Exercise 1.

1. The IP address of the website www.koala.com.au is 104.21.45.210 and 172.67.219.46. There are several IP addresses because the website runs on several servers. Different locations of servers result in several IP addresses.

```
z5305298@corelli:~$ 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

z5305298@corelli:~$ nslookup 127.0.0.1
Server:         129.94.242.45
Address:        129.94.242.45#53

1.0.0.127.in-addr.arpa  name = localhost.
```

IP of www.koala.com.au and the name of 127.0.0.1

2. The name of the IP address 127.0.0.1 is localhost, which is the computer I am using. It is special because whenever and wherever I want to check IP address of device I am using, it gives 127.0.0.1.

Exercise 2.

Except host www.getfittest.com.au, www.hola.hp, www.kremlin.ru, the rest of the host are reachable. Hosts www.getfittest.com.au and www.hola.hp seems like invalid websites. www.kremlin.ru is a valid website, which can be visited by browser. ping can send a packet to the host, but cannot receive it. It might because the host block the packet so that the packet lost somewhere.

```
z5305298@corelli:~$ ping www.getfittest.com.au
ping: unknown host www.getfittest.com.au
z5305298@corelli:~$ ping www.hola.hp
ping: unknown host www.hola.hp
z5305298@corelli:~$ ping www.kremlin.ru
PING www.kremlin.ru (95.173.136.71) 56(84) bytes of data.
```

unreachable hosts

Exercise 3

1. There are 22 routers on this path. 5 of them are in part of UNSW network because only the first 5 routers have “unsw.edu.au” as part of address. The packet went across between router 9 and 10, whose addresses are “et-2-1-

0.bdr1.a.sea.aarnet.net.au" and "abilene-1-lo-jmb-706.sttlwa.pacificwave.net". because routes before route 9 have "au" suffix while router 10 did not. Also, the time packets returned became significantly longer between router 9 and 10.

```
z5305298@corelli:~$ 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)  0.056 ms  0.058 ms  0.044 ms
 2  129.94.39.17 (129.94.39.17)  0.810 ms  0.869 ms  0.830 ms
 3  ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.674 ms  1.635 ms libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.422 ms
 4  ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.123 ms ombcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.217 ms  1.181 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.607 ms  1.619 ms  1.628 ms
 6  138.44.5.0 (138.44.5.0)  1.628 ms  1.239 ms  1.252 ms
 7  et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149)  2.086 ms  1.968 ms  2.031 ms
 8  et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99)  95.322 ms  95.363 ms  95.431 ms
 9  et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201)  146.694 ms  146.687 ms  146.545 ms
10  abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8)  177.326 ms  177.369 ms  177.332 ms
11  ae-1.4079.rtsw.minn.net.internet2.edu (162.252.70.173)  202.286 ms  202.190 ms  202.349 ms
12  ae-1.4079.rtsw.eqch.net.internet2.edu (162.252.70.106)  207.067 ms  207.112 ms  207.203 ms
13  ae-0.4079.rtsw3.eqch.net.internet2.edu (162.252.70.163)  207.011 ms  207.198 ms  207.217 ms
14  ae-1.4079.rtsw.clev.net.internet2.edu (162.252.70.130)  218.658 ms  212.957 ms  212.797 ms
15  buf-9208-I2-CLEV.nysernet.net (199.109.11.33)  216.331 ms  216.359 ms  216.343 ms
16  syr-55a1-buf-9208.nysernet.net (199.109.7.213)  219.935 ms  219.876 ms  219.615 ms
17  nyc32-55a1-syr-55a1.nysernet.net (199.109.7.206)  225.244 ms  225.114 ms  225.105 ms
18  nyc32-9208-nyc32-55a1.nysernet.net (199.109.7.201)  226.583 ms  226.536 ms  224.948 ms
19  columbia.nyc-9208.nysernet.net (199.109.4.14)  224.871 ms  225.038 ms  224.818 ms
20  cc-core-1-x-nyser32-gw-1.net.columbia.edu (128.59.255.5)  225.008 ms  225.034 ms  225.086 ms
21  cc-conc-1-x-cc-core-1.net.columbia.edu (128.59.255.21)  225.170 ms  225.164 ms  225.156 ms
22  vii.org (128.59.105.24)  224.901 ms  225.021 ms  224.961 ms
z5305298@corelli:~$
```

traceroute to www.colmbia.edu

2. After passing router with address 138.44.5.0, the paths diverge. The net name of the router is APNIC-ERX-138-44-0-0 and is supported by Asia Pacific Network Information Centre. The number of hops on paths are not proportional the physical distance. Take address www.ucla.edu as destination. On This path, first 5 routers are in Surry Hills and geotropically close, while sixth router is in somewhere in South Australia.

```
z5305298@corelli:~$ traceroute www.ucla.edu
traceroute to www.ucla.edu (164.67.228.152), 30 hops max, 60 byte packets
 1  cserouter1-server.cse.unsw.EDU.AU (129.94.242.251)  0.111 ms  0.101 ms  0.105 ms
 2  129.94.39.17 (129.94.39.17)  0.937 ms  0.923 ms  1.012 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.711 ms ombudnex1-vl-3154.gw.unsw.edu.au
 (149.171.253.35)  1.343 ms libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.638 ms
 4  ombcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.247 ms libcr1-po-6.gw.unsw.edu.au (149.171.2
55.201)  1.255 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.258 ms
 5  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.268 ms unswbr1-te-1-9.gw.unsw.edu.au (14
9.171.255.101)  1.313 ms unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.328 ms
 6  138.44.5.0 (138.44.5.0)  3.049 ms  2.422 ms  2.487 ms
 7  et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149)  2.037 ms  1.816 ms  2.609 ms
 8  et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99)  95.406 ms  95.345 ms  95.447 ms
 9  et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201)  146.756 ms  146.714 ms  146.756 ms
10  cenichpr-1-is-jmb-778.snvaca.pacificwave.net (207.231.245.129)  164.741 ms  164.054 ms  164.
715 ms
11  svl-agg10-hpr--svl-hpr3--100g.cenic.net (137.164.25.106)  180.973 ms  180.439 ms  180.387 ms
12  hpr-lax-agg10--svl-agg10-100ge.cenic.net (137.164.25.73)  171.360 ms  171.327 ms  171.320 ms
13  * * *
14  bd11f1.anderson--cr001.anderson.ucla.net (169.232.4.6)  160.276 ms  160.465 ms  160.344 ms
15  cr00f2.csb1--rtr11f4.mathsci.ucla.net (169.232.8.181)  161.089 ms cr00f1.anderson--rtr11f4.m
athsci.ucla.net (169.232.8.185)  161.309 ms cr00f2.csb1--rtr11f4.mathsci.ucla.net (169.232.8.181
)  161.193 ms
16  * * *
17  * * *
18  * * *
```

