



MikroTik RouterOS Switch Feature

Citraweb Solusi Teknologi, Indonesia

www.mikrotik.co.id



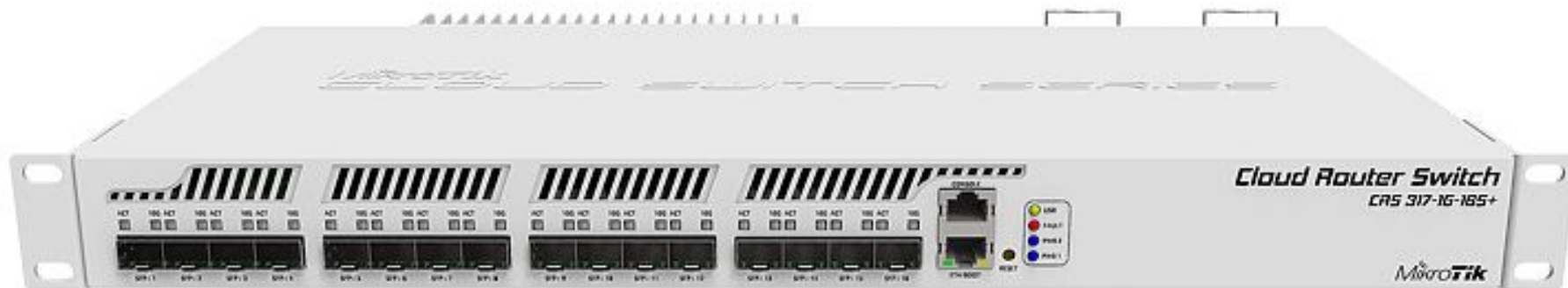
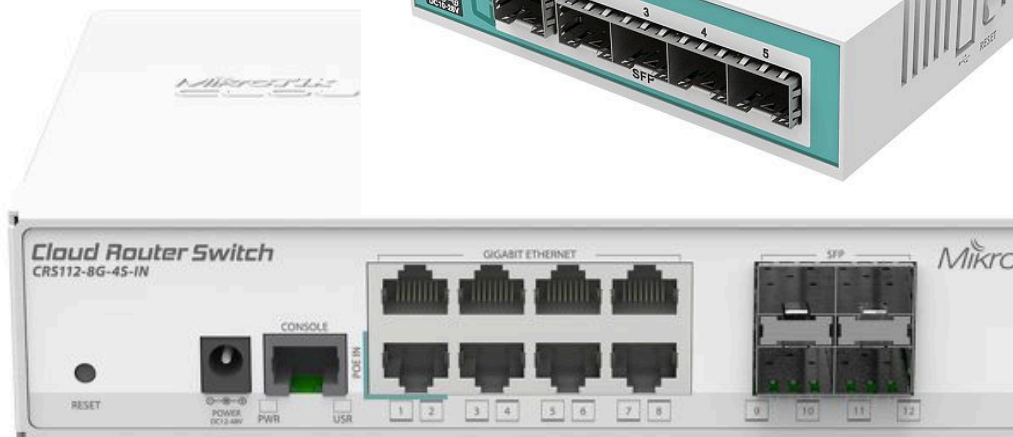
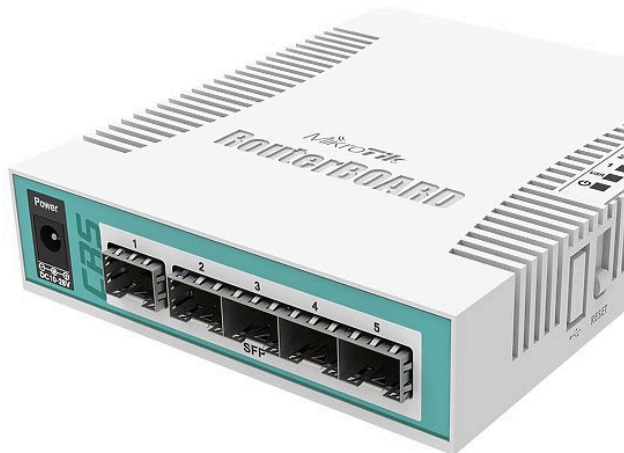
1 nusa pangsa bahasa INDONESIA



Perkenalan



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



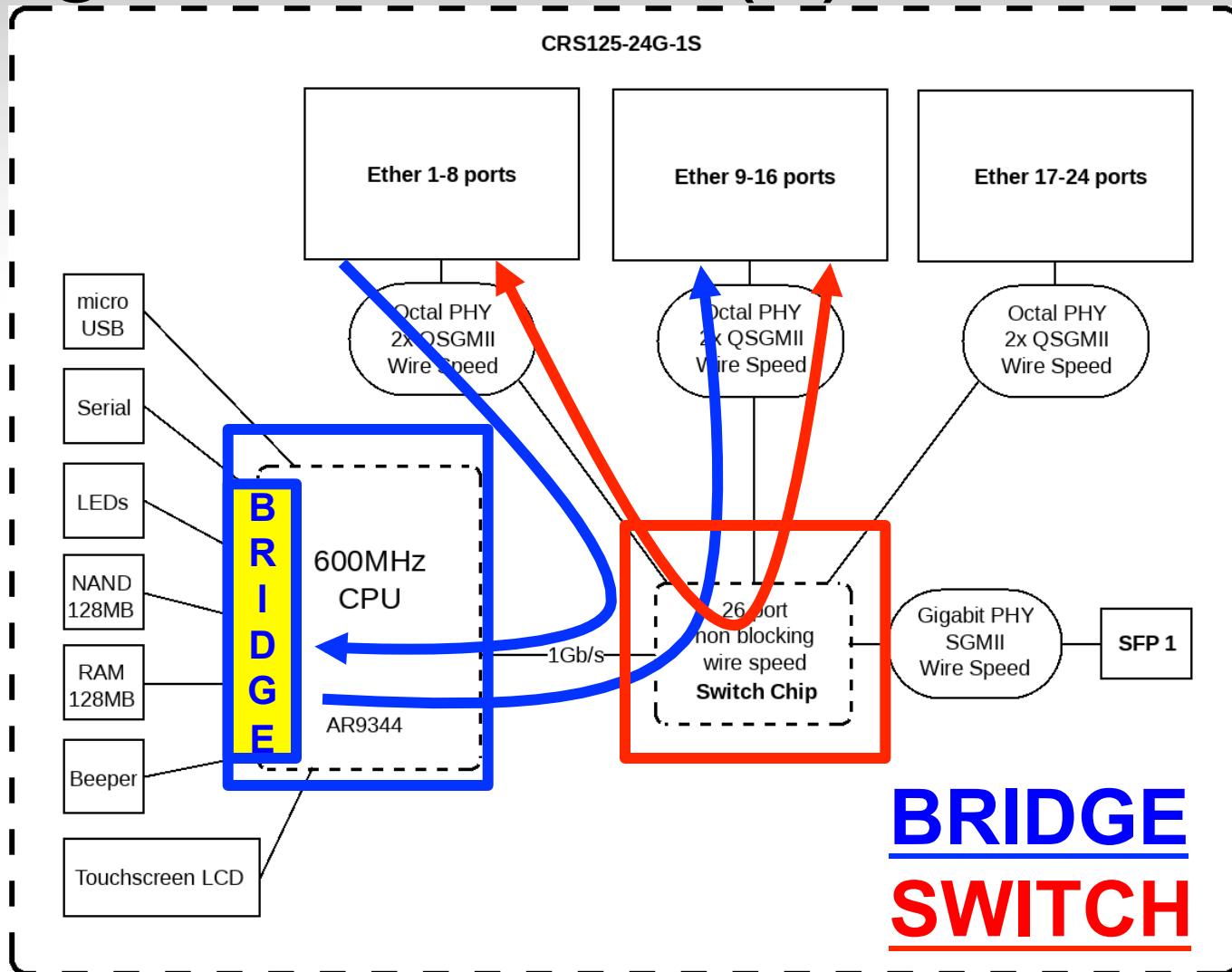
Router != Switch

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

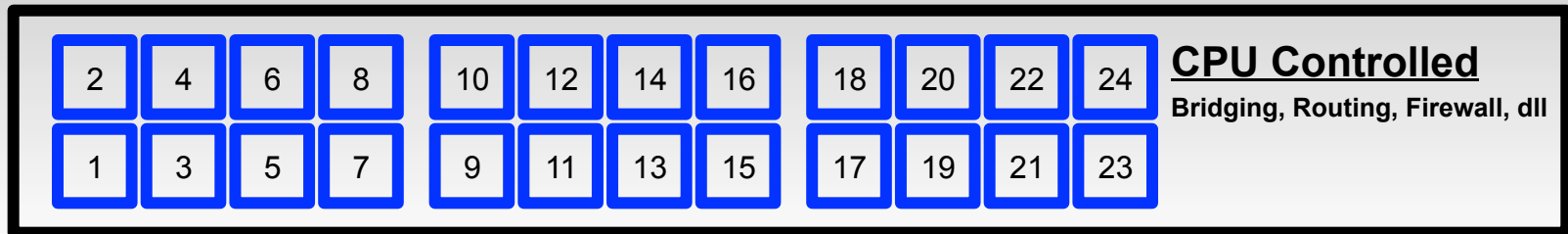
Bridge !== Switch

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

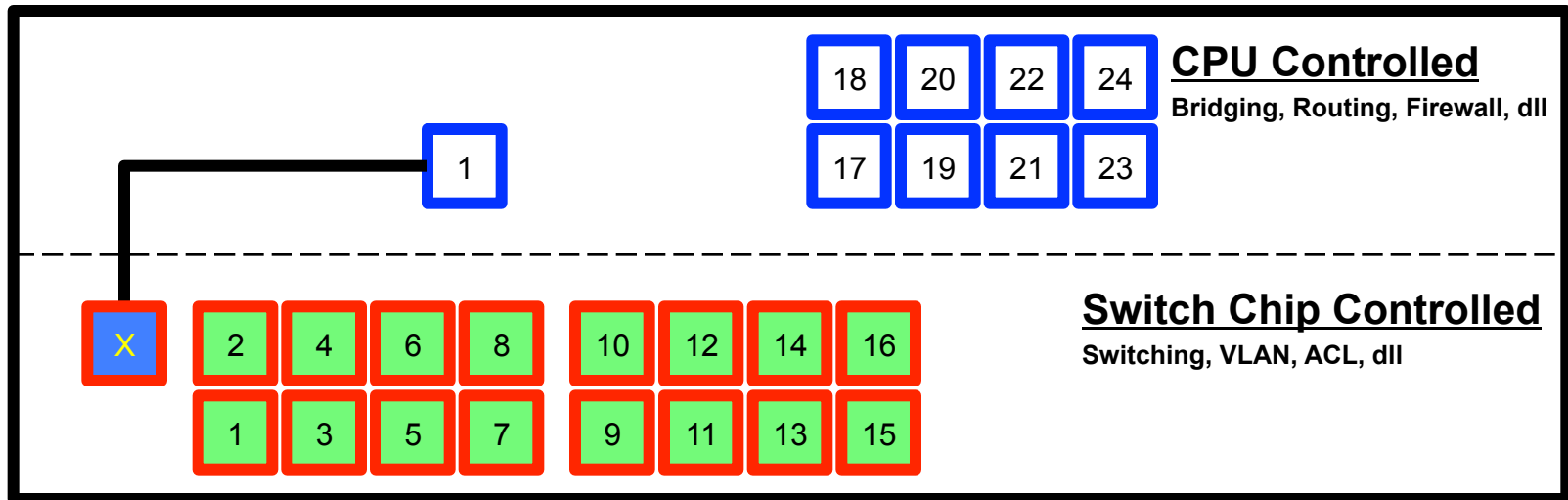
Bridge !== Switch (2)



Logika Switch Chip



ether2-ether16 diset masterport=ether1



= masterport



= Switch - CPU Port

Master Port - CPU Port

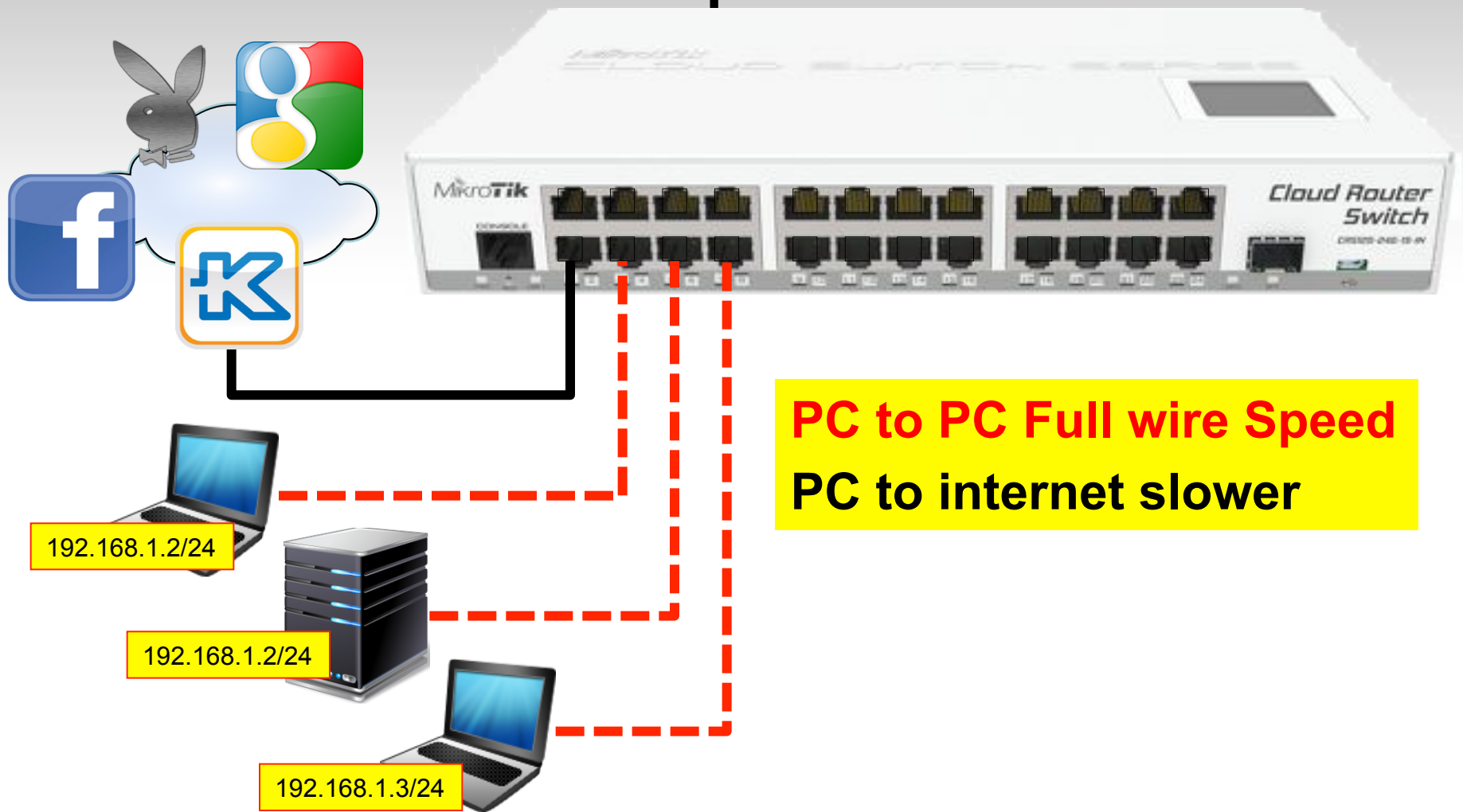
- Master port merupakan penghubung antara interface pada RouterOS dengan interface virtual "Switch-CPU Port" pada switch
- Pada CRS, support multiple "master-port" untuk membentuk banyak switch group dan setiap interface hanya bisa berada dalam 1 switch group. Tetapi fitur Switching tidak akan maximal.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

Fitur MikroTik Switch CRS125series*

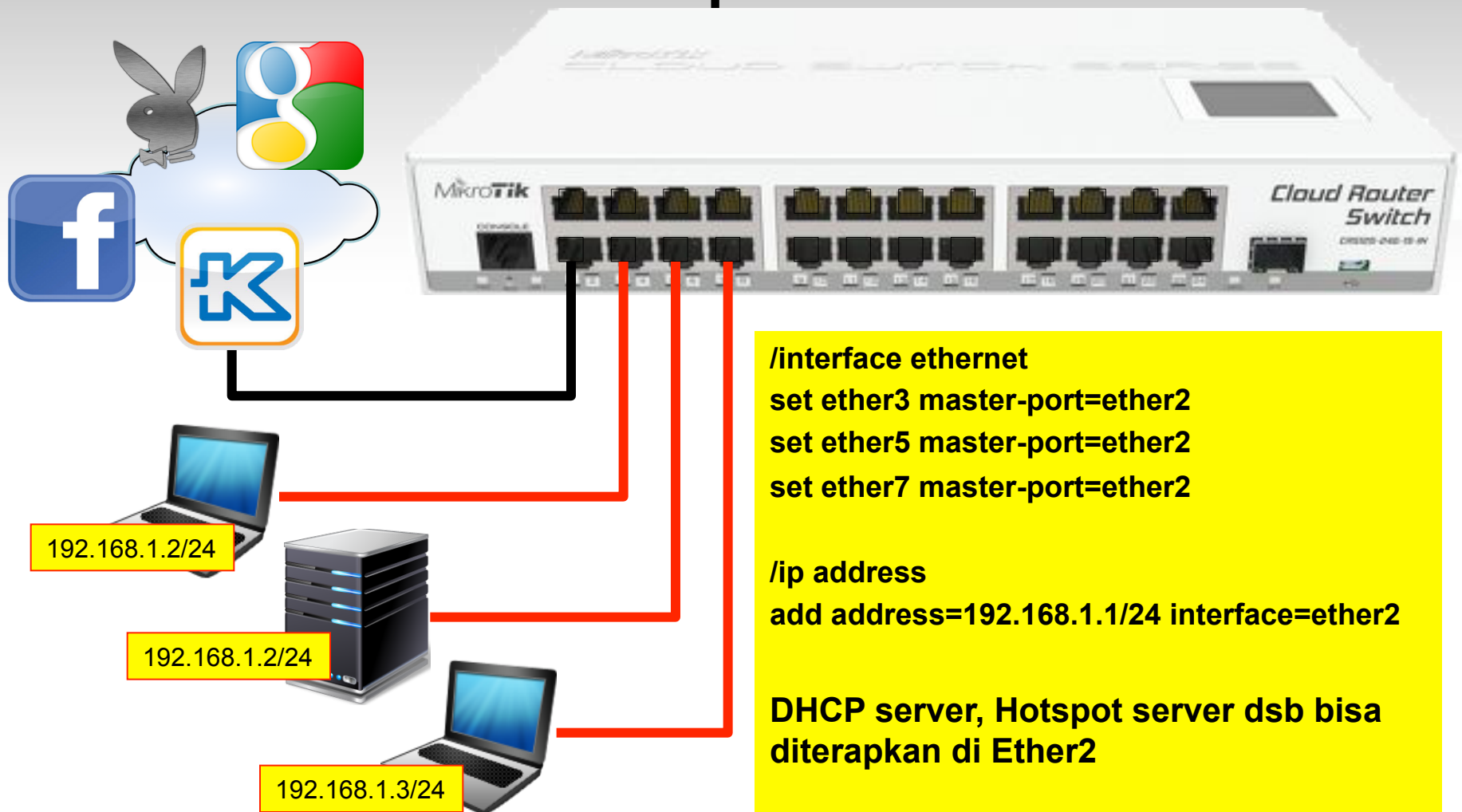
- Forwarding
 - Full non-blocking Wirespeed switching
- Mirroring
 - Port, VLAN, MAC based mirroring
- VLAN
 - Support 802.1Q & 802.1ad
 - Flexible (Port, Protocol, MAC based VLAN)
- Port Isolation & leakage
- Trunking
 - Support Link Aggregation Group
 - Hardware automatic failover & loadbalance
- QoS,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

