

MODUL

UJI KOMPETENSI KEAHLIAN
TAHUN PELAJARAN 2025/2026

Satuan Pendidikan : Sekolah Menengah Kejuruan
 Konsentrasi Keahlian : Teknik Komputer dan Jaringan
 Kode : KM25.4.2.1
 Judul : Membangun Sistem Keamanan Jaringan
 Serta Monitoring real-time terhadap Perangkat dan Server.

1. Topologi Teknis

- Router sebagai *gateway* dan *firewall*.
- *Switch manageable* sebagai segmentasi VLAN.
- Server Linux sebagai *DNS*, *Web Server*, dan *Monitoring Server*.

2. Rincian Teknis

VLAN

VLAN	Nama	Network	Gateway
10	Guru_Admin	192.168.1xx.0/24	192.168.1xx.1
20	Siswa	192.168.2xx.0/24	192.168.2xx.1
30	Server	192.168.30.0/24	192.168.30.1

Ket: xx pada penggunaan IP Address merupakan nomor urut Absen (Contoh: Siswa bernama Ahmad dengan nomor urut absen 1, maka penggunaan Networknya: 192.168.101.0/24)

Server Linux (Static)

- IP: **192.168.30.10/24**
- *DNS + Web + Monitoring*

Domain

- **ukksmktkj.xyz**

KONFIGURASI PERANGKAT

1. Konfigurasi Router

- Buat VLAN 10, 20, 30 pada *interface trunk (ether2)*.
- Atur pengelamatan IP:
 - 192.168.1xx.1/24
 - 192.168.2xx.1/24
 - 192.168.30.1/24
- Buat *DHCP Server* untuk VLAN 10 & 20.
- Buat *NAT Masquerade* untuk akses internet.
- Limitasi Bandwidth VLAN-10 dan VLAN-20 menggunakan Queue

2. Konfigurasi Switch Manageable

- Membuat VLAN 10, 20, 30 di *switch*.

3. Konfigurasi Server Linux

DNS Server

- Membuat *zone ukksmktkj.xyz*
- Record:

ukksmktkj.xyz	A	192.168.30.10
www	A	192.168.30.10
monitor	A	192.168.30.10

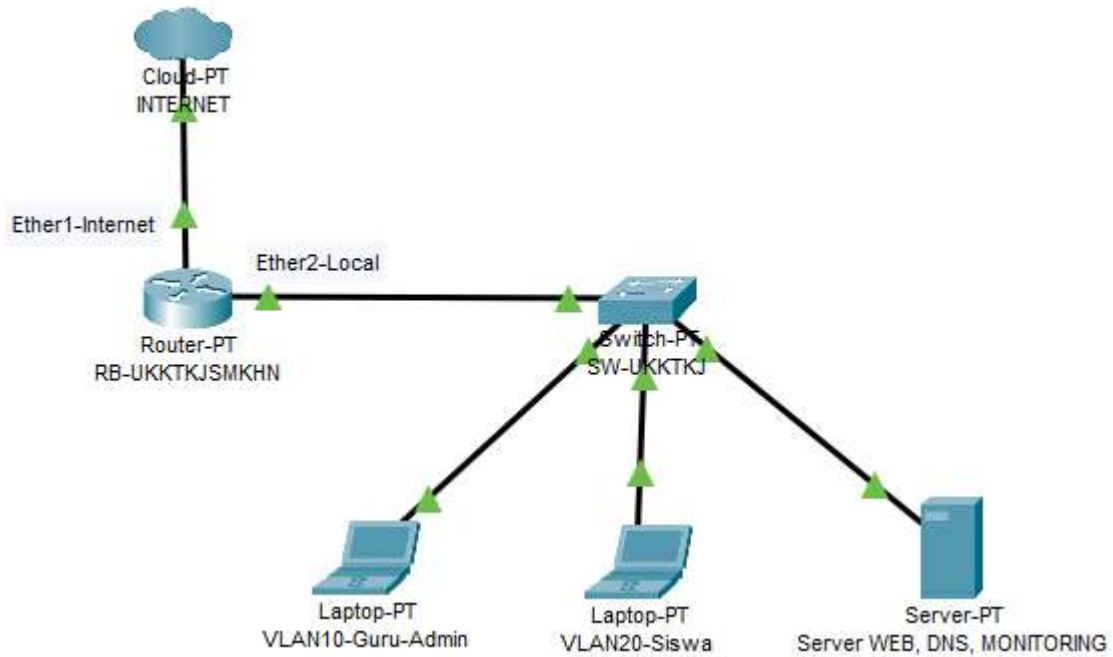
Web Server

- Menampilkan halaman web sederhana.

Monitoring Server

- *Install Zabbix/Prometheus/Cacti.*

Gambar Kerja :

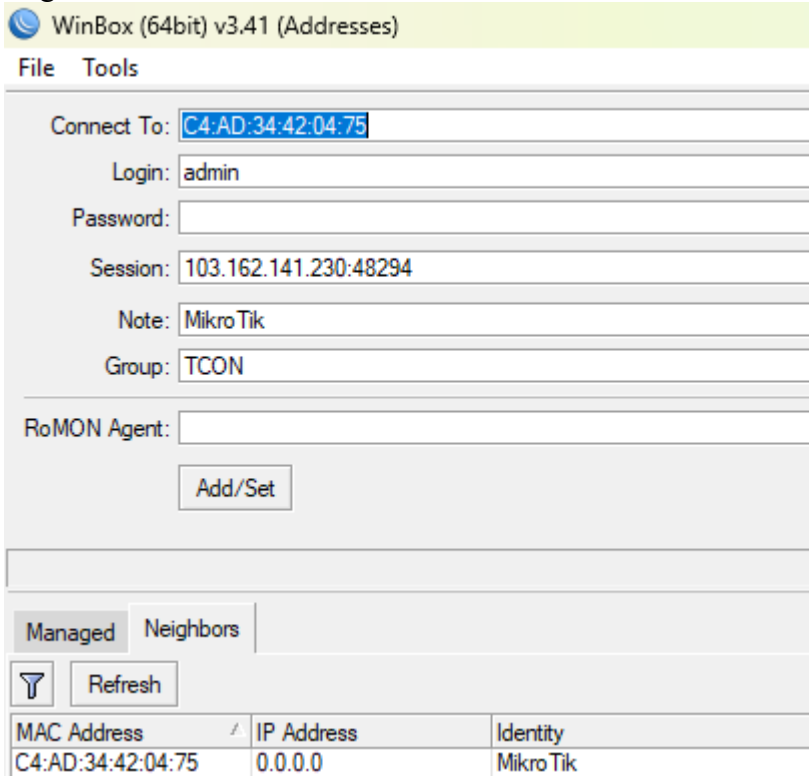


PEMBAHASAN:

A. Pasang Jaringan Sesuai Topologi di atas

B. Konfigurasi Router

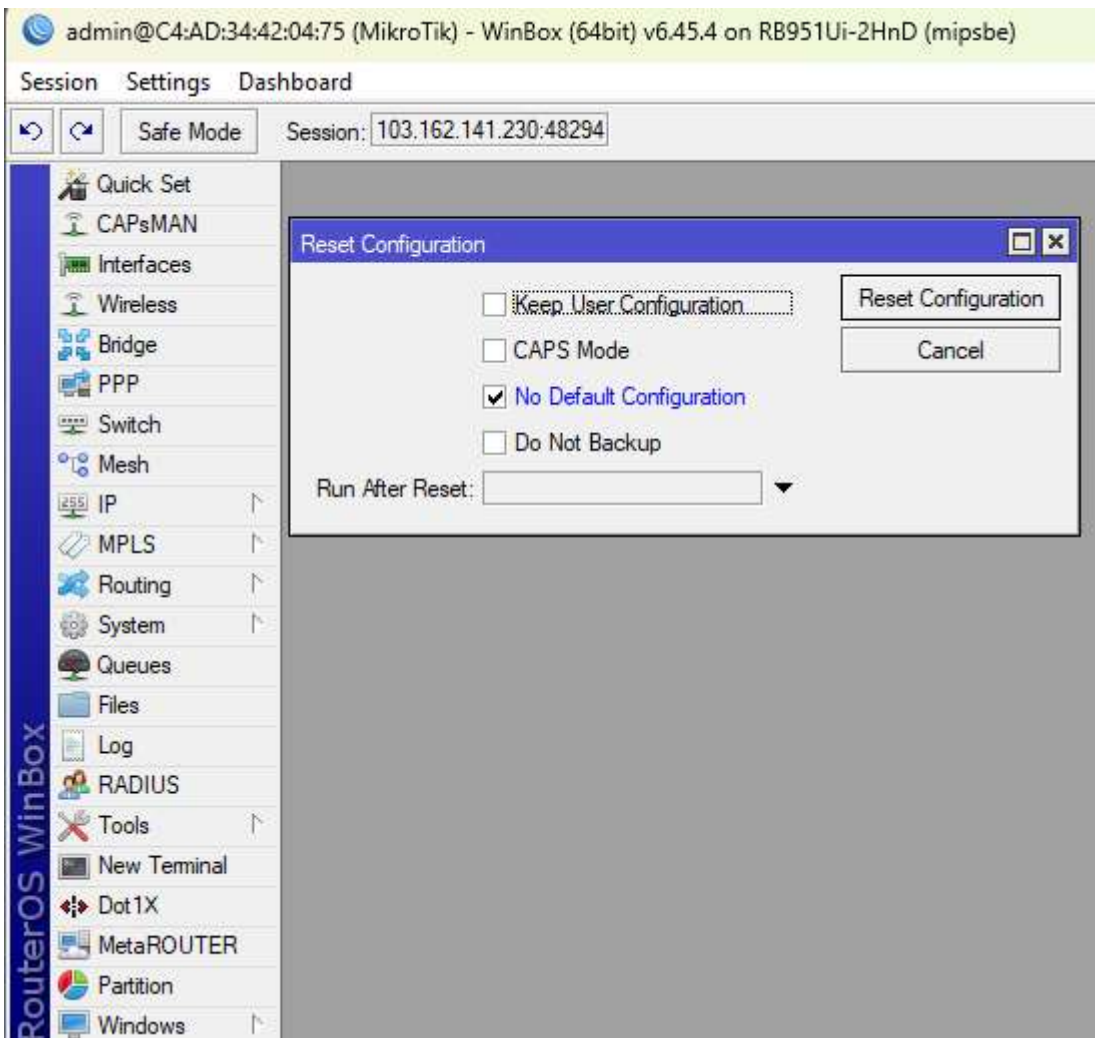
1. Login ke Router via Winbox



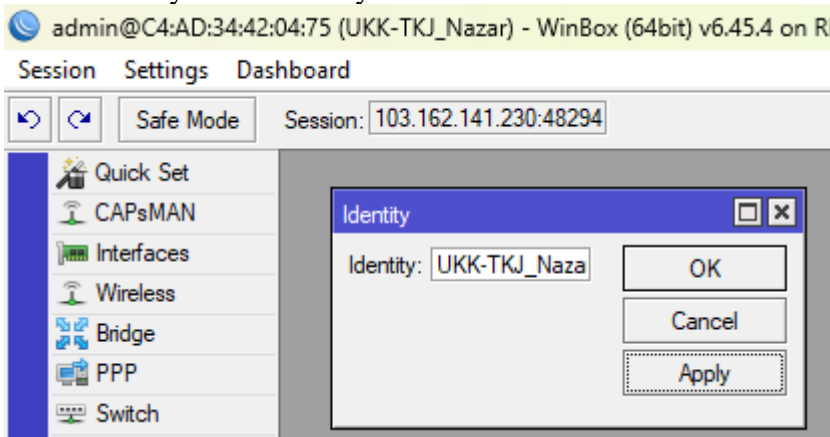
The screenshot shows the WinBox (64bit) v3.41 (Addresses) interface. The 'Connect To' field is set to C4:AD:34:42:04:75. The 'Login' field is set to admin. The 'Password' field is empty. The 'Session' field is set to 103.162.141.230:48294. The 'Note' field is set to MikroTik. The 'Group' field is set to TCON. The 'RoMON Agent' field is empty. There is an 'Add/Set' button below the 'RoMON Agent' field. Below the form, there are tabs for 'Managed' and 'Neighbors'. The 'Neighbors' tab is selected. There is a 'Refresh' button and a filter icon. Below the tabs, there is a table with the following data:

MAC Address	IP Address	Identity
C4:AD:34:42:04:75	0.0.0.0	MikroTik

2. Setelah berhasil login, lakukan Reset System dengan memilih menu System> Reset Configuration> No Default Configuration> Reset Configuration, dan tunggu Router melakukan Reboot dan Connect lagi ke Router.



3. Rename Identity Router dari Mikrotik menjadi “UKK-TKJ_Nama” (Nama disesuaikan dengan nama masing-masing)
Pilih menu System> Identity



4. Tambahkan user baru pada menu System> User

User List				
Users	Groups	SSH Keys	SSH Private Keys	Active Users
<div style="display: flex; justify-content: space-between; align-items: center;"> + - ✓ ✗ 📄 🔍 AAA </div>				
Name	Group	Allowed Address	Last Logged In	
::: system default user				
X admin	full		Apr/04/2026 12:39:06	
nazar	full			

Kemudian user admin di Disable, untuk menghindari salah masuk Router pada saat ujian, karena menggunakan banyak Router.

