3Η ΕΡΓΑΣΙΑ ΕΡΓΑΣΤΗΡΙΟΥ ΔΙΚΤΥΩΝ

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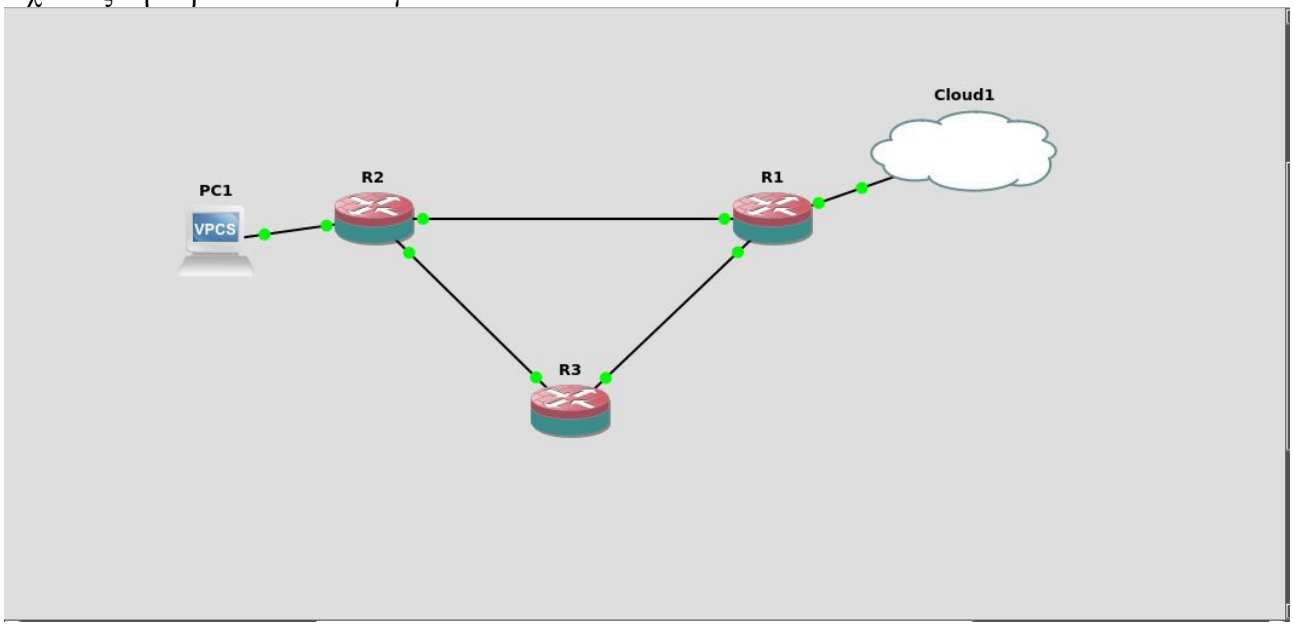
Ημερομηνία :4/5/2022
Username Mikrotik:admin
Password:bonis