***Tergantung tipe switch chip**

Contoh 1 - Simple Switch

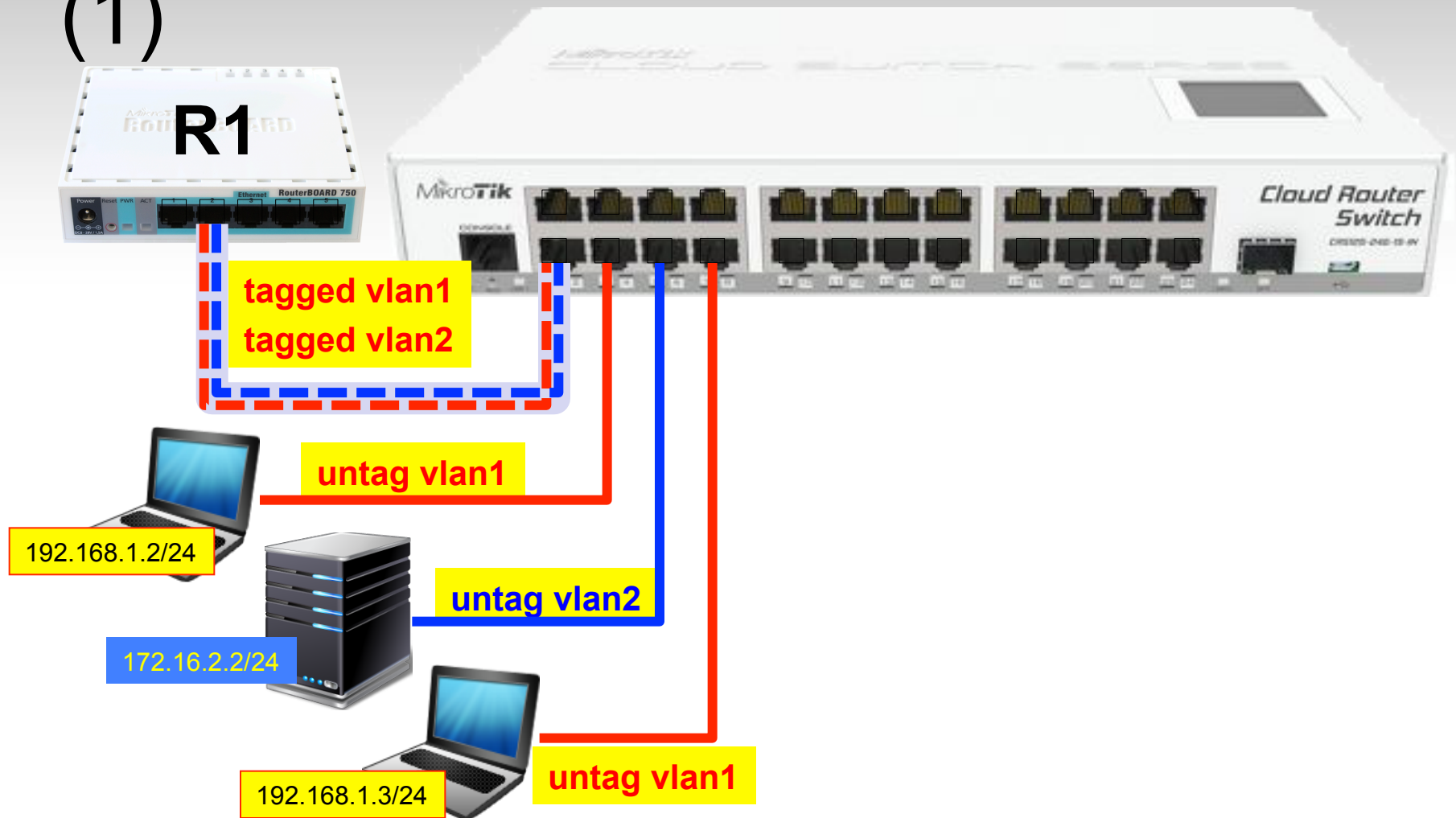


Contoh 1 - Simple Switch

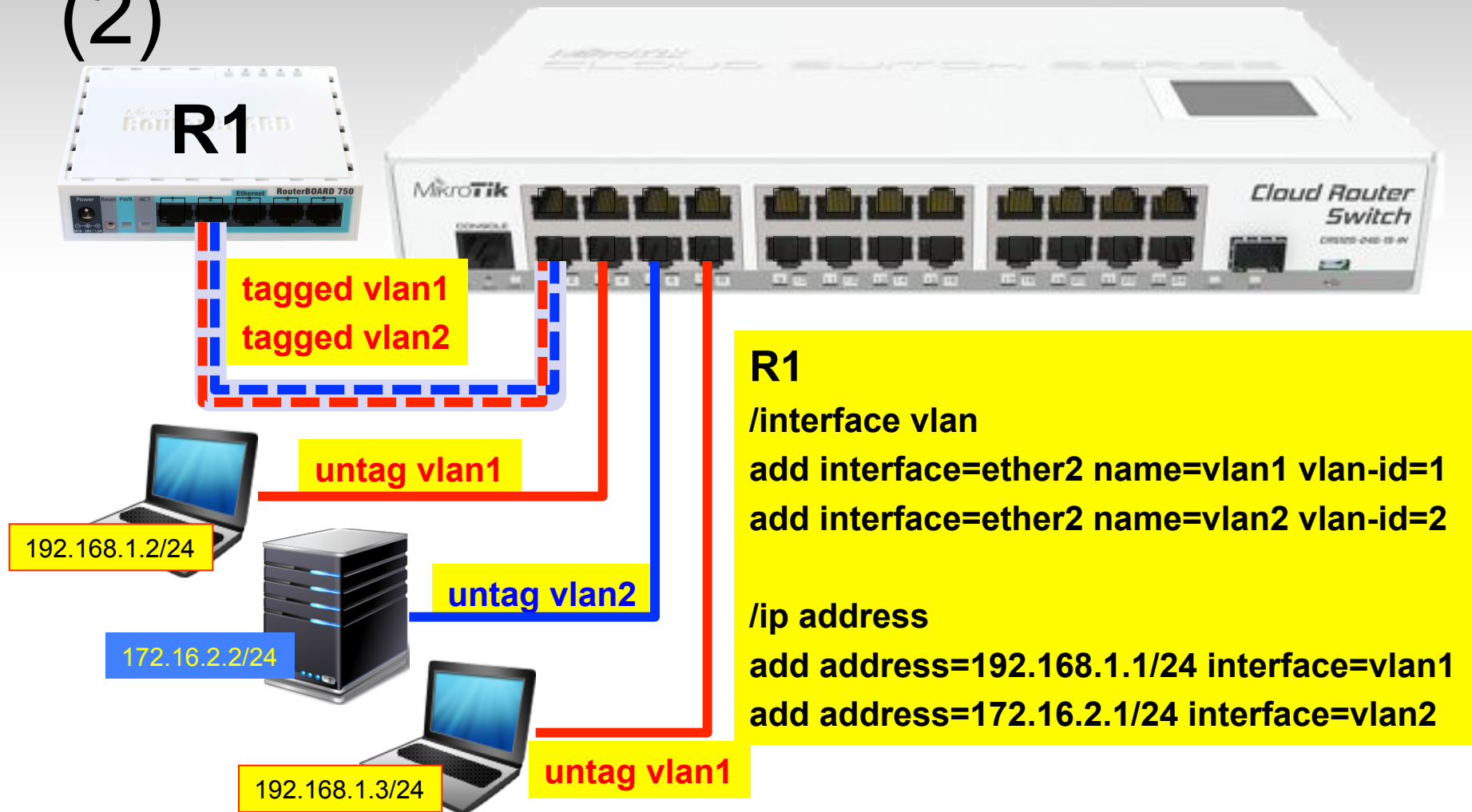


Contoh 2 - Port Based VLAN

(1)



Contoh 2 - Port Based VLAN (2)



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)

Switch VLAN			
VLAN	Eg. VLAN Tag	In. VLAN Tran.	Eg. VLAN Tran.
+ - ✓ ✕ [icon] Find			
VLAN ID	Ports		
1	ether1, ether3, ether7		
2	ether1, ether5		
4095	ether8, ether9, ether10, et...		

Switch VLAN <1>

VLAN ID: 1

OK

Ports: ether1

ether3

ether7

SVL

SA Learning

Cancel

Apply

Disable

Comment

Switch VLAN <2>

VLAN ID: 2

OK

Ports: ether1

ether5

SVL

SA Learning

Flood

Ingress Mirror

QoS Group: none

enabled

Cancel

Apply

Disable

Comment

Copy

Remove

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

The 'Switch VLAN' window shows a table with columns: VLAN, Eg. VLAN Tag, In. VLAN Tran., Eg. VLAN Tran., and The table contains three rows: VLAN 1 with tagged port ether1, VLAN 2 with tagged port ether1, and VLAN 4095 with no tagged ports. The status at the bottom is '3 items'.

VLAN	Eg. VLAN Tag	In. VLAN Tran.	Eg. VLAN Tran.	...
1	ether1			
2	ether1			
4095				

The 'Switch Egress Tag VLAN <1>' window shows the configuration for VLAN 1. The 'VLAN ID' is 1 and the 'Tagged Ports' is ether1. The status at the bottom is 'enabled'.

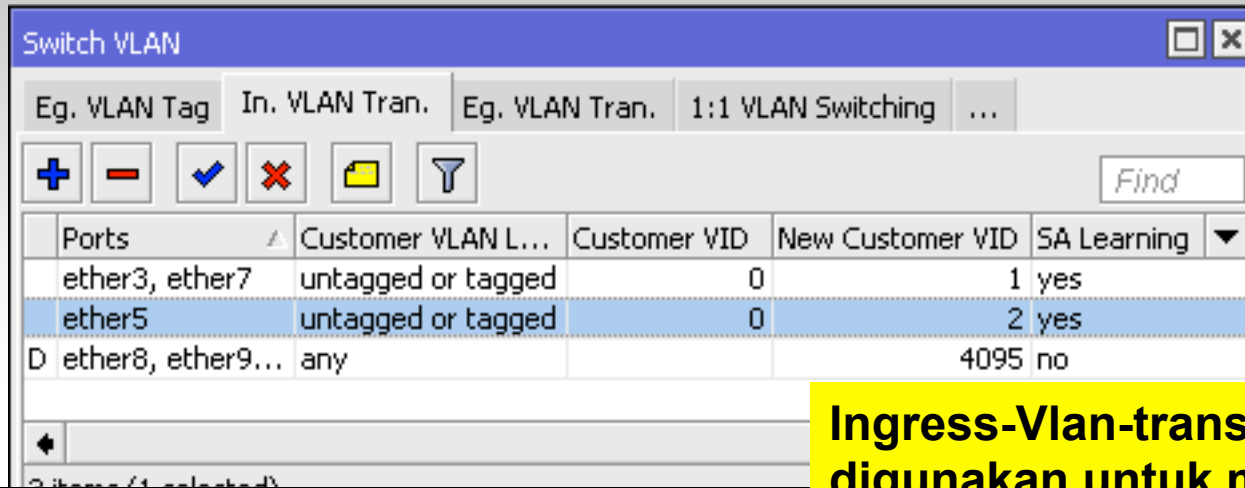
VLAN ID: 1
Tagged Ports: ether1
enabled

The 'Switch Egress Tag VLAN <2>' window shows the configuration for VLAN 2. The 'VLAN ID' is 2 and the 'Tagged Ports' is ether1. The status at the bottom is 'enabled'. Buttons on the right include OK, Cancel, Apply, Disable, Comment, Copy, and Remove.

VLAN ID: 2
Tagged Ports: ether1
enabled

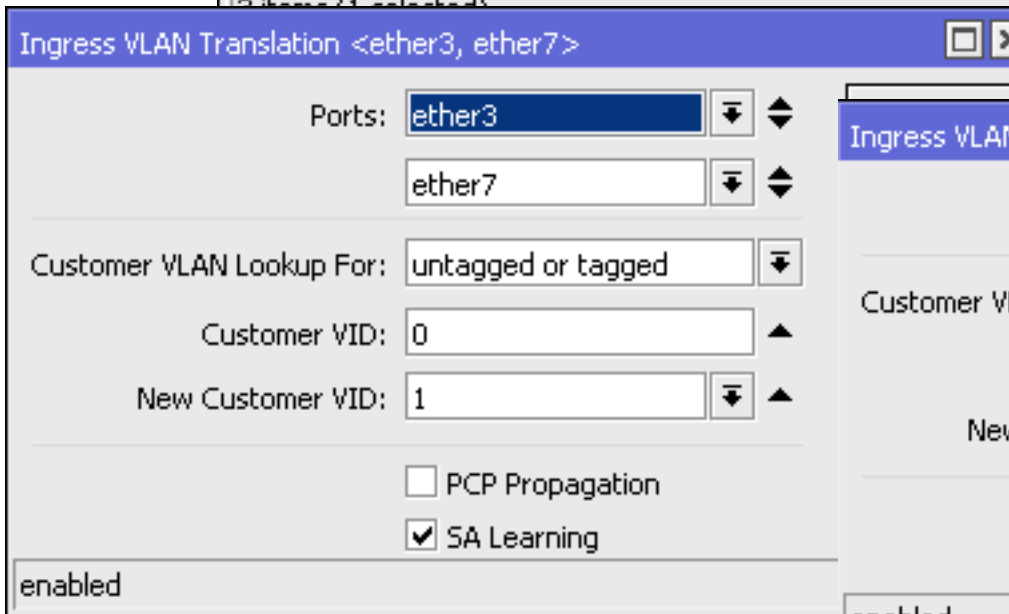
Contoh 2 - Port Based VLAN

(6)



Ports	Customer VLAN L...	Customer VID	New Customer VID	SA Learning
ether3, ether7	untagged or tagged	0	1	yes
ether5	untagged or tagged	0	2	yes
ether8, ether9...	any		4095	no