traceroute to www.ucla.edu

```
z5305298@corelli:~$ 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)  0.060 ms  0.056 ms  0.040 ms
 2  129.94.39.17 (129.94.39.17)  0.854 ms  0.864 ms  1.152 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.817 ms  1.807 ms  1.817 ms
 4  libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.171 ms ombcr1-po-6.gw.unsw.edu.au (149.171.2
55.169)  1.242 ms  1.247 ms
 5  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  81.952 ms unswbr1-te-1-9.gw.unsw.edu.au (1
49.171.255.101)  81.961 ms unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  81.968 ms
 6  138.44.5.0 (138.44.5.0)  2.248 ms  1.651 ms  1.664 ms
 7  et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147)  1.954 ms  1.929 ms  1.971 ms
 8  ge-4_0_0.bb1.a.pao.aarnet.net.au (202.158.194.177)  161.363 ms  161.283 ms  161.165 ms
 9  paloalto0.iij.net (198.32.176.24)  157.757 ms  157.260 ms  157.217 ms
10  osk004bb00.IIJ.Net (58.138.88.185)  287.064 ms  287.024 ms  287.027 ms
11  osk004ip57.IIJ.Net (58.138.106.166)  276.761 ms  276.887 ms  276.858 ms
12  210.130.135.130 (210.130.135.130)  282.326 ms  266.824 ms  266.778 ms
13  124.83.228.58 (124.83.228.58)  276.966 ms  277.130 ms  266.945 ms
14  124.83.252.178 (124.83.252.178)  283.461 ms  273.637 ms  273.583 ms
15  158.205.134.26 (158.205.134.26)  282.894 ms  282.831 ms  272.693 ms
16  * * *
17  * * *
18  * * *
```

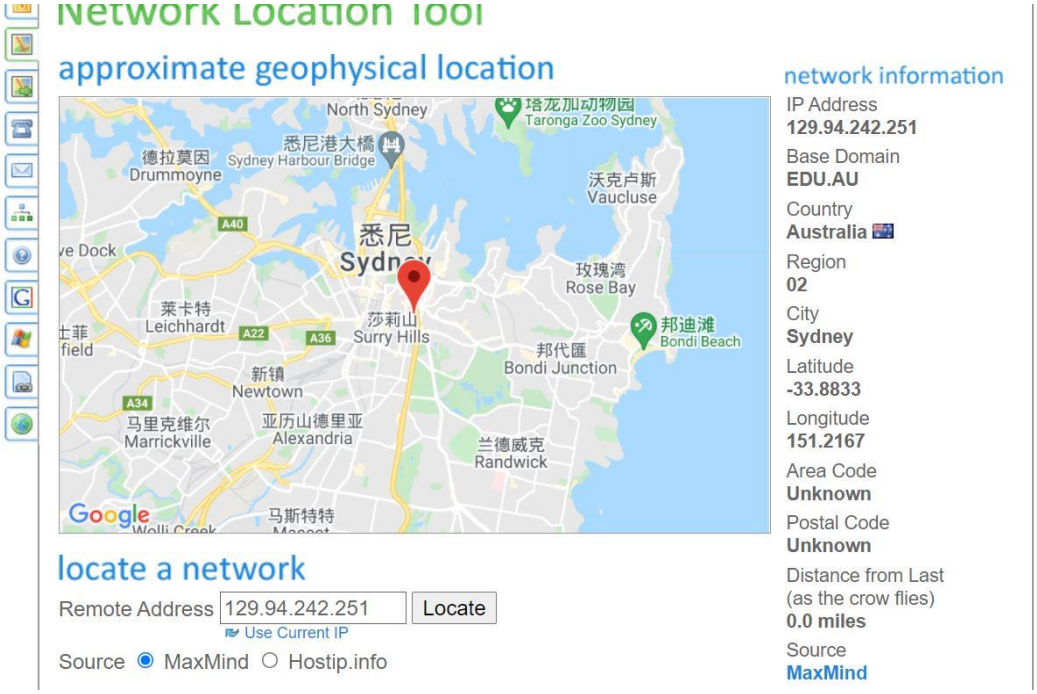
traceroute to www.u-tokyo.ac.jp

```
z5305298@corelli:~$ 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)  0.065 ms  0.049 ms  0.047 ms
 2  129.94.39.17 (129.94.39.17)  0.845 ms  0.869 ms  0.825 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.824 ms  1.339 ms ombudnex1-vl-3154.gw.u
nsw.edu.au (149.171.253.35)  1.456 ms
 4  ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.273 ms  1.150 ms  1.137 ms
 5  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.401 ms unswbr1-te-1-9.gw.unsw.edu.au (14
9.171.255.101)  1.220 ms  1.221 ms
 6  138.44.5.0 (138.44.5.0)  2.524 ms  1.849 ms  1.826 ms
 7  et-2-0-5.bdr1.sing.sin.aarnet.net.au (113.197.15.233)  92.884 ms  92.693 ms  92.685 ms
 8  138.44.226.7 (138.44.226.7)  259.570 ms  259.596 ms  259.558 ms
 9  janet-gw.mx1.lon.uk.geant.net (62.40.124.198)  259.752 ms  259.758 ms  259.665 ms
10  ae29.londpg-sbr2.ja.net (146.97.33.2)  260.180 ms  260.185 ms  260.191 ms
11  ae31.erdiss-sbr2.ja.net (146.97.33.22)  264.013 ms  263.935 ms  263.920 ms
12  ae29.manckh-sbr2.ja.net (146.97.33.42)  265.737 ms  265.846 ms  265.728 ms
13  ae25.manckh-ban1.ja.net (146.97.35.50)  265.827 ms  265.915 ms  265.704 ms
14  lancaster-uni.ja.net (146.97.40.178)  282.554 ms  282.196 ms  282.193 ms
15  * * *
16  * * *
17  * * *
```

