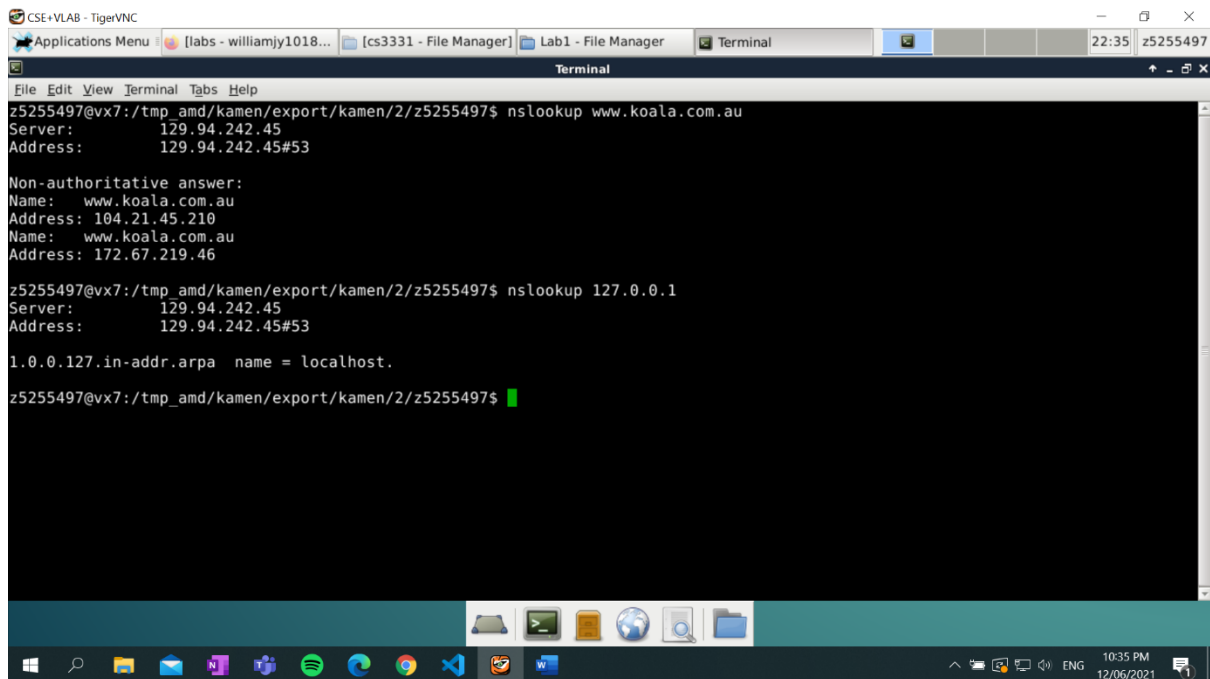


Exercise 1.1:

Address: 104.21.45.210

Address: 172.67.219.46

Because it has two web servers, in case one address is overloaded.



The screenshot shows a terminal window titled "Terminal" with a menu bar (File, Edit, View, Terminal, Tabs, Help). The terminal content is as follows:

```
z5255497@vx7:/tmp_amd/kamen/export/kamen/2/z5255497$ 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: 104.21.45.210
Name:   www.koala.com.au
Address: 172.67.219.46

z5255497@vx7:/tmp_amd/kamen/export/kamen/2/z5255497$ 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.

z5255497@vx7:/tmp_amd/kamen/export/kamen/2/z5255497$
```

The terminal window is part of a desktop environment with a taskbar at the bottom showing various application icons and a system tray on the right indicating the time as 10:35 PM on 12/06/2021.

Exercise 1.2:

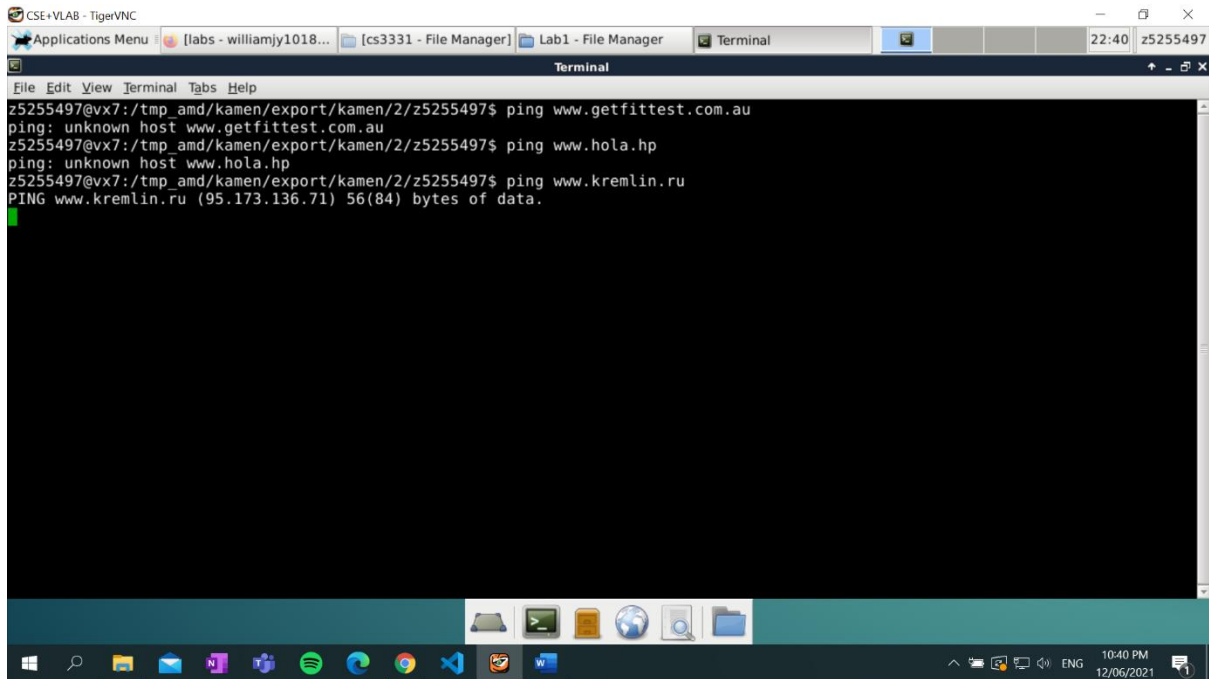
Localhost. It is special because send ping address to it is actually send to myself.

Exercise 2:

www.getfittest.com.au: Unreachable from the ping command and the web browser because the website is invalid.

www.hola.hp: Unreachable from the ping command and the web browser because the website is invalid.

www.kremlin.ru: Unreachable from the ping command. Because of security reason, they block ping requests.



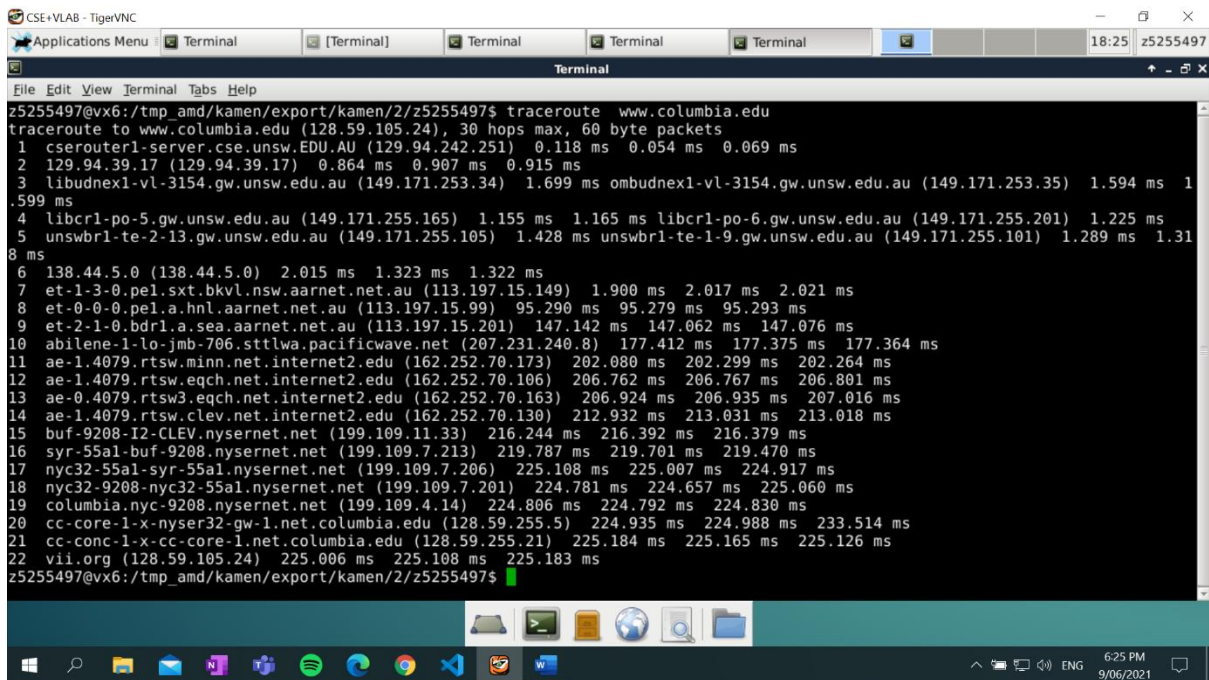
CSE+VLAB - TigerVNC

Applications Menu [labs - williamjy1018... [cs3331 - File Manager] Lab1 - File Manager Terminal 22:40 z5255497