- Rename Interface ethernet
 “ether1” menjadi “ether1-WAN”
 “ether2” menjadi “ether2-LAN”
 “ether5” menjadi “ether5-MANAGEMENT”

Interface List					
Interface	Interface List	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel
R	ether1-WAN	Ethernet			
R	ether2-LAN	Ethernet			
	ether3	Ethernet			
	ether4	Ethernet			
R	ether5-MANAGEMENT	Ethernet			
X	wlan1	Wireless (Atheros AR9...			

- Tambahkan DHCP-Client untuk mendapatkan Internet: pilih menu DHC-Client+Interface ether1-WAN> Add Default Route=no kemudian pastikan status bound.

The screenshot shows the DHCP Client configuration window for the interface ether1-WAN. The status is 'bound'. The configuration details are as follows:

Interface	Use Peer DNS	Use Peer NTP	Add Default Route	IP Address	Expires After	Status
ether1-WAN	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	no	172.27.100.250/24	00:29:42	bound

The configuration dialog for ether1-WAN shows:

- Interface: ether1-WAN
- Use Peer DNS:
- Use Peer NTP:
- Add Default Route: no

- Tambahkan Route: Pilih menu IP> Route+Gateway isikan IP Gateway= 172.27.100.1

The screenshot shows the 'New Route' configuration window with the following settings:

- General tab selected
- Dst. Address: 0.0.0.0/0
- Gateway: 172.27.100.1
- Check Gateway:
- Type: unicast
- Distance: 1
- Scope: 30
- Target Scope: 10
- Routing Mark:
- Pref. Source:

Cek kembali IP Route”

Route List		
Routes	Nexthops	Rules
DAC	172.27.100.0/24	ether1-WAN reachable
AS	0.0.0.0/0	172.27.100.1 reachable ether1-WAN

8. Tambahkan DNS-Server: Pilih menu IP>DNS> Allow Remote Reques=yes lalu tambahkan IP DNS Server= 192.168.30.10

DNS Settings

Servers: 192.168.30.10

Dynamic Servers: 172.27.100.1, 8.8.8.8, 8.8.4.4

Allow Remote Requests

Max UDP Packet Size: 4096

Query Server Timeout: 2.000 s

Query Total Timeout: 10.000 s

Max. Concurrent Queries: 100

Max. Concurrent TCP Sessions: 20

Buttons: OK, Cancel, Apply, Static, Cache

9. Cek koneksi Router ke Internet: Pilih menu Tool> Pin> masukan DNS Google: 8.8.8.8 klik start, dan pastikan mendapatkan koneksi

Ping

General / Advanced

Ping To: 8.8.8.8

Interface: [Dropdown]

ARP Ping

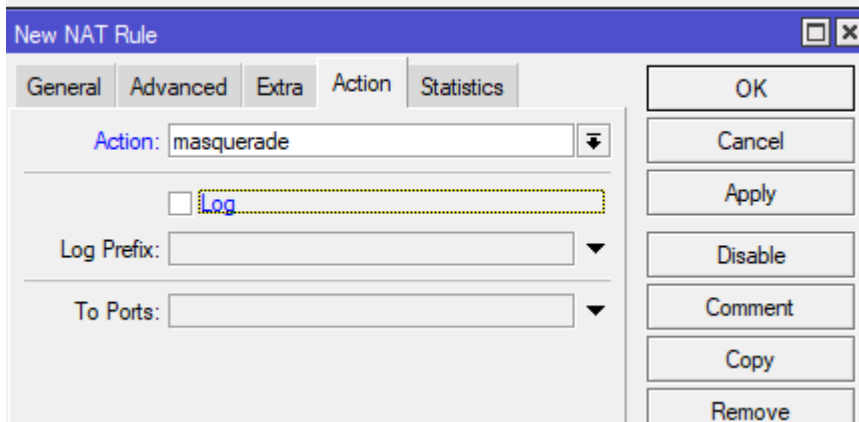
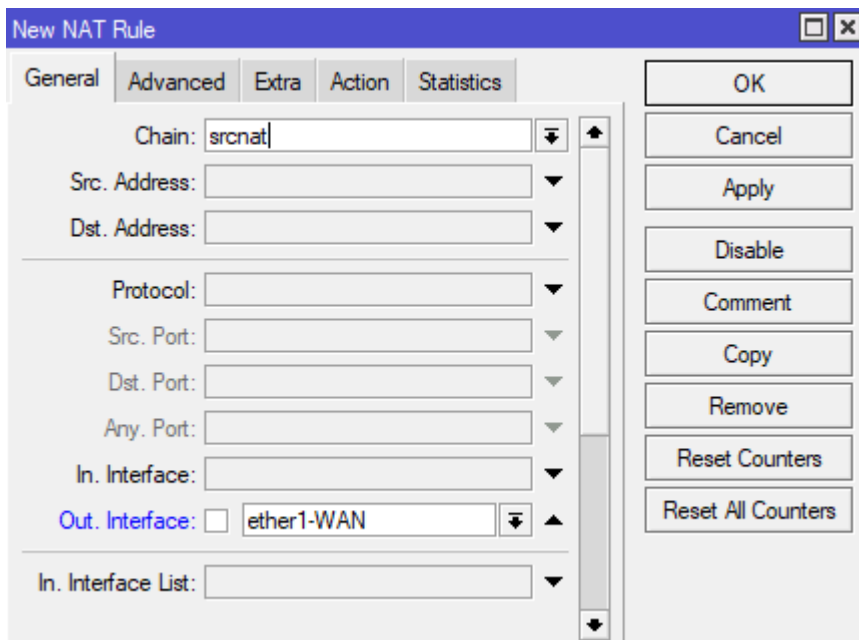
Packet Count: [Dropdown]

Timeout: 1000 ms

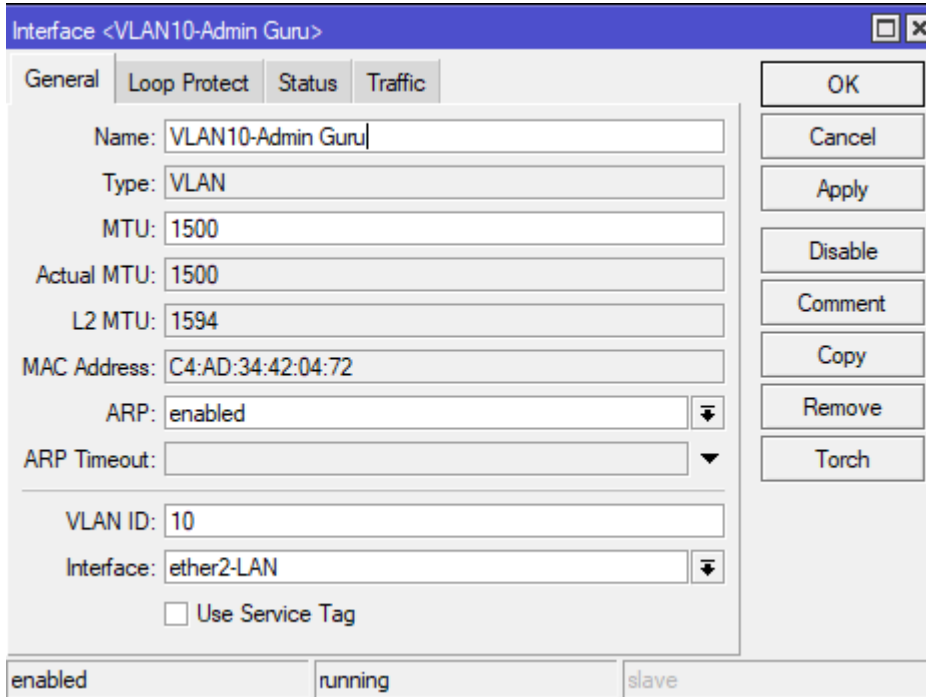
Buttons: Start, Stop, Close, New Window

Seq #	Host	Time	Reply Size	TTL	Status
0	8.8.8.8	3ms	50	114	
1	8.8.8.8	3ms	50	114	
2	8.8.8.8	3ms	50	114	
3	8.8.8.8	3ms	50	114	

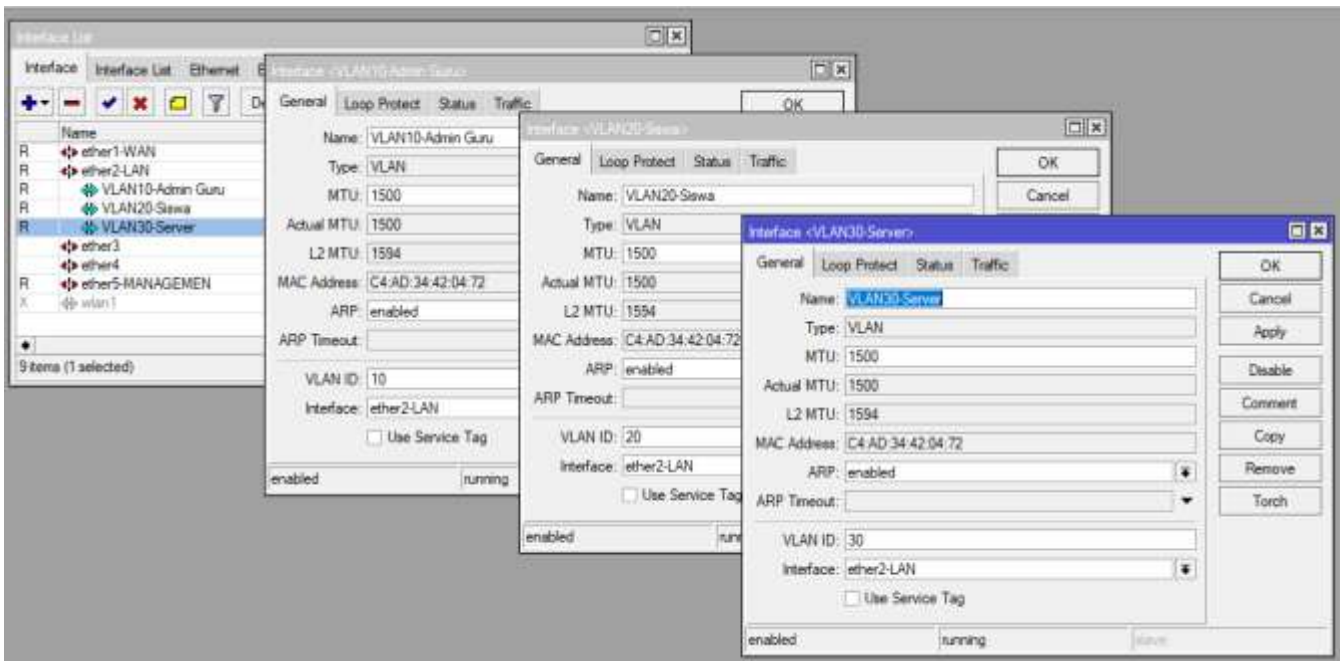
10. Tambahkan Firewall NAT, Pilih menu IP> Firewall NAT+General chain=srcnat> Out Interface=ether1-WAN> Action=masquerade



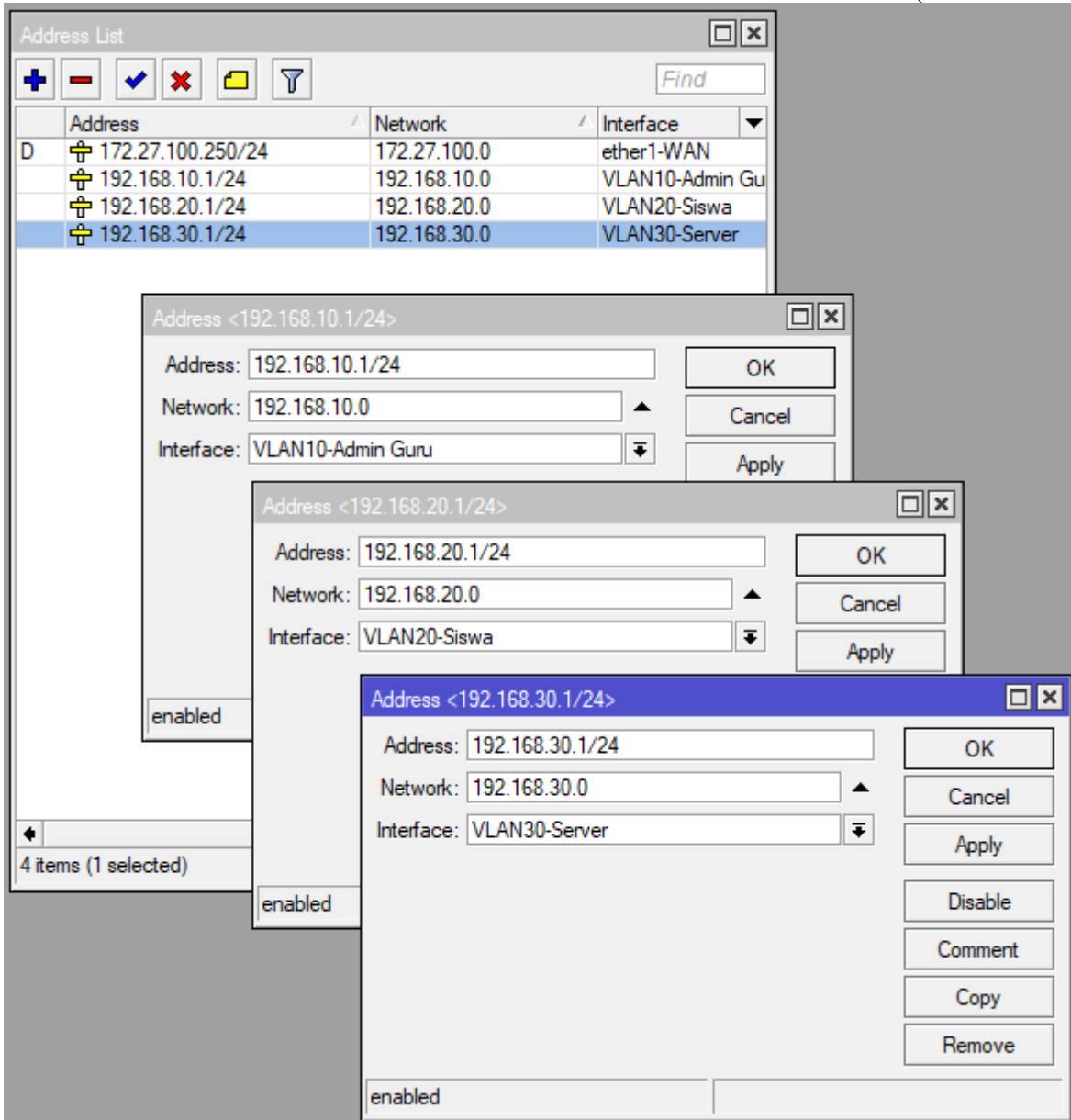
11. Tambahkan Interface **VLAN10**, **VLAN20**, **VLAN30** pada interface “**ether2-LAN**”
 Pilih menu Interface>VLAN+name=VLAN10> VLAN ID=10> Interface=**ether2-LAN**



