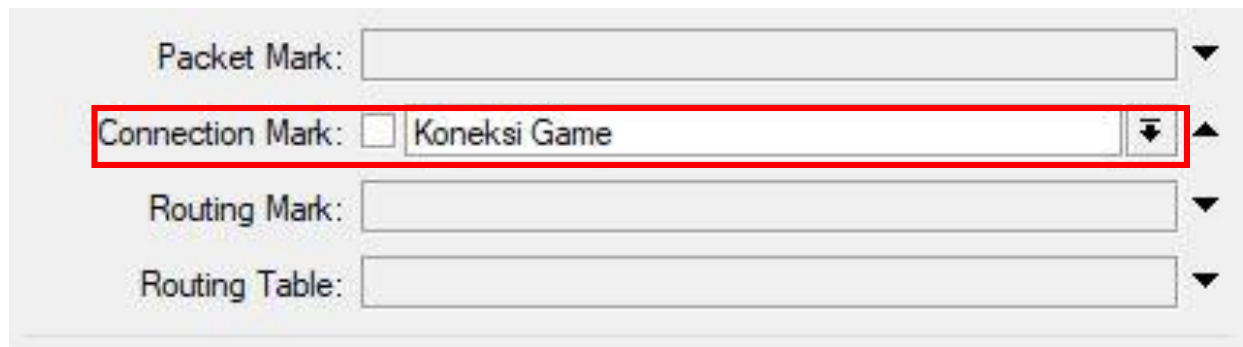
General Advanced Extra Action Statistics

Chain: **forward**

Src. Address:

Dst. Address:

OK Cancel Apply Disable

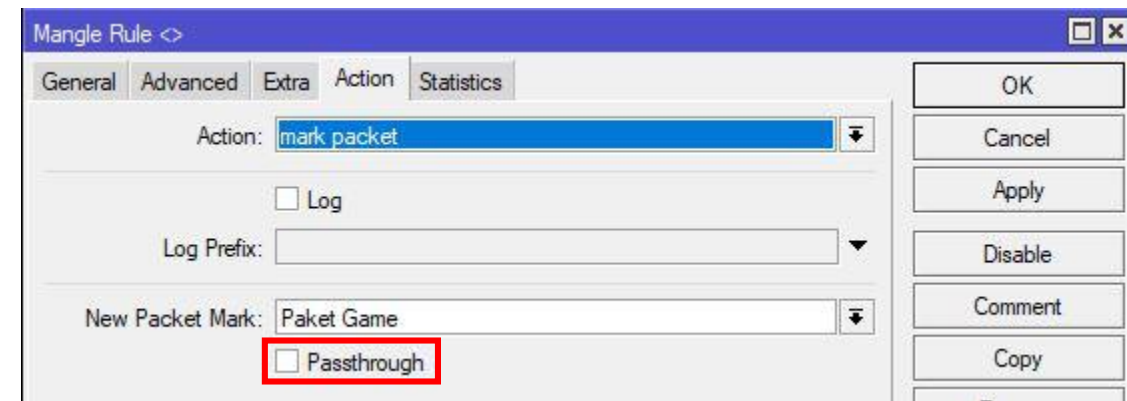
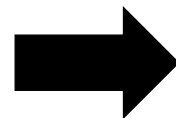


Packet Mark:

Connection Mark: ☐ **Koneksi Game**

Routing Mark:

Routing Table:



Mangle Rule <>

General Advanced Extra Action Statistics

Action: **mark packet**

☐ Log

Log Prefix:

