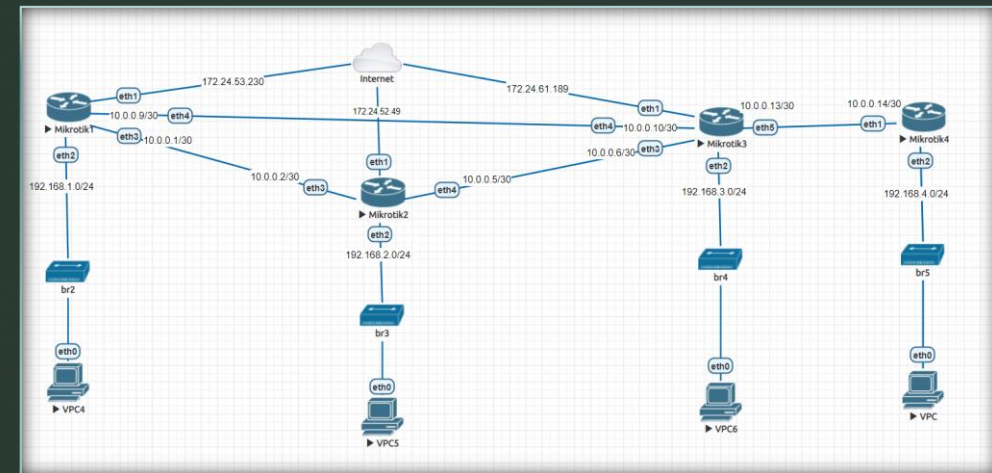


Laboratoare Retelistica

Implementarea Protocolului de Rutare OSPF (Single Area)

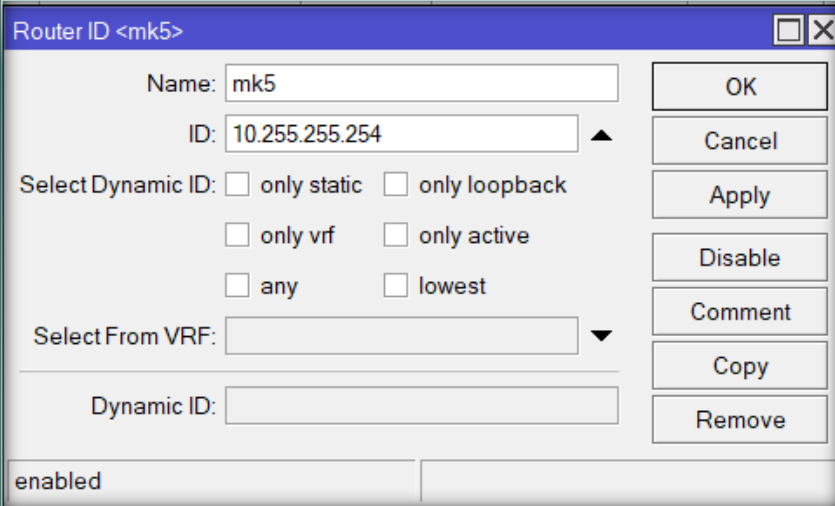
Setup Initial

- Incepem cu un setup ca in diagrama alaturata unde avem 4 routere conectate la internet, conectate in serie cu o subretea de /30 si fiecare cu o retea LAN.



Router Identity Setup

- Pe langa identitatea setata in mikrotik trebuie sa facem si o identitate a routerului in OSPF si aceasta se seteaza in primul rand, printr-o interfata de loopback prin adaugarea unui nou bridge.
- Si asignam o adresa statica acestuia (atentie nu are subretea).
- Apoi in Routing->Router ID si facem un nou id.



Router ID <mk5>

Name: mk5

ID: 10.255.255.254

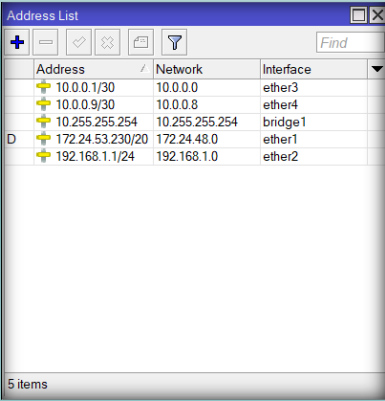
Select Dynamic ID: ☐ only static ☐ only loopback
☐ only vrf ☐ only active
☐ any ☐ lowest

Select From VRF:

Dynamic ID:

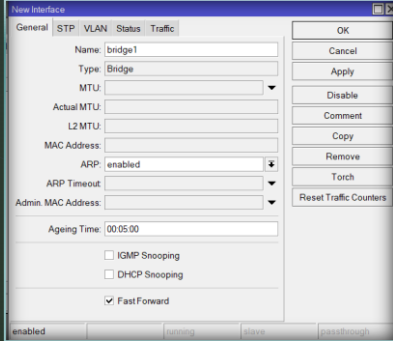
enabled

Buttons: OK, Cancel, Apply, Disable, Comment, Copy, Remove



Address	Network	Interface
10.0.0.1/30	10.0.0.0	ether3
10.0.0.9/30	10.0.0.8	ether4
10.255.255.254	10.255.255.254	bridge1
172.24.53.230/20	172.24.48.0	ether1
192.168.1.1/24	192.168.1.0	ether2

5 items



New Interface

General STP VLAN Status Traffic

Name: bridge1

Type: Bridge

MTU:

Actual MTU:

L2 MTU:

MAC Address:

ARP: enabled

ARP Timeout:

Admin MAC Address:

Ageing Time: 00:05:00

☐ IGMP Snooping

☐ DHCP Snooping

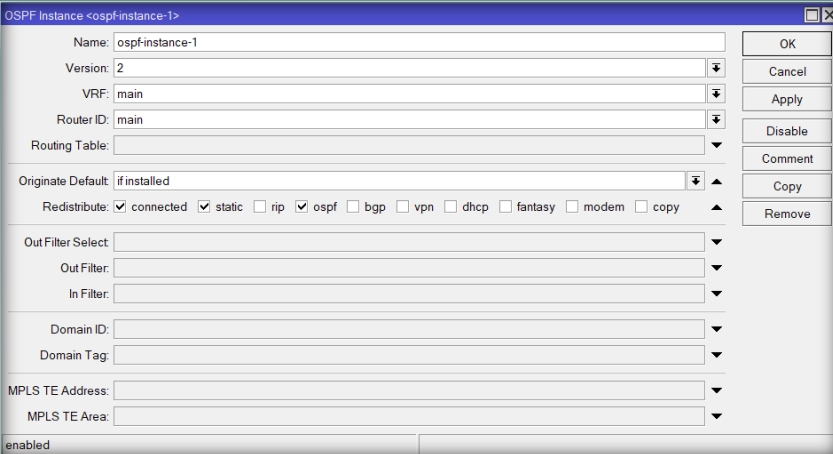
☒ Fast Forward

Buttons: OK, Cancel, Apply, Disable, Comment, Copy, Remove, Torch, Reset Traffic Counters

enabled

Setup OSPF Instance

- Pentru a incepe configurarea Protocolului OSPF mergem in Routing -> OSPF si facem o instanta noua.
- La Version selectam 2 pentru IPV4 si 3 in cazul IPV6.
- VRF setam main ca in cazul RIP.
- Originate o putem seta pentru ca are conexiune la internet.
- Redistribute selectam ca in cazul RIP optiunile connected, static si OSPF in cazul asta.



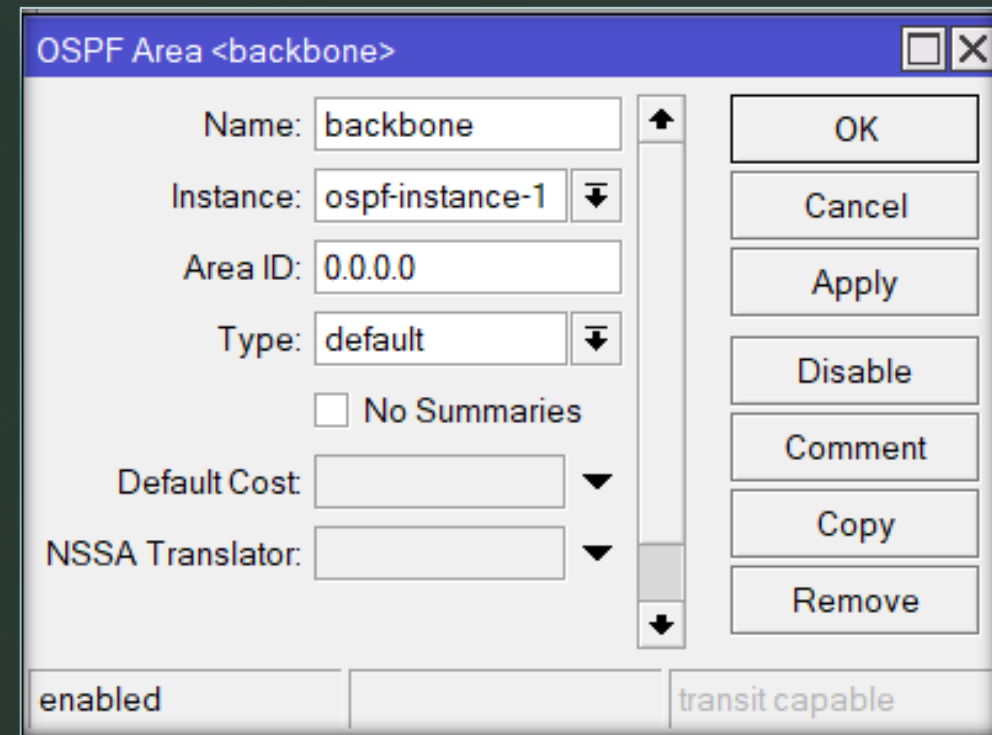
The screenshot shows the 'OSPF Instance <ospf-instance-1>' configuration window. The fields are as follows:

- Name: ospf-instance-1
- Version: 2
- VRF: main
- Router ID: main
- Routing Table: (empty)
- Originate Default: if installed
- Redistribute: ☒ connected ☒ static ☐ rip ☒ ospf ☐ bgp ☐ vpn ☐ dhcp ☐ fantasy ☐ modem ☐ copy
- Out Filter Select: (empty)
- Out Filter: (empty)
- In Filter: (empty)
- Domain ID: (empty)
- Domain Tag: (empty)
- MPLS TE Address: (empty)
- MPLS TE Area: (empty)

Buttons on the right: OK, Cancel, Apply, Disable, Comment, Copy, Remove. A status bar at the bottom shows 'enabled'.

Setup OSPF Area

- In protocolul OSPF trebuie sa definim arile ca un fel de cod postal al unei zone, desi formatul seamana cu un IP nu trebuie vazut ca atare.
- Prima zona este backbone-ul pe care il seta in Routing->OSPF si tabul Areas unde setam numele backbone si Area ID 0.0.0.0 rezervata backbone-ului.



The screenshot shows a window titled "OSPF Area <backbone>". It contains the following fields and controls:

- Name:
- Instance: with a dropdown arrow
- Area ID:
- Type: with a dropdown arrow
- ☐ No Summaries
- Default Cost: with a dropdown arrow
- NSSA Translator: with a dropdown arrow
- Buttons on the right: OK, Cancel, Apply, Disable, Comment, Copy, Remove
- At the bottom: ☒ enabled and ☐ transit capable

Setup OSPF Interface

- Pentru a seta interfata de ospf intram in Routing->OSPF in tabul "Interface Templates" si adaugam o noua interfata.
- La interfete selectam pe ce interfata/interfete avem legaturi OSPF in cazul primului router avem pe ether3 si ether4 conform diagramei.
- Area o setam pe backbone (si singura in cazul nostru)
- Network Type avem broadcast (se poate si point to point pentru ca avem o singura legatura pe interfata).
- Optional setam Authentication sha512 si Auth Key cu o parola comuna intre routere.

