

z5147986

Lab01

Exercise 1: nslookup

1.1

Which is the IP address of the website www.koala.com.au? In your opinion, what is the reason of having several IP addresses as an output?

The IPv4 addresses of www.koala.com.au are 104.18.60.21 and 104.18.61.21, the IPv6 addresses are 2606:4700:30::6812:3c15 and 2606:4700:30::6812:3d15

The reason of having several IP addresses as an output is to increase website performance by receiving it from IP that is the closest based on location.

1.2

Find out the name of the IP address 127.0.0.1. What is special about this IP address?

The name is localhost. It can run network services on host/local machine without physical network interface by using a local loopback mechanism.

Exercise 2: Use ping to test host reachability

Host	Reachable		Reason
	ping	website	
www.unsw.edu.au	T	T	-
www.getfittest.com.au	F	F	NXDOMAIN, Non-Existent Domain
www.mit.edu	T	T	-
www.intel.com.au	T	T	-
www.tpg.com.au	T	T	-
www.hola.hp	F	F	NXDOMAIN, Non-Existent Domain
www.amazon.com	T	T	-
www.tsinghua.edu.cn	T	T	-
www.kremlin.ru	F	T	Firewall blocking ICMP traffic
8.8.8.8	T	F	Domain name server

If you observe that some hosts are not reachable, then can you explain why? Check if the addresses unreachable by the ping command are reachable from the web browser.

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Exercise 3: Use traceroute to understand network topology

**Include all traceroute outputs in your report.*

3.1

Run traceroute on your machine to www.columbia.edu. How many routers are there between your workstation and www.columbia.edu? How many routers along the path are part of the UNSW network? Between which two routers do packets cross the pacific ocean? *Hint: compare the round trip times from your machine to the routers using ping.*

There are 23 routers, there are 4 routers part of UNSW, between the 9th and 10th router the packets cross the pacific ocean.

```
uxu_b ~ /cs3331/lab1
traceroute www.columbia.edu
tracert to www.wwr53.cc.columbia.edu (128.59.105.24), 64 hops max, 52 byte packets
 1 * * *
 2 ufw1-ae-1-3161.gw.unsw.edu.au (149.171.253.92) 3.181 ms 1.809 ms 1.676 ms
 3 libwdr1-vl-3090.gw.unsw.edu.au (149.171.253.66) 1.951 ms 2.173 ms 2.057 ms
 4 ombcr1-te-4-5.gw.unsw.edu.au (149.171.255.77) 2.196 ms 2.269 ms 36.840 ms
 5 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 5.033 ms 13.720 ms 4.513 ms
 6 138.44.5.0 (138.44.5.0) 3.306 ms 2.357 ms 2.741 ms
 7 et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149) 2.841 ms 3.441 ms 3.273 ms
 8 et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99) 95.963 ms 96.124 ms 96.158 ms
 9 et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201) 147.955 ms 147.774 ms 147.834 ms
10 abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8) 147.682 ms 147.702 ms 147.839 ms
11 et-4-0-0.4079.rtsw.miss2.net.internet2.edu (162.252.70.0) 158.468 ms 160.684 ms 158.986 ms
12 et-4-0-0.4079.rtsw.minn.net.internet2.edu (162.252.70.58) 181.908 ms 181.787 ms 181.782 ms
13 et-1-1-5.4079.rtsw.eqch.net.internet2.edu (162.252.70.106) 189.838 ms 189.825 ms 189.765 ms
14 ae-0.4079.rtsw3.eqch.net.internet2.edu (162.252.70.163) 191.405 ms 192.507 ms 189.888 ms
15 ae-1.4079.rtsw.clev.net.internet2.edu (162.252.70.130) 198.100 ms 198.316 ms 198.167 ms
16 buf-9208-i2-clev.nysernet.net (199.109.11.33) 202.618 ms 202.512 ms 202.458 ms
17 syr-9208-buf-9208.nysernet.net (199.109.7.193) 205.769 ms 206.096 ms 206.683 ms
18 nyc111-9204-syr-9208.nysernet.net (199.109.7.94) 337.237 ms 312.362 ms 313.281 ms
19 nyc-9208-nyc111-9204.nysernet.net (199.109.7.165) 313.539 ms 215.059 ms 306.202 ms
20 columbia.nyc-9208.nysernet.net (199.109.4.14) 313.349 ms 312.592 ms 313.561 ms
21 cc-core-1-x-nyser32-gw-1.net.columbia.edu (128.59.255.5) 312.170 ms 313.249 ms 313.235 ms
22 cc-conc-1-x-cc-core-1.net.columbia.edu (128.59.255.21) 313.166 ms 312.516 ms 313.417 ms
23 columbiauniversity.info (128.59.105.24) 313.651 ms 214.943 ms 215.233 ms
```

```
inetnum: 149.171.0.0 - 149.171.255.255
netname: UNSWNET
country: AU
org: ORG-UONS1-AP
descr: University of New South Wales
```

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Lab01

3.2

Run traceroute from your machine to the following destinations:

- www.ucla.edu → 14 hops

```
uxu_b ~/cs3331/lab1
traceroute www.ucla.edu
traceroute to gateway.lb.it.ucla.edu (164.67.228.152), 64 hops max, 52 byte packets
 1 * * *
 2 ufw1-ae-1-3161.gw.unsw.edu.au (149.171.253.92) 2.592 ms 1.949 ms 1.769 ms
 3 libwdr1-vl-3090.gw.unsw.edu.au (149.171.253.66) 2.102 ms 1.968 ms 2.043 ms
 4 ombcr1-te-4-5.gw.unsw.edu.au (149.171.255.77) 2.254 ms 2.022 ms 1.860 ms
 5 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 2.010 ms 3.714 ms 1.995 ms
 6 138.44.5.0 (138.44.5.0) 2.552 ms 2.225 ms 2.088 ms
 7 et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149) 3.123 ms 3.185 ms 3.421 ms
 8 et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99) 96.375 ms 96.362 ms 96.316 ms
 9 et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201) 147.782 ms 147.767 ms 147.724 ms
10 cenichpr-1-is-jmb-778.snvaca.pacificwave.net (207.231.245.129) 164.989 ms 166.649 ms 165.653 ms
11 hpr-lax-hpr3--svl-hpr3-100ge.cenic.net (137.164.25.73) 162.014 ms 161.216 ms 162.210 ms
12 * * *
13 bd11f1.anderson--cr001.anderson.ucla.net (169.232.4.6) 162.864 ms
   bd11f1.anderson--cr00f2.csb1.ucla.net (169.232.4.4) 162.364 ms
   bd11f1.anderson--cr001.anderson.ucla.net (169.232.4.6) 162.493 ms
14 cr00f2.csb1--dr00f2.csb1.ucla.net (169.232.4.53) 161.704 ms
   cr00f1.anderson--dr00f2.csb1.ucla.net (169.232.4.55) 161.779 ms
   cr00f2.csb1--dr00f2.csb1.ucla.net (169.232.4.53) 162.004 ms
15 * * *
16 * * *
17 * * *
18 * * *
```