File Edit View Terminal Tabs Help

```
z5255497@vx7:/tmp_amd/kamen/export/kamen/2/z5255497$ ping www.getfittest.com.au
ping: unknown host www.getfittest.com.au
z5255497@vx7:/tmp_amd/kamen/export/kamen/2/z5255497$ ping www.hola.hp
ping: unknown host www.hola.hp
z5255497@vx7:/tmp_amd/kamen/export/kamen/2/z5255497$ ping www.kremlin.ru
PING www.kremlin.ru (95.173.136.71) 56(84) bytes of data.
```

Exercise 3.1:



CSE+VLAB - TigerVNC

Applications Menu [Terminal] [Terminal] [Terminal] [Terminal] [Terminal] 18:25 z5255497

File Edit View Terminal Tabs Help

```
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$ 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) 0.118 ms 0.054 ms 0.069 ms
 2 129.94.39.17 (129.94.39.17) 0.864 ms 0.907 ms 0.915 ms
 3 libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34) 1.699 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.594 ms 1.599 ms
 4 libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.155 ms 1.165 ms libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.225 ms
 5 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.428 ms unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.289 ms 1.318 ms
 6 138.44.5.0 (138.44.5.0) 2.015 ms 1.323 ms 1.322 ms
 7 et-1-3-0.pel.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149) 1.900 ms 2.017 ms 2.021 ms
 8 et-0-0-0.pel.a.hnl.aarnet.net.au (113.197.15.90) 95.290 ms 95.279 ms 95.293 ms
 9 et-2-1-0.bdrl.a.sea.aarnet.net.au (113.197.15.201) 147.142 ms 147.062 ms 147.076 ms
10 abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8) 177.412 ms 177.375 ms 177.364 ms
11 ae-1.4079.rtsw.minn.net.internet2.edu (162.252.70.173) 202.080 ms 202.299 ms 202.264 ms
12 ae-1.4079.rtsw.eqch.net.internet2.edu (162.252.70.106) 206.762 ms 206.767 ms 206.801 ms
13 ae-0.4079.rtsw3.eqch.net.internet2.edu (162.252.70.163) 206.924 ms 206.935 ms 207.016 ms
14 ae-1.4079.rtsw.clev.net.internet2.edu (162.252.70.130) 212.932 ms 213.031 ms 213.018 ms
15 buf-9208-I2-CLEV.nysernet.net (199.109.11.33) 216.244 ms 216.392 ms 216.379 ms
16 syr-55a1-buf-9208.nysernet.net (199.109.7.213) 219.787 ms 219.701 ms 219.470 ms
17 nyc32-55a1-syr-55a1.nysernet.net (199.109.7.206) 225.108 ms 225.007 ms 224.917 ms
18 nyc32-9208-nyc32-55a1.nysernet.net (199.109.7.201) 224.781 ms 224.657 ms 225.060 ms
19 columbia.nyc-9208.nysernet.net (199.109.4.14) 224.806 ms 224.792 ms 224.830 ms
20 cc-core-1-x-nyser32-gw-1.net.columbia.edu (128.59.255.5) 224.935 ms 224.988 ms 233.514 ms
21 cc-conc-1-x-cc-core-1.net.columbia.edu (128.59.255.21) 225.184 ms 225.165 ms 225.126 ms
22 vii.org (128.59.105.24) 225.006 ms 225.108 ms 225.183 ms
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$
```

21 routers are between the workstation and www.columbia.edu. 4 routers along the path are part of the UNSW network. Between 7th and 9th routers the packets cross the Pacific Ocean.

Exercise 3.2:

www.ucla.edu:

```
CSE+VLAB - TigerVNC
Applications Menu Terminal Terminal Terminal Terminal 18:23 z5255497

File Edit View Terminal Tabs Help
z5255497@vxx6:/tmp_amd/kamen/export/kamen/2/z5255497$ 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) 0.128 ms 0.098 ms 0.08
5 ms
 2 129.94.39.17 (129.94.39.17) 0.868 ms 0.872 ms 0.804 ms
 3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.796 ms 1.752 ms 1.292
ms
 4 ombcr1-po-5.gw.unsw.edu.au (149.171.255.197) 1.130 ms libcr1-po-5.gw.unsw.e
du.au (149.171.255.165) 3.950 ms 3.964 ms
 5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.197 ms 1.231 ms 1.242 m
s
 6 138.44.5.0 (138.44.5.0) 1.331 ms 1.563 ms 1.560 ms
 7 et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149) 1.974 ms 1.829 ms
1.932 ms
 8 et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99) 95.127 ms 95.030 ms 95.0
37 ms
 9 et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201) 149.650 ms 149.602 ms
149.625 ms
10 cenichpr-1-is-jmb-778.snvaca.pacificwave.net (207.231.245.129) 163.229 ms
163.254 ms 164.010 ms
11 svl-aggl0-hpr--svl-hpr3--100g.cenic.net (137.164.25.106) 163.523 ms 163.46
7 ms 164.205 ms
12 hpr-lax-aggl0--svl-aggl0-100ge.cenic.net (137.164.25.73) 161.039 ms 160.88
7 ms 160.850 ms
13 * * *
14 bd11f1.anderson--cr00f2.csb1.ucla.net (169.232.4.4) 160.245 ms 160.379 ms
160.315 ms
10 cenichpr-1-is-jmb-778.snvaca.pacificwave.net (207.231.245.129) 163.229 ms
163.254 ms 164.010 ms
11 svl-aggl0-hpr--svl-hpr3--100g.cenic.net (137.164.25.106) 163.523 ms 163.46
7 ms 164.205 ms
12 hpr-lax-aggl0--svl-aggl0-100ge.cenic.net (137.164.25.73) 161.039 ms 160.88
7 ms 160.850 ms
13 * * *
14 bd11f1.anderson--cr00f2.csb1.ucla.net (169.232.4.4) 160.245 ms 160.379 ms
160.315 ms
15 cr00f1.anderson--rtr11f4.mathsci.ucla.net (169.232.8.185) 161.163 ms 160.4
97 ms 161.286 ms
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *
z5255497@vxx6:/tmp_amd/kamen/export/kamen/2/z5255497$
```

