Διαχείριση Δικτύων – Ευφυή Δίκτυα

1η Ομάδα Ασκήσεων

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Τα αποτελέσματα των εργαλείων ping και traceroute φαίνονται στο τέλος της αναφοράς.

α) Απο τα αποτελέσματα των ping, παρατηρούμε οτι όλοι οι προορισμοί είναι διαθέσιμοι. Κατα την χρήση traceroute με UDP πακέτα, παρατηρούμε οτι το grnet και το wikipedia εμφανίζουν απώλεια πακέτων μετά τους κόμβους eie3-to-eie2.backbone.grnet.gr και ams13-peer-1.ae0-unit0.tele2.net αντίστοιχα. Παρ'όλα αυτά, με χρήση ICMP πακέτων απαντούν όλοι οι κόμβοι. Οι δυο υλοποιήσεις του traceroute, με UDP και ICMP πακέτα, υπάρχουν ιστορικά λόγω της ανάγκης δημιουργίας raw socket για την αποστολή ICMP πακέτων, κατι που χρειάζεται root setuid και αποφεύχθηκε με την χρήση UDP πακέτων. Επίσης, πολλά routers δεν απαντούν σε ICMP echo requests ή αγνοούν UDP πακέτα, οπότε η υποστήριξη και των δύο τύπων πακέτων από το traceroute είναι αναγκαία. Τέλος, ο λόγος εμφάνισης πολλαπλών διευθύνσεων ανα συγκεκριμένα βήματα δείχνει την ύπαρξη κόμβων εσωτερικού redirecting στα συγκεκριμένα βήματα.

β) Με διαφορετικά μεγέθη πακέτων δεν παρατηρείται απώλεια πακέτων. Οι διαφορές στους χρόνους γίνονται εμφανείς μόνο στην περίπτωση του grnet όπου ο χρόνος διπλασιάζεται, ενω στα υπόλοιπα domains παραμένει σχεδόν ίδιος. Αυτό πιθανώς οφείλεται σε congestion κάποιου router της ενδιάμεσης διαδρομής.

γ) **esa.int**: Παρατηρούμε μια διαφορά 35 ms στο RTT κατα την μετάβαση απο τον grnet.mx2.ath.gr.geant.net στον ae2.rt1.vie.at.geant.net, που ουσιαστικά αποτελεί την μετάβαση απο Αθήνα σε Βιέννη στο δίκτυο geant.

grnet.gr: Η μέγιστη καθυστέρηση εμφανίζεται κατα την μεταφορά στον κόμβο platform.grnet.gr, οπου αγγίζει τα 0.2 ms.

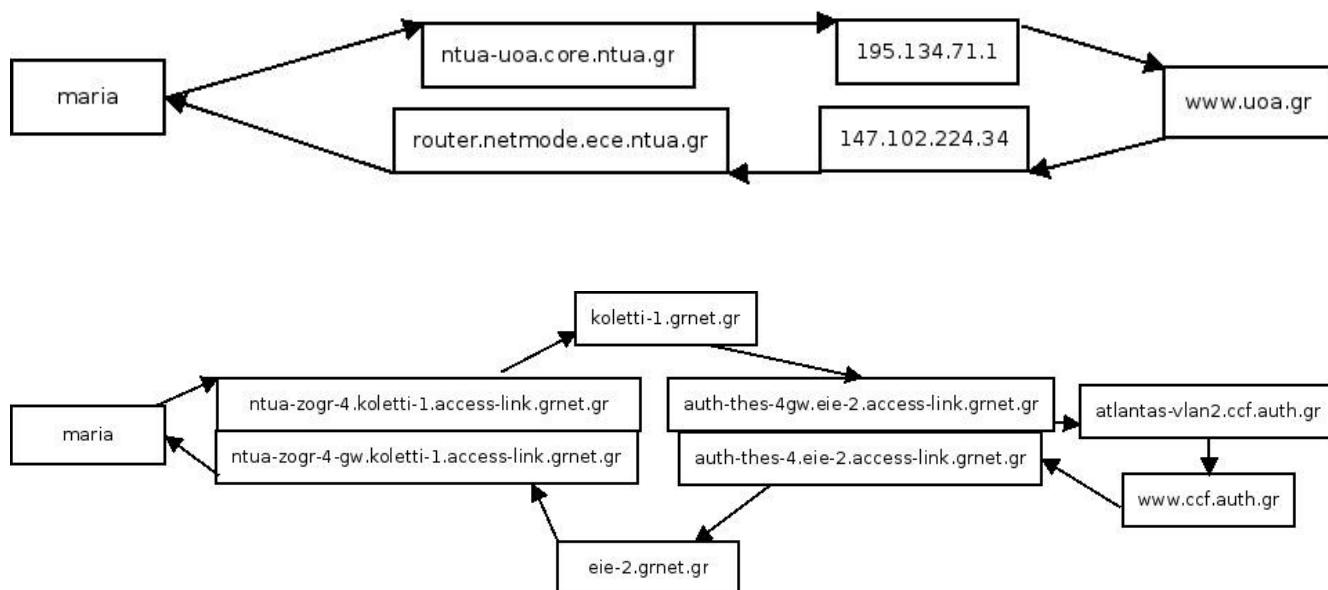stanford.edu: Παρατηρούμε οτι η διαφορά μεταξύ των ae2.rt1.ams.nl.geant.net και tge-0-5-0-4.211.newy.layer3.nlr.net αγγίζει τα 100 ms και αποτελεί ουσιαστικά την μετάβαση απο Άμστερνταμ σε Νέα Υόρκη.