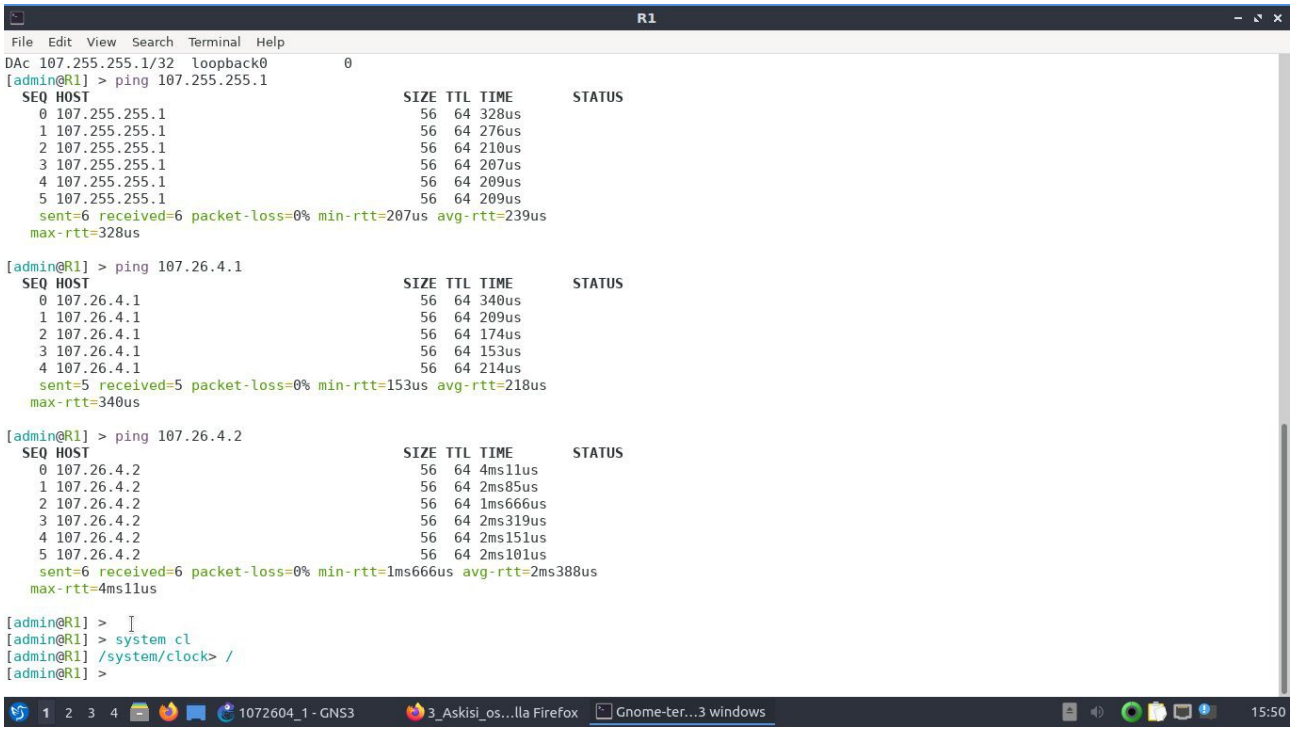
Άσκηση 6

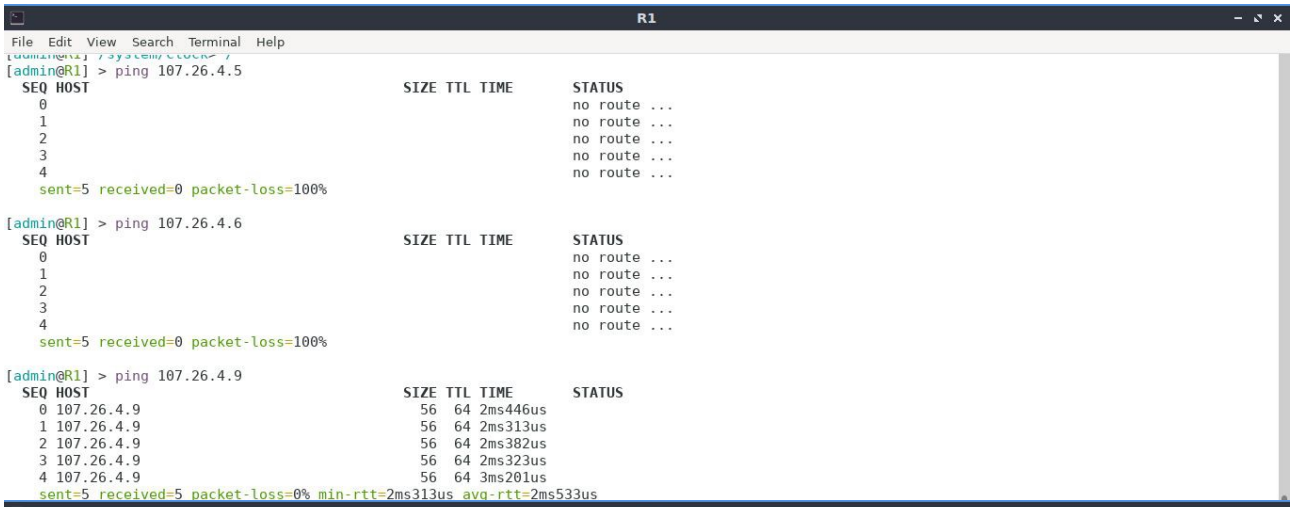
Έχοντας τη παρακάτω τοπολογία:

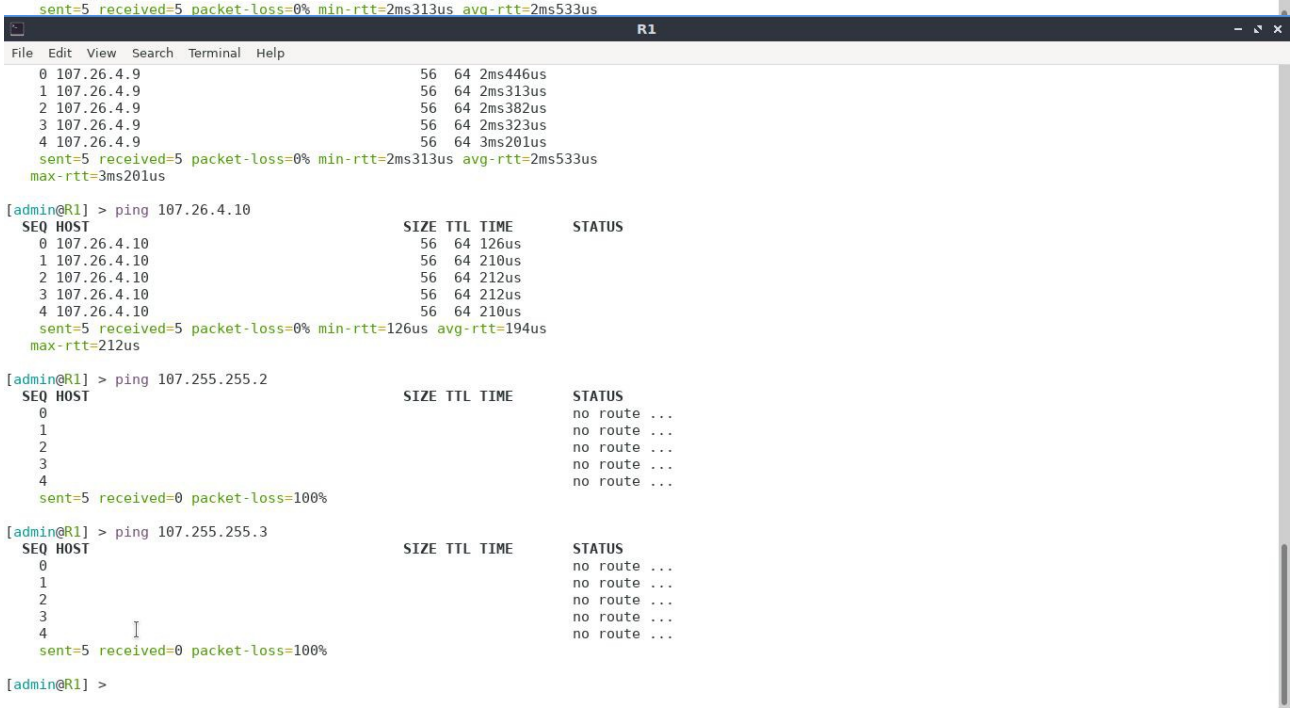


Αρχικά αναθέτουμε στατικές ip σε όλα τα interfaces των 3 router:

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 0
[admin@R1] > ping 107.255.255.1
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] >
1 2 3 4 1072604_1 - GNS3 3_Askisi_os...lla Firefox Gnome-ter...3 windows 15:50