www.u-tokyo.ac.jp:

```
CSE+VLAB - TigerVNC
Applications Menu Terminal Terminal =Terminal= 18:46 z5255497

File Edit View Terminal Tabs Help
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$ 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) 0.133 ms 0.127 ms 0.116 ms
 2 129.94.39.17 (129.94.39.17) 0.924 ms 0.878 ms 0.898 ms
 3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.870 ms 1.902 ms 1.865 ms
 4 ombcr1-po-6.gw.unsw.edu.au (149.171.255.169) 1.125 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.131 ms 1.138 ms
 5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.166 ms 1.231 ms 1.190 ms
 6 138.44.5.0 (138.44.5.0) 1.359 ms 1.314 ms 1.314 ms
 7 et-0-3-0-pe1.bkvl.nsw.aarnet.net.au (113.197.15.147) 1.767 ms 1.751 ms 1.867 ms
 8 ge-4-0-0-bb1.a.pao.aarnet.net.au (202.158.194.177) 155.008 ms 154.996 ms 154.984 ms
 9 paloalto0.iiij.net (198.32.176.24) 156.646 ms 156.755 ms 156.738 ms
10 osk004bb00.IIJ.Net (58.138.88.185) 286.999 ms osk004bb01.IIJ.Net (58.138.88.189) 266.651 ms 266.682 ms
11 osk004ip57.IIJ.Net (58.138.106.166) 276.889 ms osk004ip57.IIJ.Net (58.138.106.194) 286.918 ms osk004ip57.IIJ.Net (58.138.106.162) 286.849 ms
12 210.130.135.130 (210.130.135.130) 266.740 ms 266.584 ms 276.920 ms
13 124.83.228.58 (124.83.228.58) 277.027 ms 267.174 ms 267.072 ms
14 124.83.252.178 (124.83.252.178) 283.258 ms 293.461 ms 293.354 ms
15 158.205.134.26 (158.205.134.26) 282.930 ms 282.924 ms 282.829 ms
16 * * *
```

```
CSE+VLAB - TigerVNC
Applications Menu Terminal Terminal =Terminal= 18:46 z5255497

File Edit View Terminal Tabs Help
8 ge-4-0-0-bb1.a.pao.aarnet.net.au (202.158.194.177) 155.008 ms 154.996 ms 154.984 ms
9 paloalto0.iiij.net (198.32.176.24) 156.646 ms 156.755 ms 156.738 ms
10 osk004bb00.IIJ.Net (58.138.88.185) 286.999 ms osk004bb01.IIJ.Net (58.138.88.189) 266.651 ms 266.682 ms
11 osk004ip57.IIJ.Net (58.138.106.166) 276.889 ms osk004ip57.IIJ.Net (58.138.106.194) 286.918 ms osk004ip57.IIJ.Net (58.138.106.162) 286.849 ms
12 210.130.135.130 (210.130.135.130) 266.740 ms 266.584 ms 276.920 ms
13 124.83.228.58 (124.83.228.58) 277.027 ms 267.174 ms 267.072 ms
14 124.83.252.178 (124.83.252.178) 283.258 ms 293.461 ms 293.354 ms
15 158.205.134.26 (158.205.134.26) 282.930 ms 282.924 ms 282.829 ms
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$
```