wikipedia.org: Αντίστοιχα με το esa.int, η μεγαλύτερη καθυστέρηση είναι η μετάβαση Αθήνας – Βιέννης που κοστίζει 35 ms

facebook.com: Η μεγαλύτερη καθυστέρηση εμφανίζεται κατα την μετάβαση Αθήνας – Μιλάνου μεταξύ των κόμβων ae1.mx1.ath.gr.geant.net και ae2.mx1.mil2.it.geant.net και κοστίζει 30 ms.

δ) Παρακάτω βρίσκονται τα σκαριφήματα για τους δυο προορισμούς χρησιμοποιόντας πακέτα ICMP με την επιλογή Record Route του IP προτοκόλλου. Ο τρίτος προορισμός δεν εμφανίζει αρκετή πληροφορία μέσω του Record Route option του ping, καθώς ο αριθμός των hops ξεπερνά το μέγιστο αριθμό hops που μπορούν να ενσωματωθούν στο πακέτο, που είναι 9. Τα σκαριφήματα που θα προέκυπταν με χρήση του προγράμματος traceroute θα περιείχαν μόνο τα input interfaces του κάθε κόμβου. Αντίθετα, η χρήση Ping με Record Route καταγράφει και τα δύο interfaces κάθε κόμβου, καταγράφοντας και την διαδρομή επιστροφής. Έτσι, είναι εμφανές οτι οι διαφορετικές υλοποιήσεις των δυο εργαλείων προσφέρουν διαφορετικές πληροφορίες ως προς την κατάσταση του δικτύου.

Σημείωση: Τα βελάκια είναι αντίθετα απο την διαδρομή του πακέτου και χάσαμε τα αρχεία του dia.

ΑΠΟΤΕΛΕΣΜΑΤΑ

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======== ping -c 4 www.esa.int | tee -a lab1_output.text ========
PING www.esa.int.cdngc.net (151.249.90.217): 56 data bytes
64 bytes from 151.249.90.217: icmp_seq=0 ttl=53 time=47.066 ms
64 bytes from 151.249.90.217: icmp_seq=1 ttl=53 time=47.033 ms
64 bytes from 151.249.90.217: icmp_seq=2 ttl=53 time=47.095 ms
64 bytes from 151.249.90.217: icmp_seq=3 ttl=53 time=47.089 ms

--- www.esa.int.cdngc.net ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 47.033/47.071/47.095/0.024 ms

======== ping -c 4 www.grnet.gr | tee -a lab1_output.text ========
PING platform.grnet.gr (194.177.210.184): 56 data bytes
64 bytes from 194.177.210.184: icmp_seq=0 ttl=60 time=1.228 ms
64 bytes from 194.177.210.184: icmp_seq=1 ttl=60 time=1.214 ms
64 bytes from 194.177.210.184: icmp_seq=2 ttl=60 time=0.970 ms
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64 bytes from 194.177.210.184: icmp_seq=3 ttl=60 time=1.260 ms

--- platform.grnet.gr ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 0.970/1.168/1.260/0.116 ms