New Packet Mark: **Paket Game**

☐ Passthrough

OK Cancel Apply Disable Comment Copy

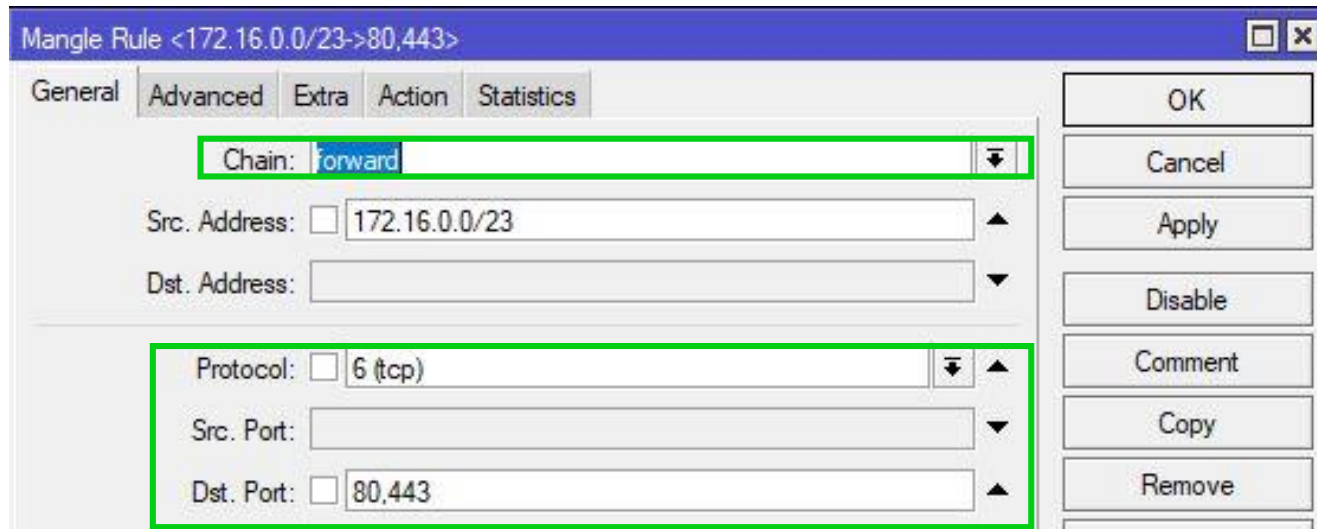
Marking Untuk Koneksi Browsing, Sosmed dan Youtube

Untuk Menandai Koneksi browsing cukup Marking Koneksi Protokol TCP port 80 dan 443.

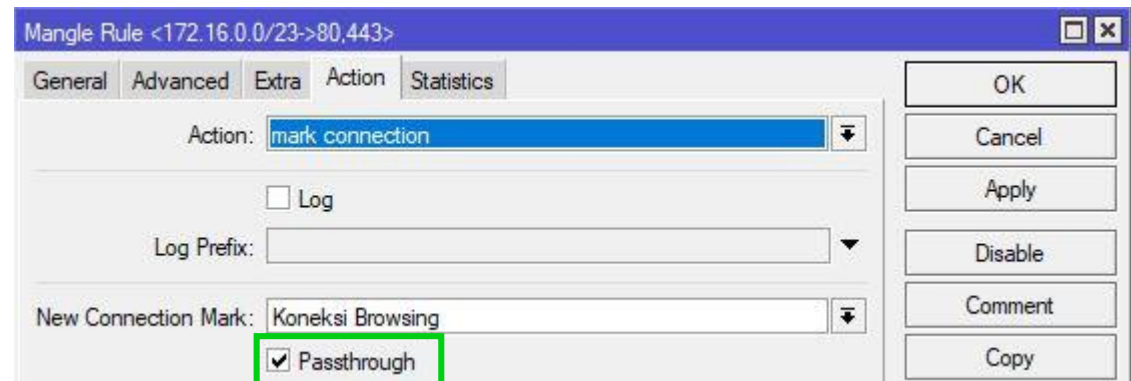
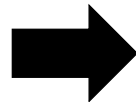
Untuk menandai koneksi Sosmed dan youtube bisa memanfaatkan L7 Protokol atau add dst to address list di Firewall Filter.

