ΔΙΚΤΥΑ ΥΠΟΛΟΓΙΣΤΩΝ

-Κατσαρός Ανδρέας (1084522)

ΑΚΑΔΗΜΑΙΚΟ ΕΤΟΣ: 2022-2023
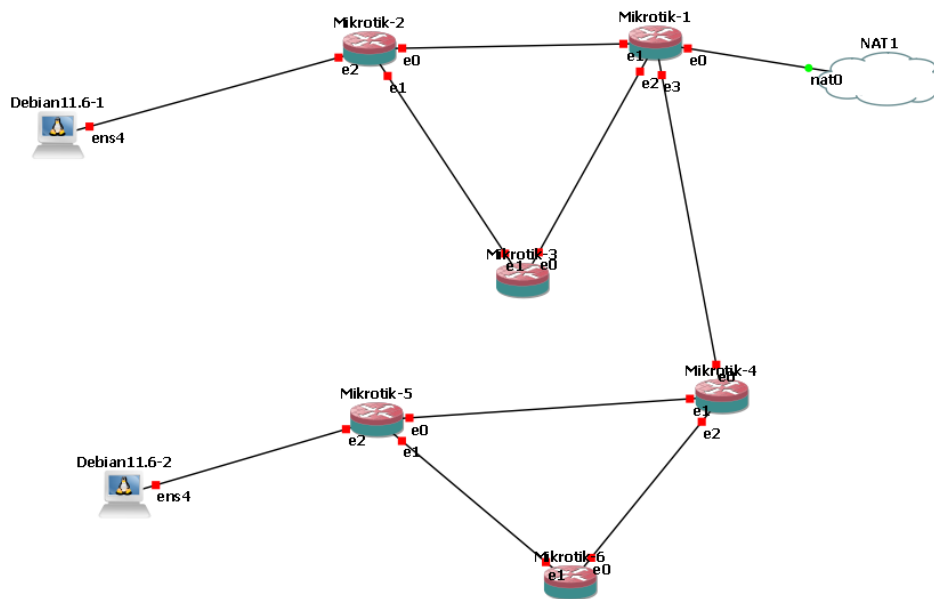
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5η Εργασία - Εισαγωγή στη Χρήση GNS3

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Κος Βλάχος

ΕΡΩΤΗΜΑΤΑ:

Τοπολογία:

1) Εκτελέστε ping από-προς όλα τα interface για να βεβαιωθείτε ότι το ospf είναι λειτουργικό.

2) Εκτελέστε ip/route/print στους R1,R2,R3 και δείξτε την έξοδο. Υπάρχει διαδρομή προς το εξωτερικό δίκτυο (0.0.0.0/0) από όλους τους δρομολογητές;