======== ping -c 4 www.stanford.edu | tee -a lab1_output.text ========
PING www.stanford.edu (171.67.215.200): 56 data bytes
64 bytes from 171.67.215.200: icmp_seq=0 ttl=231 time=237.251 ms
64 bytes from 171.67.215.200: icmp_seq=1 ttl=231 time=224.934 ms
64 bytes from 171.67.215.200: icmp_seq=2 ttl=231 time=224.898 ms
64 bytes from 171.67.215.200: icmp_seq=3 ttl=231 time=237.400 ms

--- www.stanford.edu ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 224.898/231.121/237.400/6.205 ms

======== ping -c 4 www.wikipedia.org | tee -a lab1_output.text ========
PING text-lb.esams.wikimedia.org (91.198.174.192): 56 data bytes
64 bytes from 91.198.174.192: icmp_seq=0 ttl=51 time=62.297 ms
64 bytes from 91.198.174.192: icmp_seq=1 ttl=51 time=62.254 ms
64 bytes from 91.198.174.192: icmp_seq=2 ttl=51 time=62.186 ms
64 bytes from 91.198.174.192: icmp_seq=3 ttl=51 time=62.376 ms

--- text-lb.esams.wikimedia.org ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 62.186/62.278/62.376/0.069 ms

======== ping -c 4 www.facebook.com | tee -a lab1_output.text ========
PING star.c10r.facebook.com (69.171.234.25): 56 data bytes
64 bytes from 69.171.234.25: icmp_seq=0 ttl=78 time=211.684 ms
64 bytes from 69.171.234.25: icmp_seq=1 ttl=78 time=213.459 ms
64 bytes from 69.171.234.25: icmp_seq=2 ttl=78 time=211.490 ms
64 bytes from 69.171.234.25: icmp_seq=3 ttl=78 time=211.729 ms

--- star.c10r.facebook.com ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 211.490/212.091/213.459/0.795 ms

======== traceroute -P udp www.esa.int | tee -a lab1_output.text ========
 1  * * *
 2  ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.896 ms
0.653 ms  0.556 ms
 3  eie2-to-koletti1.backbone.grnet.gr (195.251.27.46)  0.726 ms  0.695 ms  0.689
ms
 4  grnet.mx2.ath.gr.geant.net (62.40.124.89)  5.088 ms  0.765 ms  0.823 ms
 5  ae2.rt1.vie.at.geant.net (62.40.112.165)  37.851 ms  66.459 ms  37.837 ms
 6  ae51.bar1.Vienna.Level3.net (212.73.203.101)  47.020 ms  44.422 ms  46.999 ms
 7  ae-12-12.ebr2.Frankfurt1.Level3.net (4.69.153.146)  55.996 ms  56.102 ms
56.052 ms
 8  ae-63-63.csw1.Frankfurt1.Level3.net (4.69.163.2)  57.018 ms  56.034 ms
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        ae-93-93.csw4.Frankfurt1.Level3.net (4.69.163.14)  56.026 ms
 9  ae-4-90.edge4.Frankfurt1.Level3.net (4.69.154.200)  49.591 ms
        ae-2-70.edge4.Frankfurt1.Level3.net (4.69.154.72)  49.688 ms  46.956 ms
10  CDNETWORKS.edge4.Frankfurt1.Level3.net (212.162.25.138)  56.243 ms  56.300 ms
59.038 ms
11  174.35.62.45 (174.35.62.45)  47.312 ms  47.283 ms  50.223 ms
12  151.249.89.27 (151.249.89.27)  49.717 ms  49.778 ms  47.040 ms

