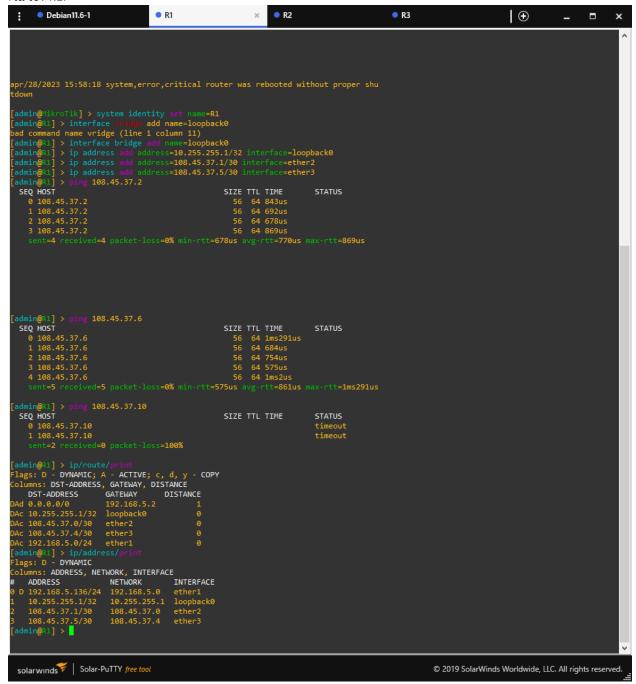**ΑΓΓΕΛΟΣ ΝΙΚΟΛΑΟΣ ΠΟΤΑΜΙΑΝΟΣ**
AM 1084537
ΕΡΓΑΣΤΗΡΙΟ ΔΙΚΤΥΑ ΥΠΟΛΟΓΙΣΤΩΝ
ΑΚ ΕΤΟΣ 2022-2023
3ο ΕΞΑΜΗΝΟ ΣΠΟΥΔΩΝ

#1 ΕΡΩΤΗΜΑ
Ελέγχω τα μονοπάτια δρομολόγησης με ip/route/print και τις IP διευθύνσεις με
ip/address/print. Παρατηρώ ότι μπορεί να κάνει ping αντικριστά interfaces αλλά δεν επικοινωνεί με μη αντικριστά
Για τον R1:

Για τον R2:


```
# ADDRESS         NETWORK        INTERFACE
0 10.255.255.2/32  10.255.255.2   loopback0
1 108.45.37.2/30   108.45.37.0    ether1
2 108.45.37.6/30   108.45.37.4    ether2
3 108.45.37.9/30   108.45.37.8    ether2
[admin@R2] > ip/address/remove/2
expected end of command (line 1 column 18)
[admin@R2] > ip address remove 2
[admin@R2] > ip/address/print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS         NETWORK        INTERFACE
0 10.255.255.2/32  10.255.255.2   loopback0
1 108.45.37.2/30   108.45.37.0    ether1
2 108.45.37.9/30   108.45.37.8    ether2
[admin@R2] > ping 108.45.37.6
  SEQ HOST                            SIZE TTL TIME      STATUS
    0                                                    no route to host
    1                                                    no route to host
    2                                                    no route to host
    3                                                    no route to host
    sent=4 received=0 packet-loss=100%

[admin@R2] > ping 108.45.37.1
  SEQ HOST                            SIZE TTL TIME      STATUS
    0 108.45.37.1                      56  64 639us
    1 108.45.37.1                      56  64 654us
    2 108.45.37.1                      56  64 649us
    3 108.45.37.1                      56  64 650us
    sent=4 received=4 packet-loss=0% min-rtt=639us avg-rtt=648us max-rtt=654us

[admin@R2] > ping 108.45.37.10
  SEQ HOST                            SIZE TTL TIME      STATUS
    0 108.45.37.10                     56  64 686us
    1 108.45.37.10                     56  64 643us
    2 108.45.37.10                     56  64 670us
    3 108.45.37.10                     56  64 804us
    4 108.45.37.10                     56  64 642us
    sent=5 received=5 packet-loss=0% min-rtt=642us avg-rtt=689us max-rtt=804us

[admin@R2] > ping 108.45.37.6
  SEQ HOST                            SIZE TTL TIME      STATUS
    0                                                    no route to host
    1                                                    no route to host
    2                                                    no route to host
    3                                                    no route to host
    4                                                    no route to host
    sent=5 received=0 packet-loss=100%

[admin@R2] > ip/route/print
Flags: D - DYNAMIC; A - ACTIVE; c, y - COPY
Columns: DST-ADDRESS, GATEWAY, DISTANCE
    DST-ADDRESS        GATEWAY       DISTANCE
DAc 10.255.255.2/32   loopback0          0
DAc 108.45.37.0/30    ether1             0
DAc 108.45.37.8/30    ether2             0
[admin@R2] > ip/address/print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS         NETWORK        INTERFACE
0 10.255.255.2/32  10.255.255.2   loopback0
1 108.45.37.2/30   108.45.37.0    ether1
2 108.45.37.9/30   108.45.37.8    ether2
[admin@R2] >
```

Για τον R3:

```
[admin@R3] > ip/address/print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS          NETWORK        INTERFACE
0 10.255.255.3/32  10.255.255.3   loopback0
1 108.45.37.6/30   108.45.37.4    ether1
2 108.45.37.10/30  108.45.37.8    ether2
[admin@R3] > ip/route/print
Flags: D - DYNAMIC; A - ACTIVE; c, y - COPY
Columns: DST-ADDRESS, GATEWAY, DISTANCE
    DST-ADDRESS      GATEWAY      DISTANCE
DAc 10.255.255.3/32  loopback0         0
DAc 108.45.37.4/30   ether1            0
DAc 108.45.37.8/30   ether2            0
[admin@R3] > ping 108.45.37.9
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.37.9                         56  64 791us
    1 108.45.37.9                         56  64 787us
    2 108.45.37.9                         56  64 577us
    3 108.45.37.9                         56  64 716us
    sent=4 received=4 packet-loss=0% min-rtt=577us avg-rtt=717us max-rtt=791us

[admin@R3] > ping 108.45.37.5
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.37.5                         56  64 899us
    1 108.45.37.5                         56  64 690us
    2 108.45.37.5                         56  64 641us
    3 108.45.37.5                         56  64 664us
    sent=4 received=4 packet-loss=0% min-rtt=641us avg-rtt=723us max-rtt=899us

[admin@R3] > ping 108.45.37.1
  SEQ HOST                              SIZE TTL TIME       STATUS
    0                                                       no route to host
    1                                                       no route to host
    2                                                       no route to host
    3                                                       no route to host
    sent=4 received=0 packet-loss=100%

[admin@R3] >
```