www.lancaster.ac.uk

```
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$ traceroute www.lancaster.ac.uk
traceroute to www.lancaster.ac.uk (148.88.65.80), 30 hops max, 60 byte packets
 1 cseruter1-server.cse.unsw.EDU.AU (129.94.242.251)  0.164 ms  0.158 ms  0.149 ms
 2 129.94.39.17 (129.94.39.17)  0.952 ms  0.988 ms  0.948 ms
 3 libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.796 ms  1.813 ms  1.846 ms
 4 ombcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.166 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.173 ms  1.184 ms
 5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.179 ms unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.417 ms unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.175 ms
 6 138.44.5.0 (138.44.5.0)  1.428 ms  1.285 ms  1.288 ms
 7 et-2-0-5.bdr1.sing.sin.aarnet.net.au (113.197.15.233)  92.628 ms  92.788 ms  92.698 ms
 8 138.44.226.7 (138.44.226.7)  255.865 ms  255.826 ms  255.762 ms
 9 janet-gw.mx1.lon.uk.geant.net (62.40.124.198)  256.200 ms  256.199 ms  256.178 ms
10 ae29.londpg-sbr2.ja.net (146.97.33.2)  256.400 ms  256.377 ms  256.454 ms
11 ae31.erdis-sbr2.ja.net (146.97.33.22)  260.358 ms  260.311 ms  260.280 ms
12 ae29.manckh-sbr2.ja.net (146.97.33.42)  262.258 ms  262.919 ms  262.800 ms
13 ae25.manckh-ban1.ja.net (146.97.35.50)  261.995 ms  262.152 ms  262.005 ms
14 lancaster-uni.ja.net (146.97.40.178)  279.791 ms  279.514 ms  279.439 ms
15 * * *
16 * * *
17 * * *
```

```
7 et-2-0-5.bdr1.sing.sin.aarnet.net.au (113.197.15.233)  92.628 ms  92.788 ms  92.698 ms
8 138.44.226.7 (138.44.226.7)  255.865 ms  255.826 ms  255.762 ms
9 janet-gw.mx1.lon.uk.geant.net (62.40.124.198)  256.200 ms  256.199 ms  256.178 ms
10 ae29.londpg-sbr2.ja.net (146.97.33.2)  256.400 ms  256.377 ms  256.454 ms
11 ae31.erdis-sbr2.ja.net (146.97.33.22)  260.358 ms  260.311 ms  260.280 ms
12 ae29.manckh-sbr2.ja.net (146.97.33.42)  262.258 ms  262.919 ms  262.800 ms
13 ae25.manckh-ban1.ja.net (146.97.35.50)  261.995 ms  262.152 ms  262.005 ms
14 lancaster-uni.ja.net (146.97.40.178)  279.791 ms  279.514 ms  279.439 ms
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *
```

The router is 138.44.5.0.

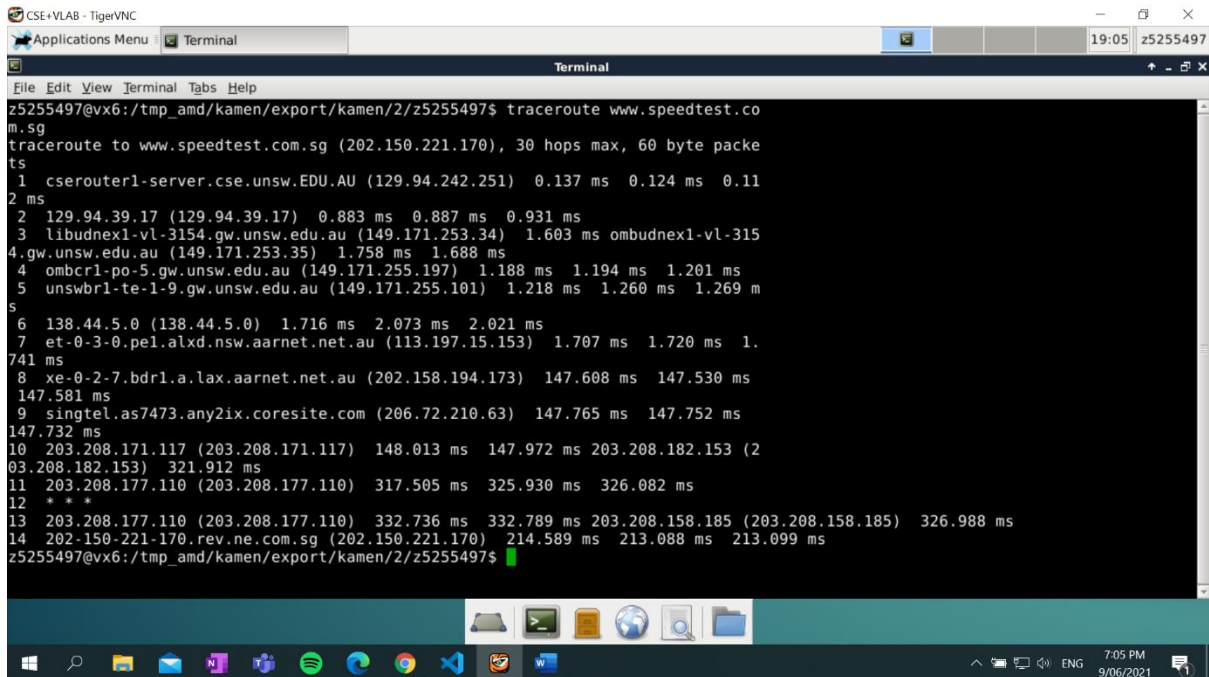
The router is at Australian Academic and Research Network, Building 9, Banks Street.