Εκτελέστε ping από-προς όλα τα interface , και ping και βλέπουμε ότι υπάρχει διαδρομή προς το εξωτερικό δίκτυο μόνο στον R1.Έπειτα εκτελούμε ip/route/print.

```
[admin@R1] > ping 108.45.22.1 count=3
  SEQ HOST                                   SIZE TTL TIME        STATUS
    0 108.45.22.1                              56  64 440us
    1 108.45.22.1                              56  64 71us
    2 108.45.22.1                              56  64 63us
    sent=3 received=3 packet-loss=0% min-rtt=63us avg-rtt=191us max-rtt=440us

[admin@R1] > ping 108.45.22.2 count=3
  SEQ HOST                                   SIZE TTL TIME        STATUS
    0 108.45.22.2                              56  64 1ms536us
    1 108.45.22.2                              56  64 2ms624us
    2 108.45.22.2                              56  64 2ms159us
    sent=3 received=3 packet-loss=0% min-rtt=1ms536us avg-rtt=2ms106us max-rtt=2ms624us

[admin@R1] > ping 108.45.22.5 count=3
  SEQ HOST                                   SIZE TTL TIME        STATUS
    0 108.45.22.5                              56  64 254us
    1 108.45.22.5                              56  64 65us
    2 108.45.22.5                              56  64 66us
    sent=3 received=3 packet-loss=0% min-rtt=65us avg-rtt=128us max-rtt=254us

[admin@R1] > ping 108.45.22.6 count=3
  SEQ HOST                                   SIZE TTL TIME        STATUS
    0 108.45.22.6                              56  64 2ms731us
    1 108.45.22.6                              56  64 2ms526us
    2 108.45.22.6                              56  64 2ms330us
    sent=3 received=3 packet-loss=0% min-rtt=2ms330us avg-rtt=2ms529us max-rtt=2ms731us

[admin@R1] > ping 108.45.22.9 count=3
  SEQ HOST                                   SIZE TTL TIME        STATUS
    0 108.45.22.9                              56  64 2ms103us
    1 108.45.22.9                              56  64 2ms355us
    2 108.45.22.9                              56  64 2ms262us
    sent=3 received=3 packet-loss=0% min-rtt=2ms103us avg-rtt=2ms240us max-rtt=2ms355us

[admin@R1] > ping 108.45.22.10 count=3
  SEQ HOST                                   SIZE TTL TIME        STATUS
    0 108.45.22.10                             56  64 3ms477us
    1 108.45.22.10                             56  64 2ms183us
    2 108.45.22.10                             56  64 2ms651us
    sent=3 received=3 packet-loss=0% min-rtt=2ms183us avg-rtt=2ms770us max-rtt=3ms477us

[admin@R1] > ping 108.45.22.14 count=3
  SEQ HOST                                   SIZE TTL TIME        STATUS
    0 108.45.22.14                             56  63 4ms134us
    1 108.45.22.14                             56  63 3ms464us
    2 108.45.22.14                             56  63 5ms189us
    sent=3 received=3 packet-loss=0% min-rtt=3ms464us avg-rtt=4ms262us max-rtt=5ms189us

[admin@R1] > ping 8.8.8.8
  SEQ HOST                                   SIZE TTL TIME        STATUS
    0 8.8.8.8                                  56 127 60ms941us
    1 8.8.8.8                                  56 127 78ms686us
    2 8.8.8.8                                  56 127 65ms92us
    3 8.8.8.8                                  56 127 70ms173us
    4 8.8.8.8                                  56 127 69ms495us
    sent=5 received=5 packet-loss=0% min-rtt=60ms941us avg-rtt=68ms877us max-rtt=78ms686us

[admin@R1] >
```

```
[admin@A2] > ping 108.45.22.14 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.14                        56  64 1ms892us
    1 108.45.22.14                        56  64 2ms18us
    2 108.45.22.14                        56  64 2ms120us
    sent=3 received=3 packet-loss=0% min-rtt=1ms892us avg-rtt=2ms10us max-rtt=2ms120us

[admin@A2] > ping 108.45.22.1 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.1                         56  64 1ms822us
    1 108.45.22.1                         56  64 2ms158us
    2 108.45.22.1                         56  64 1ms576us
    sent=3 received=3 packet-loss=0% min-rtt=1ms576us avg-rtt=1ms852us max-rtt=2ms158us

[admin@A2] > ping 108.45.22.2 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.2                         56  64 64us
    1 108.45.22.2                         56  64 37us
    2 108.45.22.2                         56  64 414us
    sent=3 received=3 packet-loss=0% min-rtt=37us avg-rtt=171us max-rtt=414us

[admin@A2] > ping 108.45.22.5 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.5                         56  63 3ms399us
    1 108.45.22.5                         56  63 4ms951us
    2 108.45.22.5                         56  63 4ms
    sent=3 received=3 packet-loss=0% min-rtt=3ms399us avg-rtt=4ms116us max-rtt=4ms951us

[admin@A2] > ping 108.45.22.6 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.6                         56  64 2ms972us
    1 108.45.22.6                         56  64 4ms912us
    2 108.45.22.6                         56  64 2ms837us
    sent=3 received=3 packet-loss=0% min-rtt=2ms837us avg-rtt=3ms573us max-rtt=4ms912us

[admin@A2] > ping 108.45.22.9 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.9                         56  64 122us
    1 108.45.22.9                         56  64 58us
    2 108.45.22.9                         56  64 57us
    sent=3 received=3 packet-loss=0% min-rtt=57us avg-rtt=79us max-rtt=122us

[admin@A2] > ping 108.45.22.10 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.10                        56  64 1ms463us
    1 108.45.22.10                        56  64 2ms228us
    2 108.45.22.10                        56  64 2ms378us
    sent=3 received=3 packet-loss=0% min-rtt=1ms463us avg-rtt=2ms23us max-rtt=2ms378us

[admin@A2] > ping 108.45.22.14 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.14                        56  64 2ms447us
    1 108.45.22.14                        56  64 1ms174us
    2 108.45.22.14                        56  64 1ms701us
    sent=3 received=3 packet-loss=0% min-rtt=1ms174us avg-rtt=1ms774us max-rtt=2ms447us

[admin@A2] > 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
```

```
[admin@A3] > ping 108.45.22.1 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.1                         56  64 2ms429us
    1 108.45.22.1                         56  64 2ms355us
    2 108.45.22.1                         56  64 2ms217us
    sent=3 received=3 packet-loss=0% min-rtt=2ms217us avg-rtt=2ms333us max-rtt=2ms429us

[admin@A3] > ping 108.45.22.2 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.2                         56  64 3ms280us
    1 108.45.22.2                         56  64 1ms842us
    2 108.45.22.2                         56  64 2ms306us
    sent=3 received=3 packet-loss=0% min-rtt=1ms842us avg-rtt=2ms476us max-rtt=3ms280us

[admin@A3] > ping 108.45.22.5 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.5                         56  64 2ms794us
    1 108.45.22.5                         56  64 1ms871us
    2 108.45.22.5                         56  64 2ms148us
    sent=3 received=3 packet-loss=0% min-rtt=1ms871us avg-rtt=2ms271us max-rtt=2ms794us

[admin@A3] > ping 108.45.22.6 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.6                         56  64 82us
    1 108.45.22.6                         56  64 62us
    2 108.45.22.6                         56  64 61us
    sent=3 received=3 packet-loss=0% min-rtt=61us avg-rtt=68us max-rtt=82us

[admin@A3] > ping 108.45.22.9 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.9                         56  64 2ms439us
    1 108.45.22.9                         56  64 2ms195us
    2 108.45.22.9                         56  64 2ms73us
    sent=3 received=3 packet-loss=0% min-rtt=2ms73us avg-rtt=2ms235us max-rtt=2ms439us

[admin@A3] > ping 108.45.22.10 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.10                        56  64 42us
    1 108.45.22.10                        56  64 61us
    2 108.45.22.10                        56  64 60us
    sent=3 received=3 packet-loss=0% min-rtt=42us avg-rtt=54us max-rtt=61us

[admin@A3] > ping 108.45.22.14 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.14                        56  63 3ms872us
    1 108.45.22.14                        56  63 4ms424us
    2 108.45.22.14                        56  63 3ms136us
    sent=3 received=3 packet-loss=0% min-rtt=3ms136us avg-rtt=3ms810us max-rtt=4ms424us

[admin@A3] > 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
    sent=3 received=0 packet-loss=100%
```

```
[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            192.168.122.1               1
DAc   10.255.255.1/32      loopback0                   0
DAo   10.255.255.2/32      108.45.22.2%ether2        110
DAo   10.255.255.3/32      108.45.22.6%ether3        110
DAc   108.45.22.0/30       ether2                      0
DAc   108.45.22.4/30       ether3                      0
DAo+  108.45.22.8/30       108.45.22.6%ether3        110
DAo+  108.45.22.8/30       108.45.22.2%ether2        110
DAo   108.45.22.12/30      108.45.22.2%ether2        110
DAc   192.168.122.0/24     ether1                      0
[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
DAo   10.255.255.1/32   108.45.22.1%ether1       110
DAc   10.255.255.2/32   loopback0                  0
DAo   10.255.255.3/32   108.45.22.10%ether2      110
DAc   108.45.22.0/30    ether1                     0
DAo+  108.45.22.4/30    108.45.22.1%ether1       110
DAo+  108.45.22.4/30    108.45.22.10%ether2      110
DAc   108.45.22.8/30    ether2                     0
DAc   108.45.22.12/30   ether3                     0
DAo   192.168.122.0/24  108.45.22.1%ether1       110
[admin@R2] >
```

```
[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      108.45.22.5%ether1        110
DAo   10.255.255.2/32      108.45.22.9%ether2        110
DAc   10.255.255.3/32      loopback0                   0
DAo+  108.45.22.0/30       108.45.22.9%ether2        110
DAo+  108.45.22.0/30       108.45.22.5%ether1        110
DAc   108.45.22.4/30       ether1                      0
DAc   108.45.22.8/30       ether2                      0
DAo   108.45.22.12/30      108.45.22.9%ether2        110
DAo   192.168.122.0/24     108.45.22.5%ether1        110
[admin@R3] >
```

3) Προσθέστε την παρακάτω στατική διαδρομή μόνο στον R2 :

R2: ip/route/add dst-address=0.0.0.0/0 gateway=109.45.49.1 distance=112

∘ Δείξτε τα route μονοπάτια σε κάθε δρομολογητή (θυμηθείτε ότι στο ospf έχει επιλεχθεί "redistribute static")