Ελέγχουμε και επιβεβαιώνουμε πως ο R1 μπορεί να επικοινωνήσει με το εξωτερικό δίκτυο.

```
Debian11.6-1        R1  ×        R2        R3        ⊕  _  □  ×
#  ADDRESS          NETWORK        INTERFACE
0 D 192.168.5.136/24 192.168.5.0   ether1
1   10.255.255.1/32  10.255.255.1  loopback0
2   108.45.37.1/30   108.45.37.0   ether2
3   108.45.37.5/30   108.45.37.4   ether3
[admin@R1] > ping 8.8.8.8
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 8.8.8.8                            56 128 42ms21us
    1 8.8.8.8                            56 128 42ms128us
    2 8.8.8.8                            56 128 42ms655us
    3 8.8.8.8                            56 128 42ms791us
    4 8.8.8.8                            56 128 43ms368us
    5 8.8.8.8                            56 128 42ms399us
    sent=6 received=6 packet-loss=0% min-rtt=42ms21us avg-rtt=42ms560us max-rtt=43ms368us

[admin@R1] > ping google.com
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 142.250.187.174                    56 128 69ms727us
    1 142.250.187.174                    56 128 70ms699us
    2 142.250.187.174                    56 128 69ms790us
    3 142.250.187.174                    56 128 69ms726us
    4 142.250.187.174                    56 128 71ms52us
    5 142.250.187.174                    56 128 70ms55us
    6 142.250.187.174                    56 128 69ms334us
    sent=7 received=7 packet-loss=0% min-rtt=69ms334us avg-rtt=70ms54us max-rtt=71ms52us

[admin@R1] >
```

#2 ΕΡΩΤΗΜΑ

Εκτελώ ping από-προς όλα τα interfaces του R1 (αντίστοιχα και τα υπόλοιπα) και επιβεβαιώνω την λειτουργικότητα του. Εκτελώ και ip/route/print:

```
[admin@R1] > ip/route/print
Flags: D - DYNAMIC; A - ACTIVE; c, o, d, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
      DST-ADDRESS        GATEWAY           DISTANCE
DAd   0.0.0.0/0          192.168.5.2          1
DAc   10.255.255.1/32    loopback0            0
DAo   10.255.255.2/32    108.45.37.2%ether2  110
DAo   10.255.255.3/32    108.45.37.6%ether3  110
DAc   108.45.37.0/30     ether2               0
DAc   108.45.37.4/30     ether3               0
DAo+  108.45.37.8/30     108.45.37.2%ether2  110
DAo+  108.45.37.8/30     108.45.37.6%ether3  110
DAc   192.168.5.0/24     ether1               0
[admin@R1] > ping 108.45.37.10
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.37.10                        56  63 1ms383us
    1 108.45.37.10                        56  63 1ms505us
    2 108.45.37.10                        56  63 1ms308us
    3 108.45.37.10                        56  63 1ms72us
    sent=4 received=4 packet-loss=0% min-rtt=1ms72us avg-rtt=1ms317us max-rtt=1ms505us

[admin@R1] > ping 108.45.37.9
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.37.9                         56  63 1ms332us
    1 108.45.37.9                         56  63 1ms464us
    2 108.45.37.9                         56  63 1ms173us
    3 108.45.37.9                         56  63 1ms109us
    4 108.45.37.9                         56  63 1ms80us
    sent=5 received=5 packet-loss=0% min-rtt=1ms80us avg-rtt=1ms231us max-rtt=1ms464us

[admin@R1] > ping 108.45.37.2
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.37.2                         56  64 1ms596us
    1 108.45.37.2                         56  64 671us
    2 108.45.37.2                         56  64 654us
    3 108.45.37.2                         56  64 717us
    sent=4 received=4 packet-loss=0% min-rtt=654us avg-rtt=909us max-rtt=1ms596us

[admin@R1] > ping 108.45.37.6
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.37.6                         56  64 798us
    1 108.45.37.6                         56  64 595us
    2 108.45.37.6                         56  64 706us
    3 108.45.37.6                         56  64 665us
    4 108.45.37.6                         56  64 742us
    5 108.45.37.6                         56  64 649us
    6 108.45.37.6                         56  64 629us
    sent=7 received=7 packet-loss=0% min-rtt=595us avg-rtt=683us max-rtt=798us

[admin@R1] > 
```

Εκτελώ και ip/route/print στον R2:

```
[admin@R2] > ping 108.45.37.6
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.6                               56  64 725us
    1 108.45.37.6                               56  64 780us
    2 108.45.37.6                               56  64 626us
    3 108.45.37.6                               56  64 667us
    4 108.45.37.6                               56  64 710us
    5 108.45.37.6                               56  64 625us
    sent=6 received=6 packet-loss=0% min-rtt=625us avg-rtt=688us max-rtt=780us

[admin@R2] > ping 108.45.37.5
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.5                               56  64 1ms771us
    1 108.45.37.5                               56  64 1ms181us
    2 108.45.37.5                               56  64 1ms33us
    3 108.45.37.5                               56  64 1ms3us
    sent=4 received=4 packet-loss=0% min-rtt=1ms3us avg-rtt=1ms247us max-rtt=1ms771us

[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  10.255.255.1/32  108.45.37.1%ether1        110
DAc  10.255.255.2/32  loopback0                   0
DAo  10.255.255.3/32  108.45.37.10%ether2       110
DAc  108.45.37.0/30   ether1                      0
DAo+ 108.45.37.4/30   108.45.37.1%ether1        110
DAo+ 108.45.37.4/30   108.45.37.10%ether2       110
DAc  108.45.37.8/30   ether2                      0
DAo  192.168.5.0/24   108.45.37.1%ether1        110
[admin@R2] > ping 108.45.37.1
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.1                               56  64 751us
    1 108.45.37.1                               56  64 723us
    2 108.45.37.1                               56  64 624us
    3 108.45.37.1                               56  64 702us
    4 108.45.37.1                               56  64 555us
    sent=5 received=5 packet-loss=0% min-rtt=555us avg-rtt=671us max-rtt=751us

[admin@R2] > ping 108.45.37.10
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.10                              56  64 560us
    1 108.45.37.10                              56  64 727us
    2 108.45.37.10                              56  64 646us
    3 108.45.37.10                              56  64 1ms32us
    4 108.45.37.10                              56  64 634us
    sent=5 received=5 packet-loss=0% min-rtt=560us avg-rtt=719us max-rtt=1ms32us

[admin@R2] >
```