R1
File Edit View Search Terminal Help
[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


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 2ms168us
    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 παραμετροποιήση για το PC1:

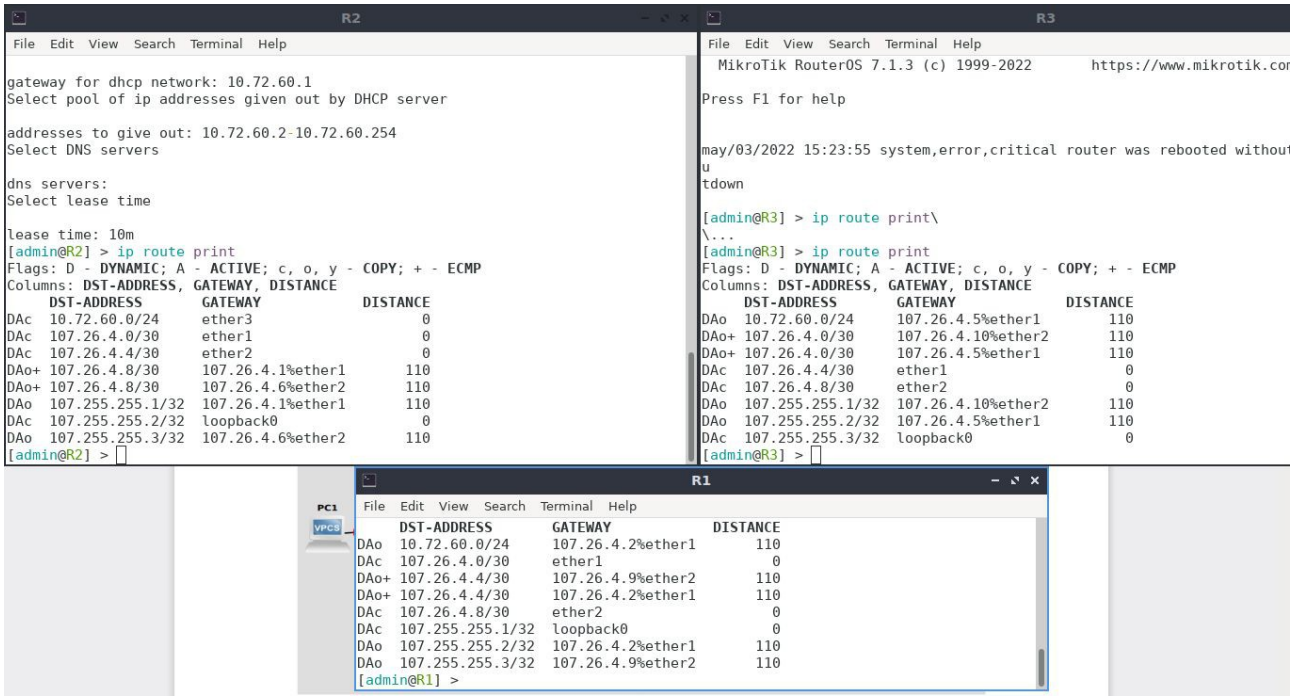
Τρέχοντας την εντολή ip route print βλέπουμε για όλους τους

```
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>
```

