

Comp3331 – lab 1 – Alex Piotrowski - z5115499

Exercise 1: nslookup

```
Alex@lab1$ nslookup www.koala.com.au
```

```
Server:      129.94.242.45
```

```
Address:     129.94.242.45#53
```

```
Non-authoritative answer:
```

```
Name:  www.koala.com.au
```

```
Address: 172.67.219.46
```

```
Name:  www.koala.com.au
```

```
Address: 104.21.45.210
```

It could have several public IP address for various of reasons – such as increased redundancy. There could be staff reasons as well. I.e for staff IT access → for example ssh 172.67.219.46:22 to allow access to their application while ssh 104.21.45.210:22 could allow access to their database. It could also allow for multiple access points for the same application – I.e if there was only one public IP then that would be a bottleneck.

2) The name of 127.0.0.1 is localhost. This is the machine itself. Often used as a loopback address.

Exercise 2: Use ping to test host reachability

1) www.unsw.edu.au is reachable via ping

```
Alex@lab1$ ping www.unsw.edu.au
```

```
PING cdn.prod65.unsw.adobecqms.net (18.67.93.81) 56(84) bytes of data.
```

```
64 bytes from server-18-67-93-81.syd62.r.cloudfront.net (18.67.93.81): icmp_seq=1 ttl=244  
time=1.46 ms
```

```
64 bytes from server-18-67-93-81.syd62.r.cloudfront.net (18.67.93.81): icmp_seq=2 ttl=244  
time=1.56 ms
```

```
64 bytes from server-18-67-93-81.syd62.r.cloudfront.net (18.67.93.81): icmp_seq=3 ttl=244  
time=1.51 ms
```

2) www.getfittest.com.au is not reachable as it does not resolve to an IP

```
Alex@lab1$ ping www.getfittest.com.au
```

```
ping: unknown host www.getfittest.com.au
```

3) www.mit.edu is reachable via ping

```
Alex@lab1$ ping www.mit.edu
```

```
PING e9566.dscb.akamaiedge.net (104.74.47.237) 56(84) bytes of data.
```

```
64 bytes from a104-74-47-237.deploy.static.akamaitechnologies.com (104.74.47.237): icmp_seq=1  
ttl=56 time=1.36 ms
```

```
64 bytes from a104-74-47-237.deploy.static.akamaitechnologies.com (104.74.47.237): icmp_seq=2  
ttl=56 time=1.31 ms
```

4) www.intel.com.au is reachable via ping

```
Alex@lab1$ ping www.intel.com.au
```

```
PING e19235.dsca.akamaiedge.net (104.98.21.56) 56(84) bytes of data.
```

```
64 bytes from a104-98-21-56.deploy.static.akamaitechnologies.com (104.98.21.56): icmp_seq=1  
ttl=56 time=1.31 ms
```

```
64 bytes from a104-98-21-56.deploy.static.akamaitechnologies.com (104.98.21.56): icmp_seq=2  
ttl=56 time=1.38 ms
```

5) www.tpg.com.au is reachable via ping

```
Alex@lab1$ ping www.tpg.com.au
```

```
PING www.tpg.com.au.cdn.cloudflare.net (104.18.11.61) 56(84) bytes of data.
```

```
64 bytes from 104.18.11.61: icmp_seq=1 ttl=56 time=2.06 ms
```

```
64 bytes from 104.18.11.61: icmp_seq=2 ttl=56 time=2.04 ms
```

6) www.hola.hp is unreachable as it does not resolve to an IP

```
Alex@lab1$ ping www.hola.hp
```

```
ping: unknown host www.hola.hp
```

7) www.amazon.com is reachable via ping

```
Alex@lab1$ ping www.amazon.com
```

```
PING d3ag4hukkh62yn.cloudfront.net (18.67.99.166) 56(84) bytes of data.
```

```
64 bytes from server-18-67-99-166.syd62.r.cloudfront.net (18.67.99.166): icmp_seq=1 ttl=244  
time=1.44 ms
```

```
64 bytes from server-18-67-99-166.syd62.r.cloudfront.net (18.67.99.166): icmp_seq=2 ttl=244  
time=1.69 ms
```

8) www.tsinghua.edu.cn is reachable via ping

Alex@lab1\$ ping www.tsinghua.edu.cn

PING www.tsinghua.edu.cn (166.111.4.100) 56(84) bytes of data.