Εκτελώ και ip/route/print στον R3:


```
[admin@R3] > ip/route print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
      DST-ADDRESS      GATEWAY              DISTANCE
DAo  10.255.255.1/32  108.45.37.5%ether1       110
DAo  10.255.255.2/32  108.45.37.9%ether2       110
DAc  10.255.255.3/32  loopback0                  0
DAo+ 108.45.37.0/30   108.45.37.5%ether1       110
DAo+ 108.45.37.0/30   108.45.37.9%ether2       110
DAc  108.45.37.4/30   ether1                     0
DAc  108.45.37.8/30   ether2                     0
DAo  192.168.5.0/24   108.45.37.5%ether1       110
[admin@R3] > ping 108.45.37.1
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.37.1                        56  64 786us
    1 108.45.37.1                        56  64 842us
    2 108.45.37.1                        56  64 734us
    3 108.45.37.1                        56  64 633us
    sent=4 received=4 packet-loss=0% min-rtt=633us avg-rtt=748us max-rtt=842us

[admin@R3] > ping 108.45.37.2
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.37.2                        56  64 650us
    1 108.45.37.2                        56  64 1ms111us
    2 108.45.37.2                        56  64 742us
    3 108.45.37.2                        56  64 593us
    4 108.45.37.2                        56  64 597us
    sent=5 received=5 packet-loss=0% min-rtt=593us avg-rtt=738us max-rtt=1ms111us

[admin@R3] > ping 108.45.37.9
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.37.9                        56  64 720us
    1 108.45.37.9                        56  64 794us
    2 108.45.37.9                        56  64 951us
    3 108.45.37.9                        56  64 754us
    4 108.45.37.9                        56  64 733us
    sent=5 received=5 packet-loss=0% min-rtt=720us avg-rtt=790us max-rtt=951us

[admin@R3] > ping 108.45.37.5
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.37.5                        56  64 814us
    1 108.45.37.5                        56  64 840us
    2 108.45.37.5                        56  64 623us
    3 108.45.37.5                        56  64 609us
    4 108.45.37.5                        56  64 695us
    sent=5 received=5 packet-loss=0% min-rtt=609us avg-rtt=716us max-rtt=840us

[admin@R3] > 
```

16°C Mostly sunny   ENG   20:12
28/4/2023

Διαδρομή προς το εξωτερικό δίκτυο υπάρχει μόνο από τον R1 που είναι συνδεδεμένος στο cloud

Εκτελώ traceroute 108.45.37.1 και traceroute 108.45.37.5 από τον Debian:

```
debian@debian:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 0c:b8:36:c7:00:00 brd ff:ff:ff:ff:ff:ff
    altname enp0s3
    inet 108.45.37.14/30 brd 108.45.37.15 scope global dynamic ens3
       valid_lft 588sec preferred_lft 588sec
    inet6 fe80::eb8:36ff:fec7:0/64 scope link
       valid_lft forever preferred_lft forever
debian@debian:~$ sudo traceroute 108.45.37.1
traceroute to 108.45.37.1 (108.45.37.1), 30 hops max, 60 byte packets
 1  108.45.37.13 (108.45.37.13)  1.585 ms  1.535 ms  1.655 ms
 2  108.45.37.1 (108.45.37.1)  4.256 ms  4.300 ms  4.361 ms
debian@debian:~$ sudo traceroute 108.45.37.5
traceroute to 108.45.37.5 (108.45.37.5), 30 hops max, 60 byte packets
 1  108.45.37.13 (108.45.37.13)  1.118 ms  2.155 ms  2.263 ms
 2  108.45.37.5 (108.45.37.5)  4.521 ms  4.573 ms  4.882 ms
debian@debian:~$
```

Ο R1 επικοινωνεί με το εξωτερικό δίκτυο κάνοντας ping 8.8.8.8:

```
[admin@R1] > ping 8.8.8.8
  SEQ HOST                          SIZE TTL TIME          STATUS
    0 8.8.8.8                         56 128 42ms241us
    1 8.8.8.8                         56 128 41ms867us
    2 8.8.8.8                         56 128 41ms511us
    3 8.8.8.8                         56 128 41ms19us
    4 8.8.8.8                         56 128 41ms111us
    5 8.8.8.8                         56 128 42ms401us
    6 8.8.8.8                         56 128 41ms212us
    7 8.8.8.8                         56 128 41ms436us
    8 8.8.8.8                         56 128 42ms689us
    9 8.8.8.8                         56 128 41ms997us
   10 8.8.8.8                         56 128 42ms896us
    sent=11 received=11 packet-loss=0% min-rtt=41ms19us avg-rtt=41ms852us max-rtt=42ms896us

[admin@R1] >
```

Ο R2 δεν επικοινωνεί με το εξωτερικό δίκτυο κάνοντας ping 8.8.8.8:


```
[admin@R2] > ping 8.8.8.8
 SEQ HOST                           SIZE TTL TIME    STATUS
   0                                                 no route to host
   1                                                 no route to host
   2                                                 no route to host
   3                                                 no route to host
   4                                                 no route to host
   5                                                 no route to host
   6                                                 no route to host
   7                                                 no route to host
   8                                                 no route to host
   9                                                 no route to host
  10                                                 no route to host
  11                                                 no route to host
  12                                                 no route to host
  13                                                 no route to host
  14                                                 no route to host
  15                                                 no route to host
  16                                                 no route to host
  17                                                 no route to host
  18                                                 no route to host
  19                                                 no route to host
   sent=20 received=0 packet-loss=100%
 SEQ HOST                           SIZE TTL TIME    STATUS
  20                                                 no route to host
  21                                                 no route to host
  22                                                 no route to host
   sent=23 received=0 packet-loss=100%

[admin@R2] >
```