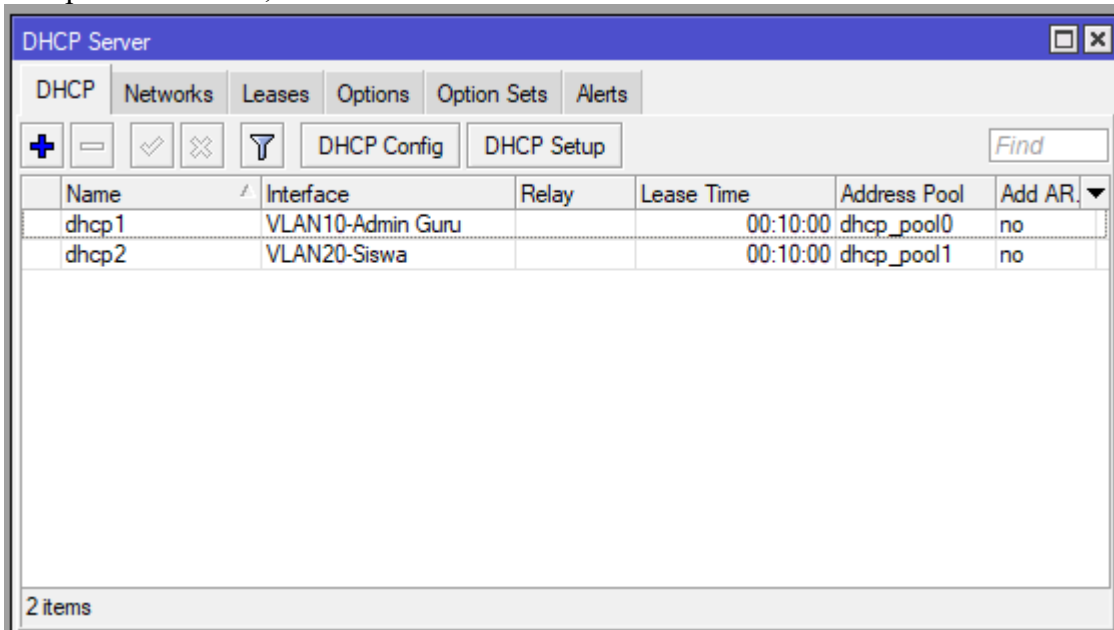
Lakukan langkah yang sama untuk VLAN20 dan VLAN30



12. Tambahkan IP Address untuk masing-masing VLAN: penting di perhatikan penggunaan IP Address disesuaikan:
 Pilih menu IP> Address+Masukan IP: 192.168.10.1/24> Interface=VLAN10 (IP disesuaikan)



13. Tambahkan DHCP-Server untuk VLAN10 dan VLAN20
Pilih menu DHC-Server> DHCP Setup> DHCP Server interface>
VLAN10>Next>Next>Next>DNS Server=192.168.30.10>Next>Next
Dan pastikan sukses;

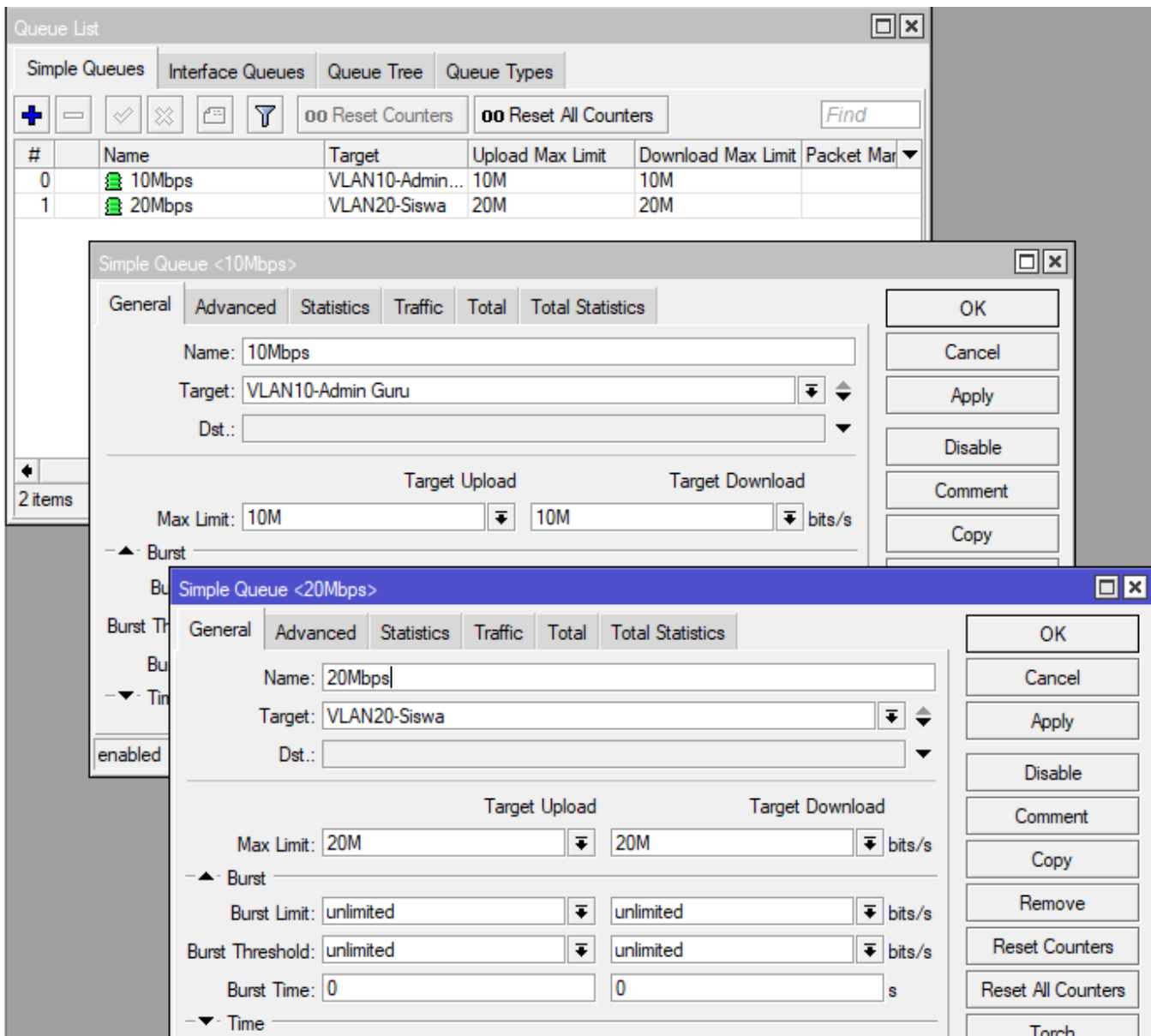


The screenshot shows the DHCP Server configuration window with the following table:

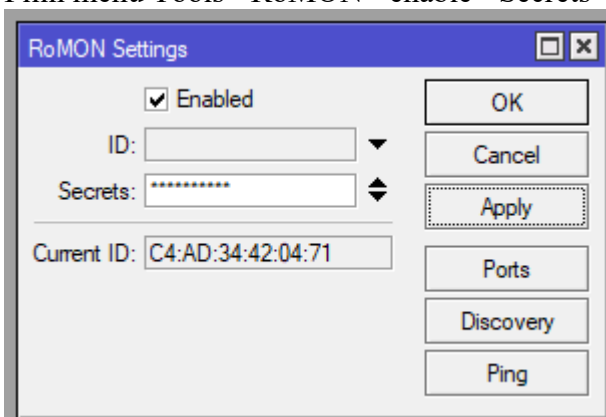
Name	Interface	Relay	Lease Time	Address Pool	Add AR.
dhcp1	VLAN10-Admin Guru		00:10:00	dhcp_pool0	no
dhcp2	VLAN20-Siswa		00:10:00	dhcp_pool1	no

2 items

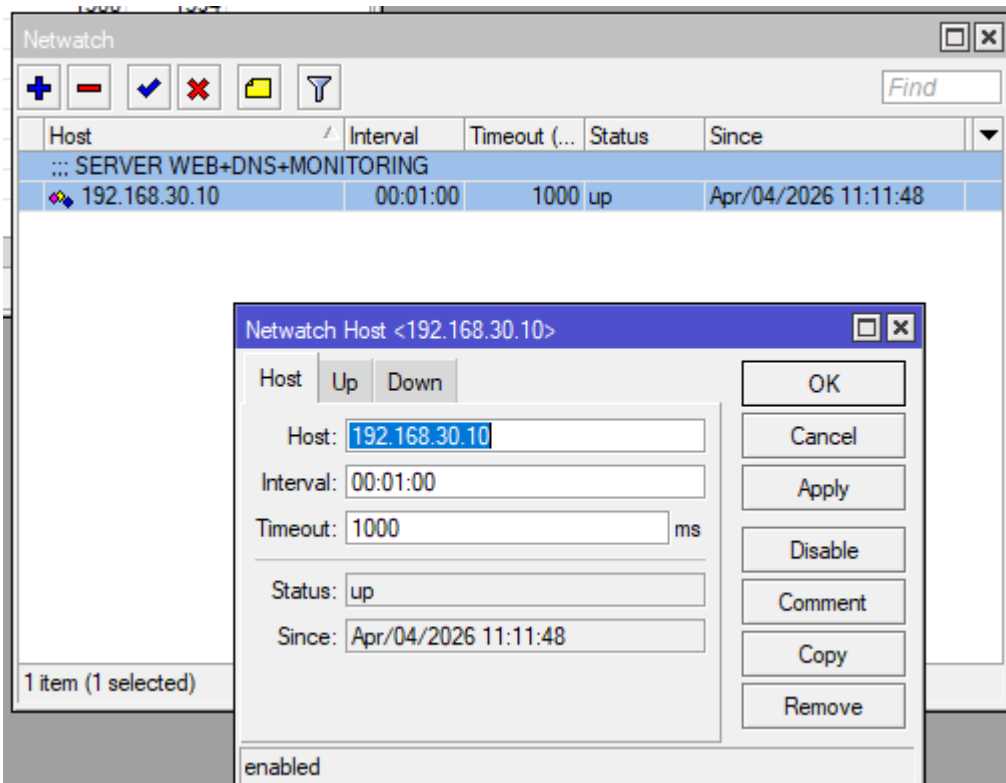
14. Limitasi Bandwidth untuk VLAN10=10Mbps dan VLAN20=20Mbps
Pilih menu Queue> Simple Queue+ Name= 10Mbps> Target= VLAN10-Admin Guru> Max
Limit 10M target Upload> 10M target Download