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



Ports: ether3, ether7

Customer VLAN Lookup For: untagged or tagged

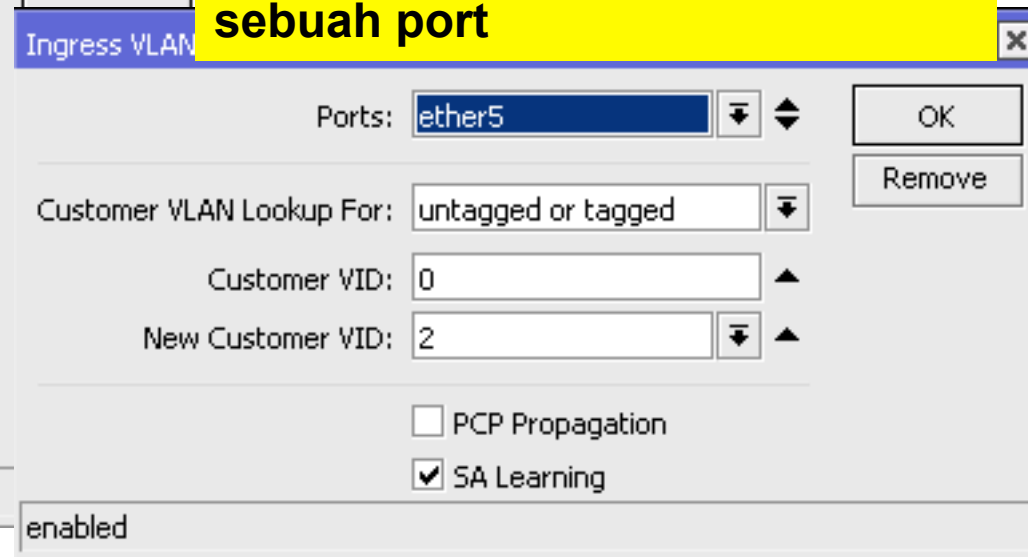
Customer VID: 0

New Customer VID: 1

☐ PCP Propagation

☒ SA Learning

enabled



Ports: ether5

Customer VLAN Lookup For: untagged or tagged

Customer VID: 0

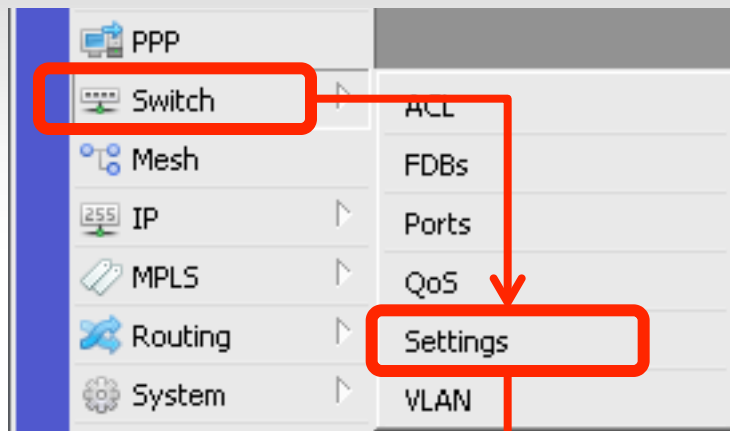
New Customer VID: 2

☐ PCP Propagation

☒ SA Learning

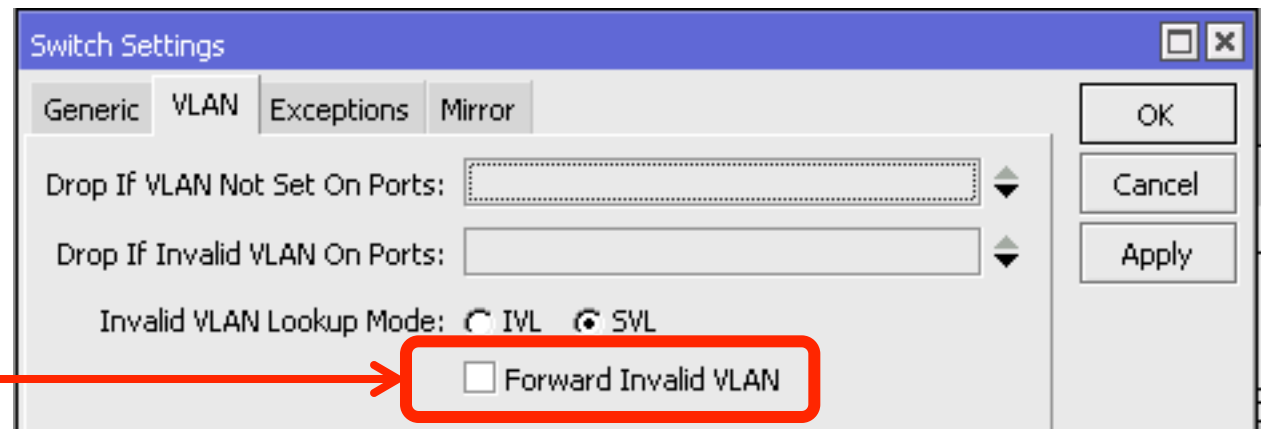
enabled

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



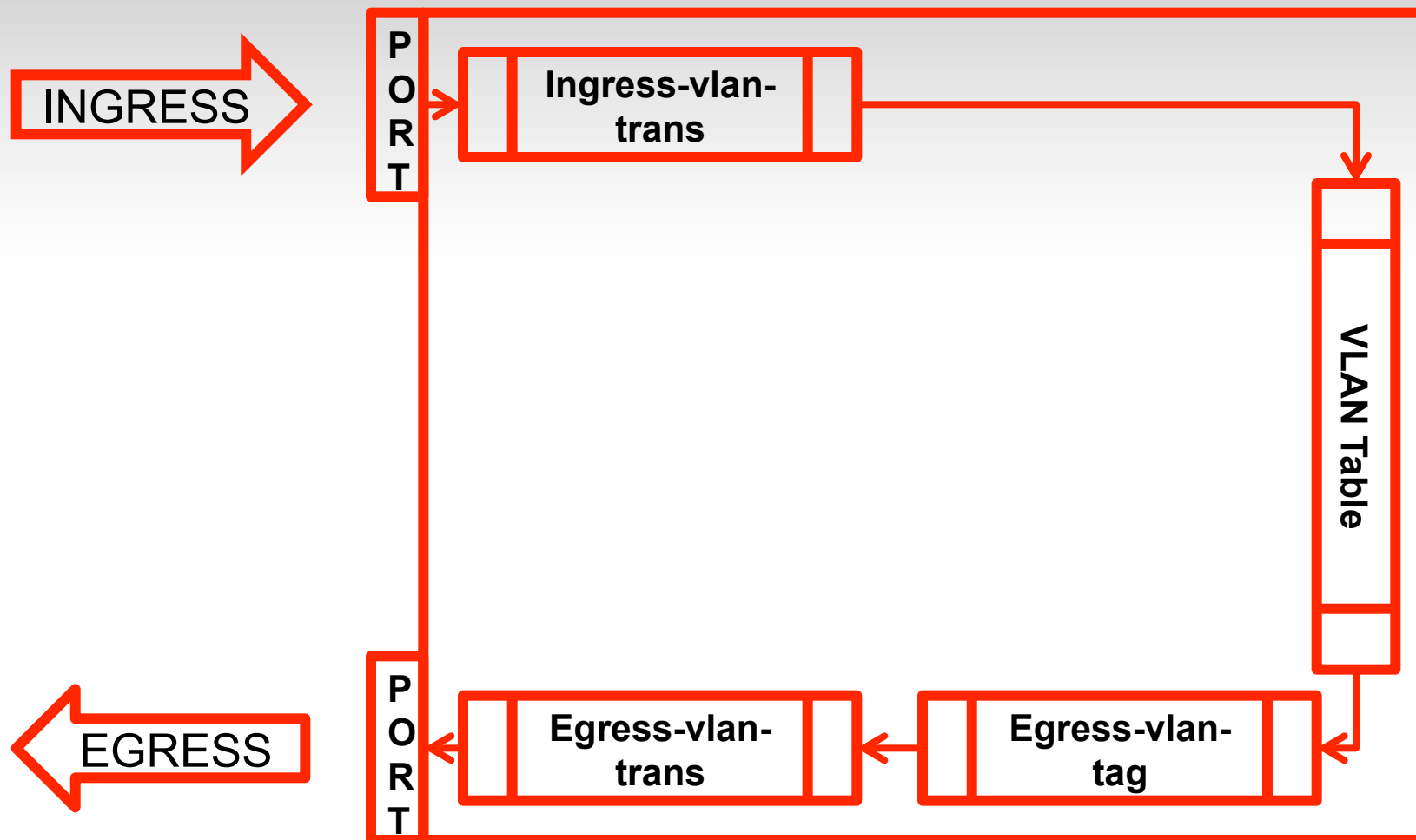
access port / untagged port



trunk port / tagged port

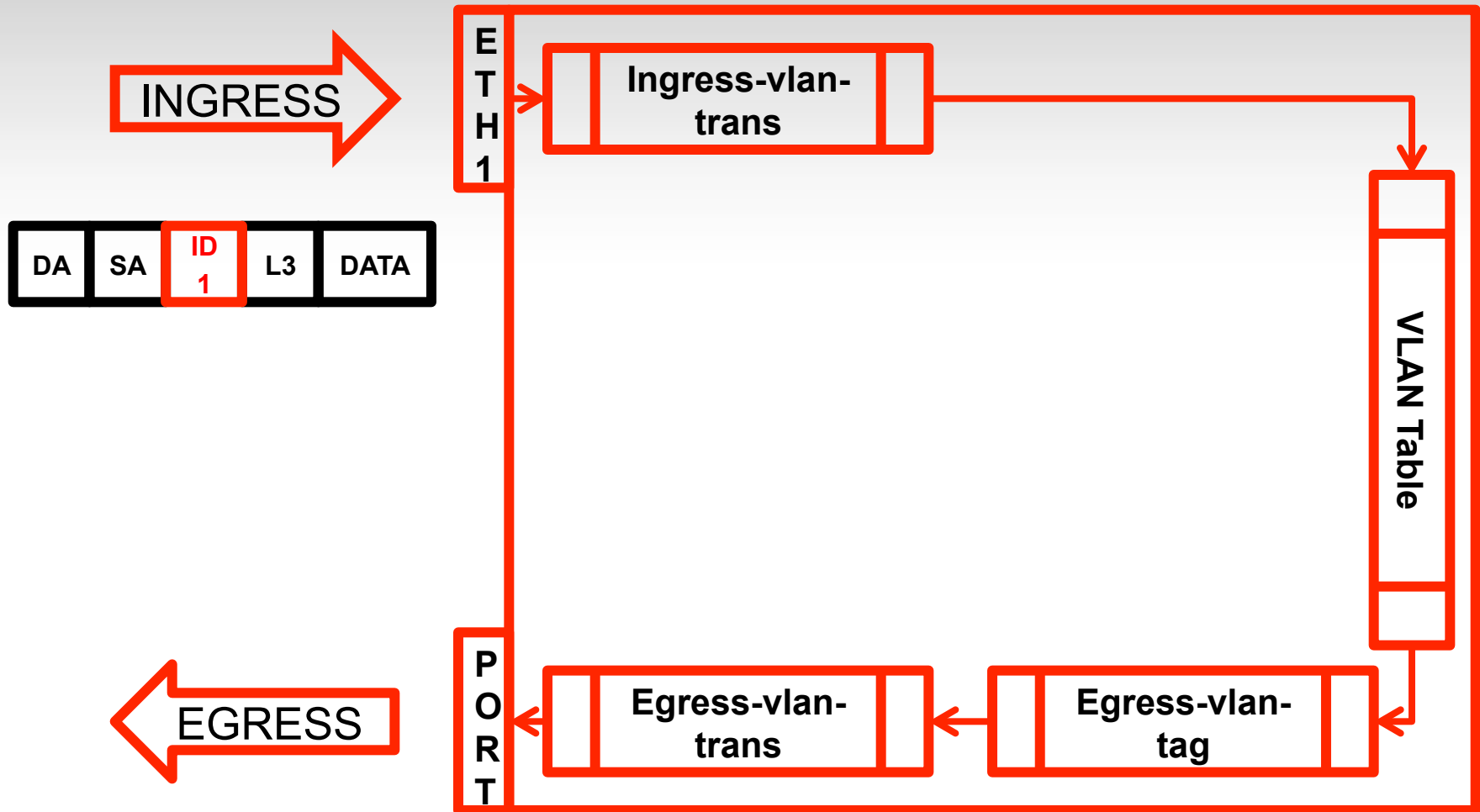


Logika CRS (1)



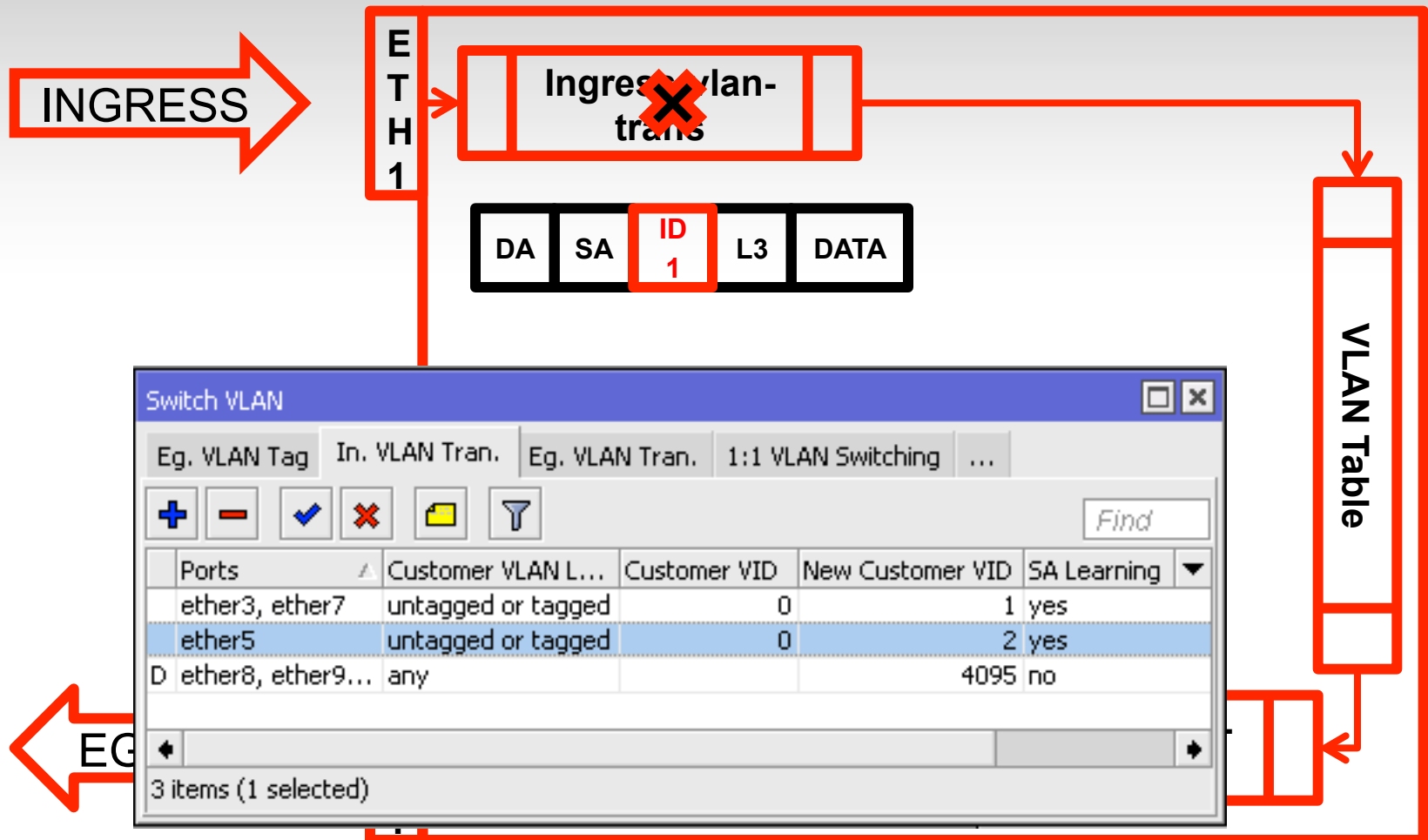
Logika CRS (2)

R1 tagged to PC untagged vid=1



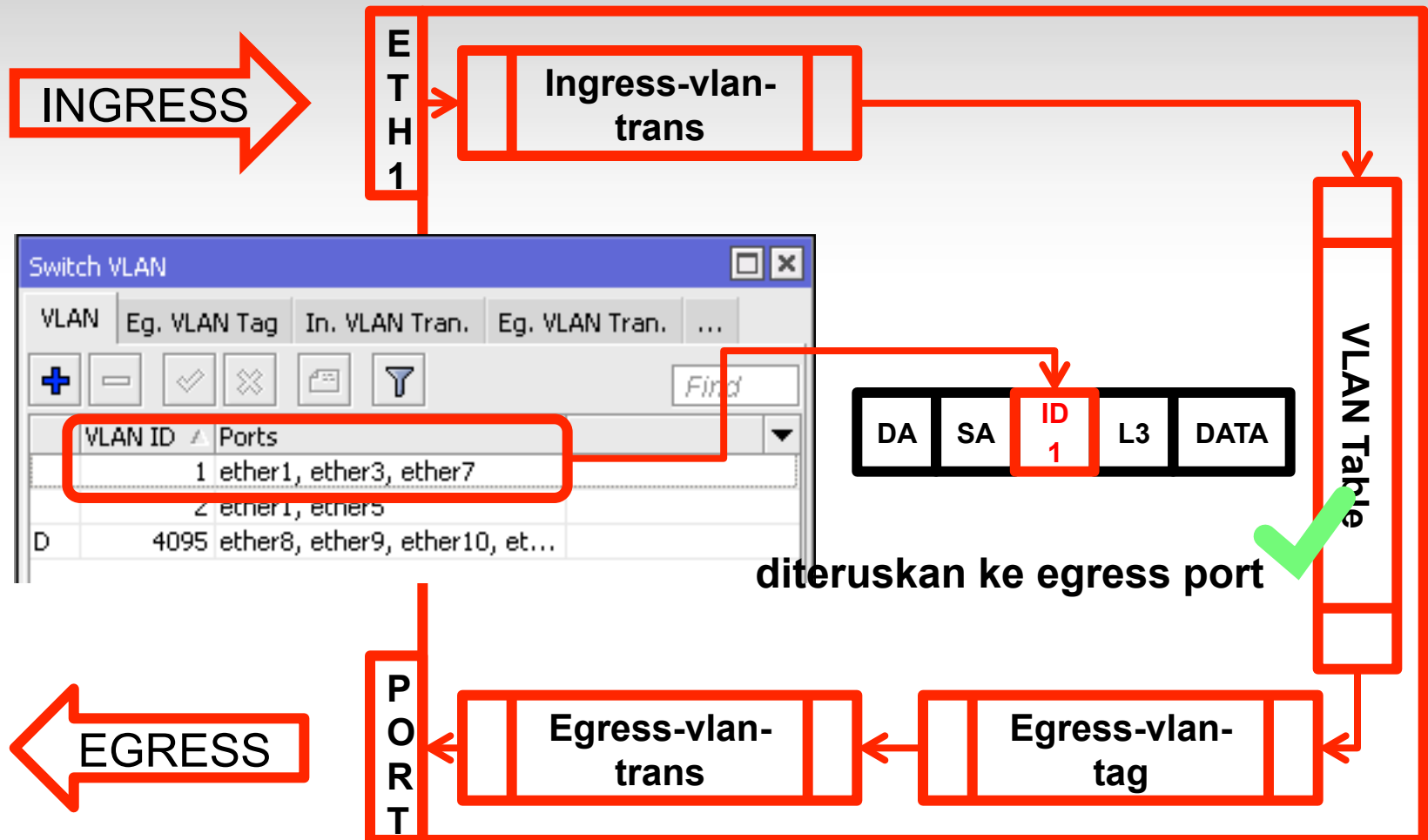
Logika CRS (3)

R1 tagged to PC untagged vid=1



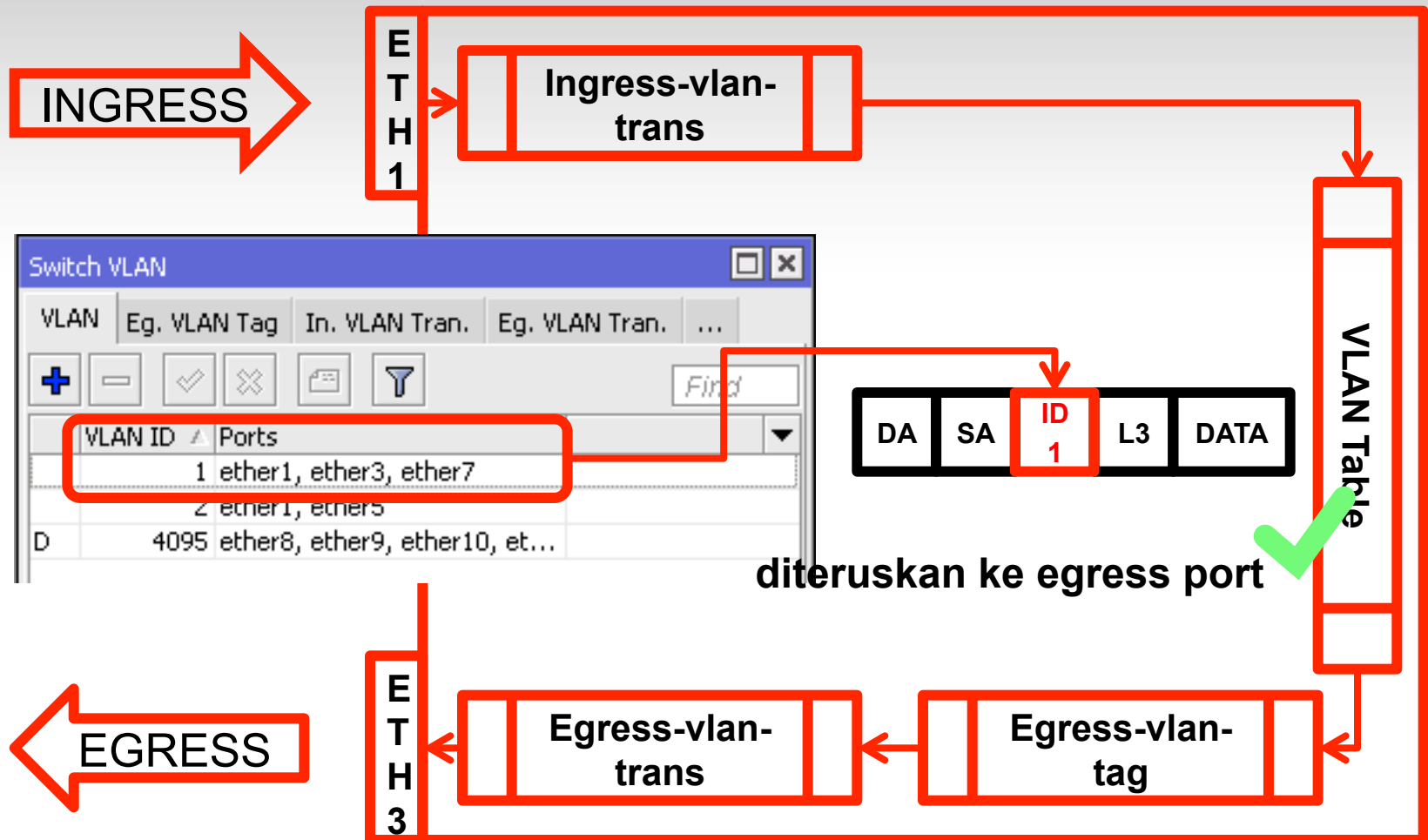
Logika CRS (4)