Ο R3 δεν επικοινωνεί με το εξωτερικό δίκτυο κάνοντας ping 8.8.8.8:


```
[admin@R3] > ping 8.8.8.8
 SEQ HOST                           SIZE TTL TIME    STATUS
   0                                                 no route to host
   1                                                 no route to host
   2                                                 no route to host
   3                                                 no route to host
   4                                                 no route to host
   5                                                 no route to host
   6                                                 no route to host
   7                                                 no route to host
   8                                                 no route to host
   9                                                 no route to host
  10                                                 no route to host
  11                                                 no route to host
  12                                                 no route to host
  13                                                 no route to host
  14                                                 no route to host
  15                                                 no route to host
  16                                                 no route to host
  17                                                 no route to host
  18                                                 no route to host
  19                                                 no route to host
   sent=20 received=0 packet-loss=100%
 SEQ HOST                           SIZE TTL TIME    STATUS
  20                                                 no route to host
  21                                                 no route to host
  22                                                 no route to host
  23                                                 no route to host
  24                                                 no route to host
  25                                                 no route to host
  26                                                 no route to host
  27                                                 no route to host
   sent=28 received=0 packet-loss=100%

[admin@R3] >
```

```
     9 8.8.8.8                              56 128 41ms997us
    10 8.8.8.8                              56 128 42ms896us
     sent=11 received=11 packet-loss=0% min-rtt=41ms19us avg-rtt=41ms852us max-rtt=42ms896us

[admin@R1] > ip route print
Flags: D - DYNAMIC; I, A - ACTIVE; c, o, d, y - COPY; H - HW-OFFLOADED; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
      DST-ADDRESS       GATEWAY            DISTANCE
DIoH  0.0.0.0/0         108.45.37.1%ether2    110
DAd   0.0.0.0/0         192.168.5.2             1
DAc   10.255.255.1/32   loopback0               0
DAo   10.255.255.2/32   108.45.37.2%ether2    110
DAo   10.255.255.3/32   108.45.37.6%ether3    110
DAc   108.45.37.0/30    ether2                  0
DAc   108.45.37.4/30    ether3                  0
DAo + 108.45.37.8/30    108.45.37.6%ether3    110
DAo + 108.45.37.8/30    108.45.37.2%ether2    110
DAo   108.45.37.12/30   108.45.37.2%ether2    110
DAc   192.168.5.0/24    ether1                  0
[admin@R1] > 
```

```
 DAo+ 108.45.37.4/30    108.45.37.10%ether2    110
 DAo+ 108.45.37.4/30    108.45.37.1%ether1     110
 DAc  108.45.37.8/30    ether2                   0
 DAc  108.45.37.12/30   ether3                   0
 DAo  192.168.5.0/24    108.45.37.1%ether1     110
[admin@R2] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, s, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
#     DST-ADDRESS       GATEWAY            DISTANCE
0  As 0.0.0.0/0         108.45.37.1           112
   DAo 10.255.255.1/32  108.45.37.1%ether1    110
   DAc 10.255.255.2/32  loopback0               0
   DAo 10.255.255.3/32  108.45.37.10%ether2   110
   DAc 108.45.37.0/30   ether1                  0
   DAo+ 108.45.37.4/30  108.45.37.10%ether2   110
   DAo+ 108.45.37.4/30  108.45.37.1%ether1    110
   DAc 108.45.37.8/30   ether2                  0
   DAc 108.45.37.12/30  ether3                  0
   DAo 192.168.5.0/24   108.45.37.1%ether1    110
[admin@R2] > 
```

```
11  142.251.65.69   0%     14 42.2ms  43   42.2 43.9  0.6
12  142.250.234.17  0%     14 43ms    44.1 42.6 51.6  2.3
13  8.8.8.8         0%     14 43.1ms  43.5 42.1 46.2  1.1

[admin@R3] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
      DST-ADDRESS       GATEWAY            DISTANCE
DAo+ 0.0.0.0/0          108.45.37.9%ether2    110
DAo+ 0.0.0.0/0          108.45.37.5%ether1    110
DAo  10.255.255.1/32    108.45.37.5%ether1    110
DAo  10.255.255.2/32    108.45.37.9%ether2    110
DAc  10.255.255.3/32    loopback0               0
DAo+ 108.45.37.0/30     108.45.37.9%ether2    110
DAo+ 108.45.37.0/30     108.45.37.5%ether1    110
DAc  108.45.37.4/30     ether1                  0
DAc  108.45.37.8/30     ether2                  0
DAo  108.45.37.12/30    108.45.37.9%ether2    110
DAo  192.168.5.0/24     108.45.37.5%ether1    110
[admin@R3] > 
```

Δρομολόγηση πριν την αφαίρεση:

```
 :    ● Debian11.6-1          ● R1              ● R2          ● R3          ×   │ ⊕    —   □   ×
  5  79.128.234.170   0%     45   5.1ms   6.3   5     8.7    0.8
  6  79.128.234.153   0%     45   9.3ms   9.1   8.2   12.2   0.7
  7  62.75.3.117      0%     45   10.4ms  10.1  8.3   12.7   0.8
  8  62.75.27.37      0%     45   42.8ms  43.3  42.1  52.7   1.6
  9  74.125.51.154    0%     45   43.3ms  43.4  42.2  48.8   1.4
 10  142.251.65.69    0%     45   42.2ms  42.9  41.2  49.7   1.2
 11  142.250.234.17   0%     45   42.8ms  43.1  42.3  44.9   0.7
 12  8.8.8.8          0%     45   43.1ms  42.8  40.9  46.4   0.9

[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  108.45.37.5      0%     7   0.7ms   0.7   0.5   1.3    0.2
    108.45.37.9
 2  192.168.5.2      0%     7   1.1ms   1.1   0.9   1.3    0.2
    108.45.37.1
 3  192.168.1.1      0%     7   1.8ms   2.3   1.4   4.1    1.1
    192.168.5.2
 4  80.106.125.100   0%     7   4.5ms   5.2   4.4   7.2    0.9
    192.168.1.1
 5  79.128.234.170   0%     7   6.7ms   7     6.2   7.6    0.5
    80.106.125.100
 6  79.128.234.153   0%     7   5.9ms   6.9   5.8   8.8    1.1
    79.128.234.170
 7  62.75.3.117      0%     7   8.8ms   9.3   8.6   10.6   0.8
    79.128.234.153
 8  62.75.27.37      0%     7   11.4ms  19.9  9.9   43.2   14.5
    62.75.3.117
 9  74.125.51.154    0%     7   44.5ms  43.4  42.8  44.5   0.6
    62.75.27.37
10  142.251.65.69    0%     7   43.8ms  43.6  42.7  44.5   0.6
    74.125.51.154
11  142.250.234.17   0%     7   43ms    43.6  42.5  47.3   1.5
    142.251.65.69
12  8.8.8.8          0%     7   42.7ms  44.1  42.7  47.6   1.6
    142.250.234.17
-  [Q quit|D dump|C-z pause]
```