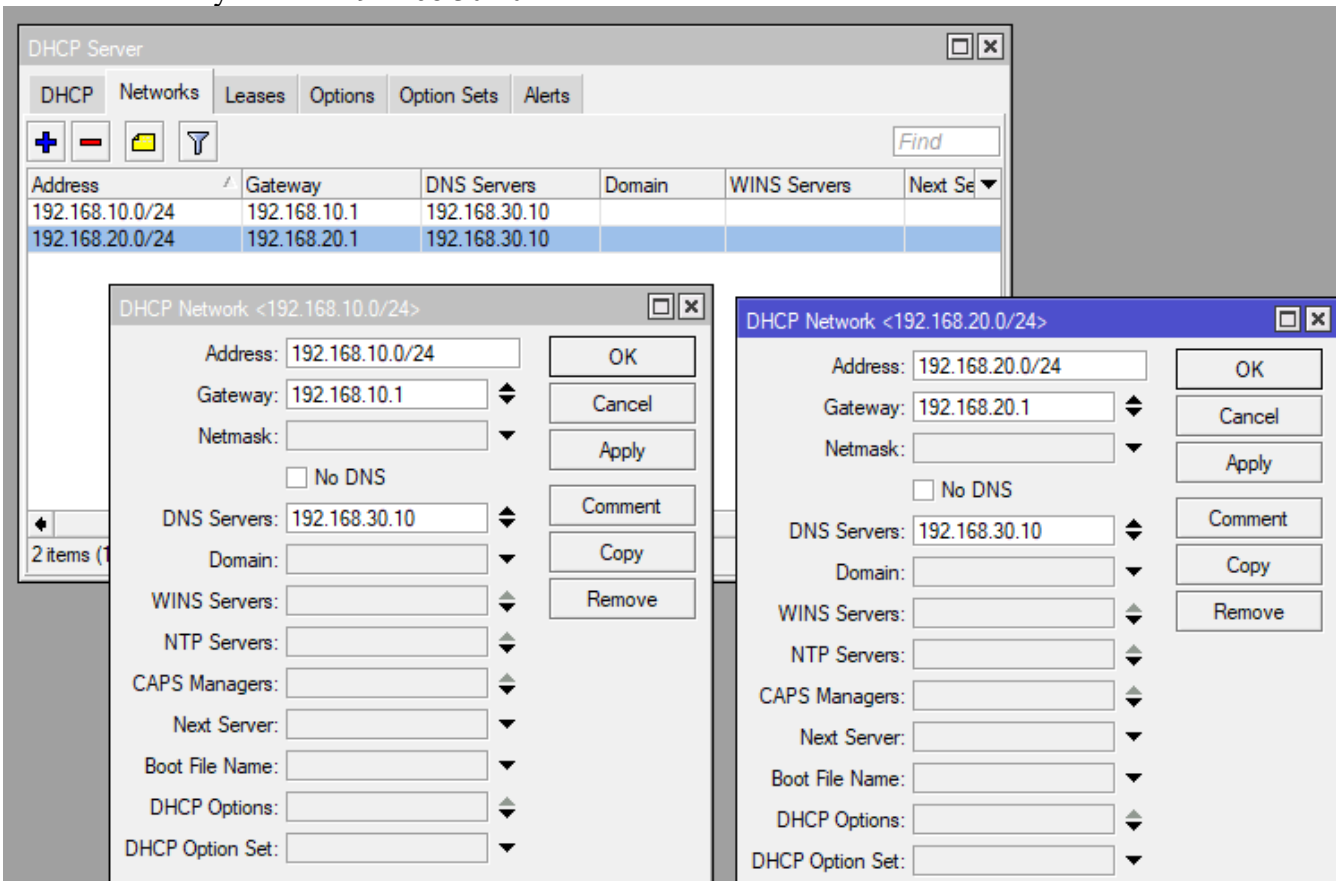
15. Aktifkan Fitur RoMON, agar bisa remote dua perangkat Router dan Switch.
Pilih menu Tools> RoMON> enable> Secrets= masukan **ukktkj2026**



16. Pasang Tools Netwatch untuk memantau status Server
Pilih menu Tools> Netwatch+ Host= 192.168.30.10



17. Seting DHCP-Server Network
 DNS Server hanya tersisa 192.168.30.10

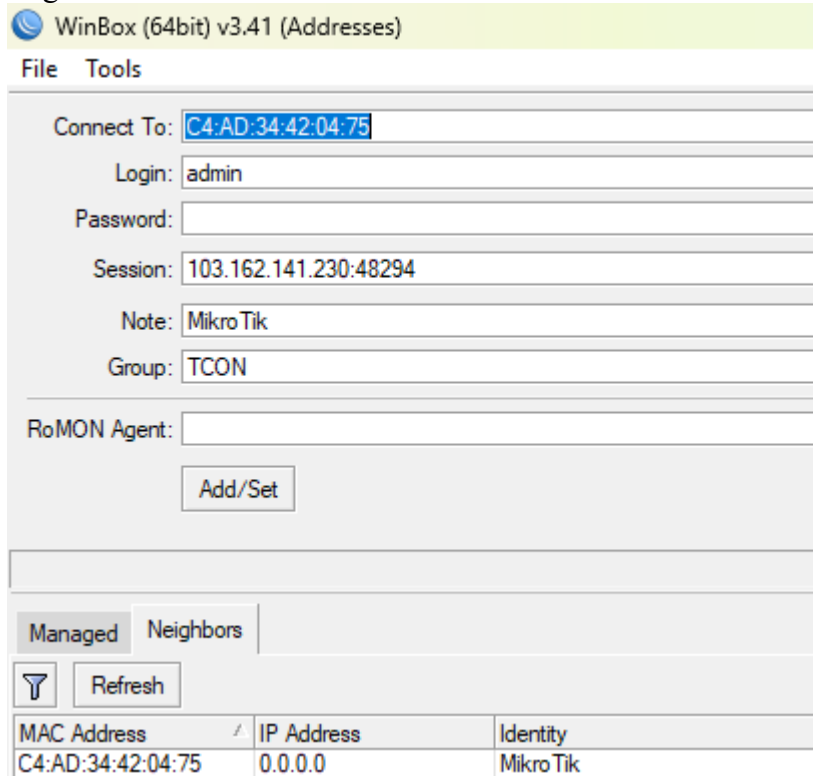


18. Aktifkan Fitur SNMP
 Pilih menu IP> SNMP> enable

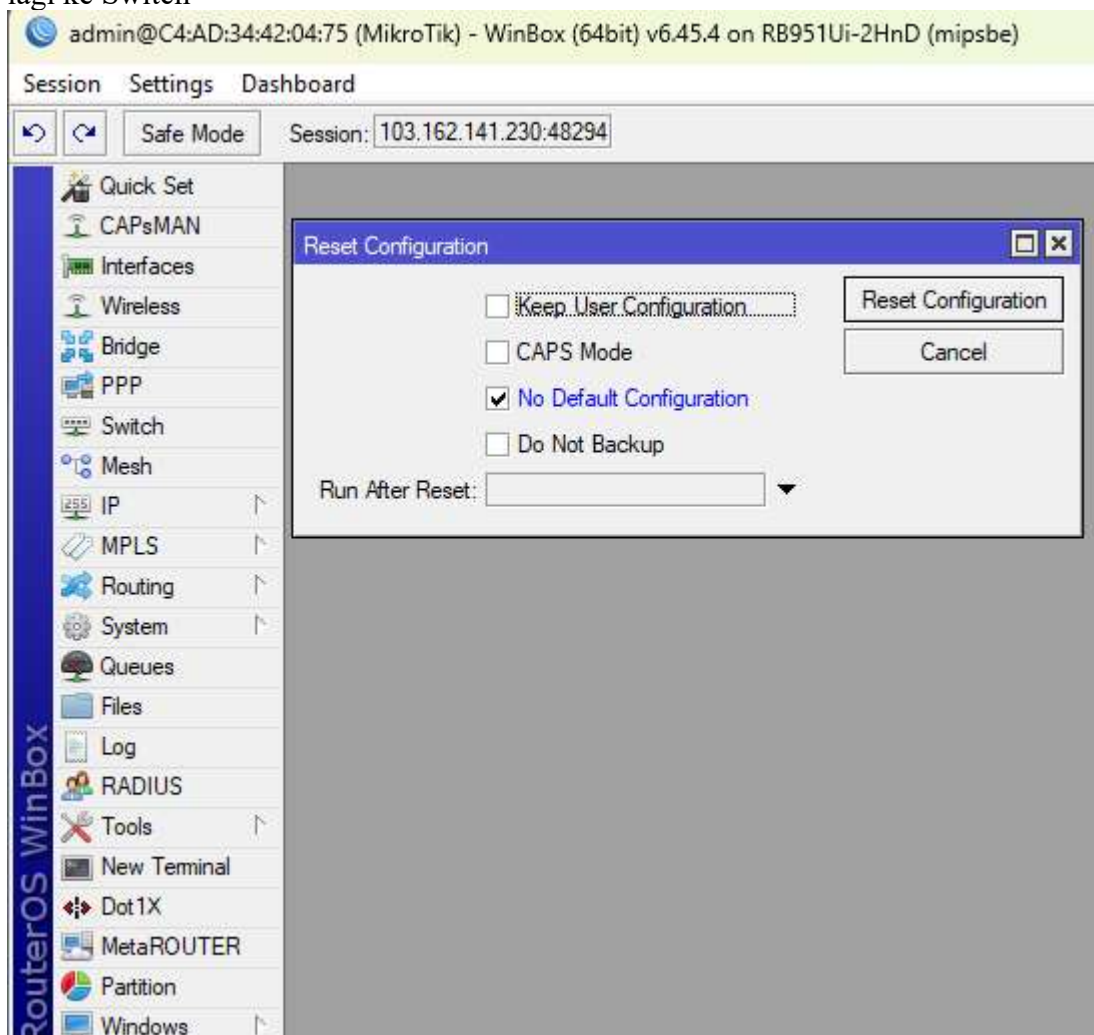
C. KONFIGURASI SWITCH

1. Hubungkan Ether5 Switch ke Laptop

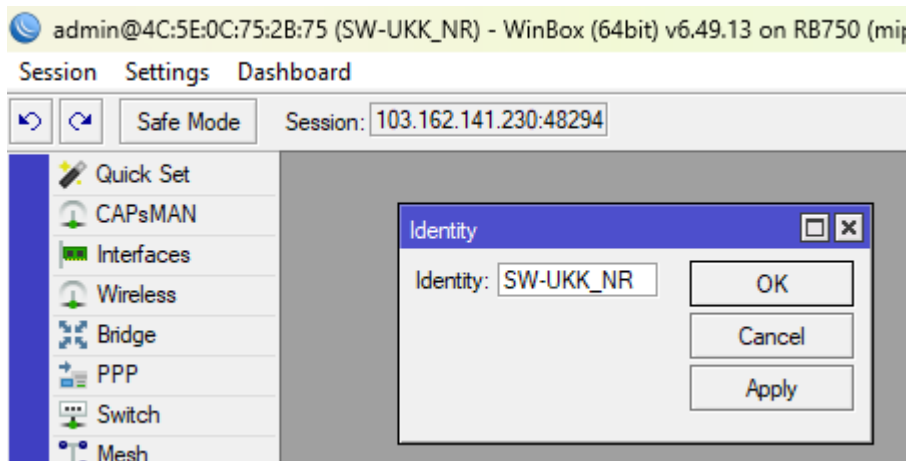
2. Login ke Switch via Winbox



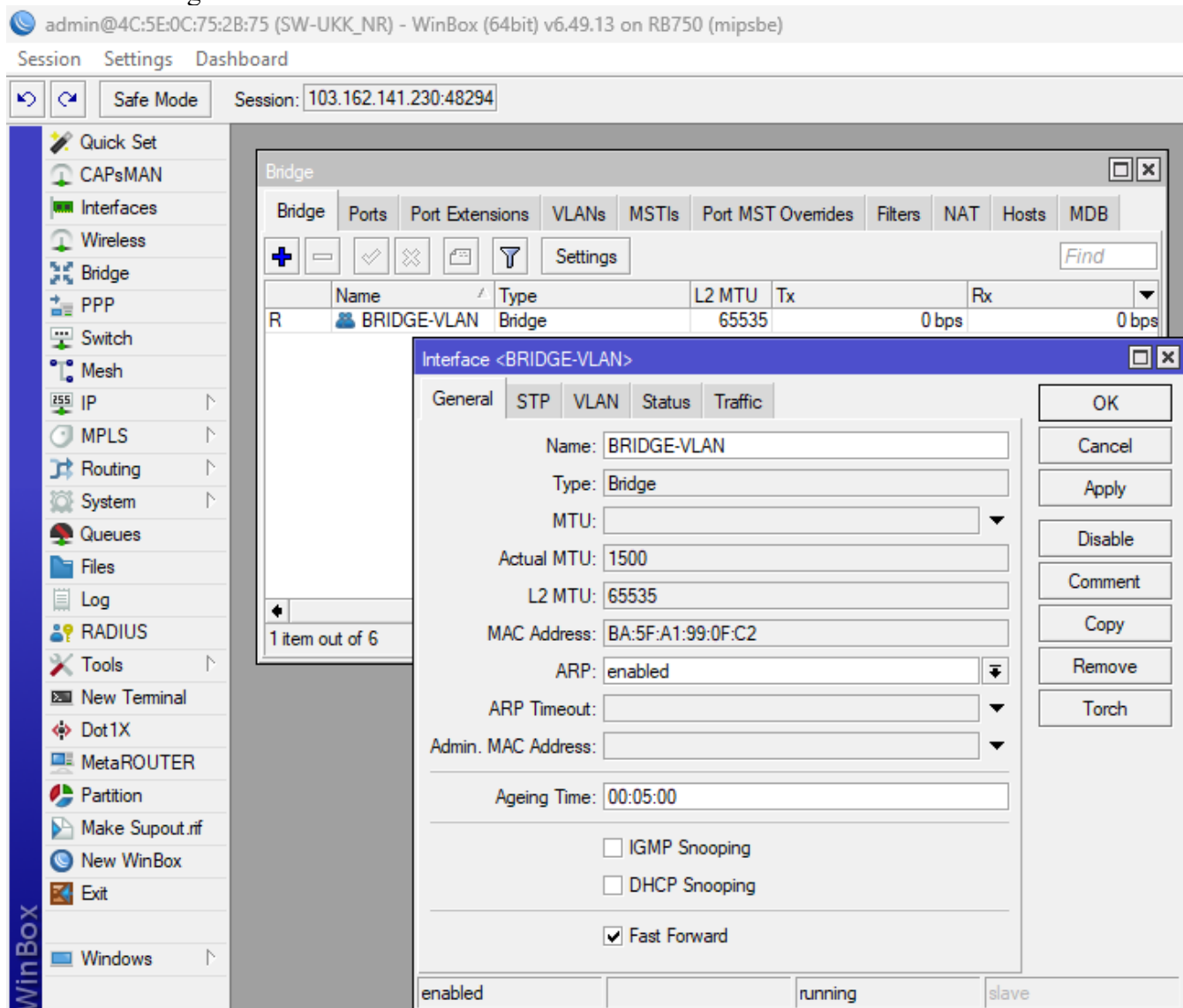
3. Setelah berhasil login, lakukan Reset System dengan memilih menu System> Reset Configuration> No Default Configuration> Reset Configuration, dan tunggu Switch melakukan Reboot dan Connect lagi ke Switch