64 bytes from www.tsinghua.edu.cn (166.111.4.100): icmp_seq=1 ttl=45 time=200 ms

64 bytes from www.tsinghua.edu.cn (166.111.4.100): icmp_seq=2 ttl=45 time=187 ms

9) www.kremlin.ru is not reachable via ping. I am able to reach this website via the web browser.

Alex@lab1\$ ping www.kremlin.ru

PING www.kremlin.ru (95.173.136.72) 56(84) bytes of data.

^C

--- www.kremlin.ru ping statistics ---

5 packets transmitted, 0 received, 100% packet loss, time 4078ms

10) 8.8.8.8 is reachable via ping

Alex@lab1\$ ping 8.8.8.8

PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.

64 bytes from 8.8.8.8: icmp_seq=1 ttl=115 time=1.82 ms

64 bytes from 8.8.8.8: icmp_seq=2 ttl=115 time=1.81 ms

Exercise 3: Use traceroute to understand the network topology

1) Traceroute to www.columbia.edu

```
Alex@lab1$ traceroute www.columbia.edu
```

```
traceroute to www.columbia.edu (128.59.105.24), 30 hops max, 60 byte packets
```

```
 1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.116 ms 0.084 ms 0.061 ms
 2 129.94.39.17 (129.94.39.17) 0.973 ms 0.959 ms 0.938 ms
 3 libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34) 2.017 ms 1.978 ms ombudnex1-vl-
3154.gw.unsw.edu.au (149.171.253.35) 2.592 ms
 4 libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 9.877 ms ombcr1-po-5.gw.unsw.edu.au
(149.171.255.197) 1.181 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169) 1.195 ms
 5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.208 ms 1.197 ms unswbr1-te-2-
13.gw.unsw.edu.au (149.171.255.105) 1.235 ms
 6 138.44.5.0 (138.44.5.0) 2.486 ms 1.537 ms 1.514 ms
 7 et-1-1-0.pe1.mcqp.nsw.aarnet.net.au (113.197.15.4) 1.803 ms 1.948 ms 1.855 ms
 8 et-0_0_2.bdr1.guam.gum.aarnet.net.au (113.197.14.137) 73.687 ms 73.633 ms 73.657 ms
 9 * * *
10 fourhundredge-0-0-0-2.4079.core2.salt.net.internet2.edu (163.253.1.115) 236.585 ms 236.576
ms 236.580 ms
11 fourhundredge-0-0-0-22.4079.core1.salt.net.internet2.edu (163.253.1.30) 237.786 ms *
237.675 ms
12 fourhundredge-0-0-0-0.4079.core1.denv.net.internet2.edu (163.253.1.170) 235.767 ms *
236.281 ms
13 fourhundredge-0-0-0-0.4079.core1.kans.net.internet2.edu (163.253.1.243) 237.984 ms 235.910
ms 235.888 ms
14 fourhundredge-0-0-0-3.4079.core2.chic.net.internet2.edu (163.253.1.244) 236.373 ms 237.515
ms 236.856 ms
15 fourhundredge-0-0-0-3.4079.core2.eqch.net.internet2.edu (163.253.2.19) 237.085 ms 237.077
ms 237.903 ms
16 fourhundredge-0-0-0-0.4079.core2.clev.net.internet2.edu (163.253.2.16) 235.002 ms 234.858
ms 237.462 ms
17 buf-9208-I2-CLEV.nysernet.net
(199.109.11https://wiki.installgentoo.com/wiki/Programming_resources#C.33) 238.025 ms
238.001 ms 237.785 ms
18 syr-55a1-buf-9208.nysernet.net (199.109.7.213) 241.616 ms 241.563 ms 241.109 ms
19 nyc32-55a1-syr-55a1.nysernet.net (199.109.7.206) 246.813 ms 246.651 ms 246.628 ms
20 nyc32-9208-nyc32-55a1.nysernet.net (199.109.7.201) 247.838 ms 246.341 ms 246.440 ms
21 columbia.nyc-9208.nysernet.net (199.109.4.14) 246.321 ms 246.554 ms 246.316 ms
22 cc-core-1-x-nyser32-gw-1.net.columbia.edu (128.59.255.5) 246.633 ms 246.564 ms 246.746
ms
23 cc-conc-1-x-cc-core-1.net.columbia.edu (128.59.255.21) 246.826 ms 246.817 ms 246.767 ms
24 neurotheory.columbia.edu (128.59.105.24) 246.639 ms 246.608 ms 246.533 ms
```