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Δρομολόγηση μετά την αφαίρεση:

```
 :    ● Debian11.6-1          ● R1              ● R2          ● R3          ×   │ ⊕    —   □   ×
  6  79.128.234.153   0%     74   8.5ms   7.3   5.6   17.8   1.9
    79.128.234.170
  7  62.75.3.117      0%     74   10.8ms  10    8.6   13.9   1.1
    79.128.234.153
  8  62.75.27.37      0%     74   10ms    11.4  9.3   43.2   5.3
    62.75.3.117
  9  74.125.51.154    0%     74   43.1ms  43.5  42.2  52.9   1.4
    62.75.27.37
 10  142.251.65.69    0%     74   43.4ms  45.4  42.7  72.8   4
    74.125.51.154
 11  142.250.234.17   0%     73   43.1ms  44    42.2  79.2   4.5
    142.251.65.69
 12  8.8.8.8          0%     73   44.6ms  44    42.3  56     2.2
    142.250.234.17

[admin@R3] > tool traceroute 8.8.8.8
Columns: ADDRESS, LOSS, SENT, LAST, AVG, BEST, WORST, STD-DEV, STATUS
 #  ADDRESS          LOSS   SENT  LAST    AVG   BEST   WORST  STD-DEV  STATUS
 1  108.45.37.5      66.7%   3   timeout  0.9   0.9    0.9    0
 2  192.168.5.2      66.7%   3   timeout  1     1      1      0
 3  192.168.1.1      33.3%   3   121.4ms  62.9  4.4    121.4  58.5     host unreachable from 108.45.37.10
    108.45.37.10
 4  80.106.125.100   33.3%   3   timeout  62.8  5.6    120    57.2     host unreachable from 108.45.37.10
    108.45.37.10
 5  79.128.234.170   66.7%   3   timeout  6.1   6.1    6.1    0
 6  79.128.234.153   66.7%   3   timeout  8.9   8.9    8.9    0
 7  62.75.3.117      33.3%   3   115ms    62.8  10.5   115    52.3     host unreachable from 108.45.37.10
    108.45.37.10
 8  62.75.27.37      33.3%   3   timeout  74.4  42.5   106.3  31.9     host unreachable from 108.45.37.10
    108.45.37.10
 9  74.125.51.154    50%     3   timeout  42.7  42.7   42.7   0
10                   100%    2   timeout
11                   100%    2   timeout
12  108.45.37.10     50%     2   124.2ms  124.2 124.2  124.2  0        host unreachable from 108.45.37.10
13  108.45.37.10     50%     2   timeout  108.7 108.7  108.7  0        host unreachable from 108.45.37.10
14                   0%      0   0ms
-  [Q quit|D dump|C-z pause]
```

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```
DAo + 108.45.37.8/30    108.45.37.6%ether3      110
DAo + 108.45.37.8/30    108.45.37.2%ether2      110
DAo   108.45.37.12/30   108.45.37.2%ether2      110
DAc   192.168.5.0/24    ether1                    0
[admin@R1] > ip route print
Flags: D - DYNAMIC; I, A - ACTIVE; c, o, d, y - COPY; H - HW-OFFLOADED; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
     DST-ADDRESS        GATEWAY            DISTANCE
DIoH 0.0.0.0/0          108.45.37.1%ether2     110
DAd  0.0.0.0/0          192.168.5.2              1
DAc  10.255.255.1/32    loopback0                0
DAo  10.255.255.2/32    108.45.37.2%ether2     110
DAo  10.255.255.3/32    108.45.37.6%ether3     110
DAc  108.45.37.0/30     ether2                   0
DAc  108.45.37.4/30     ether3                   0
DAo + 108.45.37.8/30    108.45.37.6%ether3     110
DAo + 108.45.37.8/30    108.45.37.2%ether2     110
DAo   108.45.37.12/30   108.45.37.2%ether2     110
DAc   192.168.5.0/24    ether1                   0
[admin@R1] >
```

```
  DAo 10.255.255.3/32   108.45.37.1%ether1     110
  DAc 108.45.37.0/30    ether1                   0
  DAo 108.45.37.4/30    108.45.37.1%ether1     110
  DAc 108.45.37.8/30    ether2                   0
  DAc 108.45.37.12/30   ether3                   0
  DAo 192.168.5.0/24    108.45.37.1%ether1     110
[admin@R2] > ip route print
Flags: D - DYNAMIC; A - ACTIVE; c, s, o, y - COPY
Columns: DST-ADDRESS, GATEWAY, DISTANCE
#    DST-ADDRESS        GATEWAY            DISTANCE
0  As 0.0.0.0/0          108.45.37.1           112
   DAo 10.255.255.1/32   108.45.37.1%ether1    110
   DAc 10.255.255.2/32   loopback0               0
   DAo 10.255.255.3/32   108.45.37.1%ether1    110
   DAc 108.45.37.0/30    ether1                  0
   DAo 108.45.37.4/30    108.45.37.1%ether1    110
   DAc 108.45.37.8/30    ether2                  0
   DAc 108.45.37.12/30   ether3                  0
   DAo 192.168.5.0/24    108.45.37.1%ether1    110
[admin@R2] >
```