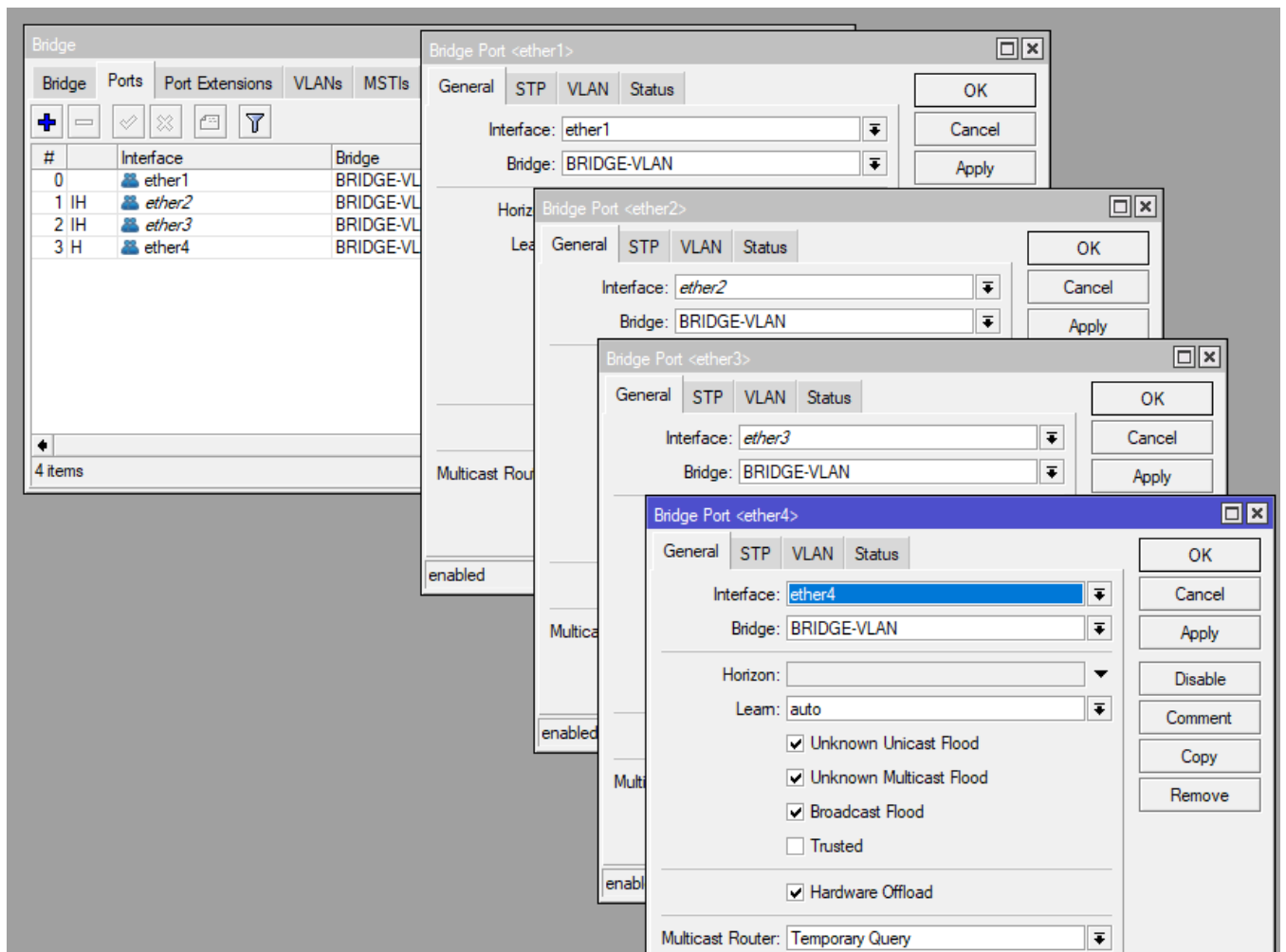
4. Rename Identity menjadi "SW-UKK_Nama" (Nama disesuaikan dengan nama masing-masing)



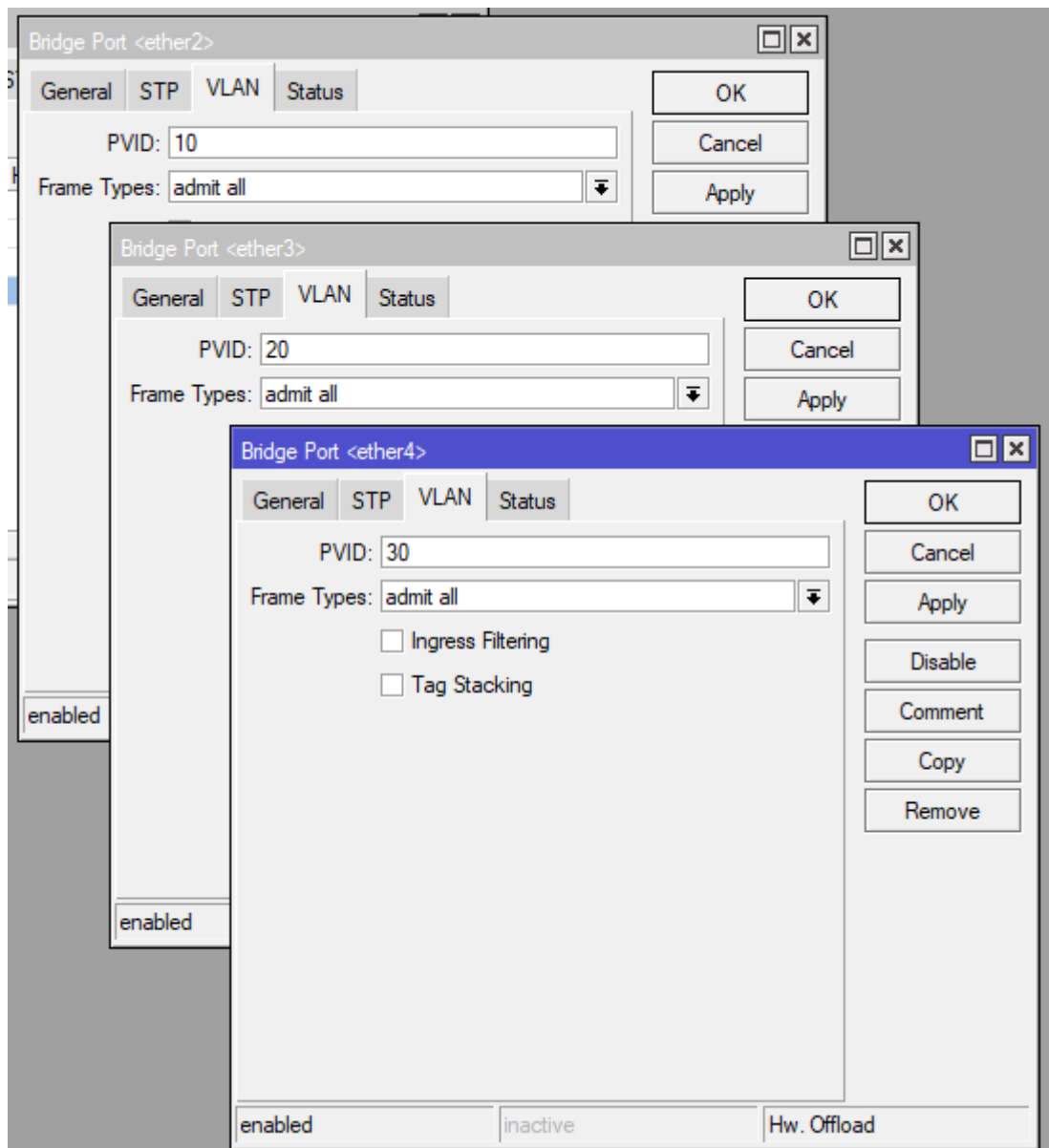
5. Buat Interface Bride untuk VLAN:
Pilih menu Bridge> + Name= BRIDGE-VLAN



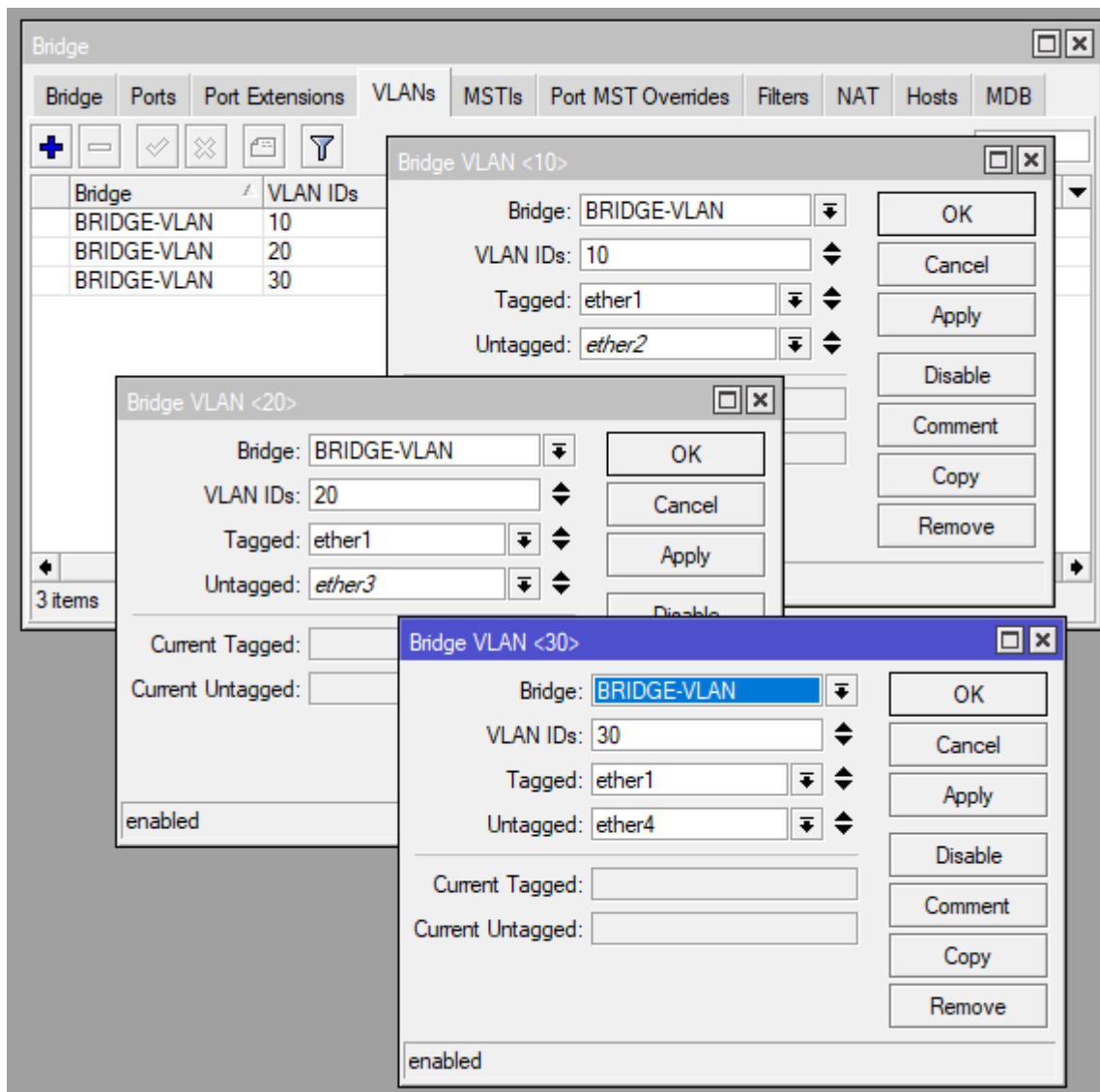
6. Masukkan Port ether1, ether2, ether3, ether4 ke dalam BRIDGE
Masih di menu Bridge pilih Ports> + ether1, ether2, ether3, ether4



- Arahkan port Ether2 ke VLAN10, port Ether3 ke VLAN20 dan port Ether4 ke VLAN30
Klik ganda pada port ether2, ether3, ether4 Masukkan ID VLAN