R1 tagged to PC untagged vid=1



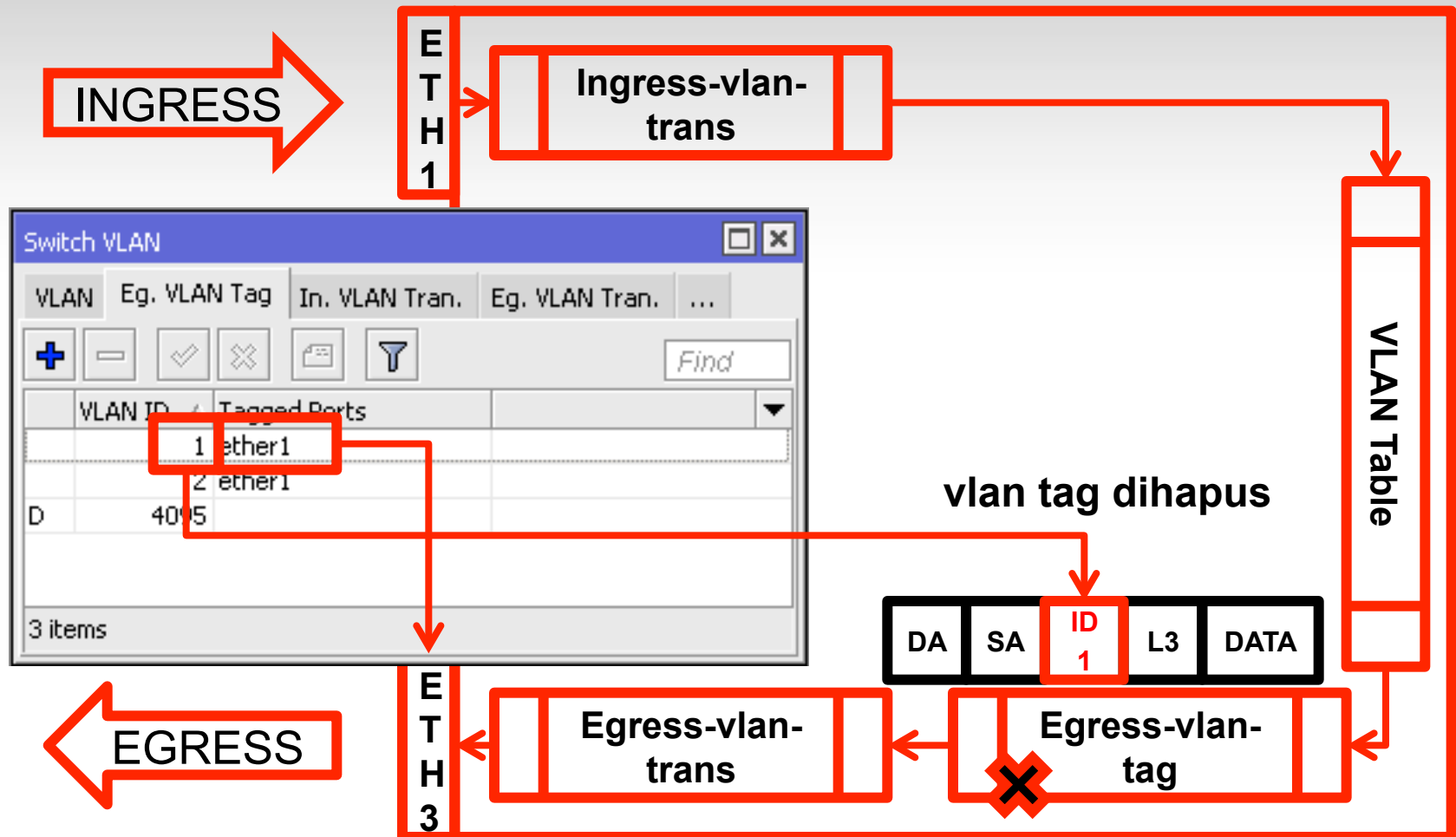
Logika CRS (5)

R1 tagged to PC untagged vid=1



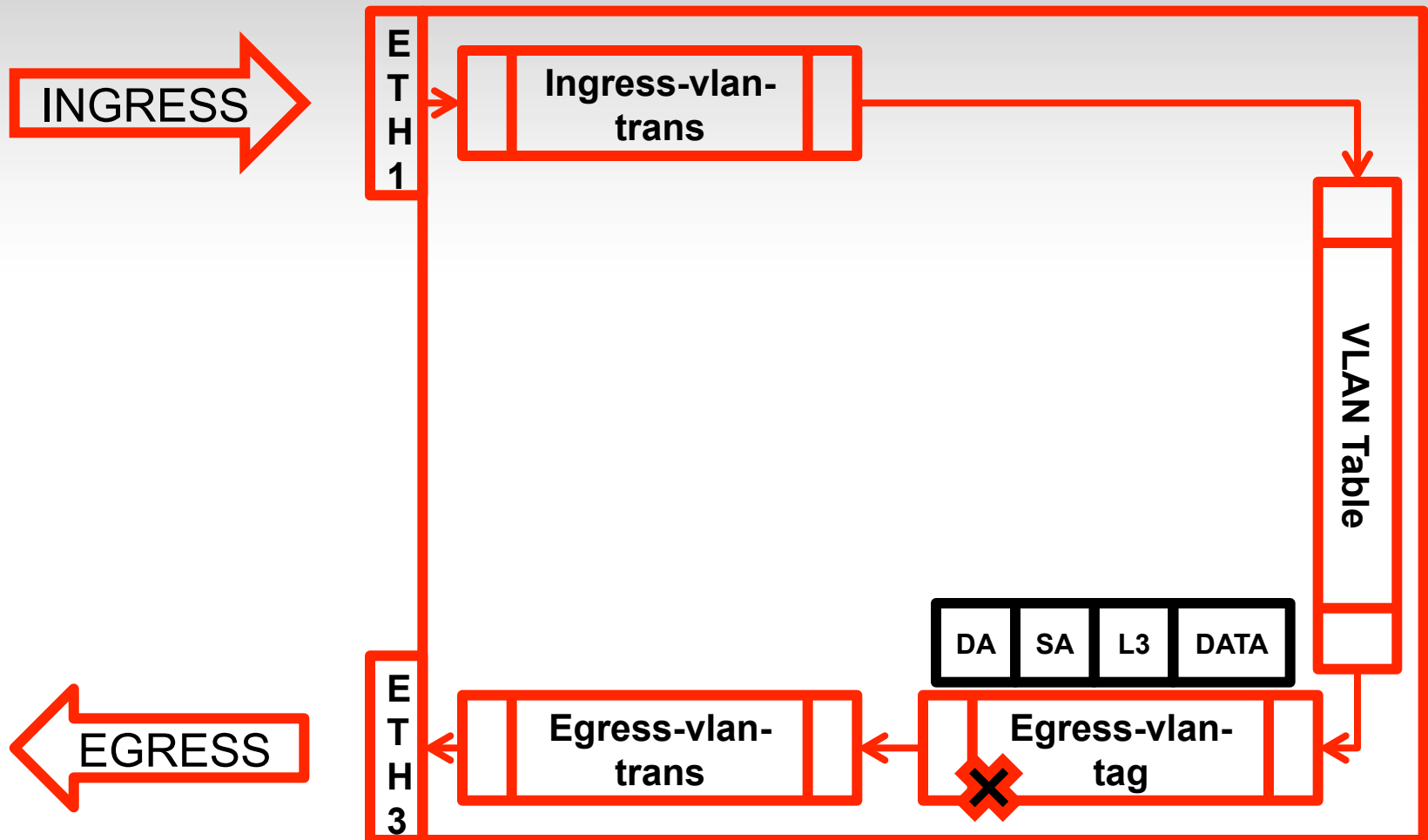
Logika CRS (6)

R1 tagged to PC untagged vid=1



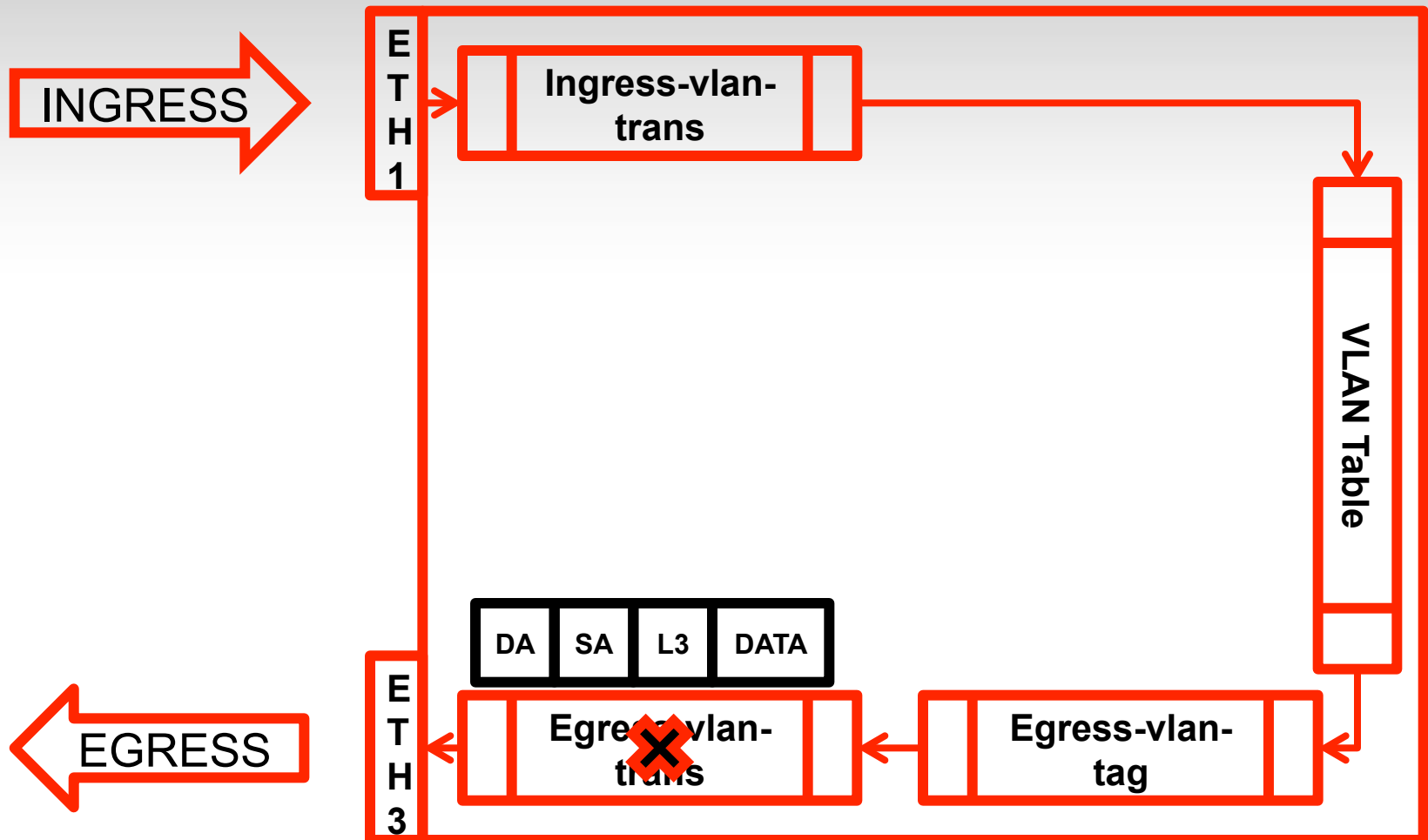
Logika CRS (7)

R1 tagged to PC untagged vid=1



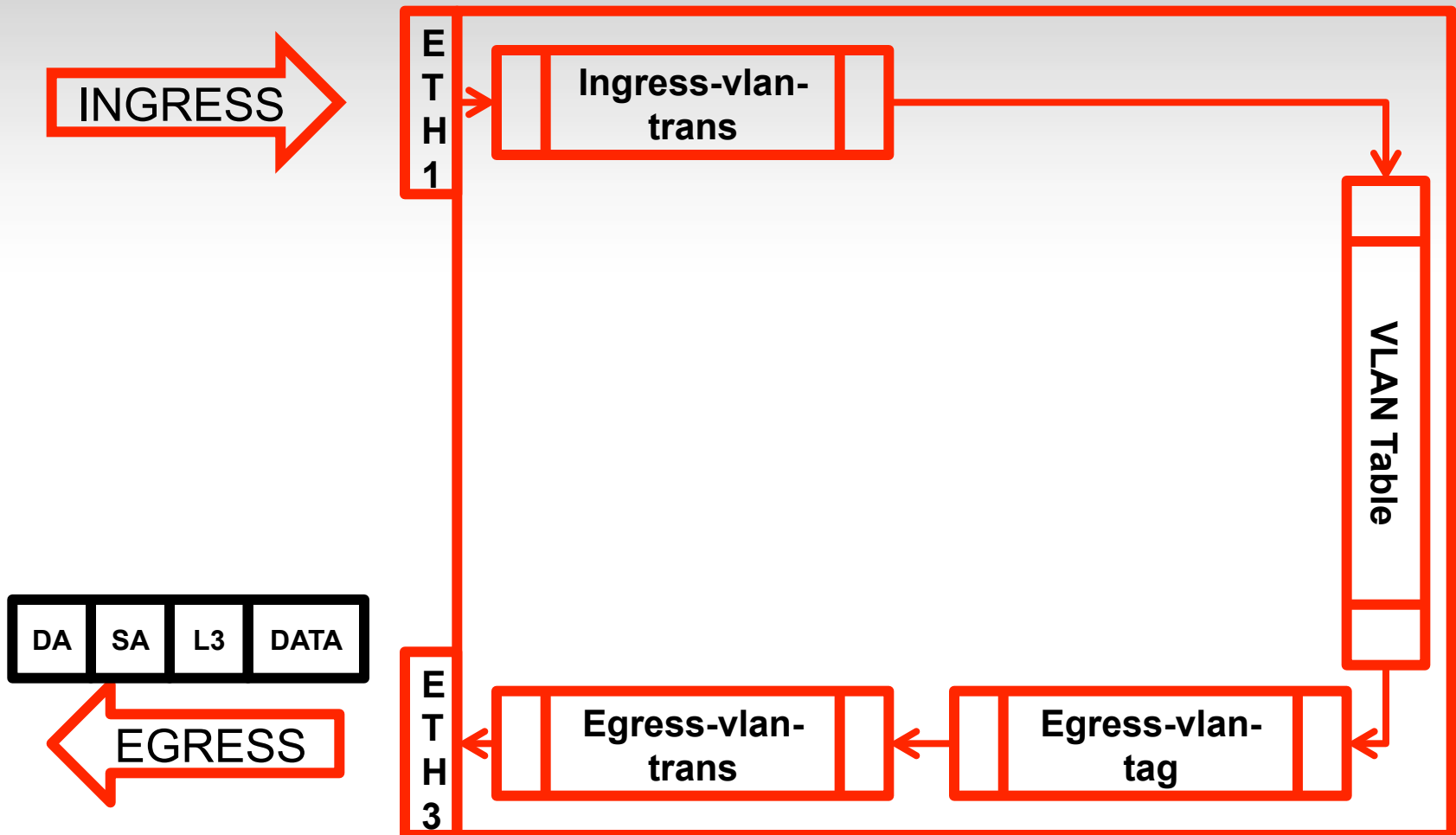
Logika CRS (8)

R1 tagged to PC untagged vid=1



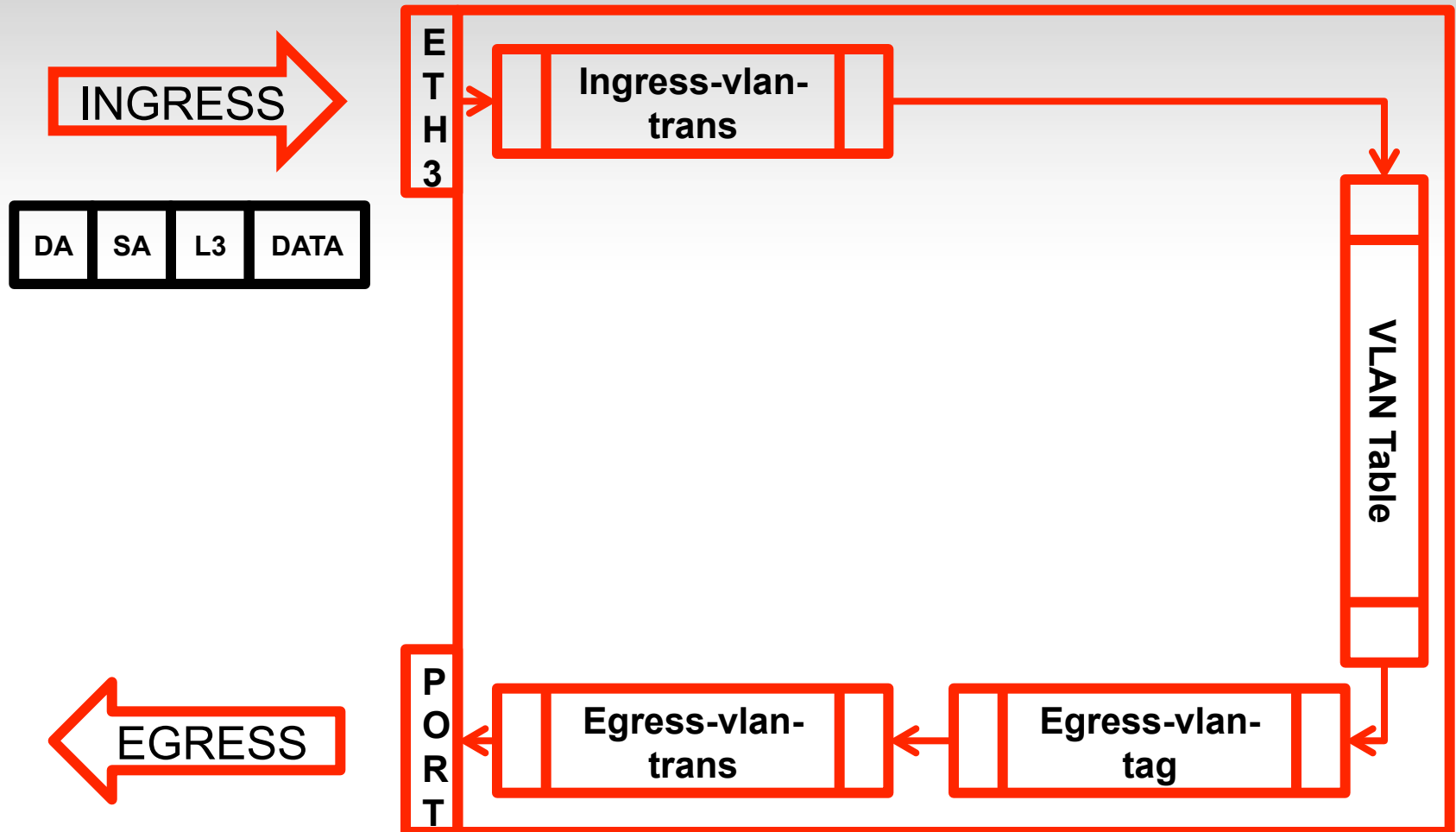
Logika CRS (9)