- www.u-tokyo.ac.jp → 15 hops

```
uxu_b ~/cs3331/lab1
traceroute www.u-tokyo.ac.jp
traceroute to www.u-tokyo.ac.jp (210.152.243.234), 64 hops max, 52 byte packets
 1 * * *
 2 ufw1-ae-1-3161.gw.unsw.edu.au (149.171.253.92) 3.235 ms 1.894 ms 1.655 ms
 3 libwdr1-vl-3090.gw.unsw.edu.au (149.171.253.66) 1.911 ms 1.941 ms 1.935 ms
 4 ombcr1-te-4-5.gw.unsw.edu.au (149.171.255.77) 2.186 ms 1.986 ms 1.880 ms
 5 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 2.078 ms 1.939 ms 1.884 ms
 6 138.44.5.0 (138.44.5.0) 2.060 ms 2.328 ms 2.533 ms
 7 et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147) 2.740 ms 2.773 ms 2.889 ms
 8 ge-4_0_0.bb1.a.pao.aarnet.net.au (202.158.194.177) 157.063 ms 157.280 ms 157.223 ms
 9 paloalto0.iij.net (198.32.176.24) 158.668 ms 158.607 ms 159.098 ms
10 osk004bb00.iij.net (58.138.88.185) 289.166 ms
   osk004bb01.iij.net (58.138.88.189) 271.719 ms 315.798 ms
11 osk004ip57.iij.net (58.138.106.162) 313.343 ms
   osk004ip57.iij.net (58.138.106.166) 307.798 ms
   osk004ip57.iij.net (58.138.106.162) 306.044 ms
12 210.130.135.130 (210.130.135.130) 312.794 ms 313.119 ms 280.491 ms
13 124.83.228.58 (124.83.228.58) 345.994 ms 312.947 ms 313.868 ms
14 124.83.252.178 (124.83.252.178) 312.765 ms 312.546 ms 626.713 ms
15 158.205.134.26 (158.205.134.26) 314.171 ms 312.935 ms 313.620 ms
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
```

- www.lancaster.ac.uk → 18 hops

```
uxu_b ~/cs3331/lab1
traceroute www.lancaster.ac.uk
traceroute to www.lancs.ac.uk (148.88.65.80), 64 hops max, 52 byte packets
 1 * * *
 2 ufw1-ae-1-3161.gw.unsw.edu.au (149.171.253.92) 2.582 ms 1.906 ms 2.091 ms
 3 libwdr1-vl-3090.gw.unsw.edu.au (149.171.253.66) 34.598 ms 38.310 ms 2.576 ms
 4 ombcr1-te-4-5.gw.unsw.edu.au (149.171.255.77) 2.154 ms 2.221 ms 2.221 ms
 5 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 2.276 ms 2.281 ms 2.223 ms
 6 138.44.5.0 (138.44.5.0) 2.376 ms 2.465 ms 2.223 ms
 7 et-2-0-5.bdr1.sing.sin.aarnet.net.au (113.197.15.233) 93.683 ms 93.927 ms 93.923 ms
 8 138.44.226.7 (138.44.226.7) 320.137 ms 305.941 ms 313.225 ms
 9 janet-gw.mx1.lon.uk.geant.net (62.40.124.198) 313.462 ms 307.317 ms 313.282 ms
10 ae29.londpg-sbr2.ja.net (146.97.33.2) 313.437 ms 257.904 ms 263.911 ms
11 ae31.erdiss-sbr2.ja.net (146.97.33.22) 261.722 ms 359.214 ms 313.556 ms
12 ae29.manckh-sbr2.ja.net (146.97.33.42) 313.724 ms 306.797 ms 313.194 ms
13 ae24.lanclu-rbr1.ja.net (146.97.38.58) 313.221 ms 307.518 ms 313.297 ms
14 lancaster-university.ja.net (194.81.46.2) 314.063 ms 317.352 ms 277.710 ms
15 is-border01.bfw01.rtr.lancs.ac.uk (148.88.253.202) 317.985 ms 307.972 ms 266.373 ms
16 bfw01.iss-servers.is-core01.rtr.lancs.ac.uk (148.88.250.98) 270.958 ms 292.941 ms 312.773 ms
17 * * *
18 www.lancs.ac.uk (148.88.65.80) 341.936 ms !Z 307.487 ms !Z 313.280 ms !Z
```

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At which router do the paths from your machine to these three destinations diverge? Find out further details about this router. *Hint: you can find out more about a router by running the whois command (whois router-IP-address).* Is the number of hops on each path proportional the physical distance? *Hint: you can find out geographical location of a server using the following tool <http://www.yougetsignal.com/tools/network-location/>*

At the 7th router, the path to these 3 destinations diverge. Japan has a shorter geographical compared to US but US(14 hops) took one less hop compared to Japan(15 hops) thus the number of hops on each path is not proportional to the physical distance.