∘ Πως δρομολογείτε η κίνηση από τον R3 προς 8.8.8.8? ∘ Αφαιρέστε την σύνδεση R3-R2. Μετά από λίγο, δείξτε ξανά τα route μονοπάτια σε κάθε δρομολογητή και ξαναδείξτε πως δρομολογείτε η κίνηση από τον R3 προς 8.8.8.8.

```
debian@debian:~$ traceroute 108.45.22.1
traceroute to 108.45.22.1 (108.45.22.1), 30 hops max, 60 byte packets
 1  108.45.22.13 (108.45.22.13)  2.979 ms  2.239 ms  1.210 ms
 2  108.45.22.1 (108.45.22.1)  2.903 ms  2.379 ms  30.052 ms
debian@debian:~$ traceroute 108.45.22.5
traceroute to 108.45.22.5 (108.45.22.5), 30 hops max, 60 byte packets
 1  108.45.22.13 (108.45.22.13)  2.082 ms  1.161 ms  1.480 ms
 2  108.45.22.5 (108.45.22.5)  2.766 ms  2.542 ms  19.924 ms
debian@debian:~$
```

```
[admin@R2] >  ip/route/add dst-address=0.0.0.0/0 gateway=108.45.22.1 distance=112
[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          108.45.22.1                112
   DAo  10.255.255.1/32    108.45.22.1%ether1         110
   DAc  10.255.255.2/32    loopback0                    0
   DAo  10.255.255.3/32    108.45.22.10%ether2        110
   DAc  108.45.22.0/30     ether1                       0
   DAo+ 108.45.22.4/30     108.45.22.1%ether1         110
   DAo+ 108.45.22.4/30     108.45.22.10%ether2        110
   DAc  108.45.22.8/30     ether2                       0
   DAc  108.45.22.12/30    ether3                       0
   DAo  192.168.122.0/24   108.45.22.1%ether1         110
```

```
[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          108.45.22.9%ether2         110
DAo+ 0.0.0.0/0          108.45.22.5%ether1         110
DAo  10.255.255.1/32    108.45.22.5%ether1         110
DAo  10.255.255.2/32    108.45.22.9%ether2         110
DAc  10.255.255.3/32    loopback0                    0
DAo+ 108.45.22.0/30     108.45.22.9%ether2         110
DAo+ 108.45.22.0/30     108.45.22.5%ether1         110
DAc  108.45.22.4/30     ether1                       0
DAc  108.45.22.8/30     ether2                       0
DAo  108.45.22.12/30    108.45.22.9%ether2         110
DAo  192.168.122.0/24   108.45.22.5%ether1         110
[admin@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+ 0.0.0.0/0          108.45.22.9%ether2        110
DAo+ 0.0.0.0/0          108.45.22.5%ether1        110
DAo  10.255.255.1/32    108.45.22.5%ether1        110
DAo  10.255.255.2/32    108.45.22.9%ether2        110
DAc  10.255.255.3/32    loopback0                   0
DAo+ 108.45.22.0/30     108.45.22.9%ether2        110
DAo+ 108.45.22.0/30     108.45.22.5%ether1        110
DAc  108.45.22.4/30     ether1                      0
DAc  108.45.22.8/30     ether2                      0
DAo  108.45.22.12/30    108.45.22.9%ether2        110
DAo  192.168.122.0/24   108.45.22.5%ether1        110
[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  108.45.22.5     0%       1  2.2ms     2.2   2.2    2.2          0
2  192.168.122.1   0%       1  2.1ms     2.1   2.1    2.1          0
3  192.168.85.2    0%       1  2.7ms     2.7   2.7    2.7          0
4                  100%     1  timeout
5                  100%     1  timeout
6                  0%       1  0ms
```

```
[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         108.45.22.1                 112
   DAo 10.255.255.1/32  108.45.22.1%ether1         110
   DAc 10.255.255.2/32  loopback0                    0
   DAo 10.255.255.3/32  108.45.22.10%ether2        110
   DAc 108.45.22.0/30   ether1                       0
   DAo+ 108.45.22.4/30  108.45.22.1%ether1         110
   DAo+ 108.45.22.4/30  108.45.22.10%ether2        110
   DAc 108.45.22.8/30   ether2                       0
   DAc 108.45.22.12/30  ether3                       0
   DAo 192.168.122.0/24 108.45.22.1%ether1         110
[admin@R2] >
```

```
[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         108.45.22.1%ether2        110
DAd   0.0.0.0/0         192.168.122.1               1
DAc   10.255.255.1/32   loopback0                   0
DAo   10.255.255.2/32   108.45.22.2%ether2        110
DAo   10.255.255.3/32   108.45.22.6%ether3        110
DAc   108.45.22.0/30    ether2                      0
DAc   108.45.22.4/30    ether3                      0
DAo + 108.45.22.8/30    108.45.22.6%ether3        110
DAo + 108.45.22.8/30    108.45.22.2%ether2        110
DAo   108.45.22.12/30   108.45.22.2%ether2        110
DAc   192.168.122.0/24  ether1                      0
[admin@R1] >
```

Υλοποίηση διασύνδεσης δικτύων με χρήση του Border Gateway Protocol

1)Εκτελέστε ping από-προς όλα τα interface για να βεβαιωθείτε ότι το ospf/bgp είναι λειτουργικό

R1

R2

```
[admin@R2] > ping 108.45.22.1 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 108.45.22.1                          56  64 2ms676us
    1 108.45.22.1                          56  64 1ms888us
    2 108.45.22.1                          56  64 2ms699us
    sent=3 received=3 packet-loss=0% min-rtt=1ms888us avg-rtt=2ms421us max-rtt=2ms699us

[admin@R2] > ping 108.45.22.2 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 108.45.22.2                          56  64 95us
    1 108.45.22.2                          56  64 66us
    2 108.45.22.2                          56  64 57us
    sent=3 received=3 packet-loss=0% min-rtt=57us avg-rtt=72us max-rtt=95us

[admin@R2] > ping 108.45.22.5 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 108.45.22.5                          56  64 1ms588us
    1 108.45.22.5                          56  64 2ms487us
    2 108.45.22.5                          56  64 3ms303us
    sent=3 received=3 packet-loss=0% min-rtt=1ms588us avg-rtt=2ms459us max-rtt=3ms303us

[admin@R2] > ping 108.45.22.6 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 108.45.22.6                          56  64 16ms385us
    1 108.45.22.6                          56  64 3ms250us
    2 108.45.22.6                          56  64 3ms766us
    sent=3 received=3 packet-loss=0% min-rtt=3ms250us avg-rtt=7ms800us max-rtt=16ms385us

[admin@R2] > ping 108.45.22.9 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 108.45.22.9                          56  64 38us
    1 108.45.22.9                          56  64 48us
    2 108.45.22.9                          56  64 43us
    sent=3 received=3 packet-loss=0% min-rtt=38us avg-rtt=43us max-rtt=48us

[admin@R2] > ping 108.45.22.10 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 108.45.22.10                         56  64 1ms820us
    1 108.45.22.10                         56  64 1ms893us
    2 108.45.22.10                         56  64 1ms997us
    sent=3 received=3 packet-loss=0% min-rtt=1ms820us avg-rtt=1ms903us max-rtt=1ms997us

[admin@R2] > ping 108.45.22.13 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 108.45.22.13                         56  64 56us
    1 108.45.22.13                         56  64 60us
    2 108.45.22.13                         56  64 59us
    sent=3 received=3 packet-loss=0% min-rtt=56us avg-rtt=58us max-rtt=60us

[admin@R2] > ping 108.45.22.14 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 108.45.22.14                         56  64 12ms861us
    1 108.45.22.14                         56  64 2ms173us
    2 108.45.22.14                         56  64 2ms641us
    sent=3 received=3 packet-loss=0% min-rtt=2ms173us avg-rtt=5ms891us max-rtt=12ms861us
```



```
    0 108.45.22.14                         56  64 12ms861us
    1 108.45.22.14                         56  64 2ms173us
    2 108.45.22.14                         56  64 2ms641us
    sent=3 received=3 packet-loss=0% min-rtt=2ms173us avg-rtt=5ms891us max-rtt=12ms861us

[admin@R2] > ping 109.45.22.1 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 109.45.22.1                          56  63 6ms759us
    1 109.45.22.1                          56  63 6ms178us
    2 109.45.22.1                          56  63 4ms310us
    sent=3 received=3 packet-loss=0% min-rtt=4ms310us avg-rtt=5ms749us max-rtt=6ms759us

[admin@R2] > ping 109.45.22.2 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 109.45.22.2                          56  62 14ms773us
    1 109.45.22.2                          56  62 7ms79us
    2 109.45.22.2                          56  62 5ms683us
    sent=3 received=3 packet-loss=0% min-rtt=5ms683us avg-rtt=9ms178us max-rtt=14ms773us

[admin@R2] > ping 109.45.22.5 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 109.45.22.5                          56  63 4ms876us
    1 109.45.22.5                          56  63 4ms297us
    2 109.45.22.5                          56  63 3ms627us
    sent=3 received=3 packet-loss=0% min-rtt=3ms627us avg-rtt=4ms266us max-rtt=4ms876us

[admin@R2] > ping 109.45.22.6 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 109.45.22.6                          56  62 5ms647us
    1 109.45.22.6                          56  62 7ms262us
    2 109.45.22.6                          56  62 607ms941us
    sent=3 received=3 packet-loss=0% min-rtt=5ms647us avg-rtt=206ms950us max-rtt=607ms941us

[admin@R2] > ping 109.45.22.9 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 109.45.22.9                          56  62 107ms431us
    1 109.45.22.9                          56  62 5ms533us
    2 109.45.22.9                          56  62 6ms151us
    sent=3 received=3 packet-loss=0% min-rtt=6ms151us avg-rtt=47ms705us max-rtt=107ms431us

[admin@R2] > ping 109.45.22.10 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 109.45.22.10                         56  62 8ms23us
    1 109.45.22.10                         56  62 27ms482us
    2 109.45.22.10                         56  62 5ms396us
    sent=3 received=3 packet-loss=0% min-rtt=5ms396us avg-rtt=13ms633us max-rtt=27ms482us

[admin@R2] > ping 109.45.22.13 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 109.45.22.13                         56  62 75ms138us
    1 109.45.22.13                         56  62 6ms537us
    2 109.45.22.13                         56  62 16ms619us
    sent=3 received=3 packet-loss=0% min-rtt=6ms537us avg-rtt=32ms764us max-rtt=75ms138us

[admin@R2] > ping 109.45.22.14 count=3
  SEQ HOST                                SIZE TTL TIME        STATUS
    0 109.45.22.14                         56  61 62ms848us
    1 109.45.22.14                         56  61 117ms100us
    2 109.45.22.14                         56  61 61ms265us
    sent=3 received=3 packet-loss=0% min-rtt=61ms265us avg-rtt=80ms404us max-rtt=117ms100us
```