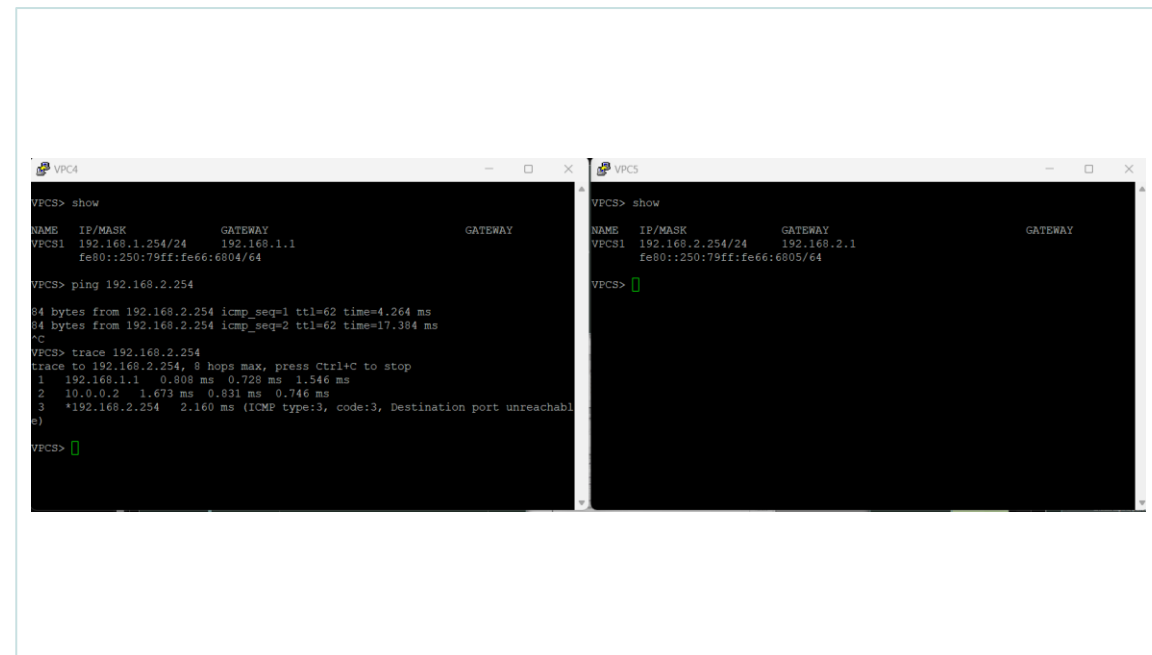
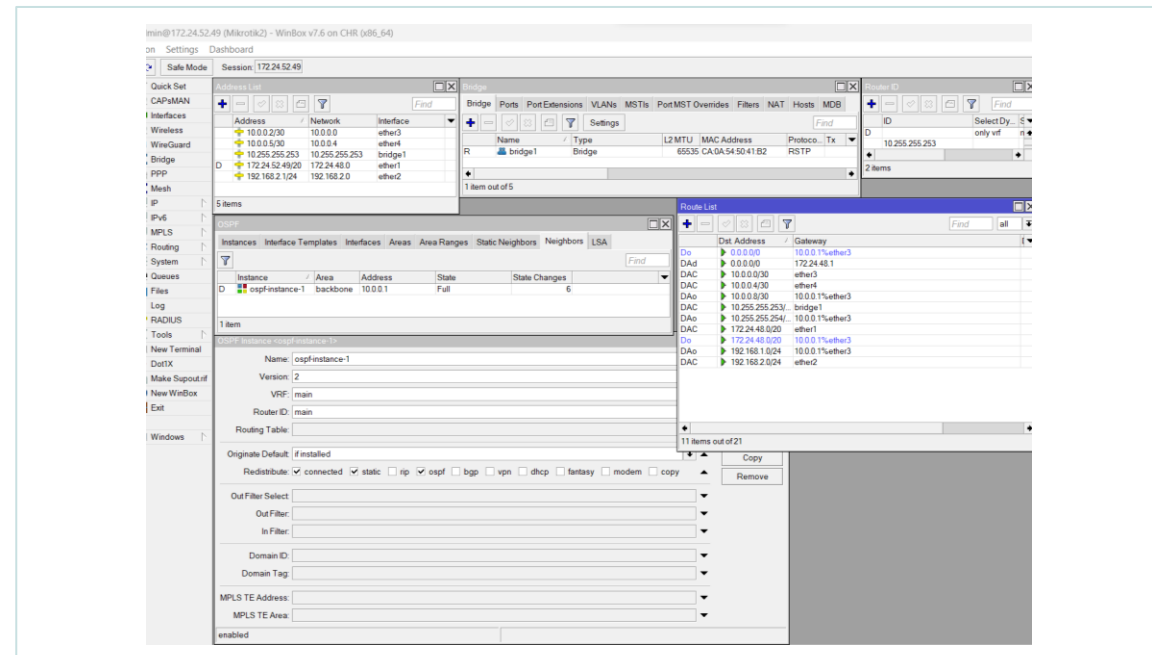
The screenshot shows the 'OSPF Interface Template' window with the following configuration:

- Interfaces:** ether4, ether3
- Area:** backbone
- Networks:** (empty)
- Network Type:** broadcast
- Prefix List:** (empty)
- Instance ID:** 0
- Cost:** 1
- Priority:** 128
- ☐ Passive
- Authentication:** sha512
- Auth. Key:** *****
- Auth. ID:** (empty)
- Vlink Transit Area:** (empty)
- Vlink Neighbor ID:** (empty)
- Retransmit Interval:** 00:00:05
- Transmit Delay:** 1
- Hello Interval:** 00:00:10
- enabled** (checkbox)

Buttons on the right: OK, Cancel, Apply, Disable, Comment, Copy, Remove.

Setup OSPF Mikrotik2

- In al doilea router trecem prin aceleasi proceduri dar modificam ca sa reflecte diagrama, IP-urile si clasele unde este necesar.
- Pentru a testa putem sa dam ping din retea routerului 1 in retea routerului 2.



admin@172.24.61.189 (Mikrotik3) - WinBox v7.6 on CHR (x86_64)

Session Settings Dashboard

Safe Mode Session: 172.24.61.189

Router ID

ID	Select Dy...	Select From V...	Dynamic ID
D 10.255.255.253	only vrf	main	192.168.3.1