Marking Untuk Koneksi Browsing

Konfigurasi Connection Mark untuk Koneksi Browsing



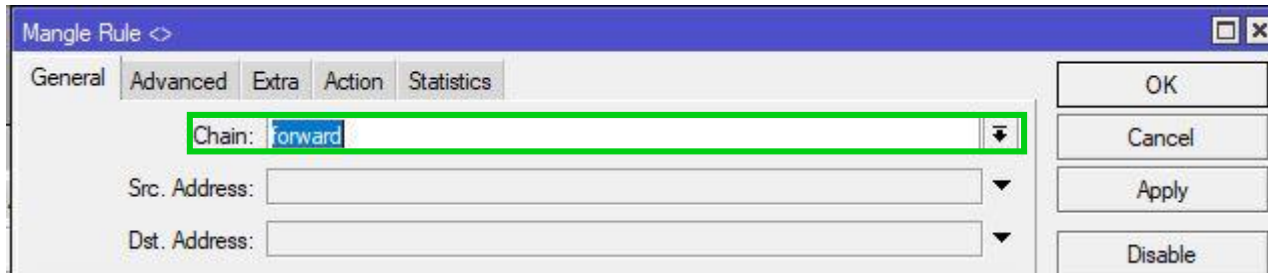
The image shows the 'Mangle Rule' configuration window for the rule '<172.16.0.0/23->80,443>'. The 'General' tab is selected. The 'Chain' is set to 'forward'. The 'Src. Address' is '172.16.0.0/23' and the 'Dst. Address' is empty. The 'Protocol' is '6 (tcp)', 'Src. Port' is empty, and 'Dst. Port' is '80,443'. The 'Chain', 'Protocol', and 'Dst. Port' fields are highlighted with a green border. On the right, there are buttons: OK, Cancel, Apply, Disable, Comment, Copy, and Remove.



The image shows the 'Mangle Rule' configuration window for the rule '<172.16.0.0/23->80,443>' after configuration. The 'Action' tab is selected. The 'Action' is set to 'mark connection'. The 'Log' checkbox is unchecked. The 'Log Prefix' is empty. The 'New Connection Mark' is 'Koneksi Browsing'. The 'Passthrough' checkbox is checked and highlighted with a green border. On the right, there are buttons: OK, Cancel, Apply, Disable, Comment, and Copy.

Marking Untuk Koneksi Browsing

Konfigurasi Packet Mark untuk trafik Selain game



Mangle Rule <>

General Advanced Extra Action Statistics

Chain: forward

Src. Address:

Dst. Address:

OK Cancel Apply Disable

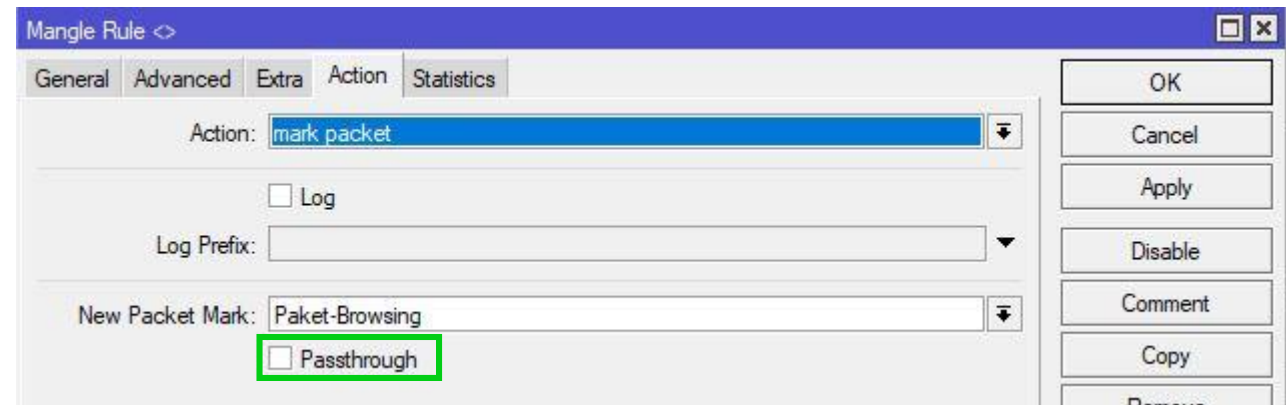


Packet Mark:

Connection Mark: ☐ Koneksi Browsing

Routing Mark:

Routing Table:



Mangle Rule <>

General Advanced Extra Action Statistics

Action: mark packet

☐ Log

Log Prefix:

New Packet Mark: Paket-Browsing

☐ Passthrough

OK Cancel Apply Disable Comment Copy Remove

Hasil Akhir Rule Firewall Mangle

Firewall

Filter RulesNATMangleRawService PortsConnectionsAddress ListsLayer7 Protocols

00

Reset Counters

00

Reset All Counters

Find

all

#	Action	Chain	Src. Address	Dst. Address	Protocol	Src. Port	Dst. Port	In. Interface	Out. Interface	Bytes	Packets	
2	D passthru...	postrouting								0 B	0	
::: PUBG Mobile												
3	✓ mark con...	forward	172.16.0.0/24		6 (tcp)		10012,17500			829.2 KiB	4 085	
4	✓ mark con...	forward	172.16.0.0/24		17 (udp)		10491,10010,10013,10612,20002,2...			1113.5 KiB	15 130	
::: FREE FIRE												
5	✓ mark con...	forward	172.16.0.0/24		6 (tcp)		39003,39698,39779			818.0 KiB	5 255	
6	✓ mark con...	forward	172.16.0.0/24		17 (udp)		10001,10003,10012			52.2 MiB	310 574	
::: MOBILE LEGEND												
7	✓ mark con...	forward	172.16.0.0/24		6 (tcp)		30097-30147			1208.3 KiB	13 865	
::: ARENA OF VALOR												
8	✓ mark con...	forward	172.16.0.0/24		6 (tcp)		10001-10094			1413.1 KiB	8 277	
9	✓ mark con...	forward	172.16.0.0/24		17 (udp)		10080			0 B	0	
::: CLASH OF CLANS												
10	✓ mark con...	forward	172.16.0.0/24		6 (tcp)		9330-9340			45.9 KiB	676	
::: LINE GET RICH												
11	✓ mark con...	forward	172.16.0.0/24		6 (tcp)		10500-10515			728 B	14	
::: CLASH ROYALE												
12	✓ mark con...	forward	172.16.0.0/24		6 (tcp)		9330-9340			45.9 KiB	676	
13	✓ mark con...	forward	172.16.0.0/24		17 (udp)		9330-9340			0 B	0	
::: Paket Game												
14	✗ mark pac...	forward								69.9 MiB	403 013	
::: Youtube												
15	✓ mark con...	forward								11.3 GiB	62 265 834	
16	✗ mark pac...	forward								146.6 GiB	174 675 ...	
::: Sosmed												
17	✓ mark con...	forward								5.9 GiB	64 627 934	
18	✗ mark pac...	forward								96.9 GiB	141 104 ...	
::: Browsing												
19	✓ mark con...	forward	172.16.0.0/24		6 (tcp)		80,443			3838.6 MiB	29 836 308	
20	✗ mark pac...	forward								36.5 GiB	61 213 617	
::: Koneksi Lain												
21	✓ mark con...	forward								216.0 MiB	1 587 067	
22	✗ mark pac...	forward								75.6 GiB	119 257 ...	
::: Rubah Nilai TTL												
23	✓ change T...	postrouting							Bridge_LAN	224.5 GiB	215 358 ...	

24 items

Effect Passthrough

#	Action	Chain	Src. Address	Dst. Address	Protocol	Src. Port	Dst. Port
... Free Fire							
0	mark conn...	forward	10.100.100.0/24		6 (tcp)		39698,39779,39003
1	mark conn...	forward	10.100.100.0/24		17 (udp)		10002,10004
... Clash OF Clan							
2	mark conn...	forward	10.100.100.0/24		6 (tcp)		9330-9340
... PUBG Mobile							
3	mark conn...	forward	10.100.100.0/24		6 (tcp)		10012,17500,10173
4	mark conn...	forward	10.100.100.0/24		17 (udp)		10100,20002,17000,9000,20001,10173
... Mobile Legend							
5	mark conn...	prerouting	10.100.100.0/24		6 (tcp)		30107,5222,5228
6	mark conn...	prerouting	10.100.100.0/24		17 (udp)		5678
... Arena Of Valor							
7	mark conn...	forward	10.100.100.0/24		6 (tcp)		10001-10094
8	mark conn...	forward	10.100.100.0/24		17 (udp)		10080,17000
... Paket Game							
9	mark packet	forward					
... Koneksi Browsing							
10	mark		10.100.100.0/24				
11	mark						

