MikroTik RouterOS Switch Feature

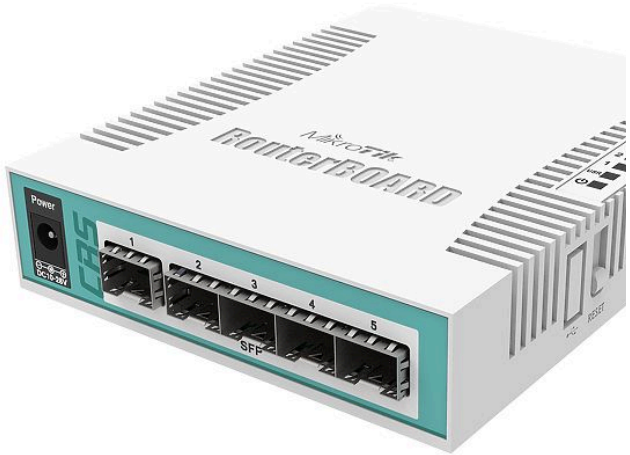
Citraweb Solusi Teknologi, Indonesia
www.mikrotik.co.id

MikroTik

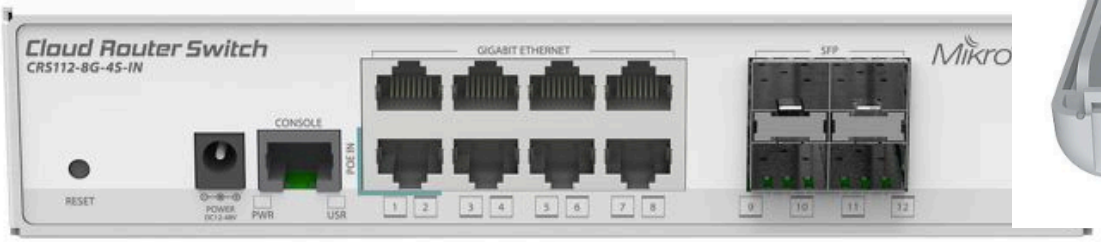
Perkenalan

- **Pujo Dewobroto**
- Citraweb Solusi Teknologi
  - Mikrotik distributor, training partner (mikrotik.co.id)
  - ISP (citra.net.id)
  - Web developer (citra.web.id)
- TR0132


RouterBOARD
RB260GS


RouterBOARD
Power
CRS
SFP


Power
Fiber
Box
SFP


Cloud Router Switch
CRS112-8G-4S-IN
GIGABIT ETHERNET
SFP
CONSOLE
RESET
PWR
USR


Cloud Router Switch
CRS 317-1G-16S+
MikroTik

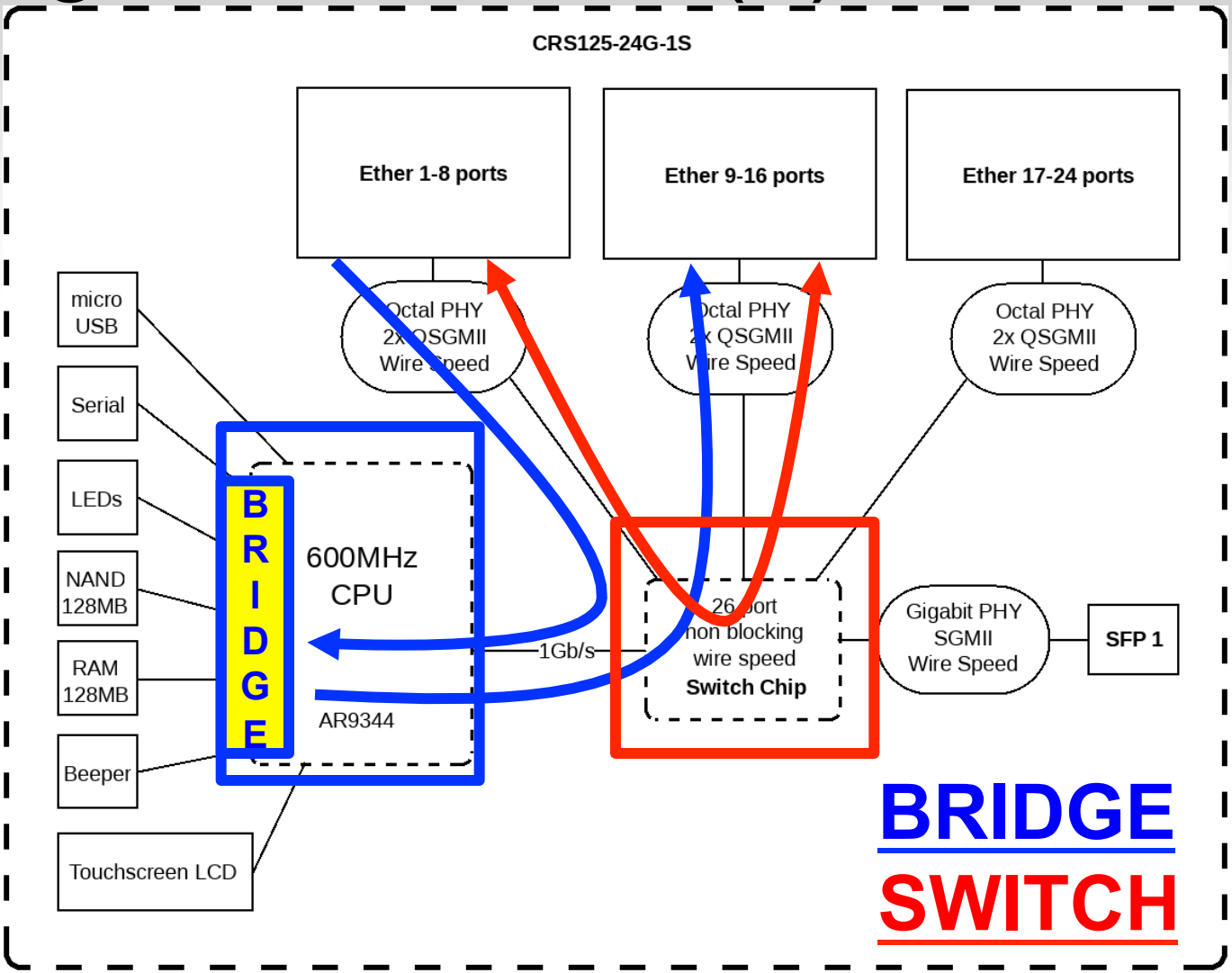
Router != Switch

Router	Switch
OSI Layer 3	OSI Layer 2
IP ADDRESS	MAC ADDRESS
PAKET	FRAME

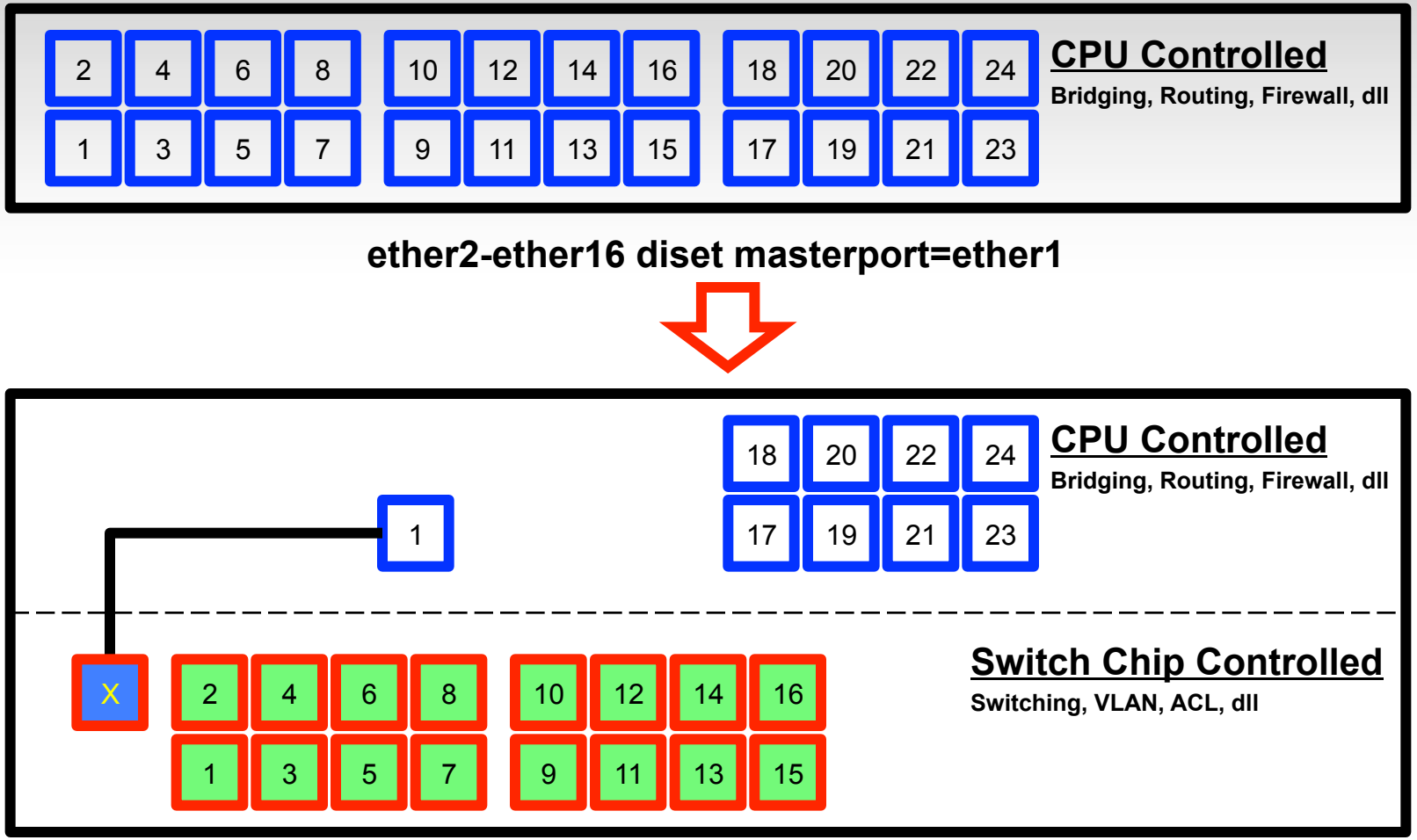
Bridge !== Switch

Bridge	Switch
Software	Hardware
Semua ROS (RB & PC)	Routerboard tertentu
Lambat	Cepat

Bridge !== Switch (2)



Logika Switch Chip



Master Port - CPU Port

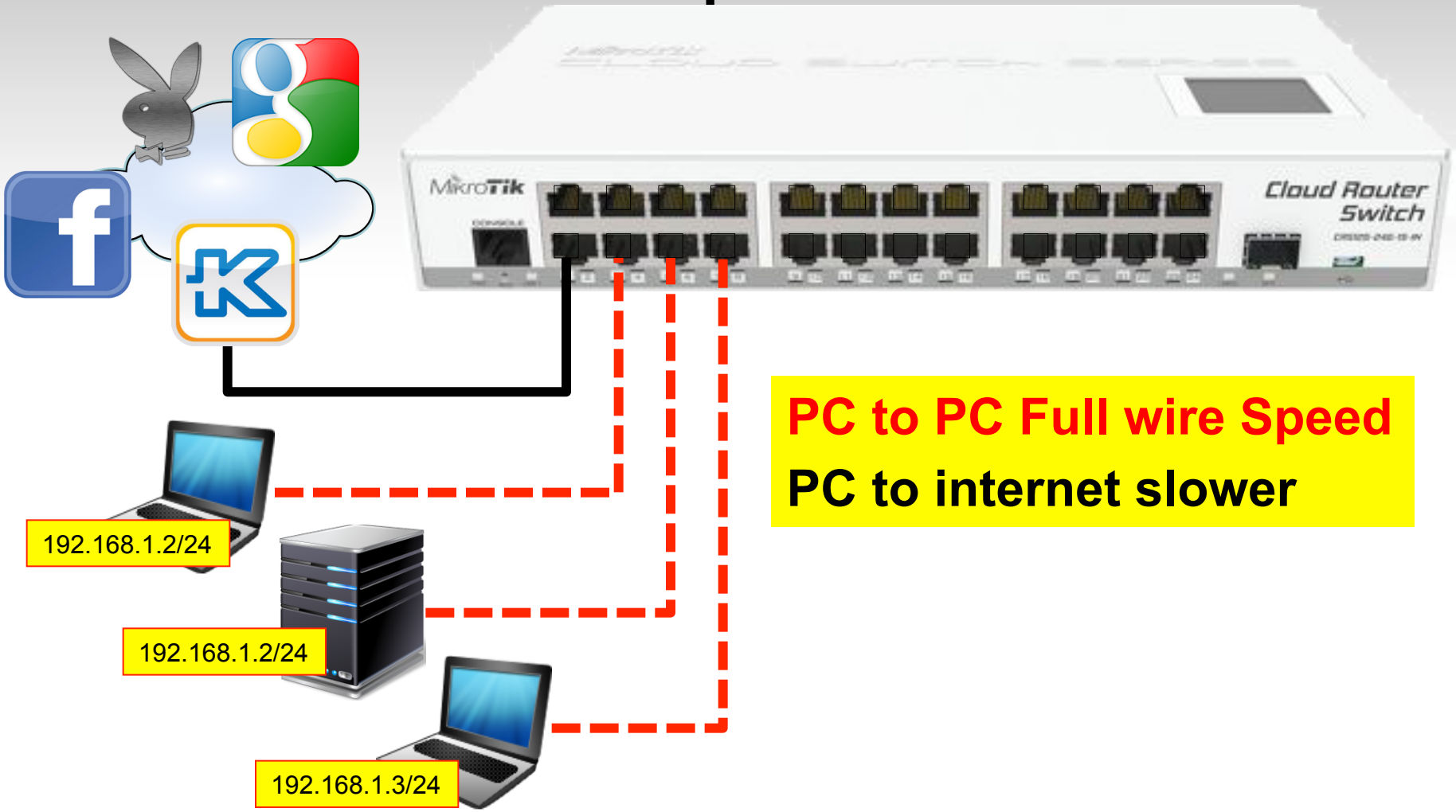
- Master port merupakan penghubung antara interface pada RouterOS dengan interface virtual "Switch-CPU Port" pada switch
- Pada CRS, support multiple "master-port" untuk membentuk banyak switch group dan setiap interface hanya bisa berada dalam 1 switch group. Tetapi fitur Switching tidak akan maximal.
- Rekomendasi hanya menggunakan 1 master-port untuk semua interface

Fitur MikroTik Switch CRS125series*

- Forwarding
  - Full non-blocking Wirespeed switching
- Mirroring
  - Port, VLAN, MAC based mirroring
- VLAN
  - Support 802.1Q & 802.1ad
  - Flexible (Port, Protocol, MAC based VLAN)
- Port Isolation & leakage
- Trunking
  - Support Link Aggregation Group
  - Hardware automatic failover & loadbalance
- QoS, Shaping & Scheduling
- Access Control List*

***Tergantung tipe switch chip**

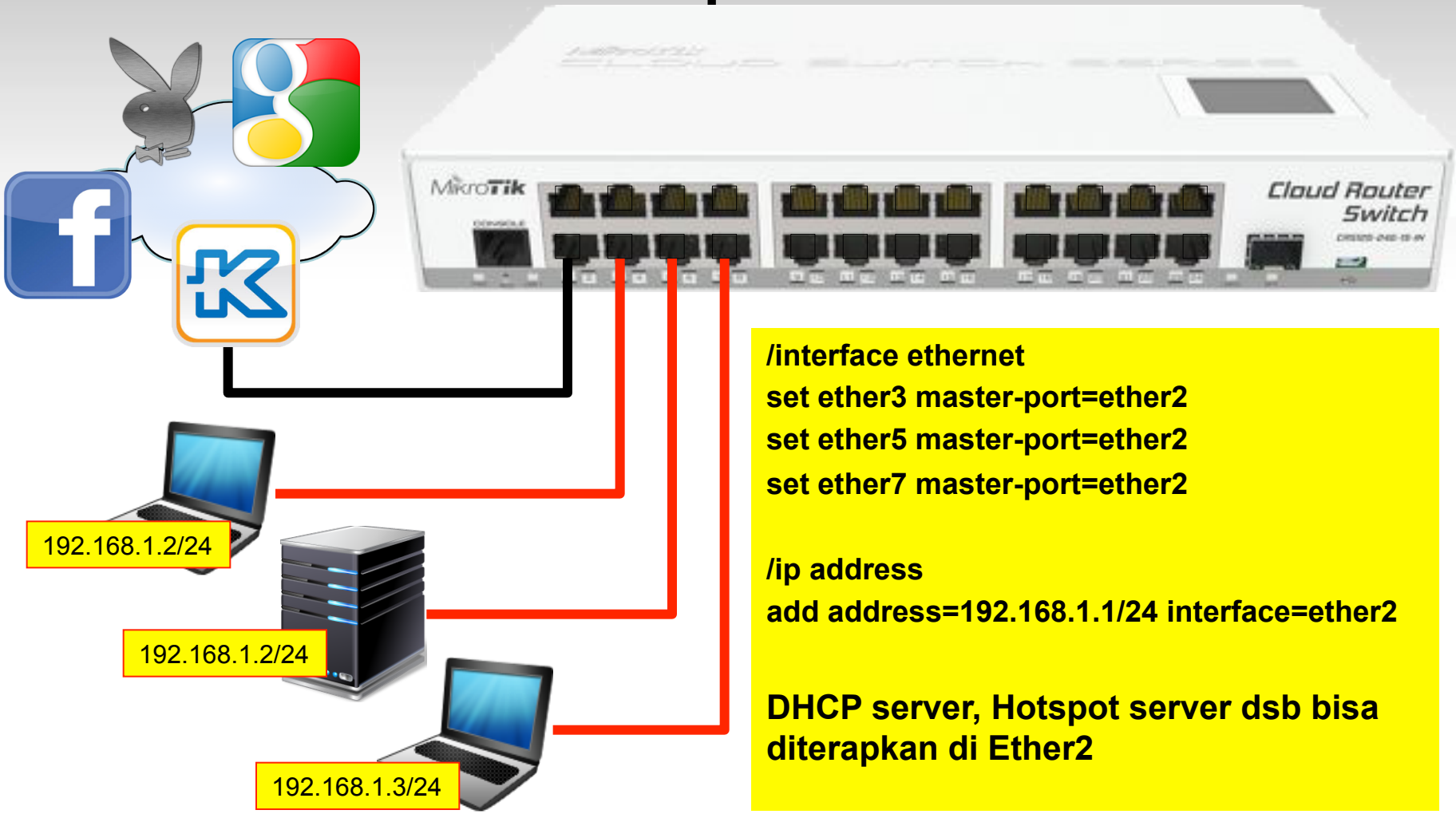
Contoh 1 - Simple Switch



PC to PC Full wire Speed

PC to internet slower

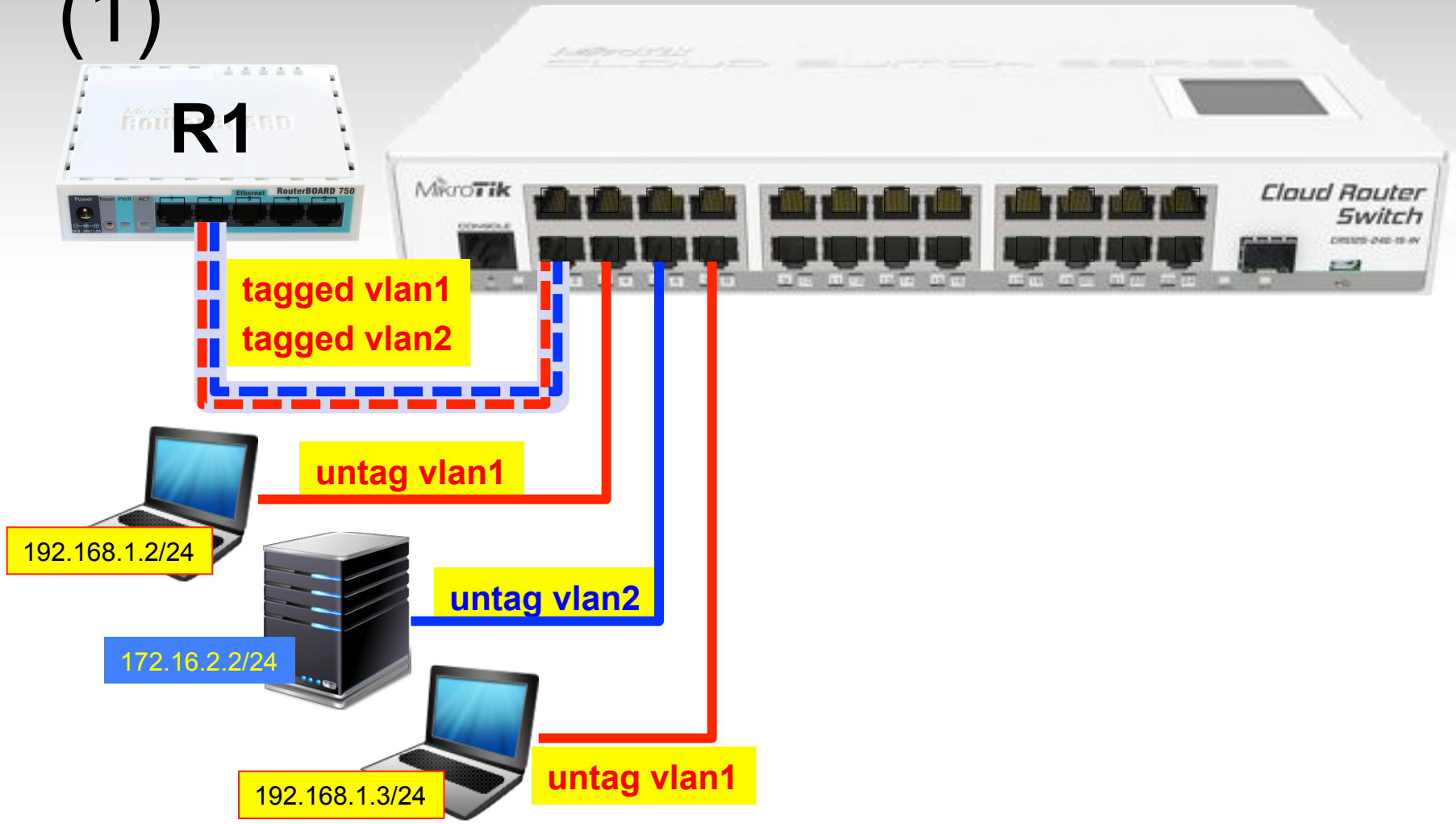
Contoh 1 - Simple Switch



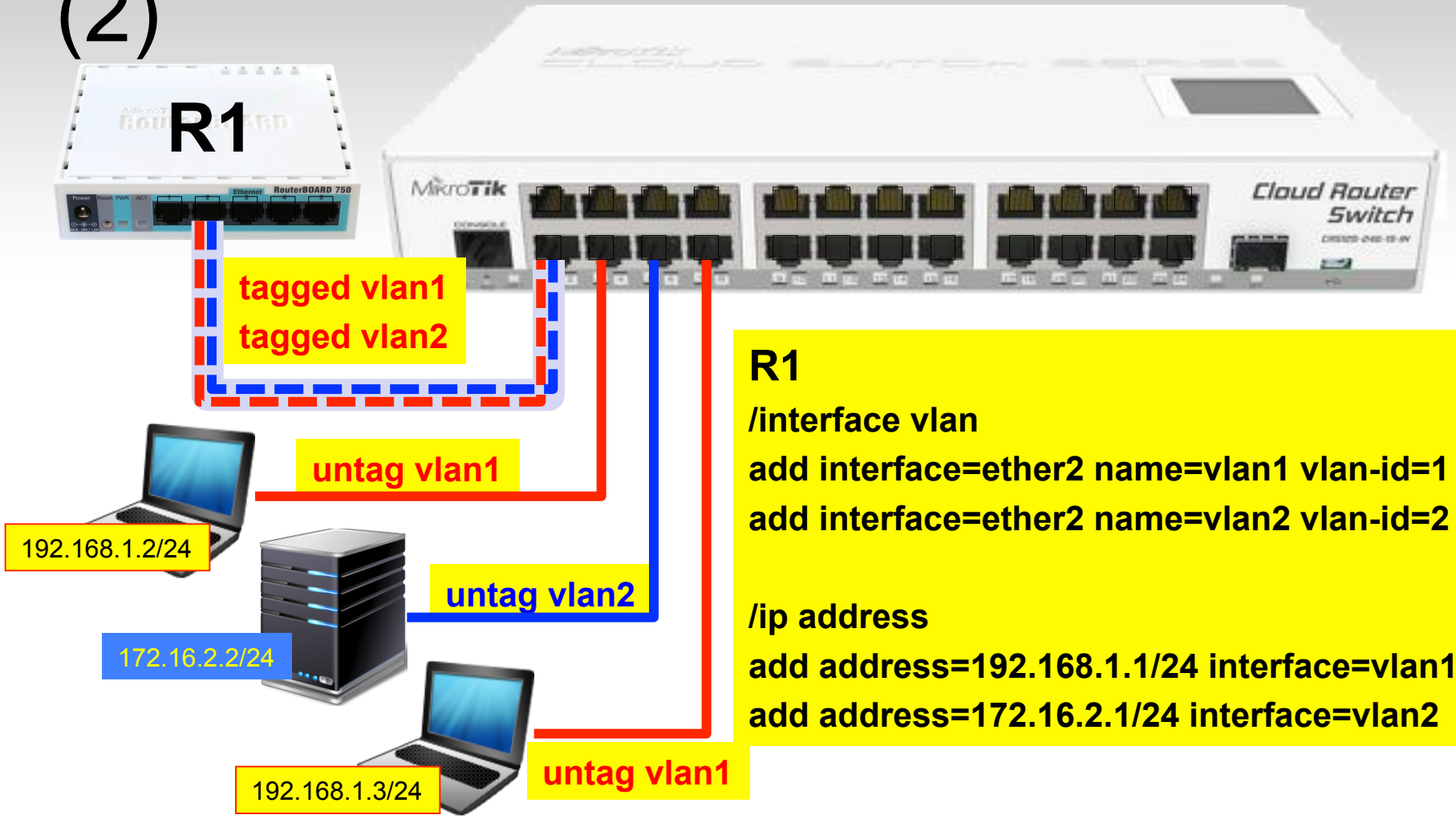

```
/interface ethernet
set ether3 master-port=ether2
set ether5 master-port=ether2
set ether7 master-port=ether2

/ip address
add address=192.168.1.1/24 interface=ether2
```