```
    142.250.234.17
12  108.45.37.10    3.4%    59  43.2ms   44.2   41.1   124.2  10.7   host unreachable from 108.45.37.10
    8.8.8.8
13  108.45.37.10   66.7%     3  timeout  108.7  108.7  108.7   0     host unreachable from 108.45.37.10
14                   0%      0  0ms

[admin@R3] > 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          108.45.37.5%ether1     110
DAo 10.255.255.1/32    108.45.37.5%ether1     110
DAo 10.255.255.2/32    108.45.37.5%ether1     110
DAc 10.255.255.3/32    loopback0                0
DAo 108.45.37.0/30     108.45.37.5%ether1     110
DAc 108.45.37.4/30     ether1                   0
DAc 108.45.37.8/30     ether2                   0
DAo 108.45.37.12/30    108.45.37.5%ether1     110
DAo 192.168.5.0/24     108.45.37.5%ether1     110
[admin@R3] >
```

#ASKHSH3


```
[admin@R4] > /routing/ospf/interface-template add network=ether3 area=backbone
[admin@R4] > ping 108.45.37.1
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.1                               56  64 866us
    1 108.45.37.1                               56  64 812us
    2 108.45.37.1                               56  64 690us
    3 108.45.37.1                               56  64 675us
    sent=4 received=4 packet-loss=0% min-rtt=675us avg-rtt=760us max-rtt=866us

[admin@R4] > ping 108.45.37.2
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.2                               56  63 1ms652us
    1 108.45.37.2                               56  63 1ms282us
    2 108.45.37.2                               56  63 1ms228us
    sent=3 received=3 packet-loss=0% min-rtt=1ms228us avg-rtt=1ms387us max-rtt=1ms652us

[admin@R4] > ping 108.45.37.6
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.6                               56  63 1ms723us
    1 108.45.37.6                               56  63 1ms493us
    2 108.45.37.6                               56  63 1ms376us
    sent=3 received=3 packet-loss=0% min-rtt=1ms376us avg-rtt=1ms530us max-rtt=1ms723us

[admin@R4] > ping 108.45.37.9
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.9                               56  63 2ms396us
    1 108.45.37.9                               56  63 1ms818us
    2 108.45.37.9                               56  63 1ms673us
    sent=3 received=3 packet-loss=0% min-rtt=1ms673us avg-rtt=1ms962us max-rtt=2ms396us

[admin@R4] > ping 108.45.37.5
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.5                               56  64 760us
    1 108.45.37.5                               56  64 823us
    2 108.45.37.5                               56  64 622us
    3 108.45.37.5                               56  64 756us
    sent=4 received=4 packet-loss=0% min-rtt=622us avg-rtt=740us max-rtt=823us

[admin@R4] > ping 108.45.37.10
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 108.45.37.10                              56  63 1ms535us
    1 108.45.37.10                              56  63 1ms506us
    2 108.45.37.10                              56  63 1ms728us
    sent=3 received=3 packet-loss=0% min-rtt=1ms506us avg-rtt=1ms589us max-rtt=1ms728us

[admin@R4] > ping 109.45.37.10
  SEQ HOST                                    SIZE TTL TIME        STATUS
    0 109.45.37.10                              56  64 718us
    1 109.45.37.10                              56  64 833us
    2 109.45.37.10                              56  64 1ms252us
    3 109.45.37.10                              56  64 1ms85us
    sent=4 received=4 packet-loss=0% min-rtt=718us avg-rtt=972us max-rtt=1ms252us

[admin@R4] >
```

```
[admin@R1] > ip/route/print
Flags: D - DYNAMIC; I, A - ACTIVE; c, b, o, d, y - COPY; H - HW-OFFLOADED; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
        DST-ADDRESS        GATEWAY              DISTANCE
DIoH  0.0.0.0/0          192.168.6.1%ether4      110
DAd   0.0.0.0/0          192.168.5.2               1
DIbH  10.255.255.1/32    192.168.6.1              20
DAc   10.255.255.1/32    loopback0                 0
DAo   10.255.255.2/32    108.45.37.2%ether2      110
DAo   10.255.255.3/32    108.45.37.6%ether3      110
DAo   10.255.255.4/32    192.168.6.2%ether4      110
DAb   10.255.255.5/32    192.168.6.2              20
D o   10.255.255.5/32    192.168.6.2%ether4      110
D o   10.255.255.6/32    192.168.6.2%ether4      110
DAb   10.255.255.6/32    192.168.6.2              20
DIbH  108.45.37.0/30     192.168.6.1              20
DAc   108.45.37.0/30     ether2                    0
DIbH  108.45.37.4/30     192.168.6.1              20
DAc   108.45.37.4/30     ether3                    0
DAo + 108.45.37.8/30     108.45.37.2%ether2      110
DAo + 108.45.37.8/30     108.45.37.6%ether3      110
DAo   108.45.37.12/30    108.45.37.2%ether2      110
DAo   109.45.37.0/30     192.168.6.2%ether4      110
DAo   109.45.37.4/30     192.168.6.2%ether4      110
DAb   109.45.37.8/30     192.168.6.2              20
D o   109.45.37.8/30     192.168.6.2%ether4      110
DAb   109.45.37.12/30    192.168.6.2              20
D o   109.45.37.12/30    192.168.6.2%ether4      110
[]- [Q quit|D dump|down]
```

```
 8  62.75.27.37      0%     11  42.6ms  43    42.5  43.3   0.3
 9  74.125.51.154    0%     11  44.2ms  43    42.2  44.2   0.8
10  142.251.65.69    0%     11  42.9ms  42.9  41.3  45.6   1
11  142.250.234.17   0%     11  43ms    44    42.4  48.8   1.7
12  8.8.8.8          0%     11  42.8ms  42.4  41.3  43.7   0.6