Passthrough=Yes (Annotation for rules 5 and 6)

Passthrough=No (Annotation for rule 9)

Mark=Koneksi-game (Callout for Mobile Legend rules)

Mark=Paket Game (Callout for Paket Game rule)

Effect Passthrough

The screenshot shows the Mikrotik WinBox Firewall Rules configuration window. The 'Filter Rules' tab is selected. The table below lists the configured rules:

#	Action	Chain	Src. Address	Dst. Address	Protocol	Src. Port	Dst. Port
... Free Fire							
0	mark connection	forward	10.100.100.0/24		6 (tcp)		39698,39779,39003
1	mark connection	forward	10.100.100.0/24		17 (udp)		10002,10004
... Clash OF Clan							
2	mark connection	forward	10.100.100.0/24		6 (tcp)		9330-9340
... PUBG Mobile							
3	mark connection	forward	10.100.100.0/24		6 (tcp)		10012,17500,10100,10012
4	mark connection	forward	10.100.100.0/24		17 (udp)		10100,20002,17000,9030,20001,10173
... Mobile Legend							
5	mark connection	prerouting	10.100.100.0/24		6 (tcp)		30107,5222,5228
6	mark connection	prerouting	10.100.100.0/24		17 (udp)		5678
... Arena Of Valor							
7	mark connection	forward	10.100.0/24		6 (tcp)		10001-10008
8	mark connection	forward	10.100.0/24		17 (udp)		10080,17000
... Paket Game							
9	mark packet	forward					
... Koneksi Browsing							
10	mark connection	forward	10.100.100.0/24				
11	mark packet	forward					

Annotations in the image:

- A green box highlights rule 9, 'Paket Game', with a callout bubble stating 'Mark= Paket Game'.
- A red box highlights rule 11, 'Koneksi Browsing', with a callout bubble stating 'Mark= Paket Browsing'.
- An arrow points from rule 8 to rule 9.
- A black box with the text 'Passthrough=Yes' is placed over rule 7.

Bandwith Management

- Untuk Contoh kali ini saya akan menggunakan Bandwith 100 M untuk Download dan 30 M untuk Upload yang akan saya alokasikan untuk
 - Paket Game=6 M,10 M
 - Paket Browsing=6 M,25 M
 - Paket Sosmed=6 M,20 M
 - Paket Youtube=6 M,30 M
 - Paket Lain=6 M,15 M

Konfigurasi PCQ

The image displays two configuration windows for PCQ (Per-Connection Queue) settings, side-by-side.

Queue Type <PCQ-Upload>

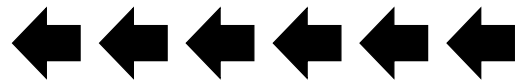
- Type Name: PCQ-Upload
- Kind: pcq
- Rate: 0 bits/s
- Limit: 50 KiB
- Total Limit: 2000 KiB
- Burst Rate: bits/s
- Burst Threshold:
- Burst Time: 00:00:10
- Classifier: ☒ Src. Address, ☐ Dst. Address, ☐ Src. Port, ☐ Dst. Port
- Src. Address Mask: 32
- Dst. Address Mask: 32
- Src. Address6 Mask: 64
- Dst. Address6 Mask: 64

Queue Type <PCQ-Download>

- Type Name: PCQ-Download
- Kind: pcq
- Rate: 0 bits/s
- Limit: 50 KiB
- Total Limit: 2000 KiB
- Burst Rate: bits/s
- Burst Threshold:
- Burst Time: 00:00:10
- Classifier: ☐ Src. Address, ☒ Dst. Address, ☐ Src. Port, ☐ Dst. Port
- Src. Address Mask: 32
- Dst. Address Mask: 32
- Src. Address6 Mask: 64
- Dst. Address6 Mask: 64