1.a) How many routers are there between your workstation and www.columbia.edu?

As we can see from the trace route, there are 24 routers

1.b) How many routers along the path are part of the UNSW network?

Provided that all UNSW routers have a hostname that ends with “.unsw.edu.au.”, then there would be 5. Hop 6 (138.44.5.0) has no hostname but looking it up on IP lookup – it shows it belongs to Australian Academic and Research Network. And therefore is not a part of UNSW network.

1.c) Between which two routers do packets cross the pacific ocean?

Most likely between hops 8-10 (hop 9 has no return). Hop 7 shows a response time of 1.803ms which would mean it is still geographically close by and likely to be in Australia. Hop 8 shows a response time of 73.687ms – So a large hop is happening here (Or it could be high latency on the wire). IP lookup shows that the IP 113.197.14.137 is still in Australia. Hop 10 (163.253.1.115) is in North America. Therefore it is between hops 8 and 10 that the packets cross the pacific ocean. We can also see that the round trip increases to 236.585ms which also is a indicator of this crossing the pacific.

2) Traceroute to www.ucla.edu

Alex@z5115499\$ traceroute www.ucla.edu

traceroute to www.ucla.edu (13.226.228.80), 30 hops max, 60 byte packets

```
1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.094 ms 0.067 ms 0.067 ms
2 129.94.39.17 (129.94.39.17) 0.930 ms 0.971 ms 0.925 ms
3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.715 ms libudnex1-vl-
3154.gw.unsw.edu.au (149.171.253.34) 1.848 ms ombudnex1-vl-3154.gw.unsw.edu.au
(149.171.253.35) 1.907 ms
4 libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.288 ms 1.288 ms ombcr1-po-
6.gw.unsw.edu.au (149.171.255.169) 1.239 ms
5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.248 ms 1.257 ms 1.265 ms
6 138.44.5.0 (138.44.5.0) 1.418 ms 1.381 ms 1.318 ms
7 et-0-3-0.pe1.alxd.nsw.aarnet.net.au (113.197.15.153) 1.751 ms 1.928 ms 1.908 ms
8 xe-0-2-4.bdr1.a.sjc.aarnet.net.au (202.158.194.162) 155.765 ms 155.867 ms 155.863 ms
9 xe-0-0-54-0.a01.snjsca04.us.bb.gin.ntt.net (129.250.192.249) 156.168 ms 156.178 ms 156.154
ms
10 ae-8.r24.snjsca04.us.bb.gin.ntt.net (129.250.2.49) 158.516 ms 158.480 ms *
11 * * *
12 ae-2.r00.lsanca07.us.bb.gin.ntt.net (129.250.3.238) 157.399 ms 157.566 ms 157.169 ms
13 ae-0.amazon.lsanca07.us.bb.gin.ntt.net (128.241.14.146) 156.769 ms ae-
1.amazon.lsanca07.us.bb.gin.ntt.net (128.241.14.218) 156.267 ms ae-
2.amazon.lsanca07.us.bb.gin.ntt.net (129.250.201.66) 155.947 ms
14 * * *
15 * * *
16 15.230.186.129 (15.230.186.129) 156.600 ms 157.640 ms 150.222.101.64 (150.222.101.64)
156.946 ms
17 150.222.232.47 (150.222.232.47) 156.498 ms 150.222.232.37 (150.222.232.37) 155.868 ms
157.098 ms
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 server-13-226-228-80.lax50.r.cloudfront.net (13.226.228.80) 155.881 ms 155.980 ms 155.621
ms
```