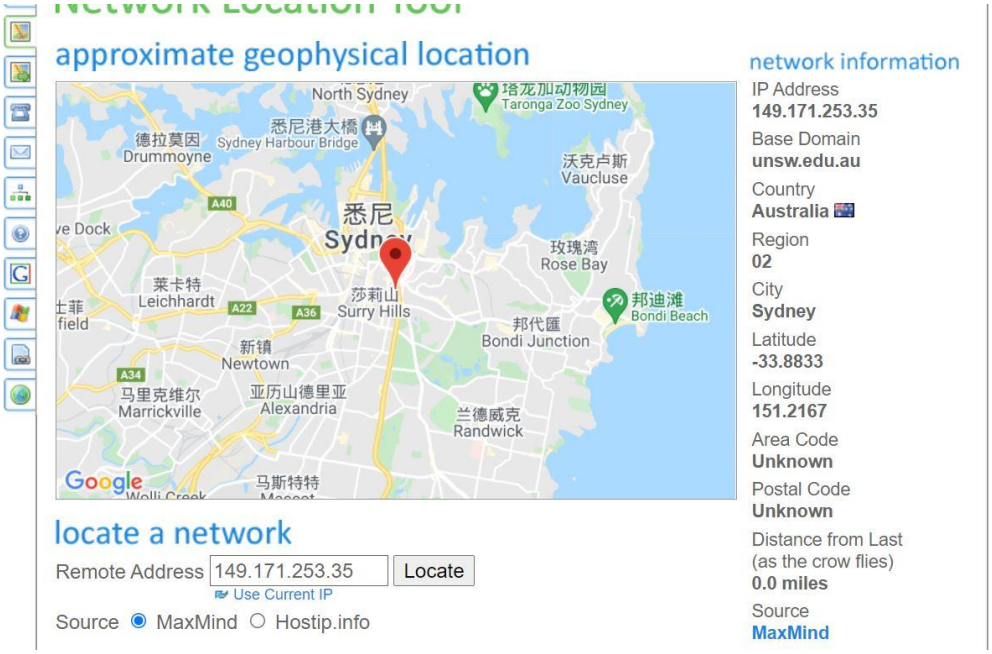
Traceroute to www.lancaster.ac.uk

```
NetRange:       138.44.0.0 - 138.44.255.255
CIDR:           138.44.0.0/16
NetName:        APNIC-ERX-138-44-0-0
NetHandle:      NET-138-44-0-0-1
Parent:         NET138 (NET-138-0-0-0-0)
NetType:        Early Registrations, Transferred to APNIC
OriginAS:
Organization:   Asia Pacific Network Information Centre (APNIC)
RegDate:        2003-12-11
Updated:        2009-10-08
Comment:        This IP address range is not registered in the ARIN database.
Comment:        This range was transferred to the APNIC Whois Database as
Comment:        part of the ERX (Early Registration Transfer) project.
Comment:        For details, refer to the APNIC Whois Database via
Comment:        WHOIS.APNIC.NET or http://wq.apnic.net/apnic-bin/whois.pl
Comment:
Comment:        ** IMPORTANT NOTE: APNIC is the Regional Internet Registry
Comment:        for the Asia Pacific region.  APNIC does not operate networks
Comment:        using this IP address range and is not able to investigate
Comment:        spam or abuse reports relating to these addresses.  For more
Comment:        help, refer to http://www.apnic.net/apnic-info/whois_search2/abuse-and-spamming
Ref:            https://rdap.arin.net/registry/ip/138.44.0.0
```