DHCP server, Hotspot server dsb bisa diterapkan di Ether2

Contoh 2 - Port Based VLAN (1)



Contoh 2 - Port Based VLAN (2)



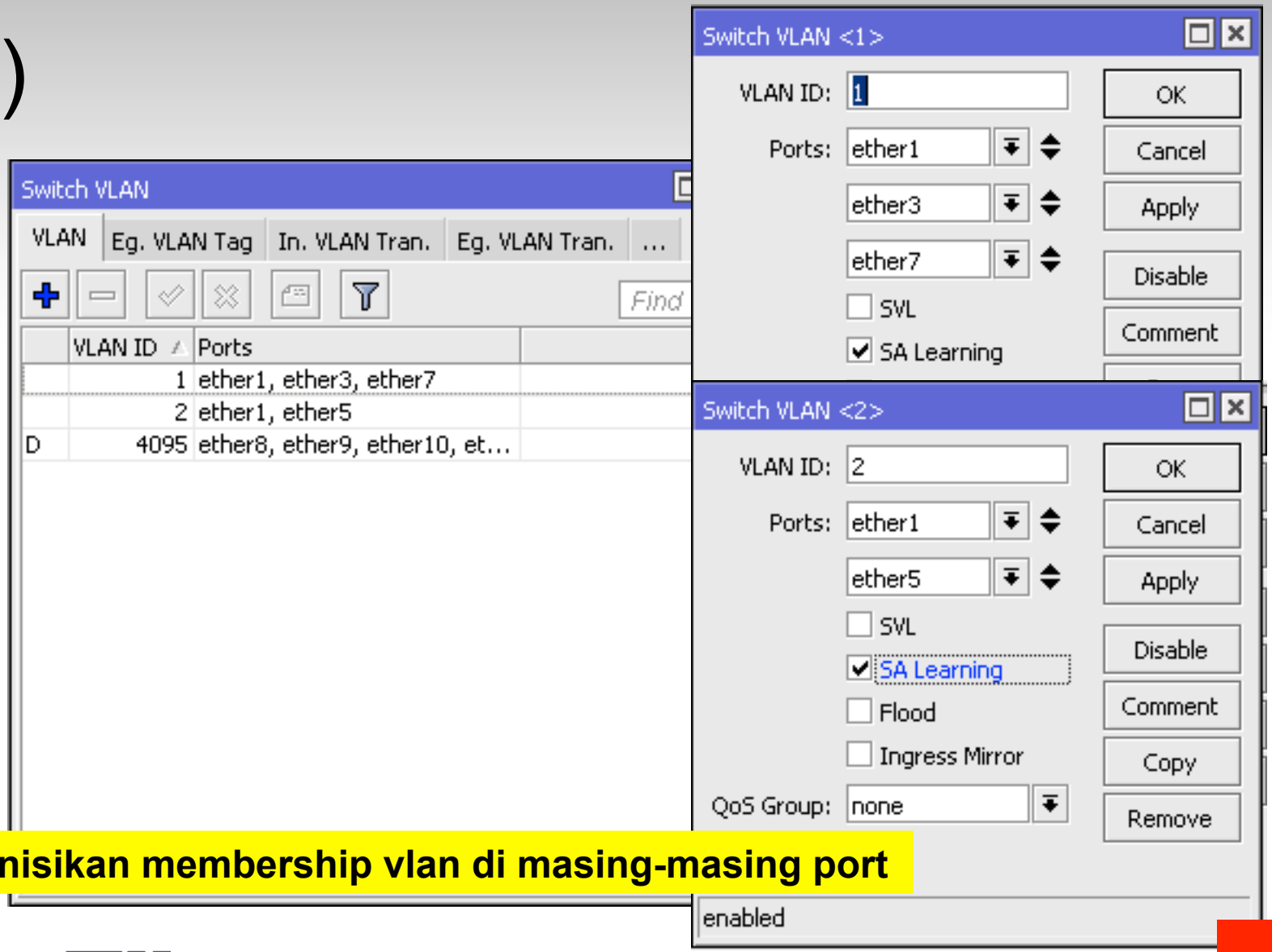
R1

```
/interface vlan
add interface=ether2 name=vlan1 vlan-id=1
add interface=ether2 name=vlan2 vlan-id=2

/ip address
add address=192.168.1.1/24 interface=vlan1
add address=172.16.2.1/24 interface=vlan2
```

Contoh 2 - Port Based VLAN (3)

- Ether1 CRS berfungsi sebagai trunk port / tagged port
- Ether3 dan Ether7 CRS berfungsi sebagai access port / untagged port dari vlan-id=1
- Ether5 CRS berfungsi sebagai access port / untagged port dari vlan-id=2
- Perangkat dengan vlan-id=1 sudah berbeda broadcast domain dengan perangkat vlan-id=2

Contoh 2 - Port Based VLAN (4)

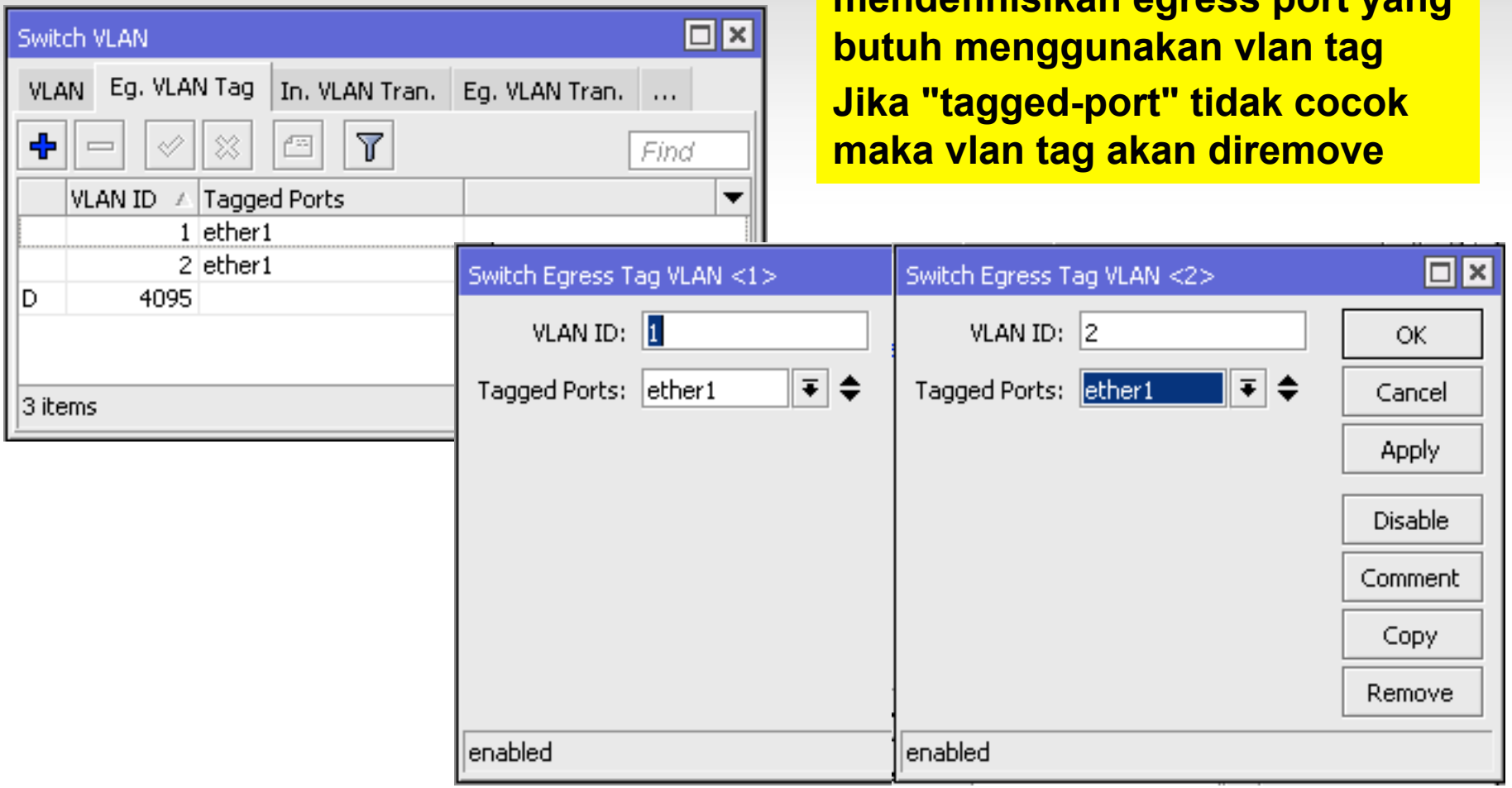


Definisikan membership vlan di masing-masing port

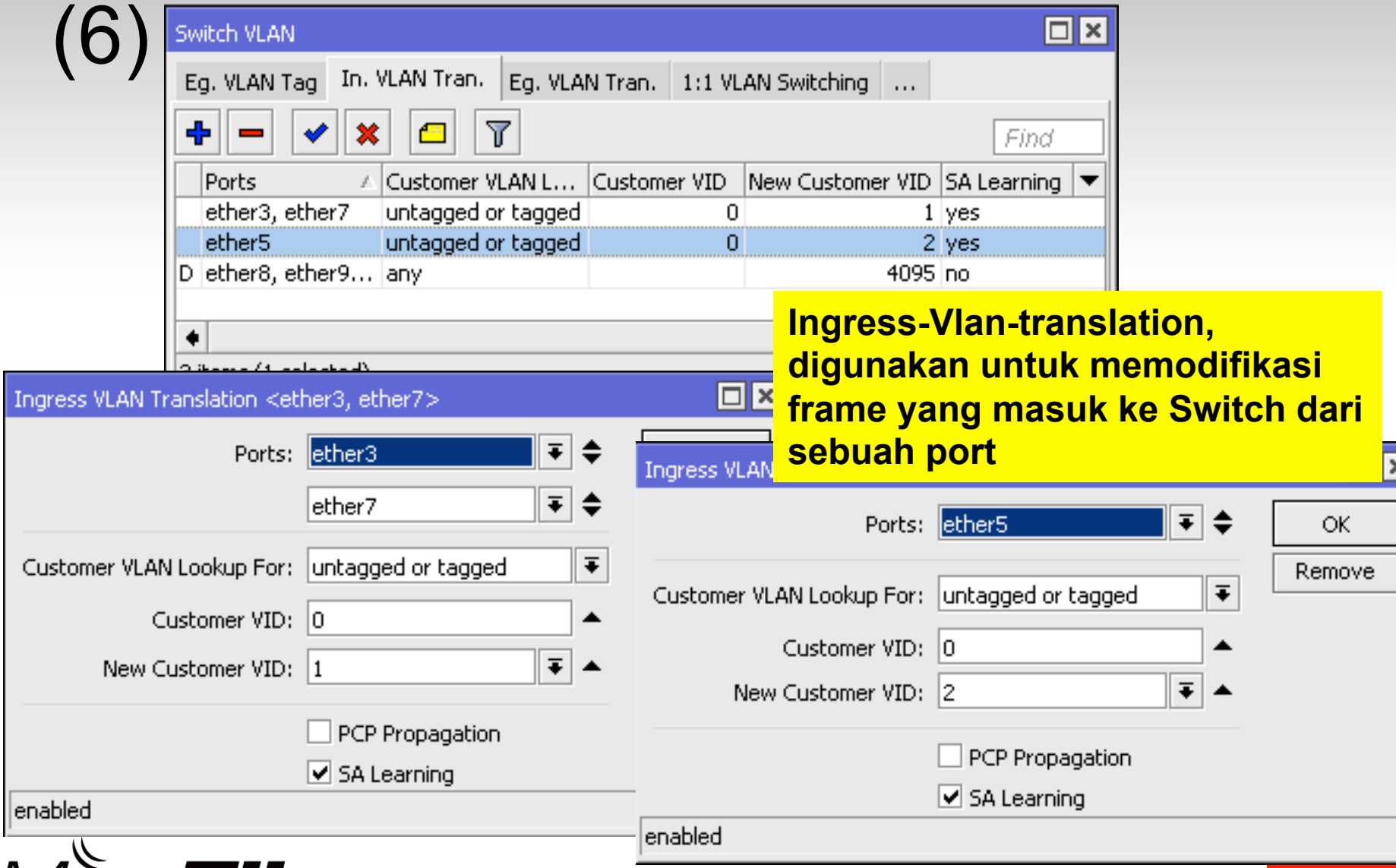
Contoh 2 - Port Based VLAN (5)

Egress-vlan-tag untuk mendefinisikan egress port yang butuh menggunakan vlan tag

Jika "tagged-port" tidak cocok maka vlan tag akan diremove

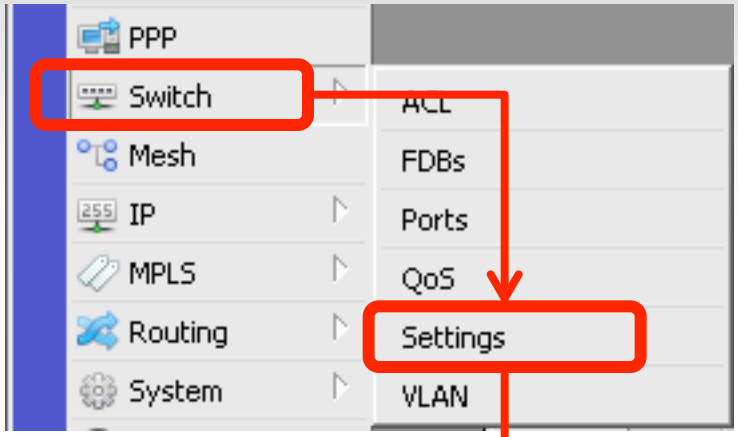


Contoh 2 - Port Based VLAN (6)



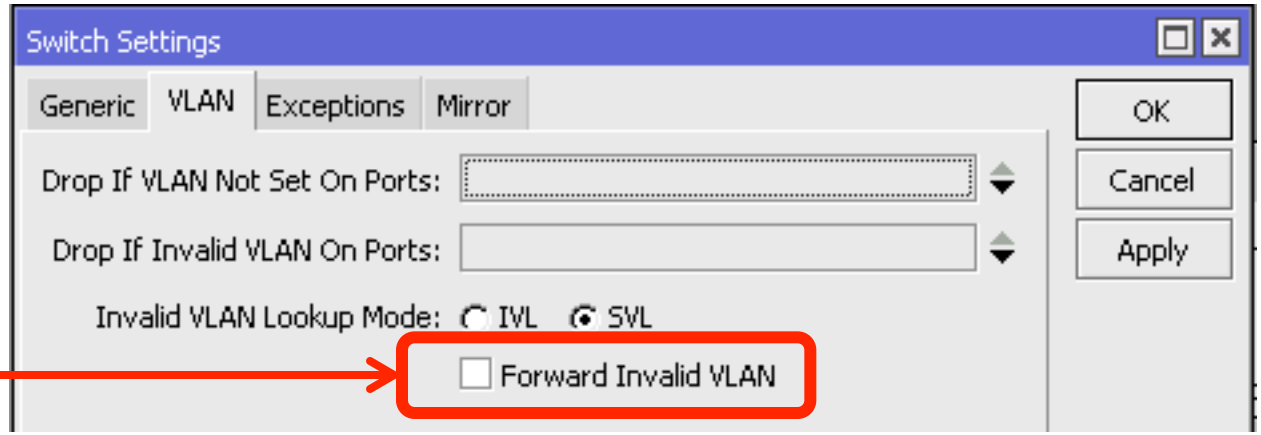
Ingress-Vlan-translation, digunakan untuk memodifikasi frame yang masuk ke Switch dari sebuah port

Contoh 2 - Port Based VLAN (7)



Disable forward-invalid-vlan untuk memblok semua frame yang tidak kita definisikan di vlan table (security purpose)

Lakukan ini setelah yakin semua vlan sudah berjalan!!



Switch LOGIC

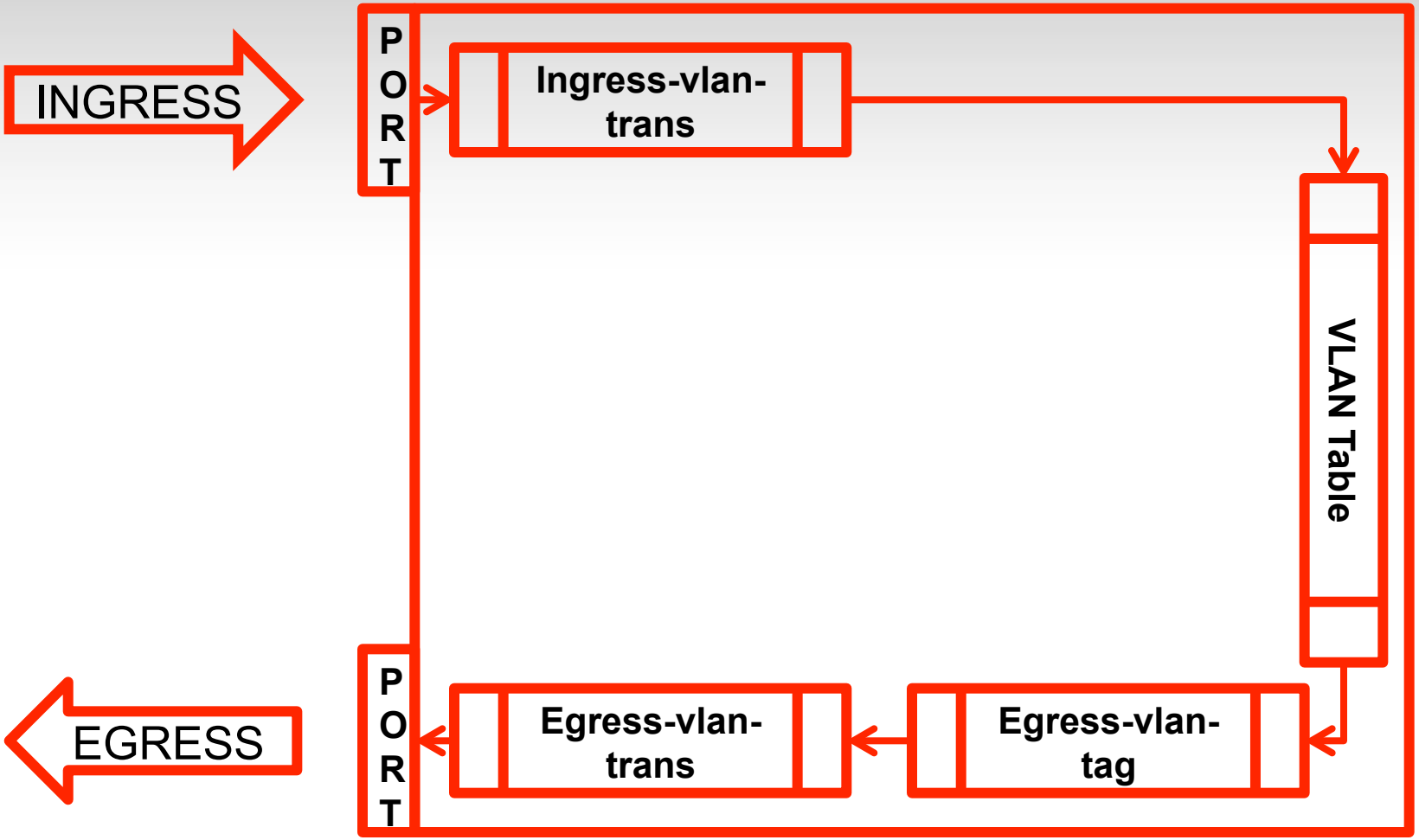
DST MAC 6	SRC MAC 6	ETH TYPE 2	DATA PAYLOAD 46-1500	FCS 4

access port / untagged port

trunk port / tagged port

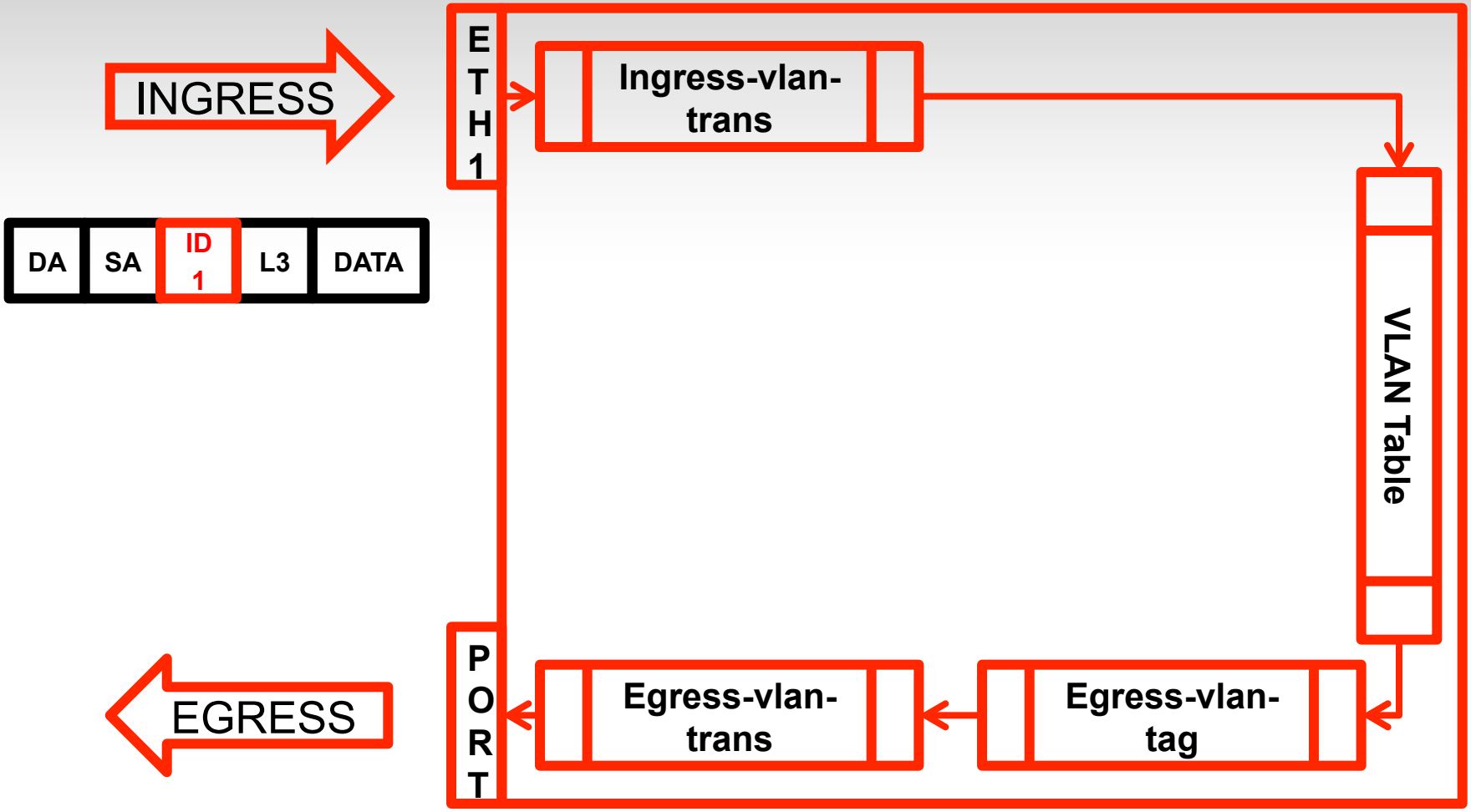
DST MAC 6	SRC MAC 6	802.1Q 4	ETH TYPE 2	DATA PAYLOAD 42-1500	FCS 4