R1 tagged to PC untagged vid=1



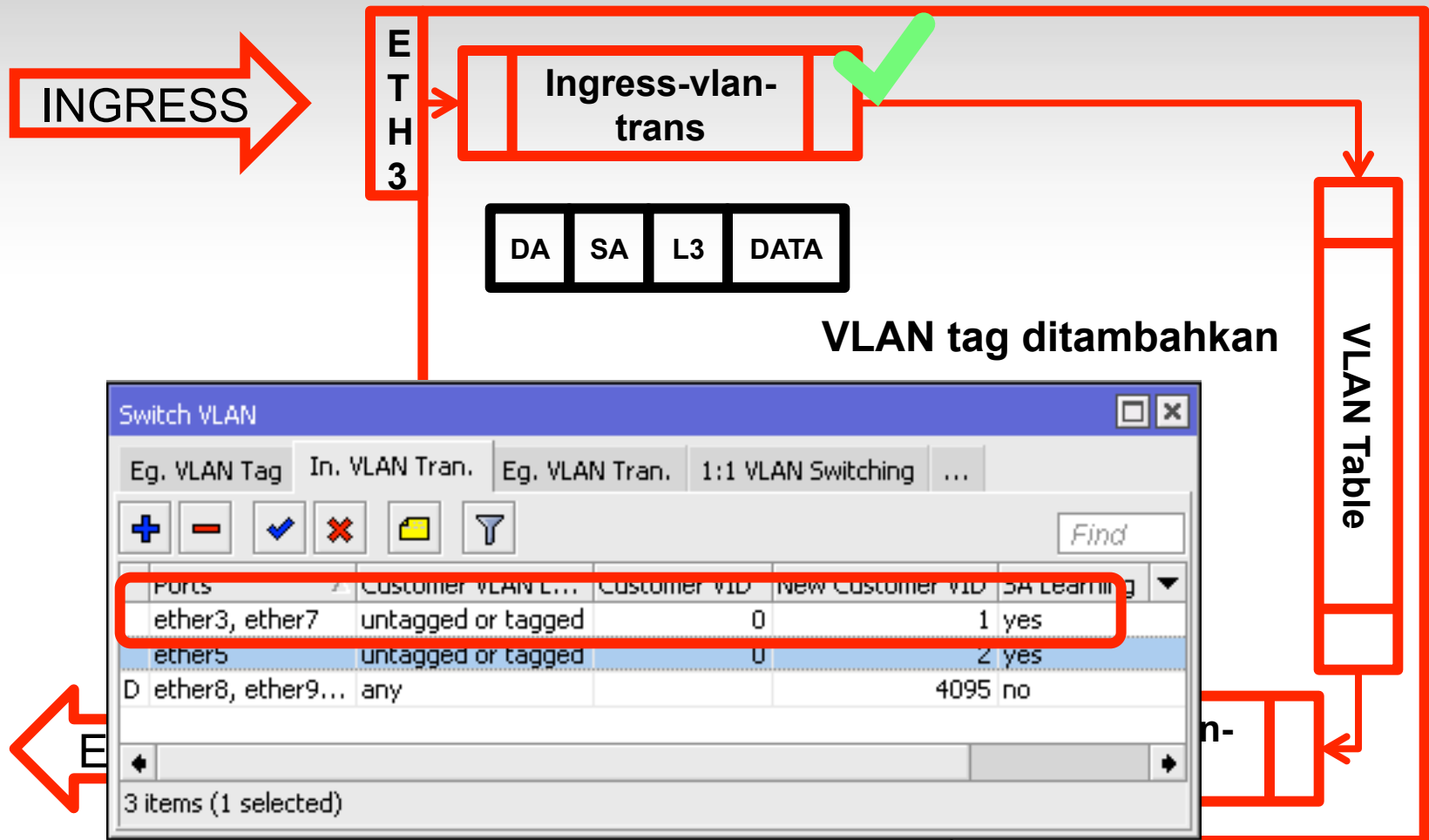
Logika CRS (10)

Untagged PC ke R1 tagged vid=1



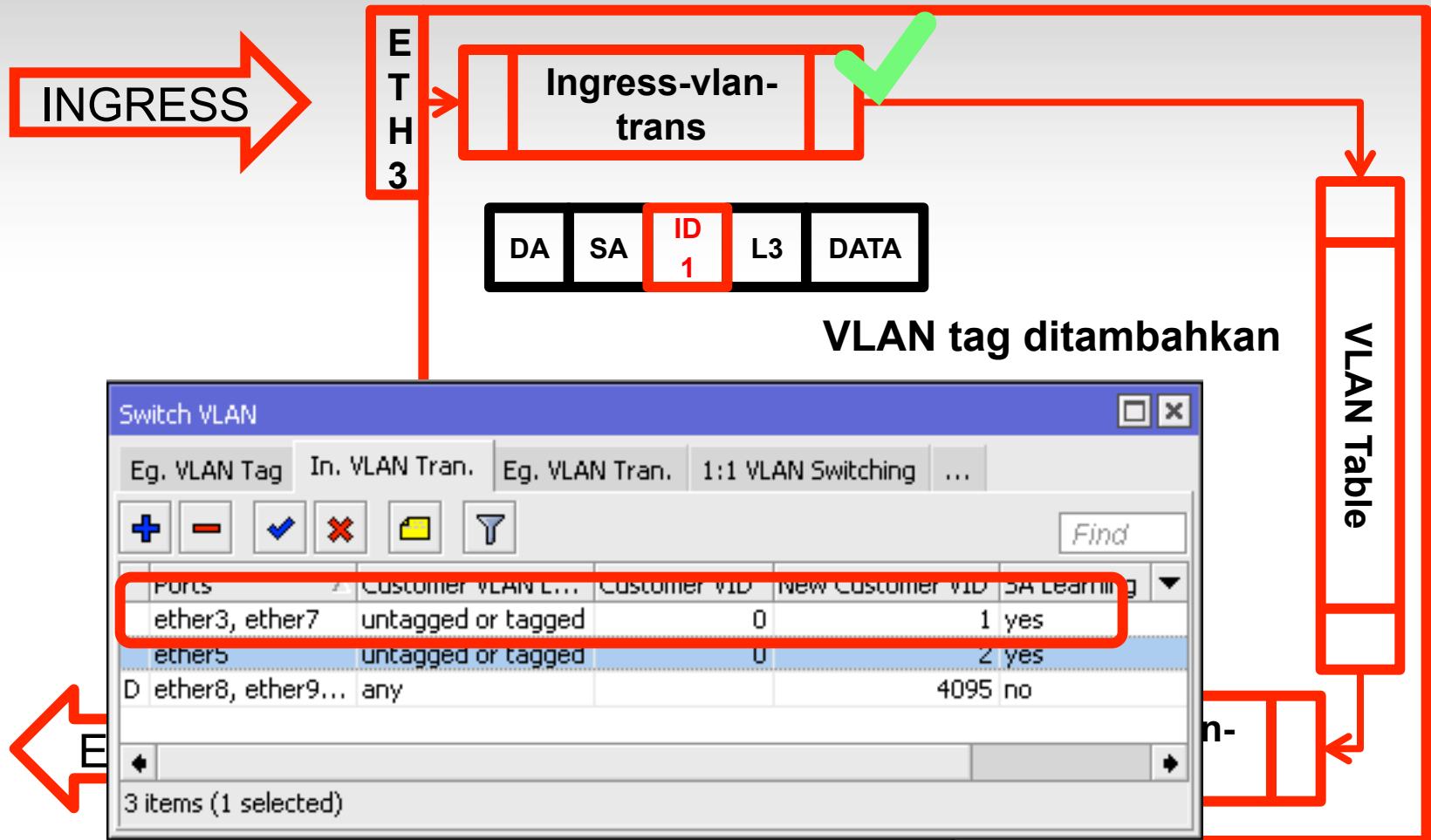
Logika CRS (11)

Untagged PC ke R1 tagged vid=1



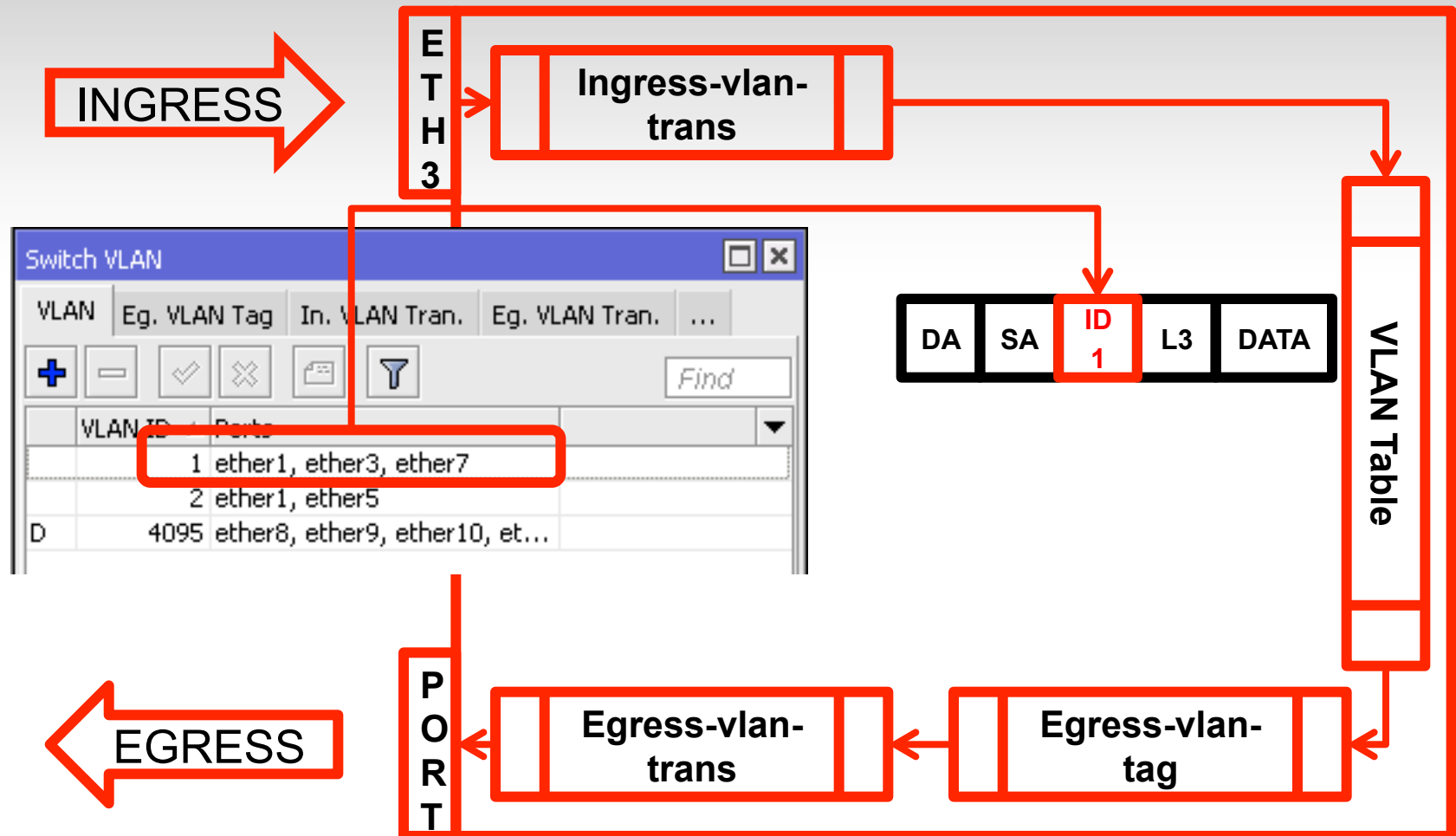
Logika CRS (12)

Untagged PC ke R1 tagged vid=1



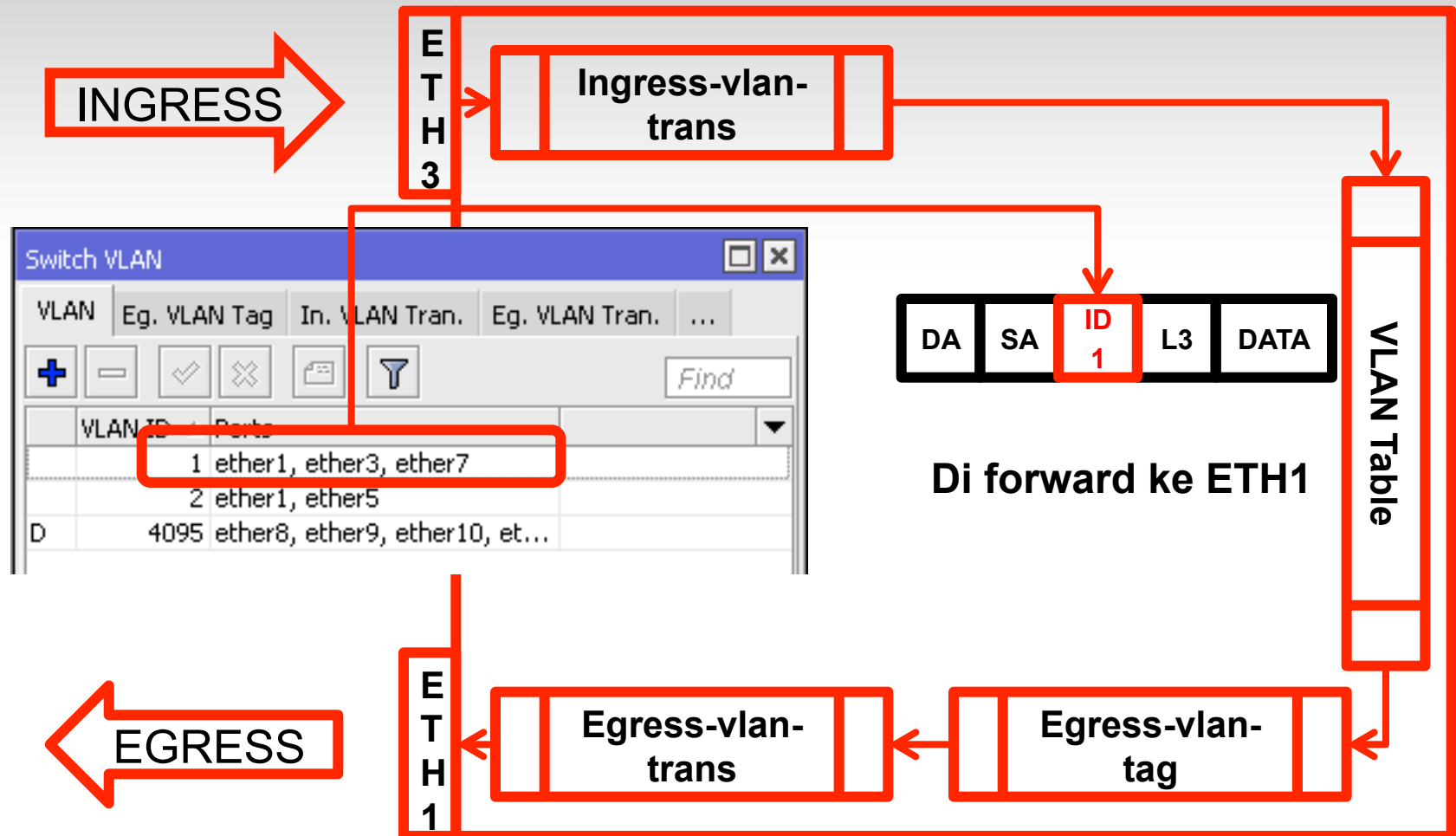
Logika CRS (13)

Untagged PC ke R1 tagged vid=1



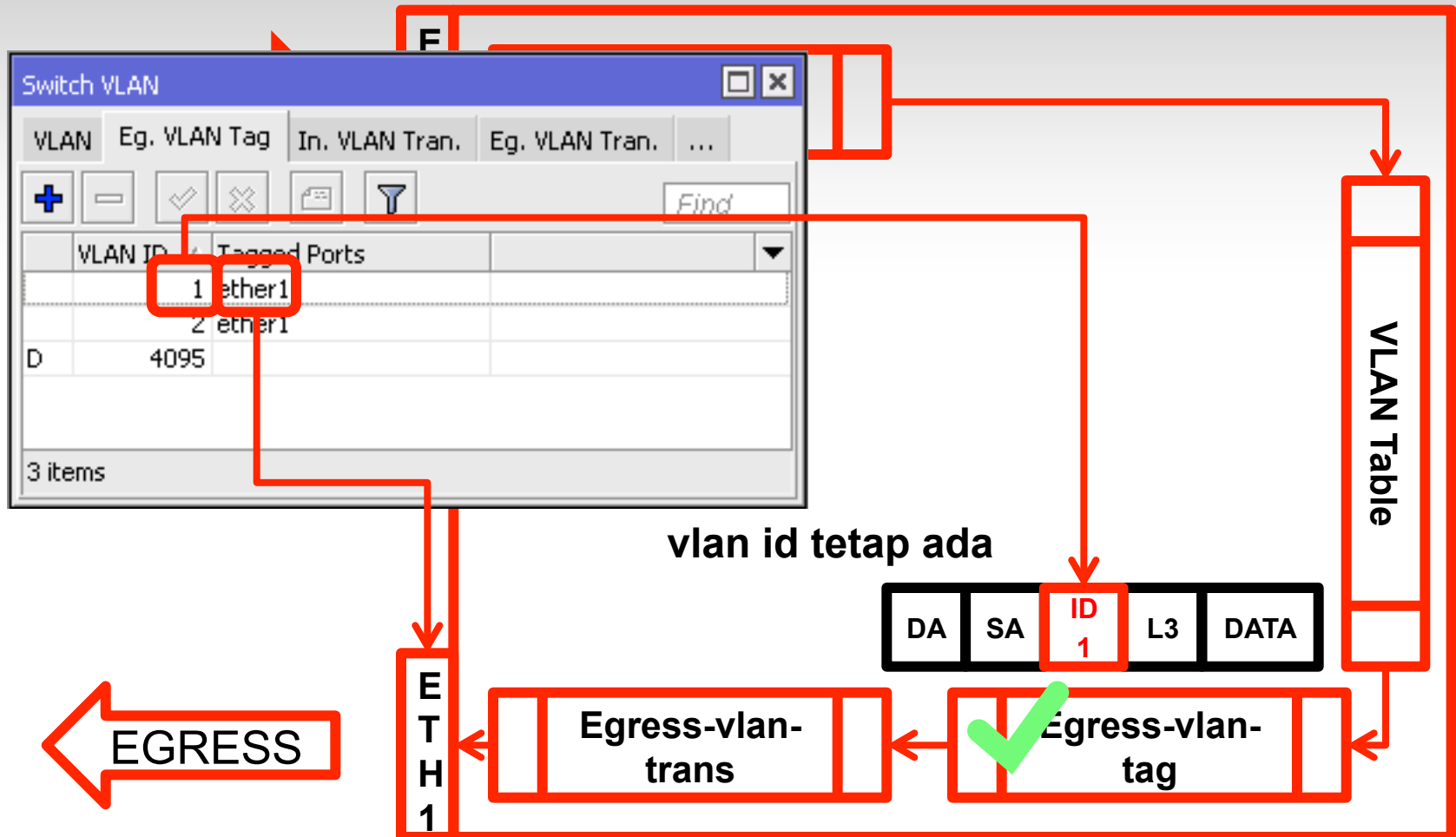
Logika CRS (14)