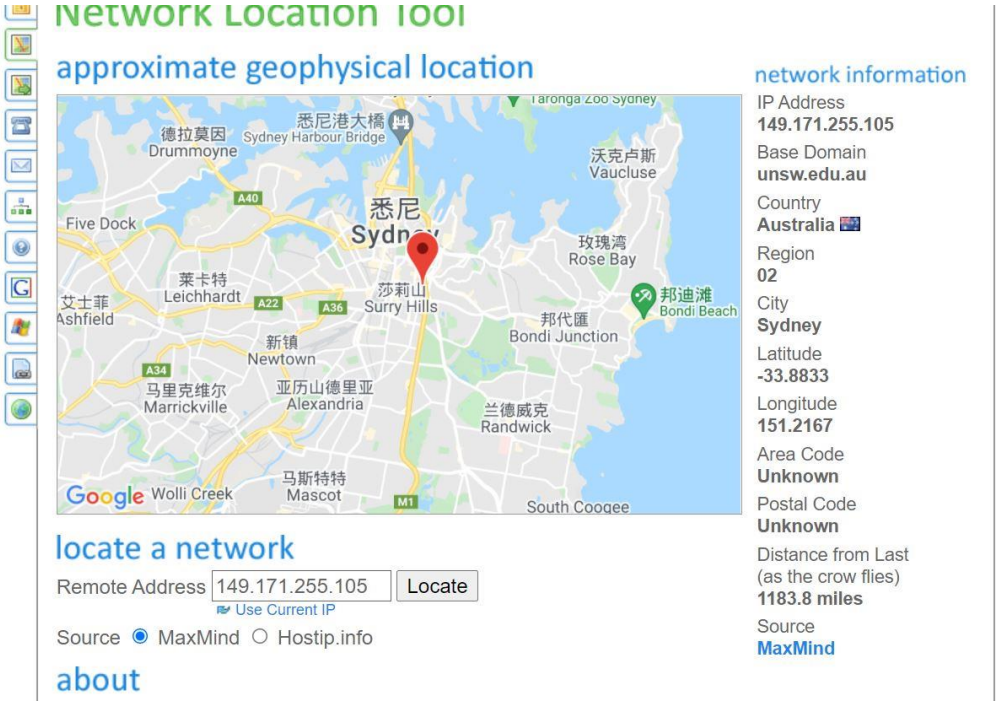
Information from whois 138.44.5.0



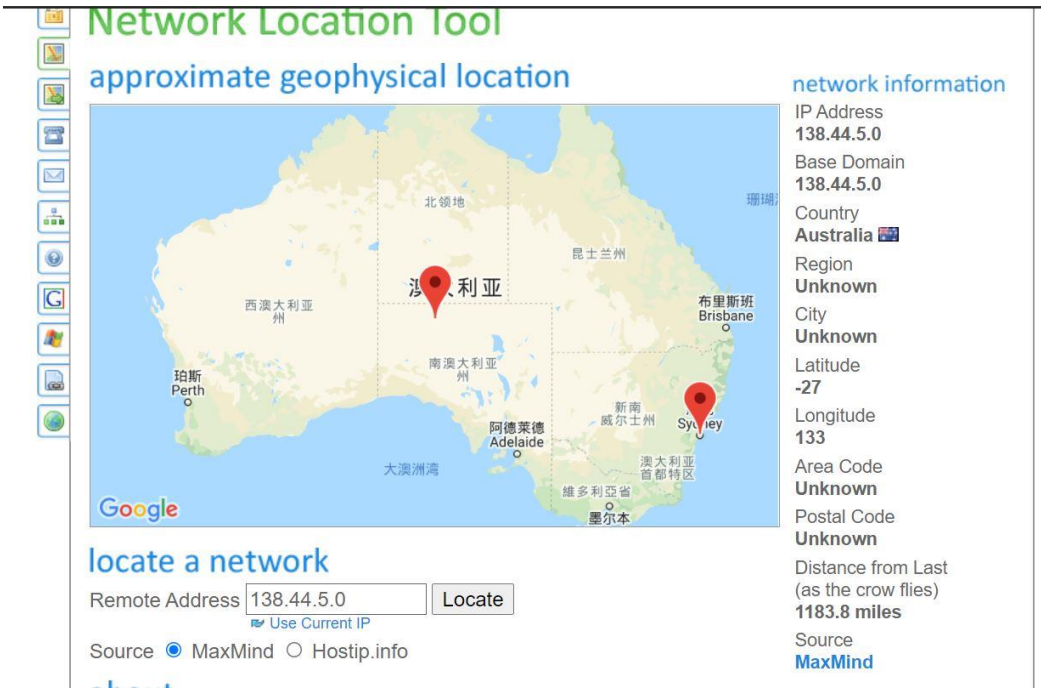
Location of the first router



Location of the third router



Location of the fifth router



Location of the sixth router

3. The IP address of http://www.speedtest.com.sg/tr.php is 202.150.221.170. The IP address of https://www.telstra.net/cgi-bin/trace is 203.50.5.178. the reverse path is different from the forward path. I did not find same routers in paths. It may be unnecessary to go forward and backward through a same path.

```
z5305298@corelli:~$ traceroute www.speedtest.com.sg
traceroute to www.speedtest.com.sg (202.150.221.170), 30 hops max, 60 byte packets
 1  cserouter1-server.cse.unsw.EDU.AU (129.94.242.251)  0.089 ms  0.072 ms  0.079 ms
 2  129.94.39.17 (129.94.39.17)  0.946 ms  0.922 ms  0.890 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.496 ms ombudnex1-vl-3154.gw.unsw.edu
.au (149.171.253.35)  1.468 ms  1.593 ms
 4  libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.189 ms ombcr1-po-6.gw.unsw.edu.au (149.17
1.255.169)  1.214 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.172 ms
 5  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.248 ms  1.208 ms unswbr1-te-1-9.gw.un
sw.edu.au (149.171.255.101)  1.333 ms
 6  138.44.5.0 (138.44.5.0)  1.928 ms  1.384 ms  1.369 ms
 7  et-0-3-0.pe1.alxd.nsw.aarnet.net.au (113.197.15.153)  1.708 ms  1.725 ms  1.742 ms
 8  xe-0-2-7.bdr1.a.lax.aarnet.net.au (202.158.194.173)  147.734 ms  147.698 ms  147.719 ms
 9  singtel.as7473.any2ix.coresite.com (206.72.210.63)  147.751 ms  147.710 ms  147.695 ms
10  203.208.171.117 (203.208.171.117)  148.056 ms 203.208.171.9 (203.208.171.9)  328.421 ms 2
03.208.171.117 (203.208.171.117)  147.984 ms
11  203.208.153.121 (203.208.153.121)  239.648 ms 203.208.177.110 (203.208.177.110)  329.350
ms 203.208.172.145 (203.208.172.145)  246.098 ms
12  * 203.208.158.17 (203.208.158.17)  328.025 ms *
13  202-150-221-170.rev.ne.com.sg (202.150.221.170)  205.350 ms  200.622 ms  200.654 ms
z5305298@corelli:~$
```