======== traceroute -P udp www.grnet.gr | tee -a lab1_output.text ========
 1  * * *
 2  ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.804 ms
0.615 ms  0.645 ms
 3  eie2-to-koletti1.backbone.grnet.gr (195.251.27.46)  0.752 ms  0.820 ms  0.743
ms
 4  eie3-to-eie2.backbone.grnet.gr (62.217.100.43)  0.987 ms  0.936 ms  0.968 ms
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======== traceroute -P udp www.stanford.edu | tee -a lab1_output.text ========
 1  * router (147.102.13.200)  3.124 ms *
 2  ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.803 ms
0.594 ms  0.625 ms
 3  eie2-to-kol1.backbone.grnet.gr (195.251.27.54)  126.777 ms  0.776 ms  0.740 ms
 4  grnet.mx2.ath.gr.geant.net (62.40.124.89)  0.797 ms  0.741 ms  0.891 ms
 5  ae1.mx1.ath.gr.geant.net (62.40.112.215)  0.842 ms  0.813 ms  0.774 ms
 6  ae2.mx1.mil2.it.geant.net (62.40.98.150)  31.388 ms  31.375 ms  31.508 ms
 7  ae2.mx1.gen.ch.geant.net (62.40.98.112)  38.404 ms  38.419 ms  38.694 ms
 8  ae4.mx1.par.fr.geant.net (62.40.98.152)  45.805 ms  45.546 ms  45.808 ms
 9  ae1.mx1.lon.uk.geant.net (62.40.98.76)  53.607 ms  53.543 ms  53.559 ms
10  ae0.mx1.ams.nl.geant.net (62.40.98.81)  58.915 ms  58.771 ms  58.797 ms
11  ae2.rt1.ams.nl.geant.net (62.40.98.114)  58.939 ms  58.783 ms  58.739 ms
12  tge-0-5-0-4.211.newy.layer3.nlr.net (216.24.184.85)  147.969 ms  148.026 ms
135.625 ms
13  vlan-62.clev.layer2.nlr.net (216.24.186.66)  210.370 ms  210.382 ms  210.364 ms
14  vlan-63.chic.layer2.nlr.net (216.24.186.60)  224.062 ms  224.745 ms  226.734 ms
15  vlan-48.kans.layer2.nlr.net (216.24.186.63)  225.127 ms  224.985 ms  237.217 ms
16  vlan-46.denv.layer2.nlr.net (216.24.186.70)  210.445 ms  223.409 ms  210.764 ms
17  vlan-44.albu.layer2.nlr.net (216.24.186.48)  211.731 ms  223.977 ms  211.746 ms
18  vlan-45.elpa.layer2.nlr.net (216.24.186.51)  225.333 ms  212.669 ms  212.809 ms
19  vlan-43.losa.layer2.nlr.net (216.24.186.73)  226.547 ms  339.419 ms  213.915 ms
20  hpr-lax-hpr2--nlr-pn.cenic.net (137.164.26.25)  212.807 ms  225.278 ms  212.836
ms
21  riv-hpr2--lax-hpr2-10g.cenic.net (137.164.25.34)  230.737 ms  229.880 ms
217.606 ms
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22  sac-hpr2--riv-hpr2-10g.cenic.net (137.164.25.45)  227.764 ms  227.760 ms
227.869 ms
23  hpr-stanford--sac-hpr2-10g.cenic.net (137.164.27.58)  230.093 ms  230.177 ms
230.246 ms
24  west-rtr-vlan8.SUNet (171.64.255.193)  225.289 ms  226.693 ms  224.725 ms
25  * * *
26  www.Stanford.EDU (171.67.215.200)  225.282 ms  225.146 ms  225.246 ms