Traceroute to www.u-tokyo.ac.jp

Alex@z5115499\$ traceroute www.u-tokyo.ac.jp

traceroute to www.u-tokyo.ac.jp (210.152.243.234), 30 hops max, 60 byte packets

```
1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.069 ms 0.062 ms 0.065 ms
2 129.94.39.17 (129.94.39.17) 0.966 ms 0.915 ms 0.952 ms
3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.805 ms libudnex1-vl-
3154.gw.unsw.edu.au (149.171.253.34) 1.956 ms 1.963 ms
4 libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.158 ms ombcr1-po-5.gw.unsw.edu.au
(149.171.255.197) 1.231 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.177 ms
5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.241 ms unswbr1-te-2-13.gw.unsw.edu.au
(149.171.255.105) 1.265 ms 1.281 ms
6 138.44.5.0 (138.44.5.0) 4.212 ms 3.329 ms 3.310 ms
7 et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147) 1.894 ms 1.873 ms 1.815 ms
8 ge-4_0_0.bb1.a.pao.aarnet.net.au (202.158.194.177) 155.240 ms 155.157 ms 155.163 ms
9 paloalto0.iij.net (198.32.176.24) 156.490 ms 156.554 ms 156.594 ms
```

```

10  osk011bb01.IIJ.Net (58.138.84.229) 266.581 ms 266.525 ms osk004bb01.IIJ.Net
(58.138.88.189) 266.700 ms
11  osk004ip57.IIJ.Net (58.138.81.78) 276.491 ms 276.529 ms osk004ip57.IIJ.Net (58.138.81.74)
286.490 ms
12  210.130.135.130 (210.130.135.130) 276.605 ms 276.586 ms 276.559 ms
13  124.83.228.58 (124.83.228.58) 276.521 ms 276.675 ms 276.636 ms
14  124.83.252.178 (124.83.252.178) 293.105 ms 291.416 ms 291.358 ms
15  158.205.134.26 (158.205.134.26) 282.403 ms 282.296 ms 282.354 ms
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *

```

Traceroute to www.lancaster.ac.uk

Alex@z5115499\$ traceroute www.lancaster.ac.uk

traceroute to www.lancaster.ac.uk (148.88.65.80), 30 hops max, 60 byte packets

```

 1  cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.102 ms 0.082 ms 0.086 ms
 2  129.94.39.17 (129.94.39.17) 0.926 ms 0.930 ms 0.938 ms
 3  ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.445 ms 2.110 ms 1.845 ms
 4  libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.211 ms ombcr1-po-6.gw.unsw.edu.au
(149.171.255.169) 1.214 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.215 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.289 ms 1.234 ms unswbr1-te-2-
13.gw.unsw.edu.au (149.171.255.105) 1.276 ms
 6  138.44.5.0 (138.44.5.0) 1.492 ms 1.340 ms 1.339 ms
 7  et-2-0-5.bdr1.sing.sin.aarnet.net.au (113.197.15.233) 92.932 ms 92.929 ms 92.976 ms
 8  138.44.226.7 (138.44.226.7) 256.800 ms 256.754 ms 256.763 ms
 9  janet-gw.mx1.lon.uk.geant.net (62.40.124.198) 274.405 ms 274.361 ms 274.363 ms
10  ae29.londpg-sbr2.ja.net (146.97.33.2) 257.414 ms 257.401 ms 257.344 ms
11  ae31.erdiss-sbr2.ja.net (146.97.33.22) 261.101 ms 261.171 ms 261.139 ms
12  ae29.manckh-sbr2.ja.net (146.97.33.42) 262.938 ms 265.572 ms 265.529 ms
13  ae25.manckh-ban1.ja.net (146.97.35.50) 265.498 ms 263.021 ms 262.938 ms
14  lancaster-uni.ja.net (146.97.40.178) 284.638 ms 284.655 ms 284.587 ms
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *

```

24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *

2.a) At which router do the paths from your machine to these three destinations diverge?
Hop 6 is the last router that is common between the 3 trace routes (138.44.5.0) After that point, they diverge.