traceroute www.speedtest.com.sg and its IP

```
traceroute to 129.94.242.48 (129.94.242.48), 30 hops max, 60 byte packets
 1  ge2-8.r01.sin01.ne.com.sg (202.150.221.169)  0.131 ms  0.157 ms  0.174 ms
 2  10.11.34.146 (10.11.34.146)  0.374 ms  0.462 ms  0.540 ms
 3  aarnet.sgix.sg (103.16.102.67)  213.516 ms  213.532 ms  213.549 ms
 4  et-7-3-0.pe1.nsw.brwy.aarnet.net.au (113.197.15.232)  208.136 ms  208.109 ms  208.079 ms
 5  138.44.5.1 (138.44.5.1)  215.046 ms  214.945 ms  214.986 ms
 6  ombcr1-te-1-5.gw.unsw.edu.au (149.171.255.106)  209.207 ms  209.186 ms  209.264 ms
 7  libudnex1-po-2.gw.unsw.edu.au (149.171.255.198)  209.871 ms  210.129 ms  209.887 ms
 8  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  210.015 ms  210.004 ms  209.877 ms
 9  129.94.39.23 (129.94.39.23)  210.057 ms  210.132 ms  210.057 ms
10  * * *
11  * * *
12  * * *
```

traceroute from www.speedtest.com.sg to my virtual machine

```
z5305298@corelli:~$ 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)  0.073 ms  0.072 ms  0.081 ms
 2  129.94.39.17 (129.94.39.17)  0.878 ms  0.836 ms  0.907 ms
 3  ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.734 ms libudnex1-vl-3154.gw.unsw.edu
.au (149.171.253.34)  1.383 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.727 ms
 4  ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.155 ms  1.201 ms libcr1-po-6.gw.unsw.edu.
au (149.171.255.201)  1.233 ms
 5  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.319 ms unswbr1-te-1-9.gw.unsw.edu.au
(149.171.255.101)  1.565 ms unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.311 ms
 6  138.44.5.0 (138.44.5.0)  1.561 ms  1.305 ms  1.262 ms
 7  et-1-1-0.pe1.rsby.nsw.aarnet.net.au (113.197.15.12)  1.886 ms  1.738 ms  1.945 ms
 8  xe-0-0-3.bdr1.rsby.nsw.aarnet.net.au (113.197.15.31)  1.551 ms  1.561 ms  1.570 ms
 9  HundredGigE0-1-0-4.ken-edge903.sydney.telstra.net (139.130.0.77)  2.252 ms  2.281 ms  2.3
59 ms
10  bundle-ether2.chw-edge903.sydney.telstra.net (203.50.11.175)  2.368 ms  2.326 ms bundle-e
ther17.ken-core10.sydney.telstra.net (203.50.11.172)  3.773 ms
11  bundle-ether17.chw-core10.sydney.telstra.net (203.50.11.176)  4.118 ms  2.932 ms bundle-e
ther10.win-core10.melbourne.telstra.net (203.50.11.123)  14.779 ms
12  bundle-ether8.exi-core10.melbourne.telstra.net (203.50.11.125)  15.262 ms bundle-ether1-2
.exi-core10.melbourne.telstra.net (203.50.6.40)  16.236 ms  16.206 ms
13  203.50.11.209 (203.50.11.209)  15.368 ms  15.635 ms  15.492 ms
14  www.telstra.net (203.50.5.178)  13.780 ms  13.890 ms  14.570 ms
z5305298@corelli:~$
```

traceroute to www.telstra.net and its IP

Traceroute

This traceroute commences from **www.telstra.net**, within **AS 1221**.

Enter the desired destination host.domain or IPv4 or IPv6 address:

```
 1  gigabitethernet3-3.exi2.melbourne.telstra.net (203.50.77.53)  0.311 ms  0.222 ms  1.118 ms
 2  bundle-ether3-100.win-core10.melbourne.telstra.net (203.50.80.129)  1.993 ms  2.609 ms  0.995 ms
 3  bundle-ether12.ken-core10.sydney.telstra.net (203.50.11.122)  13.112 ms  13.355 ms  13.236 ms
 4  bundle-ether1.ken-edge903.sydney.telstra.net (203.50.11.173)  11.988 ms  11.981 ms  11.988 ms
 5  aar3533567.lnk.telstra.net (139.130.0.78)  75.826 ms  29.346 ms  11.487 ms
 6  et-7-1-0.pe1.brwy.nsw.aarnet.net.au (113.197.15.13)  11.738 ms  11.858 ms  11.866 ms
 7  138.44.5.1 (138.44.5.1)  12.109 ms  11.984 ms  11.988 ms
 8  libcr1-te-1-5.gw.unsw.edu.au (149.171.255.102)  11.985 ms  11.982 ms  12.113 ms
 9  ombudnex1-po-1.gw.unsw.edu.au (149.171.255.202)  12.238 ms  12.232 ms  12.488 ms
10  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  12.738 ms  12.856 ms  12.737 ms
11  129.94.39.23 (129.94.39.23)  12.862 ms  12.857 ms  13.236 ms
```