3.3

Several servers distributed around the world provide a web interface from which you can perform a traceroute to any other host in the Internet. Here are two examples:

- <http://www.speedtest.com.sg/tr.php>

```
traceroute to 110.23.193.34 (110.23.193.34), 30 hops max, 60 byte packets
 1  ge2-8.r01.sin01.ne.com.sg (202.150.221.169)  0.155 ms  0.186 ms  0.203 ms
 2  10.15.62.222 (10.15.62.222)  32.886 ms  32.895 ms  32.898 ms
 3  xe-0-0-24-2.a01.newthk03.hk.bb.gin.ntt.net (203.131.240.133)  33.045 ms  33.053 ms  33.061 ms
 4  ae-12.r03.tkokhk01.hk.bb.gin.ntt.net (129.250.5.254)  171.040 ms  171.077 ms  171.049 ms
 5  ae-6.r25.tkokhk01.hk.bb.gin.ntt.net (129.250.6.101)  34.727 ms  34.532 ms  34.763 ms
 6  ae-7.r24.osakjp02.jp.bb.gin.ntt.net (129.250.2.42)  77.299 ms  77.701 ms  77.769 ms
 7  ae-4.r23.sttlwa01.us.bb.gin.ntt.net (129.250.3.60)  166.650 ms  166.454 ms  171.356 ms
 8  ae-11.r04.sttlwa01.us.bb.gin.ntt.net (129.250.2.6)  177.090 ms  171.740 ms  177.078 ms
 9  sea-b2-link.telvia.net (213.248.70.12)  193.951 ms  185.730 ms  193.935 ms
10  port-b1-link.telvia.net (62.115.115.23)  179.366 ms  sjo-b21-link.telvia.net (62.115.118.169)  178.526 ms  port-b1-link.te
11  palo-b22-link.telvia.net (62.115.115.216)  194.260 ms  palo-b22-link.telvia.net (62.115.125.0)  200.311 ms  palo-b22-link.
12  las-b24-link.telvia.net (62.115.119.91)  194.734 ms  las-b24-link.telvia.net (62.115.136.47)  191.754 ms  sjo-b21-link.tel
13  singaporetelcom-ic-335365-las-b24.c.telvia.net (62.115.8.203)  179.454 ms  180.207 ms  181.564 ms
14  203.208.171.117 (203.208.171.117)  180.016 ms  181.728 ms  184.735 ms
15  singaporetelcom-ic-335365-las-b24.c.telvia.net (62.115.8.203)  180.913 ms  203.208.191.186 (203.208.191.186)  233.140 m
16  * * *
17  203.208.169.130 (203.208.169.130)  227.460 ms * *
18  * * *
19  * * *
20  210.49.119.90 (210.49.119.90)  229.358 ms * *
21  * * *
22  * * *
23  * * *
24  * * *
```

**reverse(to speedtest.com.sg)*



```
uxu_b ~ /cs3331/lab1
traceroute www.speedtest.com.sg
traceroute to www.speedtest.com.sg (202.150.221.170), 64 hops max, 52 byte packets
 1  h1192a (192.168.10.1)  3.423 ms  2.770 ms  2.206 ms
 2  10.83.0.1 (10.83.0.1)  14.401 ms  9.415 ms  12.036 ms
 3  * * *
 4  * * *
 5  * * *
 6  * * *
 7  mas1-hu0-5-0.ig.optusnet.com.au (198.142.249.246)  15.215 ms  15.325 ms  14.451 ms
 8  * * *
 9  mas2-hu0-5-0.ig.optusnet.com.au (198.142.249.254)  14.672 ms
    mas2-hu0-4-0.ig.optusnet.com.au (198.142.249.250)  12.744 ms  14.039 ms
10  203.208.148.185 (203.208.148.185)  105.914 ms  109.779 ms  107.177 ms
11  203.208.158.41 (203.208.158.41)  106.303 ms  106.462 ms
    203.208.158.185 (203.208.158.185)  109.791 ms
12  203.208.177.110 (203.208.177.110)  135.727 ms  129.626 ms  134.766 ms
13  * * *
14  202-150-221-170.rev.ne.com.sg (202.150.221.170)  534.644 ms  407.170 ms  408.046 ms
```

- <https://www.telstra.net/cgi-bin/trace>

```
1  gigabitethernet3-3.exi2.melbourne.telstra.net (203.50.77.53)  0.332 ms  0.205 ms  0.240 ms
2  bundle-ether3-100.win-core10.melbourne.telstra.net (203.50.80.129)  2.615 ms  1.472 ms  2.114 ms
3  bundle-ether12.ken-core10.sydney.telstra.net (203.50.11.122)  13.360 ms  12.346 ms  12.986 ms
4  bundle-ether1.ken-edge903.sydney.telstra.net (203.50.11.173)  11.608 ms  11.848 ms  11.485 ms
5  opt2822815.lnk.telstra.net (110.145.210.198)  12.985 ms  12.973 ms  12.984 ms
```


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Lab01

**reverse(to telstra.net)*

```
uxu_b ~/cs3331/lab1
tracert www.telstra.net
tracert to www.telstra.net (203.50.5.178), 64 hops max, 52 byte packets
 1 h1192a (192.168.10.1) 6.356 ms 1.876 ms 2.140 ms
 2 10.83.0.1 (10.83.0.1) 13.216 ms 9.505 ms 10.233 ms
 3 * * *
 4 * * *
 5 * * *
 6 * * *
 7 hu0-5-0-0.22btp01.optus.net.au (59.154.18.234) 16.616 ms 12.759 ms
 8 hu0-4-1-0.22btp01.optus.net.au (124.19.61.70) 24.821 ms
 9 bundle-ether46.ken-edge903.sydney.telstra.net (110.145.210.197) 15.061 ms 14.857 ms 15.346 ms
10 bundle-ether2.chw-edge903.sydney.telstra.net (203.50.11.175) 15.575 ms
   bundle-ether17.ken-core10.sydney.telstra.net (203.50.11.172) 21.604 ms 25.368 ms
11 bundle-ether17.chw-core10.sydney.telstra.net (203.50.11.176) 15.659 ms
   bundle-ether10.win-core10.melbourne.telstra.net (203.50.11.123) 29.308 ms 28.745 ms
12 203.50.6.40 (203.50.6.40) 28.791 ms
   bundle-ether8.ext-core10.melbourne.telstra.net (203.50.11.125) 26.159 ms
   203.50.6.40 (203.50.6.40) 26.291 ms
13 bundle-ether2.ext-ncprouter101.melbourne.telstra.net (203.50.11.209) 24.276 ms 25.348 ms 26.673 ms
   www.telstra.net (203.50.5.178) 23.376 ms 23.808 ms 24.986 ms
```

Run traceroute from both these servers towards your machine and in the reverse direction (i.e. from your machine to these servers). You may also try other traceroute servers from the list at www.traceroute.org . What are the IP addresses of the two servers that you have chosen. Does the reverse path go through the same routers as the forward path? If you observe common routers between the forward and the reverse path, do you also observe the same IP addresses? Why or why not?