[admin@R2] > ip/route/print
Flags: D - DYNAMIC; A - ACTIVE; c, s, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
#      DST-ADDRESS        GATEWAY              DISTANCE
 DAo  0.0.0.0/0          108.45.37.1%ether1      110
0  s  0.0.0.0/0          108.45.37.1             112
 DAo  10.255.255.1/32    108.45.37.1%ether1      110
 DAc  10.255.255.2/32    loopback0                 0
 DAo  10.255.255.3/32    108.45.37.10%ether2     110
 DAo  10.255.255.4/32    108.45.37.1%ether1      110
 DAo  10.255.255.5/32    108.45.37.1%ether1      110
 DAo  10.255.255.6/32    108.45.37.1%ether1      110
 DAc  108.45.37.0/30     ether1                    0
 DAo+ 108.45.37.4/30     108.45.37.10%ether2     110
 DAo+ 108.45.37.4/30     108.45.37.1%ether1      110
 DAc  108.45.37.8/30     ether2                    0
 DAc  108.45.37.12/30    ether3                    0
 DAo  109.45.37.0/30     108.45.37.1%ether1      110
 DAo  109.45.37.4/30     108.45.37.1%ether1      110
 DAo  109.45.37.8/30     108.45.37.1%ether1      110
 DAo  109.45.37.12/30    108.45.37.1%ether1      110
 DAo  192.168.5.0/24     108.45.37.1%ether1      110
 DAo  192.168.6.0/30     108.45.37.1%ether1      110
[admin@R2] >
```

```
   0 8.8.8.8                          56 127 44ms617us
   1 8.8.8.8                          56 127 44ms60us
   2 8.8.8.8                          56 127 43ms466us
   3 8.8.8.8                          56 127 43ms151us
   4 8.8.8.8                          56 127 43ms213us
   sent=5 received=5 packet-loss=0% min-rtt=43ms151us avg-rtt=43ms701us max-rtt=44ms617us

[admin@R3] > ip/route/print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
    DST-ADDRESS       GATEWAY            DISTANCE
DAo  0.0.0.0/0        108.45.37.5%ether1    110
DAo  10.255.255.1/32  108.45.37.5%ether1    110
DAo  10.255.255.2/32  108.45.37.9%ether2    110
DAc  10.255.255.3/32  loopback0               0
DAo  10.255.255.4/32  108.45.37.5%ether1    110
DAo  10.255.255.5/32  108.45.37.5%ether1    110
DAo  10.255.255.6/32  108.45.37.5%ether1    110
DAo+ 108.45.37.0/30   108.45.37.5%ether1    110
DAo+ 108.45.37.0/30   108.45.37.9%ether2    110
DAc  108.45.37.4/30   ether1                  0
DAc  108.45.37.8/30   ether2                  0
DAo  108.45.37.12/30  108.45.37.9%ether2    110
DAo  109.45.37.0/30   108.45.37.5%ether1    110
DAo  109.45.37.4/30   108.45.37.5%ether1    110
DAo  109.45.37.8/30   108.45.37.5%ether1    110
DAo  109.45.37.12/30  108.45.37.5%ether1    110
DAo  192.168.5.0/24   108.45.37.5%ether1    110
DAo  192.168.6.0/30   108.45.37.5%ether1    110
[admin@R3] >
```

```
[admin@R4] > ip/route/print
Flags: D - DYNAMIC; I, A - ACTIVE; c, b, o, y - COPY; H - HW-OFFLOADED; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
      DST-ADDRESS       GATEWAY            DISTANCE
DAb   0.0.0.0/0         192.168.6.1              20
DAo   10.255.255.1/32   192.168.6.1%ether1      110
D o   10.255.255.2/32   192.168.6.1%ether1      110
DAb   10.255.255.2/32   192.168.6.1              20
D o   10.255.255.3/32   192.168.6.1%ether1      110
DAb   10.255.255.3/32   192.168.6.1              20
DIbH  10.255.255.4/32   192.168.6.2              20
DAc   10.255.255.4/32   loopback0                 0
DAo   10.255.255.5/32   109.45.37.2%ether2      110
DAo   10.255.255.6/32   109.45.37.5%ether3      110
DAo   108.45.37.0/30    192.168.6.1%ether1      110
DAo   108.45.37.4/30    192.168.6.1%ether1      110
D o   108.45.37.8/30    192.168.6.1%ether1      110
DAb   108.45.37.8/30    192.168.6.1              20
D o   108.45.37.12/30   192.168.6.1%ether1      110
DAb   108.45.37.12/30   192.168.6.1              20
DIbH  109.45.37.0/30    192.168.6.2              20
DAc   109.45.37.0/30    ether2                    0
DIbH  109.45.37.4/30    192.168.6.2              20
DAc   109.45.37.4/30    ether3                    0
DAo + 109.45.37.8/30    109.45.37.5%ether3      110
DAo + 109.45.37.8/30    109.45.37.2%ether2      110
DAo   109.45.37.12/30   109.45.37.2%ether2      110
DAo   192.168.5.0/24    192.168.6.1%ether1      110
DAc   192.168.6.0/30    ether1                    0
-- [Q quit|D dump|up]
```

```
[admin@R1] > routing/ospf/area/ add name=backbone area-id=0.0.0.0 instance=default
[admin@R1] > /routing/ospf/interface-template add network=109.45.37.0/30 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=ether1 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=109.45.37.8/30 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=ether2 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=109.45.37.12/30 area=backbone
[admin@R1] > /routing/ospf/interface-template add network=ether3 area=backbone
[admin@R1] > ip/route/print
Flags: D - DYNAMIC; A - ACTIVE; c, o, y - COPY; + - ECMP
Columns: DST-ADDRESS, GATEWAY, DISTANCE
      DST-ADDRESS       GATEWAY             DISTANCE
DAo   0.0.0.0/0         109.45.37.1%ether1       110
DAo   10.255.255.1/32   109.45.37.1%ether1       110
DAo   10.255.255.2/32   109.45.37.1%ether1       110
DAo   10.255.255.3/32   109.45.37.1%ether1       110
DAo   10.255.255.4/32   109.45.37.1%ether1       110
DAc   10.255.255.5/32   loopback0                  0
DAo   10.255.255.6/32   109.45.37.10%ether2      110
DAo   108.45.37.0/30    109.45.37.1%ether1       110
DAo   108.45.37.4/30    109.45.37.1%ether1       110
DAo   108.45.37.8/30    109.45.37.1%ether1       110
DAo   108.45.37.12/30   109.45.37.1%ether1       110
DAc   109.45.37.0/30    ether1                     0
DAo+  109.45.37.4/30    109.45.37.1%ether1       110
DAo+  109.45.37.4/30    109.45.37.10%ether2      110
DAc   109.45.37.8/30    ether2                     0
DAc   109.45.37.12/30   ether3                     0
DAo   192.168.5.0/24    109.45.37.1%ether1       110
DAo   192.168.6.0/30    109.45.37.1%ether1       110
[admin@R1] >
```