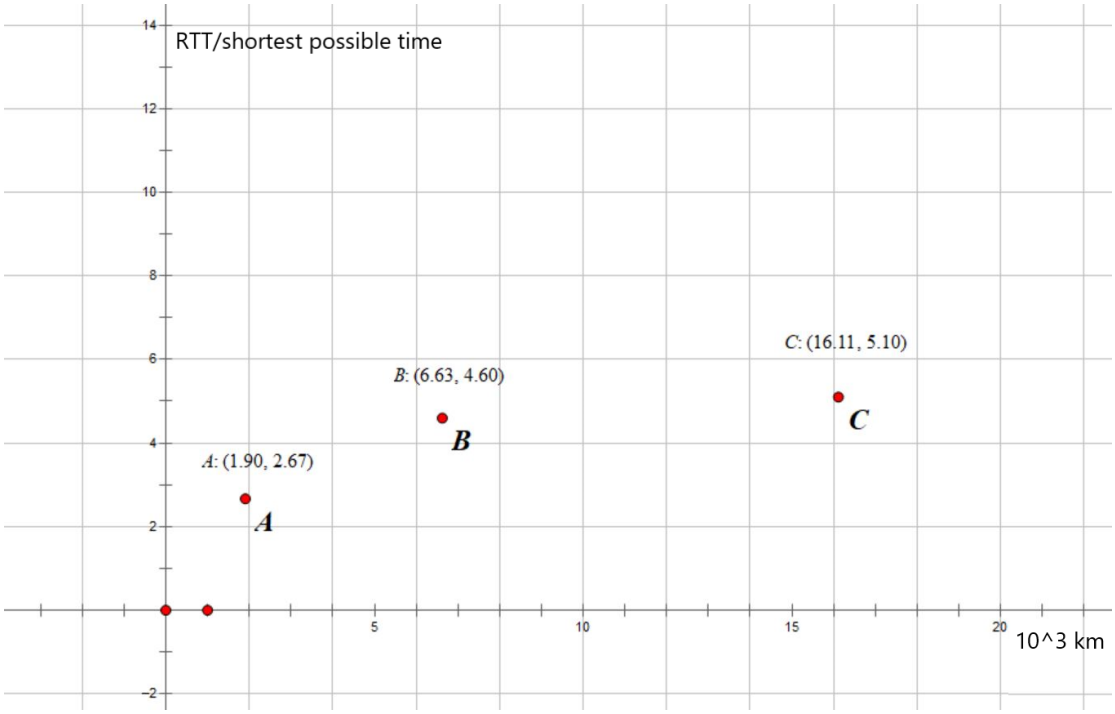
There are other traceroute sites listed here.

The traceroute CGI source can be found via:

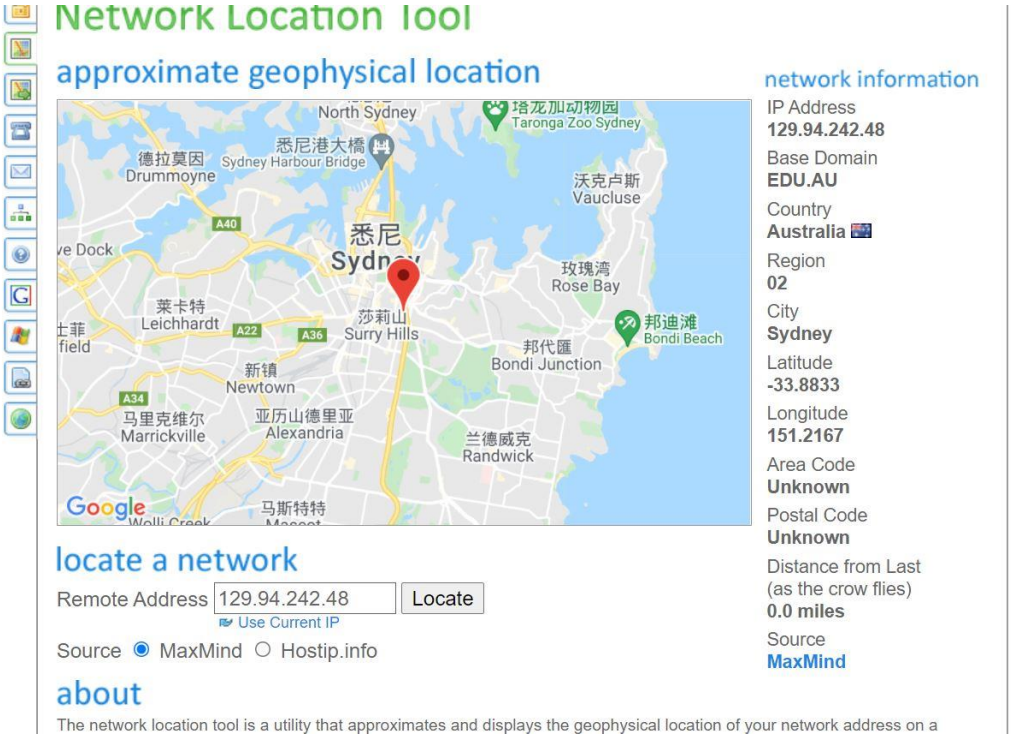
traceroute from www.telstra.net to my virtual machine