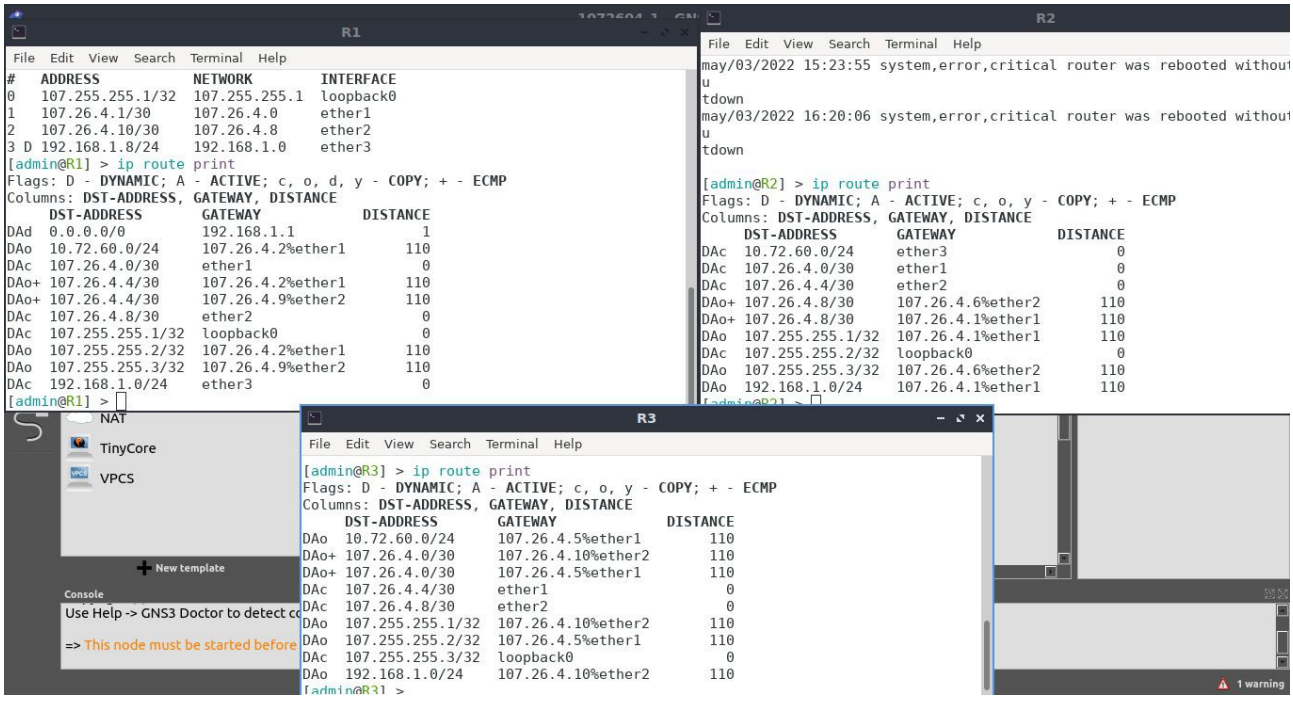
δρομολογητές όλα τα μονοπάτια δρομολόγησης:



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



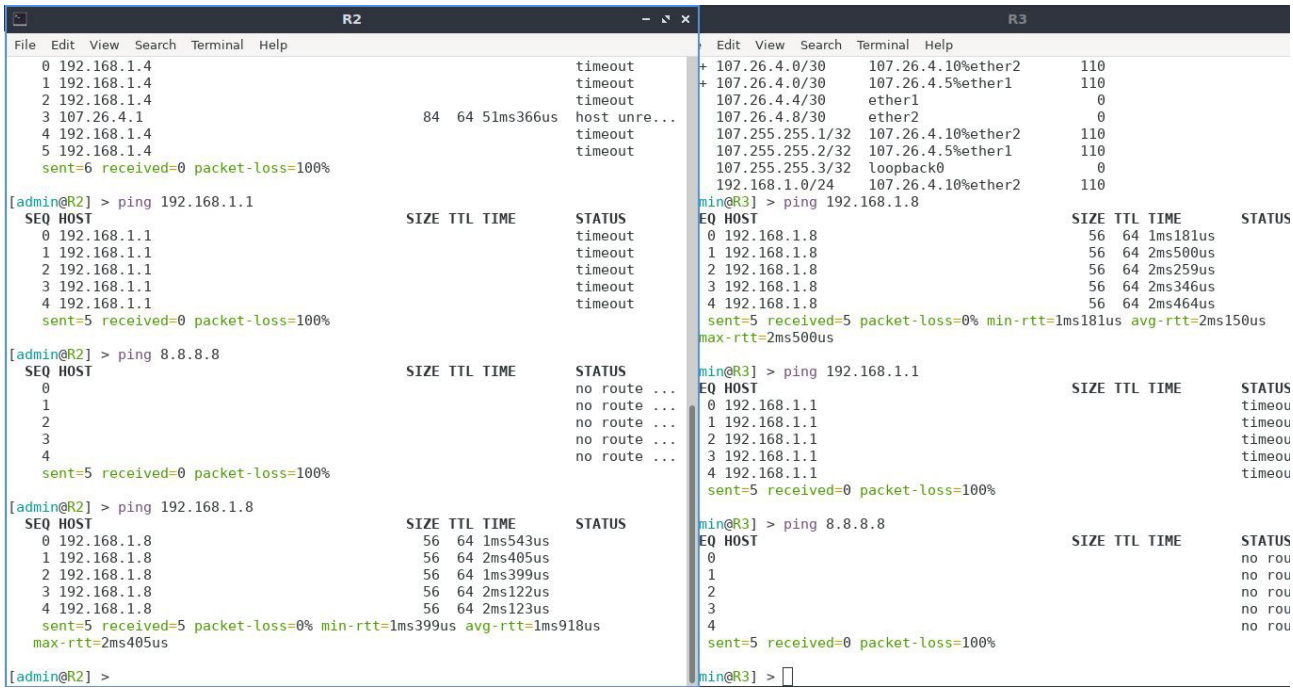
Ερώτηση 6:

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:



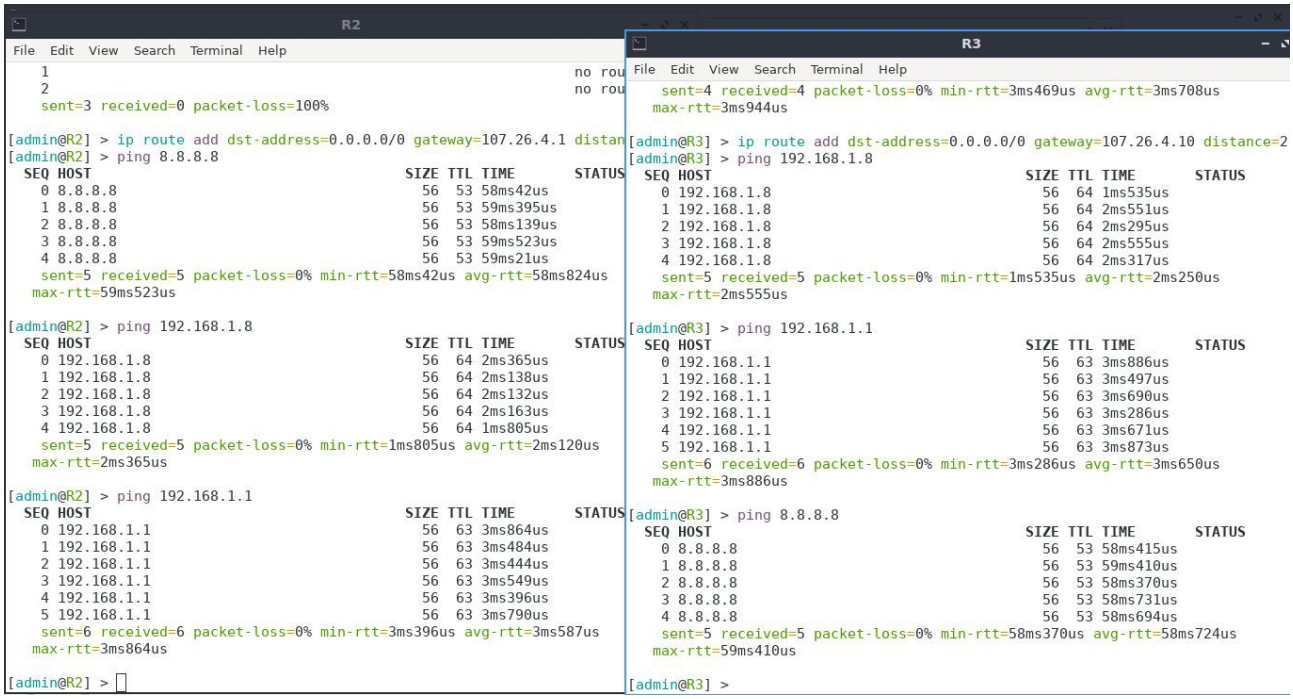
Παρατηρούμε ότι ενώ επικοινωνούν με το ether3 του R1 δεν επικοινωνούν με το gateway 192.168.1.1 και το 8.8.8.8.