2 items

Address List

Address	Network	Interface
10.0.0.6/30	10.0.0.4	ether3
10.0.0.10/30	10.0.0.8	ether4
10.0.0.13/30	10.0.0.12	ether5
10.255.255.253	10.255.255.253	bridge1
D 172.24.61.189/20	172.24.48.0	ether1
192.168.3.1/24	192.168.3.0	ether2

OSPF

Instance	Area	Address	State	State Changes
D ospf-in...	backbone	10.0.0.9	Full	6
D ospf-in...	backbone	10.0.0.5	Full	6

2 items

OSPF Interface Template

Interfaces: ether3, ether4, ether5

Area: backbone

Networks:

Network Type: broadcast

Prefix List

Instance ID: 0

Cost: 1

Priority: 128

☐ Passive

Authentication: sha512

Auth. Key: *****

Auth. ID:

Vlink Transit Area:

Vlink Neighbor ID:

Retransmit Interval: 00:00:05

Transmit Delay: 1

Route List

	Dst Address	Gateway
Do	0.0.0.0/0	10.0.0.9%ether4
Do	0.0.0.0/0	10.0.0.5%ether3
DAd	0.0.0.0/0	172.24.48.1
DAo+	10.0.0.0/30	10.0.0.5%ether3
DAo+	10.0.0.0/30	10.0.0.9%ether4
DAC	10.0.0.4/30	ether3
DAC	10.0.0.8/30	ether4
DAC	10.0.0.12/30	ether5
DAC	10.255.255.253/...	bridge1
Do	10.255.255.253/...	10.0.0.5%ether3
DAo	10.255.255.254/...	10.0.0.9%ether4
DAC	172.24.48.0/20	ether1
Do	172.24.48.0/20	10.0.0.9%ether4
Do	172.24.48.0/20	10.0.0.5%ether3
DAo	192.168.1.0/24	10.0.0.9%ether4
DAo	192.168.2.0/24	10.0.0.5%ether3
DAC	192.168.3.0/24	ether2

17 items out of 29

OSPF Instance <ospf-instance-1>

Name: ospf-instance-1

Version: 2

VRF: main

Router ID: main

Routing Table:

Originate Default: if installed

Redistribute: ☒ connected ☒ static ☐ rip ☒ ospf ☐ bgp ☐ vpn ☐ dhcp ☐ f

Out Filter Select:

Out Filter:

In Filter:

Domain ID:

Domain Tag:

MPLS TE Address:

MPLS TE Area:

Setup OSPF Mikrotik3

- Un setup similar cu celelalte doua.

Setup OSPF Mikrotik3

- Si acesta va avea un setup similar si trebuie sa avem in vedere faptul ca nu este conectat la internet.
- Pe acesta il voi configura din linia de comanda.

```
Mikrotik4
[admin@Mikrotik4] /ip/firewall/nat> /interface/bridge/add name=bridge1
[admin@Mikrotik4] /ip/firewall/nat> /interface/bridge/print
Flags: X - disabled, R - running
0 R name="bridge1" mtu=auto actual-mtu=1500 l2mtu=65535 arp=enabled
  arp-timeout=auto mac-address=A2:64:83:1A:00:2D protocol-mode=rstp
  fast-forward=yes igmp-snooping=no auto-mac=yes ageing-time=5m
  priority=0x8000 max-message-age=20s forward-delay=15s
  transmit-hold-count=6 vlan-filtering=no dhcp-snooping=no
[admin@Mikrotik4] /ip/firewall/nat> █
```

```
[admin@Mikrotik4] > /ip/address/add interface=bridge1 address=10.255.255.252
[admin@Mikrotik4] > /ip/address/print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS NETWORK INTERFACE
0 10.0.0.14/30 10.0.0.12 ether1
1 192.168.4.1/24 192.168.4.0 ether2
2 10.255.255.252/32 10.255.255.252 bridge1
[admin@Mikrotik4] > █
```

```
[admin@Mikrotik4] > /routing/id/add name=mk4 id=10.225.255.252
[admin@Mikrotik4] > /routing/id/print
Flags: D, I - INACTIVE
Columns: NAME, ID, DYNAMIC-ID, SELECT-DYNAMIC-ID, SELECT-FROM-VRF
# NAME ID DYNAMIC-ID SELECT-DYNAMIC-ID SELECT-FROM-VRF
0 D main 192.168.4.1 only-vrf main
1 mk4 10.225.255.252
```

```
[admin@Mikrotik4] > /routing/ospf/instance/add name=ospf1 vrf=main version=2 redistribute=connected,ospf,static router-id=mk4
[admin@Mikrotik4] > /routing/ospf/instance/print
Flags: X - disabled, I - inactive
0 name="ospf1" version=2 vrf=main router-id=mk4
  redistribute=connected,static,ospf
```

```
[admin@Mikrotik4] > /routing/ospf/area/add name=backbone area-id=0.0.0.0 instance=ospf1 type=default
[admin@Mikrotik4] > /routing/ospf/area/print
Flags: X - disabled, I - inactive, D - dynamic; T - transit-capable
0 name="backbone" instance=ospf1 area-id=0.0.0.0 type=default
[admin@Mikrotik4] > █
```