Exercise 4

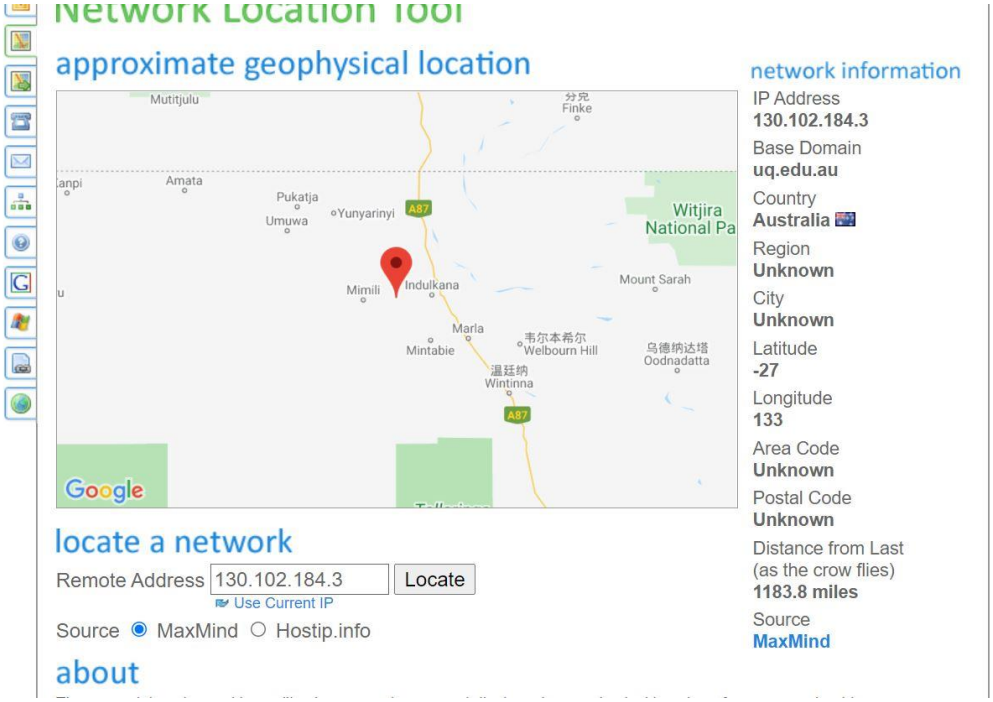
1. One of the reasons that y is greater than 2 is while the calculated value used shortest distance between servers, in reality the path the routers on might not be the shortest one due to cost, geographical reasons and so on. Another question can be multiple delay, such processing delay, queueing delay, transmission delay, propagation delay and so on.



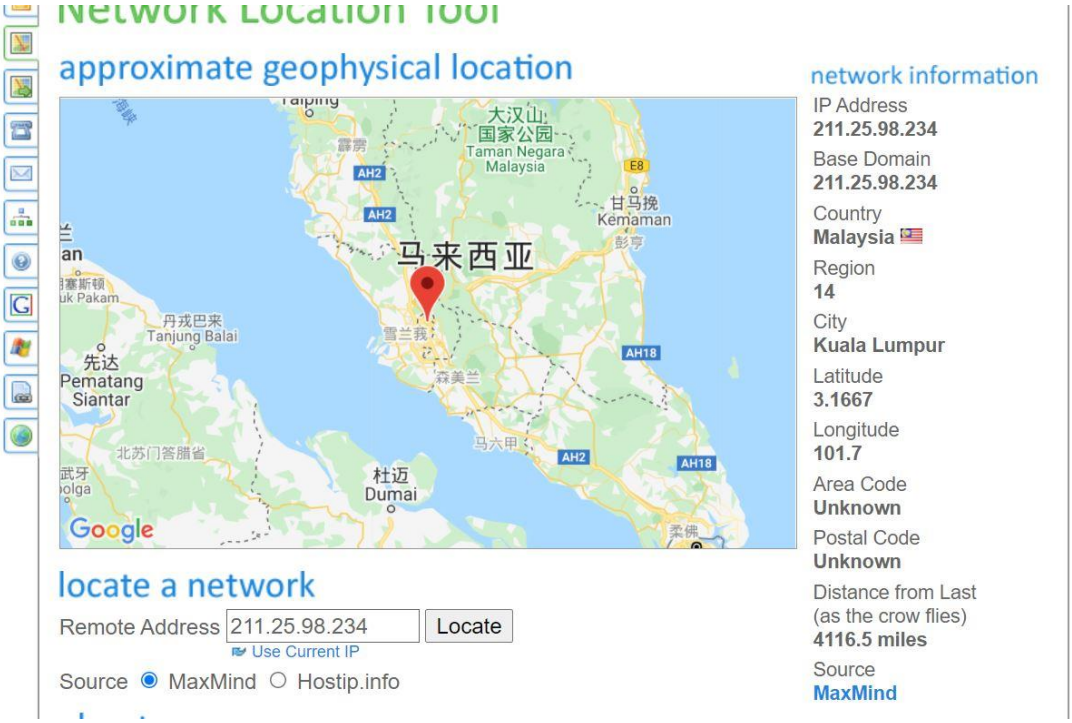
Ratio-distance graph. To get the data, I did calculations shown in below pictures.