======== traceroute -P udp www.wikipedia.org | tee -a lab1_output.text ========
 1  * router (147.102.13.200)  22.157 ms *
 2  ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.825 ms
0.622 ms  0.676 ms
 3  eie2-to-koletti1.backbone.grnet.gr (195.251.27.46)  0.740 ms  0.689 ms  0.737
ms
 4  * grnet.mx2.ath.gr.geant.net (62.40.124.89)  1.096 ms  0.738 ms
 5  * ae2.rt1.vie.at.geant.net (62.40.112.165)  37.994 ms  37.848 ms
 6  te0-0-0-6.ccr21.vie01.atlas.cogentco.com (149.6.174.33)  44.610 ms  44.683 ms
47.424 ms
 7  wen3-peer-2.xe-1-2-1-unit0.tele2.net (130.244.200.65)  44.381 ms  47.136 ms
44.403 ms
 8  wen3-core-2.bundle-ether2.tele2.net (130.244.64.72)  45.088 ms  45.040 ms
44.979 ms
 9  wen1-core-2.bundle-ether1.tele2.net (130.244.205.73)  38.749 ms  38.688 ms
36.136 ms
10  fra36-core-1.bundle-ether7.tele2.net (130.244.206.28)  56.646 ms  59.370 ms
56.809 ms
11  ams-core-2.bundle-ether4.tele2.net (130.244.64.201)  66.210 ms  66.008 ms
64.747 ms
12  ams13-peer-1.ae0-unit0.tele2.net (130.244.53.123)  75.834 ms  72.914 ms  79.420
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======== traceroute -P udp www.facebook.com | tee -a lab1_output.text ========
 1   *  * router (147.102.13.200)  0.863 ms
 2   ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.614 ms
0.536 ms  0.565 ms
 3   eie2-to-kol1.backbone.grnet.gr (195.251.27.54)  0.695 ms  0.682 ms  0.708 ms
 4   grnet.mx2.ath.gr.geant.net (62.40.124.89)  0.754 ms  0.824 ms  0.683 ms
 5   ae2.rt1.vie.at.geant.net (62.40.112.165)  35.098 ms  37.818 ms  35.137 ms
 6   193.203.0.194 (193.203.0.194)  35.215 ms  35.454 ms  35.324 ms
 7   ae14.bb01.fra2.tfbnw.net (31.13.29.158)  51.300 ms  54.248 ms  58.810 ms
 8   ae4.bb01.cdg1.tfbnw.net (31.13.28.25)  64.231 ms
     ae8.bb02.cdg1.tfbnw.net (74.119.78.118)  61.923 ms  82.663 ms
 9   ae7.bb01.lga1.tfbnw.net (31.13.30.92)  131.841 ms
     ae6.bb01.lga1.tfbnw.net (204.15.23.17)  135.045 ms
     ae7.bb02.lhr2.tfbnw.net (173.252.64.1)  65.999 ms
10   ae9.bb02.iad1.tfbnw.net (31.13.25.73)  144.006 ms
     ae28.bb01.iad2.tfbnw.net (31.13.25.126)  141.123 ms
     ae19.bb02.iad2.tfbnw.net (31.13.25.71)  141.368 ms
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11  * * ae11.bb02.prn1.tfbnw.net (204.15.20.90)  227.404 ms
12  ae9.dr06.prn1.tfbnw.net (173.252.64.23)  206.733 ms
    ae1.dr02.prn1.tfbnw.net (74.119.79.107)  203.024 ms
    ae1.dr06.prn1.tfbnw.net (204.15.20.105)  204.312 ms
13  * * *
14  * * *
15  edge-star-shv-08-prn1.facebook.com (69.171.234.25)  205.330 ms  208.061 ms
205.479 ms


======== traceroute -P icmp www.esa.int | tee -a lab1_output.text ========
 1  router (147.102.13.200)  0.604 ms * *
 2  ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.855 ms
0.661 ms  0.612 ms
 3  eie2-to-kol1.backbone.grnet.gr (195.251.27.54)  0.790 ms  0.695 ms  0.730 ms
 4  grnet.mx2.ath.gr.geant.net (62.40.124.89)  0.835 ms  0.834 ms  4.529 ms
 5  * ae2.rt1.vie.at.geant.net (62.40.112.165)  35.339 ms *
 6  ae51.bar1.Vienna.Level3.net (212.73.203.101)  44.608 ms  44.183 ms  48.866 ms
 7  wien-b4-link.telia.net (80.239.128.177)  44.380 ms  44.320 ms  45.860 ms
 8  prag-bb1-link.telia.net (80.91.246.50)  50.406 ms  50.333 ms  50.460 ms
 9  ffm-bb1-link.telia.net (62.115.136.66)  53.335 ms  53.311 ms  53.331 ms
10  mno-b2-link.telia.net (213.155.136.193)  80.826 ms
    mno-b2-link.telia.net (213.155.136.185)  71.381 ms  71.291 ms
11  cdnetwork-ic-302145-mno-b2.c.telia.net (213.248.71.114)  69.460 ms  71.313 ms
75.038 ms
12  93.188.134.22 (93.188.134.22)  60.453 ms  60.392 ms  59.876 ms
13  93.188.134.237 (93.188.134.237)  62.270 ms  62.253 ms  62.345 ms


======== traceroute -P icmp www.grnet.gr | tee -a lab1_output.text ========
 1  * router (147.102.13.200)  0.794 ms *
 2  ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.868 ms
0.624 ms  33.896 ms
 3  eie2-to-koletti1.backbone.grnet.gr (195.251.27.46)  0.828 ms  0.616 ms  0.692
ms
 4  eie3-to-eie2.backbone.grnet.gr (62.217.100.43)  0.988 ms  0.971 ms  0.999 ms
 5  platform.grnet.gr (194.177.210.184)  1.352 ms  1.107 ms  1.286 ms