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:



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:

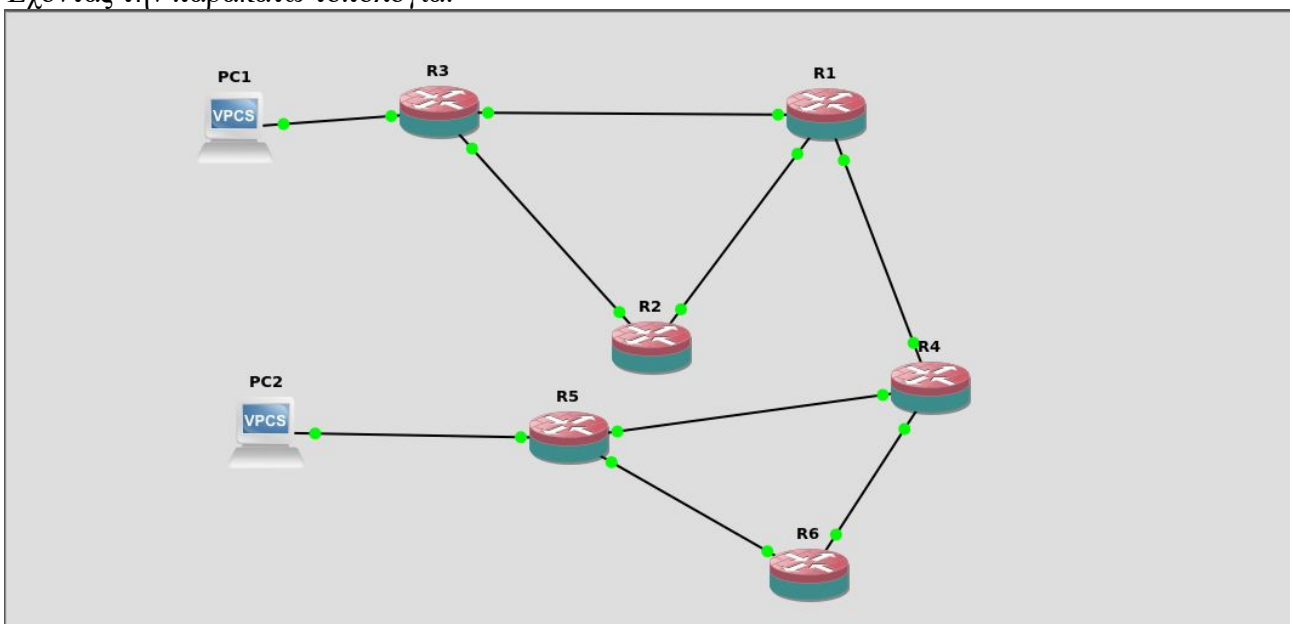
```
[admin@R3] > tool traceroute 8.8.8.8
Columns: ADDRESS, LOSS, SENT, LAST, AVG, BEST, WORST, STD-DEV
 #  ADDRESS          LOSS  SENT  LAST     AVG   BEST  WORST  STD-DEV
 1  107.26.4.10      0%       7  1.7ms    1.8   1.6   2.1    0.2
 2  192.168.1.1      0%       7  3ms      2.9   2     4.1    0.6
 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 , ενεργοποιήση 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
lt
[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
kbone
[admin@R4] > /routing/ospf/interface-template add network=ether1 area=backbo
[admin@R4] > /routing/ospf/interface-template add network=107.26.5.8/30 area
kbone
[admin@R4] > /routing/ospf/interface-template add network=ether2 area=backbo
[admin@R4] > /routing/ospf/interface-template add network=192.168.2.0/30 are
ckbone
[admin@R4] > /routing/ospf/interface-template add network=ether3 area=backbo
[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=107.255.2
55.5
[admin@R5] > /routing/ospf/area/add name=backbone area-id=0.0.0.0 instan
ce=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=ba
ckbone
[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=ba
ckbone
[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=ba
ckbone
```