Logika CRS (1)


INGRESS
PORT
Ingress-vlan-trans
VLAN Table
EGRESS
PORT
Egress-vlan-trans
Egress-vlan-tag

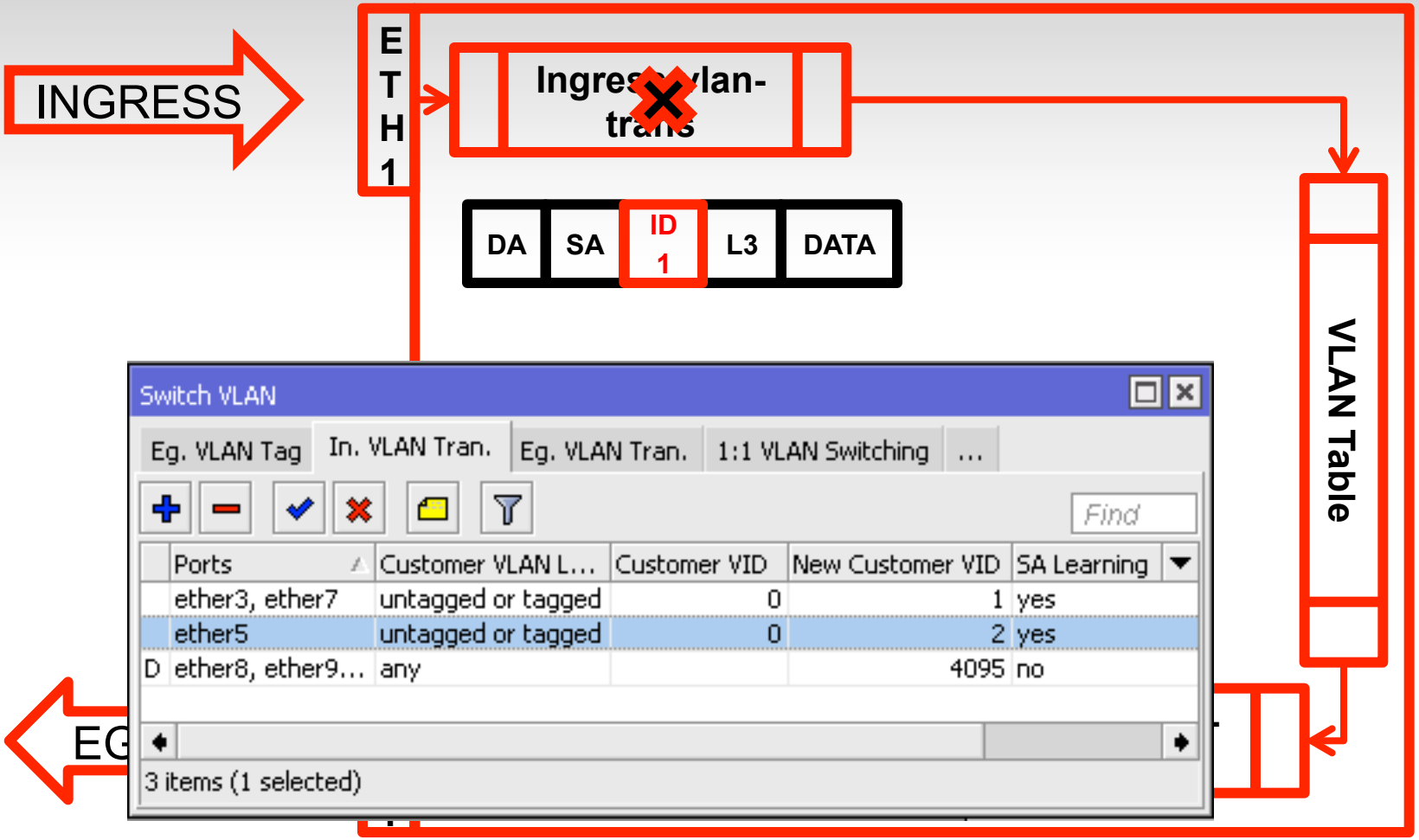
Logika CRS (2)

R1 tagged to PC untagged vid=1



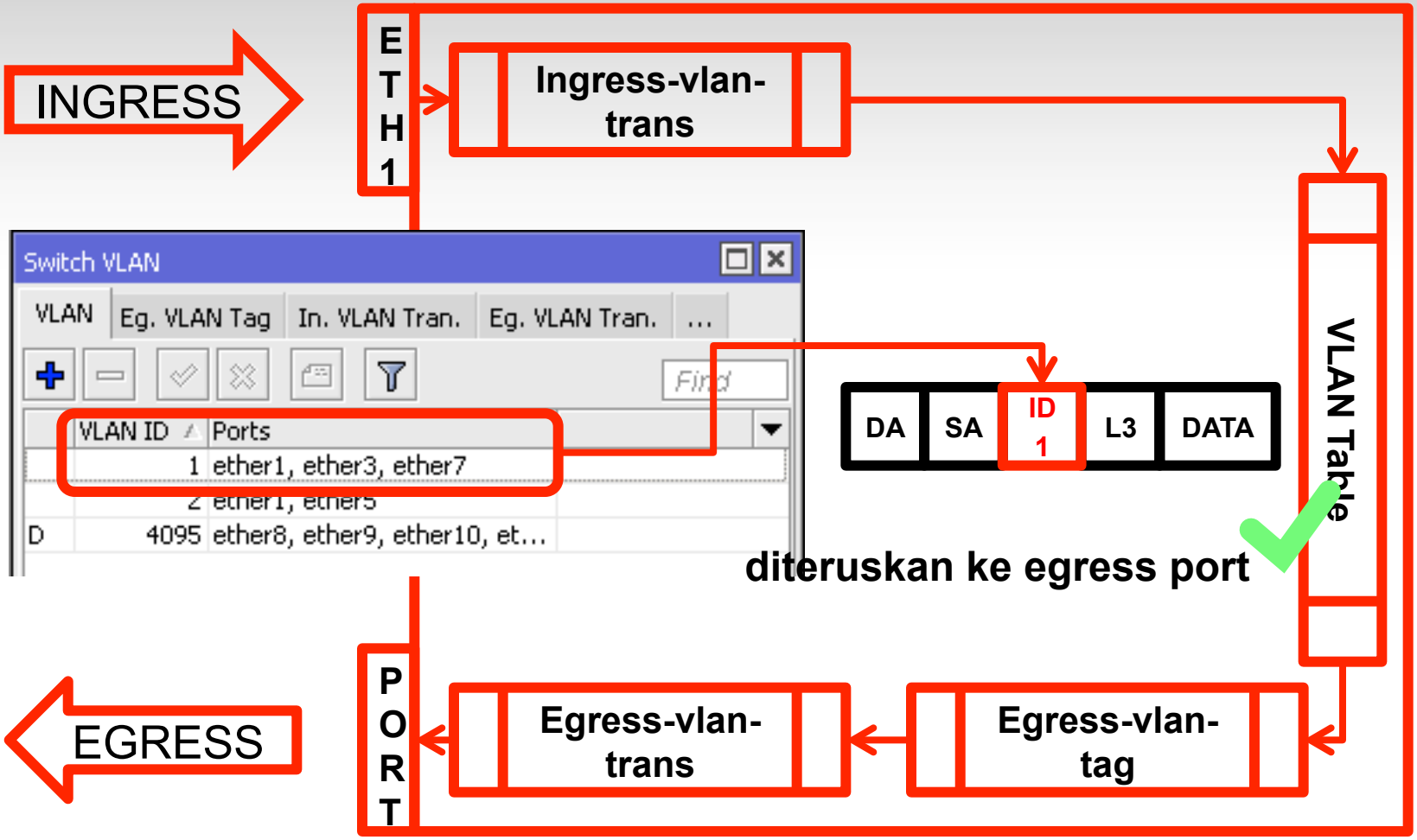
Logika CRS (3)

R1 tagged to PC untagged vid=1

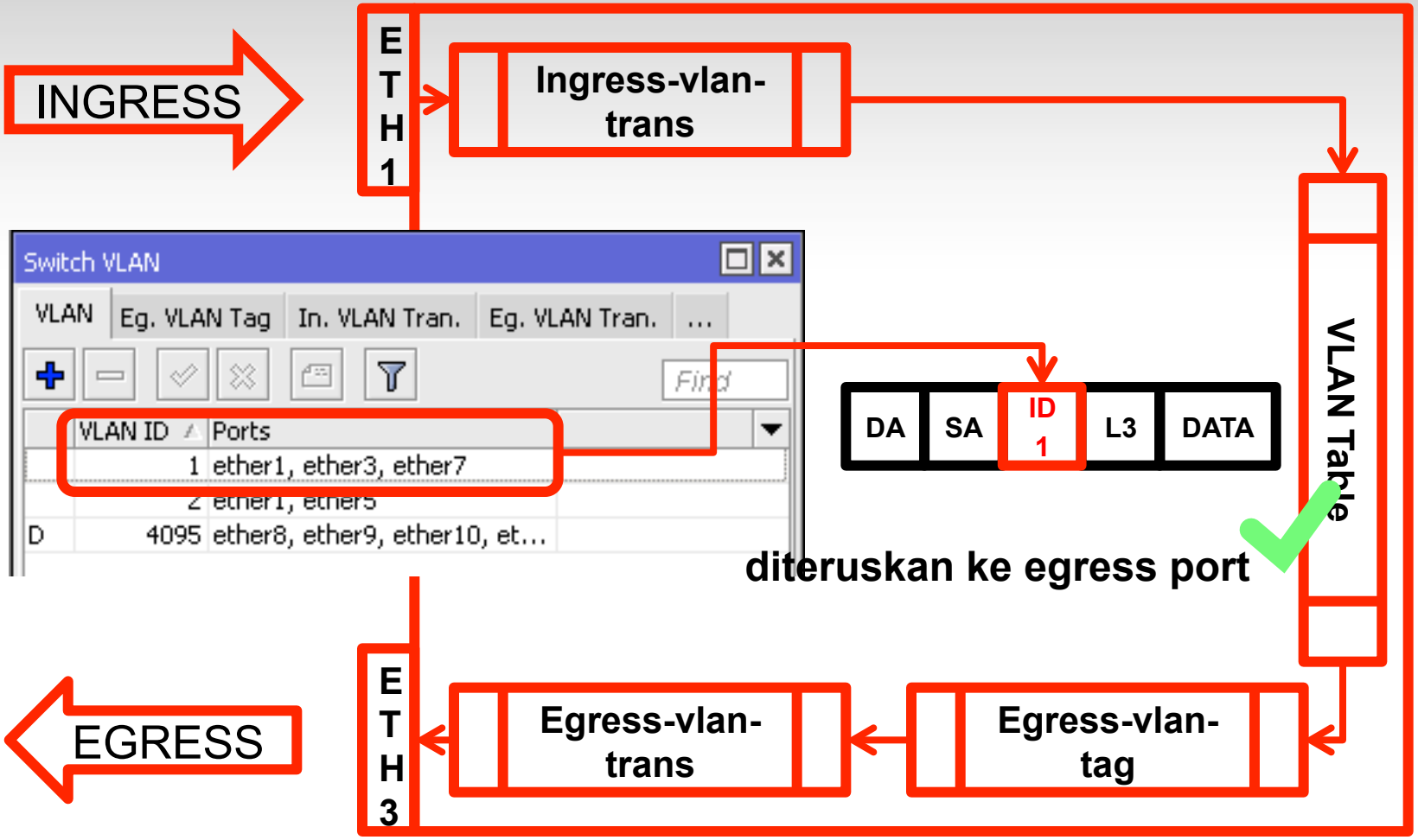


Logika CRS (4)

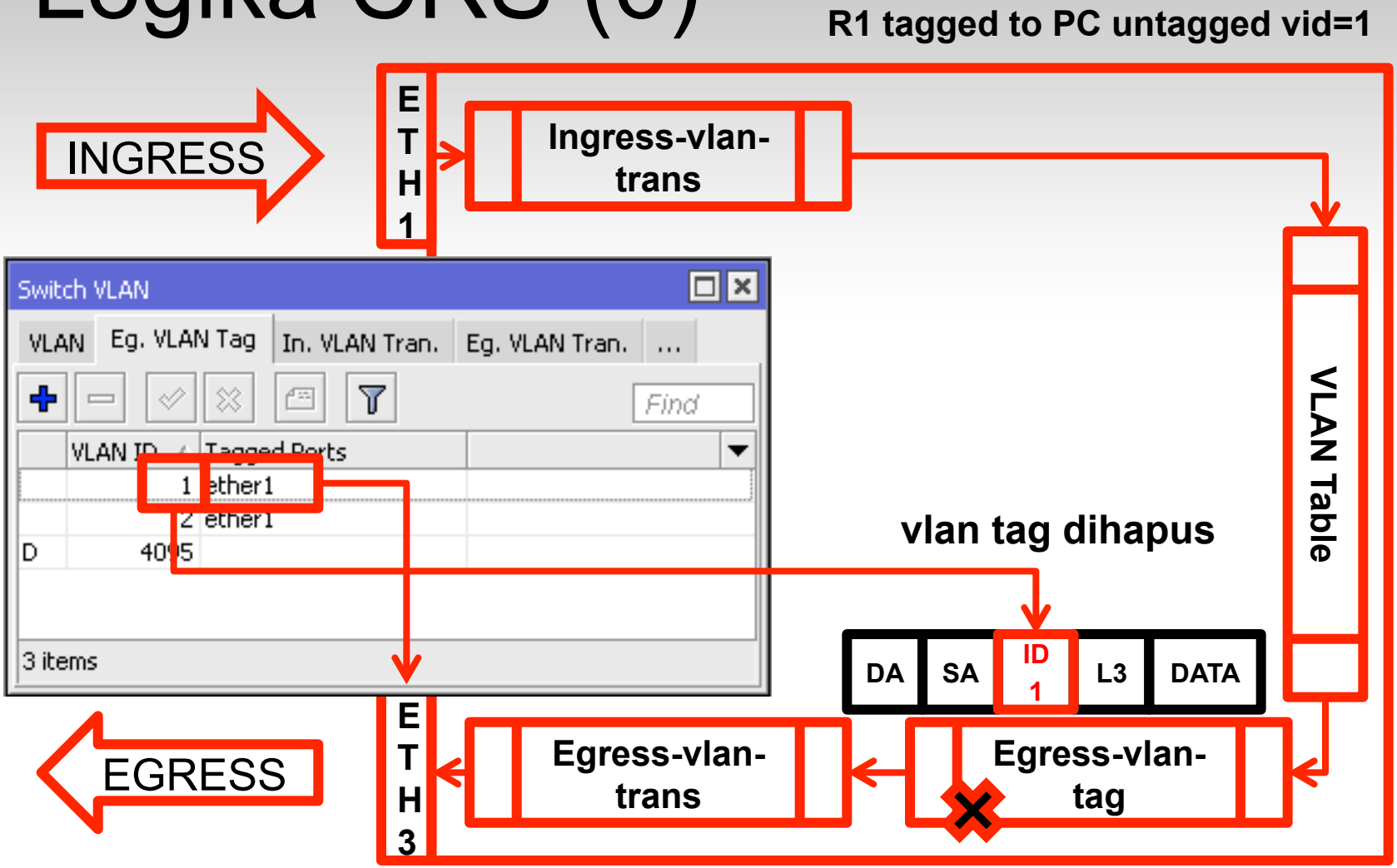
R1 tagged to PC untagged vid=1



Logika CRS (5)

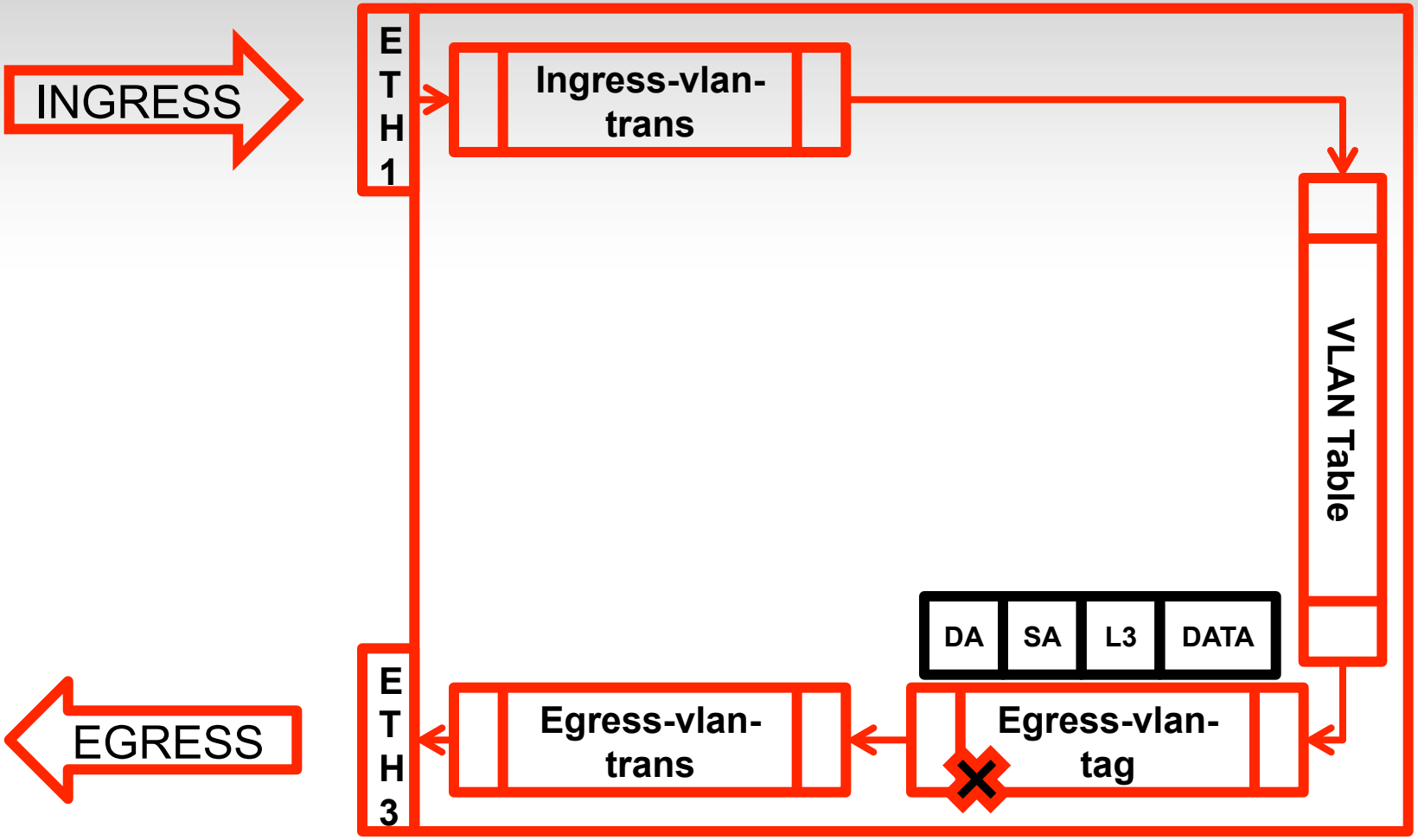

R1 tagged to PC untagged vid=1
INGRESS
ETH 1
Ingress-vlan-trans
VLAN Table
Switch VLAN
VLAN
Eg. VLAN Tag
In. VLAN Tran.
Eg. VLAN Tran.
...
Find
VLAN ID
Ports
1 ether1, ether3, ether7
2 ether1, ether5
D 4095 ether8, ether9, ether10, et...
DA
SA
ID 1
L3
DATA
diteruskan ke egress port
EGRESS
ETH 3
Egress-vlan-trans
Egress-vlan-tag

Logika CRS (6)

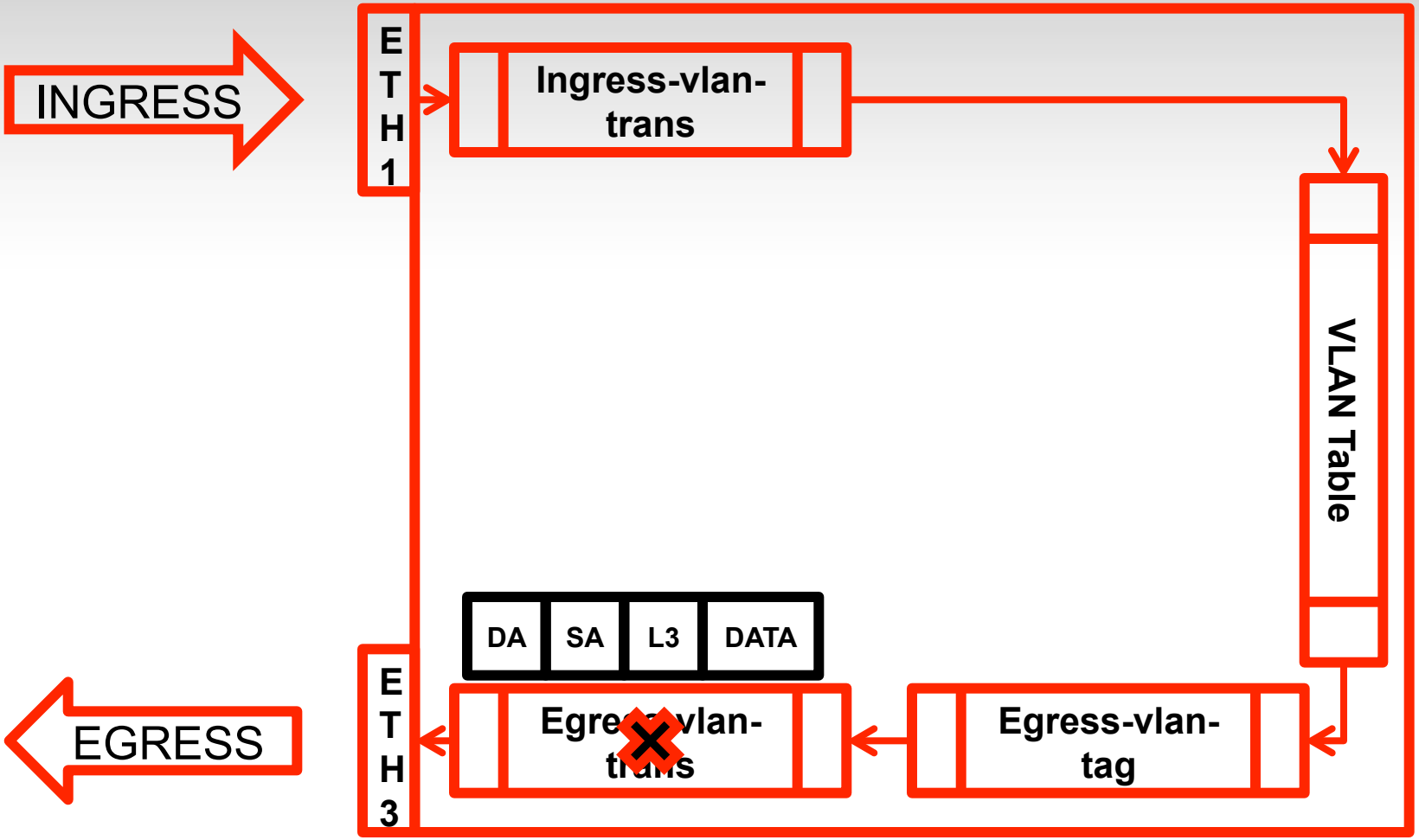

R1 tagged to PC untagged vid=1
INGRESS
ETH 1
Ingress-vlan-trans
VLAN Table
Switch VLAN
VLAN
Eg. VLAN Tag
In. VLAN Tran.
Eg. VLAN Tran.
...
Find
VLAN ID
Tagged Ports
1 ether1
2 ether1
D 4095
3 items
vlan tag dihapus
DA
SA
ID 1
L3
DATA
EGRESS
ETH 3
Egress-vlan-trans
Egress-vlan-tag