Website	Physical distance	Hops	Ratio (Approximately)
www.ucla.edu	13284 km	14	949
www.u-tokyo.ac.jp	8945 km	15	596
www.lancaster.ac.uk	15329 km	14	1095

The number of hops on each path is not proportional to the physical distance.

Exercise 3.3:

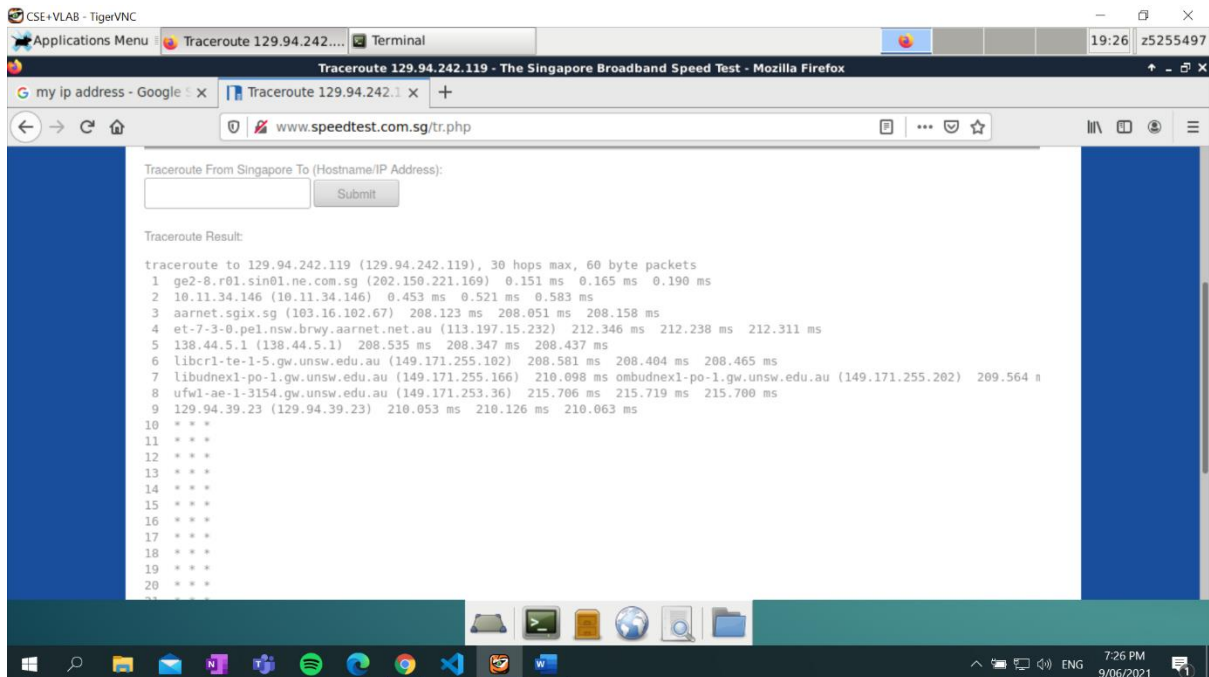
To www.speedtest.com.sg:



A screenshot of a terminal window titled "Terminal" within a TigerVNC session. The terminal shows the command `traceroute www.speedtest.com.sg` and its output. The output displays the path from the source to the destination, including hop numbers, IP addresses, and round-trip times in milliseconds. The path starts at `cserouter1-server.cse.unsw.EDU.AU` and ends at `202-150-221-170.rev.ne.com.sg`. The terminal window has a menu bar with "File", "Edit", "View", "Terminal", and "Tabs", and a status bar at the bottom showing the time as 7:05 PM on 9/06/2021.

```
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$ 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)  0.137 ms  0.124 ms  0.112 ms
 2  129.94.39.17 (129.94.39.17)  0.883 ms  0.887 ms  0.931 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.603 ms  ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.758 ms  1.688 ms
 4  ombcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.188 ms  1.194 ms  1.201 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.218 ms  1.260 ms  1.269 ms
 6  138.44.5.0 (138.44.5.0)  1.716 ms  2.073 ms  2.021 ms
 7  et-0-3-0.pe1.alxd.nsw.aarnet.net.au (113.197.15.153)  1.707 ms  1.720 ms  1.741 ms
 8  xe-0-2-7.bdr1.a.lax.aarnet.net.au (202.158.194.173)  147.608 ms  147.530 ms  147.581 ms
 9  singtel.as7473.any2ix.coresite.com (206.72.210.63)  147.765 ms  147.752 ms  147.732 ms
10  203.208.171.117 (203.208.171.117)  148.013 ms  147.972 ms  203.208.182.153 (203.208.182.153)  321.912 ms
11  203.208.177.110 (203.208.177.110)  317.505 ms  325.930 ms  326.082 ms
12  * * *
13  203.208.177.110 (203.208.177.110)  332.736 ms  332.789 ms  203.208.158.185 (203.208.158.185)  326.988 ms
14  202-150-221-170.rev.ne.com.sg (202.150.221.170)  214.589 ms  213.088 ms  213.099 ms
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$
```