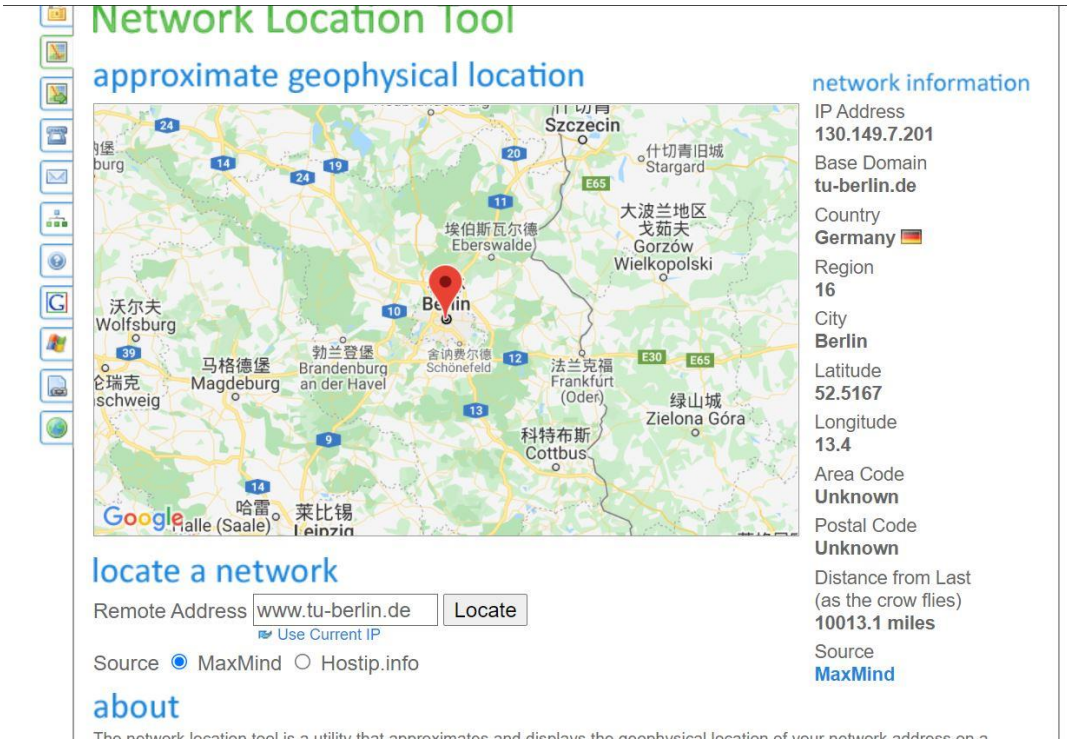
My local virtual machine



Distance from UNSW to servers of www.uq.edu.au. 1183.8 miles ≈ 1900 km.$x_1 = 1.9$



Distance from UNSW to servers of www.upm.edu.my. 4116.5 miles ≈ 6630 km. $x_2 = 6.63$



Distance from UNSW to servers of www.tu-berlin.de. 10013.1 miles $\approx$ 16110 km. $x_3 = 16.11$

Release Notes: 1.57.0 | *www.uq.edu.au_avg.txt* ×

3331 > lab > week01 > www.uq.edu.au_avg.txt

```
1   50 17.187 16.945
2   250 17.332 17.095
3   500 17.456 17.255
4   750 17.593 17.329
5   1000 17.663 17.419
6   1250 17.752 17.450
7   1500 17.810 17.613
8
```

The minimum RTT for 50 byte packets is 16.945 ms. $y_1 = 16.945 * 10^{-3}/(\frac{1900*10^3}{3*10^8}) = 2.67$.

Release Notes: 1.57.0 | *www.upm.edu.my_avg.txt* ×

3331 > lab > week01 > www.upm.edu.my_avg.txt

```
1   50 101.870 101.588
2   250 102.287 101.764
3   500 102.342 101.893
4   750 102.356 102.022
5   1000 102.443 102.121
6   1250 102.657 102.276
7   1500 102.585 102.390
8
```

The minimum RTT for 50 byte packets is 101.588 ms. $y_2 = 101.588 * 10^{-3}/(\frac{6630*10^3}{3*10^8}) = 4.60$.

Release Notes: 1.57.0 | www.tu-berlin.de_avg.txt

3331 > lab > week01 > www.tu-berlin.de_avg.txt

```
1   50 274.015 273.904
2   250 274.138 274.112
3   500
4   750 274.358 274.196
5   1000 274.408 274.308
6   1250 274.558 274.378
7   1500 274.587 274.477
8
```

The minimum RTT for 50 byte packets is 273.904 ms. $y_3 = 273.904 * 10^{-3}/(\frac{16110*10^3}{3*10^8}) = 5.10$.

2. Delay varies over time. The further a packet needs to reach, the longer it takes, and more extra cost it needs. For example, the further it goes, the more routers it might pass, and more delay may happen while passing them.
3. The servers running www.epfl.ch is in the San Francisco. First we use nslookup to find IP of the host. Then use whois to find details of it.

```
z5305298@corelli:~$ nslookup www.epfl.ch
Server:         129.94.242.45
Address:        129.94.242.45#53

Non-authoritative answer:
www.epfl.ch     canonical name = www.epfl.ch.cdn.cloudflare.net.
Name:   www.epfl.ch.cdn.cloudflare.net
Address: 172.67.2.106
Name:   www.epfl.ch.cdn.cloudflare.net
Address: 104.20.228.42
Name:   www.epfl.ch.cdn.cloudflare.net
Address: 104.20.229.42
```

IP addresses of www.epfl.ch

```
NetRange:       172.64.0.0 - 172.71.255.255
CIDR:           172.64.0.0/13
NetName:        CLOUDFLARENET
NetHandle:      NET-172-64-0-0-1
Parent:         NET172 (NET-172-0-0-0-0)
NetType:        Direct Allocation
OriginAS:       AS13335
Organization:   Cloudflare, Inc. (CLOUD14)
RegDate:        2015-02-25
Updated:        2021-05-26
Comment:        All Cloudflare abuse reporting can be done v
se
Ref:            https://rdap.arin.net/registry/ip/172.64.0.0



OrgName:        Cloudflare, Inc.
OrgId:          CLOUD14
Address:        101 Townsend Street
City:           San Francisco
```

Information of first IP address. The city is San Francisco.

4. Propagation and queueing delay does not depend on packet size. Transmission and processing delay depends on packet size.