Logika CRS (7)

R1 tagged to PC untagged vid=1

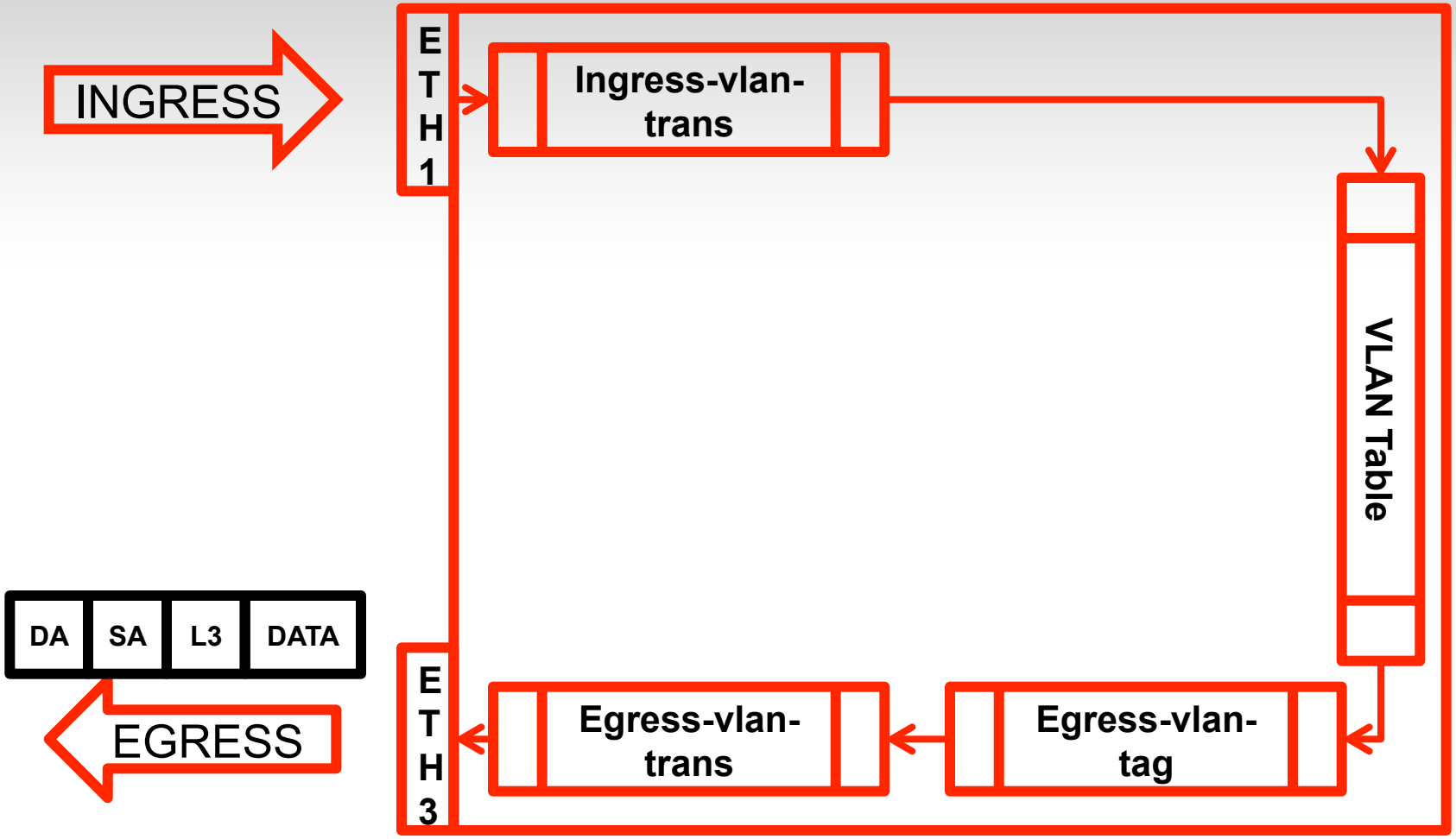


Logika CRS (8)


R1 tagged to PC untagged vid=1
INGRESS
ETH 1
Ingress-vlan-trans
VLAN Table
DA
SA
L3
DATA
ETH 3
Egress-vlan-trans
Egress-vlan-tag
EGRESS

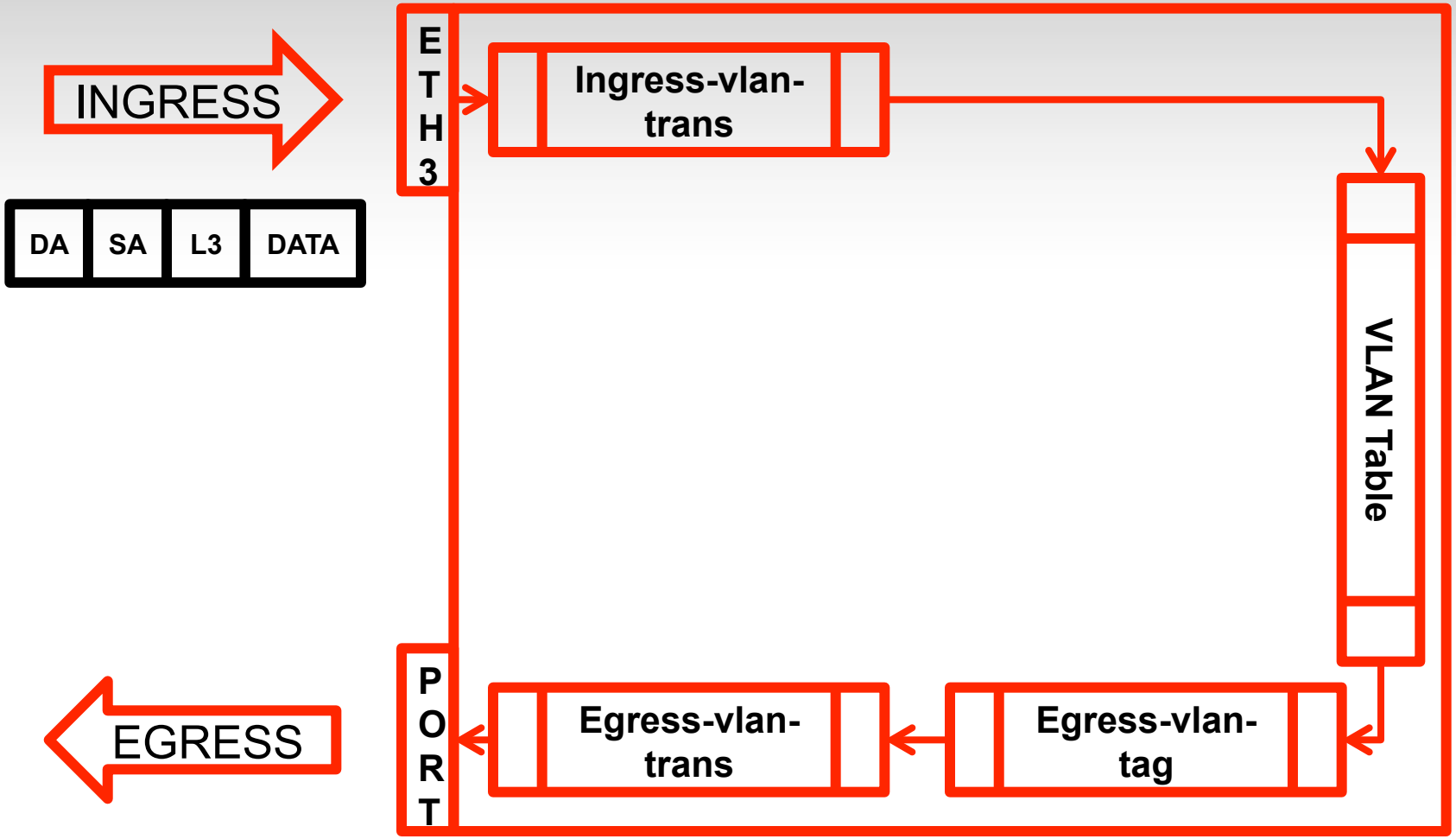
Logika CRS (9)

R1 tagged to PC untagged vid=1

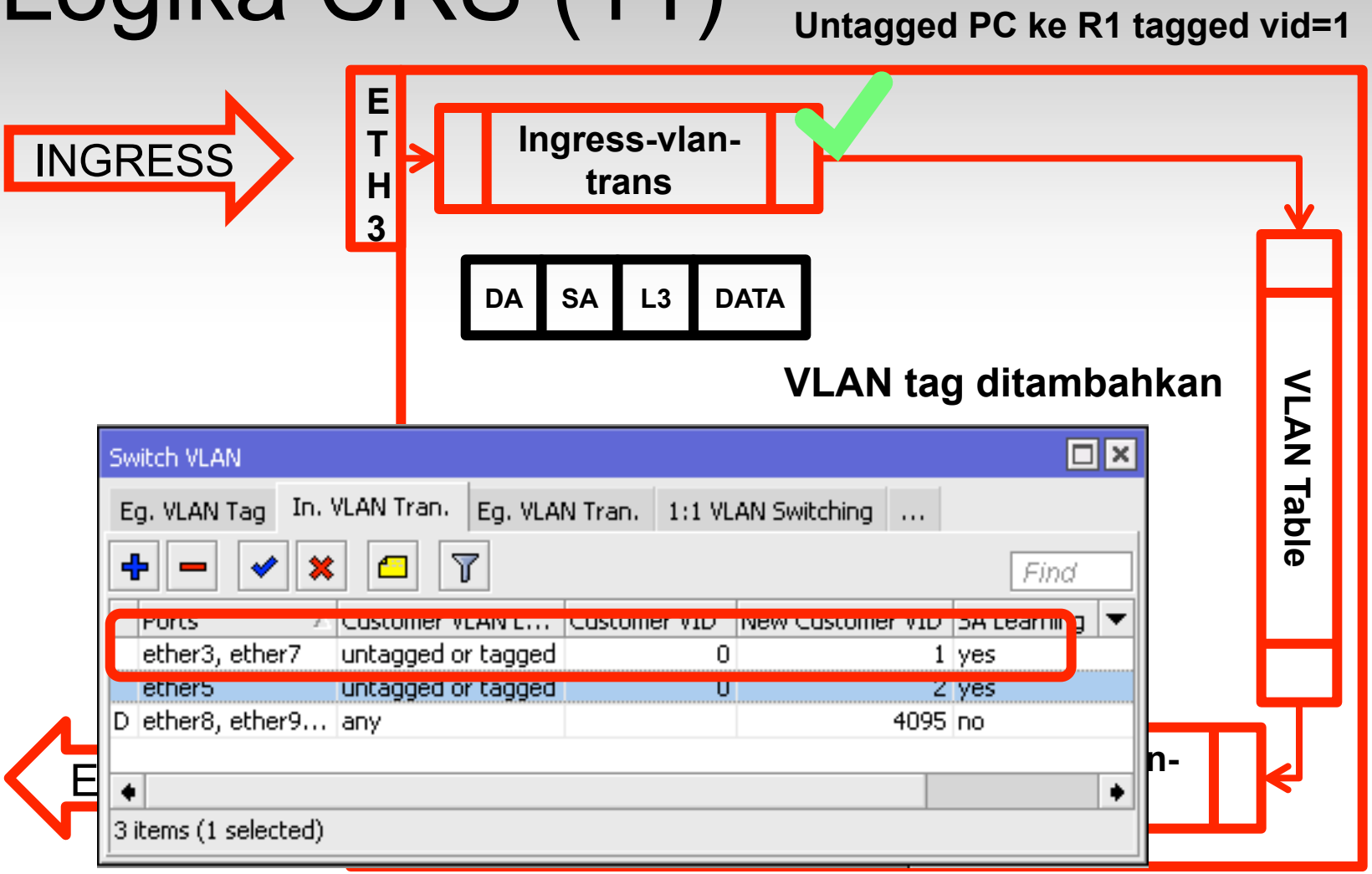


Logika CRS (10)

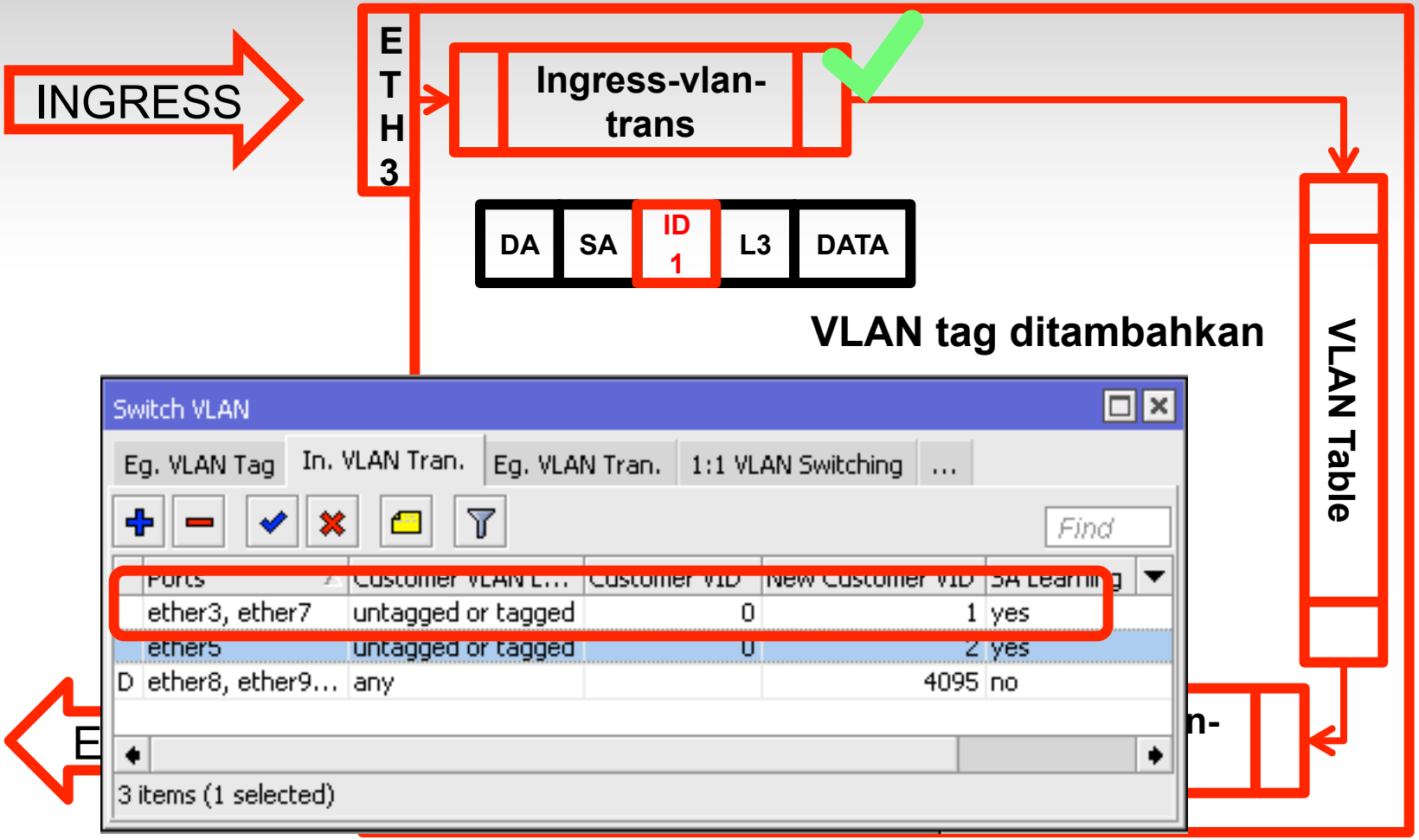
Untagged PC ke R1 tagged vid=1



Logika CRS (11)

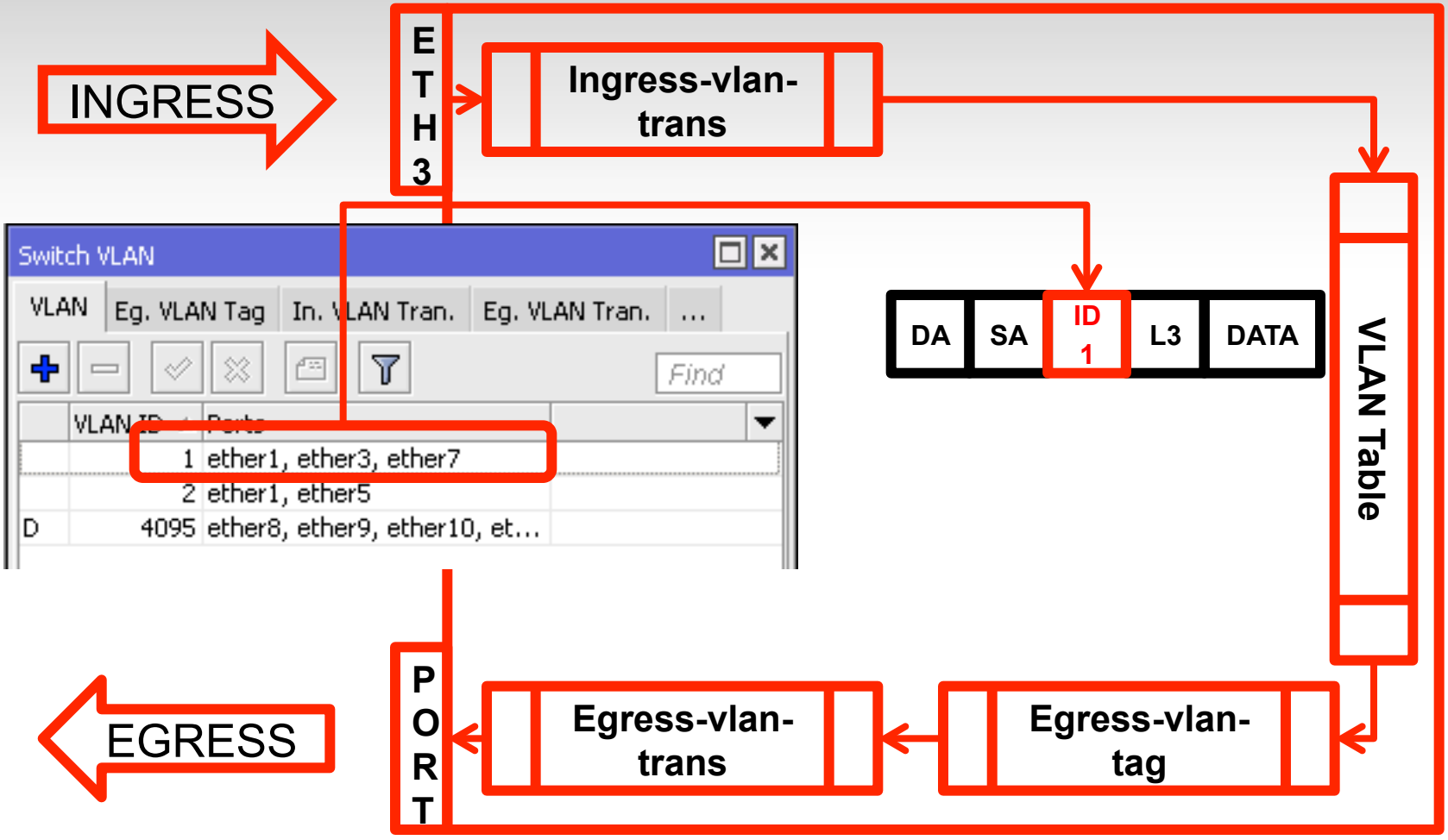


Logika CRS (12)

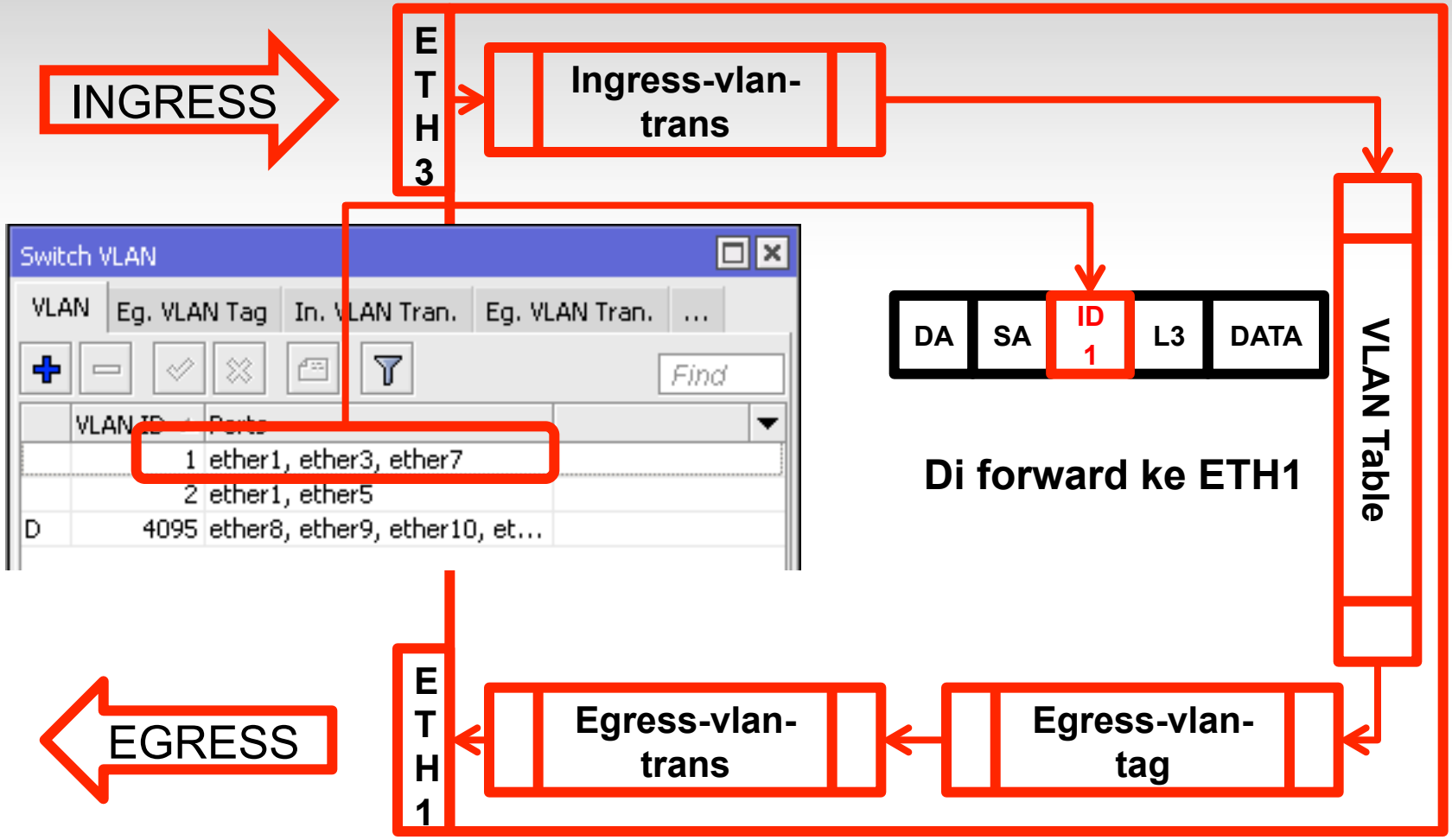


Logika CRS (13)