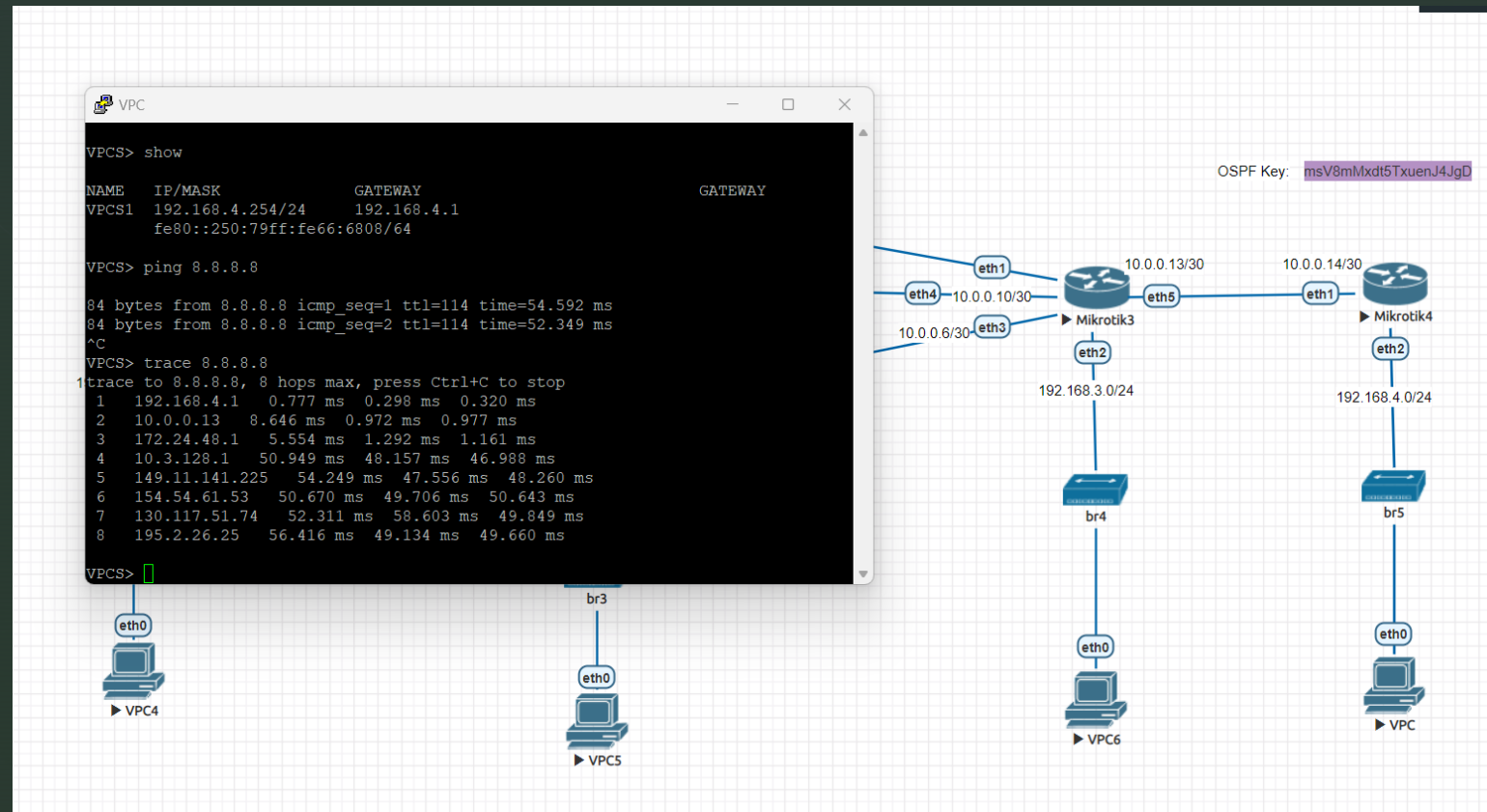
Setup OSPF Mikrotik3

- Sa nu uitam ca la ultimul router nu avem conexiune la internet direct prin el.
- Verificam faptul ca am primit rute de la OSPF.