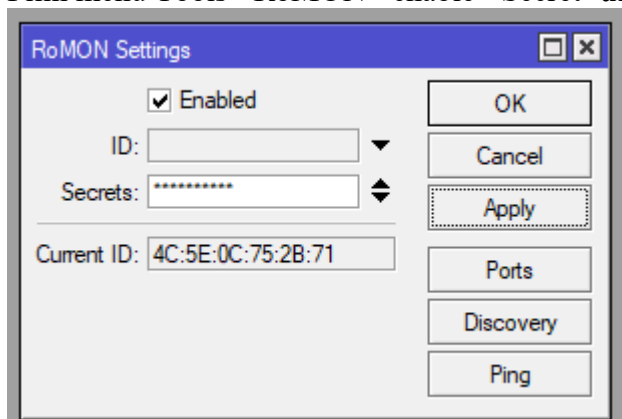


8. Buat VLANs masih pada menu Bride pilih VLANs
 VLANs+Bridge=BRIDGE-VLAN> VLAN Ids= 10> Tagged= ether1 Untaged= ether2



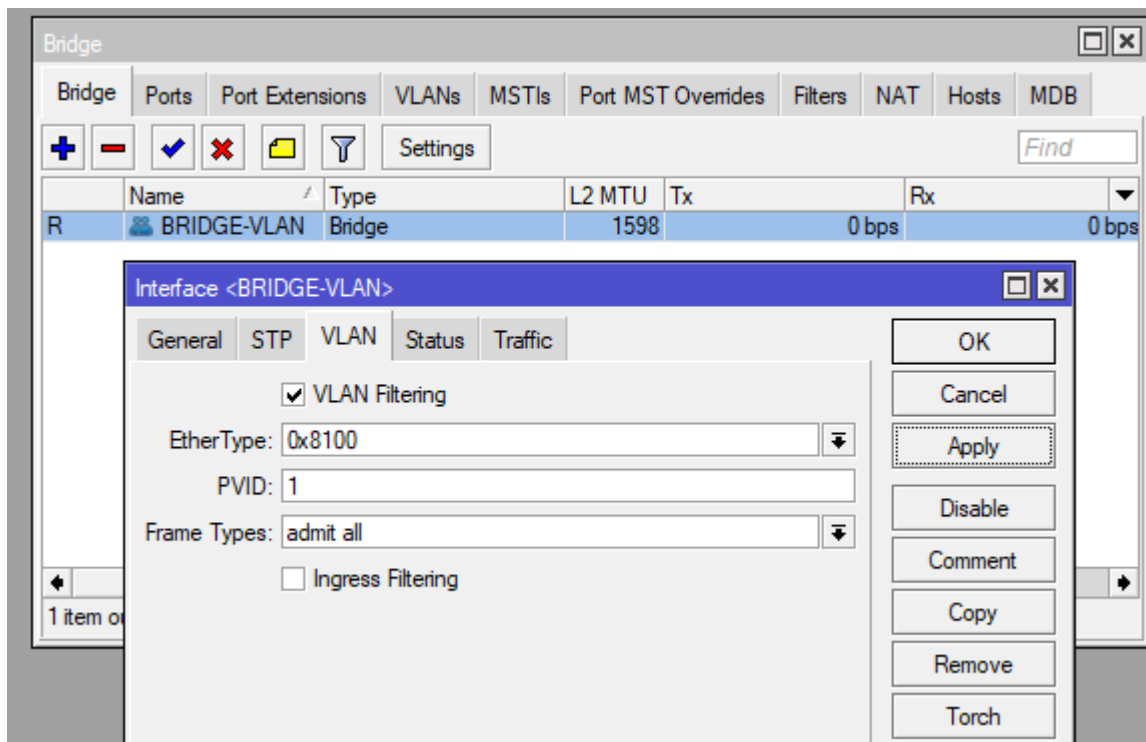
9. Aktifkan fitur RoMON

Pilih menu Tools> RoMON> enable> Secret=**ukktkj2026**



10. Aktifkan Bridge Filtering

Pilih menu Bridge> BRIDGE-VLAN> pada menu VLAN centang VLAN Filtering



11. Pindah koneksi laptop/PC ke ether2 Switch, kemudian cek apakah Laptop mendapatkan IP VLAN10, jika sudah mendapatkan IP VLAN 10, artinya jaringan VLAN 10 sudah berjalan. Pilih menu Command Prompt, lalu ketik ipconfig:

```

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::494d:a10:b48c:4ad9%25
    IPv4 Address. . . . . : 192.168.10.254
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.10.1

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 

Wireless LAN adapter Wi-Fi:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 

C:\Windows\System32>

```

12. Pindah koneksi laptop/PC ke ether3 Switch, kemudian cek apakah Laptop mendapatkan IP VLAN20, jika sudah mendapatkan IP VLAN 20, artinya jaringan VLAN 20 sudah berjalan. Pilih menu Command Prompt, lalu ketik ipconfig:

```

Ethernet adapter Ethernet:

Connection-specific DNS Suffix . :
Link-local IPv6 Address . . . . . : fe80::494d:a10:b48c:4ad9%25
IPv4 Address. . . . . : 192.168.20.254
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.20.1

Ethernet adapter Bluetooth Network Connection:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :

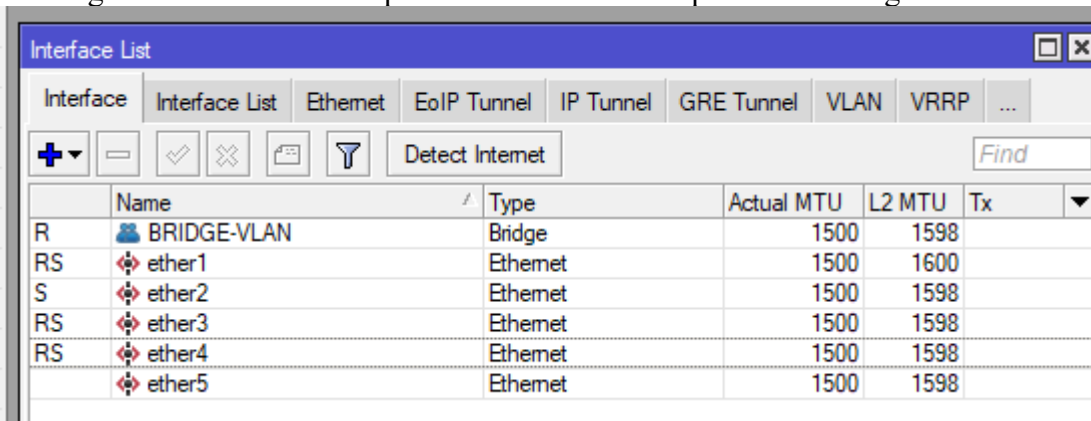
Wireless LAN adapter Wi-Fi:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :

C:\Windows\System32>

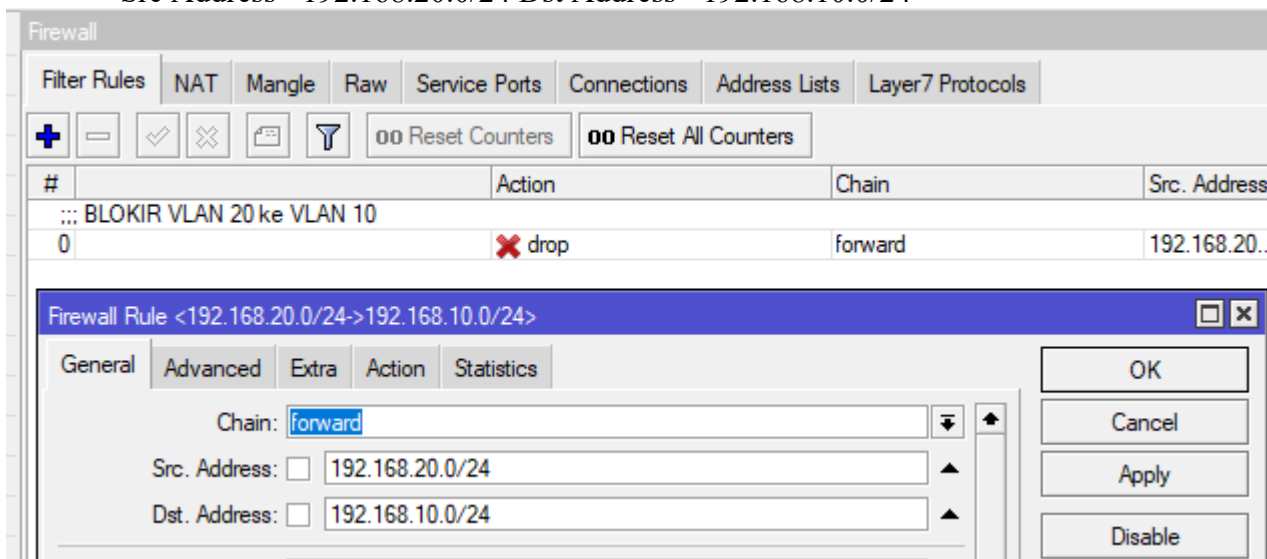
```

13. Hubungkan Server ke Switch pada ether4 Switch dan pastikan Runnig



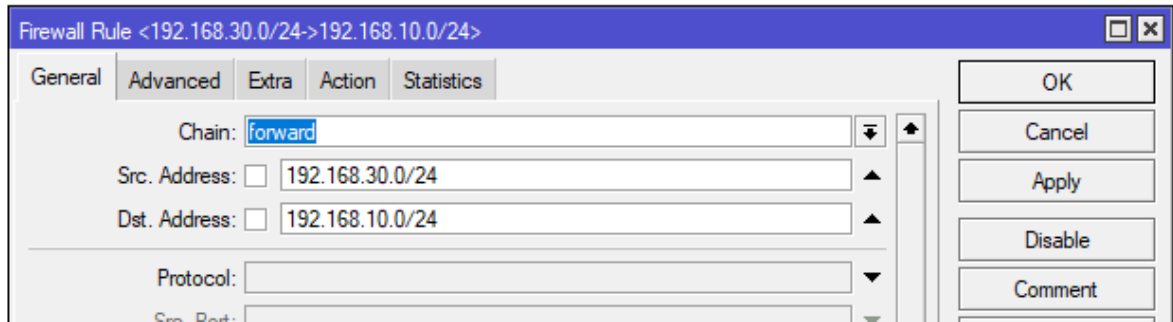
14. Blokir Service dari VLAN 20 ke VLAN 10

- a. Tambahkan Rule Firewall, pilih menu IP Firewall> Filter Rule> Chain= Forward> Action=Drop
Src Address= 192.168.20.0/24 Dst Address= 192.168.10.0/24



- b. Tambahkan Rule mengizinkan akses VLAN 30 ke VLAN 10
Pilih menu IP> Firewall> Filter Rules> + chain=forward Src Address= 192.168.30.0/24 Dst Address= 192.168.10.0/24 Action=accept

...	IZINKAN AKSES VLAN 30 KE VLAN 10	drop	forward	192.168.20...	192.168.10...
1		accept	forward	192.168.30...	192.168.10...

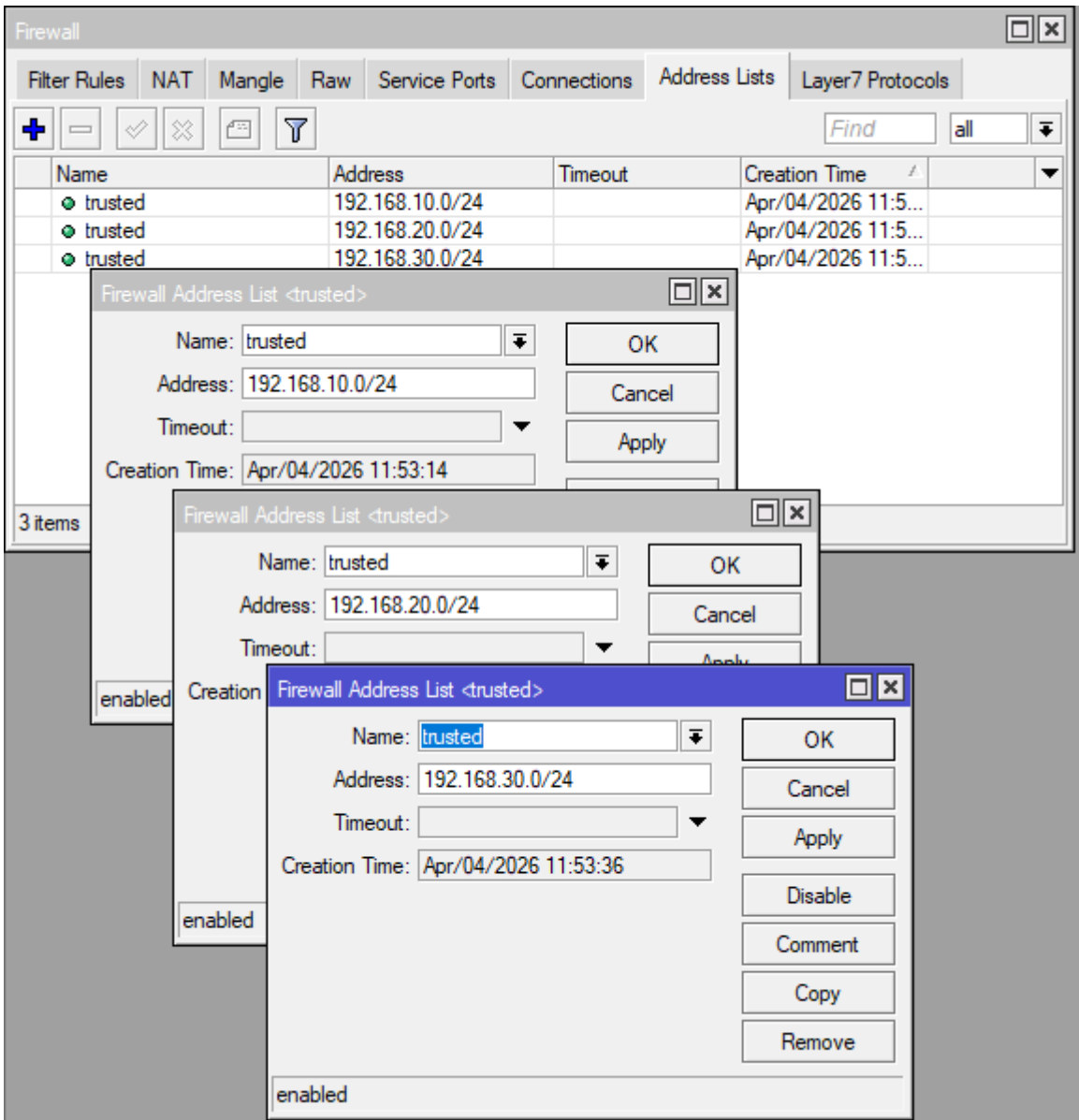


- c. Tambahkan Address List untuk mendaftarkan IP yang terpercaya
Pilih menu IP> Firewall>