- <https://network-tools.com>

Traceroute Check for: '110.23.193.34'

```
tracert to 110.23.193.34 (110.23.193.34), 10 hops max, 60 byte packets
 1 45.79.12.202 (45.79.12.202) 1.144 ms 45.79.12.201 (45.79.12.201) 0.710 ms 45.79.12.202
   (45.79.12.202) 1.127 ms
 2 45.79.12.6 (45.79.12.6) 1.013 ms 1.009 ms 45.79.12.0 (45.79.12.0) 0.593 ms
 3 dls-b22-link.telia.net (62.115.172.134) 0.985 ms 0.966 ms 45.79.12.9 (45.79.12.9) 0.948 ms
 4 phx-b1-link.telia.net (62.115.136.85) 23.586 ms dls-b22-link.telia.net (62.115.172.134) 0.927 ms phx-
   b1-link.telia.net (62.115.136.85) 23.722 ms
 5 singaporetelecom-ic-335365-las-b24.c.telia.net (62.115.8.203) 40.388 ms 40.383 ms las-b24-
   link.telia.net (62.115.119.174) 31.196 ms
 6 singaporetelecom-ic-335365-las-b24.c.telia.net (62.115.8.203) 40.357 ms 203.208.171.117
   (203.208.171.117) 31.055 ms 31.139 ms
 7 203.208.191.186 (203.208.191.186) 194.024 ms 193.653 ms 203.208.171.117 (203.208.171.117) 31.063
   ms
 8 203.208.191.186 (203.208.191.186) 193.878 ms 203.208.169.130 (203.208.169.130) 185.768 ms *
 9 * * *
10 * * *
```

**reverse(to network-tools.com)*

```
uxu_b ~/cs3331/lab1
tracert network-tools.com
tracert to network-tools.com (45.79.14.160), 64 hops max, 52 byte packets
 1 h1192a (192.168.10.1) 6.262 ms 2.451 ms 2.300 ms
 2 10.83.0.1 (10.83.0.1) 12.558 ms 14.805 ms 14.039 ms
 3 * * *
 4 * * *
 5 * * *
 6 mas1-hu0-4-0.ig.optusnet.com.au (198.142.249.242) 17.401 ms 15.812 ms 14.741 ms
 7 203.208.174.189 (203.208.174.189) 163.381 ms
   203.208.192.205 (203.208.192.205) 186.857 ms
   203.208.131.205 (203.208.131.205) 166.592 ms
 8 las-b24-link.telia.net (62.115.8.202) 179.288 ms 170.265 ms 167.958 ms
 9 dls-b22-link.telia.net (62.115.118.246) 193.618 ms 193.698 ms 199.388 ms
10 linode-ic-342730-dls-b22.c.telia.net (62.115.172.135) 204.704 ms 597.402 ms 191.445 ms
11 45.79.12.5 (45.79.12.5) 191.664 ms 193.787 ms 192.883 ms
12 * * *
13 * * *
14 * * *
15 * * *
```

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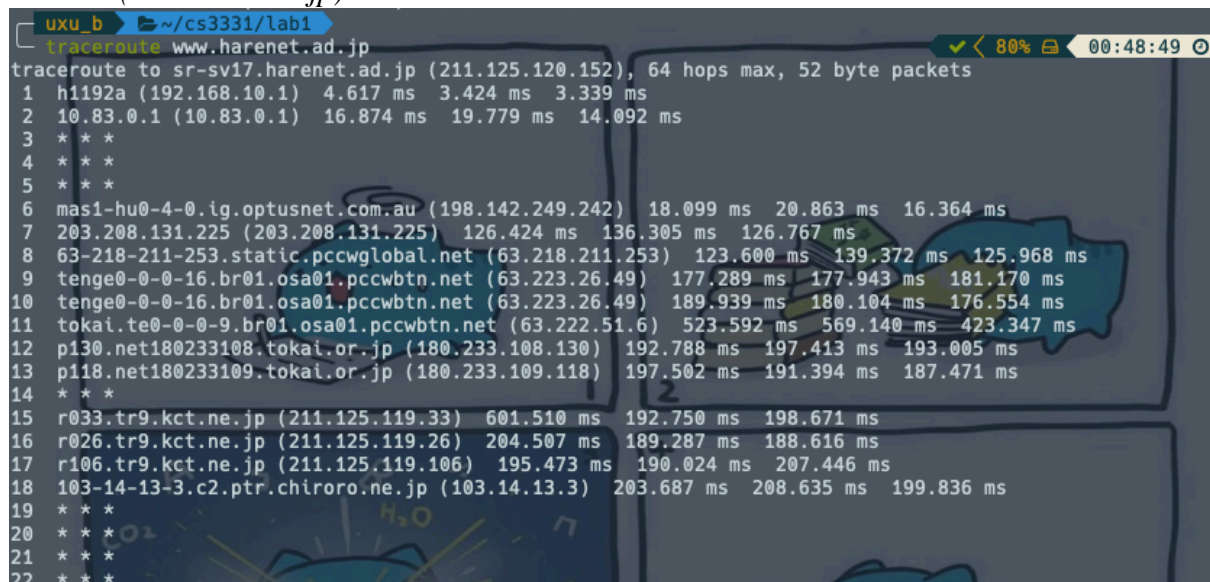
Lab01

- www.harenet.ad.jp

Traceroute from www.harenet.ad.jp to 110.23.193.34

```
traceroute to 110.23.193.34 (110.23.193.34), 30 hops max, 60 byte packets
 1 no50-0-lcgsbr (192.168.0.50)  0.024 ms  0.006 ms  0.005 ms
 2 * * *
 3 * * *
 4 * * *
 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 * * *
```