```
   1 108.45.37.2                          56  62 2ms452us
   2 108.45.37.2                          56  62 1ms820us
   3 108.45.37.2                          56  62 2ms27us
   4 108.45.37.2                          56  62 1ms621us
   5 108.45.37.2                          56  62 1ms883us
     sent=6 received=6 packet-loss=0% min-rtt=1ms621us avg-rtt=2ms12us max-rtt=2ms452us

[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   0.0.0.0/0         109.45.37.6%ether1      110
DAo   10.255.255.1/32   109.45.37.6%ether1      110
DAo   10.255.255.2/32   109.45.37.6%ether1      110
DAo   10.255.255.3/32   109.45.37.6%ether1      110
DAo   10.255.255.4/32   109.45.37.6%ether1      110
DAo   10.255.255.5/32   109.45.37.9%ether2      110
DAc   10.255.255.6/32   loopback0                 0
DAo   108.45.37.0/30    109.45.37.6%ether1      110
DAo   108.45.37.4/30    109.45.37.6%ether1      110
DAo   108.45.37.8/30    109.45.37.6%ether1      110
DAo   108.45.37.12/30   109.45.37.6%ether1      110
DAo+  109.45.37.0/30    109.45.37.6%ether1      110
DAo+  109.45.37.0/30    109.45.37.9%ether2      110
DAc   109.45.37.4/30    ether1                    0
DAc   109.45.37.8/30    ether2                    0
DAo   109.45.37.12/30   109.45.37.9%ether2      110
DAo   192.168.5.0/24    109.45.37.6%ether1      110
DAo   192.168.6.0/30    109.45.37.6%ether1      110
[admin@R6] >
```

Υπάρχει διαδρομή προς το εξωτερικό δίκτυο 0.0.0.0/0 από όλους τους δρομολογητές

Εκτελώ traceroute 8.8.8.8 από τον Debian-2:


```
Password:
Linux debian 5.10.0-20-cloud-amd64 #1 SMP Debian 5.10.158-2 (2022-12-13) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Fri Apr 28 22:45:21 UTC 2023 on ttyS0
debian@debian:~$ sudo traceroute 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 60 byte packets
 1  ip-109-45-37-13.web.vodafone.de (109.45.37.13)  1.436 ms  1.316 ms  1.292 ms
 2  ip-109-45-37-1.web.vodafone.de (109.45.37.1)  4.172 ms  4.437 ms  4.414 ms
 3  192.168.6.1 (192.168.6.1)  9.963 ms  11.930 ms  12.091 ms
 4  192.168.5.2 (192.168.5.2)  12.226 ms  12.348 ms  12.403 ms
 5  * * *
 6  * * *
 7  * * *
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
debian@debian:~$
```

Εκτελώ traceroute από τον Debian-1 στον Debian-2

```
18  *  *  *
19  *  *  *
20  *  *  *
21  *  *  *
22  *  *  *
23  *  *  *
24  *  *  *
25  *  *  *
26  *  *  *
27  *  *  *
28  *  *  *
29  *  *  *
30  *  *  *
debian@debian:~$ sudo traceroute 108.45.37.13
traceroute to 108.45.37.13 (108.45.37.13), 30 hops max, 60 byte packets
 1  ip-109-45-37-13.web.vodafone.de (109.45.37.13)  1.246 ms  1.093 ms  2.216 ms
 2  ip-109-45-37-1.web.vodafone.de (109.45.37.1)  4.163 ms  4.107 ms  4.087 ms
 3  192.168.6.1 (192.168.6.1)  9.740 ms  9.779 ms  10.011 ms
 4  static-108-45-37-13.washdc.fios.verizon.net (108.45.37.13)  10.001 ms  10.046 ms  10.955 ms
debian@debian:~$
```

ΥΠΟΒΟΛΉ ΕΡΓΑΣΙΑΣ

```
Subnet 109.45.37.4/30 Found
Subnet 109.45.37.8/30 Found
Subnet 109.45.37.12/30 Found
Telnet to 108.45.37.1 (R1). Get BGP connection info.
admin@108.45.37.1's password:
Connection to 108.45.37.1 closed.
BGP connection exists: SUCCESS
BGP connection is active: SUCCESS
Found Remote AS: 10945
Found BGP link remote address: 192.168.6.2
BGP link remote address (192.168.6.2) found in R1 tables: SUCCESS
Remote AS is correct: 10945: SUCCESS
Found local AS: 10845
Found local  BGP link local address: 192.168.6.1
Calculating BGP subnet network:
192.168.6.0/30
BGP subnet network (192.168.6.0/30) found in R1 tables: SUCCESS
Local AS is correct: 10845: SUCCESS
Telnet to 108.45.37.1 (R1). Get interfaces info.
admin@108.45.37.1's password:
Connection to 108.45.37.1 closed.
Starting traceroute to Debian 2 (max hops set to 7)
traceroute to 109.45.37.14 (109.45.37.14), 7 hops max, 60 byte packets
 1  108.45.37.13  1.520 ms  1.618 ms  1.627 ms
 2  108.45.37.1  8.254 ms  8.195 ms  8.137 ms
 3  192.168.6.2  10.686 ms  10.626 ms  11.437 ms
 4  109.45.37.2  11.746 ms  11.689 ms  11.631 ms
 5  109.45.37.14  12.076 ms  13.431 ms  14.590 ms
Traceroute to Debian 2 reach: you reach 109.45.37.14 in 5 hops
Testing IPs of hops:
ip address (108.45.37.1) of R1 found in path: SUCCESS
BGP remote address (192.168.6.2) found in path: SUCCESS
Begin ping to 8.8.8.8:  ping to 8.8.8.8: CORRECT
Begin ping to google.com:  ping to google.com: CORRECT
Start traceroute to 8.8.8.8 with ICMP:  SUCCESS : you reach 8.8.8.8 in 13 hops
Submit result: y/n ? y
entered yes. uploading results....good bye
debian@debian:~$
```