Untagged PC ke R1 tagged vid=1



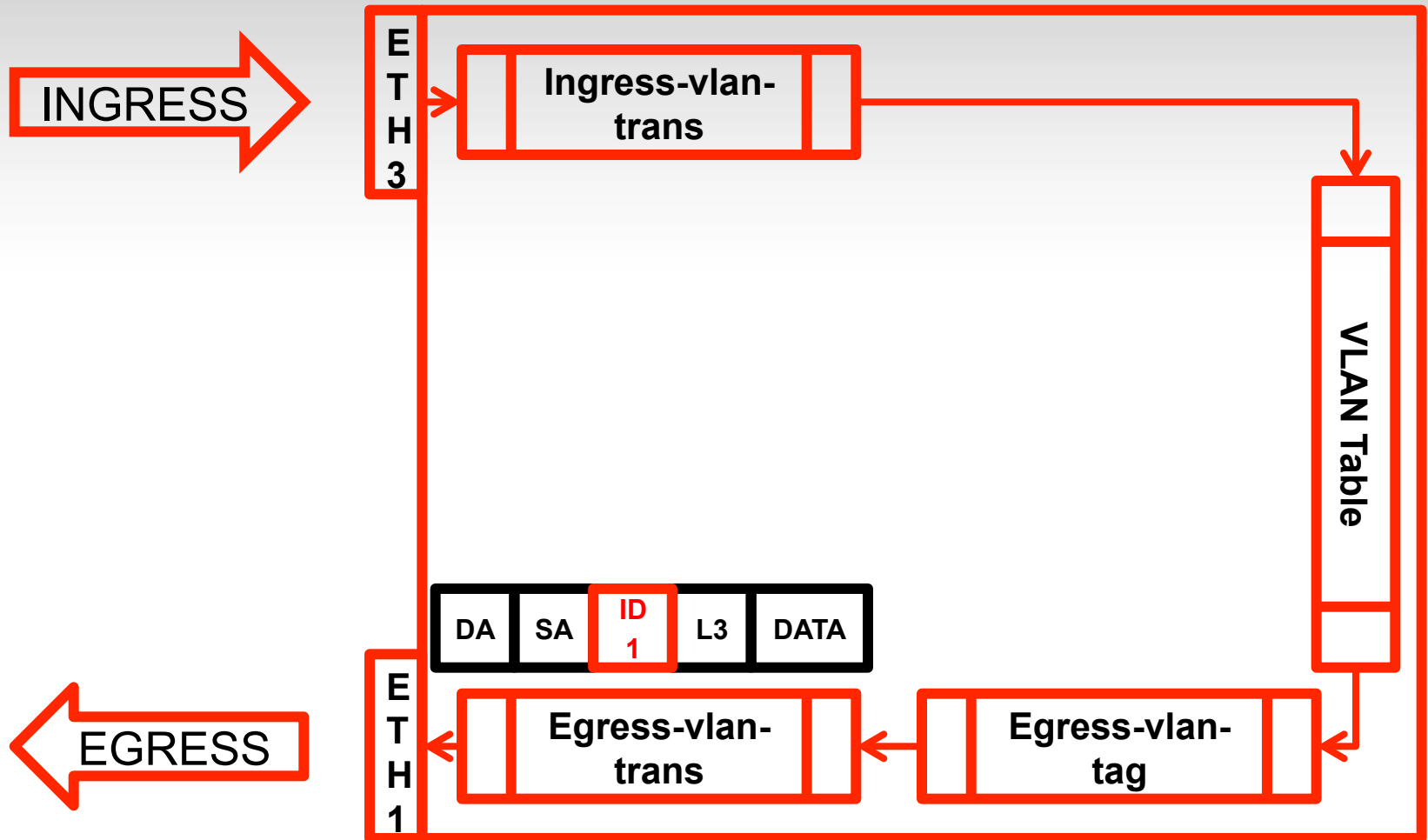
Logika CRS (15)

Untagged PC ke R1 tagged vid=1



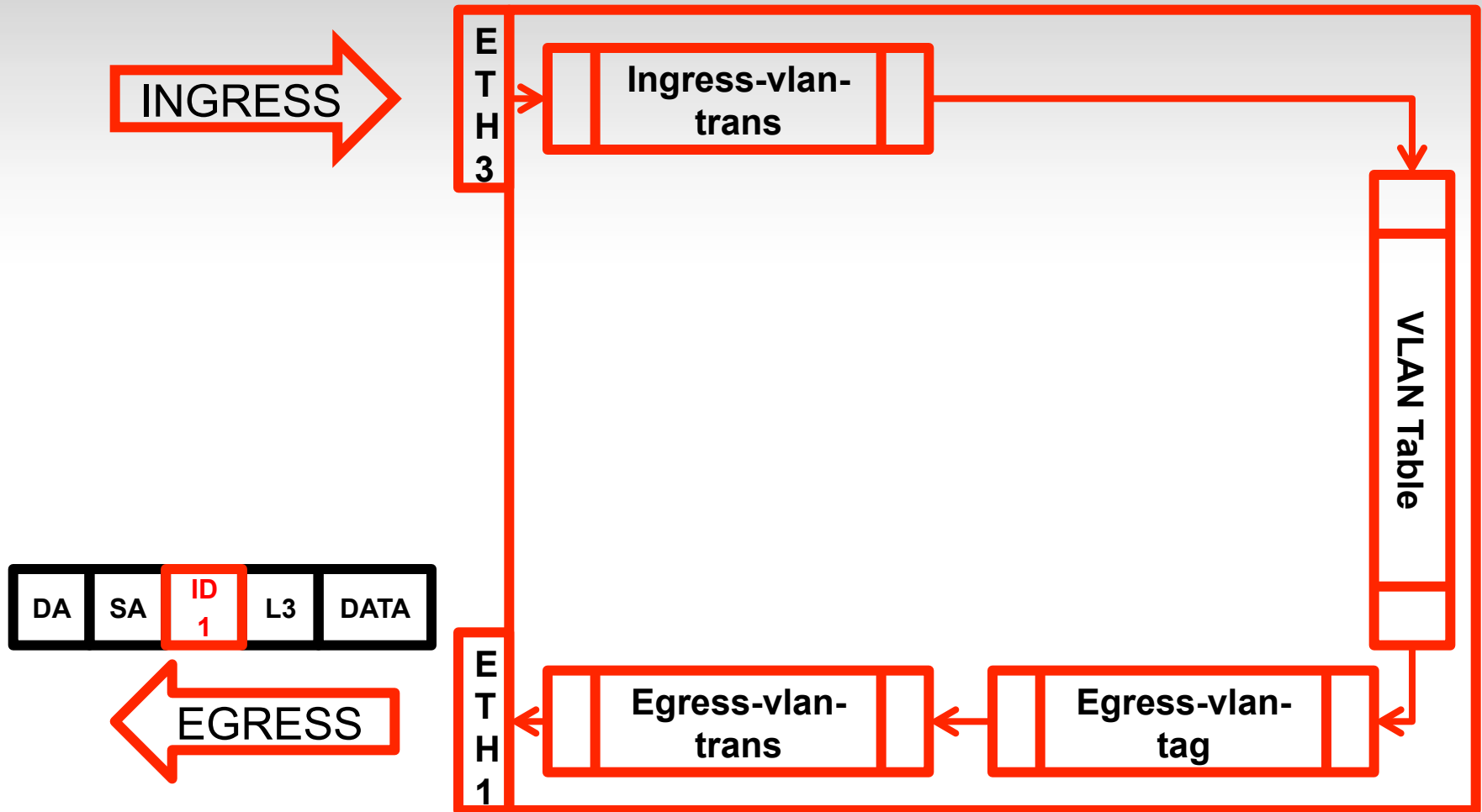
Logika CRS (16)

Untagged PC ke R1 tagged vid=1



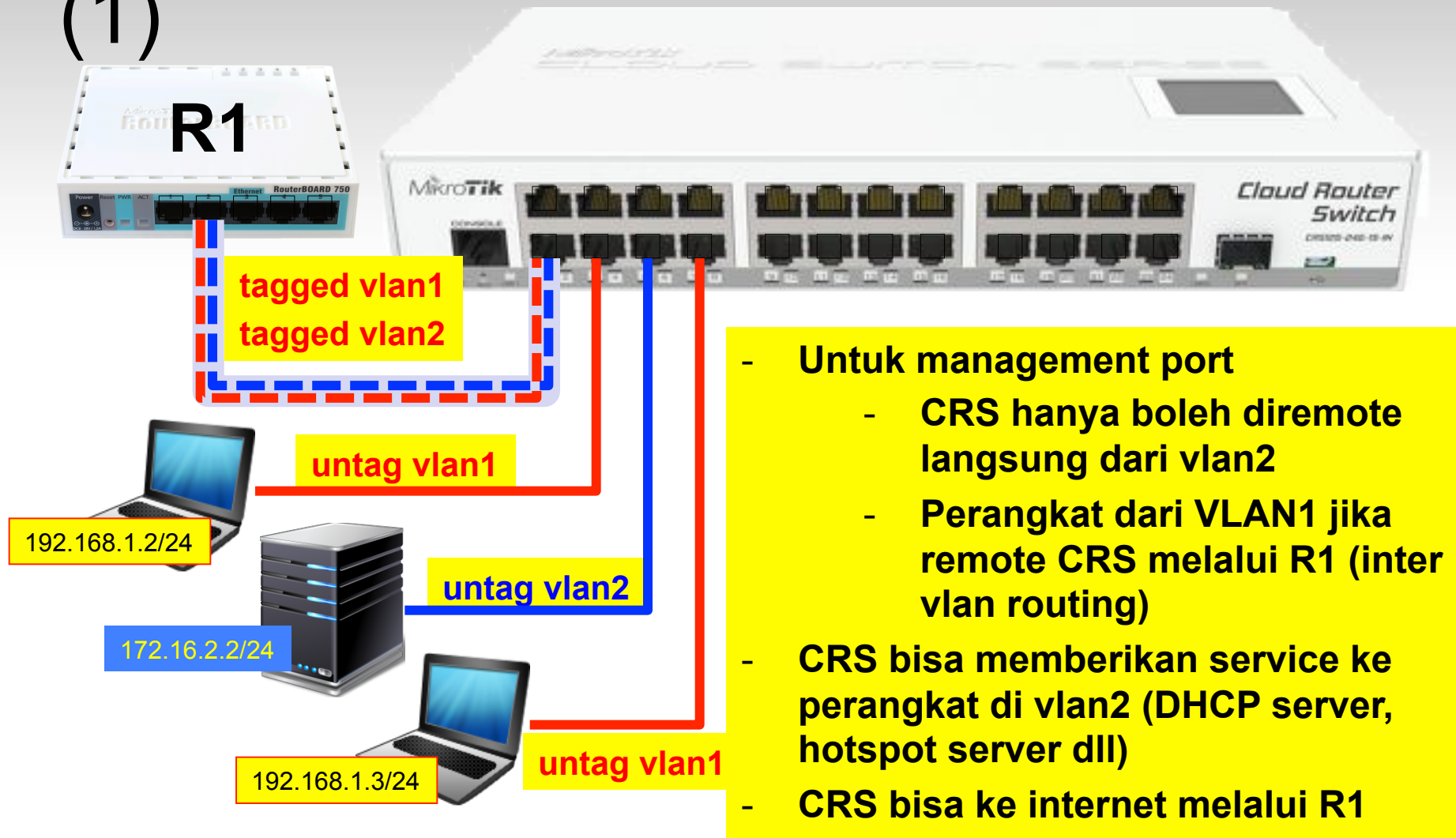
Logika CRS (17)

Untagged PC ke R1 tagged vid=1

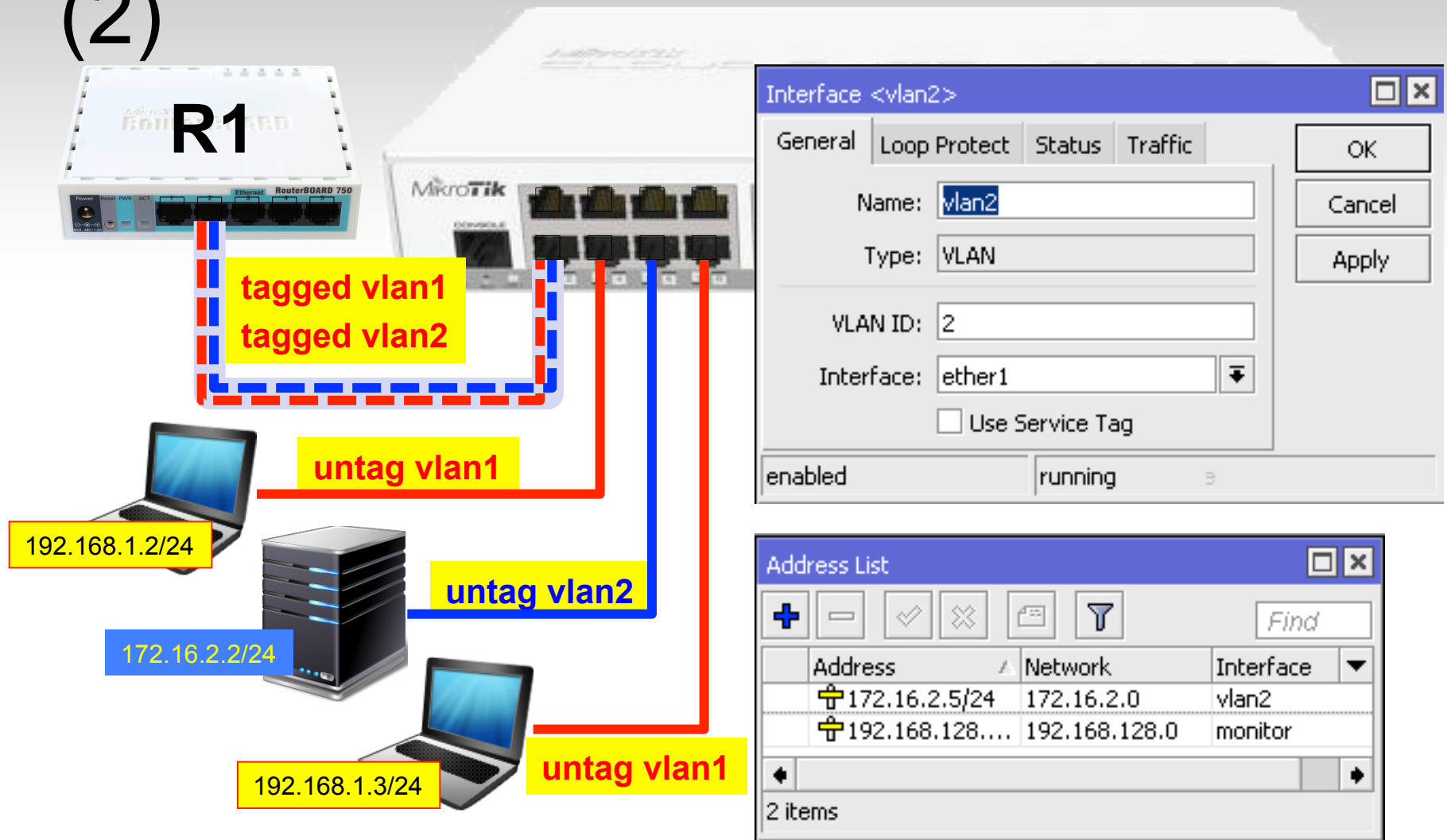


Contoh 3 - Komunikasi Switch

(1)



Contoh 3 - Komunikasi Switch (2)



Contoh 3 - Komunikasi Switch (3)

Switch VLAN

VLAN

Eg. VLAN Tag

In. VLAN Tran.

Eg. VLAN Tran.

1:1 VLAN Switching

+

-

✓

✗

Filter

VLAN ID	Ports	SVL	SA Learn...	Flo
1	ether1, ether3, ether7	no	yes	no
2	ether1, ether5, switch1-cpu	no	yes	no
4095	ether6, ether9, ether10, ether...	no	no	no

◀

3 items

Switch VLAN <2>

VLAN ID: 2

Ports: ether1 ether5 switch1-cpu

☐ SVL

☒ SA Learning

☐ Flood

☐ Ingress Mirror

QoS Group: none

enabled

OK

Cancel

Apply

Disable

Comment

Copy

Remove

Contoh 3 - Komunikasi Switch (4)

The image shows two windows from the Mikrotik WinBox interface. The main window is 'Switch VLAN', which contains a table of VLAN configurations. The second row of the table is selected, showing VLAN ID 2 with tagged ports 'ether1, switch1-cpu'. A red box highlights this row, and a red arrow points from it to the 'Switch Egress Tag VLAN <2>' dialog box. This dialog box is open, showing 'VLAN ID: 2' and 'Tagged Ports: ether1'. A second red box highlights the 'switch1-cpu' option in the dropdown menu, with a red arrow pointing to it from the main window's selection.

VLAN	Eg. VLAN Tag	In. VLAN Tran.	Eg. VLAN Tran.	1:1 VLAN Sw
1	ether1			
2	ether1, switch1-cpu			

3 items (1 selected)

Switch Egress Tag VLAN <2>

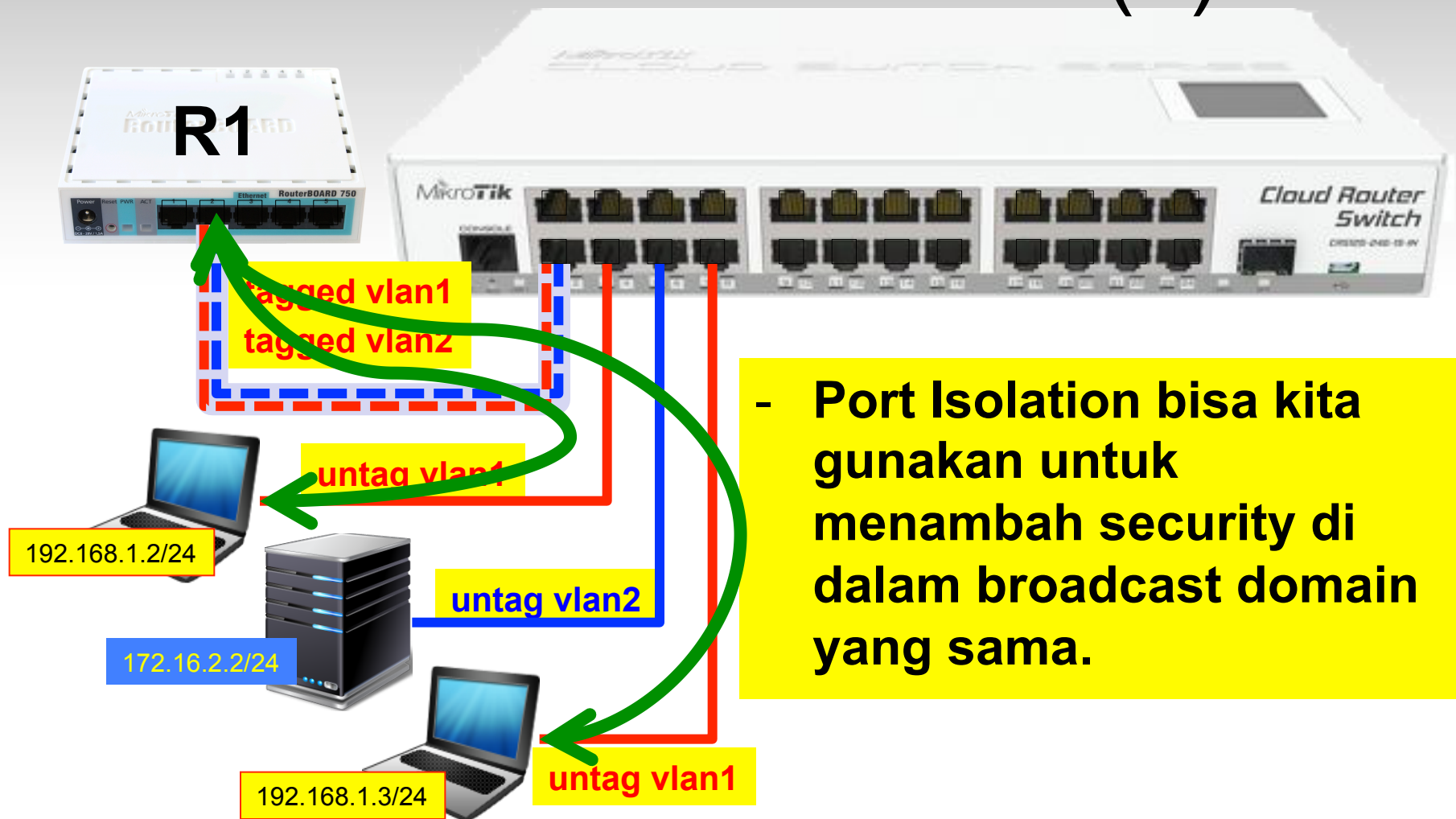
VLAN ID: 2

Tagged Ports: ether1

switch1-cpu

enabled

Contoh 4 - Port Isolation (1)



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)

The screenshot illustrates the configuration of Port Isolation in Mikrotik WinBox. The left sidebar shows the navigation tree with 'Switch' selected, leading to 'Ports'. The right pane shows the 'Switch Ports' window with the 'Port Isolation' tab active. A table lists network ports and their isolation profiles. Ports ether3, ether5, and ether9 are highlighted with red boxes, showing they are isolated.