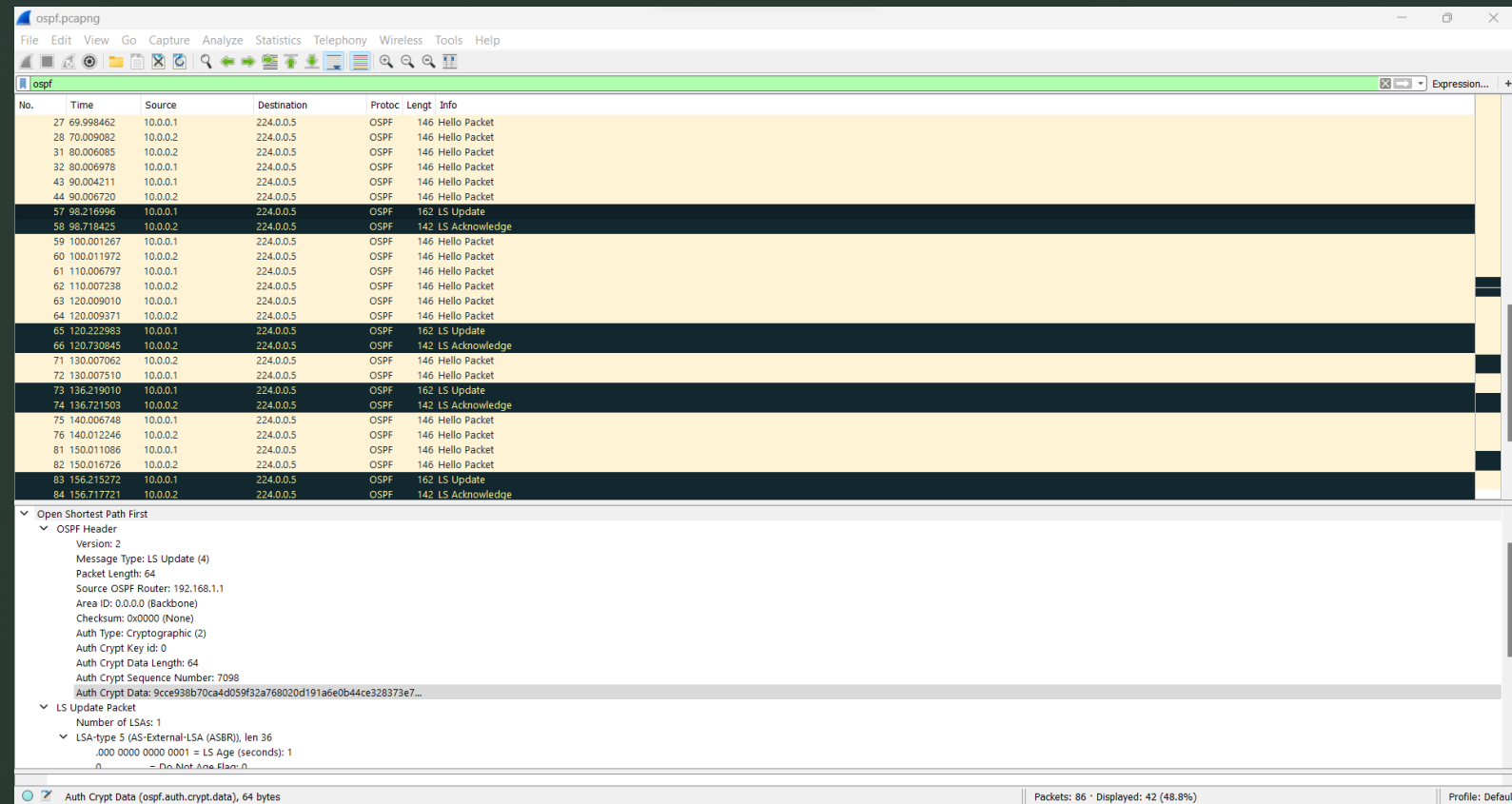
```
[admin@Mikrotik4] > /routing/ospf/interface-template/add area=backbone auth=sha512 auth-key=msV8mMxdT5TxuenJ4JgD interfaces=ether1 type=broadcast
[admin@Mikrotik4] > /routing/ospf/interface-template/print
Flags: X - disabled, I - inactive
 0 area=backbone interfaces=ether1 instance-id=0 type=broadcast
  retransmit-interval=5s transmit-delay=1s hello-interval=10s
  dead-interval=40s priority=128 cost=1 auth=sha512
  auth-key="msV8mMxdT5TxuenJ4JgD"
[admin@Mikrotik4] >
```

```
[admin@Mikrotik4] > /ip/route/print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY
Columns: DST-ADDRESS, GATEWAY, DISTANCE
  DST-ADDRESS      GATEWAY           DISTANCE
DAo 0.0.0.0/0      10.0.0.13%ether1   110
DAo 10.0.0.0/30    10.0.0.13%ether1   110
DAo 10.0.0.4/30    10.0.0.13%ether1   110
DAo 10.0.0.8/30    10.0.0.13%ether1   110
DAc 10.0.0.12/30   ether1             0
DAc 10.255.255.252/32 bridge1            0
DAo 10.255.255.253/32 10.0.0.13%ether1   110
DAo 10.255.255.254/32 10.0.0.13%ether1   110
DAo 172.24.48.0/20  10.0.0.13%ether1   110
DAo 192.168.1.0/24  10.0.0.13%ether1   110
DAo 192.168.2.0/24  10.0.0.13%ether1   110
DAo 192.168.3.0/24  10.0.0.13%ether1   110
DAc 192.168.4.0/24  ether2             0
[admin@Mikrotik4] >
```