======== traceroute -P icmp www.stanford.edu | tee -a lab1_output.text ========
 1  * * *
 2  ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.812 ms
0.635 ms  0.596 ms
 3  eie2-to-koletti1.backbone.grnet.gr (195.251.27.46)  0.704 ms  0.672 ms  0.642
ms
 4  grnet.mx2.ath.gr.geant.net (62.40.124.89)  0.736 ms  0.779 ms  0.765 ms
 5  ae1.mx1.ath.gr.geant.net (62.40.112.215)  0.825 ms  0.736 ms  0.819 ms
 6  ae2.mx1.mil2.it.geant.net (62.40.98.150)  31.351 ms  31.386 ms  31.339 ms
 7  ae2.mx1.gen.ch.geant.net (62.40.98.112)  38.346 ms  38.342 ms  38.463 ms
 8  ae4.mx1.par.fr.geant.net (62.40.98.152)  45.595 ms  45.576 ms  45.567 ms
 9  ae1.mx1.lon.uk.geant.net (62.40.98.76)  53.457 ms  62.749 ms  53.635 ms
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10  ae0.mx1.ams.nl.geant.net (62.40.98.81)  58.875 ms  58.757 ms  60.345 ms
11  ae2.rt1.ams.nl.geant.net (62.40.98.114)  61.577 ms  58.942 ms  58.758 ms
12  tge-0-5-0-4.211.newy.layer3.nlr.net (216.24.184.85)  147.950 ms  135.670 ms
147.922 ms
13  vlan-62.clev.layer2.nlr.net (216.24.186.66)  210.254 ms  210.205 ms  210.275 ms
14  vlan-63.chic.layer2.nlr.net (216.24.186.60)  223.921 ms  211.401 ms  211.556 ms
15  vlan-48.kans.layer2.nlr.net (216.24.186.63)  224.911 ms  224.836 ms  224.874 ms
16  vlan-46.denv.layer2.nlr.net (216.24.186.70)  210.283 ms  210.196 ms  210.358 ms
17  vlan-44.albu.layer2.nlr.net (216.24.186.48)  223.942 ms  223.811 ms  223.932 ms
18  vlan-45.elpa.layer2.nlr.net (216.24.186.51)  225.035 ms  212.609 ms  226.156 ms
19  vlan-43.losa.layer2.nlr.net (216.24.186.73)  213.733 ms  213.571 ms  226.057 ms
20  hpr-lax-hpr2--nlr-pn.cenic.net (137.164.26.25)  231.186 ms  212.921 ms  212.845
ms
21  riv-hpr2--lax-hpr2-10g.cenic.net (137.164.25.34)  217.626 ms  217.613 ms
217.609 ms
22  sac-hpr2--riv-hpr2-10g.cenic.net (137.164.25.45)  227.730 ms  227.549 ms
227.533 ms
23  hpr-stanford--sac-hpr2-10g.cenic.net (137.164.27.58)  230.224 ms  242.378 ms
230.093 ms
24  west-rtr-vlan8.SUNet (171.64.255.193)  226.772 ms  224.701 ms  224.702 ms
25  * * *
26  www.Stanford.EDU (171.67.215.200)  225.104 ms  237.200 ms  224.971 ms


======== traceroute -P icmp www.wikipedia.org | tee -a lab1_output.text ========
 1  * * *
 2  ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.846 ms
0.587 ms  0.593 ms
 3  eie2-to-kol1.backbone.grnet.gr (195.251.27.54)  0.698 ms  0.680 ms  0.768 ms
 4  grnet.mx2.ath.gr.geant.net (62.40.124.89)  0.856 ms  0.760 ms  0.815 ms
 5  ae2.rt1.vie.at.geant.net (62.40.112.165)  37.836 ms  38.497 ms  37.947 ms
 6  te0-0-0-6.ccr21.vie01.atlas.cogentco.com (149.6.174.33)  47.517 ms  47.505 ms
47.400 ms
 7  wen3-peer-1.xe-0-0-2-unit0.tele2.net (130.244.200.65)  92.605 ms  47.012 ms
47.083 ms
 8  wen3-core-2.bundle-ether2.tele2.net (130.244.64.72)  47.593 ms  47.701 ms
47.571 ms
 9  wen1-core-2.bundle-ether1.tele2.net (130.244.205.73)  39.847 ms  39.102 ms
38.832 ms
10  fra36-core-1.bundle-ether7.tele2.net (130.244.206.28)  59.494 ms  59.439 ms
59.520 ms
11  ams-core-2.bundle-ether4.tele2.net (130.244.64.201)  66.298 ms  66.315 ms
67.453 ms
12  ams13-peer-1.ae0-unit0.tele2.net (130.244.53.123)  75.767 ms  75.805 ms  78.362
ms
13  ge-2-5.br1-knams.wikimedia.org (130.244.6.250)  64.537 ms  71.810 ms  64.554 ms
14  text-lb.esams.wikimedia.org (91.198.174.192)  62.422 ms  62.294 ms  62.222 ms