**reverse(to harenet.ad.jp)*



```
uxu_b ~ /cs3331/lab1
traceroute www.harenet.ad.jp
traceroute to sr-sv17.harenet.ad.jp (211.125.120.152), 64 hops max, 52 byte packets
 1 h1192a (192.168.10.1)  4.617 ms  3.424 ms  3.339 ms
 2 10.83.0.1 (10.83.0.1)  16.874 ms  19.779 ms  14.092 ms
 3 * * *
 4 * * *
 5 * * *
 6 mas1-hu0-4-0-ig.optusnet.com.au (198.142.249.242)  18.099 ms  20.863 ms  16.364 ms
 7 203.208.131.225 (203.208.131.225)  126.424 ms  136.305 ms  126.767 ms
 8 63-218-211-253.static.pccwglobal.net (63.218.211.253)  123.600 ms  139.372 ms  125.968 ms
 9 tenge0-0-0-16.br01.osa01.pccwbtn.net (63.223.26.49)  177.289 ms  177.943 ms  181.170 ms
10 tenge0-0-0-16.br01.osa01.pccwbtn.net (63.223.26.49)  189.939 ms  180.104 ms  176.554 ms
11 tokai.te0-0-0-9.br01.osa01.pccwbtn.net (63.222.51.6)  523.592 ms  569.140 ms  423.347 ms
12 p130.net180233108.tokai.or.jp (180.233.108.130)  192.788 ms  197.413 ms  193.005 ms
13 p118.net180233109.tokai.or.jp (180.233.109.118)  197.502 ms  191.394 ms  187.471 ms
14 * * *
15 r033.tr9.kct.ne.jp (211.125.119.33)  601.510 ms  192.750 ms  198.671 ms
16 r026.tr9.kct.ne.jp (211.125.119.26)  204.507 ms  189.287 ms  188.616 ms
17 r106.tr9.kct.ne.jp (211.125.119.106)  195.473 ms  190.024 ms  207.446 ms
18 103-14-13-3.c2.ptr.chiroro.ne.jp (103.14.13.3)  203.687 ms  208.635 ms  199.836 ms
19 * * *
20 * * *
21 * * *
22 * * *
```

The IP address of the chosen 2 are network-tools.com(45.79.14.160) and harenet.ad.jp(211.125.120.152). Both didn't go to and from on the same path/ routers but there are common routers with different IP as routing selects the optimal path.

z5147986

Lab01

Exercise 4: use ping to gain insights into network performance

**Include all graphs in your report*

We now use the ping utility to investigate network delay and its implications on network performance. In particular, we will analyze the dependency of packet size and delay.

There is a shell script, [runping.sh](#), provided that you can use instead of running many pings with different packet sizes by hand. After downloading this script on your machine make sure you can execute it. If not, you will have to execute the following command in the command line: `chmod u+x runping.sh`. To run the ping traces you may use the `runping.sh` script as follows: `./runping.sh www.abc.net` (or whatever other destination you want to ping). It will automatically run ping for different packet sizes and with 50 ping packets per size. Note, since a ping is sent once per second, this script will take a few minutes to finish. Basically, this script only executes the commands:

```
$ ./runping.sh www.uq.edu.au
$ ./runping.sh www.dlsu.edu.ph
$ ./runping.sh www.tu-berlin.de
```

Note that all delay values reported are in milliseconds (ms) and reflect the round trip time (RTT) between your host and the destinations.

When the `runping.sh` script is finished for all destinations, you can plot the results using another provided script, [plot.sh](#), as follows:

The graph *destination_delay.pdf* shows how delay varies over time (different colours correspond to different packet sizes), and *destination_scatter.pdf* shows delay vs. packet size as a scatter plot. *destination_avg.txt* contains the average (2nd column) and minimum (3rd column) delay values corresponding to each packet size (1st column).

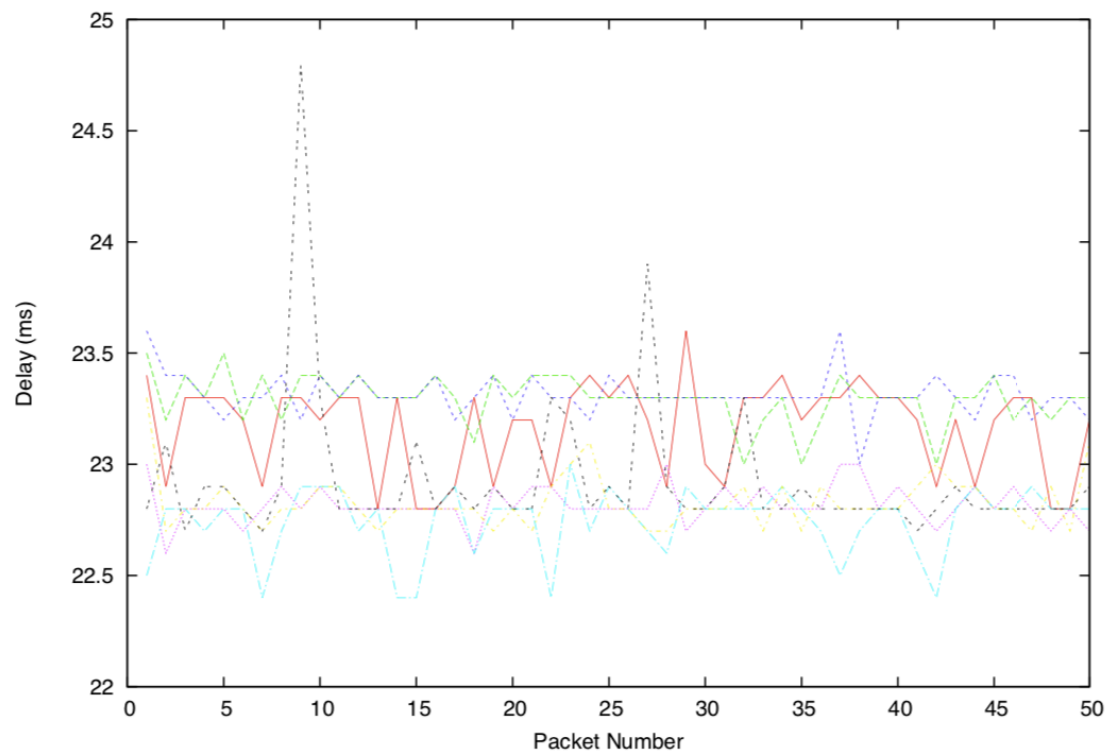
```
$ ./plot.sh www.uq.edu.au-p*
$ ./plot.sh www.dlsu.edu.ph-p*
$ ./plot.sh www.tu-berlin.de-p*
```

Use this script for the following destinations:

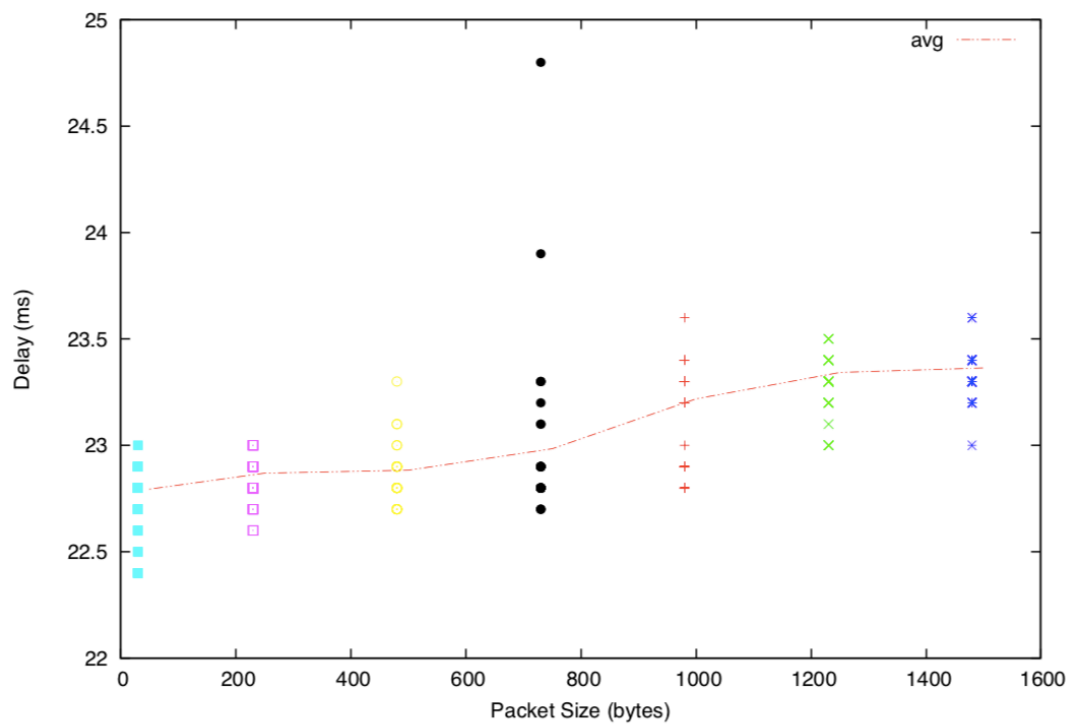
z5147986

Lab01

- www.unsw.edu.au/



*delay

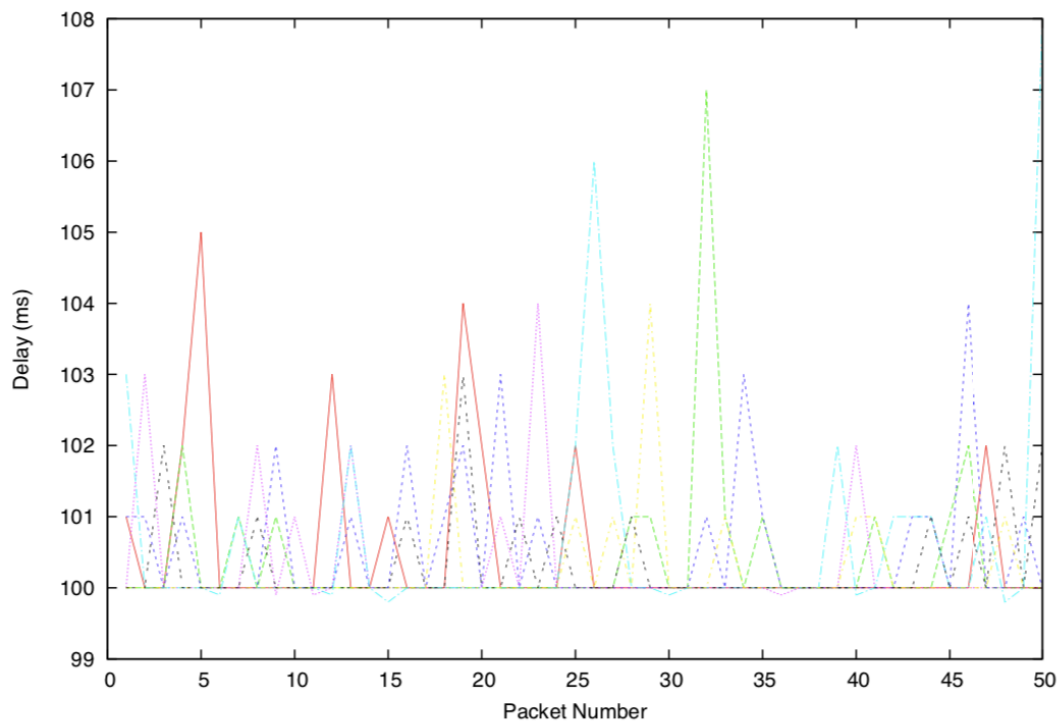


*scatter

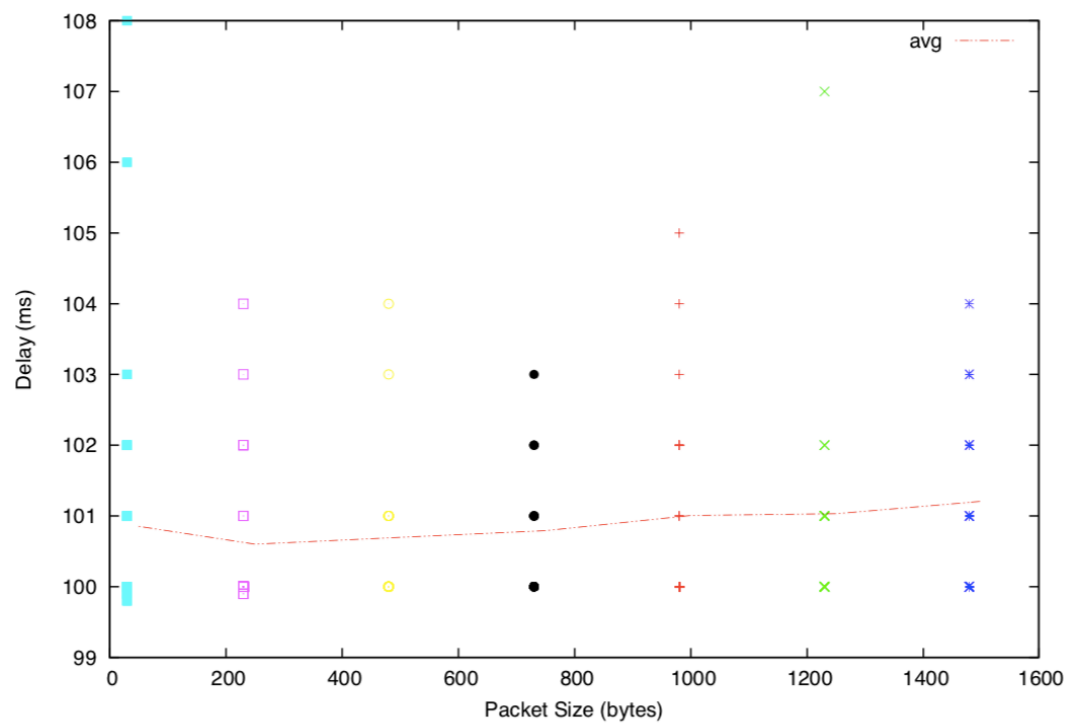
z5147986

Lab01

- www.upm.edu.my/



*delay

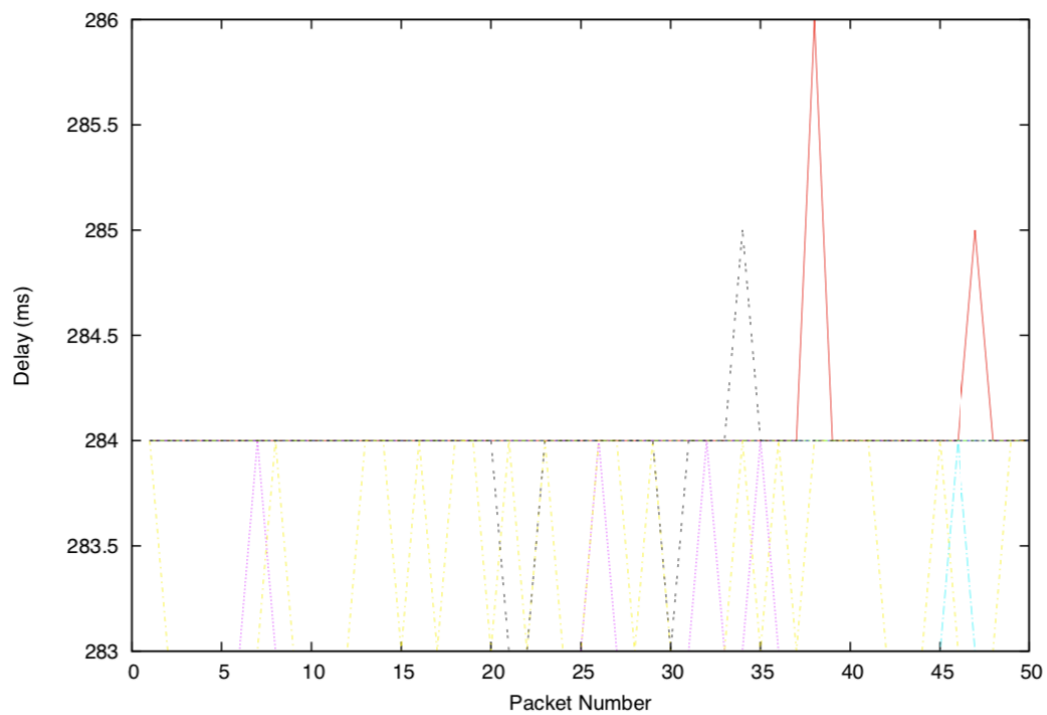


*scatter

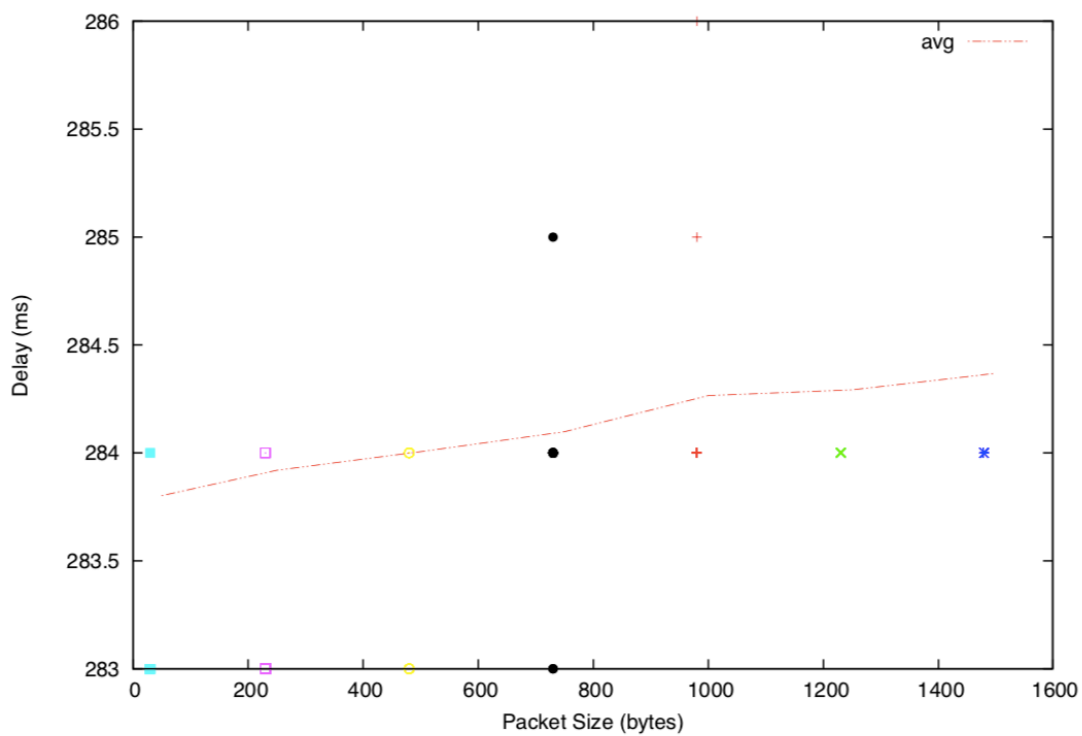
z5147986

Lab01

- www.tu-berlin.de



*delay

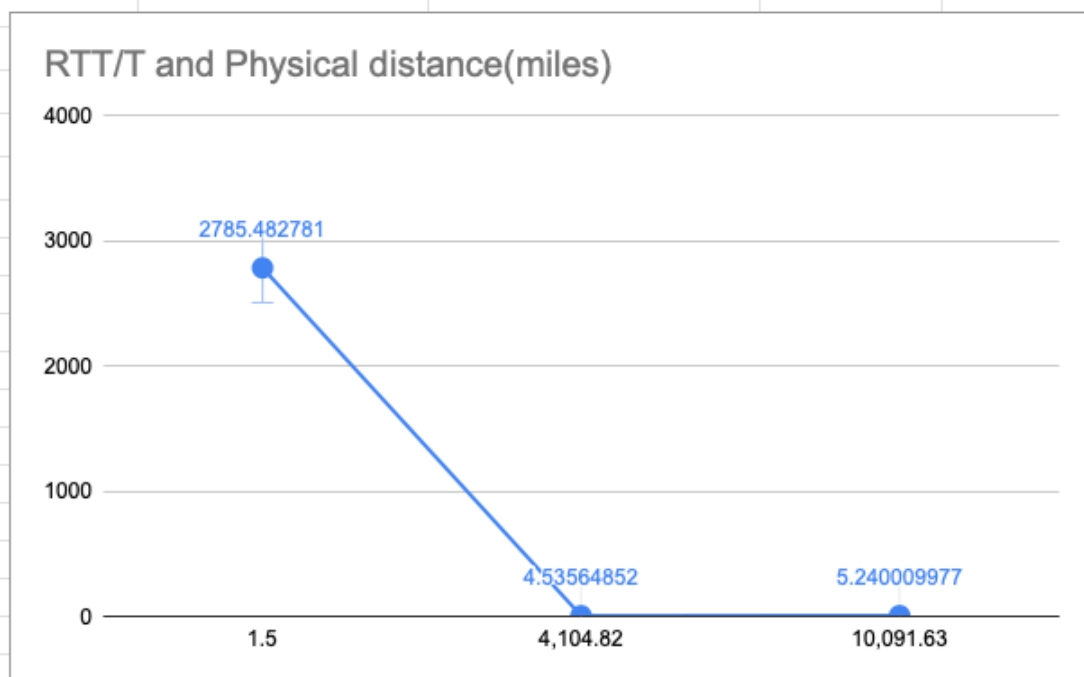


*scatter

4.1

For each of these locations find the (approximate) physical distance from UNSW using Google Maps and compute the shortest possible time T for a packet to reach that location from UNSW. You should assume that the packet moves (i.e. propagates) at the speed of light, 3×10^8 m/s. Note that the shortest possible time will simply be the distance divided by the propagation speed. Plot a graph where the x-axis represents the distance to each city (i.e. Brisbane, Manila and Berlin), and the y-axis represents the ratio between the minimum delay (i.e. RTT) as measured by the ping program (select the values for 50 byte packets) and the shortest possible time T to reach that city from UNSW. (Note that the y-values are no smaller than 2 since it takes at least $2 \cdot T$ time for any packet to reach the destination from UNSW and get back). Can you think of at least two reasons why the y-axis values that you plot are greater than 2?

	Physical distance(miles)	Shortest possible time, T(s)	RTT (ms)	RTT/T
UNSW -> UNSV	1.5	8.05E-06	22.414	2.79E+03