2.b) Find out further details about this router.

Details about 138.44.5.0:

Hostname: 138.44.5.0

ASN: 7575

ISP: Australian Academic and Research Network

Organization: Australian Academic and Research Network

Services: None detected

Type: Broadband

Assignment: Likely Static IP

Continent: Oceania

Country: Australia

2.c) Is the number of hops on each path proportional to the physical distance?

Yes – the further away the destination is, the more likely it is that you will have to travel through more hops.

3) Traceroute from www.speedtest.com.sg to 129.94.242.119 (I am currently on the UNSW machine).

traceroute to 129.94.242.119 (129.94.242.119), 30 hops max, 60 byte packets

1 202.150.221.169 (202.150.221.169) 0.125 ms 0.130 ms 0.140 ms
2 10.11.34.146 (10.11.34.146) 0.387 ms 0.461 ms 0.519 ms
3 aarnet.sgix.sg (103.16.102.67) 212.819 ms 212.800 ms 212.828 ms
4 et-7-3-0.pe1.nsw.brwy.aarnet.net.au (113.197.15.232) 214.810 ms 214.814 ms 214.791 ms
5 138.44.5.1 (138.44.5.1) 214.975 ms 214.982 ms 215.072 ms
6 libcr1-te-1-5.gw.unsw.edu.au (149.171.255.102) 214.868 ms 214.879 ms 214.861 ms
7 ombudnex1-po-1.gw.unsw.edu.au (149.171.255.202) 204.728 ms libudnex1-po-
1.gw.unsw.edu.au (149.171.255.166) 212.678 ms 212.759 ms
8 ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36) 210.072 ms 210.041 ms 210.005 ms
9 129.94.39.23 (129.94.39.23) 210.238 ms 210.114 ms 210.205 ms
10 * * *
11 * * *
12 * * *
13 * * *

Traceroute from 129.94.242.119 to www.speedtest.com.sg

Alex@lab1\$ traceroute www.telstra.net

traceroute to www.telstra.net (203.50.5.178), 30 hops max, 60 byte packets

```
1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.126 ms 0.118 ms 0.103 ms
2 129.94.39.17 (129.94.39.17) 0.935 ms 0.939 ms 0.948 ms
3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 2.262 ms 2.348 ms libudnex1-vl-
3154.gw.unsw.edu.au (149.171.253.34) 1.448 ms
4 libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.189 ms libcr1-po-5.gw.unsw.edu.au
(149.171.255.165) 1.210 ms ombcr1-po-5.gw.unsw.edu.au (149.171.255.197) 44.793 ms
5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.285 ms unswbr1-te-2-13.gw.unsw.edu.au
(149.171.255.105) 1.199 ms 1.223 ms
6 138.44.5.0 (138.44.5.0) 1.744 ms 2.321 ms 2.346 ms
7 et-1-1-0.pe1.rsby.nsw.aarnet.net.au (113.197.15.12) 2.059 ms 1.972 ms 2.143 ms
8 xe-0-0-3.bdr1.rsby.nsw.aarnet.net.au (113.197.15.31) 1.615 ms 1.605 ms 1.561 ms
9 139.130.0.77 (139.130.0.77) 2.338 ms 2.400 ms 2.463 ms
10 bundle-ether2.chw-edge903.sydney.telstra.net (203.50.11.175) 2.732 ms 2.825 ms bundle-
ether17.ken-core10.sydney.telstra.net (203.50.11.172) 2.435 ms
11 bundle-ether10.win-core10.melbourne.telstra.net (203.50.11.123) 15.113 ms 15.079 ms
15.067 ms
12 bundle-ether1-2.exi-core10.melbourne.telstra.net (203.50.6.40) 14.409 ms bundle-ether8.exi-
core10.melbourne.telstra.net (203.50.11.125) 15.593 ms 15.558 ms
13 203.50.11.209 (203.50.11.209) 15.393 ms 15.342 ms 15.280 ms
14 www.telstra.net (203.50.5.178) 13.625 ms 13.777 ms 13.538 ms
```

