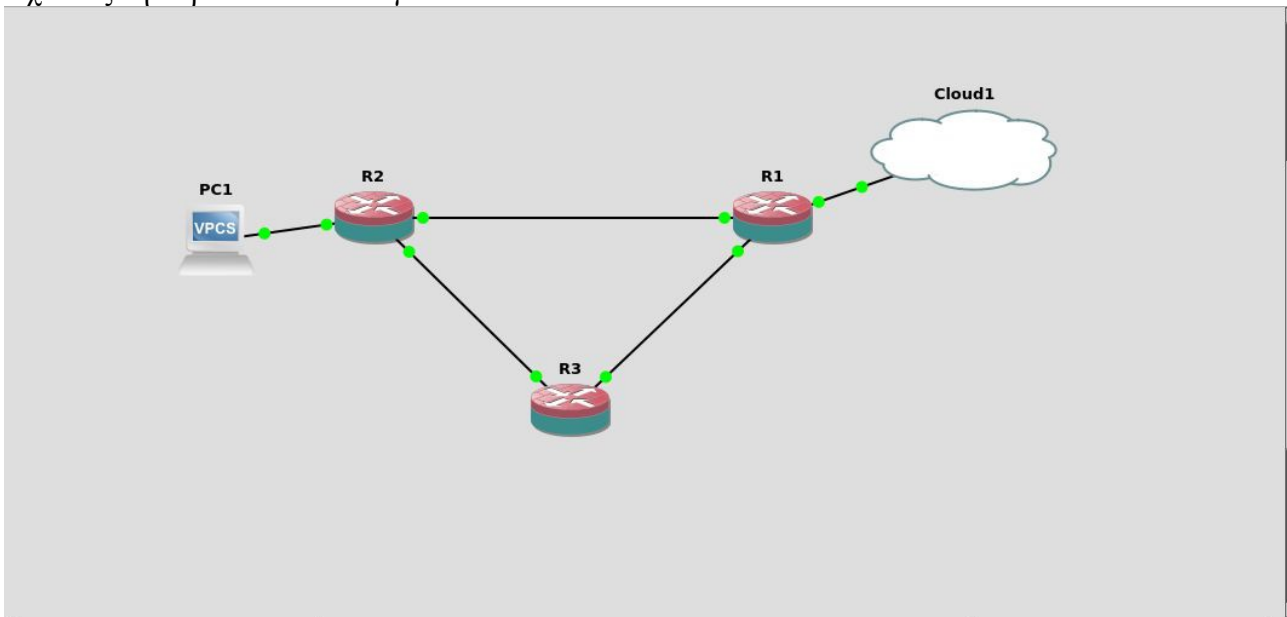


### 3Η ΕΡΓΑΣΙΑ ΕΡΓΑΣΤΗΡΙΟΥ ΔΙΚΤΥΩΝ

Όνομα: Γεώργιος  
Επώνυμο: Βέργος  
Αριθμός Μητρώου: 1072604  
Ημερομηνία : 4/5/2022  
Username Mikrotik: admin  
Password: bonis

#### Άσκηση 6

Έχοντας τη παρακάτω τοπολογία:



Αρχικά αναθέτουμε στατικές ip σε όλα τα interfaces των 3 router:

```
R1
File Edit View Search Terminal Help
MikroTik Login: adminPassword:

MMM      MMM      KKK      TTTTTTTTTT      KKK
MMM      MMM      KKK      TTTTTTTTTT      KKK
MMM MMMM MMM III KKK KKK RRRRRR 000000 TTT III KKK KKK
MMM MM  MMM III KKKKK RRR RRR 000 000 TTT III KKKKK
MMM  MMM III KKK KKK RRRRRR 000 000 TTT III KKK KKK
MMM  MMM III KKK KKK RRR RRR 000000 TTT III KKK KKK

MikroTik RouterOS 7.1.3 (c) 1999-2022 https://www.mikrotik.com/

Do you want to see the software license? [Y/n]: n
Press F1 for help
Change your password
new password>
repeat new password>
Try again, error: New password is the same as old one
new password> *****
repeat new password> *****

Password changed
[admin@MikroTik] > /system identity set name=R1
[admin@R1] > /interface bridge add name=loopback0
[admin@R1] > /ip address add address=107.255.255.1/32 interface=loopback0
[admin@R1] > /ip address add address=107.26.4.1/30 interface=ether1
[admin@R1] > /ip address add address=107.26.4.10/30 interface=ether2
[admin@R1] >
```

```
File Edit View Search Terminal Help

MMM   MMM   KKK               TTTTTTTTTT   KKK
MMMM  MMMM  KKK               TTTTTTTTTT   KKK
MMMM MMMM  III KKK KKK RRRRRR  000000      TTT   III KKK KKK
MMMM MM   III KKKKK  RRR RRR  000 000      TTT   III KKKKK
MMMM   III KKK KKK  RRRRRR  000 000      TTT   III KKK KKK
MMMM   III KKK KKK  RRR RRR  000000      TTT   III KKK KKK

MikroTik RouterOS 7.1.3 (c) 1999-2022      https://www.mikrotik.com/

Do you want to see the software license? [Y/n]: n

Press F1 for help

Change your password

new password> *****
repeat new password> *****

Password changed
[admin@MikroTik] > /system identity set name=R2

[admin@R2] > /interface bridge add name=loopback0
[admin@R2] > /ip address add address=107.255.255.2/32 interface=loopback0
[admin@R2] > /ip address add address=107.26.4.2/30 interface=ether1
[admin@R2] > /ip address add address=107.26.4.5/30 interface=ether2
[admin@R2] >
```

```
File Edit View Search Terminal Help

MikroTik 7.1.3 (stable)
MikroTik Login: admin
Password:

MMM   MMM   KKK               TTTTTTTTTT   KKK
MMMM  MMMM  KKK               TTTTTTTTTT   KKK
MMMM MMMM  III KKK KKK RRRRRR  000000      TTT   III KKK KKK
MMMM MM   III KKKKK  RRR RRR  000 000      TTT   III KKKKK
MMMM   III KKK KKK  RRRRRR  000 000      TTT   III KKK KKK
MMMM   III KKK KKK  RRR RRR  000000      TTT   III KKK KKK

MikroTik RouterOS 7.1.3 (c) 1999-2022      https://www.mikrotik.com/

Do you want to see the software license? [Y/n]: n

Press F1 for help

Change your password

new password> *****
repeat new password> *****

Password changed
[admin@MikroTik] > /system identity set name=R3
[admin@R3] > /interface bridge add name=loopback0
[admin@R3] > /ip address add address=107.255.255.3/32 interface=loopback0
[admin@R3] > /ip address add address=107.26.4.6/30 interface=ether1
[admin@R3] > /ip address add address=107.26.4.9/30 interface=ether2
[admin@R3] >
```