R3:

```
[admin@R3] > ping 108.45.22.1 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 108.45.22.1                      56  64 2ms115us
    1 108.45.22.1                      56  64 2ms834us
    2 108.45.22.1                      56  64 3ms534us
    sent=3 received=3 packet-loss=0% min-rtt=2ms115us avg-rtt=2ms827us max-rtt=3ms534us

[admin@R3] > ping 108.45.22.2 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 108.45.22.2                      56  64 1ms759us
    1 108.45.22.2                      56  64 1ms908us
    2 108.45.22.2                      56  64 2ms370us
    sent=3 received=3 packet-loss=0% min-rtt=1ms759us avg-rtt=2ms12us max-rtt=2ms370us

[admin@R3] > ping 108.45.22.5 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 108.45.22.5                      56  64 2ms347us
    1 108.45.22.5                      56  64 1ms877us
    2 108.45.22.5                      56  64 2ms48us
    sent=3 received=3 packet-loss=0% min-rtt=1ms877us avg-rtt=2ms90us max-rtt=2ms347us

[admin@R3] > ping 108.45.22.6 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 108.45.22.6                      56  64 91us
    1 108.45.22.6                      56  64 56us
    2 108.45.22.6                      56  64 65us
    sent=3 received=3 packet-loss=0% min-rtt=56us avg-rtt=70us max-rtt=91us

[admin@R3] > ping 108.45.22.9 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 108.45.22.9                      56  64 3ms434us
    1 108.45.22.9                      56  64 2ms160us
    2 108.45.22.9                      56  64 2ms964us
    sent=3 received=3 packet-loss=0% min-rtt=2ms160us avg-rtt=2ms852us max-rtt=3ms434us

[admin@R3] > ping 108.45.22.10 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 108.45.22.10                     56  64 41us
    1 108.45.22.10                     56  64 87us
    2 108.45.22.10                     56  64 82us
    sent=3 received=3 packet-loss=0% min-rtt=41us avg-rtt=70us max-rtt=87us

[admin@R3] > ping 108.45.22.13 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 108.45.22.13                     56  64 6ms421us
    1 108.45.22.13                     56  64 3ms43us
    2 108.45.22.13                     56  64 1ms824us
    sent=3 received=3 packet-loss=0% min-rtt=1ms824us avg-rtt=3ms762us max-rtt=6ms421us

[admin@R3] > ping 108.45.22.14 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 108.45.22.14                     56  63 2ms478us
    1 108.45.22.14                     56  63 3ms531us
    2 108.45.22.14                     56  63 2ms986us
    sent=3 received=3 packet-loss=0% min-rtt=2ms478us avg-rtt=2ms998us max-rtt=3ms531us

[admin@R3] > ping 109.45.22.1 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 109.45.22.1                      56  63 6ms508us
    1 109.45.22.1                      56  63 4ms704us
    2 109.45.22.1                      56  63 371ms237us
    sent=3 received=3 packet-loss=0% min-rtt=4ms704us avg-rtt=127ms483us max-rtt=371ms237us
```

```
    0 108.45.22.14                     56  63 2ms478us
    1 108.45.22.14                     56  63 3ms531us
    2 108.45.22.14                     56  63 2ms986us
    sent=3 received=3 packet-loss=0% min-rtt=2ms478us avg-rtt=2ms998us max-rtt=3ms531us

[admin@R3] > ping 109.45.22.1 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 109.45.22.1                      56  63 6ms508us
    1 109.45.22.1                      56  63 4ms704us
    2 109.45.22.1                      56  63 371ms237us
    sent=3 received=3 packet-loss=0% min-rtt=4ms704us avg-rtt=127ms483us max-rtt=371ms237us

[admin@R3] > ping 109.45.22.2 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 109.45.22.2                      56  62 20ms754us
    1 109.45.22.2                      56  62 17ms982us
    2 109.45.22.2                      56  62 5ms56us
    sent=3 received=3 packet-loss=0% min-rtt=5ms56us avg-rtt=14ms597us max-rtt=20ms754us

[admin@R3] > ping 109.45.22.5 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 109.45.22.5                      56  63 13ms215us
    1 109.45.22.5                      56  63 4ms812us
    2 109.45.22.5                      56  63 4ms720us
    sent=3 received=3 packet-loss=0% min-rtt=4ms720us avg-rtt=7ms582us max-rtt=13ms215us

[admin@R3] > ping 109.45.22.6 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 109.45.22.6                      56  62 48ms802us
    1 109.45.22.6                      56  62 66ms114us
    2 109.45.22.6                      56  62 11ms145us
    sent=3 received=3 packet-loss=0% min-rtt=11ms145us avg-rtt=42ms20us max-rtt=66ms114us

[admin@R3] > ping 109.45.22.9 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 109.45.22.9                      56  62 155ms541us
    1 109.45.22.9                      56  62 35ms615us
    2 109.45.22.9                      56  62 65ms67us
    sent=3 received=3 packet-loss=0% min-rtt=35ms615us avg-rtt=85ms407us max-rtt=155ms541us

[admin@R3] > ping 109.45.22.10 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 109.45.22.10                     56  62 6ms3us
    1 109.45.22.10                     56  62 23ms73us
    2 109.45.22.10                     56  62 12ms820us
    sent=3 received=3 packet-loss=0% min-rtt=6ms3us avg-rtt=13ms965us max-rtt=23ms73us

[admin@R3] > ping 109.45.22.13 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 109.45.22.13                     56  62 10ms648us
    1 109.45.22.13                     56  62 5ms1us
    2 109.45.22.13                     56  62 8ms518us
    sent=3 received=3 packet-loss=0% min-rtt=5ms1us avg-rtt=8ms55us max-rtt=10ms648us

[admin@R3] > ping 109.45.22.14 count=3
  SEQ HOST                           SIZE TTL TIME        STATUS
    0 109.45.22.14                     56  61 27ms624us
    1 109.45.22.14                     56  61 41ms162us
    2 109.45.22.14                     56  61 8ms467us
    sent=3 received=3 packet-loss=0% min-rtt=8ms467us avg-rtt=25ms751us max-rtt=41ms162us
```