UNSW -> UPM	4,104.82	2.20E-02	99.876	4.54E+00
UNSW -> TU	10,091.63	5.41E-02	283.675	5.24E+00
1 mile =	1609.344			
Speed of light	300000000			
1ms =	0.001			



The round trip time, RTT is the time taken to travel to and from source to destination. The shortest possible time, T taken thus, RTT will be more or at least $2 \cdot T$, also it can't be faster than the speed of light.

z5147986

Lab01

4.2

Is the delay to the destinations constant or does it vary over time? Explain why.

It seems pretty constant expect for UNSW -> UNSW. I am assuming that since UNSW -> UNSW have shortest length of physical link, the propagation delay might have effect and queueing delay might have also have effected it as it depends on congestion level of the routers and the time waiting(output link) for transmission

4.3

Explore where the website for www.epfl.ch is hosted. Is it in Switzerland?

Yes it is in Switzerland.

The screenshot shows the SecurityTrails website interface. The domain 'www.epfl.ch' is entered in the search bar. The 'Historical Data' section is active, displaying a table of IP addresses and their associated organizations and dates.

IP Addresses	Organization	First Seen	Last Seen	Duration Seen
104.20.229.42 104.20.228.42	Cloudflare, Inc.	2018-10-29 (11 months ago)	2019-09-26 (today)	11 months
128.178.222.108	SWITCH	2018-04-04 (1 year ago)	2018-10-29 (11 months ago)	6 months
128.178.222.69	SWITCH	2017-11-14 (1 year ago)	2018-04-04 (1 year ago)	4 months