R6

```
File  Edit  View  Search  Terminal  Help


may/03/2022 19:21:45 system,error,critical router was rebooted without proper
u
tdown

[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=de
lt
[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=
kbone
[admin@R6] > /routing/ospf/interface-template add network=ether2 area=backbon
[admin@R6] > /routing/ospf/interface-template add network=107.26.5.4/30 area=
kbone
[admin@R6] > /routing/ospf/interface-template add network=ether1 area=backbon
[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

File Edit View Search Terminal Help

```
    listen=yes routing-table=main router-id=107.255.255.1 templates=defaul
    as=65531
[admin@R1] > 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] >
[admin@R1] >
```

R2

File Edit View Search Terminal Help

```
[admin@R2] > /routing/ospf/interface-template add network=107.26.4.4/30 area
kbone
[admin@R2] > /routing/ospf/interface-template add network=ether2 area=backbo
[admin@R2] > 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] >
```

R3

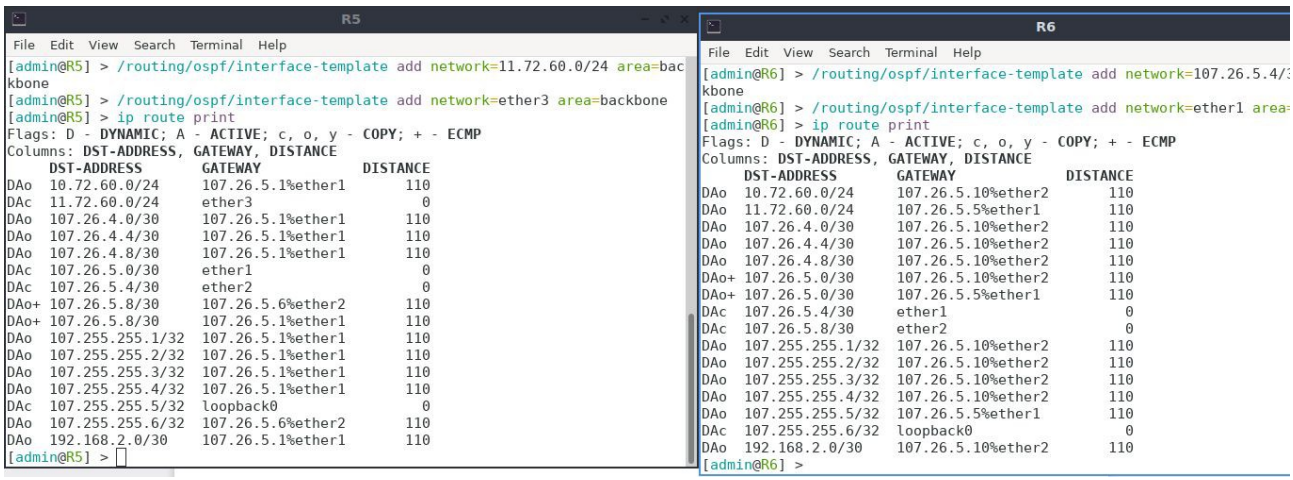
File Edit View Search Terminal Help

```
[admin@R3] > /routing/ospf/interface-template add network=10.72.60.0/24 area=bac
kbone
[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
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] >
```

R4

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=de
    as=65531
[admin@R4] > 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
DAo  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] >
```



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>
```