Name	VLAN	Type	Isolation Profile	Isolation Prof...
ether1	29	network port	0 (promiscuous)	
ether3	29	network port	1 (isolated)	
ether5	29	network port	1 (isolated)	
ether7	29	network port		
ether2	30	network port		
ether4	30	network port		
ether6	30	network port		
ether8	30	network port		
ether9	30	network port		
ether10	30	network port		
ether11	30	network port		
ether12	30	network port		
ether13	30	network port		
ether14	30	network port		
ether15	30	network port		

26 items (1 selected)

Contoh 4 - Port Isolation (3)

Switch Port <ether1>

Generic Ingress VLAN Egress VLAN Mirroring QoS Queues TPIDs Counters

Name: ether1

VLAN Type: network port

Isolation Profile: 29

Isolation Profile Override: 0 (promiscuous)

TRUNK

Isolated

Switch Port <ether3>

Generic Ingress VLAN Egress VLAN Mirroring QoS Queues TPIDs Counters

Name: ether3

VLAN Type: network port

Isolation Profile: 29

Isolation Profile Override: 1 (isolated)

Switch Port <ether7>

Generic Ingress VLAN Egress VLAN Mirroring QoS Queues TPIDs Counters

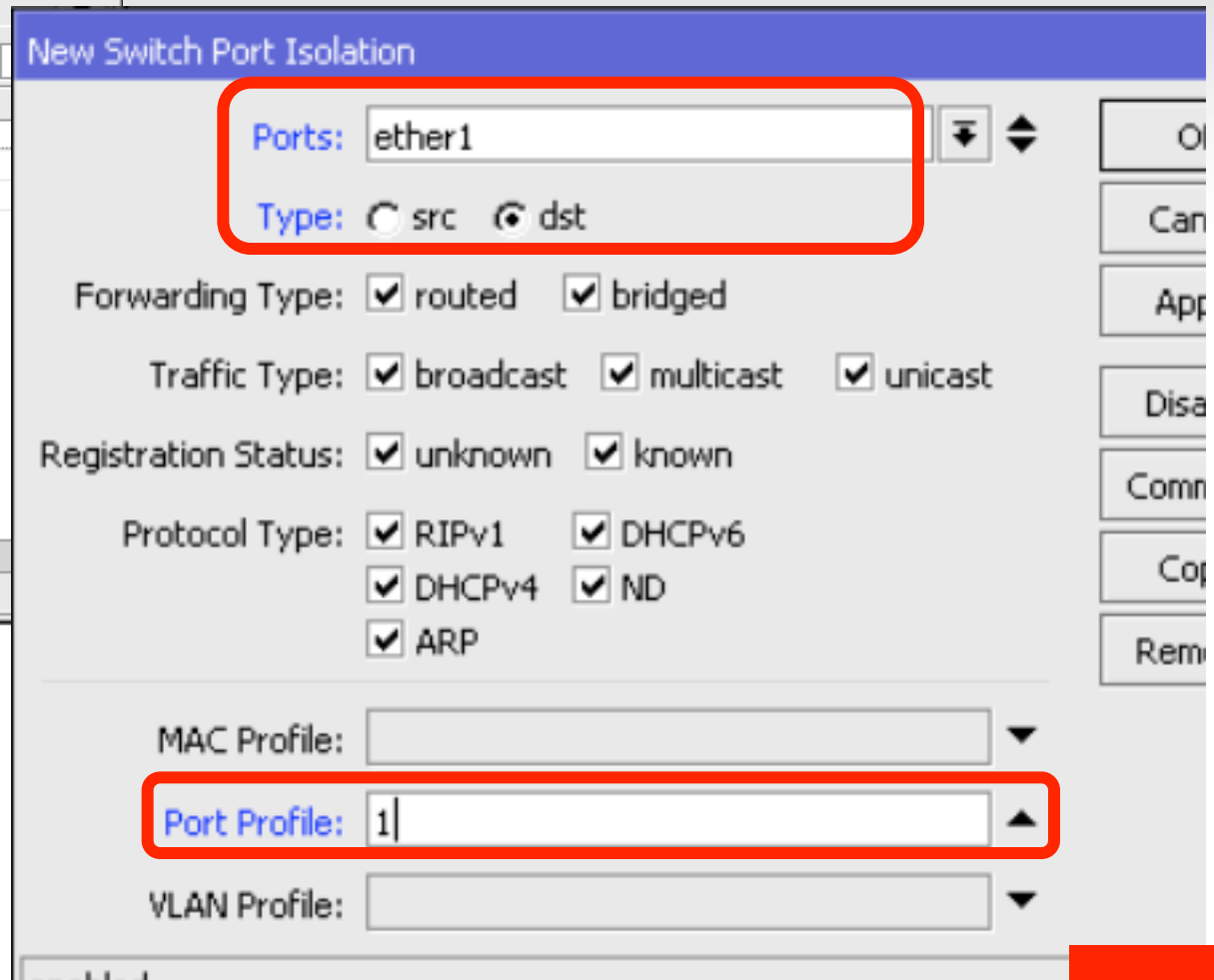
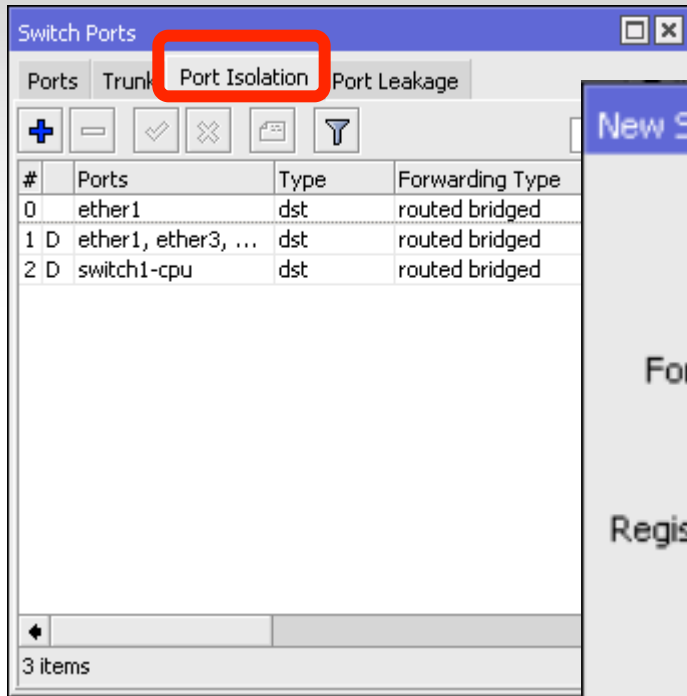
Name: ether7

VLAN Type: network port

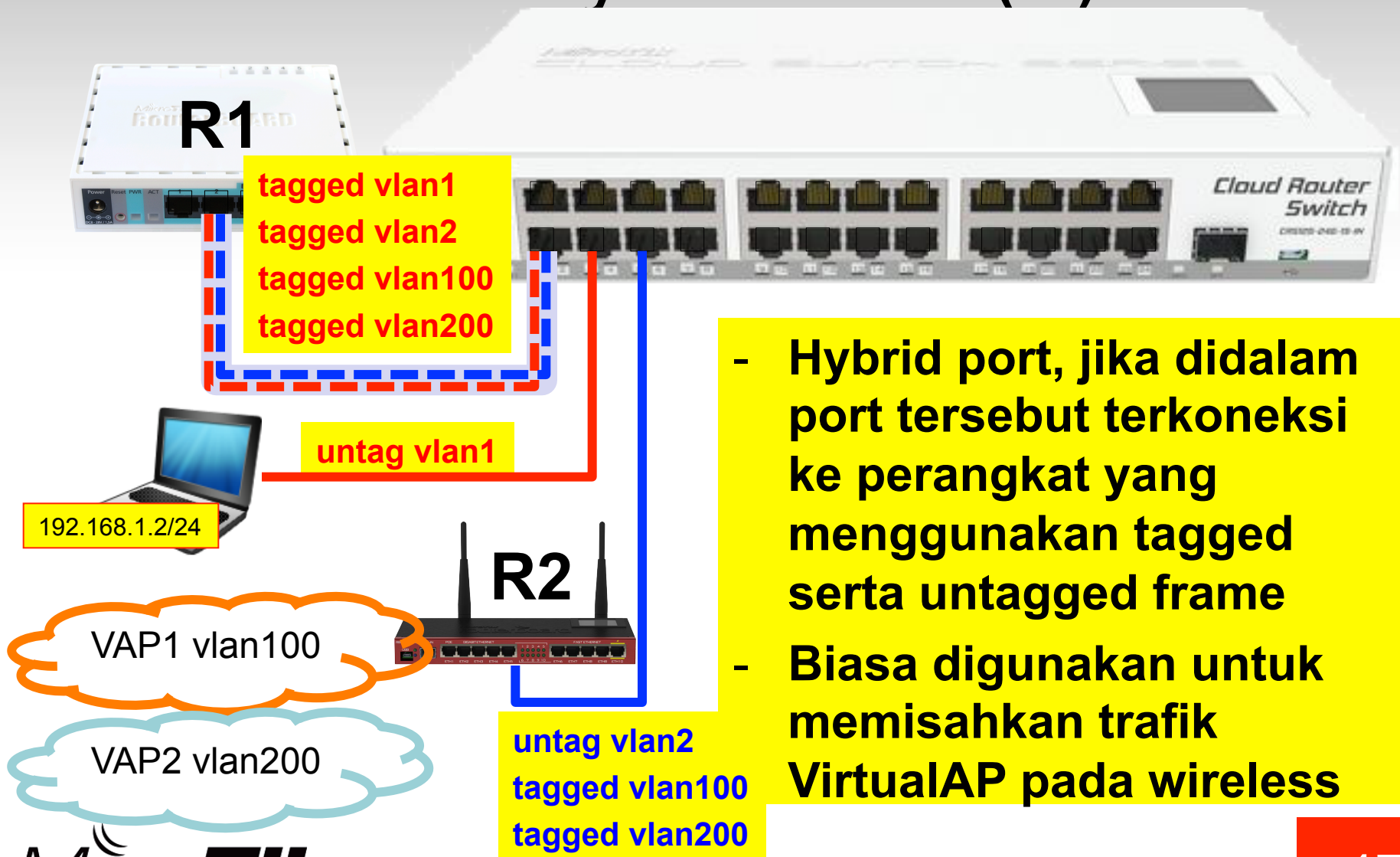
Isolation Profile: 29

Isolation Profile Override: 1 (isolated)

Contoh 4 - Port Isolation (4)



Contoh 5 - Hybrid Port (1)



- 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

Interface List				
GRE Tunnel VLAN VRRP Bonding LTE ...				
+ - ✓ ✗ [icon] Find				
	Name	Type	VLAN ID	Interface
R	vlan1	VLAN	1	ether1
R	vlan2	VLAN	2	ether1
R	vlan100	VLAN	100	ether1
R	vlan200	VLAN	200	ether1
4 items out of 10				

Find			
+ - ✓ ✗ [icon] Find			
	Address	Network	Interface
	172.16.1.1/24	172.16.1.0	vlan1
	172.16.2.1/24	172.16.2.0	vlan2
	172.16.100.1/24	172.16.100.0	vlan100
	172.16.200.1/24	172.16.200.0	vlan200
6 items			

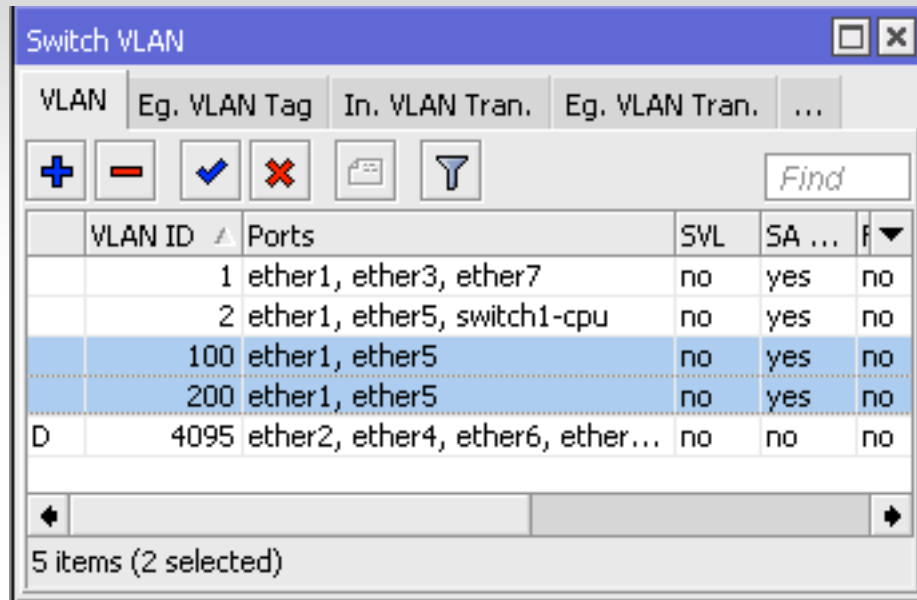
R2

Interface List				
IP Tunnel GRE Tunnel VLAN VRRP Bonding LTE ...				
+ - ✓ ✗ [icon] Find				
	Name	Type	VLAN ID	Interface
R	vlan100	VLAN	100	ether1
R	vlan200	VLAN	200	ether1
2 items out of 8				

Address List		
+ - ✓ ✗ [icon] Find		
	Address	Network
	172.16.2.3/24	172.16.2.0
	192.168.128....	192.168.128.0
2 items		

Contoh 5 - Hybrid Port (2)

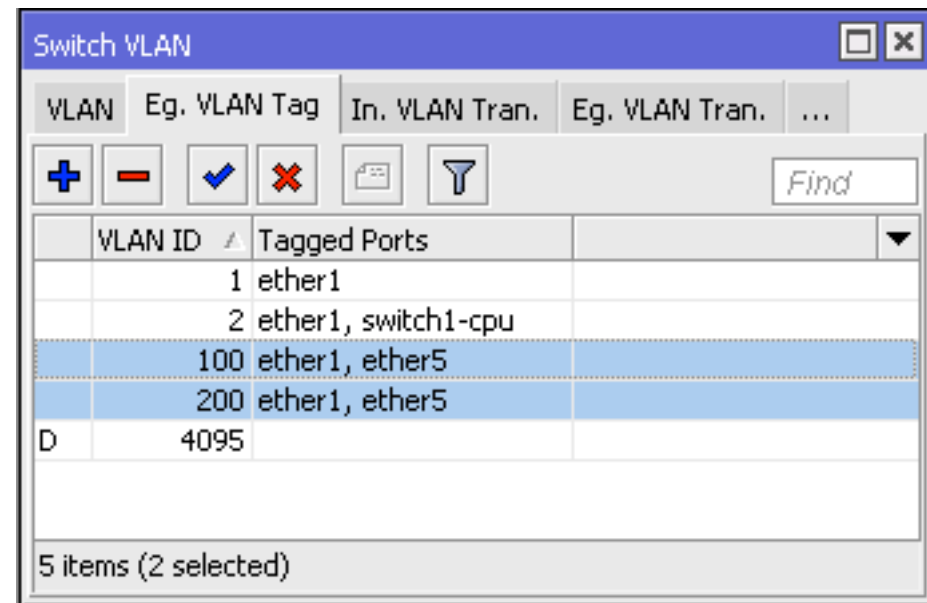
CRS



Switch VLAN

VLAN	Eg. VLAN Tag	In. VLAN Tran.	Eg. VLAN Tran.	...
+	-	✓	✗	Find
VLAN ID	Ports	SVL	SA ...	
1	ether1, ether3, ether7	no	yes	no
2	ether1, ether5, switch1-cpu	no	yes	no
100	ether1, ether5	no	yes	no
200	ether1, ether5	no	yes	no
D	4095 ether2, ether4, ether6, ether...	no	no	no

5 items (2 selected)

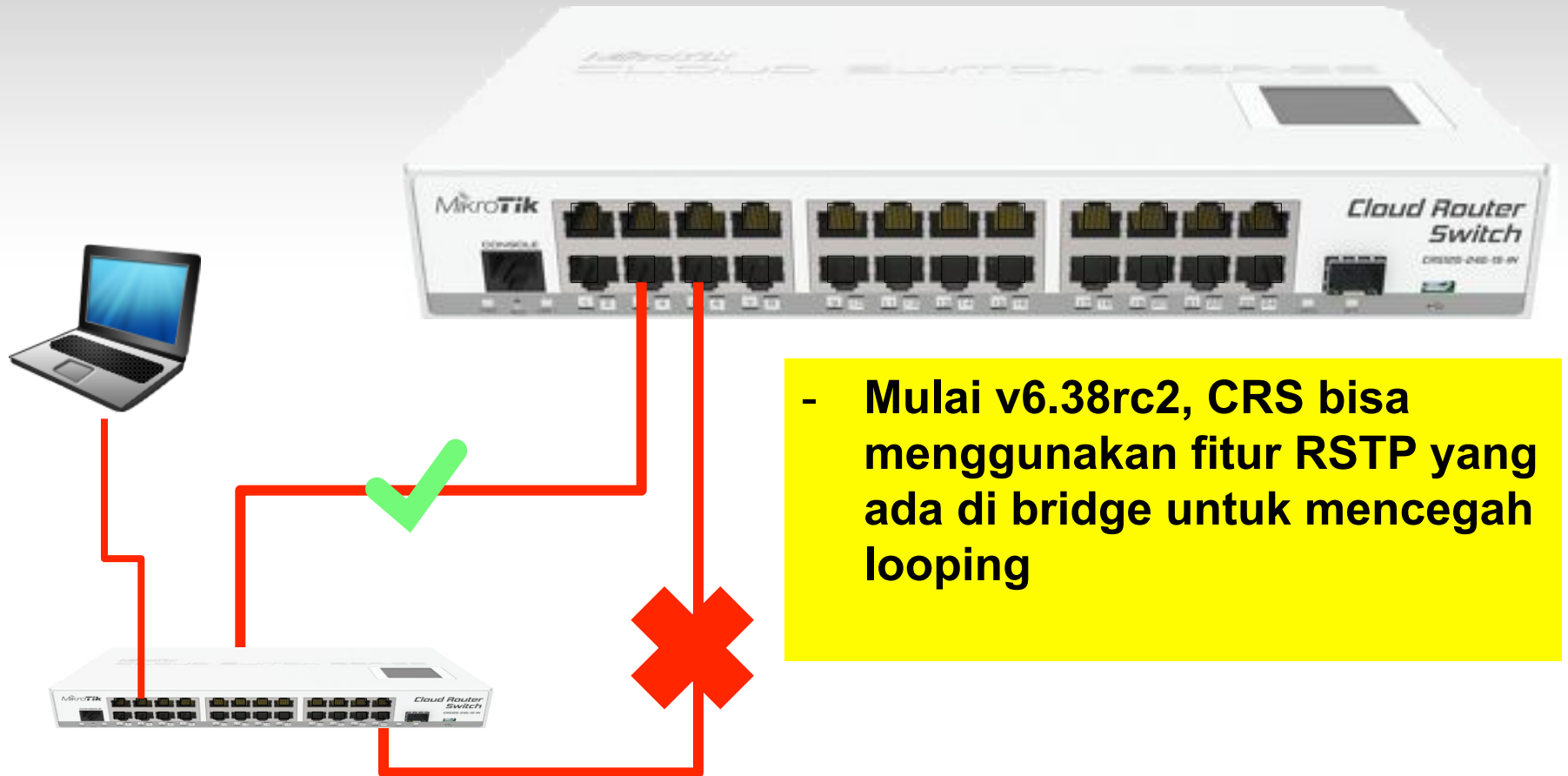


Switch VLAN

VLAN	Eg. VLAN Tag	In. VLAN Tran.	Eg. VLAN Tran.	...
+	-	✓	✗	Find
VLAN ID	Tagged Ports			
1	ether1			
2	ether1, switch1-cpu			
100	ether1, ether5			
200	ether1, ether5			
D	4095			

5 items (2 selected)

Contoh 6 - Loop Protection (1)



Contoh 6 - Loop Protection (2)

The image shows two overlapping Mikrotik WinBox dialog boxes. The background dialog is titled 'Interface <bridge-for-switching>' and has tabs for 'General', 'STP', 'Status', and 'Traffic'. The 'General' tab is active, showing fields for Name (bridge-for-switching), Type (Bridge), MTU, Actual MTU (1500), L2 MTU (65535), MAC Address, ARP (enabled), ARP Timeout, and Admin. MAC Address. The foreground dialog is titled 'New Interface' and also has tabs for 'General', 'STP', 'Status', and 'Traffic'. The 'STP' tab is active, showing 'Protocol Mode' with radio buttons for 'none' (selected), 'stp', and 'rstp'. Other fields include 'Priority' (8000 hex), 'Max Message Age' (00:00:20), 'Forward Delay' (00:00:15), 'Transmit Hold Count' (6), and 'Ageing Time' (00:05:00). Both dialogs have 'OK', 'Cancel', and 'Apply' buttons.