======== traceroute -P icmp www.facebook.com | tee -a lab1_output.text ========
 1  router (147.102.13.200)  0.759 ms * *
```

```
 2   ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)  0.797 ms
0.631 ms  0.591 ms
 3   eie2-to-koletti1.backbone.grnet.gr (195.251.27.46)  0.722 ms  0.675 ms  0.750
ms
 4   grnet.mx2.ath.gr.geant.net (62.40.124.89)  0.769 ms  0.786 ms  0.904 ms
 5   ae1.mx1.ath.gr.geant.net (62.40.112.215)  0.787 ms  0.759 ms  0.782 ms
 6   ae2.mx1.mil2.it.geant.net (62.40.98.150)  31.386 ms  31.380 ms  31.470 ms
 7   ae2.mx1.gen.ch.geant.net (62.40.98.112)  45.395 ms  38.352 ms  38.534 ms
 8   ae1.mx1.fra.de.geant.net (62.40.98.109)  46.844 ms  46.656 ms  46.786 ms
 9   ae1.br01.fra1.tfbnw.net (80.81.194.40)  49.446 ms  49.437 ms *
10   ae1.bb01.fra2.tfbnw.net (31.13.27.203)  47.571 ms  47.301 ms  47.300 ms
11   ae1.pr02.fra2.tfbnw.net (31.13.27.206)  47.030 ms  47.029 ms  47.032 ms
12   po126.msw01.02.fra2.tfbnw.net (31.13.27.63)  59.941 ms  47.147 ms  52.239 ms
13   edge-star-shv-02-fra2.facebook.com (31.13.81.17)  47.028 ms  47.011 ms  46.968
ms
```

================== ping -n 1 www.esa.int ====================

Pinging www.esa.int.cdngc.net [151.249.90.212] with 32 bytes of data:

Reply from 151.249.90.212: bytes=32 time=41ms TTL=53

Ping statistics for 151.249.90.212:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 41ms, Maximum = 41ms, Average = 41ms

================== ping -n 1 -l 64 www.esa.int ===============

Pinging www.esa.int.cdngc.net [151.249.90.212] with 64 bytes of data:

Reply from 151.249.90.212: bytes=64 time=41ms TTL=53

Ping statistics for 151.249.90.212:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 41ms, Maximum = 41ms, Average = 41ms

================== ping -n 1 -l 1400 www.esa.int =============

Pinging www.esa.int.cdngc.net [151.249.90.212] with 1400 bytes of data:

Reply from 151.249.90.212: bytes=1400 time=42ms TTL=53

Ping statistics for 151.249.90.212:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 42ms, Maximum = 42ms, Average = 42ms

================== ping -n 1 www.grnet.gr ====================

```
Pinging platform.grnet.gr [194.177.210.184] with 32 bytes of data:

Reply from 194.177.210.184: bytes=32 time=1ms TTL=60

Ping statistics for 194.177.210.184:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms

================== ping -n 1 -l 64 www.grnet.gr =====================

Pinging platform.grnet.gr [194.177.210.184] with 64 bytes of data:

Reply from 194.177.210.184: bytes=64 time<1ms TTL=60

Ping statistics for 194.177.210.184:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

================== ping -n 1 -l 1400 www.grnet.gr ===================

Pinging platform.grnet.gr [194.177.210.184] with 1400 bytes of data:

Reply from 194.177.210.184: bytes=1400 time=1ms TTL=60

Ping statistics for 194.177.210.184:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms

================== ping -n 1  www.stanford.edu  =====================

Pinging www.stanford.edu [171.67.215.200] with 32 bytes of data:

Reply from 171.67.215.200: bytes=32 time=224ms TTL=231

Ping statistics for 171.67.215.200:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 224ms, Maximum = 224ms, Average = 224ms