128.178.50.12	SWITCH	2017-05-26 (2 years ago)	2017-11-14 (1 year ago)	5 months

The screenshot displays WHOIS data for the EPFL SI domain and the AS559 IP address. The data is presented in a structured format with various fields and their corresponding values.

```
organisation: ORG-EPFD2-RIPE
org-name: Ecole Polytechnique Federale de Lausanne
org-type: Other
address: EPFL SI
address: Station 14
address: CH-1015 Lausanne
abuse-c: ESNS1-RIPE
mnt-ref: SWITCH-MNT
mnt-by: SWITCH-MNT
created: 2015-04-21T11:55:03Z
last-modified: 2015-04-21T11:55:03Z
source: RIPE # Filtered

role: EPFL SI - Network services EXINFR
address: Swiss Federal Institute of Technology
address: EPFL SI
address: CH-1015 Lausanne
address: Switzerland
phone: +41 21 693 2254
admin-c: NR2855-RIPE
tech-c: NR2855-RIPE
ntc-hdl: ESNS1-RIPE
abuse-mailbox: abuse@epfl.ch
mnt-by: SWITCH-MNT
created: 2015-02-26T14:47:46Z
last-modified: 2015-02-26T14:47:46Z
source: RIPE # Filtered

% Information related to '128.178.0.0/15AS559'

route: 128.178.0.0/15
descr: EPNET
origin: AS559
mnt-by: AS559-MNT
created: 1970-01-01T00:00:00Z
last-modified: 2001-09-22T09:32:16Z
```


z5147986

Lab01

4.4

The measured delay (i.e., the delay you can see in the graphs) is composed of propagation delay, transmission delay, processing delay and queuing delay. Which of these delays depend on the packet size and which do not?

Dependant on packet size.		
	Yes	No
Propagation delay		√
Transmission delay	√	
Processing delay		√
Queueing delay		√