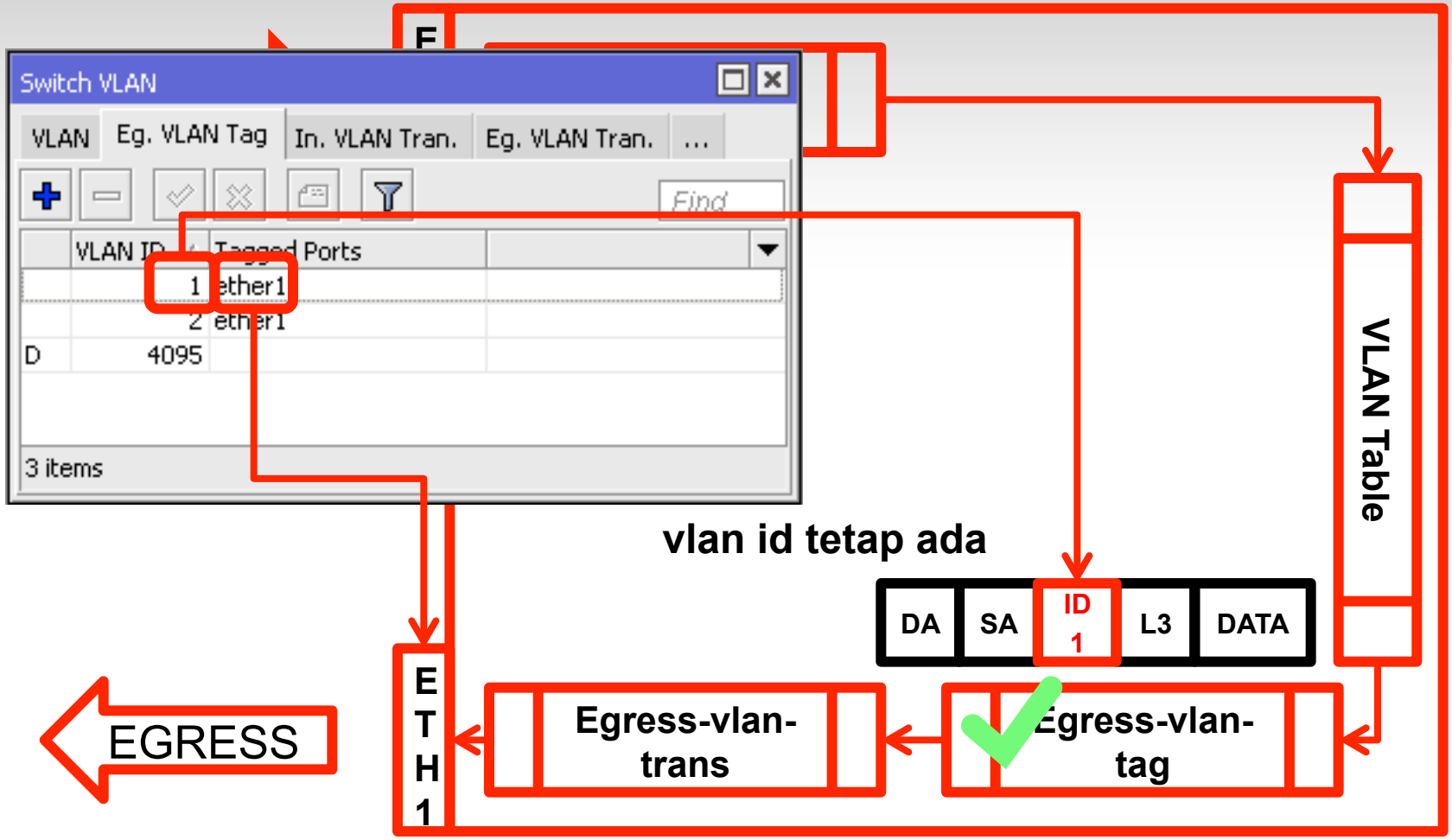
Untagged PC ke R1 tagged vid=1



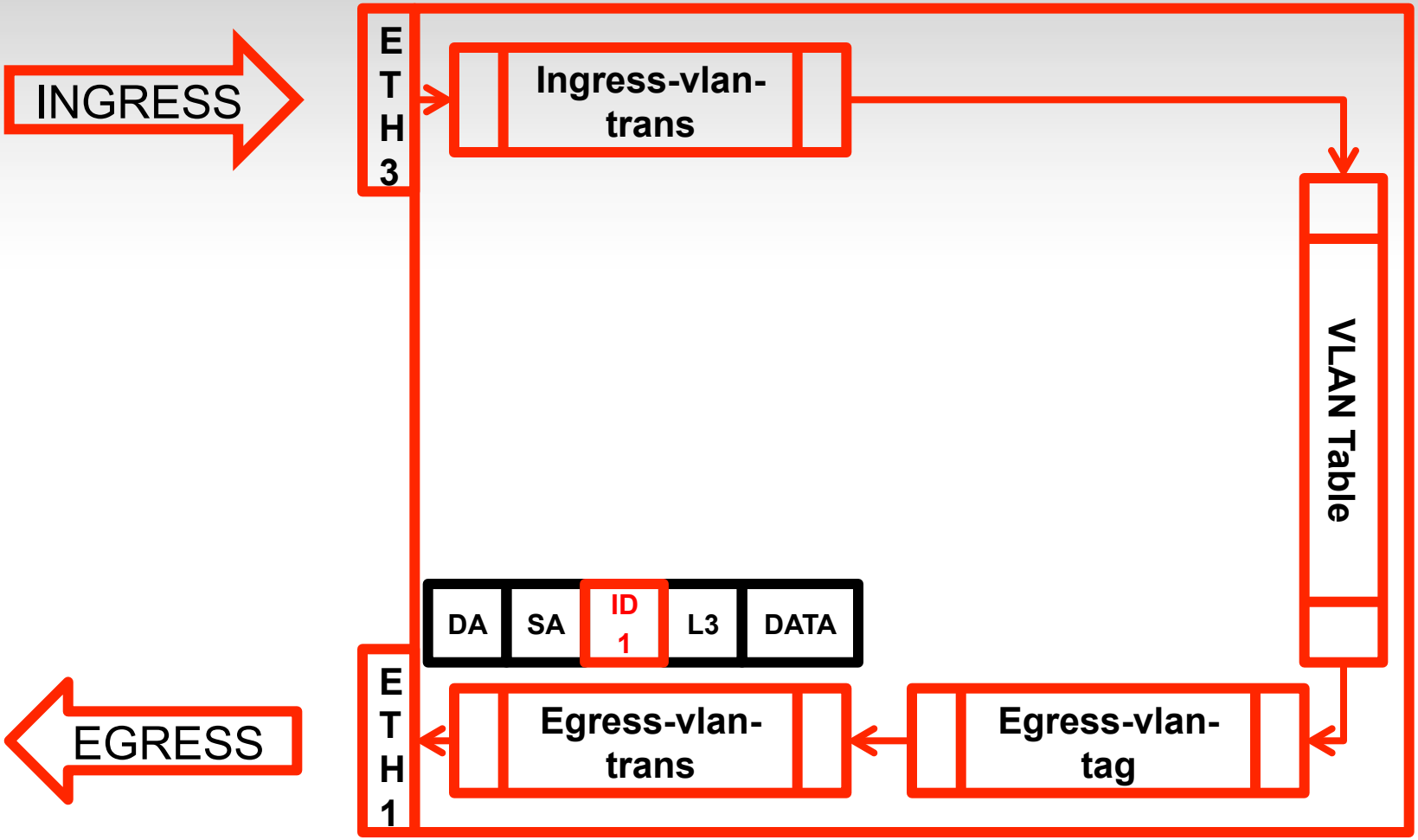
Logika CRS (14)



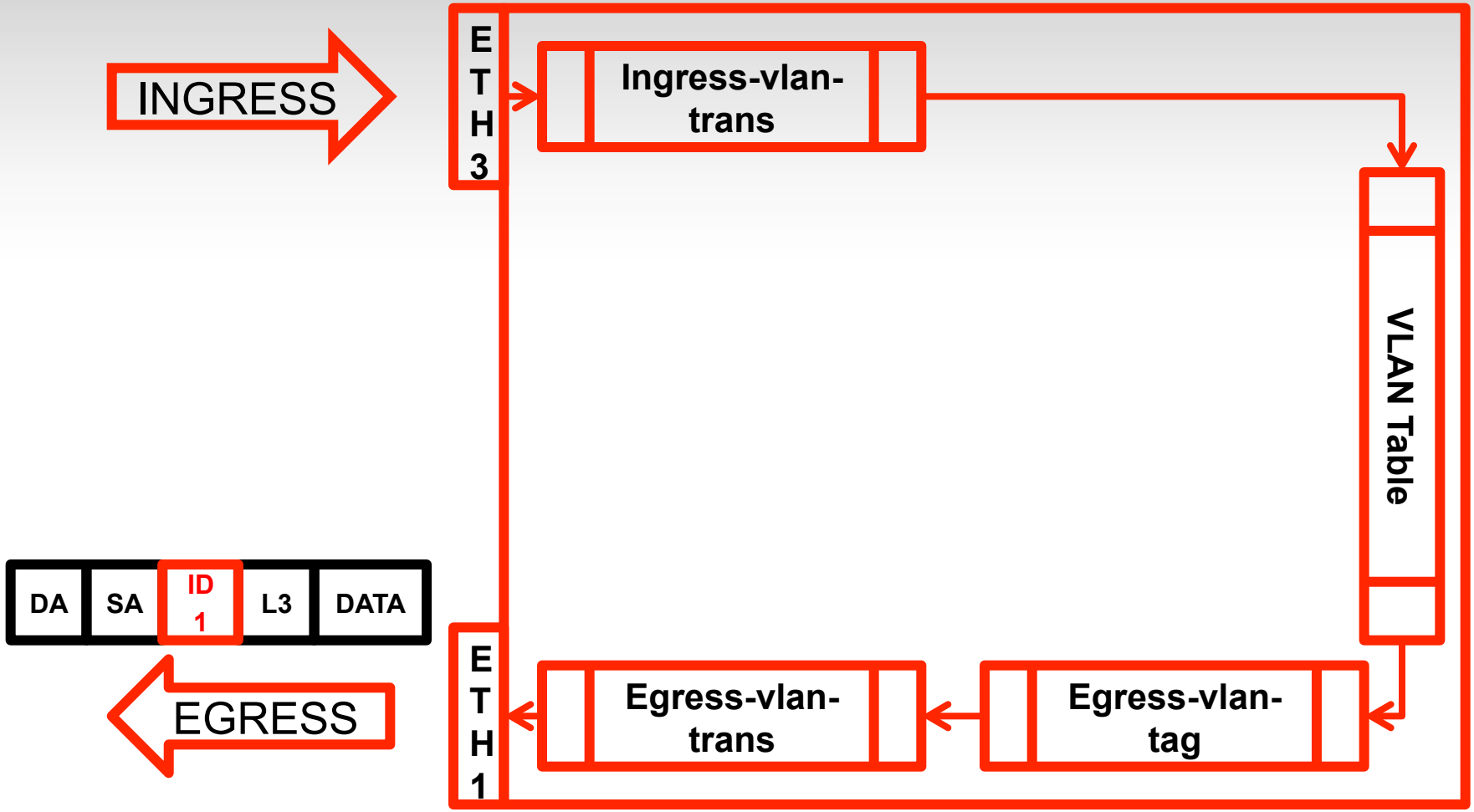
Logika CRS (15)



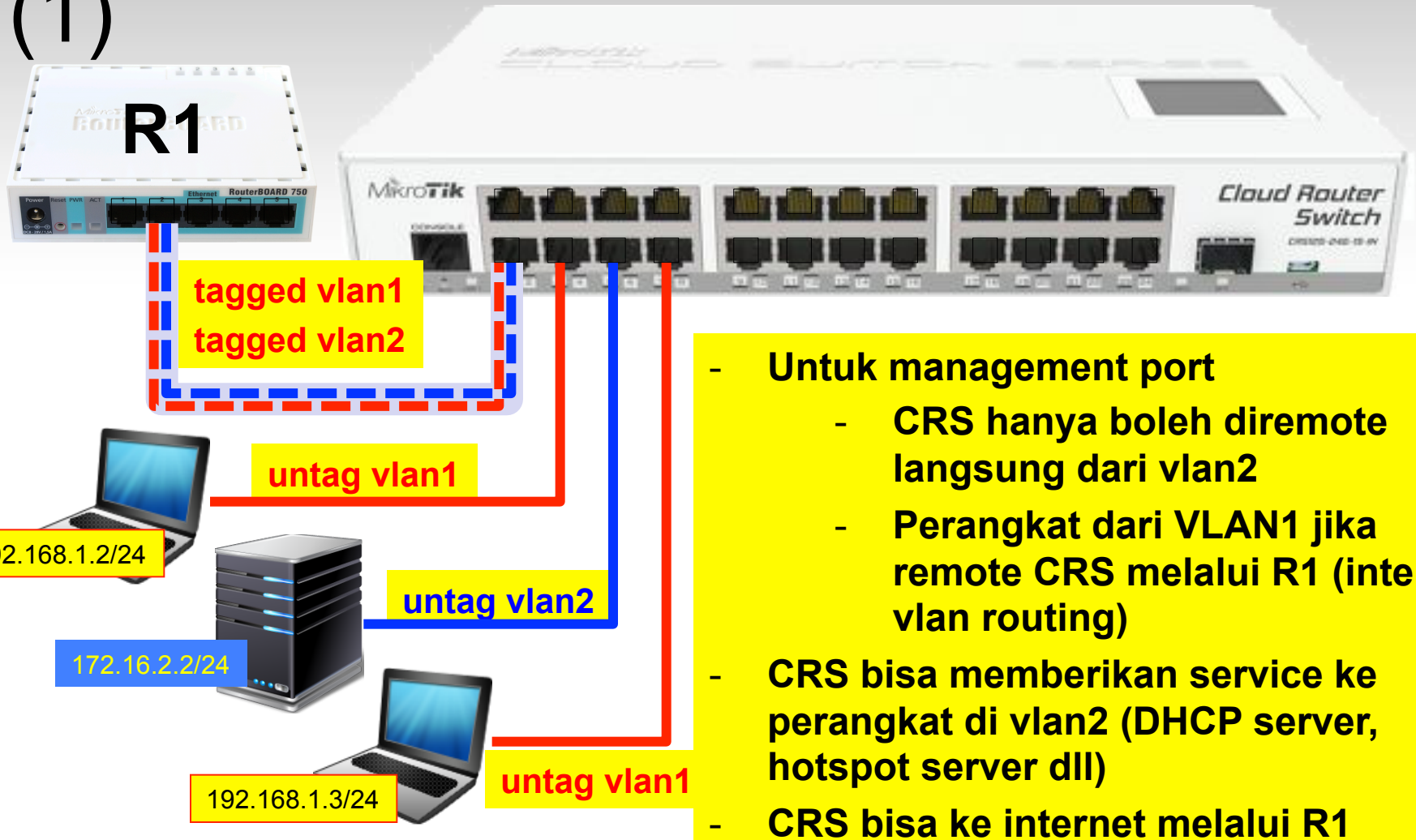
Logika CRS (16)



Logika CRS (17)

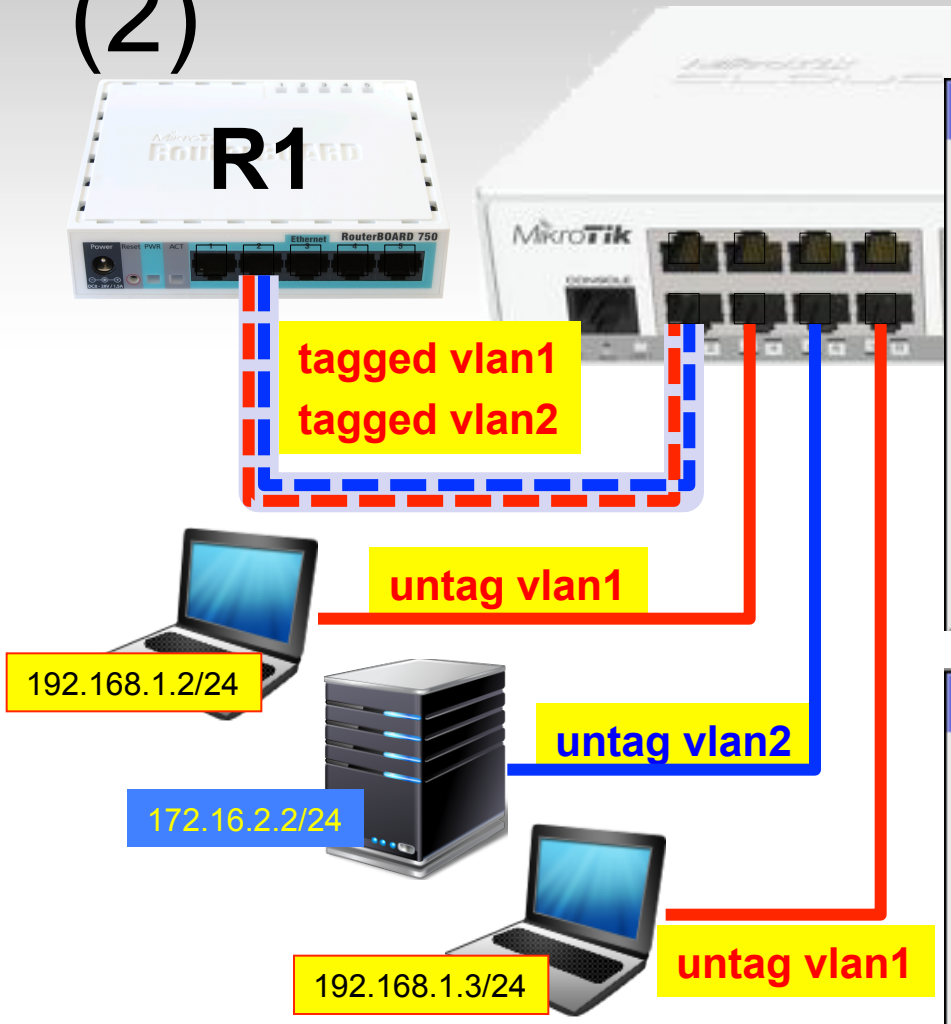


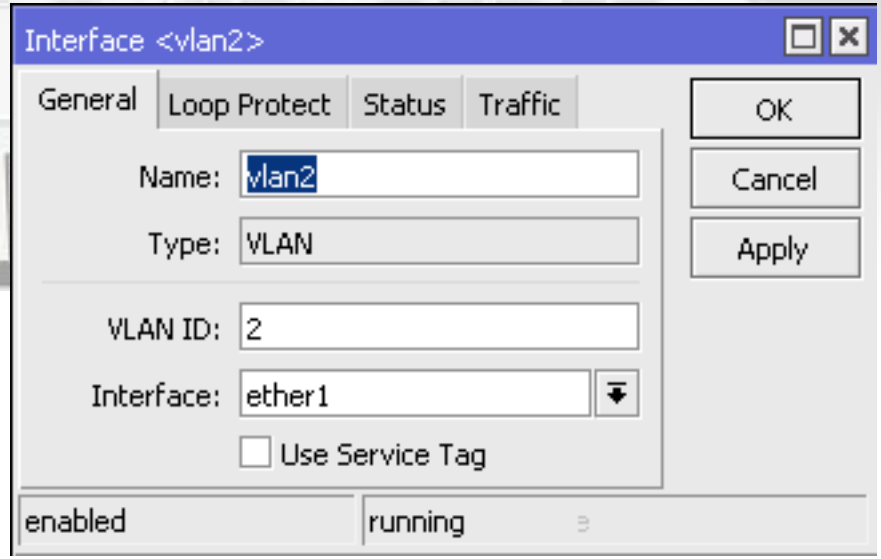
Contoh 3 - Komunikasi Switch (1)

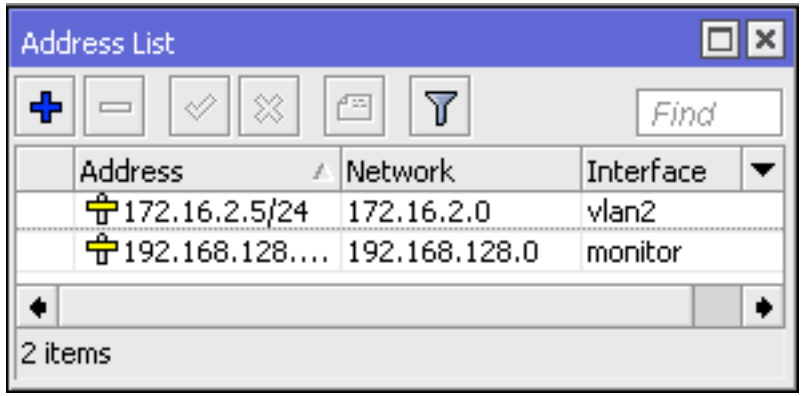


- **Untuk management port**
  - **CRS hanya boleh diremote langsung dari vlan2**
  - **Perangkat dari VLAN1 jika remote CRS melalui R1 (inter vlan routing)**
- **CRS bisa memberikan service ke perangkat di vlan2 (DHCP server, hotspot server dll)**
- **CRS bisa ke internet melalui R1**

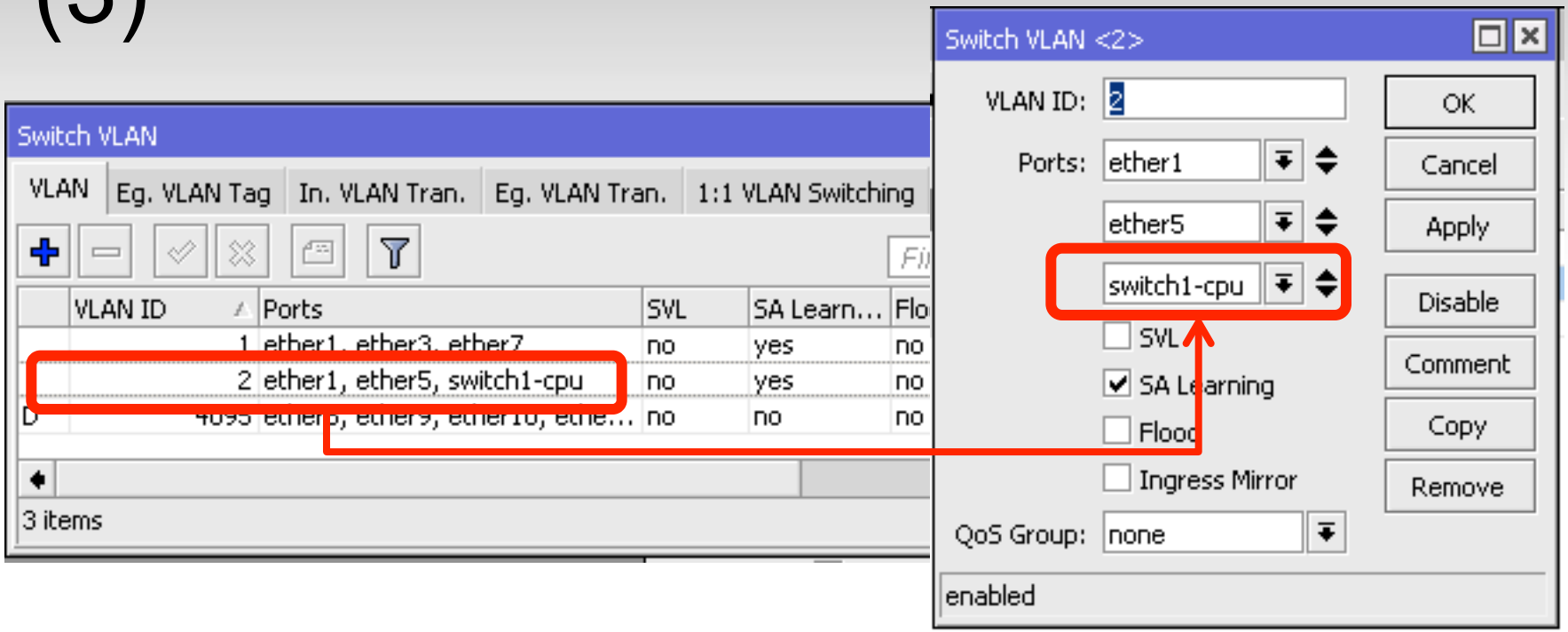
Contoh 3 - Komunikasi Switch (2)