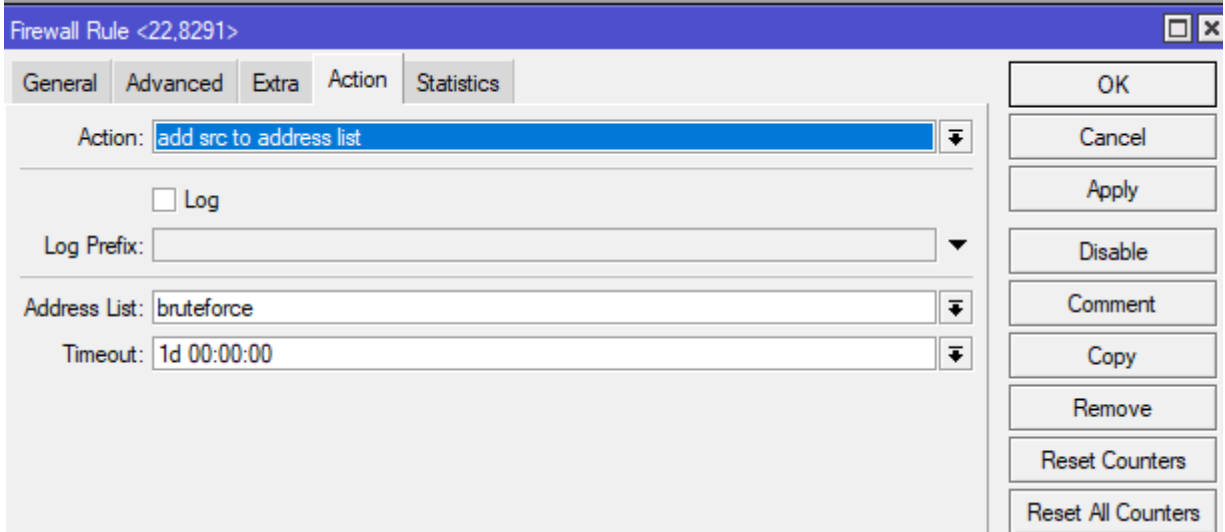
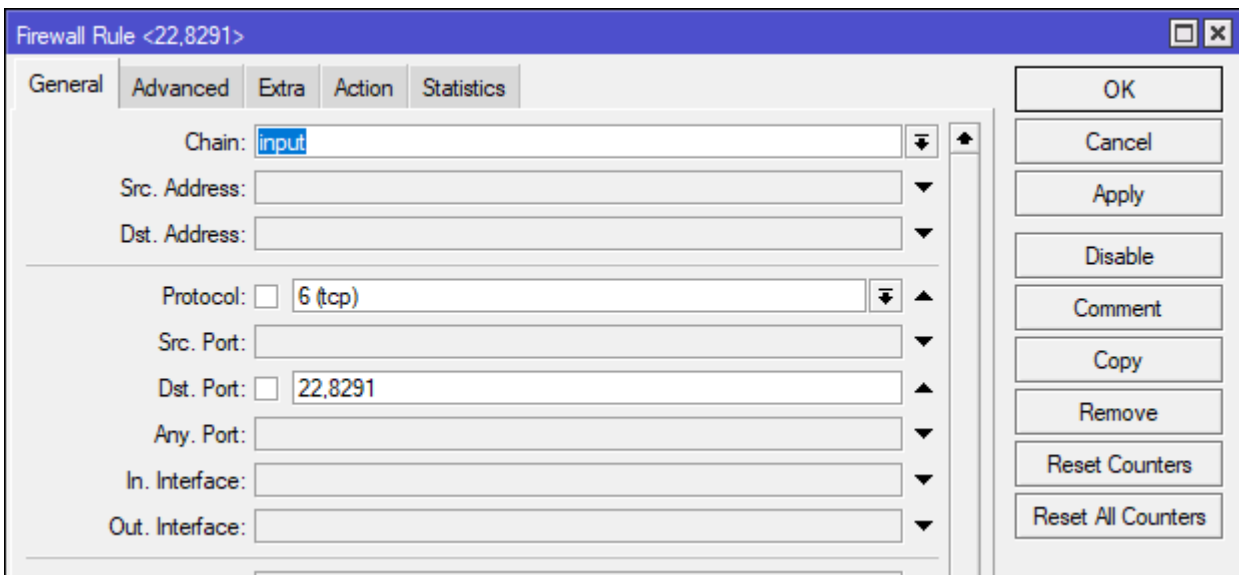
Address List> + name=trusted> Address= 192.168.10.0/24

Address List> + name=trusted> Address= 192.168.20.0/24

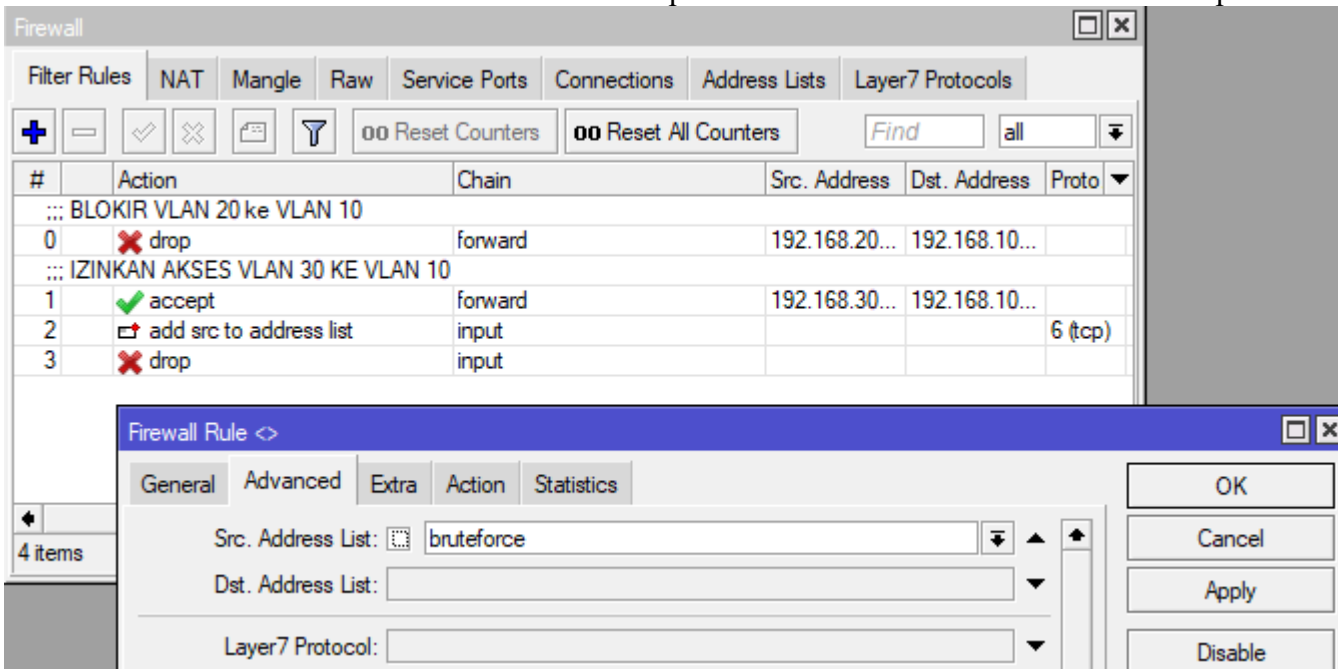
Address List> + name=trusted> Address= 192.168.30.0/24



- d. Tambahkan Rule untuk mendeteksi bruteforce pada WinBox dan pada SSH
Pilih menu IP> Firewall> Filter Rule+ Chain=input> Protocol=tcp> Dst Port 22,8291> Action= add src to address list> Address list=bruteforce> Timeout= 1d 00:00:00

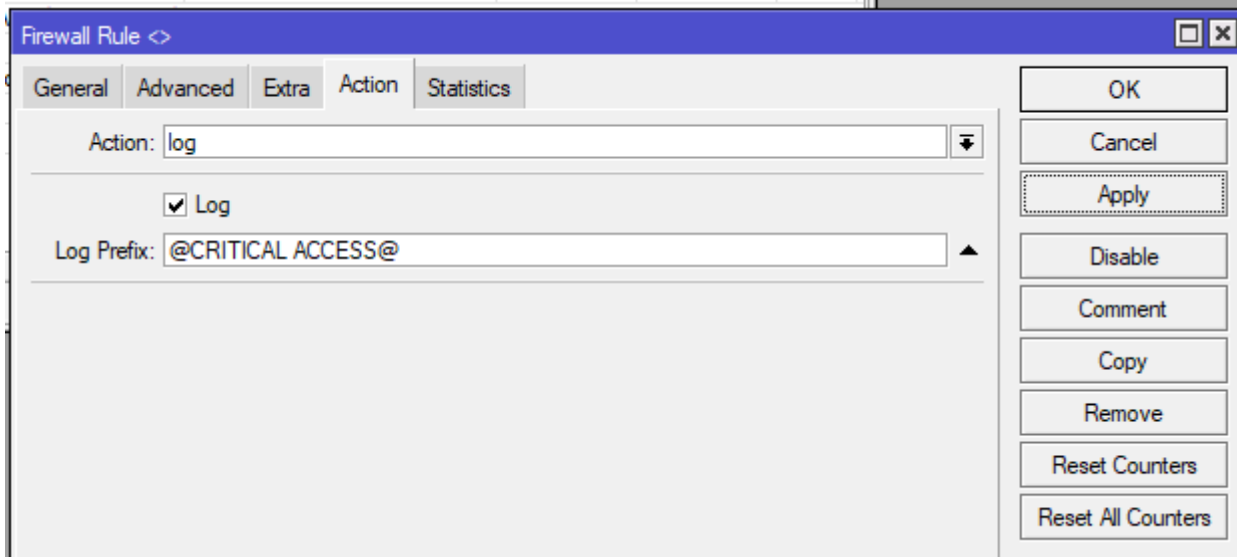
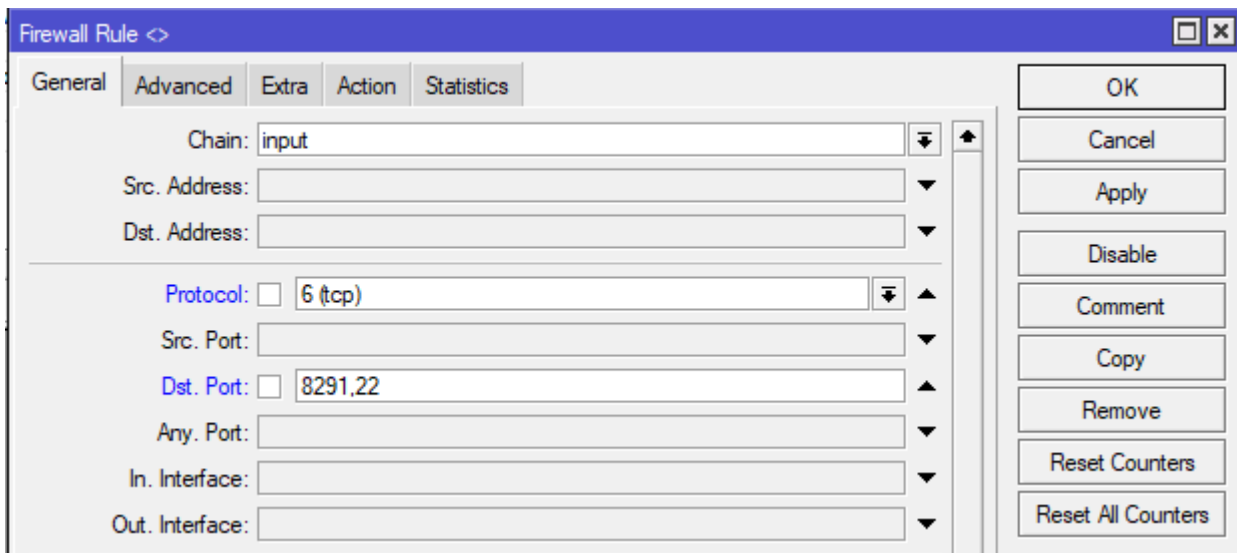


- e. Buat Rule untuk memblokir bruteforce
 Pilih menu IP> Firewall> Filter Rule> add chain=input Src Address lis= bruteforce action=drop



15. Buatkan Filter Logging

Pilih menu IP> Firewall> Filter Rule> Chain=input Action=log> Log Prefix= @CRITICAL ACCESS@



Cek Menu Log, maka hasilnya akan menampilkan Histori Log

Log

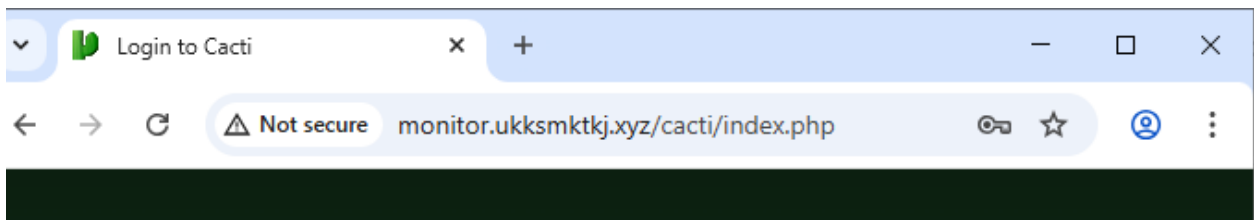
Freeze Find all

#	Time	Buffer	Topics	Message
979	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
980	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
981	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
982	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
983	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
984	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
985	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
986	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
987	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
988	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
989	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
990	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
991	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
992	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
993	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
994	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
995	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
996	Apr/04/2026 12:22:13	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
997	Apr/04/2026 12:22:14	memory	system, info	filter rule changed by admin
998	Apr/04/2026 12:22:14	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...
999	Apr/04/2026 12:22:14	memory	firewall, info	@CRITICAL ACCESS@ input: in:VLAN20-Siswa out:(unknown 0), src-...