Traceroute from telstra.net to 129.94.242.119

```
1 gigabitethernet3-3.exi2.melbourne.telstra.net (203.50.77.53) 0.859 ms 0.721 ms 0.619 ms
2 TenGigE0-0-0-21.win-dlr20.melbourne.telstra.net (203.50.233.148) 0.744 ms 0.738 ms 0.620 ms
3 bundle-ether30.win-core10.melbourne.telstra.net (203.50.11.248) 2.369 ms 1.737 ms 2.120 ms
4 bundle-ether12.ken-core10.sydney.telstra.net (203.50.11.122) 13.114 ms 12.231 ms 12.489 ms
5 bundle-ether1.ken-edge903.sydney.telstra.net (203.50.11.173) 11.988 ms 12.108 ms 12.112 ms
6 139.130.0.78 (139.130.0.78) 11.614 ms 11.608 ms 11.738 ms
7 et-7-1-0.pe1.brwy.nsw.aarnet.net.au (113.197.15.13) 11.864 ms 11.856 ms 11.864 ms
8 138.44.5.1 (138.44.5.1) 12.112 ms 11.983 ms 11.989 ms
9 ombcr1-te-1-5.gw.unsw.edu.au (149.171.255.106) 11.988 ms 12.107 ms 11.990 ms
10 ombudnex1-po-2.gw.unsw.edu.au (149.171.255.170) 12.611 ms 12.232 ms 12.488 ms
11 ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36) 12.861 ms 12.732 ms 12.739 ms
12 129.94.39.23 (129.94.39.23) 12.987 ms 12.983 ms 12.987 ms
```

Traceroute from 129.94.242.119 to telstra.net

Alex@lab1\$ traceroute www.telstra.net

traceroute to www.telstra.net (203.50.5.178), 30 hops max, 60 byte packets

```
1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.126 ms 0.118 ms 0.103 ms
2 129.94.39.17 (129.94.39.17) 0.935 ms 0.939 ms 0.948 ms
3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 2.262 ms 2.348 ms libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34) 1.448 ms
4 libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.189 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.210 ms ombcr1-po-5.gw.unsw.edu.au (149.171.255.197) 44.793 ms
5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.285 ms unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.199 ms 1.223 ms
6 138.44.5.0 (138.44.5.0) 1.744 ms 2.321 ms 2.346 ms
7 et-1-1-0.pe1.rsby.nsw.aarnet.net.au (113.197.15.12) 2.059 ms 1.972 ms 2.143 ms
8 xe-0-0-3.bdr1.rsby.nsw.aarnet.net.au (113.197.15.31) 1.615 ms 1.605 ms 1.561 ms
9 139.130.0.77 (139.130.0.77) 2.338 ms 2.400 ms 2.463 ms
10 bundle-ether2.chw-edge903.sydney.telstra.net (203.50.11.175) 2.732 ms 2.825 ms bundle-ether17.ken-core10.sydney.telstra.net (203.50.11.172) 2.435 ms
11 bundle-ether10.win-core10.melbourne.telstra.net (203.50.11.123) 15.113 ms 15.079 ms 15.067 ms
12 bundle-ether1-2.exi-core10.melbourne.telstra.net (203.50.6.40) 14.409 ms bundle-ether8.exi-core10.melbourne.telstra.net (203.50.11.125) 15.593 ms 15.558 ms
13 203.50.11.209 (203.50.11.209) 15.393 ms 15.342 ms 15.280 ms
14 www.telstra.net (203.50.5.178) 13.625 ms 13.777 ms 13.538 ms
```

3.a) what are the IP addresses of the two servers that you have chosen?

Alex@lab1\$ host www.speedtest.com.sg

www.speedtest.com.sg has address 202.150.221.170

www.speedtest.com.sg has IPv6 address 2406:f400:8:8::2

Alex@lab1\$ host www.traceroute.org

www.traceroute.org has address 193.141.43.158

www.traceroute.org has IPv6 address 2001:680:0:19::2

3.b) Does the reverse path go through the same routers as the forward path?