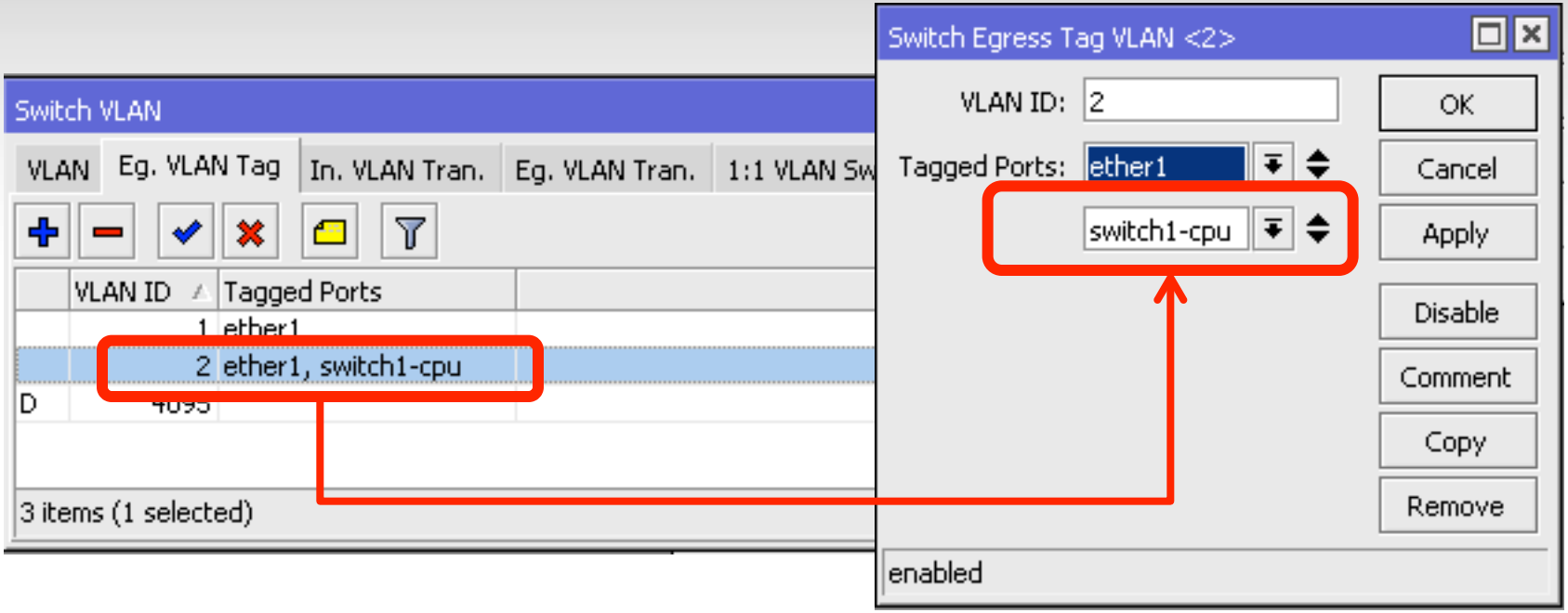




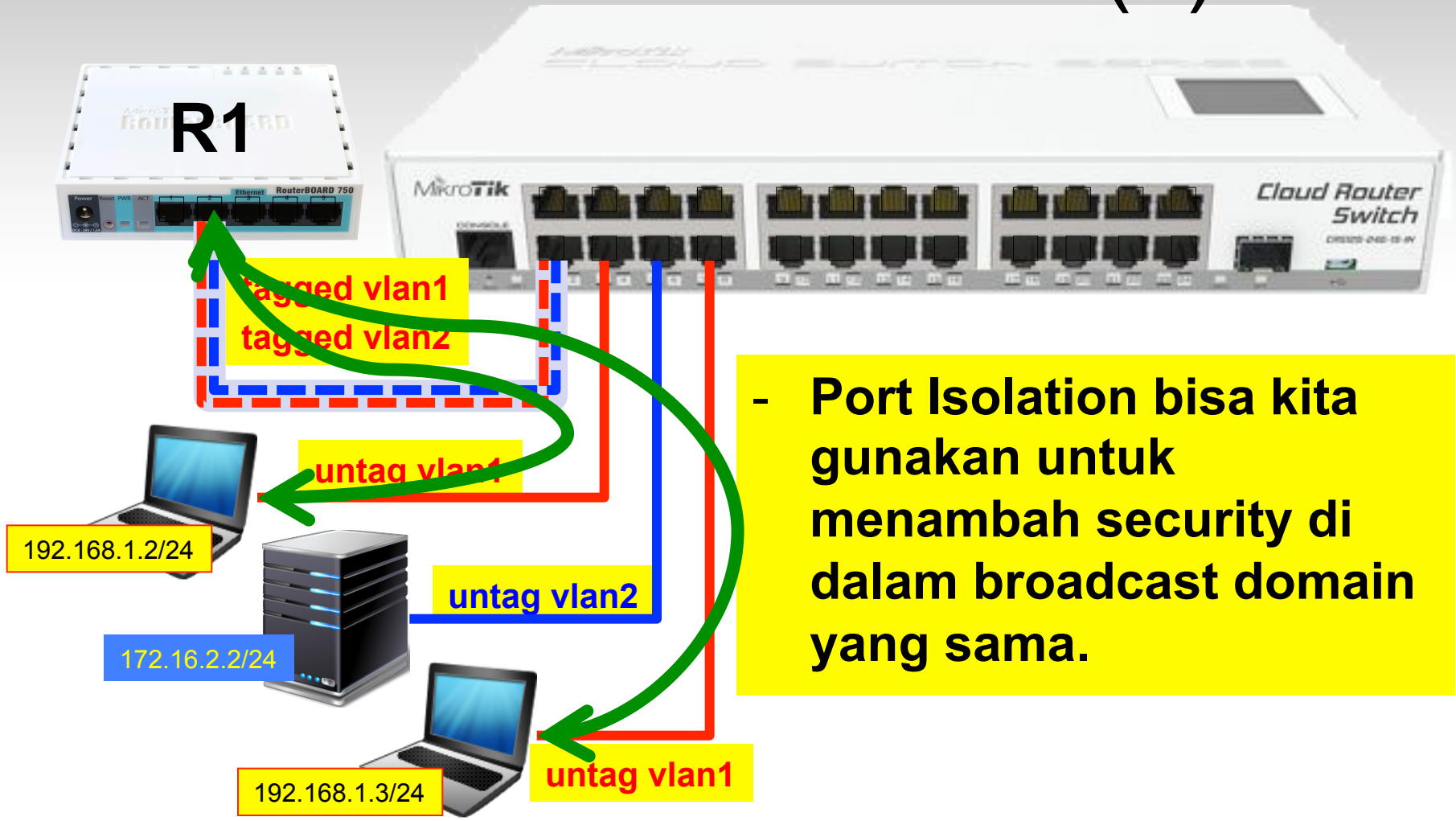
Contoh 3 - Komunikasi Switch (3)



Contoh 3 - Komunikasi Switch (4)



Contoh 4 - Port Isolation (1)

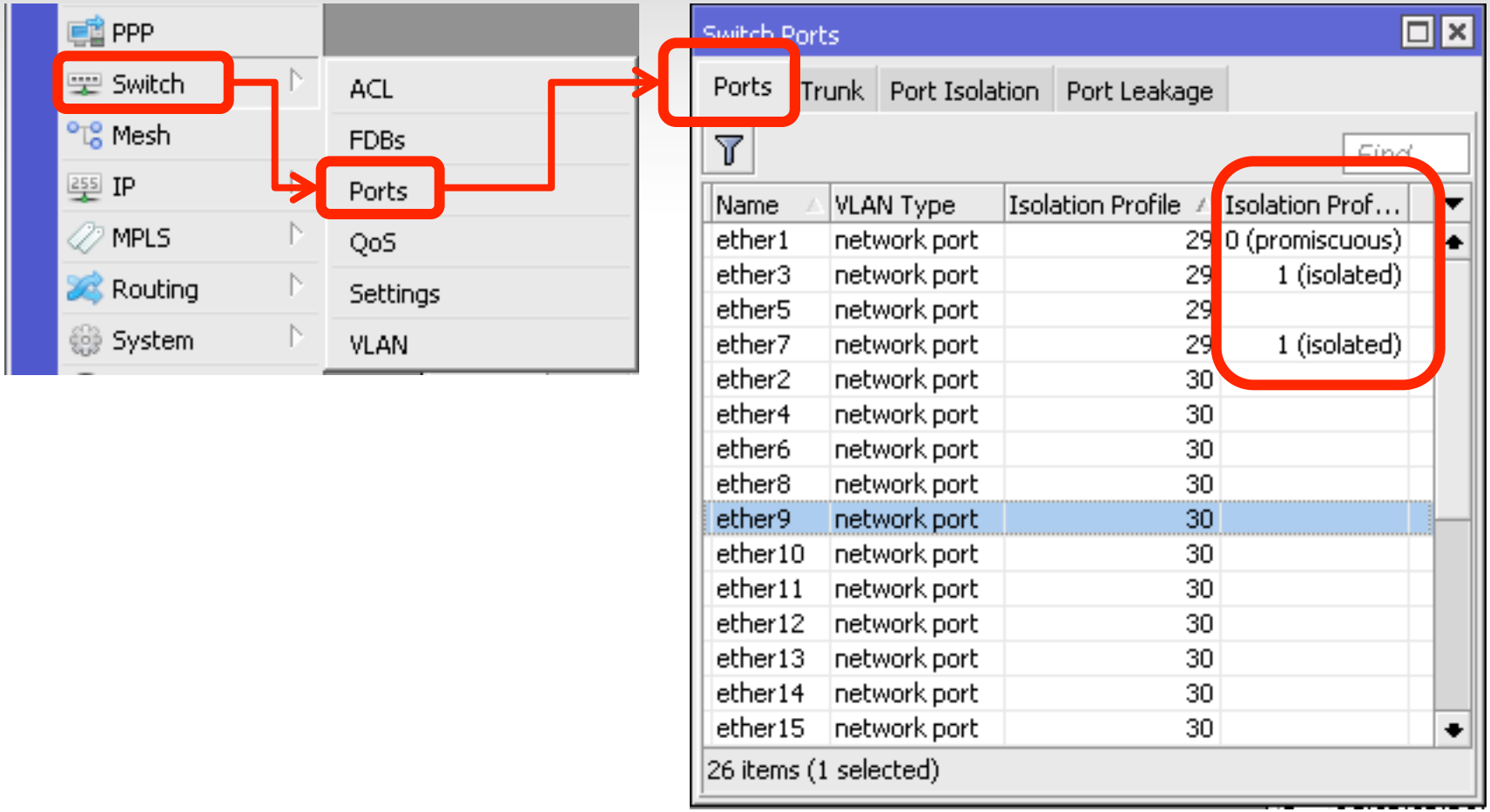


- **Port Isolation bisa kita gunakan untuk menambah security di dalam broadcast domain yang sama.**

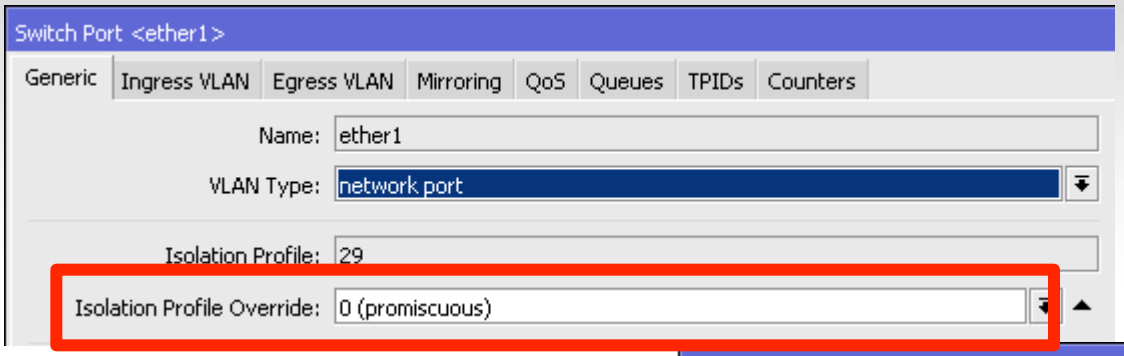
Isolation Port

- Pada CRS, kita bisa menerapkan isolation berdasarkan profile di masing-masing port sesuai kebutuhan misalnya
  - Promiscuous Port (profile 0), digunakan pada Trunk port agar frame dari trunk port bisa ke semua port
  - Isolated Port (profile 1), digunakan untuk port yang hanya bisa akses ke trunk port
  - Community port (profile 2-31), digunakan untuk membentuk custom group

Contoh 4 - Port Isolation (2)

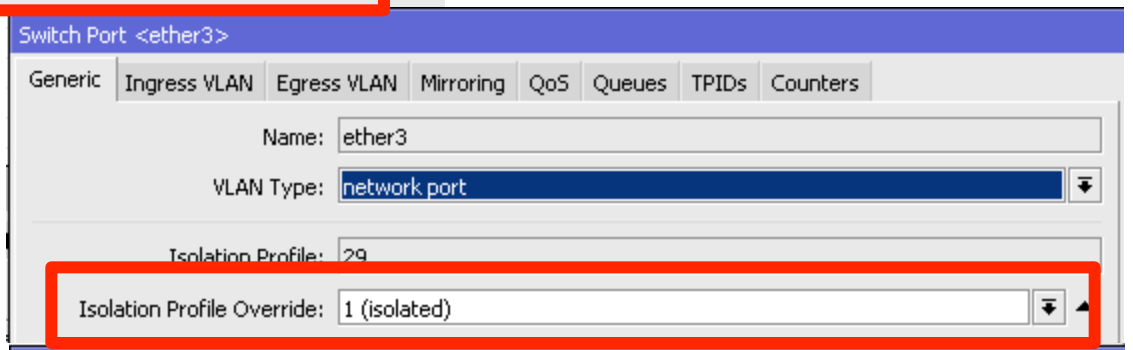


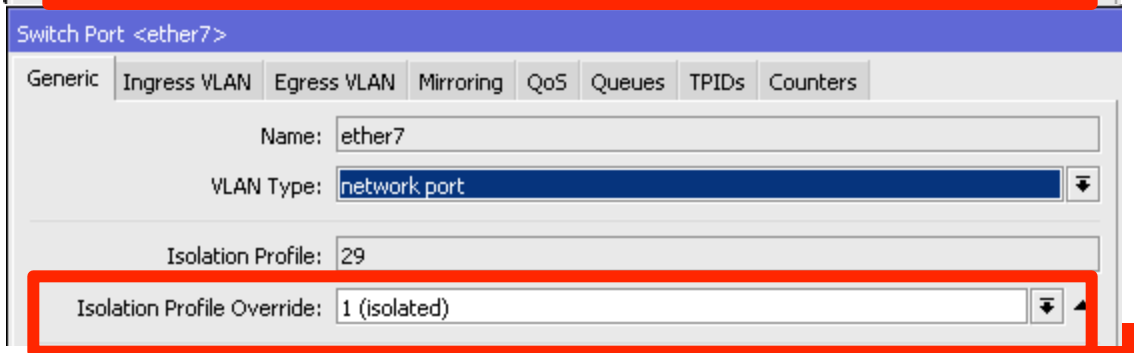
Contoh 4 - Port Isolation (3)



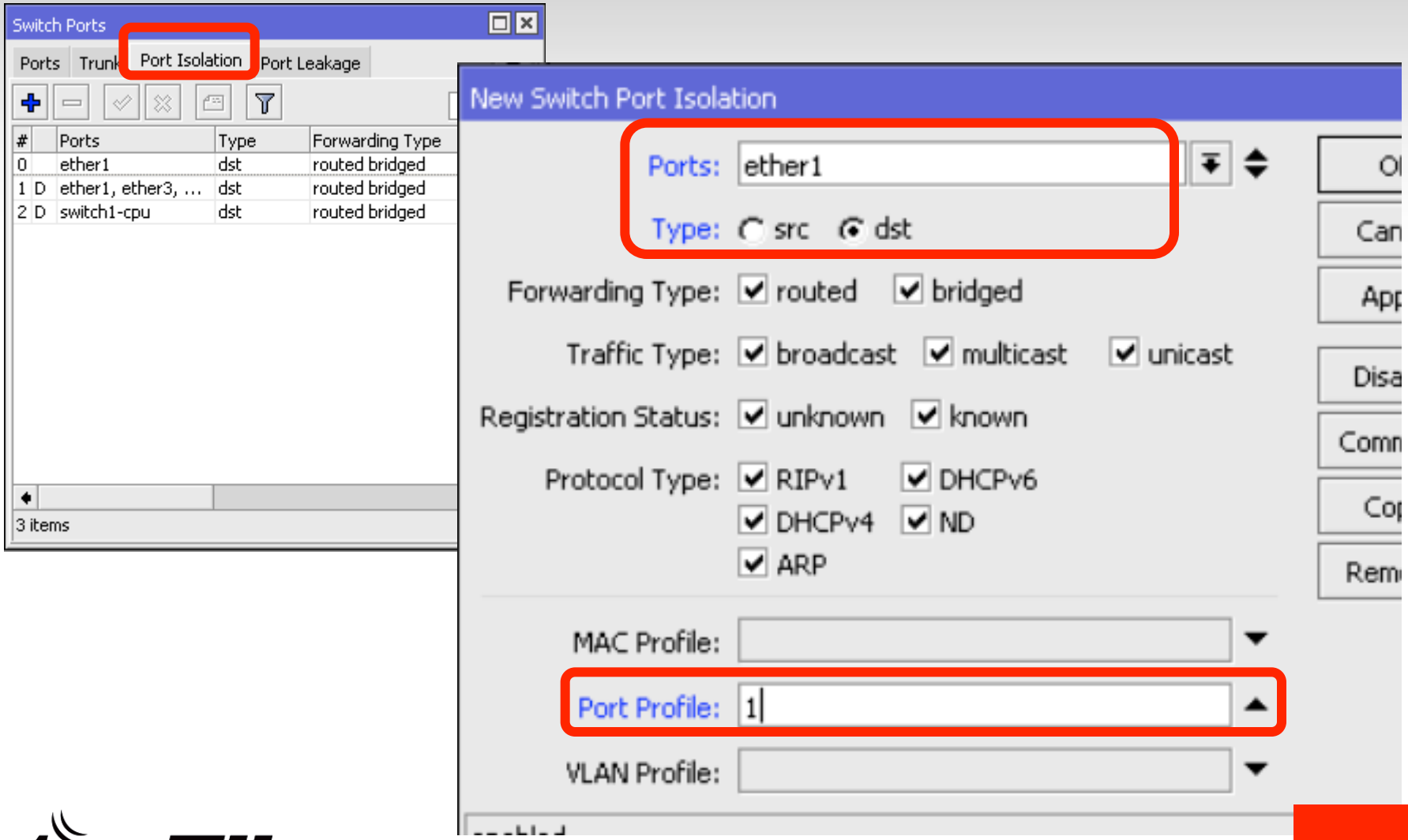
TRUNK

Isolated





Contoh 4 - Port Isolation (4)



Contoh 5 - Hybrid Port (1)

tagged vlan1
tagged vlan2
tagged vlan100
tagged vlan200

untag vlan1

192.168.1.2/24

R2

VAP1 vlan100

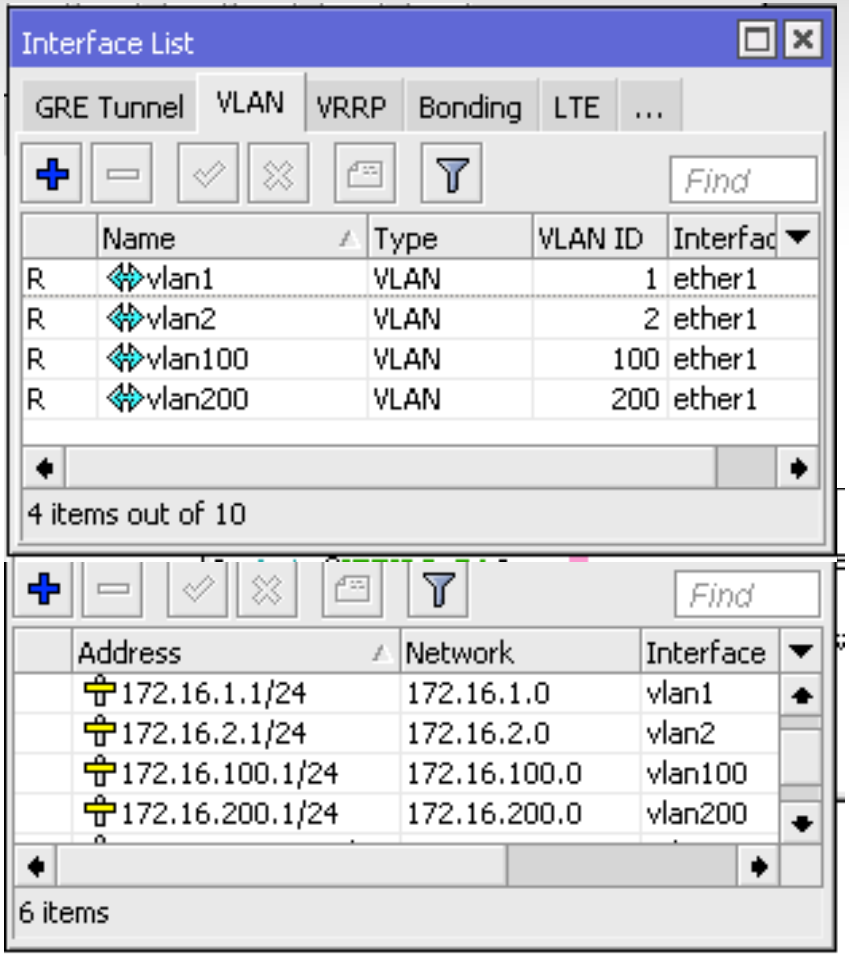
VAP2 vlan200

untag vlan2
tagged vlan100
tagged vlan200

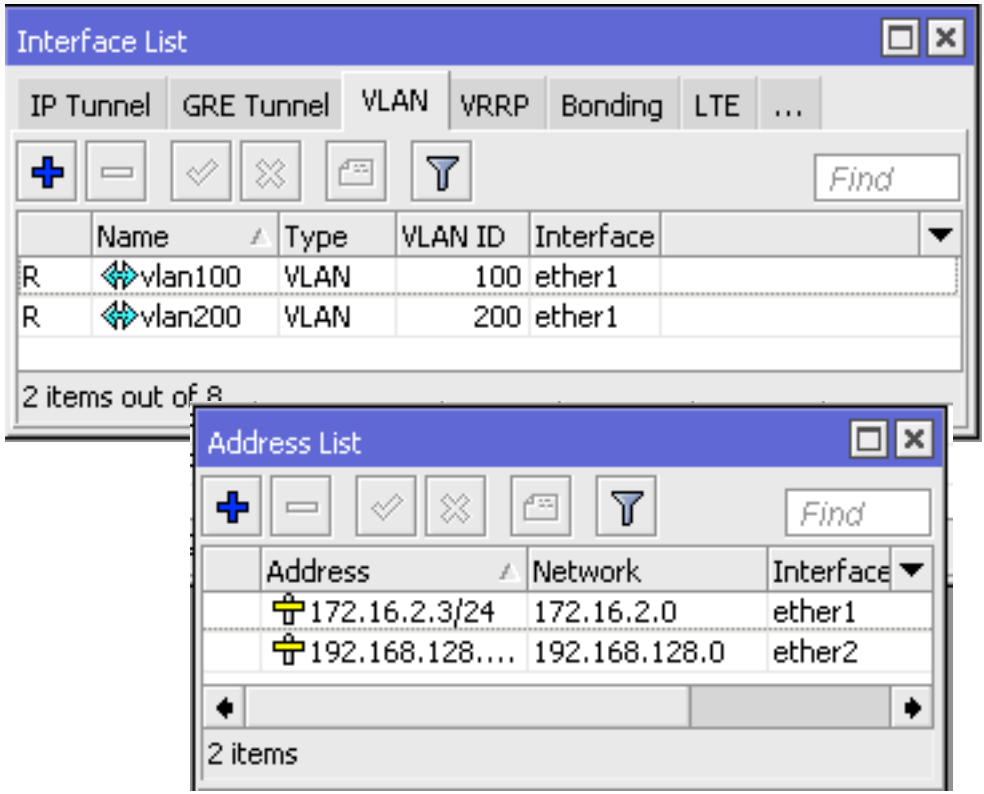
- **Hybrid port, jika didalam port tersebut terkoneksi ke perangkat yang menggunakan tagged serta untagged frame**
- **Biasa digunakan untuk memisahkan trafik VirtualAP pada wireless**

Contoh 5 - Hybrid Port (2)