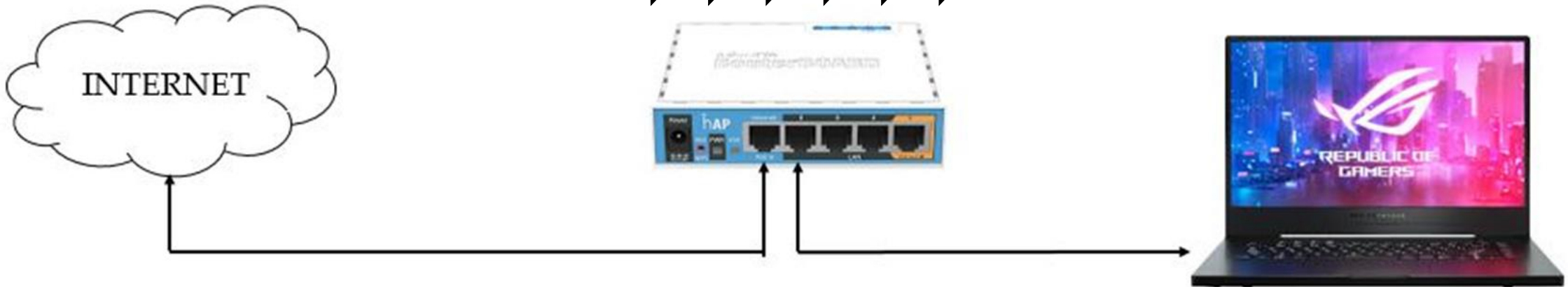
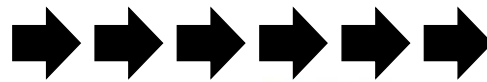
PCQ Classifier

PCQ Upload
Classifier=Src-Address



PCQ Classifier

PCQ Download
Classifier= Dst-Address



Queue Tree

Konfigurasi Parent untuk Upload dan Download

Queue <Upload Hotspot>

General Statistics

Name: Upload Hotspot

Parent: ether1_Internet

Packet Marks:

Queue Type: default

Priority: 8

Bucket Size: 0.100

Limit At:

Max Limit: 30M

Burst Limit:

Burst Threshold:

Burst Time:

OK

Cancel

Apply

Disable

Comment

Copy

Remove

Reset Counters

Reset All Counters

enabled

Queue <Download Hotspot>

General Statistics

Name: Download Hotspot

Parent: Bridge_LAN

Packet Marks:

Queue Type: default

Priority: 8

Bucket Size: 0.100

Limit At:

Max Limit: 100M

Burst Limit:

Burst Threshold:

Burst Time:

OK

Cancel

Apply

Disable

Comment

Copy

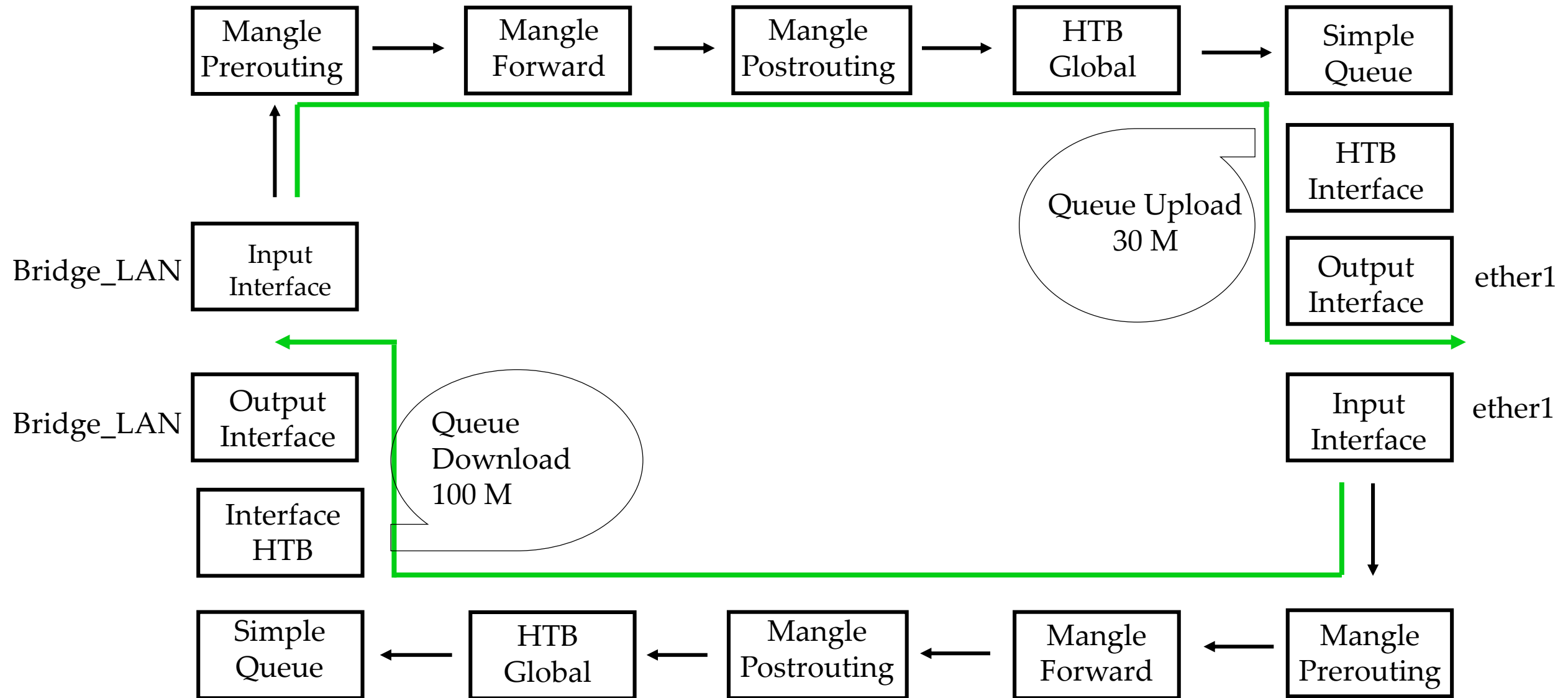
Remove

Reset Counters

Reset All Counters

enabled

Pemilihan Parent



Konfigurasi child upload Queue Tree

The image shows a screenshot of a network configuration window titled "Queue <browsing>". The window has two tabs: "General" and "Statistics", with "General" currently selected. The configuration fields are as follows:

- Name:** browsing
- Parent:** Upload Hotspot
- Packet Marks:** Paket Browsing
- Queue Type:** PCQ_Upload
- Priority:** 8
- Bucket Size:** 0.100
- Limit At:** (empty field) ▼ bits/s
- Max Limit:** 6M ▲ bits/s
- Burst Limit:** (empty field) ▼ bits/s
- Burst Threshold:** (empty field) ▼ bits/s
- Burst Time:** (empty field) ▼ s

On the right side of the window, there is a vertical stack of buttons: OK, Cancel, Apply, Disable, Comment, Copy, Remove, Reset Counters, and Reset All Counters.

At the bottom left of the window, the status "enabled" is displayed.

Konfigurasi child Download Queue Tree

Queue <Browsing>

General Statistics

Name:

Parent:

Packet Marks:

Queue Type:

Priority:

Bucket Size:

Limit At: ▼ bits/s

Max Limit: ▲ bits/s

Burst Limit: ▼ bits/s

Burst Threshold: ▼ bits/s

Burst Time: ▼ s

OK

Cancel

Apply

Disable

Comment

Copy

Remove

Reset Counters

Reset All Counters

enabled

Hasil Queue Tree

Queue List

Simple Queues

Interface Queues

Queue Tree

Queue Types

+

−

✓

✗

📄

🔍

00 Reset Counters

00 Reset All Counters

Find

Name	Parent	Packet Marks	Queue Type	Limit At (b...	Max Limit (bits/s)	Avg. Rate	Queued Bytes	Bytes	Packets	
Download Hotspot	Bridge_LAN		default		100M	0 bps	0 B	164.7 GiB	143 802 642	
Browsing	Download Hotspot	Paket Browsing	PCQ_Download		25M	0 bps	0 B	27.0 GiB	23 959 114	
Game	Download Hotspot	Paket Game	PCQ_Download		10M	0 bps	0 B	12.2 MiB	40 527	
Paket Lain Down	Download Hotspot	Paket Lain	PCQ_Download		15M	0 bps	0 B	2026.9 MiB	5 637 212	
Sosmed	Download Hotspot	P Sosmed	PCQ_Download		20M	0 bps	0 B	68.7 GiB	57 224 257	
Youtube	Download Hotspot	P Youtube	PCQ_Download		30M	0 bps	0 B	67.0 GiB	56 823 522	
Upload Hotspot	ether1_Internet		default		30M	0 bps	0 B	22.9 GiB	152 338 172	
Paket lain up	Upload Hotspot	Paket Lain	PCQ_Upload		6M	0 bps	0 B	3927.5 MiB	27 430 622	
browsing	Upload Hotspot	Paket Browsing	PCQ_Upload		6M	0 bps	0 B	3219.0 MiB	21 795 215	
game	Upload Hotspot	Paket Game	PCQ_Upload		6M	0 bps	0 B	4756.8 KiB	41 919	
sosmed	Upload Hotspot	P Sosmed	PCQ_Upload		6M	0 bps	0 B	5.6 GiB	53 089 490	
youtube	Upload Hotspot	P Youtube	PCQ_Upload		6M	0 bps	0 B	10.3 GiB	49 980 924	

12 items

0 B queued

0 packets queued

Pengujian

Queue List										
Simple Queues		Interface Queues		Queue Tree		Queue Types				
+ -	✓ ✗	📄	⏮	Reset Counters		Reset All Counters		Find		
Name /	Parent	Packet Marks	Queue Type	Limit At (b...	Max Limit (bits/s)	Avg. Rate	Queued Bytes	Bytes	Packets	
Download Hotspot	Bridge_LAN		default		100M	10.3 Mbps	0 B	166.2 GiB	145 016 416	
Browsing	Download Hotspot	Paket Browsing	PCQ_Download		25M	826.8 kbps	0 B	27.3 GiB	24 174 345	
Game	Download Hotspot	Paket Game	PCQ_Download		10M	3.0 kbps	0 B	12.4 MiB	40 870	
Paket Lain Down	Download Hotspot	Paket Lain	PCQ_Download		15M	26.0 kbps	0 B	2045.2 MiB	5 659 033	
Sosmed	Download Hotspot	P Sosmed	PCQ_Download		20M	3.8 Mbps	0 B	69.2 GiB	57 705 153	
Youtube	Download Hotspot	P Youtube	PCQ_Download		30M	5.6 Mbps	5.4 KiB	67.6 GiB	57 319 009	
Upload Hotspot	ether1_Internet		default		30M	628.3 kbps	0 B	23.0 GiB	153 227 502	
Paket lain up	Upload Hotspot	Paket Lain	PCQ_Upload		6M	7.6 kbps	0 B	3936.4 MiB	27 473 832	
browsing	Upload Hotspot	Paket Browsing	PCQ_Upload		6M	125.2 kbps	0 B	3236.9 MiB	21 968 320	
game	Upload Hotspot	Paket Game	PCQ_Upload		6M	1248 bps	0 B	4833.1 KiB	42 294	
sosmed	Upload Hotspot	P Sosmed	PCQ_Upload		6M	134.8 kbps	0 B	5.6 GiB	53 481 137	
youtube	Upload Hotspot	P Youtube	PCQ_Upload		6M	359.3 kbps	0 B	10.4 GiB	50 261 917	
12 items		17.7 KiB queued			13 packets queued					



Terima Kasih