R4:

```
[admin@R4] > ping 108.45.22.1 count=3
  SEQ HOST                                    SIZE TTL TIME       STATUS
    0 108.45.22.1                               56  64 4ms230us
    1 108.45.22.1                               56  64 1ms927us
    2 108.45.22.1                               56  64 2ms865us
    sent=3 received=3 packet-loss=0% min-rtt=1ms927us avg-rtt=3ms7us max-rtt=4ms230us

[admin@R4] > ping 108.45.22.2 count=3
  SEQ HOST                                    SIZE TTL TIME       STATUS
    0 108.45.22.2                               56  63 12ms624us
    1 108.45.22.2                               56  63 2ms747us
    2 108.45.22.2                               56  63 4ms206us
    sent=3 received=3 packet-loss=0% min-rtt=2ms747us avg-rtt=6ms525us max-rtt=12ms624us

[admin@R4] > ping 108.45.22.5 count=3
  SEQ HOST                                    SIZE TTL TIME       STATUS
    0 108.45.22.5                               56  64 2ms295us
    1 108.45.22.5                               56  64 3ms756us
    2 108.45.22.5                               56  64 2ms292us
    sent=3 received=3 packet-loss=0% min-rtt=2ms292us avg-rtt=2ms781us max-rtt=3ms756us

[admin@R4] > ping 108.45.22.6 count=3
  SEQ HOST                                    SIZE TTL TIME       STATUS
    0 108.45.22.6                               56  63 14ms982us
    1 108.45.22.6                               56  63 3ms200us
    2 108.45.22.6                               56  63 3ms415us
    sent=3 received=3 packet-loss=0% min-rtt=3ms200us avg-rtt=7ms199us max-rtt=14ms982us

[admin@R4] > ping 108.45.22.9 count=3
  SEQ HOST                                    SIZE TTL TIME       STATUS
    0 108.45.22.9                               56  63 10ms684us
    1 108.45.22.9                               56  63 4ms179us
    2 108.45.22.9                               56  63 3ms483us
    sent=3 received=3 packet-loss=0% min-rtt=3ms483us avg-rtt=6ms115us max-rtt=10ms684us

[admin@R4] > ping 108.45.22.10 count=3
  SEQ HOST                                    SIZE TTL TIME       STATUS
    0 108.45.22.10                              56  63 7ms704us
    1 108.45.22.10                              56  63 4ms335us
    2 108.45.22.10                              56  63 26ms278us
    sent=3 received=3 packet-loss=0% min-rtt=4ms335us avg-rtt=12ms772us max-rtt=26ms278us

[admin@R4] > ping 108.45.22.13 count=3
  SEQ HOST                                    SIZE TTL TIME       STATUS
    0 108.45.22.13                              56  63 20ms219us
    1 108.45.22.13                              56  63 3ms711us
    2 108.45.22.13                              56  63 7ms115us
    sent=3 received=3 packet-loss=0% min-rtt=3ms711us avg-rtt=10ms348us max-rtt=20ms219us

[admin@R4] > ping 108.45.22.14 count=3
  SEQ HOST                                    SIZE TTL TIME       STATUS
    0 108.45.22.14                              56  62 463ms478us
    1 108.45.22.14                              56  62 76ms280us
    2 108.45.22.14                              56  62 4ms55us
    sent=3 received=3 packet-loss=0% min-rtt=4ms55us avg-rtt=181ms271us max-rtt=463ms478us

[admin@R4] > ping 109.45.22.1 count=3
  SEQ HOST                                    SIZE TTL TIME       STATUS
    0 109.45.22.1                               56  64 10ms784us
    1 109.45.22.1                               56  64 50us
    2 109.45.22.1                               56  64 79us
    sent=3 received=3 packet-loss=0% min-rtt=50us avg-rtt=3ms637us max-rtt=10ms784us
```

```
[admin@R4] > ping 108.45.22.14 count=3
  SEQ HOST                          SIZE TTL TIME       STATUS
    0 108.45.22.14                    56  62 463ms478us
    1 108.45.22.14                    56  62 76ms280us
    2 108.45.22.14                    56  62 4ms55us
    sent=3 received=3 packet-loss=0% min-rtt=4ms55us avg-rtt=181ms271us max-rtt=463ms478us

[admin@R4] > ping 109.45.22.1 count=3
  SEQ HOST                          SIZE TTL TIME       STATUS
    0 109.45.22.1                     56  64 10ms784us
    1 109.45.22.1                     56  64 50us
    2 109.45.22.1                     56  64 79us
    sent=3 received=3 packet-loss=0% min-rtt=50us avg-rtt=3ms637us max-rtt=10ms784us

[admin@R4] > ping 109.45.22.2 count=3
  SEQ HOST                          SIZE TTL TIME       STATUS
    0 109.45.22.2                     56  64 9ms704us
    1 109.45.22.2                     56  64 5ms887us
    2 109.45.22.2                     56  64 2ms359us
    sent=3 received=3 packet-loss=0% min-rtt=2ms359us avg-rtt=5ms983us max-rtt=9ms704us

[admin@R4] > ping 109.45.22.5 count=3
  SEQ HOST                          SIZE TTL TIME       STATUS
    0 109.45.22.5                     56  64 933us
    1 109.45.22.5                     56  64 70us
    2 109.45.22.5                     56  64 242us
    sent=3 received=3 packet-loss=0% min-rtt=70us avg-rtt=415us max-rtt=933us

[admin@R4] > ping 109.45.22.6 count=3
  SEQ HOST                          SIZE TTL TIME       STATUS
    0 109.45.22.6                     56  64 4ms129us
    1 109.45.22.6                     56  64 3ms161us
    2 109.45.22.6                     56  64 2ms278us
    sent=3 received=3 packet-loss=0% min-rtt=2ms278us avg-rtt=3ms189us max-rtt=4ms129us

[admin@R4] > ping 109.45.22.9 count=3
  SEQ HOST                          SIZE TTL TIME       STATUS
    0 109.45.22.9                     56  64 1ms965us
    1 109.45.22.9                     56  64 2ms161us
    2 109.45.22.9                     56  64 16ms458us
    sent=3 received=3 packet-loss=0% min-rtt=1ms965us avg-rtt=6ms861us max-rtt=16ms458us

[admin@R4] > ping 109.45.22.10 count=3
  SEQ HOST                          SIZE TTL TIME       STATUS
    0 109.45.22.10                    56  63 7ms559us
    1 109.45.22.10                    56  63 3ms663us
    2 109.45.22.10                    56  63 45ms752us
    sent=3 received=3 packet-loss=0% min-rtt=3ms663us avg-rtt=18ms991us max-rtt=45ms752us

[admin@R4] > ping 109.45.22.13 count=3
  SEQ HOST                          SIZE TTL TIME       STATUS
    0 109.45.22.13                    56  64 6ms427us
    1 109.45.22.13                    56  64 3ms395us
    2 109.45.22.13                    56  64 25ms65us
    sent=3 received=3 packet-loss=0% min-rtt=3ms395us avg-rtt=11ms629us max-rtt=25ms65us

[admin@R4] > ping 109.45.22.14 count=3
  SEQ HOST                          SIZE TTL TIME       STATUS
    0 109.45.22.14                    56  63 16ms845us
    1 109.45.22.14                    56  63 3ms101us
    2 109.45.22.14                    56  63 31ms471us
    sent=3 received=3 packet-loss=0% min-rtt=3ms101us avg-rtt=17ms139us max-rtt=31ms471us
```