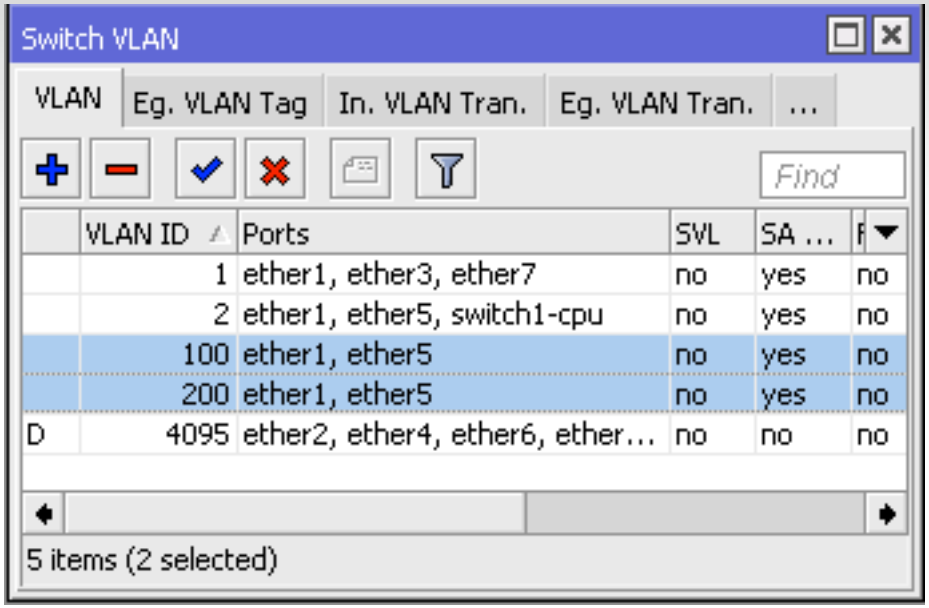
R1



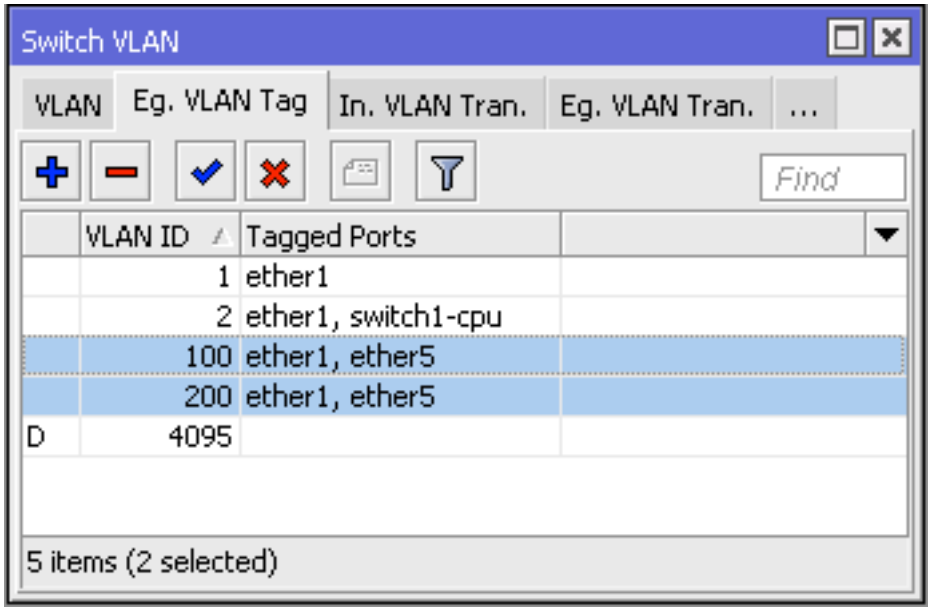
R2



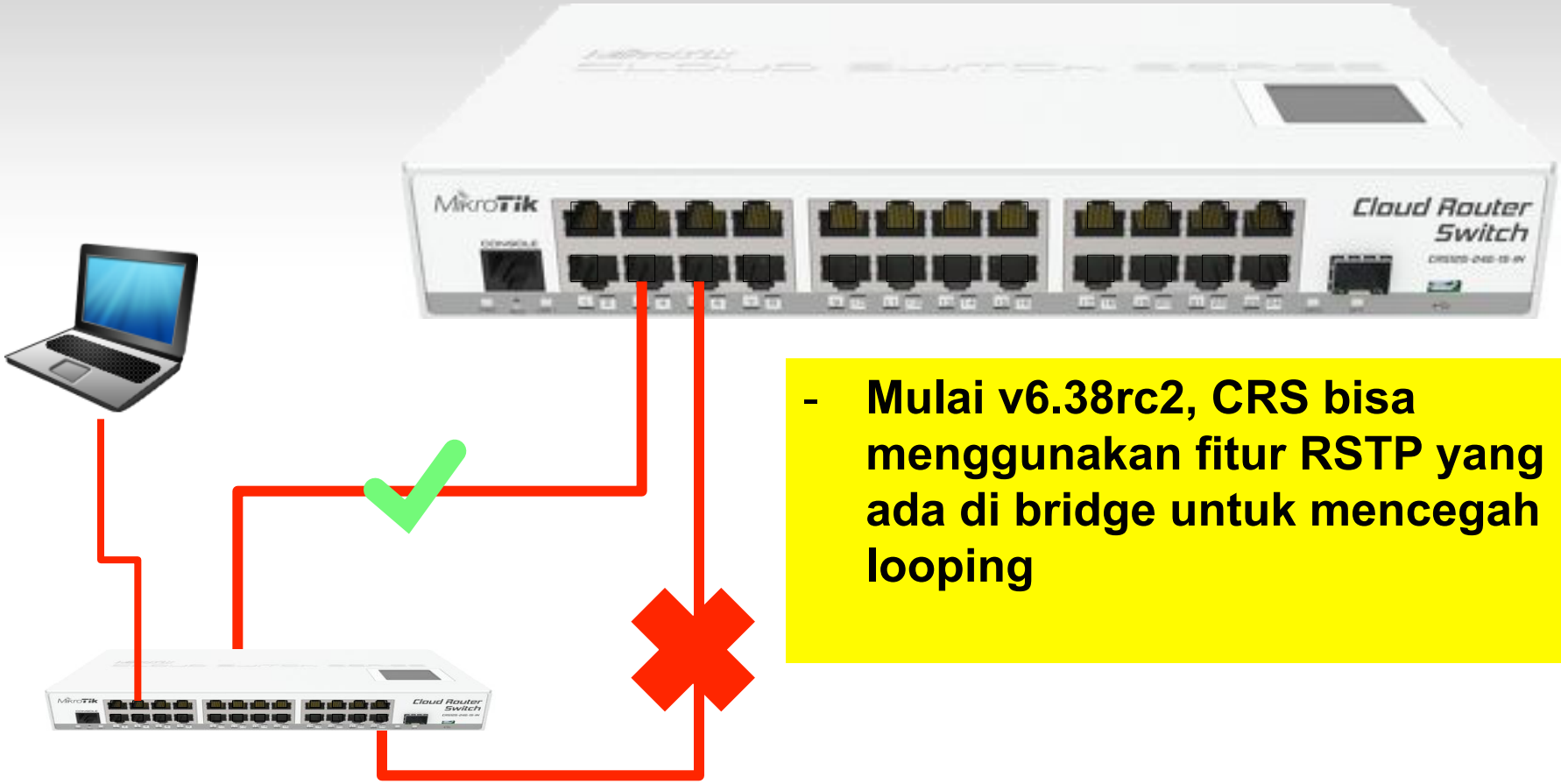
Contoh 5 - Hybrid Port (2)



CRS

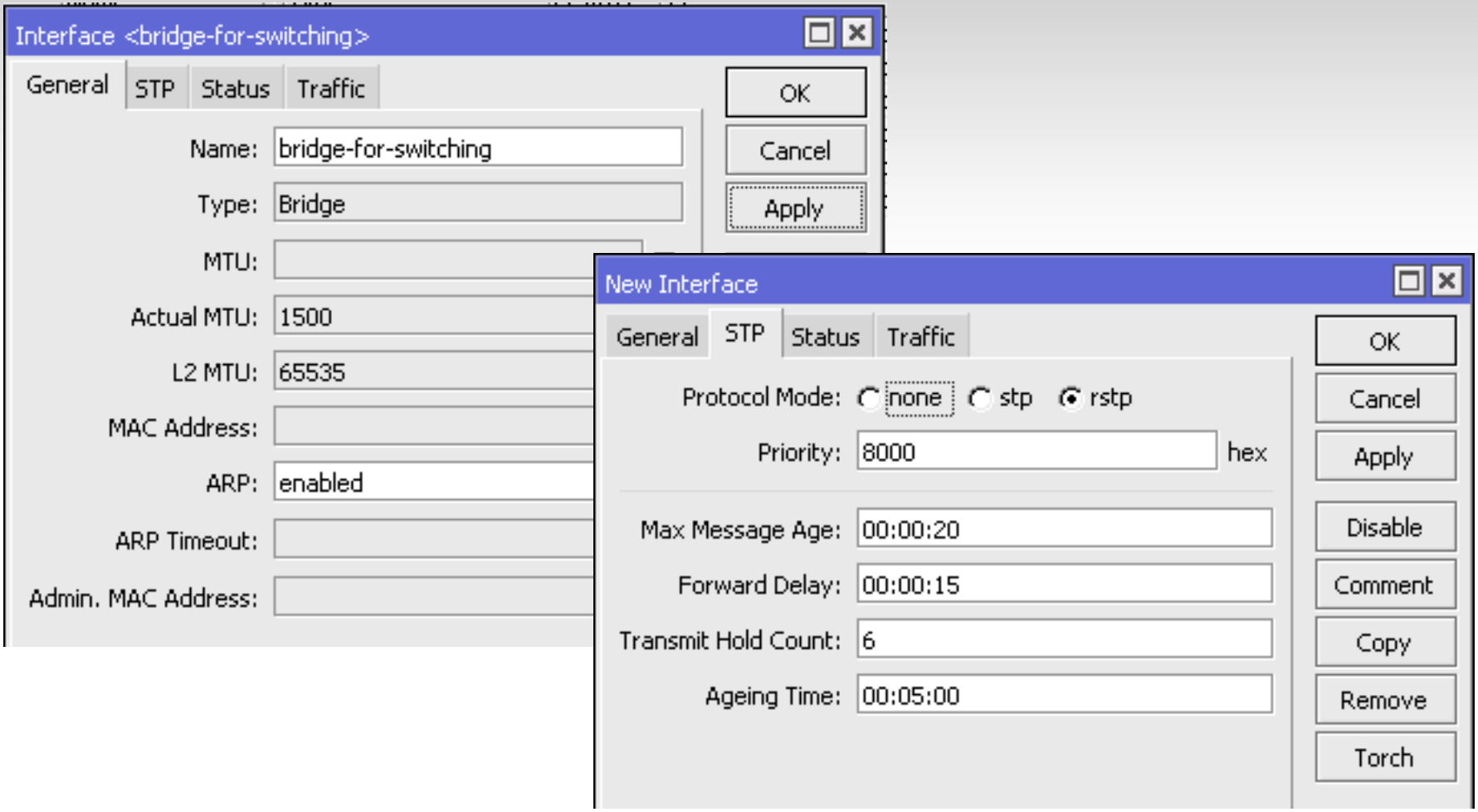


Contoh 6 - Loop Protection (1)

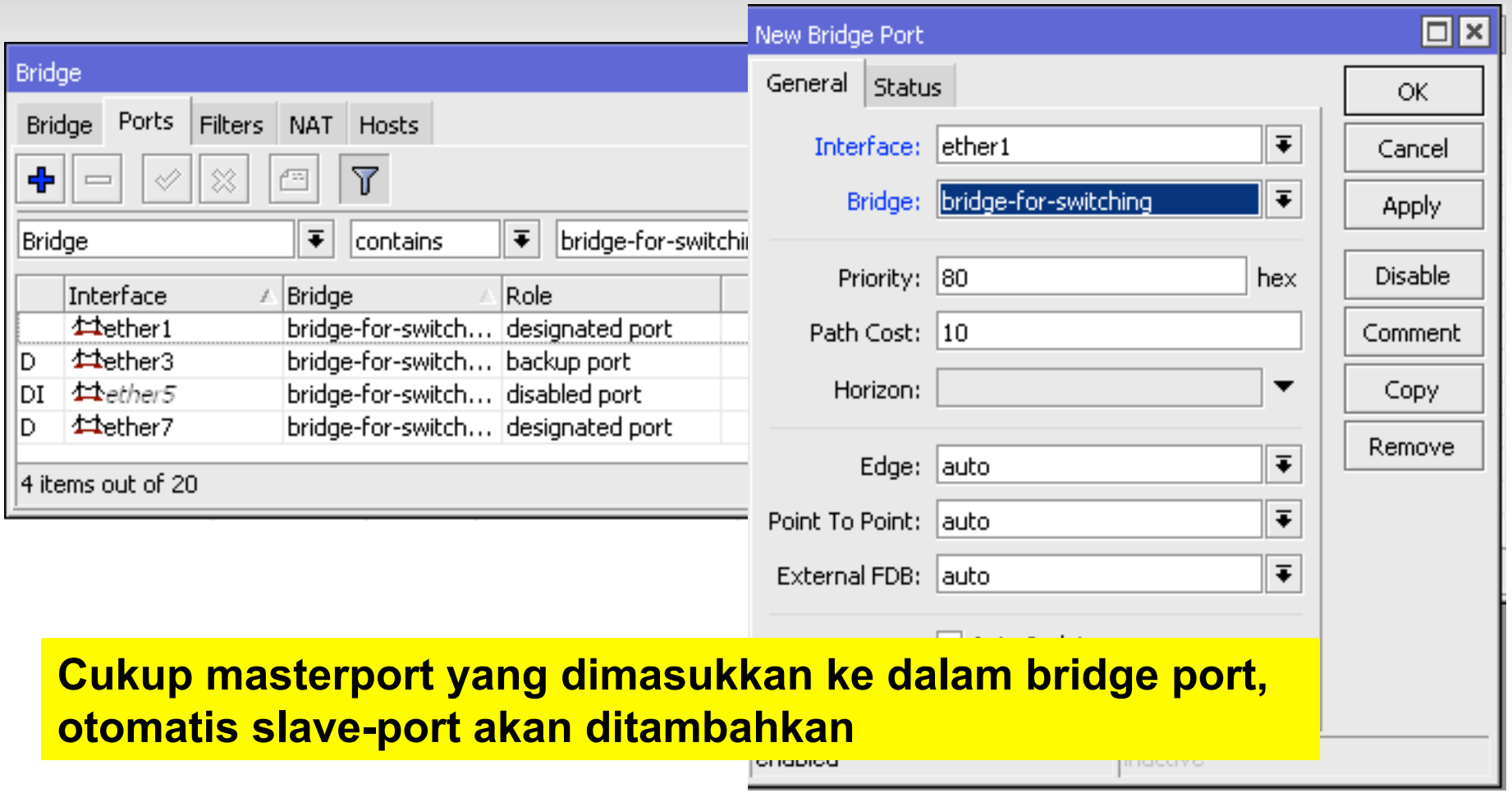


- **Mulai v6.38rc2, CRS bisa menggunakan fitur RSTP yang ada di bridge untuk mencegah looping**

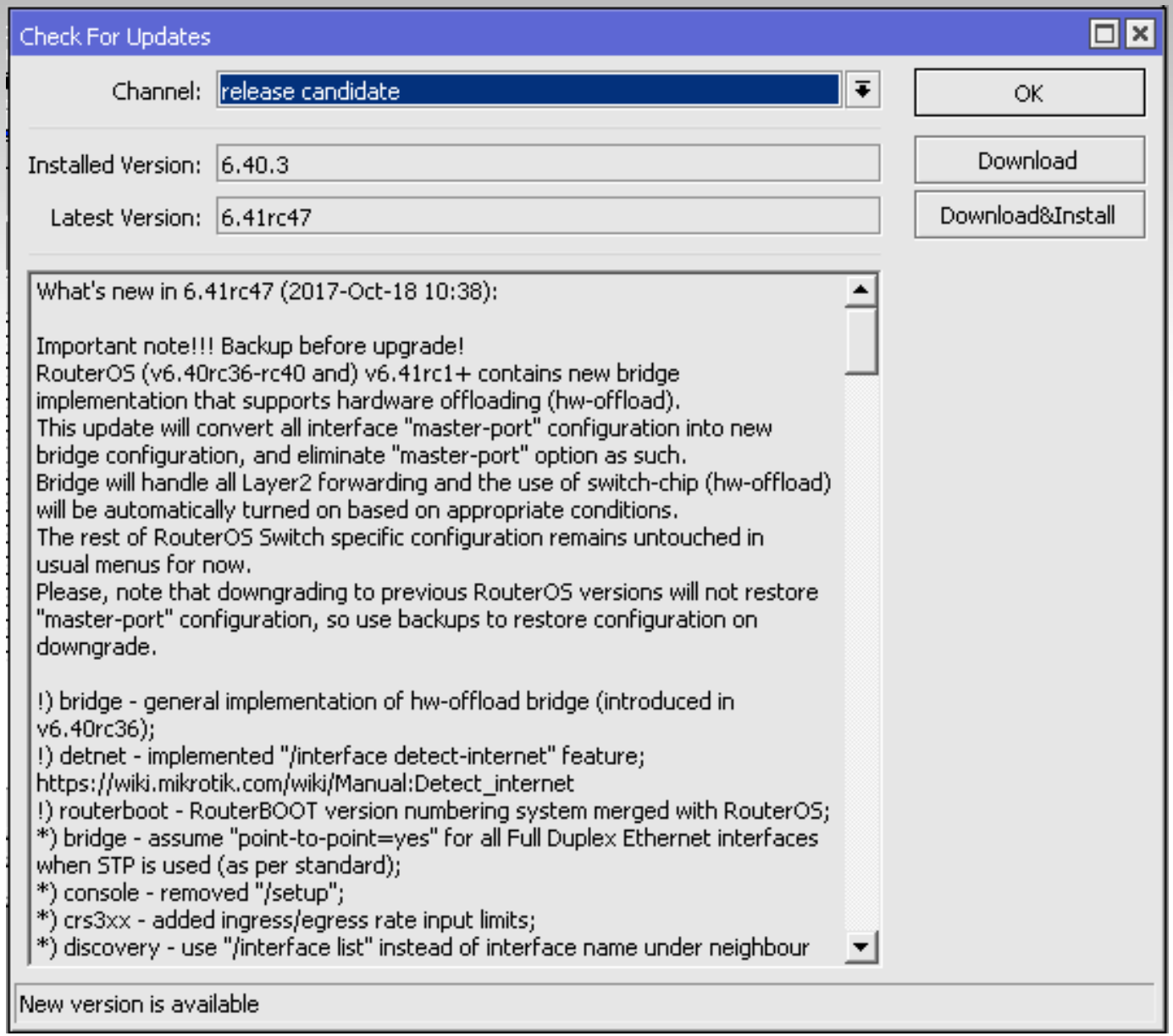
Contoh 6 - Loop Protection (2)



Contoh 6 - Loop Protection (3)



Cukup masterport yang dimasukkan ke dalam bridge port, otomatis slave-port akan ditambahkan


Check For Updates
Channel:
release candidate
OK
Installed Version:
6.40.3
Download
Latest Version:
6.41rc47
Download&Install
What's new in 6.41rc47 (2017-Oct-18 10:38):
Important note!!! Backup before upgrade!
RouterOS (v6.40rc36-rc40 and) v6.41rc1+ contains new bridge implementation that supports hardware offloading (hw-offload).
This update will convert all interface "master-port" configuration into new bridge configuration, and eliminate "master-port" option as such.
Bridge will handle all Layer2 forwarding and the use of switch-chip (hw-offload) will be automatically turned on based on appropriate conditions.
The rest of RouterOS Switch specific configuration remains untouched in usual menus for now.
Please, note that downgrading to previous RouterOS versions will not restore "master-port" configuration, so use backups to restore configuration on downgrade.
!) bridge - general implementation of hw-offload bridge (introduced in v6.40rc36);
!) detnet - implemented "/interface detect-internet" feature; https://wiki.mikrotik.com/wiki/Manual:Detect_internet
!) routerboot - RouterBOOT version numbering system merged with RouterOS;
*) bridge - assume "point-to-point=yes" for all Full Duplex Ethernet interfaces when STP is used (as per standard);
*) console - removed "/setup";
*) crs3xx - added ingress/egress rate input limits;
*) discovery - use "/interface list" instead of interface name under neighbour
New version is available

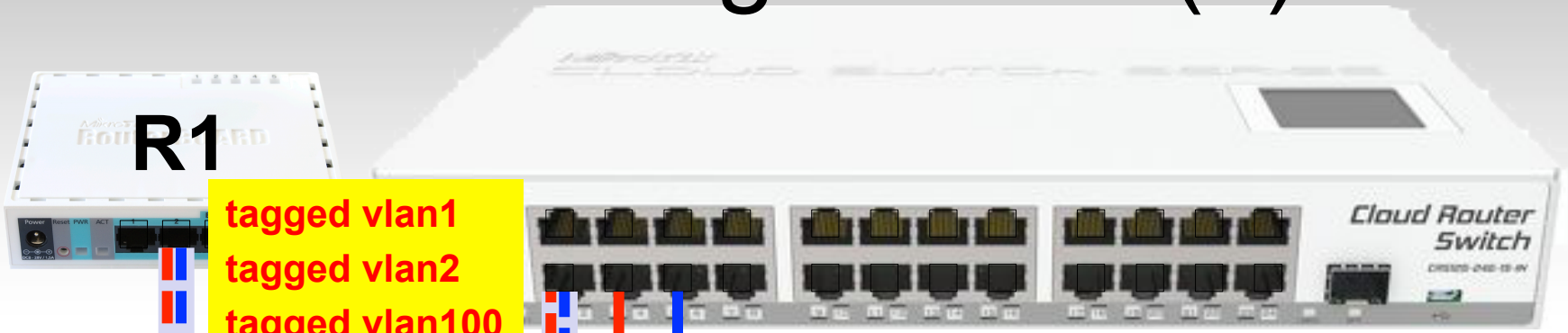
HW-Offloading

- Mulai versi 6.40rc36, Interface bridge pada RouterOS akan menghandle L2 Forwarding dan bisa menggunakan switch-chip (Hw-offloading) jika kondisi memungkinkan
- Tidak ada lagi pengaturan masterport pada interface
- Hati-hati jika sudah diupgrade ke versi baru, jika di downgrade tidak akan otomatis menggunakan setting masterport

Fitur HW-Offload

Switch Routeroard	Switch Menu	Bridge R/STP	Bridge MSTP	Bridge IGMP Snoop	Bridge VLAN Filtering	Bonding
CRS3xx	Y	Y	Y	Y	Y	N
CRS1xx	Y	Y	N	Y	N	N
CRS2xx	Y	Y	N	N	N	N
QCA8377	Y	Y	N	N	N	N
AR8327	Y	Y	N	N	N	N
AR8227	Y	Y	N	N	N	N
AR8316	Y	Y	N	N	N	N
AR7240	Y	Y	N	N	N	N
MT7621	Y	N	N	N	N	N
RTL8367	Y	N	N	N	N	N
ICPlus175D	Y	N	N	N	N	N