================== ping -n 1 -l 64 www.stanford.edu ==================

Pinging www.stanford.edu [171.67.215.200] with 64 bytes of data:

Reply from 171.67.215.200: bytes=64 time=224ms TTL=231

Ping statistics for 171.67.215.200:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
    Minimum = 224ms, Maximum = 224ms, Average = 224ms


================= ping -n 1 -l 1400 www.stanford.edu ==================

Pinging www.stanford.edu [171.67.215.200] with 1400 bytes of data:

Reply from 171.67.215.200: bytes=1400 time=225ms TTL=231

Ping statistics for 171.67.215.200:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 225ms, Maximum = 225ms, Average = 225ms

======== ping -c 4 -R www.uoa.gr | tee -a lab1_output.text ========
PING sites.uoa.gr (195.134.71.229): 56 data bytes
64 bytes from 195.134.71.229: icmp_seq=0 ttl=62 time=2.365 ms
RR:   ntua-uoa.core.ntua.gr (147.102.224.33)
      195.134.71.1
      195.134.71.229
      195.134.71.229
      147.102.224.34
      router.netmode.ece.ntua.gr (147.102.13.200)
      maria.netmode.ece.ntua.gr (147.102.13.19)
64 bytes from 195.134.71.229: icmp_seq=1 ttl=62 time=2.018 ms    (same route)
64 bytes from 195.134.71.229: icmp_seq=2 ttl=62 time=1.657 ms    (same route)
64 bytes from 195.134.71.229: icmp_seq=3 ttl=62 time=1.691 ms    (same route)

--- sites.uoa.gr ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 1.657/1.933/2.365/0.287 ms



======== ping -c 4 -R www.auth.gr | tee -a lab1_output.text ========
PING www.ccf.auth.gr (155.207.1.12): 56 data bytes
64 bytes from 155.207.1.12: icmp_seq=0 ttl=60 time=135.253 ms
RR:   ntua-zogr-4.koletti-1.access-link.grnet.gr (194.177.209.118)
      koletti-1.grnet.gr (195.251.27.2)
      auth-thes-4-gw.eie-2.access-link.grnet.gr (62.217.98.22)
      atlantas-vlan2.ccf.auth.gr (155.207.1.101)
      www.ccf.auth.gr (155.207.1.12)
      www.ccf.auth.gr (155.207.1.12)
      auth-thes-4.eie-2.access-link.grnet.gr (62.217.98.23)
      eie-2.grnet.gr (195.251.27.7)
      ntua-zogr-4-gw.koletti-1.access-link.grnet.gr (194.177.209.117)
64 bytes from 155.207.1.12: icmp_seq=1 ttl=60 time=10.691 ms    (same route)
64 bytes from 155.207.1.12: icmp_seq=2 ttl=60 time=14.241 ms    (same route)
64 bytes from 155.207.1.12: icmp_seq=3 ttl=60 time=10.794 ms    (same route)

--- www.ccf.auth.gr ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
```

```
round-trip min/avg/max/stddev = 10.691/42.745/135.253/53.429 ms


======== ping -c 4 -R www.esa.int | tee -a lab1_output.text ========
PING www.esa.int.cdngc.net (151.249.90.136): 56 data bytes
64 bytes from 151.249.90.136: icmp_seq=0 ttl=53 time=66.391 ms
RR:    ntua-zogr-4.koletti-1.access-link.grnet.gr (194.177.209.118)
       koletti-1.grnet.gr (195.251.27.2)
       grnet-gw.mx2.ath.gr.geant.net (62.40.124.90)
       ae2.mx2.ath.gr.geant.net (62.40.112.166)
       212.73.203.102
       lo-22.bar1.Vienna1.Level3.net (4.69.177.164)
       lo-0.edge4.Frankfurt1.Level3.net (4.68.186.79)
       174.35.62.36
       151.249.90.129
64 bytes from 151.249.90.136: icmp_seq=1 ttl=52 time=129.030 ms   (same route)
64 bytes from 151.249.90.136: icmp_seq=2 ttl=53 time=56.976 ms    (same route)
64 bytes from 151.249.90.136: icmp_seq=3 ttl=52 time=54.666 ms    (same route)

--- www.esa.int.cdngc.net ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 54.666/76.766/129.030/30.493 ms
```