Interface <bridge-for-switching>

General | STP | Status | Traffic

Name: bridge-for-switching

Type: Bridge

MTU:

Actual MTU: 1500

L2 MTU: 65535

MAC Address:

ARP: enabled

ARP Timeout:

Admin. MAC Address:

OK

Cancel

Apply

New Interface

General | STP | Status | Traffic

Protocol Mode: ☒ none ☐ stp ☐ rstp

Priority: 8000 hex

Max Message Age: 00:00:20

Forward Delay: 00:00:15

Transmit Hold Count: 6

Ageing Time: 00:05:00

OK

Cancel

Apply

Disable

Comment

Copy

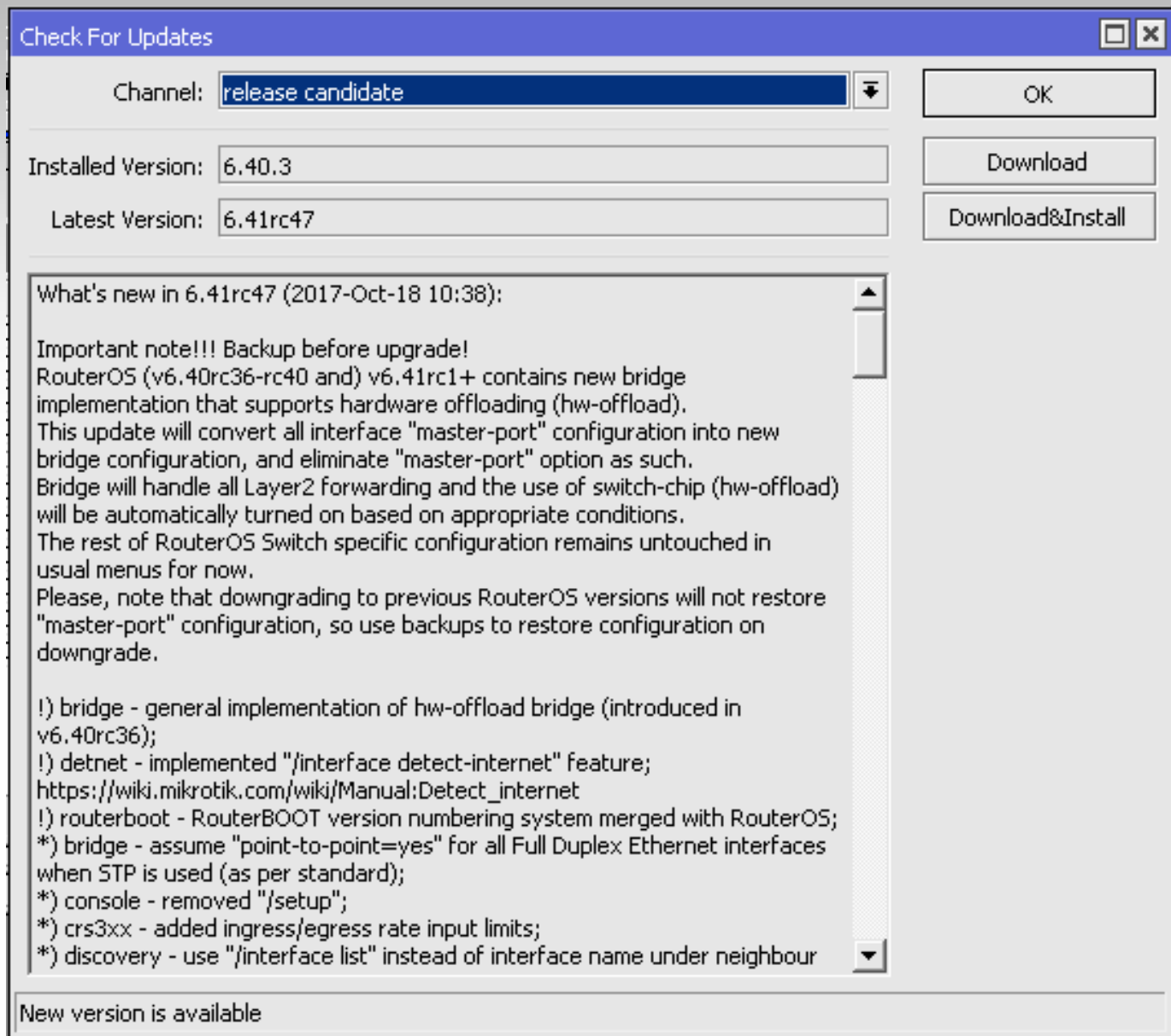
Remove

Torch

Contoh 6 - Loop Protection (3)

The screenshot displays the Mikrotik WinBox interface. On the left, the 'Bridge' configuration window is open, showing a list of ports under the 'Ports' tab. The list includes ether1 (designated port), ether3 (backup port), ether5 (disabled port), and ether7 (designated port). On the right, the 'New Bridge Port' dialog box is open, showing the 'General' tab. The 'Interface' is set to 'ether1' and the 'Bridge' is set to 'bridge-for-switching'. Other settings like Priority (80), Path Cost (10), and Edge (auto) are also visible.

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



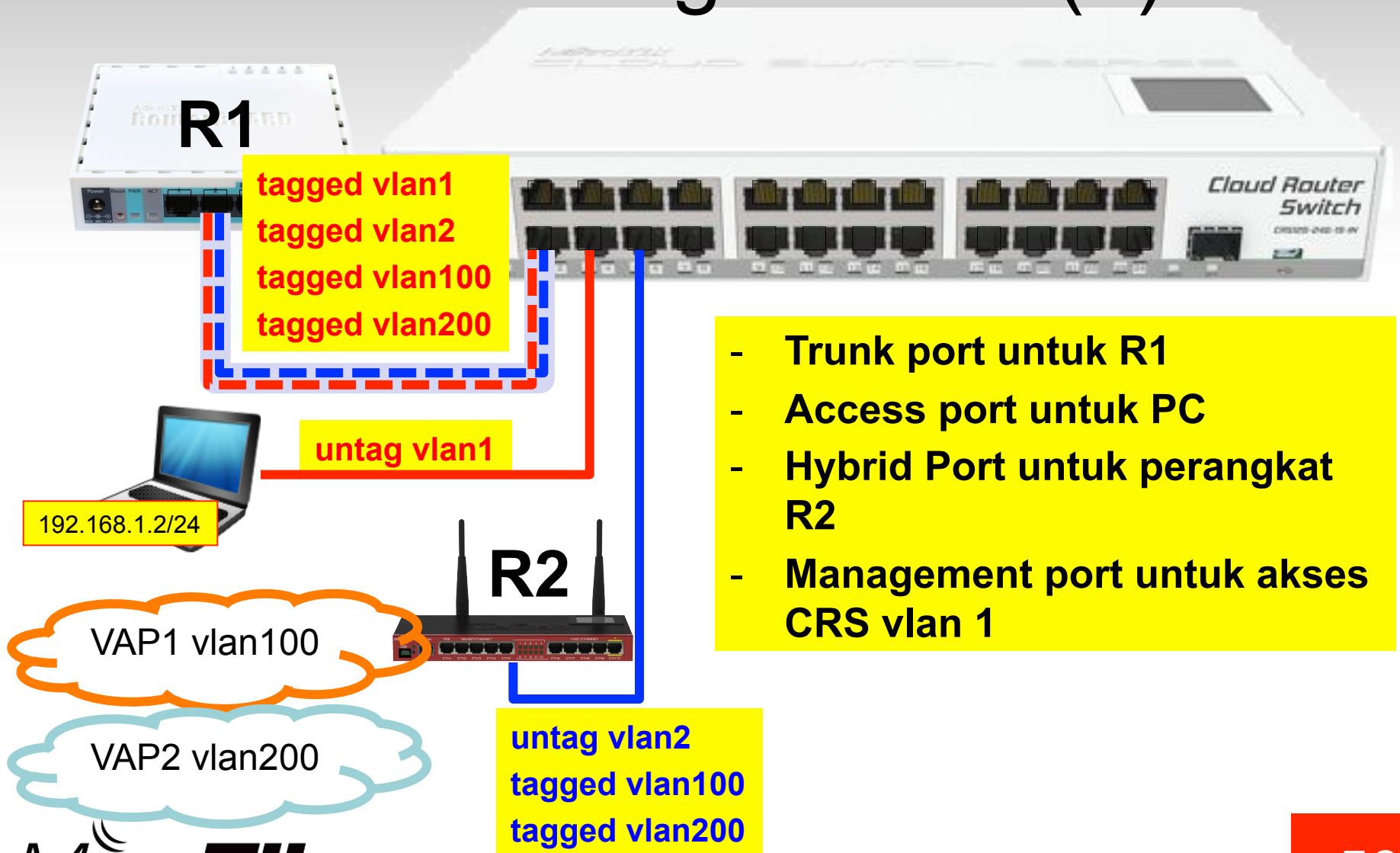
HW-Offloading

- Mulai versi 6.40rc36, Interface bridge pada RouterOS akan handle 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 Routerboard	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)



Contoh 7 - Bridge VLAN (2)

The screenshot displays the MikroTik WinBox interface for configuring a bridge. The main window shows a list of bridges with the following data:

Name	Type	L2 MTU	Tx	Rx
bridge-mainan-vlan	Bridge	1588	0 bps	0

Below the table, it indicates "1 item out of 32 (1 selected)".

Two pop-up windows are shown, both for the interface "bridge-mainan-vlan".

The top pop-up window shows the "General" tab configuration:

- Name: bridge-mainan-vlan
- Type: Bridge
- MTU: (empty)
- Actual MTU: 1500
- L2 MTU: 65535
- MAC Address: A2:E2:C3:FC:F8:31
- ARP: enabled

The bottom pop-up window shows the "VLAN" tab configuration:

- VLAN Filtering: ☐
- PVID: 1
- enabled
- running

Contoh 7 - Bridge VLAN (3)

The screenshot displays the Mikrotik WinBox interface for configuring bridge VLANs. The main window is titled 'Bridge' and shows a list of bridge ports. The 'ether1' port is selected, and a detail window is open for it.

Bridge List:

#	Interface	Bridge	Hardware Offload	PVID	Hw. Offload
16	ether1	bridge-mainan-vlan	yes	1	yes
17	ether3	bridge-mainan-vlan	yes	1	yes
18	ether5	bridge-mainan-vlan	yes	2	yes

3 items out of 19 (1 selected)

Bridge Port <ether1> Configuration:

- General tab selected
- Interface: ether1
- Bridge: bridge-mainan-vlan
- Horizon: (empty)
- External FDB: auto
- ☒ Hardware Offload

Contoh 7 - Bridge VLAN (4)

Bridge Port <ether3>

General STP VLAN Status

Interface: ether3

Bridge: bridge-mainan-vlan

Horizon:

External FDB: auto

☒ Hardware Offload

Bridge Port <ether3>

General STP VLAN Status

PVID: 1

Frame Types: admit all

☐ Ingress Filtering

Bridge Port <ether5>

General STP VLAN Status

Interface: ether5

Bridge: bridge-mainan-vlan

Horizon:

External FDB: auto

☒ Hardware Offload

Bridge Port <ether5>

General STP VLAN Status

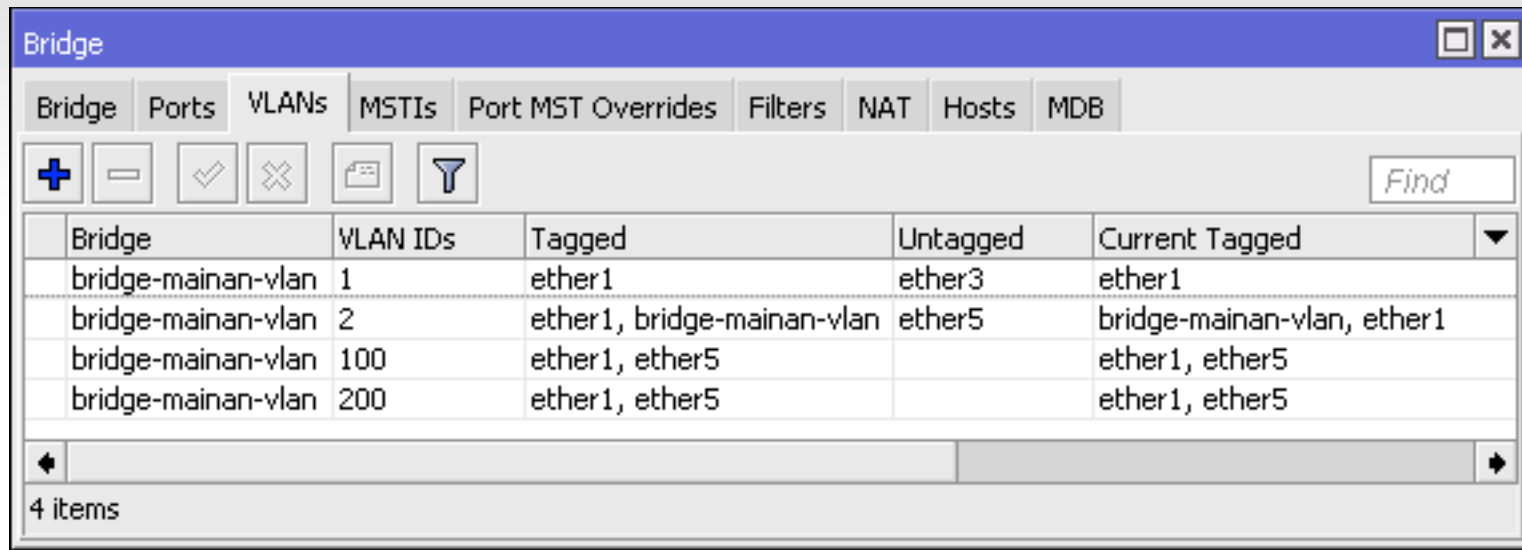
PVID: 2

Frame Types: admit all

☐ Ingress Filtering

PVID digunakan untagged frame

Contoh 7 - Bridge VLAN (5)



Bridge	VLAN IDs	Tagged	Untagged	Current Tagged
bridge-mainan-vlan	1	ether1	ether3	ether1
bridge-mainan-vlan	2	ether1, bridge-mainan-vlan	ether5	bridge-mainan-vlan, ether1
bridge-mainan-vlan	100	ether1, ether5		ether1, ether5
bridge-mainan-vlan	200	ether1, ether5		ether1, ether5

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

Contoh 7 - Bridge VLAN (6)

Bridge VLAN <1>

Bridge:

VLAN IDs:

Tagged:

Untagged:

Bridge VLAN <2>

Bridge:

VLAN IDs:

Tagged:

Untagged:

Bridge VLAN <100>

Bridge:

VLAN IDs:

Tagged:

Untagged:

Bridge VLAN <200>

Bridge:

VLAN IDs:

Tagged:

Untagged:

Contoh 7 - Bridge VLAN (7)

Interface List

	Name	Type	Actual
R	bridge-mainan-vlan	Bridge	
R	vlan2	VLAN	
RS	ether1	Ethernet	
	ether2	Ethernet	
RS	ether3	Ethernet	
	ether4	Ethernet	
RS	ether5	Ethernet	
	ether6	Ethernet	
R	ether7	Ethernet	
	ether8	Ethernet	
RS	ether9	Ethernet	
RS	ether10	Ethernet	
RS	ether11	Ethernet	
RS	ether12	Ethernet	

32 items (1 selected)

Interface <vlan2>

General | Loop Protect | Status | Traffic

Name: vlan2

Type: VLAN

VLAN ID: 2

Interface: bridge-mainan-vlan

☐ Use Service Tag

Address List

Address	Network	Interface
172.16.2.5/24	172.16.2.0	vlan2
192.168.128....	192.168.128.0	monitoring

2 items

Contoh 7 - Bridge VLAN (8)

The image shows two windows from the Mikrotik WinBox interface. The top window is the 'Bridge' configuration window, with the 'VLANs' tab selected. It displays a table of bridge VLANs. The bottom window is the 'Interface <bridge-mainan-vlan>' configuration window, with the 'VLAN' tab selected. In this window, the 'VLAN Filtering' checkbox is checked and highlighted with a red rectangle. The 'PVID' is set to 1.

Bridge Window:

Name	Type	L2 MTU	Tx	Rx	Tx Pac...	Rx ...	FP Tx	FP R
R bridge-mainan-vlan	Bridge	1588	0 bps	0 bps	0	0	0 bps	

Interface <bridge-mainan-vlan> Window:

☒ VLAN Filtering

PVID: 1

- 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!

Dijinkan menggunakan sebagian atau seluruh materi pada modul ini, baik berupa ide, foto, tulisan, konfigurasi dan diagram selama untuk kepentingan pengajaran, dan memberikan kredit kepada penulis serta link ke www.mikrotik.co.id