Contoh 7 - Bridge VLAN (1)



tagged vlan1
tagged vlan2
tagged vlan100
tagged vlan200

untag vlan1

192.168.1.2/24

R2

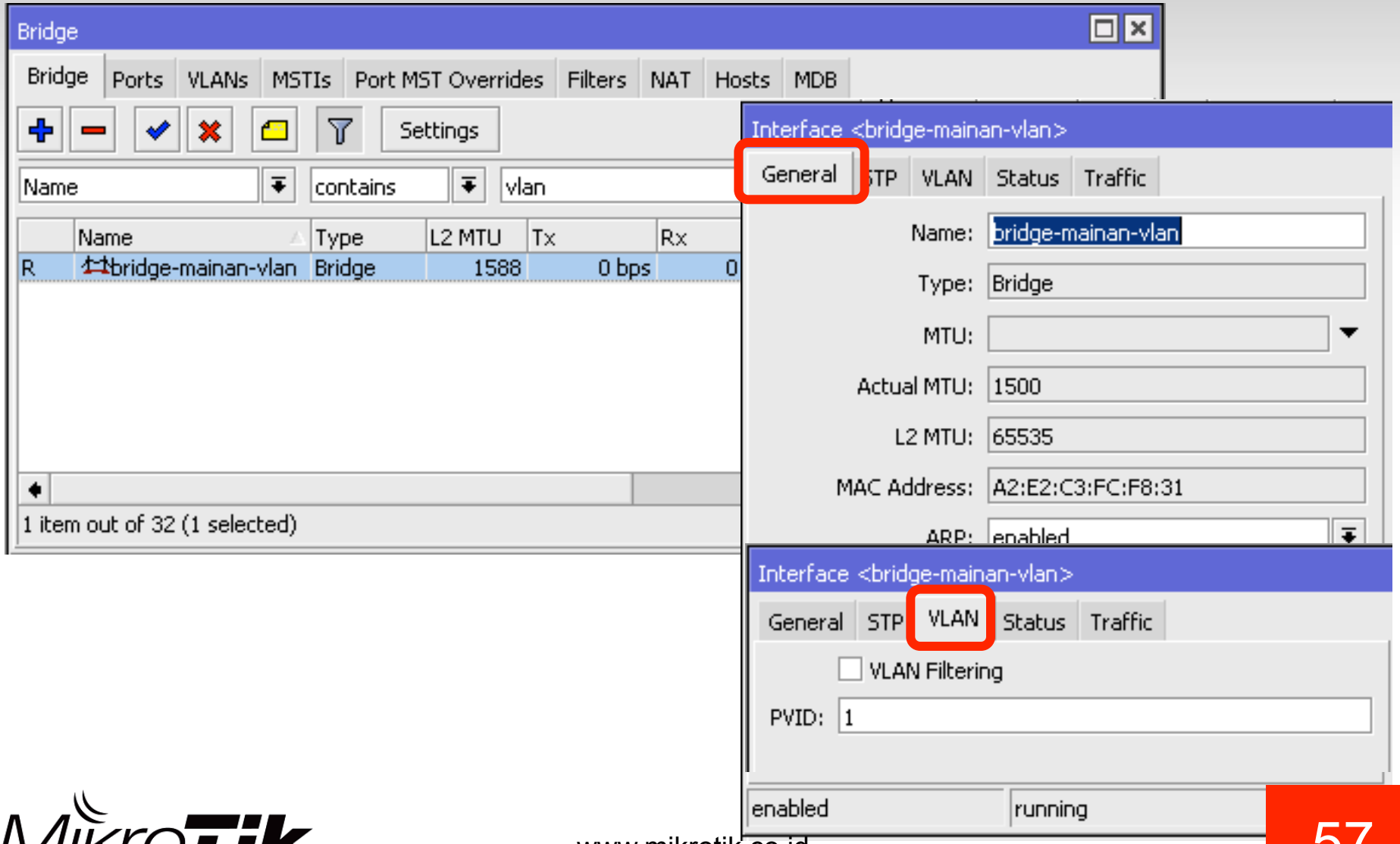
VAP1 vlan100

VAP2 vlan200

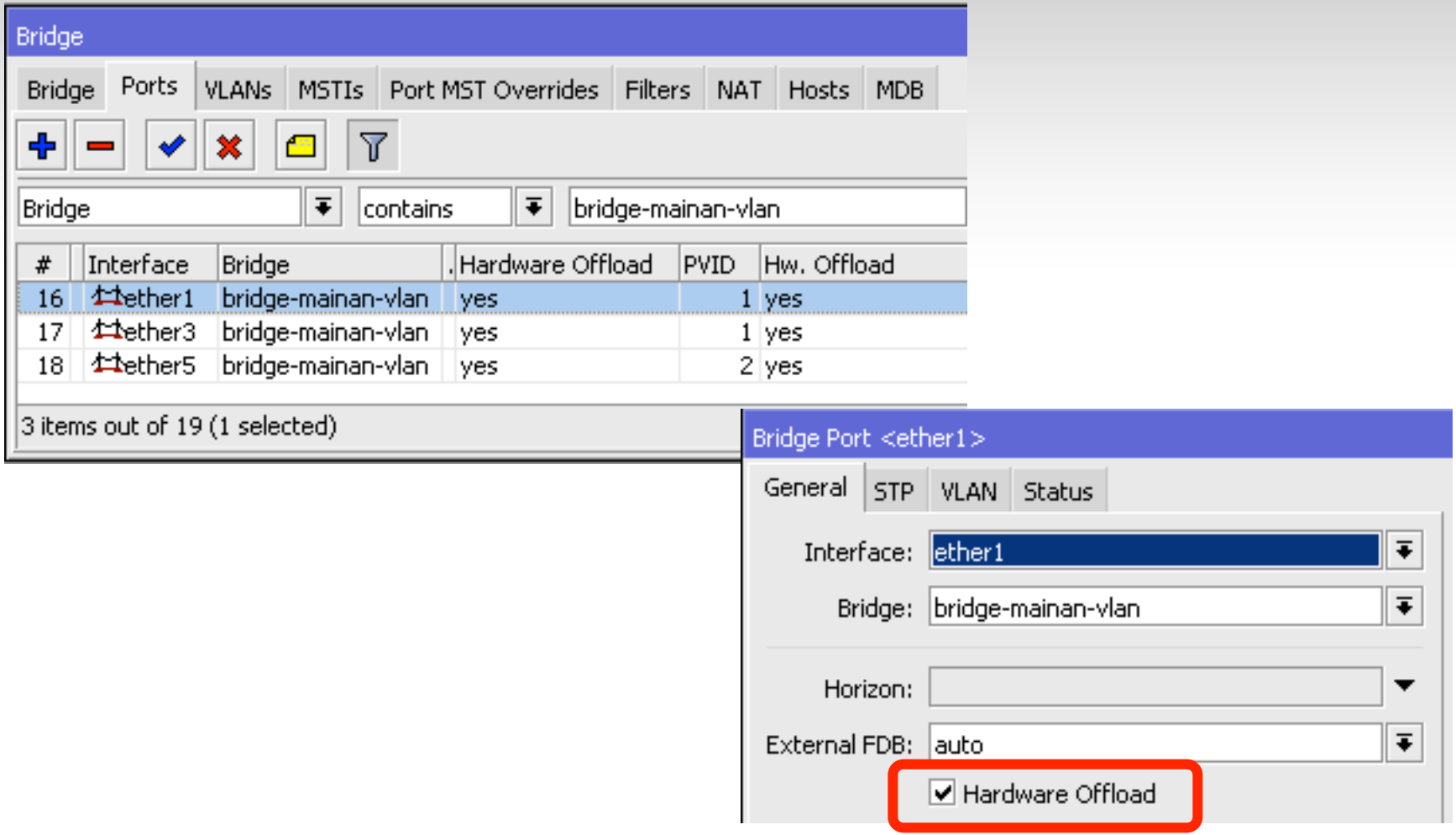
untag vlan2
tagged vlan100
tagged vlan200

- Trunk port untuk R1
- Access port untuk PC
- Hybrid Port untuk perangkat R2
- Management port untuk akses CRS vlan 1

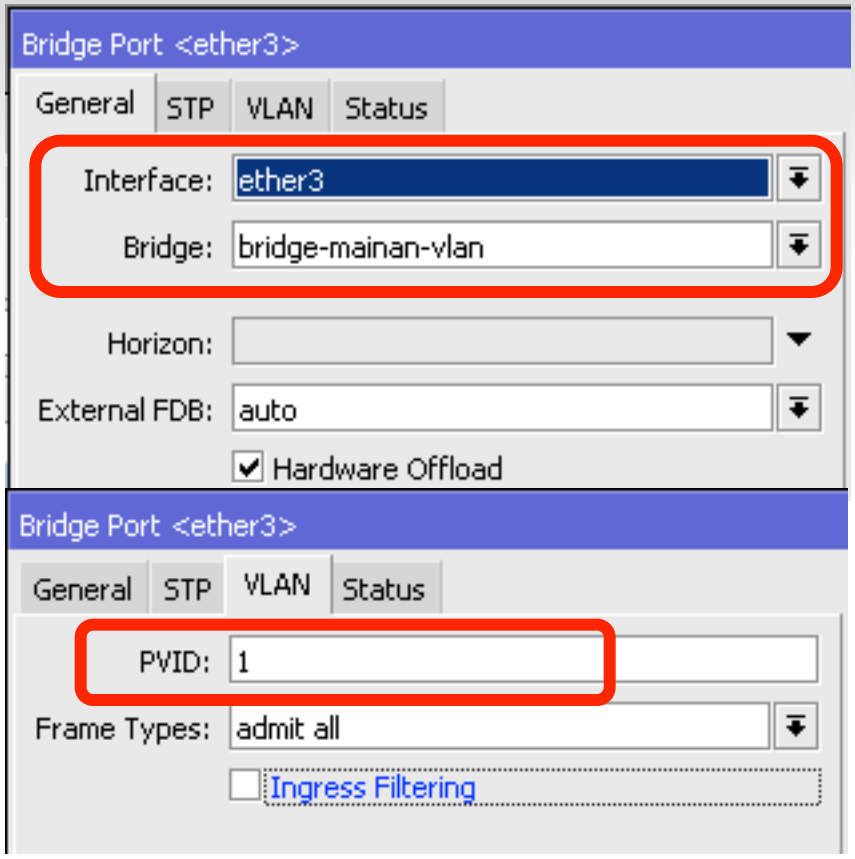
Contoh 7 - Bridge VLAN (2)

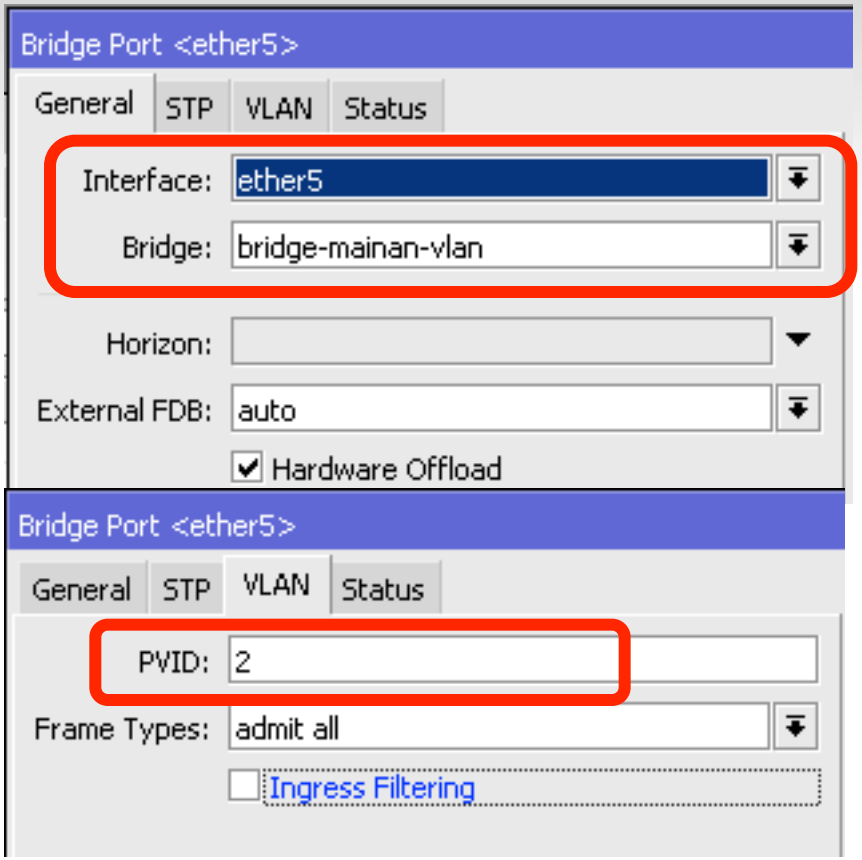


Contoh 7 - Bridge VLAN (3)



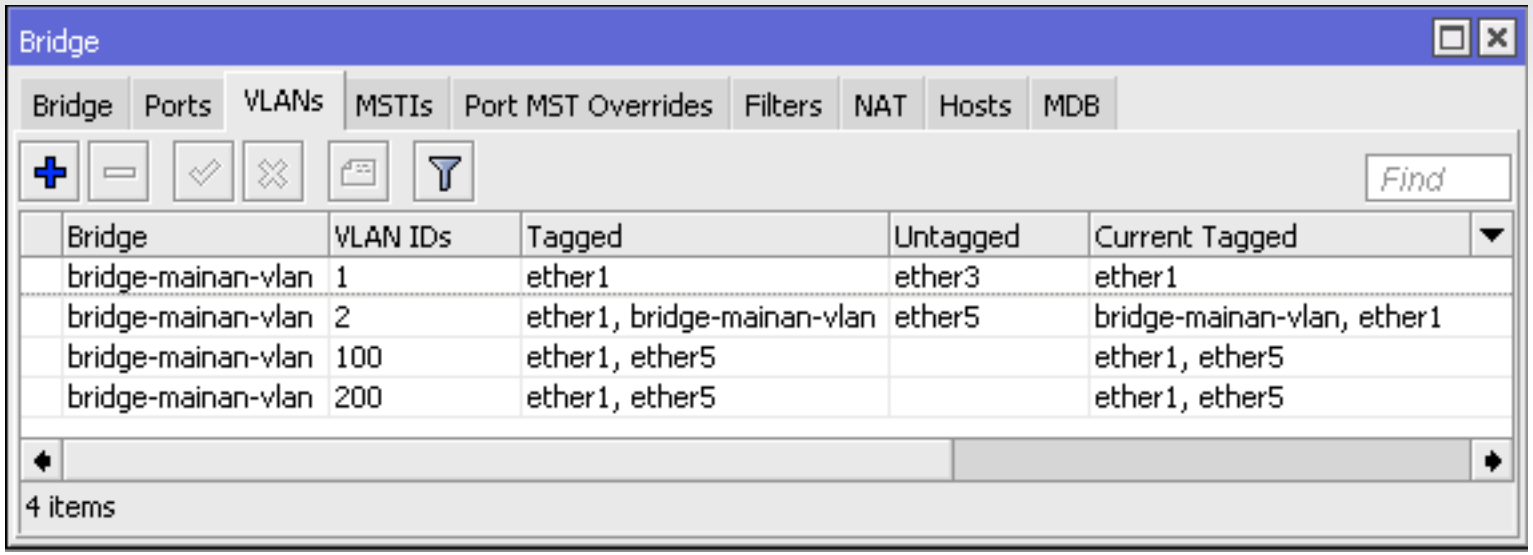
Contoh 7 - Bridge VLAN (4)





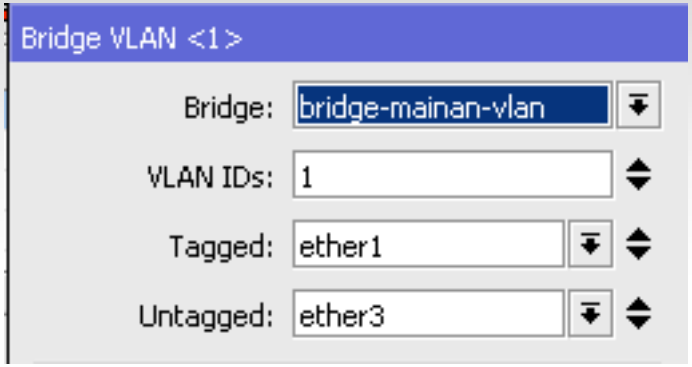
PVID digunakan untagged frame

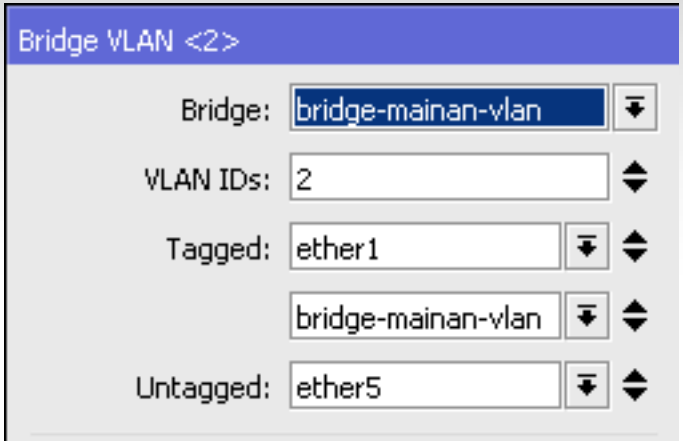
Contoh 7 - Bridge VLAN (5)

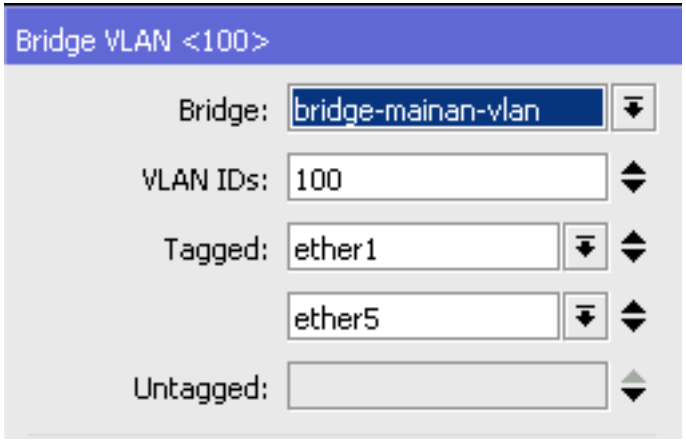


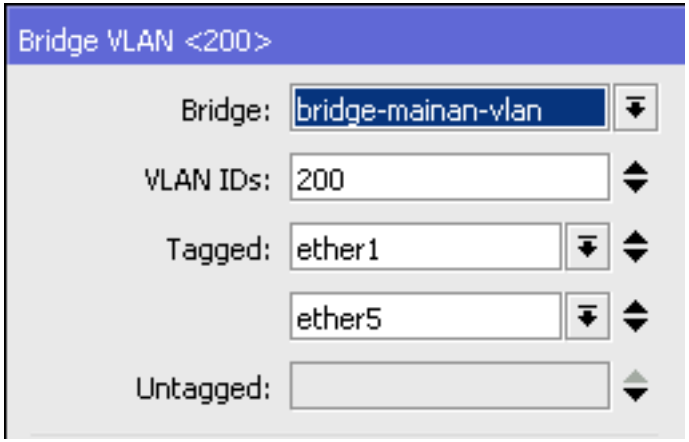
di menu bridge-vlan, kita tentukan vlan membership dari masing-masing port

Contoh 7 - Bridge VLAN (6)

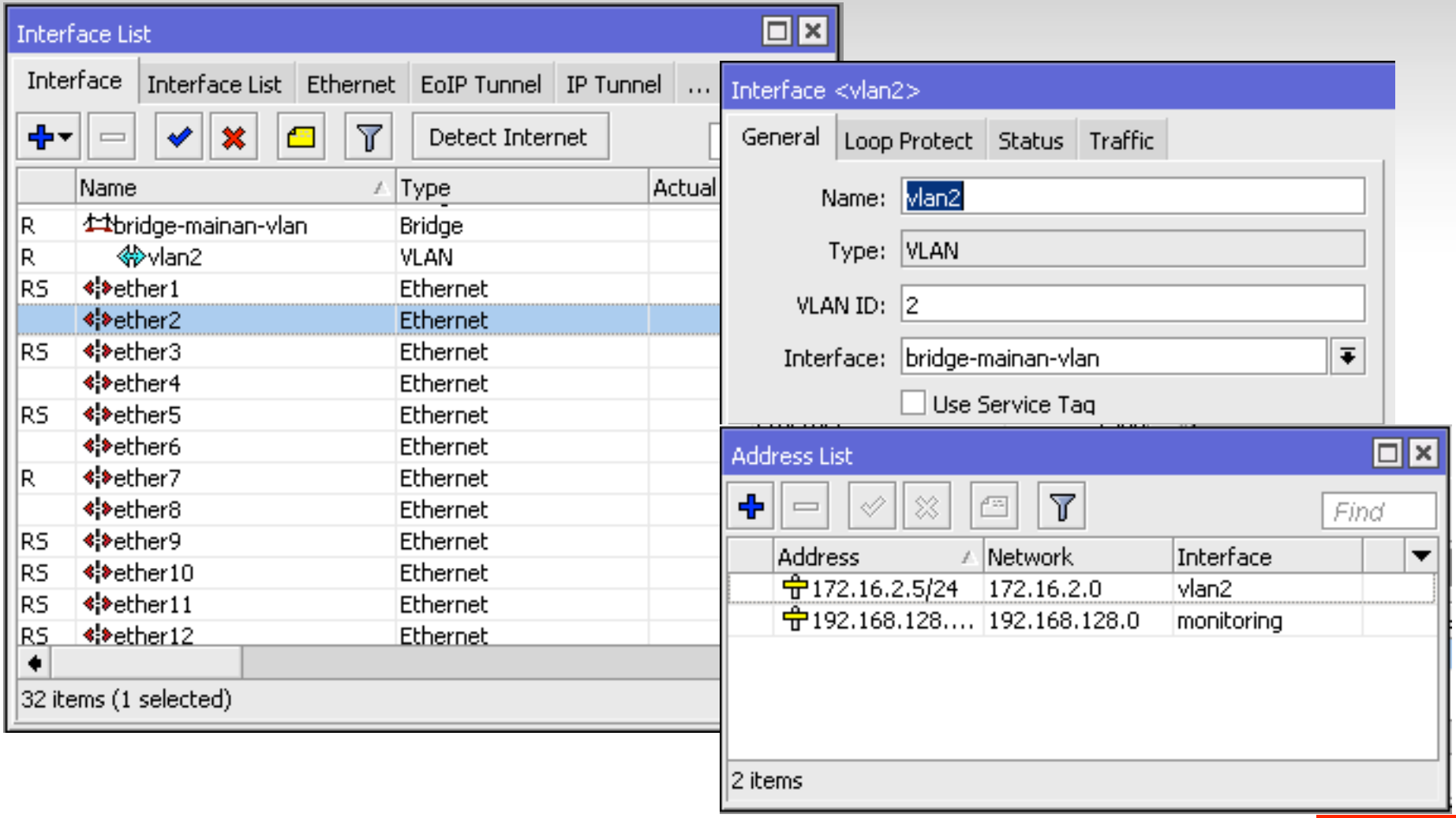




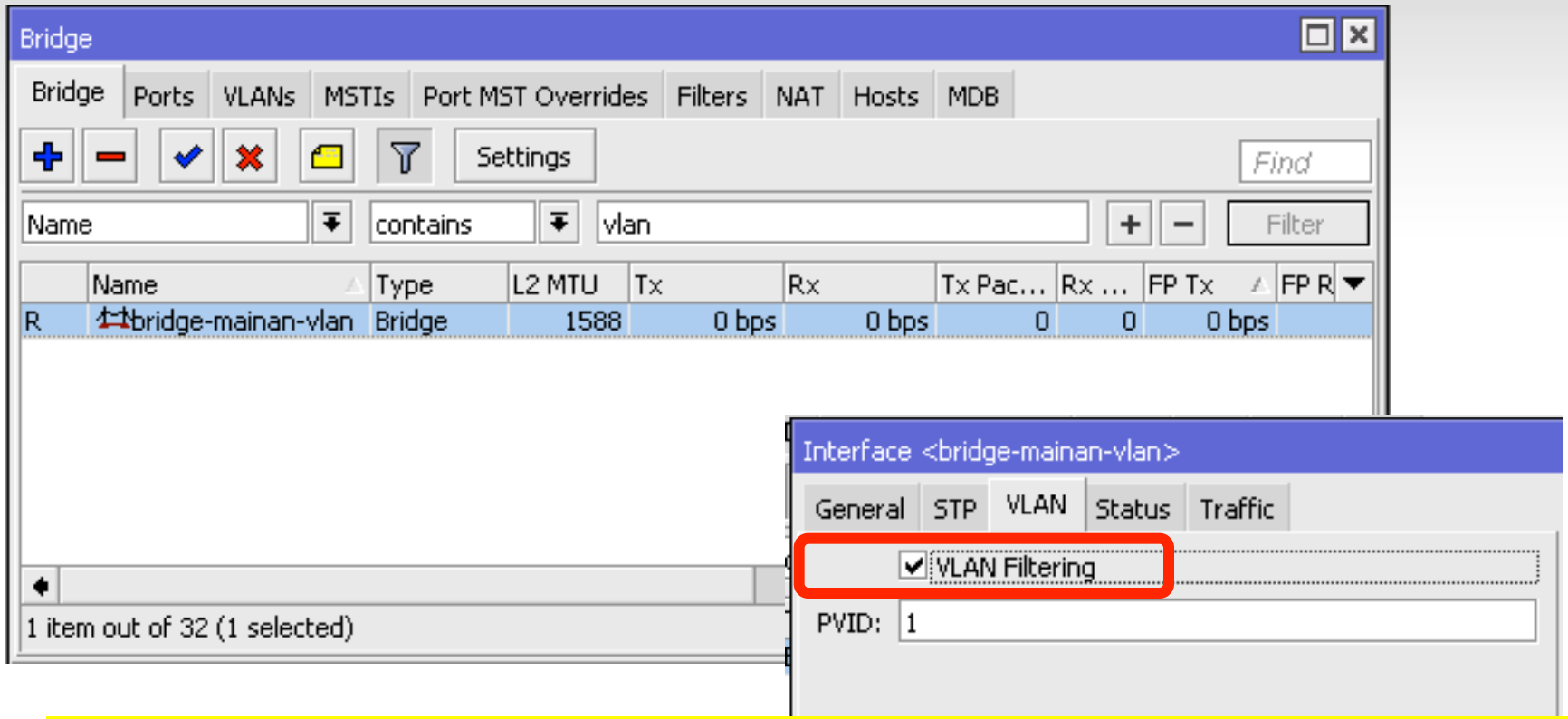




Contoh 7 - Bridge VLAN (7)



Contoh 7 - Bridge VLAN (8)



- **VLAN filtering diaktifkan sesudah semua vlan dibuat**
- **Berfungsi supaya bridge mengenali vlan dan bisa memodifikasi frame**

Tips

- Meskipun di Bridge juga terdapat fitur VLAN, fitur Switch saat ini juga masih bisa digunakan
- Biasakan untuk menyisakan 1 port yang tidak masuk bridge / switch
- Biasakan menggunakan ROS versi sama
- Jika melakukan pengubahan konfigurasi switch dan tidak berjalan, Flush table FDB switch
- Pada versi ini, fungsi VLAN pada bridge masih belum bisa menggunakan HW-Offload, gunakan menu switch pada CRS1xx series
- Gunakan CRS untuk switch ☺

Thank You!