Έπειτα εκτελούμε ping και για αντικριστές και για μη αντικριστές συνδέσεις καθενός δρομολογητή:

```
R1
File Edit View Search Terminal Help
DAC 107.255.255.1/32 loopback0
[admin@R1] > ping 107.255.255.1
 0
SEQ HOST                               SIZE TTL TIME          STATUS
0 107.255.255.1                         56 64 328us
1 107.255.255.1                         56 64 276us
2 107.255.255.1                         56 64 210us
3 107.255.255.1                         56 64 207us
4 107.255.255.1                         56 64 209us
5 107.255.255.1                         56 64 209us
sent=6 received=6 packet-loss=0% min-rtt=207us avg-rtt=239us
max-rtt=328us

[admin@R1] > ping 107.26.4.1
SEQ HOST                               SIZE TTL TIME          STATUS
0 107.26.4.1                           56 64 340us
1 107.26.4.1                           56 64 209us
2 107.26.4.1                           56 64 174us
3 107.26.4.1                           56 64 153us
4 107.26.4.1                           56 64 214us
sent=5 received=5 packet-loss=0% min-rtt=153us avg-rtt=218us
max-rtt=340us

[admin@R1] > ping 107.26.4.2
SEQ HOST                               SIZE TTL TIME          STATUS
0 107.26.4.2                           56 64 4ms11us
1 107.26.4.2                           56 64 2ms85us
2 107.26.4.2                           56 64 1ms666us
3 107.26.4.2                           56 64 2ms319us
4 107.26.4.2                           56 64 2ms151us
5 107.26.4.2                           56 64 2ms101us
sent=6 received=6 packet-loss=0% min-rtt=1ms666us avg-rtt=2ms388us
max-rtt=4ms11us

[admin@R1] > 
[admin@R1] > system cl
[admin@R1] /system/clock> /
[admin@R1] >
```

```
R1
File Edit View Search Terminal Help
[admin@R1] /system/clock> /
[admin@R1] > ping 107.26.4.5
SEQ HOST                               SIZE TTL TIME          STATUS
0                                     no route ...
1                                     no route ...
2                                     no route ...
3                                     no route ...
4                                     no route ...
sent=5 received=0 packet-loss=100%

[admin@R1] > ping 107.26.4.6
SEQ HOST                               SIZE TTL TIME          STATUS
0                                     no route ...
1                                     no route ...
2                                     no route ...
3                                     no route ...
4                                     no route ...
sent=5 received=0 packet-loss=100%

[admin@R1] > ping 107.26.4.9
SEQ HOST                               SIZE TTL TIME          STATUS
0 107.26.4.9                           56 64 2ms446us
1 107.26.4.9                           56 64 2ms313us
2 107.26.4.9                           56 64 2ms382us
3 107.26.4.9                           56 64 2ms323us
4 107.26.4.9                           56 64 3ms201us
sent=5 received=5 packet-loss=0% min-rtt=2ms313us avg-rtt=2ms533us
max-rtt=3ms201us
```

```
R1
File Edit View Search Terminal Help
0 107.26.4.9                           56 64 2ms446us
1 107.26.4.9                           56 64 2ms313us
2 107.26.4.9                           56 64 2ms382us
3 107.26.4.9                           56 64 2ms323us
4 107.26.4.9                           56 64 3ms201us
sent=5 received=5 packet-loss=0% min-rtt=2ms313us avg-rtt=2ms533us
max-rtt=3ms201us

[admin@R1] > ping 107.26.4.10
SEQ HOST                               SIZE TTL TIME          STATUS
0 107.26.4.10                          56 64 126us
1 107.26.4.10                          56 64 210us
2 107.26.4.10                          56 64 212us
3 107.26.4.10                          56 64 212us
4 107.26.4.10                          56 64 210us
sent=5 received=5 packet-loss=0% min-rtt=126us avg-rtt=194us
max-rtt=212us

[admin@R1] > ping 107.255.255.2
SEQ HOST                               SIZE TTL TIME          STATUS
0                                     no route ...
1                                     no route ...
2                                     no route ...
3                                     no route ...
4                                     no route ...
sent=5 received=0 packet-loss=100%

[admin@R1] > ping 107.255.255.3
SEQ HOST                               SIZE TTL TIME          STATUS
0                                     no route ...
1                                     no route ...
2                                     no route ...
3                                     no route ...
4                                     no route ...
sent=5 received=0 packet-loss=100%

[admin@R1] >
```

## Για τον R2:

```
[admin@R2] > ping 107.26.4.2
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.26.4.2                            56 64 220us
1 107.26.4.2                            56 64 212us
2 107.26.4.2                            56 64 223us
3 107.26.4.2                            56 64 210us
4 107.26.4.2                            56 64 208us
sent=5 received=5 packet-loss=0% min-rtt=208us avg-rtt=214us
max-rtt=223us
```

```
[admin@R2] > ping 107.26.4.1
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.26.4.1                            56 64 2ms309us
1 107.26.4.1                            56 64 2ms142us
2 107.26.4.1                            56 64 2ms160us
3 107.26.4.1                            56 64 1ms860us
4 107.26.4.1                            56 64 2ms79us
sent=5 received=5 packet-loss=0% min-rtt=1ms860us avg-rtt=2ms111us
max-rtt=2ms309us
```

```
[admin@R2] > ping 107.26.4.5
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.26.4.5                            56 64 207us
1 107.26.4.5                            56 64 208us
2 107.26.4.5                            56 64 204us
3 107.26.4.5                            56 64 209us
4 107.26.4.5                            56 64 214us
sent=5 received=5 packet-loss=0% min-rtt=204us avg-rtt=208us
max-rtt=214us
```

```
[admin@R2] > ping 107.26.4.6
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.26.4.6                            56 64 4ms679us
1 107.26.4.6                            56 64 2ms348us
2 107.26.4.6                            56 64 2ms274us
3 107.26.4.6                            56 64 2ms170us
4 107.26.4.6                            56 64 2ms445us
sent=5 received=5 packet-loss=0% min-rtt=2ms170us avg-rtt=2ms783us
max-rtt=4ms679us
```

```
[admin@R2] > ping 107.26.4.9
SEQ HOST                                SIZE TTL TIME                        STATUS
0                                          no route ...
1                                          no route ...
2                                          no route ...
3                                          no route ...
4                                          no route ...
sent=5 received=0 packet-loss=100%
```

```
[admin@R2] > ping 107.255.255.1
SEQ HOST                                SIZE TTL TIME                        STATUS
0                                          no route ...
1                                          no route ...
2                                          no route ...
3                                          no route ...
4                                          no route ...
sent=5 received=0 packet-loss=100%
```

```
[admin@R2] > ping 107.255.255.2
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.255.255.2                          56 64 293us
1 107.255.255.2                          56 64 216us
2 107.255.255.2                          56 64 214us
3 107.255.255.2                          56 64 211us
4 107.255.255.2                          56 64 215us
sent=5 received=5 packet-loss=0% min-rtt=211us avg-rtt=229us
max-rtt=293us
```

```
[admin@R2] > ping 107.255.255.3
SEQ HOST                                SIZE TTL TIME                        STATUS
0                                          no route ...
1                                          no route ...
2                                          no route ...
3                                          no route ...
4                                          no route ...
sent=5 received=0 packet-loss=100%
```

```
[admin@R2] >
```