I am only looking at the path between myself and traceroute.org.

win-core10.melbourne.telstra.net is a common prefix. ken-core10.sydney.telstra.net is also common. nsw.aarnet.net.au is common. gw.unsw.edu.au is common.

So it is not the Same routers per say as the hostnames are slightly different. I also do not observe the same IP address. This is likely because I am traveling through the network on a different Interface (And different interfaces can have different Ips, Or even Secondary Ips).

Exercise 4: Use ping to gain insights into network performance.

4.1.a) For each of these locations find the (Approximate) physical distance from UNSW to the geographic location of the destination host and compute the shortest possible time T for a packet to reach that location.

Assumptions: Packet propagates at $3 \times 10^8 \text{ m/s}$

UNSW geo location (129.94.242.118):

latitude: -33.8601

longitude: 151.2101

uq.edu.au geo location (130.102.184.3)

latitude: -27.4977

longitude: 152.9988

Distance from UNSW: 727,809.79 meters

Time to travel: $727,809.79 / 3 \times 10^8 = 0.0024$ seconds

upm.edu.au geo location (211.25.98.234)

latitude: 5.4103

longitude: 100.3386

Distance from UNSW: 6,896,292.61 meters

Time to travel: $6,896,292.61 / 3 \times 10^8 = 0.0229$ seconds

tu-berlin.de geo location (130.149.7.201)

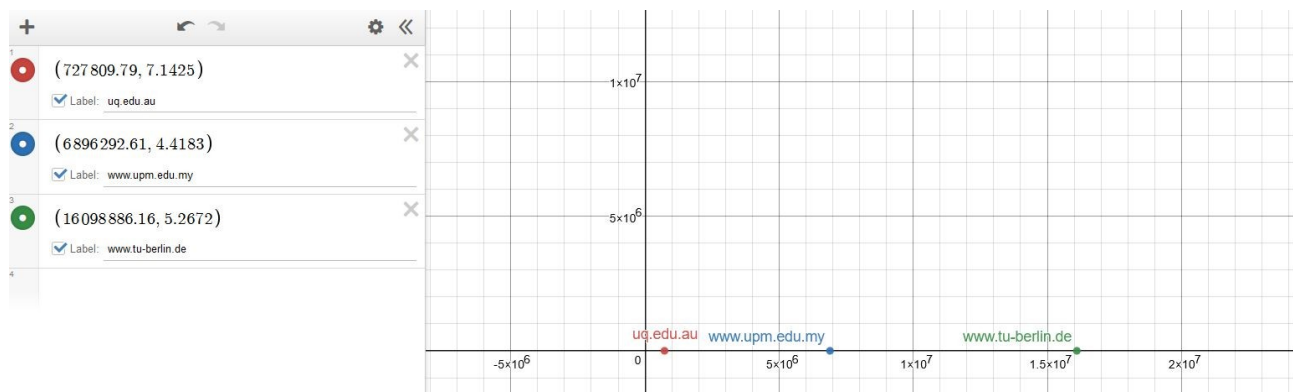
latitude: 52.5126

longitude: 13.3315

Distance from UNSW: 16,098,886.16 meters

Time to travel: $16,098,886.16 / 3 \times 10^8 = 0.05366$ seconds

4.1.b) Plot a graph where the x-axis represent the distance to each city, and the y-axis represents the ratio between the minimum delay as measured by the ping program (50 byte packets) and the shortest possible time.



4.1.c) Two reasons why the y-axis values that you plot are greater than 2?

- The math does not consider the fact the ping needs to return back to source – I.e only one way traffic. Another reason being that the math does not consider all the delays that could be happening (propagation delay, transmission delay, processing delay and queuing delay). Another reason could be that packets do not travel at the speed at light

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

Will need more clarification on this question. The delay could potentially vary during peak hour and “quiet” hours – Peak hour there would be more of a chance that the network would be congested and therefore would cause a delay.

4.3)

Propagation delay depends on distance and propagation speed

Transmission delay depends on **packet size** and bandwidth

Processing delay is the time taken to process the packet

Queuing delay depends on congestion.