Verificarea conexiuni la internet prin Router3



Exemplu captura pachete OSPF



The image shows a Wireshark packet capture of OSPF traffic. The main packet list displays 24 packets, including Hello packets, LS Updates, and LS Acknowledgments. The selected packet (No. 57) is an OSPF LS Update, and its details pane is expanded to show the internal structure, including the OSPF Header and the LS Update Packet fields.

No.	Time	Source	Destination	Protoc	Length	Info
27	69.998462	10.0.0.1	224.0.0.5	OSPF	146	Hello Packet
28	70.009082	10.0.0.2	224.0.0.5	OSPF	146	Hello Packet
31	80.006085	10.0.0.2	224.0.0.5	OSPF	146	Hello Packet
32	80.006978	10.0.0.1	224.0.0.5	OSPF	146	Hello Packet
43	90.004211	10.0.0.1	224.0.0.5	OSPF	146	Hello Packet
44	90.006720	10.0.0.2	224.0.0.5	OSPF	146	Hello Packet
57	98.216996	10.0.0.1	224.0.0.5	OSPF	162	LS Update
58	98.718425	10.0.0.2	224.0.0.5	OSPF	142	LS Acknowledge
59	100.001267	10.0.0.1	224.0.0.5	OSPF	146	Hello Packet
60	100.011972	10.0.0.2	224.0.0.5	OSPF	146	Hello Packet
61	110.006797	10.0.0.1	224.0.0.5	OSPF	146	Hello Packet
62	110.007238	10.0.0.2	224.0.0.5	OSPF	146	Hello Packet
63	120.009010	10.0.0.1	224.0.0.5	OSPF	146	Hello Packet
64	120.009371	10.0.0.2	224.0.0.5	OSPF	146	Hello Packet
65	120.222983	10.0.0.1	224.0.0.5	OSPF	162	LS Update
66	120.730845	10.0.0.2	224.0.0.5	OSPF	142	LS Acknowledge
71	130.007062	10.0.0.2	224.0.0.5	OSPF	146	Hello Packet
72	130.007510	10.0.0.1	224.0.0.5	OSPF	146	Hello Packet
73	136.219010	10.0.0.1	224.0.0.5	OSPF	162	LS Update
74	136.721503	10.0.0.2	224.0.0.5	OSPF	142	LS Acknowledge
75	140.006748	10.0.0.1	224.0.0.5	OSPF	146	Hello Packet
76	140.012246	10.0.0.2	224.0.0.5	OSPF	146	Hello Packet
81	150.011086	10.0.0.1	224.0.0.5	OSPF	146	Hello Packet
82	150.016726	10.0.0.2	224.0.0.5	OSPF	146	Hello Packet
83	156.215272	10.0.0.1	224.0.0.5	OSPF	162	LS Update
84	156.717721	10.0.0.2	224.0.0.5	OSPF	142	LS Acknowledge

Open Shortest Path First

- OSPF Header
 - Version: 2
 - Message Type: LS Update (4)
 - Packet Length: 64
 - Source OSPF Router: 192.168.1.1
 - Area ID: 0.0.0.0 (Backbone)
 - Checksum: 0x0000 (None)
 - Auth Type: Cryptographic (2)
 - Auth Key ID: 0
 - Auth Crypt Data Length: 64
 - Auth Crypt Sequence Number: 7098
 - Auth Crypt Data: 9cce938b70ca4d059f32a768020d191a6e0b44ce328373e7...
- LS Update Packet
 - Number of LSAs: 1
 - LSA-type 5 (AS-External-LSA (ASBR)), len 36
 - .000 0000 0000 0001 = LS Age (seconds): 1
 - 0 = Do Not Age Flag: 0

Auth Crypt Data (ospf.auth.crypt.data), 64 bytes

Packets: 86 • Displayed: 42 (48.8%)

Profile: Default