## Για τον R3:

```
[admin@R3] > ping 107.26.4.1
SEQ HOST                                SIZE TTL TIME                        STATUS
0                                           no route ...
1                                           no route ...
2                                           no route ...
3                                           no route ...
4                                           no route ...
sent=5 received=0 packet-loss=100%

[admin@R3] > ping 107.26.4.2
SEQ HOST                                SIZE TTL TIME                        STATUS
0                                           no route ...
1                                           no route ...
2                                           no route ...
3                                           no route ...
4                                           no route ...
sent=5 received=0 packet-loss=100%

[admin@R3] > ping 107.26.4.5
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.26.4.5                             56 64 2ms581us
1 107.26.4.5                             56 64 2ms321us
2 107.26.4.5                             56 64 3ms447us
3 107.26.4.5                             56 64 2ms356us
4 107.26.4.5                             56 64 3ms98us
sent=5 received=5 packet-loss=0% min-rtt=2ms321us avg-rtt=2ms760us
max-rtt=3ms447us

[admin@R3] > ping 107.26.4.6
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.26.4.6                             56 64 229us
1 107.26.4.6                             56 64 355us
2 107.26.4.6                             56 64 211us
3 107.26.4.6                             56 64 220us
4 107.26.4.6                             56 64 221us
sent=5 received=5 packet-loss=0% min-rtt=211us avg-rtt=247us
max-rtt=355us

[admin@R3] > ping 107.26.4.9
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.26.4.9                             56 64 257us
1 107.26.4.9                             56 64 226us
2 107.26.4.9                             56 64 221us
3 107.26.4.9                             56 64 221us
4 107.26.4.9                             56 64 223us
sent=5 received=5 packet-loss=0% min-rtt=221us avg-rtt=229us
max-rtt=257us
```

---

```
[admin@R3] > ping 107.26.4.10
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.26.4.10                             56 64 2ms397us
1 107.26.4.10                             56 64 2ms431us
2 107.26.4.10                             56 64 2ms506us
3 107.26.4.10                             56 64 2ms488us
4 107.26.4.10                             56 64 3ms624us
sent=5 received=5 packet-loss=0% min-rtt=2ms397us avg-rtt=2ms689us
max-rtt=3ms624us

[admin@R3] > ping 107.255.255.1
SEQ HOST                                SIZE TTL TIME                        STATUS
0                                           no route ...
1                                           no route ...
2                                           no route ...
3                                           no route ...
4                                           no route ...
sent=5 received=0 packet-loss=100%

[admin@R3] > ping 107.255.255.2
SEQ HOST                                SIZE TTL TIME                        STATUS
0                                           no route ...
1                                           no route ...
2                                           no route ...
3                                           no route ...
4                                           no route ...
sent=5 received=0 packet-loss=100%

[admin@R3] > ping 107.255.255.3
SEQ HOST                                SIZE TTL TIME                        STATUS
0 107.255.255.3                           56 64 189us
1 107.255.255.3                           56 64 268us
2 107.255.255.3                           56 64 214us
3 107.255.255.3                           56 64 214us
4 107.255.255.3                           56 64 215us
sent=5 received=5 packet-loss=0% min-rtt=189us avg-rtt=220us
max-rtt=268us

[admin@R3] >
```

Έπειτα ενεργοποιούμε το πρωτόκολλο OSPF ώστε οι δρομολογητές να ενημερωθούν για όλα τα διαθέσιμα μονοπάτια:

Για τον R1:

```
routing/ospf/instance/add name=default router-id=107.255.255.1
routing/ospf/area/add name=backbone area-id=0.0.0.0 instance=default
routing/ospf/interface-template add network=107.26.4.0/30 area=backbone
routing/ospf/interface-template add network=ether1 area=backbone
routing/ospf/interface-template add network=107.26.4.8/30 area=backbone
routing/ospf/interface-template add network=ether2 area=backbone
```

Για τον R2:

```
[admin@R2] > /routing/ospf/instance/add name=default router-id=107.255.255.2
[admin@R2] > /routing/ospf/area/add name=backbone area-id=0.0.0.0 instance=default
[admin@R2] > /routing/ospf/interface-template add network=107.26.4.0/30 area=backbone
[admin@R2] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R2] > /routing/ospf/interface-template add network=107.26.4.4/30 area=backbone
[admin@R2] > /routing/ospf/interface-template add network=ether2 area=backbone
[admin@R2] >
```

Για τον R3:



```
[admin@R3] > /routing/ospf/instance/add name=default router-id=107.255.255.3
[admin@R3] > /routing/ospf/area/add name=backbone area-id=0.0.0.0 instance=default
[admin@R3] > /routing/ospf/interface-template add network=107.26.4.4/30 area=backbone
[admin@R3] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R3] > /routing/ospf/interface-template add network=107.26.4.8/30 area=backbone
[admin@R3] > /routing/ospf/interface-template add network=ether2 area=backbone
```

2η Ερώτηση:

Εκτελούμε την εντολή ip route print για να δείξουμε όλα τα μονοπάτια:

```
[admin@R1] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
```

	DST-ADDRESS	GATEWAY	DISTANCE
DAc	107.26.4.0/30	ether1	0
DAo+	107.26.4.4/30	107.26.4.2%ether1	110
DAo+	107.26.4.4/30	107.26.4.9%ether2	110
DAc	107.26.4.8/30	ether2	0
DAc	107.255.255.1/32	loopback0	0
DAo	107.255.255.2/32	107.26.4.2%ether1	110
DAo	107.255.255.3/32	107.26.4.9%ether2	110

```
[admin@R1] >
```

```
[admin@R2] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
```

	DST-ADDRESS	GATEWAY	DISTANCE
DAc	107.26.4.0/30	ether1	0
DAc	107.26.4.4/30	ether2	0
DAo+	107.26.4.8/30	107.26.4.6%ether2	110
DAo+	107.26.4.8/30	107.26.4.1%ether1	110
DAo	107.255.255.1/32	107.26.4.1%ether1	110
DAc	107.255.255.2/32	loopback0	0
DAo	107.255.255.3/32	107.26.4.6%ether2	110

```
[admin@R2] >
```

Ερώτηση 3:

Εκτελούμε ping από τον R1 προς όλα τα μη αντικριστά interfaces :

```
[admin@R1] > ping 107.26.4.5
```

SEQ	HOST	SIZE	TTL	TIME	STATUS
0	107.26.4.5	56	64	1ms919us	
1	107.26.4.5	56	64	3ms270us	
2	107.26.4.5	56	64	3ms332us	
3	107.26.4.5	56	64	1ms763us	
4	107.26.4.5	56	64	3ms435us	

```
sent=5 received=5 packet-loss=0% min-rtt=1ms763us avg-rtt=2ms743us
max-rtt=3ms435us
```

```
[admin@R1] > ping 107.26.4.6
```

SEQ	HOST	SIZE	TTL	TIME	STATUS
0	107.26.4.6	56	64	2ms500us	
1	107.26.4.6	56	64	2ms270us	
2	107.26.4.6	56	64	2ms434us	
3	107.26.4.6	56	64	2ms304us	
4	107.26.4.6	56	64	2ms373us	

```
sent=5 received=5 packet-loss=0% min-rtt=2ms270us avg-rtt=2ms376us
max-rtt=2ms500us
```

```
[admin@R1] >
```

Παρατηρούμε ότι μπορούμε να pingάρουμε μη αντικριστά interfaces.

Ερώτηση 4:

Υλοποιούμε dhcp-server στην διεπαφή ether3 του R2:

```
[admin@R2] > /ip address add address=10.72.60.1/24 interface=ether3
[admin@R2] > ip dhcp-server setup
Select interface to run DHCP server on

dhcp server interface: ether3
Select network for DHCP addresses

dhcp address space: 10.72.60.0/24
Select gateway for given network

gateway for dhcp network: 10.72.60.1
Select pool of ip addresses given out by DHCP server

addresses to give out: 10.72.60.2-10.72.60.254
Select DNS servers

dns servers:
Select lease time

lease time: 10m
[admin@R2] >
```

και η παραμετροποίηση για το PC1:

Τρέχοντας  
την εντολή  
ip route  
print  
βλέπουμε  
για όλους  
τους

```
PC1> ip dhcp  
DORA IP 10.72.60.254/24 GW 10.72.60.1  
  
PC1> ip 10.72.60.4 255.255.255.0 10.72.60.1  
Checking for duplicate address...  
PC1 : 10.72.60.4 255.255.255.0 gateway 10.72.60.1  
  
PC1>
```

δρομολογητές όλα τα μονοπάτια δρομολόγησης:

The screenshot shows three Mikrotik RouterOS terminals (R2, R3, and R1) and a PC terminal. R2 and R3 display their routing tables after the configuration. R1 shows the configuration for the PC.