1000 items

D. MONITORING ROUTER DAN SERVER DARI CACTI

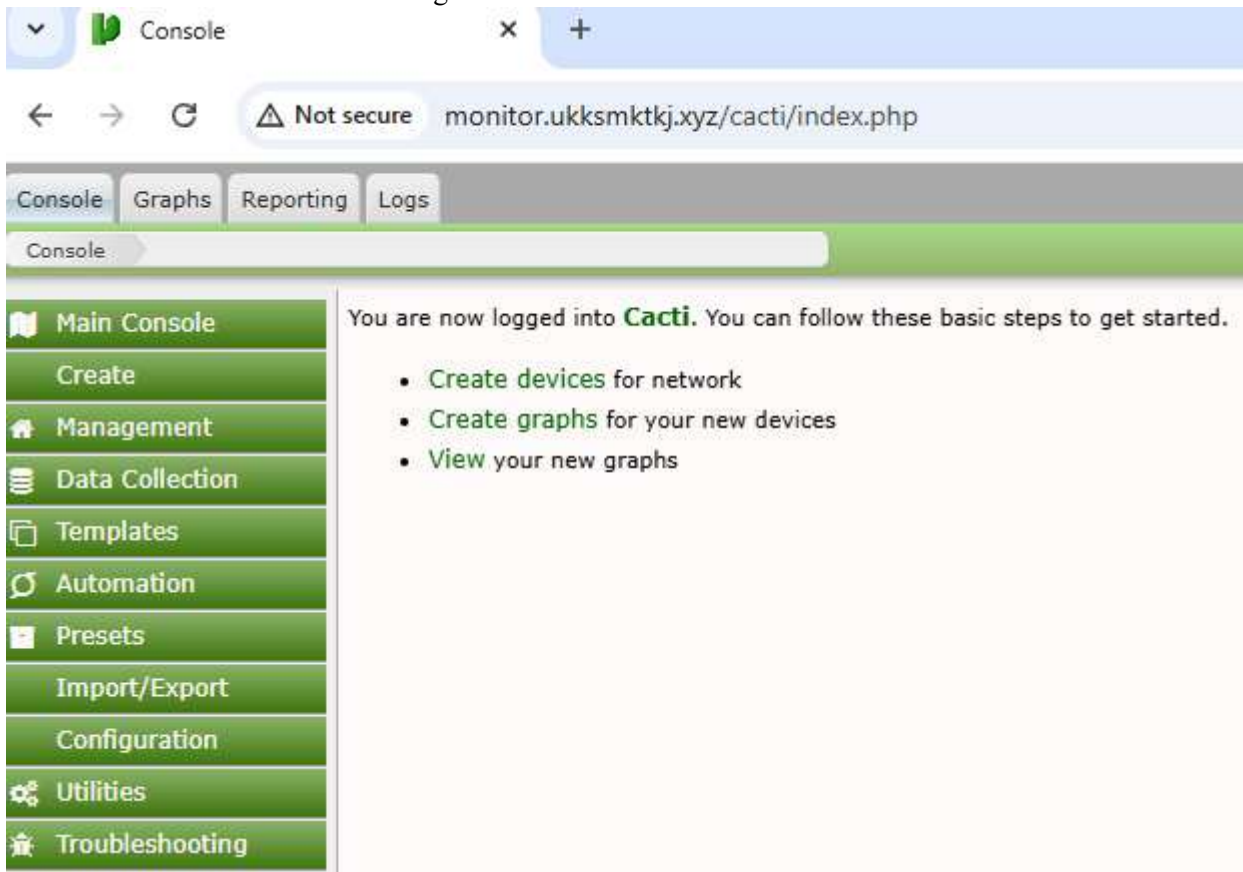
1. Akses monitoring Cacti dengan memasukkan monitor.ukksmktkj.xyz pada URL



2. Login ke Cacti dengan username= admin dan password=tkjismkhn



3. Tambahkan Device ROUTER dengan cara klik Create Device



kemudian Klik + di Bagian kanan Atas, kemudian isi parameter Router Berikut:

Device [edit: ROUTER]	
General Device Options	
Description ?	ROUTER
Hostname ?	192.168.30.1
Location ?	None
Poller Association ?	Main Poller
Device Site Association ?	Edge
Device Template ?	MikroTik Device
Number of Collection Threads ?	1 Thread
Disable Device ?	<input type="checkbox"/>
SNMP Options	
SNMP Version ?	Version 2
SNMP Community String ?	public
SNMP Port ?	161
SNMP Timeout ?	500
Maximum OIDs Per Get Request ?	10 OID's
Bulk Walk Maximum Repetitions ?	Auto Detect on Re-Index
Availability/Reachability Options	
Downed Device Detection ?	SNMP Uptime

kemudian klik Create pada pojok bagian bawah:

- Pastikan Router sudah terkoneksi dengan Cacti yang di tandai adanya Identitas Router di Bagian Atas

- Tambahkan SERVER dengan memilih Create Device langkahnya sama dengan menambahkan ROUTER
- Isikan Parameter SERVER seperti berikut:

General Device Options	
Description ?	SERVER
Hostname ?	192.168.30.10
Location ?	None
Poller Association ?	Main Poller
Device Site Association ?	Edge
Device Template ?	Local Linux Machine
Number of Collection Threads ?	1 Thread
Disable Device ?	<input type="checkbox"/>
SNMP Options	
SNMP Version ?	Version 2
SNMP Community String ?	public
SNMP Port ?	161
SNMP Timeout ?	500
Maximum OIDs Per Get Request ?	10 OID's
Bulk Walk Maximum Repetitions ?	Auto Detect on Re-Index
Availability/Reachability Options	
Downed Device Detection ?	SNMP Uptime
Ping Timeout Value ?	400
Ping Retry Count ?	1

Klik Create pada bagian Kanan Bawah.

- Pastikan juga Server sudah terbaca pada Cacti, ditandai dengan adanya Identitas Server pada bagian Atas

← → ↻ Not secure monitor.ukksmktkj.xyz/cacti/host.php?action=edit&id=2

Console Graphs Reporting Logs

Console Devices (Edit)

Main Console
Create
Management

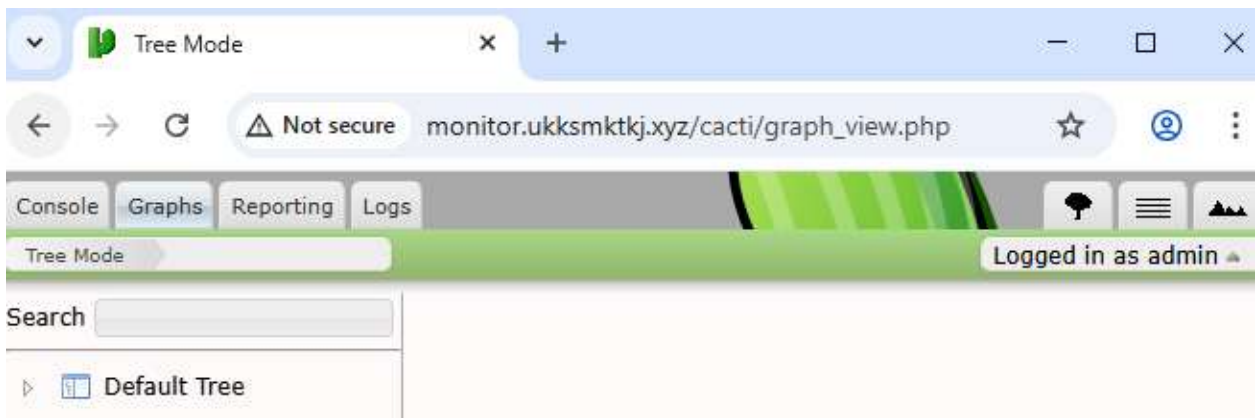
Devices
Sites
Trees
Graphs
Data Sources
Aggregates
Data Collection
Templates
Automation

SERVER (192.168.30.10)
SNMP Information
System: Linux ukktkj 6.1.0-15-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.1.66-1 (2023-12-09) x86_64
Uptime: 153046 (0days, 0hours, 25minutes)
Hostname: ukktkj
Location: Sitting on the Dock of the Bay
Contact: Me me@example.org

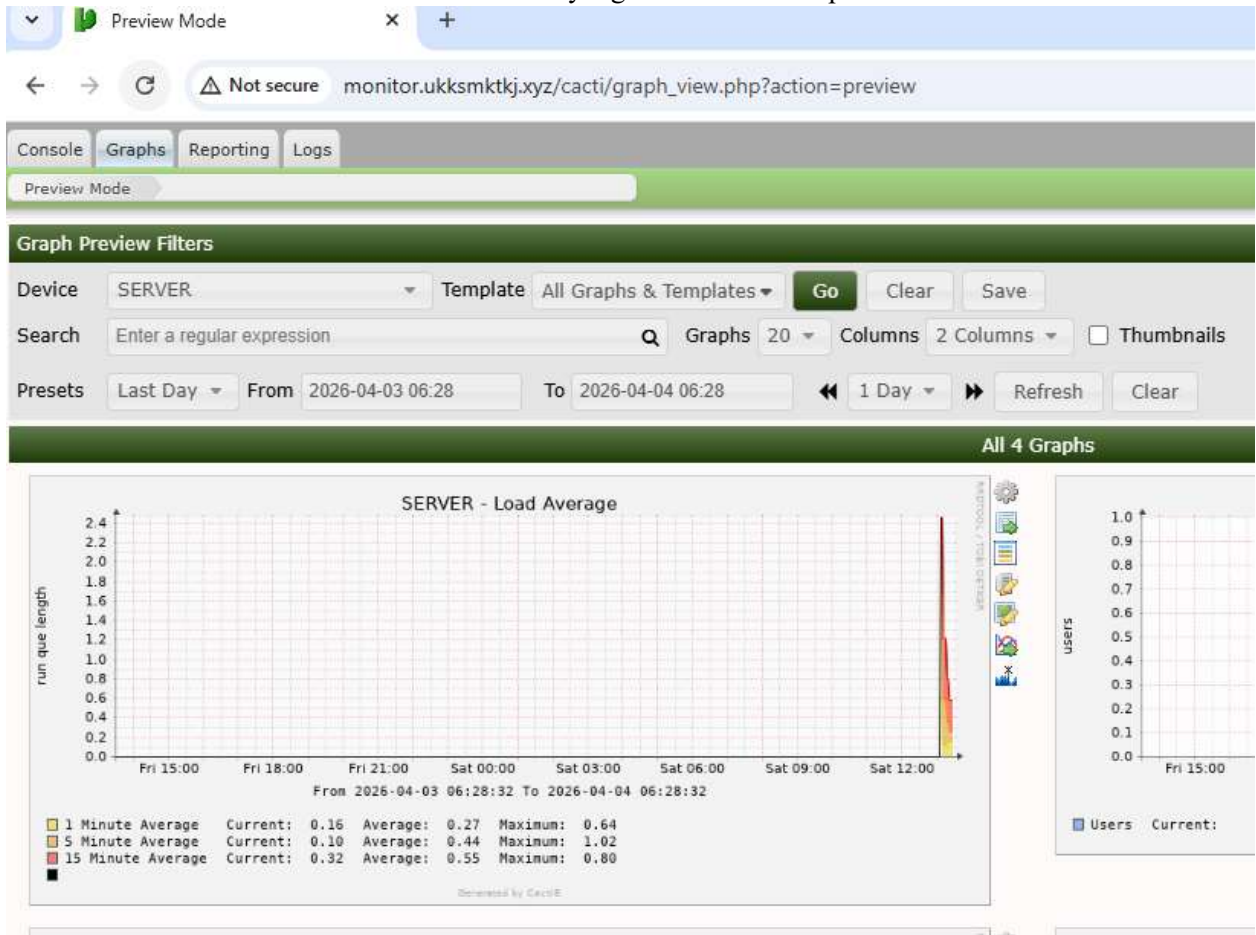
Device [edit: SERVER]
General Device Options

Description ?	SERVER
Hostname ?	192.168.30.10
Location ?	None
Poller Association ?	Main Poller

- Buatkan Grapich Monitoring Router dan Server dengan memilih menu Graphs kemudian Pilih Previwe pada bagian kanan atas



9. Pilih menu Device untuk melihat Device mana yang akan di lihat Grapich



PENGUJIAN:

1.