R5:

```
[admin@R5] > ping 108.45.22.1 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.1                        56  63 15ms179us
    1 108.45.22.1                        56  63 93ms78us
    2 108.45.22.1                        56  63 3ms183us
    sent=3 received=3 packet-loss=0% min-rtt=3ms183us avg-rtt=37ms146us max-rtt=93ms78us

[admin@R5] > ping 108.45.22.2 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.2                        56  62 9ms98us
    1 108.45.22.2                        56  62 40ms216us
    2 108.45.22.2                        56  62 37ms743us
    sent=3 received=3 packet-loss=0% min-rtt=9ms98us avg-rtt=29ms19us max-rtt=40ms216us

[admin@R5] > ping 108.45.22.5 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.5                        56  63 6ms912us
    1 108.45.22.5                        56  63 3ms123us
    2 108.45.22.5                        56  63 5ms970us
    sent=3 received=3 packet-loss=0% min-rtt=3ms123us avg-rtt=5ms335us max-rtt=6ms912us

[admin@R5] > ping 108.45.22.6 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.6                        56  62 15ms142us
    1 108.45.22.6                        56  62 6ms491us
    2 108.45.22.6                        56  62 8ms293us
    sent=3 received=3 packet-loss=0% min-rtt=6ms491us avg-rtt=9ms975us max-rtt=15ms142us

[admin@R5] > ping 108.45.22.9 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.9                        56  62 8ms577us
    1 108.45.22.9                        56  62 5ms524us
    2 108.45.22.9                        56  62 466ms351us
    sent=3 received=3 packet-loss=0% min-rtt=5ms524us avg-rtt=160ms150us max-rtt=466ms351us

[admin@R5] > ping 108.45.22.10 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.10                       56  62 10ms601us
    1 108.45.22.10                       56  62 22ms258us
    2 108.45.22.10                       56  62 65ms329us
    sent=3 received=3 packet-loss=0% min-rtt=10ms601us avg-rtt=32ms729us max-rtt=65ms329us

[admin@R5] > ping 108.45.22.13 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.13                       56  62 6ms262us
    1 108.45.22.13                       56  62 7ms149us
    2 108.45.22.13                       56  62 15ms51us
    sent=3 received=3 packet-loss=0% min-rtt=6ms262us avg-rtt=9ms487us max-rtt=15ms51us

[admin@R5] > ping 108.45.22.14 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 108.45.22.14                       56  61 7ms106us
    1 108.45.22.14                       56  61 9ms744us
    2 108.45.22.14                       56  61 68ms767us
    sent=3 received=3 packet-loss=0% min-rtt=7ms106us avg-rtt=28ms539us max-rtt=68ms767us
```

```
[admin@R5] > ping 109.45.22.1 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 109.45.22.1                        56  64 9ms74us
    1 109.45.22.1                        56  64 1ms774us
    2 109.45.22.1                        56  64 1ms570us
    sent=3 received=3 packet-loss=0% min-rtt=1ms570us avg-rtt=4ms139us max-rtt=9ms74us

[admin@R5] > ping 109.45.22.2 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 109.45.22.2                        56  64 91us
    1 109.45.22.2                        56  64 140us
    2 109.45.22.2                        56  64 55us
    sent=3 received=3 packet-loss=0% min-rtt=55us avg-rtt=95us max-rtt=140us

[admin@R5] > ping 109.45.22.5 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 109.45.22.5                        56  64 6ms454us
    1 109.45.22.5                        56  64 2ms721us
    2 109.45.22.5                        56  64 2ms895us
    sent=3 received=3 packet-loss=0% min-rtt=2ms721us avg-rtt=4ms23us max-rtt=6ms454us

[admin@R5] > ping 109.45.22.6 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 109.45.22.6                        56  64 8ms269us
    1 109.45.22.6                        56  64 4ms456us
    2 109.45.22.6                        56  64 2ms662us
    sent=3 received=3 packet-loss=0% min-rtt=2ms662us avg-rtt=5ms129us max-rtt=8ms269us

[admin@R5] > ping 109.45.22.9 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 109.45.22.9                        56  64 56us
    1 109.45.22.9                        56  64 58us
    2 109.45.22.9                        56  64 558us
    sent=3 received=3 packet-loss=0% min-rtt=56us avg-rtt=224us max-rtt=558us

[admin@R5] > ping 109.45.22.10 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 109.45.22.10                       56  64 3ms952us
    1 109.45.22.10                       56  64 1ms923us
    2 109.45.22.10                       56  64 2ms614us
    sent=3 received=3 packet-loss=0% min-rtt=1ms923us avg-rtt=2ms829us max-rtt=3ms952us

[admin@R5] > ping 109.45.22.13 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 109.45.22.13                       56  64 55us
    1 109.45.22.13                       56  64 69us
    2 109.45.22.13                       56  64 67us
    sent=3 received=3 packet-loss=0% min-rtt=55us avg-rtt=63us max-rtt=69us

[admin@R5] > ping 109.45.22.14 count=3
  SEQ HOST                              SIZE TTL TIME        STATUS
    0 109.45.22.14                       56  64 1ms185us
    1 109.45.22.14                       56  64 2ms441us
    2 109.45.22.14                       56  64 1ms539us
    sent=3 received=3 packet-loss=0% min-rtt=1ms185us avg-rtt=1ms721us max-rtt=2ms441us

[admin@R5] >
```