**R2 Routing Table:**

DST-ADDRESS	GATEWAY	DISTANCE
DAc 10.72.60.0/24	ether3	0
DAc 107.26.4.0/30	ether1	0
DAc 107.26.4.4/30	ether2	0
DAo+ 107.26.4.8/30	107.26.4.1%ether1	110
DAo+ 107.26.4.8/30	107.26.4.6%ether2	110
DAo 107.255.255.1/32	107.26.4.1%ether1	110
DAc 107.255.255.2/32	loopback0	0
DAo 107.255.255.3/32	107.26.4.6%ether2	110

**R3 Routing Table:**

DST-ADDRESS	GATEWAY	DISTANCE
DAo 10.72.60.0/24	107.26.4.5%ether1	110
DAo+ 107.26.4.0/30	107.26.4.10%ether2	110
DAo+ 107.26.4.0/30	107.26.4.5%ether1	110
DAc 107.26.4.4/30	ether1	0
DAc 107.26.4.8/30	ether2	0
DAo 107.255.255.1/32	107.26.4.10%ether2	110
DAo 107.255.255.2/32	107.26.4.5%ether1	110
DAc 107.255.255.3/32	loopback0	0

**R1 Routing Table:**

DST-ADDRESS	GATEWAY	DISTANCE
DAo 10.72.60.0/24	107.26.4.2%ether1	110
DAc 107.26.4.0/30	ether1	0
DAo+ 107.26.4.4/30	107.26.4.9%ether2	110
DAo+ 107.26.4.4/30	107.26.4.2%ether1	110
DAc 107.26.4.8/30	ether2	0
DAc 107.255.255.1/32	loopback0	0
DAo 107.255.255.2/32	107.26.4.2%ether1	110
DAo 107.255.255.3/32	107.26.4.9%ether2	110

Ερώτηση 5:

Εκτελώντας την εντολή ip route print δείχνουμε τα μονοπάτια δρομολόγησης των 3 router μετά την προσθήκη του internet node και dhcp-client στην ether3 του R1:

ip/dhcp-client/ add interface=ether3

The screenshot shows three Mikrotik RouterOS terminals (R1, R2, and R3) and a PC terminal. R1 shows the configuration for the PC and the routing table. R2 and R3 show their routing tables after the configuration.

**R1 Routing Table:**

DST-ADDRESS	GATEWAY	DISTANCE
DAc 0.0.0.0/0	192.168.1.1	1
DAo 10.72.60.0/24	107.26.4.2%ether1	110
DAc 107.26.4.0/30	ether1	0
DAo+ 107.26.4.4/30	107.26.4.2%ether1	110
DAo+ 107.26.4.4/30	107.26.4.9%ether2	110
DAc 107.26.4.8/30	ether2	0
DAc 107.255.255.1/32	loopback0	0
DAo 107.255.255.2/32	107.26.4.2%ether1	110
DAo 107.255.255.3/32	107.26.4.9%ether2	110
DAc 192.168.1.0/24	ether3	0

**R2 Routing Table:**

DST-ADDRESS	GATEWAY	DISTANCE
DAc 10.72.60.0/24	ether3	0
DAc 107.26.4.0/30	ether1	0
DAc 107.26.4.4/30	ether2	0
DAo+ 107.26.4.8/30	107.26.4.6%ether2	110
DAo+ 107.26.4.8/30	107.26.4.1%ether1	110
DAo 107.255.255.1/32	107.26.4.1%ether1	110
DAc 107.255.255.2/32	loopback0	0
DAo 107.255.255.3/32	107.26.4.6%ether2	110
DAo 192.168.1.0/24	107.26.4.1%ether1	110

**R3 Routing Table:**

DST-ADDRESS	GATEWAY	DISTANCE
DAo 10.72.60.0/24	107.26.4.5%ether1	110
DAo+ 107.26.4.0/30	107.26.4.10%ether2	110
DAo+ 107.26.4.0/30	107.26.4.5%ether1	110
DAc 107.26.4.4/30	ether1	0
DAc 107.26.4.8/30	ether2	0
DAo 107.255.255.1/32	107.26.4.10%ether2	110
DAo 107.255.255.2/32	107.26.4.5%ether1	110
DAc 107.255.255.3/32	loopback0	0
DAo 192.168.1.0/24	107.26.4.10%ether2	110



Ερώτηση 6:

Εκτελώντας ping 8.8.8.8 από τον R1 βλέπουμε ότι έχουμε πρόσβαση:

```
[admin@R1] > ping 8.8.8.8
```

SEQ	HOST	SIZE	TTL	TIME	STATUS
0	8.8.8.8	56	54	56ms436us	
1	8.8.8.8	56	54	56ms620us	
2	8.8.8.8	56	54	56ms935us	
3	8.8.8.8	56	54	57ms649us	
4	8.8.8.8	56	54	55ms764us	

sent=5 received=5 packet-loss=0% min-rtt=55ms764us avg-rtt=56ms680us  
max-rtt=57ms649us

```
[admin@R1] >
```

Ακολουθούν στιγμιότυπα από ping προς τις ζητούμενες διευθύνσεις:

The screenshot shows two terminal windows side-by-side. The left window is titled 'R2' and the right window is titled 'R3'. Both windows show the output of ping commands from their respective hosts.

**R2 Terminal Output:**

```
[admin@R2] > ping 192.168.1.1
SEQ HOST          SIZE TTL TIME          STATUS
0 192.168.1.1      56 64 51ms366us      timeout
1 192.168.1.1      56 64 51ms366us      timeout
2 192.168.1.1      56 64 51ms366us      timeout
3 107.26.4.1       84 64 51ms366us      host unre...
4 192.168.1.1      56 64 51ms366us      timeout
5 192.168.1.1      56 64 51ms366us      timeout
sent=6 received=0 packet-loss=100%

[admin@R2] > ping 8.8.8.8
SEQ HOST          SIZE TTL TIME          STATUS
0 192.168.1.1      56 64 51ms366us      no route ...
1 192.168.1.1      56 64 51ms366us      no route ...
2 192.168.1.1      56 64 51ms366us      no route ...
3 192.168.1.1      56 64 51ms366us      no route ...
4 192.168.1.1      56 64 51ms366us      no route ...
sent=5 received=0 packet-loss=100%

[admin@R2] > ping 192.168.1.8
SEQ HOST          SIZE TTL TIME          STATUS
0 192.168.1.8      56 64 1ms543us      56 64 2ms405us
1 192.168.1.8      56 64 1ms399us      56 64 2ms122us
2 192.168.1.8      56 64 1ms399us      56 64 2ms123us
3 192.168.1.8      56 64 1ms399us      56 64 2ms123us
4 192.168.1.8      56 64 1ms399us      56 64 2ms123us
sent=5 received=5 packet-loss=0% min-rtt=1ms399us avg-rtt=1ms918us
max-rtt=2ms405us

[admin@R2] >
```

**R3 Terminal Output:**

```
[admin@R3] > ping 192.168.1.8
SEQ HOST          SIZE TTL TIME          STATUS
0 192.168.1.8      56 64 1ms181us      56 64 2ms500us
1 192.168.1.8      56 64 1ms181us      56 64 2ms259us
2 192.168.1.8      56 64 1ms181us      56 64 2ms346us
3 192.168.1.8      56 64 1ms181us      56 64 2ms464us
4 192.168.1.8      56 64 1ms181us      56 64 2ms464us
sent=5 received=5 packet-loss=0% min-rtt=1ms181us avg-rtt=2ms150us
max-rtt=2ms500us

[admin@R3] > ping 192.168.1.1
SEQ HOST          SIZE TTL TIME          STATUS
0 192.168.1.1      56 64 1ms181us      timeout
1 192.168.1.1      56 64 1ms181us      timeout
2 192.168.1.1      56 64 1ms181us      timeout
3 192.168.1.1      56 64 1ms181us      timeout
4 192.168.1.1      56 64 1ms181us      timeout
sent=5 received=0 packet-loss=100%

[admin@R3] > ping 8.8.8.8
SEQ HOST          SIZE TTL TIME          STATUS
0 8.8.8.8           56 54 56ms436us      no rou
1 8.8.8.8           56 54 56ms620us      no rou
2 8.8.8.8           56 54 56ms935us      no rou
3 8.8.8.8           56 54 57ms649us      no rou
4 8.8.8.8           56 54 55ms764us      no rou
sent=5 received=0 packet-loss=100%

[admin@R3] >
```

Παρατηρούμε ότι ενώ επικοινωνούν με το ether3 του R1 δεν επικοινωνούν με το gateway 192.168.1.1 και το 8.8.8.8.

Ερώτηση 8:

Υλοποιούμε αρχικά NAT στην ether3:

```
[admin@R1] > ip firewall nat add chain=srcnat action=masquerade out-interface=ether3
[admin@R1] >
```

και προσθέτουμε τα απαραίτητα μονοπάτια μέσω της ip route:

```

R2
File Edit View Search Terminal Help
1
2
sent=3 received=0 packet-loss=100%

[admin@R2] > ip route add dst-address=0.0.0.0/0 gateway=107.26.4.1 distance=2
[admin@R2] > ping 8.8.8.8
  SEQ HOST                                SIZE TTL TIME                        STATUS
  0 8.8.8.8                                56 53 58ms42us                        50
  1 8.8.8.8                                56 53 59ms395us                       50
  2 8.8.8.8                                56 53 58ms139us                       50
  3 8.8.8.8                                56 53 59ms523us                       50
  4 8.8.8.8                                56 53 59ms21us                        50
sent=5 received=5 packet-loss=0% min-rtt=58ms42us avg-rtt=58ms824us max-rtt=59ms523us

[admin@R2] > ping 192.168.1.8
  SEQ HOST                                SIZE TTL TIME                        STATUS
  0 192.168.1.8                            56 64 2ms365us                        50
  1 192.168.1.8                            56 64 2ms138us                       50
  2 192.168.1.8                            56 64 2ms132us                       50
  3 192.168.1.8                            56 64 2ms163us                       50
  4 192.168.1.8                            56 64 1ms805us                       50
sent=5 received=5 packet-loss=0% min-rtt=1ms805us avg-rtt=2ms120us max-rtt=2ms365us

[admin@R2] > ping 192.168.1.1
  SEQ HOST                                SIZE TTL TIME                        STATUS
  0 192.168.1.1                            56 63 3ms864us                       50
  1 192.168.1.1                            56 63 3ms484us                       50
  2 192.168.1.1                            56 63 3ms444us                       50
  3 192.168.1.1                            56 63 3ms549us                       50
  4 192.168.1.1                            56 63 3ms396us                       50
  5 192.168.1.1                            56 63 3ms790us                       50
sent=6 received=6 packet-loss=0% min-rtt=3ms396us avg-rtt=3ms587us max-rtt=3ms864us

[admin@R2] >

R3
File Edit View Search Terminal Help
sent=4 received=4 packet-loss=0% min-rtt=3ms469us avg-rtt=3ms708us max-rtt=3ms944us

[admin@R3] > ip route add dst-address=0.0.0.0/0 gateway=107.26.4.10 distance=2
[admin@R3] > ping 192.168.1.8
  SEQ HOST                                SIZE TTL TIME                        STATUS
  0 192.168.1.8                            56 64 1ms535us                       50
  1 192.168.1.8                            56 64 2ms551us                       50
  2 192.168.1.8                            56 64 2ms295us                       50
  3 192.168.1.8                            56 64 2ms555us                       50
  4 192.168.1.8                            56 64 2ms317us                       50
sent=5 received=5 packet-loss=0% min-rtt=1ms535us avg-rtt=2ms250us max-rtt=2ms555us

[admin@R3] > ping 192.168.1.1
  SEQ HOST                                SIZE TTL TIME                        STATUS
  0 192.168.1.1                            56 63 3ms886us                       50
  1 192.168.1.1                            56 63 3ms497us                       50
  2 192.168.1.1                            56 63 3ms690us                       50
  3 192.168.1.1                            56 63 3ms286us                       50
  4 192.168.1.1                            56 63 3ms671us                       50
  5 192.168.1.1                            56 63 3ms873us                       50
sent=6 received=6 packet-loss=0% min-rtt=3ms286us avg-rtt=3ms650us max-rtt=3ms886us

[admin@R3] > ping 8.8.8.8
  SEQ HOST                                SIZE TTL TIME                        STATUS
  0 8.8.8.8                                56 53 58ms415us                       50
  1 8.8.8.8                                56 53 59ms410us                       50
  2 8.8.8.8                                56 53 58ms370us                       50
  3 8.8.8.8                                56 53 58ms731us                       50
  4 8.8.8.8                                56 53 58ms694us                       50
sent=5 received=5 packet-loss=0% min-rtt=58ms370us avg-rtt=58ms724us max-rtt=59ms410us

[admin@R3] >

```

Έπειτα από τις απαραίτητες παραμετροποιήσεις παίρνουμε απάντηση από όλους τους προορισμούς.

Ερώτημα 9:

Για να προστατευτούμε από πιθανή διακοπή της ζεύξης R1-R3 ορίζουμε εναλλακτικό gateway για την κίνηση προς το internet ως εξής:

`ip route add dst-address=0.0.0.0/0 gateway=107.26.4.5 distance=3`

Τρέχοντας tool traceroute 8.8.8.8 πριν διακόψουμε την παραπάνω ζεύξη θα έχουμε:

```

[admin@R3] > tool traceroute 8.8.8.8
Columns: ADDRESS, LOSS, SENT, LAST, AVG, BEST, WORST, STD-DEV
# ADDRESS          LOSS  SENT  LAST      AVG    BEST  WORST  STD-DEV
1 107.26.4.10       0%    7     1.7ms     1.8    1.6    2.1    0.2
2 192.168.1.1       0%    7     3ms       2.9    2      4.1    0.6
3 10.106.108.100    0%    7     18.4ms    18.2   17.7   19.4   0.6
4 79.128.234.0      0%    7     20.3ms    20.4   19.9   21.2   0.4
5 79.128.229.22     0%    7     21.2ms    23.2   20.7   35.9   5.2
6 79.128.234.86     0%    7     21.2ms    21      20.2   22.1   0.6
7                      100%  7     timeout
8 79.128.234.89     0%    6     23ms      22.4   21.7   23      0.5
9 62.75.3.9         0%    6     23ms      22.8   22     23.2   0.4
10 62.75.6.10        0%    6     59.3ms    58.9   58.3   59.3   0.3
11 74.125.51.154     0%    6     57.6ms    59.1   57.6   61      1.1
12 142.251.65.71     0%    6     60.1ms    60      59.8   60.2   0.1
13 142.250.214.193   0%    6     58.4ms    57.7   57     58.4   0.4
14 8.8.8.8           0%    6     58.4ms    58      57.1   58.7   0.6
-- [Q quit|D dump|C-z pause]

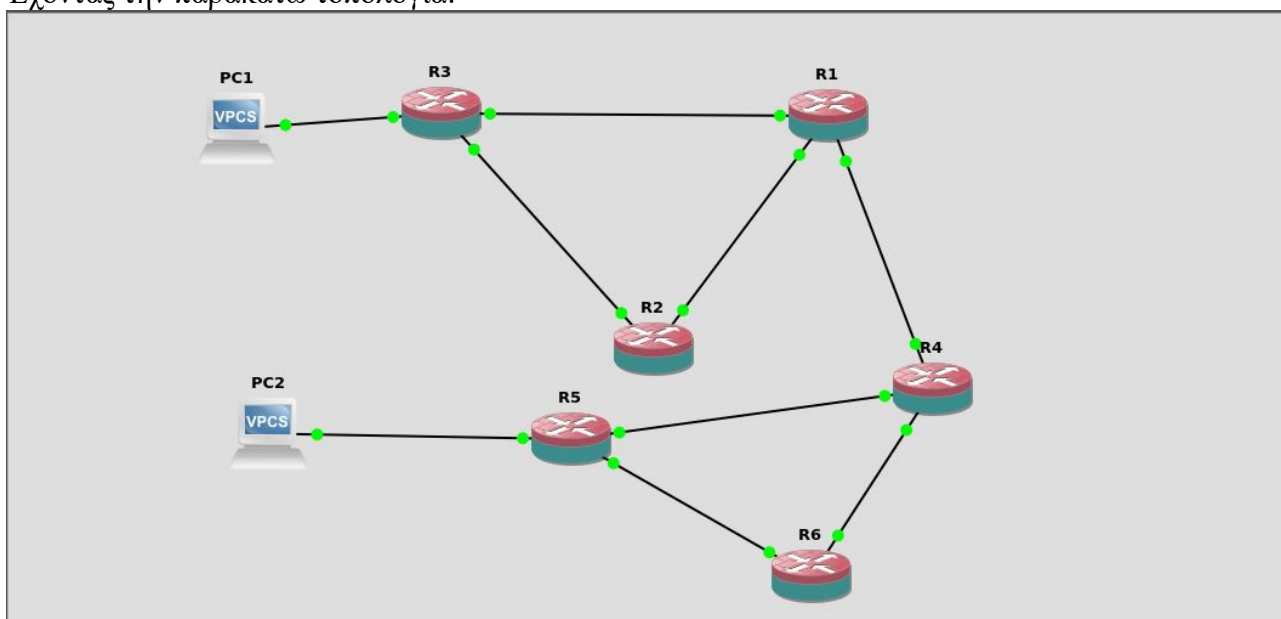
```

Αφαιρούμε τη ζεύξη μεταξύ R1-R3 και τέλος εκτελούμε πάλι ping 8.8.8.8:

```
[admin@R3] > tool traceroute 8.8.8.8
Columns: ADDRESS, LOSS, SENT, LAST, AVG, BEST, WORST, STD-DEV
# ADDRESS LOSS SENT LAST AVG BEST WORST STD-DEV
1 107.26.4.5 0% 9 2.3ms 1.7 0.7 2.4 0.6
2 107.26.4.1 0% 9 4.5ms 3.1 1.4 4.5 1.1
3 192.168.1.1 0% 9 5.4ms 4.4 2.5 5.6 0.9
4 10.106.108.100 0% 9 20.8ms 19.9 19.2 20.8 0.5
5 79.128.234.0 0% 9 22.2ms 22.1 21.4 23.1 0.4
6 79.128.229.22 0% 9 22.5ms 22.9 22.1 24 0.5
7 79.128.234.86 0% 9 23.9ms 22.7 20.8 23.9 0.8
8 79.128.35.173 62.5% 9 timeout 22.6 21.9 23.2 0.5
9 79.128.234.89 0% 8 24.3ms 24.2 23.4 26.2 0.8
10 62.75.3.9 0% 8 24.4ms 25.7 24.3 32.5 2.6
11 62.75.6.10 0% 8 61.2ms 61 60.5 61.5 0.4
12 74.125.51.154 0% 8 58.7ms 60.4 58.7 61.2 0.8
13 142.251.65.71 0% 8 61.6ms 62 60.9 63 0.7
14 142.250.214.193 0% 8 64.6ms 60.3 58.5 64.6 1.7
15 8.8.8.8 0% 8 60.5ms 59.3 57.4 60.5 1.1
-- [Q quit|D dump|C-z pause]
```

### Άσκηση 7

Έχοντας την παρακάτω τοπολογία:



Κάνουμε τις απαραίτητες τροποποιήσεις στους δρομολογητές δηλαδή αντίστοιχη διευθυνσιοδότηση, ενεργοποίηση πρωτοκόλλου OSPF και BGP προκειμένου να πετύχουμε επικοινωνία μεταξύ των 2 VPCs:



```
R1
File Edit View Search Terminal Help
DAc 107.255.255.1/32 loopback0 0
DAc 192.168.2.0/30 ether3 0
[admin@R1] > /routing/ospf/instance/add name=default router-id=107.255.255.1
[admin@R1] > /routing/ospf/area/add name=backbone area-id=0.0.0.0 instance=default
[admin@R1] > /routing/
[admin@R1] /routing> /
[admin@R1] > /routing/ospf/interface-template add network=107.26.4.0/30 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=107.26.4.8/30 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=ether2 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=192.168.2.0/30 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=ether3 area=backbone
[admin@R1] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, y - COPY
```

```
R2
File Edit View Search Terminal Help
may/03/2022 19:21:42 system,error,critical router was rebooted without proper shu
tdown

[admin@R2] > ip print
bad command name print (line 1 column 4)
[admin@R2] >
[admin@R2] > ip address print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS NETWORK INTERFACE
0 107.26.4.9/30 107.26.4.8 ether1
1 107.26.4.5/30 107.26.4.4 ether2
2 107.255.255.2/32 107.255.255.2 loopback0
[admin@R2] > /routing/ospf/instance/add name=default router-id=107.255.255.2
[admin@R2] > /routing/ospf/area/add name=backbone area-id=0.0.0.0 instance=default
[admin@R2] > /routing/ospf/interface-template add network=107.26.4.8/30 area=backbone
[admin@R2] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R2] > /routing/ospf/interface-template add network=107.26.4.4/30 area=backbone
[admin@R2] > /routing/ospf/interface-template add network=ether2 area=backbone
[admin@R2] > ip route print
```

```
R3
File Edit View Search Terminal Help
[admin@R3] > /routing/ospf/instance/add name=default router-id=107.255.255.3
[admin@R3] > /routing/ospf/area/add name=backbone area-id=0.0.0.0 instance=default
[admin@R3] > ip address print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS NETWORK INTERFACE
0 107.26.4.2/30 107.26.4.0 ether1
1 107.26.4.6/30 107.26.4.4 ether2
2 107.255.255.3/32 107.255.255.3 loopback0
3 10.72.60.1/24 10.72.60.0 ether3
[admin@R3] > /routing/ospf/interface-template add network=107.26.4.0/30 area=backbone
[admin@R3] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R3] > /routing/ospf/interface-template add network=107.26.4.4/30 area=backbone
[admin@R3] > /routing/ospf/interface-template add network=ether2 area=backbone
[admin@R3] > /routing/ospf/interface-template add network=10.72.60.0/24 area=backbone
[admin@R3] > /routing/ospf/interface-template add network=ether3 area=backbone
[admin@R3] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
DST-ADDRESS GATEWAY DISTANCE
DAc 10.72.60.0/24 ether3 0
DAo 11.72.60.0/24 107.26.4.1 ether1 110
DAc 107.26.4.0/30 ether1 0
DAc 107.26.4.4/30 ether2 0
DAo+ 107.26.4.8/30 107.26.4.5 ether2 110

R4
File Edit View Search Terminal Help
[admin@R4] > ip address print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS NETWORK INTERFACE
0 107.26.5.1/30 107.26.5.0 ether1
1 107.26.5.10/30 107.26.5.8 ether2
2 192.168.2.1/30 192.168.2.0 ether3
3 107.255.255.4/32 107.255.255.4 loopback0
[admin@R4] > /routing/ospf/interface-template add network=107.26.5.0/30 area=backbone
[admin@R4] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R4] > /routing/ospf/interface-template add network=107.26.5.8/30 area=backbone
[admin@R4] > /routing/ospf/interface-template add network=ether2 area=backbone
[admin@R4] > /routing/ospf/interface-template add network=192.168.2.0/30 area=backbone
[admin@R4] > /routing/ospf/interface-template add network=ether3 area=backbone
[admin@R4] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY
Columns: DST-ADDRESS, GATEWAY, DISTANCE
DST-ADDRESS GATEWAY DISTANCE
DAo 10.72.60.0/24 192.168.2.2 ether3 110
DAo 107.26.4.0/30 192.168.2.2 ether3 110
DAo 107.26.4.4/30 192.168.2.2 ether3 110
```

```
R5
File Edit View Search Terminal Help
[admin@R5] > /routing/ospf/instance/add name=default router-id=107.255.255.5
[admin@R5] > /routing/ospf/area/add name=backbone area-id=0.0.0.0 instance=default
[admin@R5] > ip address print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS NETWORK INTERFACE
0 107.26.5.2/30 107.26.5.0 ether1
1 107.26.5.5/30 107.26.5.4 ether2
2 107.255.255.5/32 107.255.255.5 loopback0
3 11.72.60.1/24 11.72.60.0 ether3
[admin@R5] > /routing/ospf/interface-template add network=107.26.5.0/30 area=backbone
[admin@R5] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R5] > /routing/ospf/interface-template add network=107.26.5.4/30 area=backbone
[admin@R5] > /routing/ospf/interface-template add network=ether2 area=backbone
[admin@R5] > /routing/ospf/interface-template add network=11.72.60.0/24 area=backbone
[admin@R5] > /routing/ospf/interface-template add network=ether3 area=backbone

R6
File Edit View Search Terminal Help
may/03/2022 19:21:45 system,error,critical router was rebooted without proper shutdown
[admin@R6] > /routing/ospf/instance/add name=default router-id=107.255.255.6
[admin@R6] > /routing/ospf/area/add name=backbone area-id=0.0.0.0 instance=default
[admin@R6] > ip address print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS NETWORK INTERFACE
0 107.26.5.9/30 107.26.5.8 ether2
1 107.26.5.6/30 107.26.5.4 ether1
2 107.255.255.6/32 107.255.255.6 loopback0
[admin@R6] > /routing/ospf/interface-template add network=107.26.5.8/30 area=backbone
[admin@R6] > /routing/ospf/interface-template add network=ether2 area=backbone
[admin@R6] > /routing/ospf/interface-template add network=107.26.5.4/30 area=backbone
[admin@R6] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R6] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
```

Flags: D - dynamic, X - disabled, I - inactive

```
0 name="toR1"
  remote.address=192.168.2.2
  local.default-address=192.168.2.1 .role=ebgp
  listen=yes routing-table=main router-id=107.255.255.4 templates=default
  as=65531
```

[admin@R4] >

[admin@R1] > /routing/bgp/connection/print

Flags: D - dynamic, X - disabled, I - inactive

```
0 name="toR4"
  remote.address=192.168.2.1
  local.default-address=192.168.2.2 .role=ebgp
  listen=yes routing-table=main router-id=107.255.255.1 templates=default
  as=65531
```

[admin@R1] >

Ερώτηση 10: Με την εντολή ip route print δείχνουμε όλα τα μονοπάτια δρομολόγησης σε κάθε router:

R1	R2
<pre>File Edit View Search Terminal Help listen=yes routing-table=main router-id=107.255.255.1 templates=default as=65531 [admin@R1] &gt; ip route print Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP Columns: DST-ADDRESS, GATEWAY, DISTANCE DST-ADDRESS    GATEWAY    DISTANCE DAo 10.72.60.0/24 107.26.4.2%ether1 110 DAo 11.72.60.0/24 192.168.2.1%ether3 110 DAc 107.26.4.0/30 ether1 0 DAo+ 107.26.4.4/30 107.26.4.2%ether1 110 DAo+ 107.26.4.4/30 107.26.4.9%ether2 110 DAc 107.26.4.8/30 ether2 0 DAo 107.26.5.0/30 192.168.2.1%ether3 110 DAo 107.26.5.4/30 192.168.2.1%ether3 110 DAo 107.26.5.8/30 192.168.2.1%ether3 110 DAc 107.255.255.1/32 loopback0 0 DAo 107.255.255.2/32 107.26.4.9%ether2 110 DAo 107.255.255.3/32 107.26.4.2%ether1 110 DAo 107.255.255.4/32 192.168.2.1%ether3 110 DAo 107.255.255.5/32 192.168.2.1%ether3 110 DAo 107.255.255.6/32 192.168.2.1%ether3 110 DAc 192.168.2.0/30 ether3 0 [admin@R1] &gt; [admin@R1] &gt; █</pre>	<pre>File Edit View Search Terminal Help [admin@R2] &gt; /routing/ospf/interface-template add network=107.26.4.4/30 area kbone [admin@R2] &gt; /routing/ospf/interface-template add network=ether2 area=backbo kbone [admin@R2] &gt; ip route print Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP Columns: DST-ADDRESS, GATEWAY, DISTANCE DST-ADDRESS    GATEWAY    DISTANCE DAo 10.72.60.0/24 107.26.4.6%ether2 110 DAo 11.72.60.0/24 107.26.4.10%ether1 110 DAo+ 107.26.4.0/30 107.26.4.10%ether1 110 DAo+ 107.26.4.0/30 107.26.4.6%ether2 110 DAc 107.26.4.4/30 ether2 0 DAc 107.26.4.8/30 ether1 0 DAo 107.26.5.0/30 107.26.4.10%ether1 110 DAo 107.26.5.4/30 107.26.4.10%ether1 110 DAo 107.26.5.8/30 107.26.4.10%ether1 110 DAo 107.255.255.1/32 107.26.4.10%ether1 110 DAc 107.255.255.2/32 loopback0 0 DAo 107.255.255.3/32 107.26.4.6%ether2 110 DAo 107.255.255.4/32 107.26.4.10%ether1 110 DAo 107.255.255.5/32 107.26.4.10%ether1 110 DAo 107.255.255.6/32 107.26.4.10%ether1 110 DAo 192.168.2.0/30 107.26.4.10%ether1 110 [admin@R2] &gt;</pre>
R3	R4
<pre>File Edit View Search Terminal Help [admin@R3] &gt; /routing/ospf/interface-template add network=10.72.60.0/24 area=bac kbone [admin@R3] &gt; /routing/ospf/interface-template add network=ether3 area=backbone [admin@R3] &gt; ip route print Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP Columns: DST-ADDRESS, GATEWAY, DISTANCE DST-ADDRESS    GATEWAY    DISTANCE DAc 10.72.60.0/24 ether3 0 DAo 11.72.60.0/24 107.26.4.1%ether1 110 DAc 107.26.4.0/30 ether1 0 DAc 107.26.4.4/30 ether2 0 DAo+ 107.26.4.8/30 107.26.4.5%ether2 110 DAo+ 107.26.4.8/30 107.26.4.1%ether1 110 DAo 107.26.5.0/30 107.26.4.1%ether1 110 DAo 107.26.5.4/30 107.26.4.1%ether1 110 DAo 107.26.5.8/30 107.26.4.1%ether1 110 DAo 107.255.255.1/32 107.26.4.1%ether1 110 DAo 107.255.255.2/32 107.26.4.5%ether2 110 DAc 107.255.255.3/32 loopback0 0 DAo 107.255.255.4/32 107.26.4.1%ether1 110 DAo 107.255.255.5/32 107.26.4.1%ether1 110 DAo 107.255.255.6/32 107.26.4.1%ether1 110 DAo 192.168.2.0/30 107.26.4.1%ether1 110 [admin@R3] &gt; [admin@R3] &gt; █</pre>	<pre>File Edit View Search Terminal Help local.default-address=192.168.2.1 .role=ebgp listen=yes routing-table=main router-id=107.255.255.4 templates=default as=65531 [admin@R4] &gt; ip route print Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP Columns: DST-ADDRESS, GATEWAY, DISTANCE DST-ADDRESS    GATEWAY    DISTANCE DAo 10.72.60.0/24 192.168.2.2%ether3 110 DAo 11.72.60.0/24 107.26.5.2%ether1 110 DAo 107.26.4.0/30 192.168.2.2%ether3 110 DAo 107.26.4.4/30 192.168.2.2%ether3 110 DAc 107.26.4.8/30 192.168.2.2%ether3 110 DAc 107.26.5.0/30 ether1 0 DAo+ 107.26.5.4/30 107.26.5.2%ether1 110 DAo+ 107.26.5.4/30 107.26.5.9%ether2 110 DAc 107.26.5.8/30 ether2 0 DAo 107.255.255.1/32 192.168.2.2%ether3 110 DAo 107.255.255.2/32 192.168.2.2%ether3 110 DAo 107.255.255.3/32 192.168.2.2%ether3 110 DAc 107.255.255.4/32 loopback0 0 DAo 107.255.255.5/32 107.26.5.2%ether1 110 DAo 107.255.255.6/32 107.26.5.9%ether2 110 DAc 192.168.2.0/30 ether3 0 [admin@R4] &gt;</pre>



```
R5
File Edit View Search Terminal Help
[admin@R5] > /routing/ospf/interface-template add network=11.72.60.0/24 area=backbone
[admin@R5] > /routing/ospf/interface-template add network=ether3 area=backbone
[admin@R5] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
DST-ADDRESS  GATEWAY  DISTANCE
DAo 10.72.60.0/24 107.26.5.1%ether1 110
DAc 11.72.60.0/24 ether3 0
DAo 107.26.4.0/30 107.26.5.1%ether1 110
DAo 107.26.4.4/30 107.26.5.1%ether1 110
DAo 107.26.4.8/30 107.26.5.1%ether1 110
DAc 107.26.5.0/30 ether1 0
DAc 107.26.5.4/30 ether2 0
DAo+ 107.26.5.8/30 107.26.5.6%ether2 110
DAo+ 107.26.5.8/30 107.26.5.1%ether1 110
DAo 107.255.255.1/32 107.26.5.1%ether1 110
DAo 107.255.255.2/32 107.26.5.1%ether1 110
DAo 107.255.255.3/32 107.26.5.1%ether1 110
DAo 107.255.255.4/32 107.26.5.1%ether1 110
DAc 107.255.255.5/32 loopback0 0
DAo 107.255.255.6/32 107.26.5.6%ether2 110
DAo 192.168.2.0/30 107.26.5.1%ether1 110
[admin@R5] >

R6
File Edit View Search Terminal Help
[admin@R6] > /routing/ospf/interface-template add network=107.26.5.4/30 area=backbone
[admin@R6] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R6] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
DST-ADDRESS  GATEWAY  DISTANCE
DAo 10.72.60.0/24 107.26.5.10%ether2 110
DAo 11.72.60.0/24 107.26.5.5%ether1 110
DAo 107.26.4.0/30 107.26.5.10%ether2 110
DAo 107.26.4.4/30 107.26.5.10%ether2 110
DAo 107.26.4.8/30 107.26.5.10%ether2 110
DAo+ 107.26.5.0/30 107.26.5.10%ether1 110
DAo+ 107.26.5.0/30 107.26.5.5%ether1 110
DAc 107.26.5.4/30 ether1 0
DAc 107.26.5.8/30 ether2 0
DAo 107.255.255.1/32 107.26.5.10%ether2 110
DAo 107.255.255.2/32 107.26.5.10%ether2 110
DAo 107.255.255.3/32 107.26.5.10%ether2 110
DAo 107.255.255.4/32 107.26.5.10%ether2 110
DAo 107.255.255.5/32 107.26.5.5%ether1 110
DAc 107.255.255.6/32 loopback0 0
DAo 192.168.2.0/30 107.26.5.10%ether2 110
[admin@R6] >
```

Ερώτηση 11:  
Εκτελώ ping από το PC1→PC2:

```
PC1> ping 11.72.60.4

84 bytes from 11.72.60.4 icmp_seq=1 ttl=60 time=7.782 ms
84 bytes from 11.72.60.4 icmp_seq=2 ttl=60 time=8.398 ms
84 bytes from 11.72.60.4 icmp_seq=3 ttl=60 time=5.444 ms
84 bytes from 11.72.60.4 icmp_seq=4 ttl=60 time=7.825 ms
84 bytes from 11.72.60.4 icmp_seq=5 ttl=60 time=7.712 ms

PC1>
```

Ερώτηση 12:  
Εκτελώ trace PC1→PC2:

```
PC1> trace 11.72.60.4 -P 1
trace to 11.72.60.4, 8 hops max (ICMP), press Ctrl+C to stop
 1  10.72.60.1    1.774 ms    1.142 ms    1.269 ms
 2  107.26.4.1    4.685 ms    1.374 ms    1.564 ms
 3  192.168.2.1   2.200 ms    2.439 ms    2.122 ms
 4  107.26.5.2    5.481 ms    6.925 ms    3.215 ms
 5  11.72.60.4    7.150 ms    7.491 ms    7.512 ms

PC1> trace 11.72.60.4
trace to 11.72.60.4, 8 hops max, press Ctrl+C to stop
 1  10.72.60.1    1.831 ms    1.182 ms    1.363 ms
 2  107.26.4.1    3.051 ms    2.963 ms    3.957 ms
 3  192.168.2.1   5.351 ms    2.350 ms    2.405 ms
 4  107.26.5.2    5.335 ms    4.464 ms    4.498 ms
 5  *11.72.60.4   7.840 ms    (ICMP type:3, code:3, Destination port unreachable)

PC1>
```