R6:

```
[admin@R6] > ping 108.45.22.1 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.22.1                        56  63 3ms403us
    1 108.45.22.1                        56  63 5ms376us
    2 108.45.22.1                        56  63 3ms844us
    sent=3 received=3 packet-loss=0% min-rtt=3ms403us avg-rtt=4ms207us max-rtt=5ms376us

[admin@R6] > ping 108.45.22.2 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.22.2                        56  62 6ms12us
    1 108.45.22.2                        56  62 20ms819us
    2 108.45.22.2                        56  62 13ms746us
    sent=3 received=3 packet-loss=0% min-rtt=6ms12us avg-rtt=13ms525us max-rtt=20ms819us

[admin@R6] > ping 108.45.22.5 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.22.5                        56  63 4ms203us
    1 108.45.22.5                        56  63 3ms741us
    2 108.45.22.5                        56  63 73ms523us
    sent=3 received=3 packet-loss=0% min-rtt=3ms741us avg-rtt=27ms155us max-rtt=73ms523us

[admin@R6] > ping 108.45.22.6 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.22.6                        56  62 8ms267us
    1 108.45.22.6                        56  62 5ms746us
    2 108.45.22.6                        56  62 24ms143us
    sent=3 received=3 packet-loss=0% min-rtt=5ms746us avg-rtt=12ms718us max-rtt=24ms143us

[admin@R6] > ping 108.45.22.9 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.22.9                        56  62 7ms207us
    1 108.45.22.9                        56  62 5ms648us
    2 108.45.22.9                        56  62 17ms18us
    sent=3 received=3 packet-loss=0% min-rtt=5ms648us avg-rtt=9ms957us max-rtt=17ms18us

[admin@R6] > ping 108.45.22.10 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.22.10                       56  62 7ms983us
    1 108.45.22.10                       56  62 7ms70us
    2 108.45.22.10                       56  62 63ms581us
    sent=3 received=3 packet-loss=0% min-rtt=7ms70us avg-rtt=26ms211us max-rtt=63ms581us

[admin@R6] > ping 108.45.22.13 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.22.13                       56  62 326ms997us
    1 108.45.22.13                       56  62 7ms641us
    2 108.45.22.13                       56  62 6ms865us
    sent=3 received=3 packet-loss=0% min-rtt=6ms865us avg-rtt=113ms834us max-rtt=326ms997us

[admin@R6] > ping 108.45.22.14 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 108.45.22.14                       56  61 15ms304us
    1 108.45.22.14                       56  61 7ms515us
    2 108.45.22.14                       56  61 10ms435us
    sent=3 received=3 packet-loss=0% min-rtt=7ms515us avg-rtt=11ms84us max-rtt=15ms304us
```

```
[admin@R6] > ping 109.45.22.1 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 109.45.22.1                        56  64 5ms779us
    1 109.45.22.1                        56  64 1ms944us
    2 109.45.22.1                        56  64 6ms400us
    sent=3 received=3 packet-loss=0% min-rtt=1ms944us avg-rtt=4ms707us max-rtt=6ms400us

[admin@R6] > ping 109.45.22.2 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 109.45.22.2                        56  64 3ms655us
    1 109.45.22.2                        56  64 46ms650us
    2 109.45.22.2                        56  64 4ms99us
    sent=3 received=3 packet-loss=0% min-rtt=3ms655us avg-rtt=18ms134us max-rtt=46ms650us

[admin@R6] > ping 109.45.22.5 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 109.45.22.5                        56  64 6ms683us
    1 109.45.22.5                        56  64 4ms468us
    2 109.45.22.5                        56  64 2ms839us
    sent=3 received=3 packet-loss=0% min-rtt=2ms839us avg-rtt=4ms663us max-rtt=6ms683us

[admin@R6] > ping 109.45.22.6 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 109.45.22.6                        56  64 85us
    1 109.45.22.6                        56  64 54us
    2 109.45.22.6                        56  64 66us
    sent=3 received=3 packet-loss=0% min-rtt=54us avg-rtt=68us max-rtt=85us

[admin@R6] > ping 109.45.22.9 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 109.45.22.9                        56  64 4ms766us
    1 109.45.22.9                        56  64 3ms907us
    2 109.45.22.9                        56  64 1ms638us
    sent=3 received=3 packet-loss=0% min-rtt=1ms638us avg-rtt=3ms437us max-rtt=4ms766us

[admin@R6] > ping 109.45.22.10 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 109.45.22.10                       56  64 52us
    1 109.45.22.10                       56  64 137us
    2 109.45.22.10                       56  64 205us
    sent=3 received=3 packet-loss=0% min-rtt=52us avg-rtt=131us max-rtt=205us

[admin@R6] > ping 109.45.22.13 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 109.45.22.13                       56  64 3ms564us
    1 109.45.22.13                       56  64 6ms415us
    2 109.45.22.13                       56  64 5ms15us
    sent=3 received=3 packet-loss=0% min-rtt=3ms564us avg-rtt=4ms998us max-rtt=6ms415us

[admin@R6] > ping 109.45.22.14 count=3
  SEQ HOST                              SIZE TTL TIME       STATUS
    0 109.45.22.14                       56  63 3ms658us
    1 109.45.22.14                       56  63 6ms671us
    2 109.45.22.14                       56  63 5ms222us
    sent=3 received=3 packet-loss=0% min-rtt=3ms658us avg-rtt=5ms183us max-rtt=6ms671us
```

2) Εκτελέστε ip/route/print στους R1,R2,R3,R4,R5,R6 και δείξτε την έξοδο. Υπάρχει διαδρομή προς το εξωτερικό δίκτυο (0.0.0.0/0) από όλους τους δρομολογητές?

R5

```
[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    0.0.0.0/0         109.45.22.1%ether1      110
DAo    10.255.255.1/32   109.45.22.1%ether1      110
DAo    10.255.255.2/32   109.45.22.1%ether1      110
DAo    10.255.255.3/32   109.45.22.1%ether1      110
DAo    10.255.255.4/32   109.45.22.1%ether1      110
DAc    10.255.255.5/32   loopback0                 0
DAo    10.255.255.6/32   109.45.22.10%ether2     110
DAo    108.45.22.0/30    109.45.22.1%ether1      110
DAo    108.45.22.4/30    109.45.22.1%ether1      110
DAo    108.45.22.8/30    109.45.22.1%ether1      110
DAo    108.45.22.12/30   109.45.22.1%ether1      110
DAc    109.45.22.0/30    ether1                    0
DAo+   109.45.22.4/30    109.45.22.1%ether1      110
DAo+   109.45.22.4/30    109.45.22.10%ether2     110
DAc    109.45.22.8/30    ether2                    0
DAc    109.45.22.12/30   ether3                    0
DAo    192.168.5.0/30    109.45.22.1%ether1      110
DAo    192.168.122.0/24  109.45.22.1%ether1      110
[admin@R5] >
```

R6

```
[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         109.45.22.5%ether1      110
DAo    10.255.255.1/32   109.45.22.5%ether1      110
DAo    10.255.255.2/32   109.45.22.5%ether1      110
DAo    10.255.255.3/32   109.45.22.5%ether1      110
DAo    10.255.255.4/32   109.45.22.5%ether1      110
DAo    10.255.255.5/32   109.45.22.9%ether2      110
DAc    10.255.255.6/32   loopback0                 0
DAo    108.45.22.0/30    109.45.22.5%ether1      110
DAo    108.45.22.4/30    109.45.22.5%ether1      110
DAo    108.45.22.8/30    109.45.22.5%ether1      110
DAo    108.45.22.12/30   109.45.22.5%ether1      110
DAo+   109.45.22.0/30    109.45.22.5%ether1      110
DAo+   109.45.22.0/30    109.45.22.9%ether2      110
DAc    109.45.22.4/30    ether1                    0
DAc    109.45.22.8/30    ether2                    0
DAo    109.45.22.12/30   109.45.22.9%ether2      110
DAo    192.168.5.0/30    109.45.22.5%ether1      110
DAo    192.168.122.0/24  109.45.22.5%ether1      110
[admin@R6] >
```

R4

```
[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    0.0.0.0/0            192.168.5.1%ether1        110
DAo    10.255.255.1/32      192.168.5.1%ether1        110
DAo    10.255.255.2/32      192.168.5.1%ether1        110
DAo    10.255.255.3/32      192.168.5.1%ether1        110
DAc    10.255.255.4/32      loopback0                   0
DAo    10.255.255.5/32      109.45.22.2%ether2        110
DAo    10.255.255.6/32      109.45.22.6%ether3        110
DAo    108.45.22.0/30       192.168.5.1%ether1        110
DAo    108.45.22.4/30       192.168.5.1%ether1        110
DAo    108.45.22.8/30       192.168.5.1%ether1        110
DAo    108.45.22.12/30      192.168.5.1%ether1        110
DAc    109.45.22.0/30       ether2                      0
DAc    109.45.22.4/30       ether3                      0
DAo+   109.45.22.8/30       109.45.22.2%ether2        110
DAo+   109.45.22.8/30       109.45.22.6%ether3        110
DAo    109.45.22.12/30      109.45.22.2%ether2        110
DAc    192.168.5.0/30       ether1                      0
DAo    192.168.122.0/24     192.168.5.1%ether1        110
[admin@R4] >
```

R1

```
[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            108.45.22.1%ether2        110
DAd    0.0.0.0/0            192.168.122.1               1
DAc    10.255.255.1/32      loopback0                   0
DAo    10.255.255.2/32      108.45.22.2%ether2        110
DAo    10.255.255.3/32      108.45.22.6%ether3        110
DAo    10.255.255.4/32      192.168.5.2%ether4        110
DAo    10.255.255.5/32      192.168.5.2%ether4        110
DAo    10.255.255.6/32      192.168.5.2%ether4        110
DAc    108.45.22.0/30       ether2                      0
DAc    108.45.22.4/30       ether3                      0
DAo +  108.45.22.8/30       108.45.22.6%ether3        110
DAo +  108.45.22.8/30       108.45.22.2%ether2        110
DAo    108.45.22.12/30      108.45.22.2%ether2        110
DAo    109.45.22.0/30       192.168.5.2%ether4        110
DAo    109.45.22.4/30       192.168.5.2%ether4        110
DAo    109.45.22.8/30       192.168.5.2%ether4        110
DAo    109.45.22.12/30      192.168.5.2%ether4        110
DAc    192.168.5.0/30       ether4                      0
DAc    192.168.122.0/24     ether1                      0
```

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+   0.0.0.0/0            108.45.22.5%ether1        110
DAo+   0.0.0.0/0            108.45.22.9%ether2        110
DAo    10.255.255.1/32      108.45.22.5%ether1        110
DAo    10.255.255.2/32      108.45.22.9%ether2        110
DAc    10.255.255.3/32      loopback0                   0
DAo    10.255.255.4/32      108.45.22.5%ether1        110
DAo    10.255.255.5/32      108.45.22.5%ether1        110
DAo    10.255.255.6/32      108.45.22.5%ether1        110
DAo+   108.45.22.0/30       108.45.22.9%ether2        110
DAo+   108.45.22.0/30       108.45.22.5%ether1        110
DAc    108.45.22.4/30       ether1                      0
DAc    108.45.22.8/30       ether2                      0
DAo    108.45.22.12/30      108.45.22.9%ether2        110
DAo    109.45.22.0/30       108.45.22.5%ether1        110
DAo    109.45.22.4/30       108.45.22.5%ether1        110
DAo    109.45.22.8/30       108.45.22.5%ether1        110
DAo    109.45.22.12/30      108.45.22.5%ether1        110
DAo    192.168.5.0/30       108.45.22.5%ether1        110
DAo    192.168.122.0/24     108.45.22.5%ether1        110
[admin@R3] >
```

R2

```
[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            108.45.22.1              112
   DAo  10.255.255.1/32     108.45.22.1%ether1       110
   DAc  10.255.255.2/32     loopback0                  0
   DAo  10.255.255.3/32     108.45.22.10%ether2      110
   DAo  10.255.255.4/32     108.45.22.1%ether1       110
   DAo  10.255.255.5/32     108.45.22.1%ether1       110
   DAo  10.255.255.6/32     108.45.22.1%ether1       110
   DAc  108.45.22.0/30      ether1                     0
   DAo+ 108.45.22.4/30      108.45.22.10%ether2      110
   DAo+ 108.45.22.4/30      108.45.22.1%ether1       110
   DAc  108.45.22.8/30      ether2                     0
   DAc  108.45.22.12/30     ether3                     0
   DAo  109.45.22.0/30      108.45.22.1%ether1       110
   DAo  109.45.22.4/30      108.45.22.1%ether1       110
   DAo  109.45.22.8/30      108.45.22.1%ether1       110
   DAo  109.45.22.12/30     108.45.22.1%ether1       110
   DAo  192.168.5.0/30      108.45.22.1%ether1       110
   DAo  192.168.122.0/24    108.45.22.1%ether1       110
[admin@R2] >
```

3) Εκτελέστε traceroute από το debian-2 και δείξτε τις διαδρομές προς το 8.8.8.8

```
debian@debian:~$ traceroute 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 60 byte packets
 1  109.45.22.13 (109.45.22.13)  3.030 ms  1.349 ms  1.140 ms
 2  109.45.22.1 (109.45.22.1)  2.835 ms  42.399 ms  41.905 ms
 3  192.168.5.1 (192.168.5.1)  40.315 ms  40.099 ms  52.792 ms
 4  192.168.122.1 (192.168.122.1)  51.651 ms  62.140 ms  77.855 ms
 5  192.168.85.2 (192.168.85.2)  80.438 ms  83.181 ms  90.776 ms

 6  * * *
 7  * * *
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  *^[c
 * *
28  * * *
29  * * *
30  * * *
debian@debian:~$
```

4) Εκτελέστε traceroute από το debian-2 στο debian-1και δείξτε τις διαδρομές.

```
debian@debian:~$ traceroute 108.45.22.14
traceroute to 108.45.22.14 (108.45.22.14), 30 hops max, 60 byte packets
 1  109.45.22.13 (109.45.22.13)  2.040 ms  1.401 ms  1.852 ms
 2  109.45.22.1 (109.45.22.1)  3.685 ms  28.703 ms  29.092 ms
 3  192.168.5.1 (192.168.5.1)  30.729 ms  27.678 ms  60.035 ms
 4  108.45.22.2 (108.45.22.2)  59.424 ms  58.514 ms  71.572 ms
 5  108.45.22.14 (108.45.22.14)  71.230 ms  79.920 ms  85.192 ms
debian@debian:~$
```

ΤΕΛΟΣ ΑΝΑΦΟΡΑΣ