From www.speedtest.com.sg:



A screenshot of a web browser window titled "Traceroute 129.94.242.119 - The Singapore Broadband Speed Test - Mozilla Firefox". The browser shows the URL `www.speedtest.com.sg/tr.php` and the traceroute result. The result displays the path from Singapore to the destination, including hop numbers, IP addresses, and round-trip times in milliseconds. The path starts at `ge2-8-r01.sin01.ne.com.sg` and ends at `129.94.39.23`. The browser window has a menu bar with "File", "Edit", "View", "Terminal", and "Tabs", and a status bar at the bottom showing the time as 7:26 PM on 9/06/2021.

```
Traceroute From Singapore To (Hostname/IP Address):
Traceroute Result:
traceroute to 129.94.242.119 (129.94.242.119), 30 hops max, 60 byte packets
 1  ge2-8-r01.sin01.ne.com.sg (202.150.221.169)  0.151 ms  0.165 ms  0.190 ms
 2  10.11.34.146 (10.11.34.146)  0.453 ms  0.521 ms  0.583 ms
 3  aarnet.sgix.sg (103.16.102.67)  208.123 ms  208.051 ms  208.158 ms
 4  et-7-3-0.pe1.nsw.brwy.aarnet.net.au (113.197.15.232)  212.346 ms  212.238 ms  212.311 ms
 5  138.44.5.1 (138.44.5.1)  208.535 ms  208.347 ms  208.437 ms
 6  libcr1-te-1-5.gw.unsw.edu.au (149.171.255.102)  208.581 ms  208.404 ms  208.465 ms
 7  libudnex1-po-1.gw.unsw.edu.au (149.171.255.166)  210.098 ms  ombudnex1-po-1.gw.unsw.edu.au (149.171.255.202)  209.564 ms
 8  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  215.706 ms  215.719 ms  215.700 ms
 9  129.94.39.23 (129.94.39.23)  210.053 ms  210.126 ms  210.063 ms
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
```

To www.telstra.net:

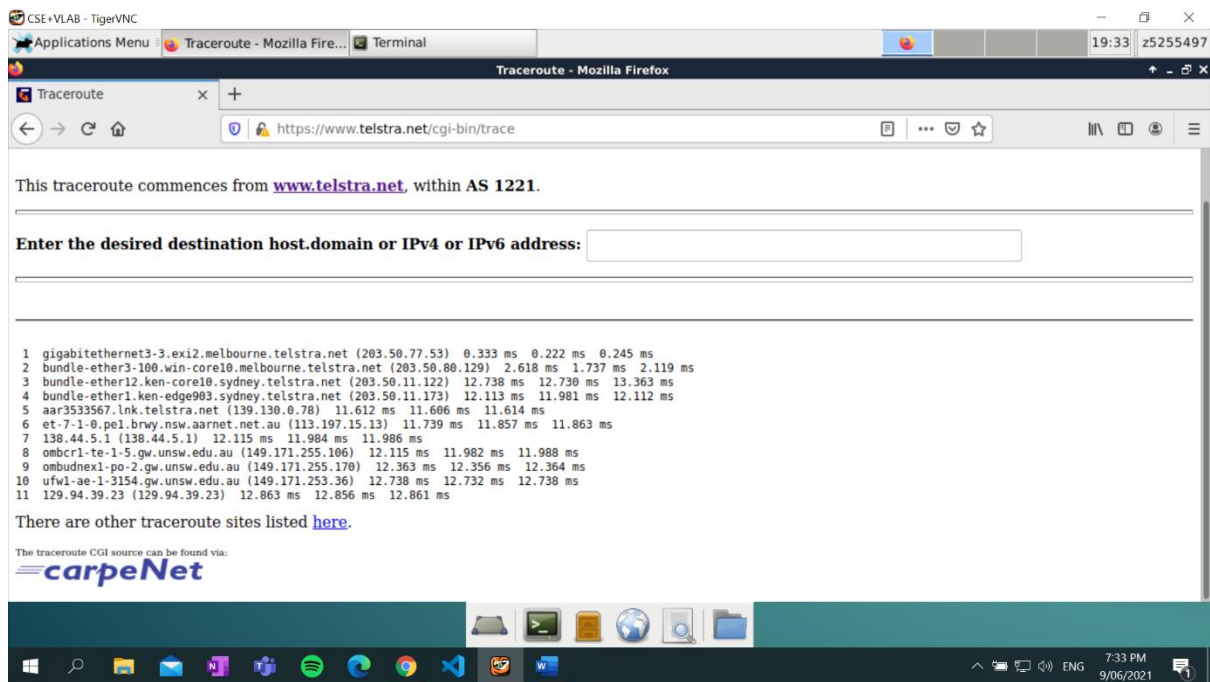

```
CSE+VLAB - TigerVNC
Applications Menu Traceroute 129.94.242... Terminal 19:28 z5255497

File Edit View Terminal Tabs Help
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$ 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) 0.076 ms 0.064 ms 0.08
 4 ms
 2 129.94.39.17 (129.94.39.17) 0.905 ms 0.910 ms 0.844 ms
 3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.702 ms 1.929 ms 1.645
 ms
 4 libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.319 ms libcr1-po-6.gw.unsw.e
 du.au (149.171.255.201) 1.257 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)
 1.174 ms
 5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 29.692 ms unswbr1-te-2-13.g
 w.unsw.edu.au (149.171.255.105) 29.766 ms unswbr1-te-1-9.gw.unsw.edu.au (149.17
 1.255.101) 29.678 ms
 6 138.44.5.0 (138.44.5.0) 1.392 ms 1.303 ms 1.302 ms
 7 et-1-1-0.pe1.rsby.nsw.aarnet.net.au (113.197.15.12) 1.710 ms 2.059 ms 2.2
 09 ms
 8 xe-0-0-3.bdr1.rsby.nsw.aarnet.net.au (113.197.15.31) 1.652 ms 1.649 ms 1.
 602 ms
 9 HundredGigE0-1-0-4.ken-edge903.sydney.telstra.net (139.130.0.77) 2.443 ms
 2.451 ms 2.370 ms
10 bundle-ether2.chw-edge903.sydney.telstra.net (203.50.11.175) 2.561 ms bundl
 e-ether17.ken-core10.sydney.telstra.net (203.50.11.172) 2.170 ms bundle-ether2.
 chw-edge903.sydney.telstra.net (203.50.11.175) 2.490 ms
11 bundle-ether17.chw-core10.sydney.telstra.net (203.50.11.176) 4.097 ms 3.65
 0 ms bundle-ether10.win-core10.melbourne.telstra.net (203.50.11.123) 13.339 ms
12 bundle-ether8.exi-core10.melbourne.telstra.net (203.50.11.125) 16.089 ms 1
 6.077 ms bundle-ether1-2.exi-core10.melbourne.telstra.net (203.50.6.40) 14.807
 ms
```

```
CSE+VLAB - TigerVNC
Applications Menu Traceroute 129.94.242... Terminal 19:28 z5255497

File Edit View Terminal Tabs Help
 2 129.94.39.17 (129.94.39.17) 0.905 ms 0.910 ms 0.844 ms
 3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.702 ms 1.929 ms 1.645
 ms
 4 libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.319 ms libcr1-po-6.gw.unsw.e
 du.au (149.171.255.201) 1.257 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)
 1.174 ms
 5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 29.692 ms unswbr1-te-2-13.g
 w.unsw.edu.au (149.171.255.105) 29.766 ms unswbr1-te-1-9.gw.unsw.edu.au (149.17
 1.255.101) 29.678 ms
 6 138.44.5.0 (138.44.5.0) 1.392 ms 1.303 ms 1.302 ms
 7 et-1-1-0.pe1.rsby.nsw.aarnet.net.au (113.197.15.12) 1.710 ms 2.059 ms 2.2
 09 ms
 8 xe-0-0-3.bdr1.rsby.nsw.aarnet.net.au (113.197.15.31) 1.652 ms 1.649 ms 1.
 602 ms
 9 HundredGigE0-1-0-4.ken-edge903.sydney.telstra.net (139.130.0.77) 2.443 ms
 2.451 ms 2.370 ms
10 bundle-ether2.chw-edge903.sydney.telstra.net (203.50.11.175) 2.561 ms bundl
 e-ether17.ken-core10.sydney.telstra.net (203.50.11.172) 2.170 ms bundle-ether2.
 chw-edge903.sydney.telstra.net (203.50.11.175) 2.490 ms
11 bundle-ether17.chw-core10.sydney.telstra.net (203.50.11.176) 4.097 ms 3.65
 0 ms bundle-ether10.win-core10.melbourne.telstra.net (203.50.11.123) 13.339 ms
12 bundle-ether8.exi-core10.melbourne.telstra.net (203.50.11.125) 16.089 ms 1
 6.077 ms bundle-ether1-2.exi-core10.melbourne.telstra.net (203.50.6.40) 14.807
 ms
13 203.50.11.209 (203.50.11.209) 14.168 ms 14.210 ms 14.263 ms
14 www.telstra.net (203.50.5.178) 14.381 ms 13.551 ms 14.307 ms
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$
```

From www.telstra.net:



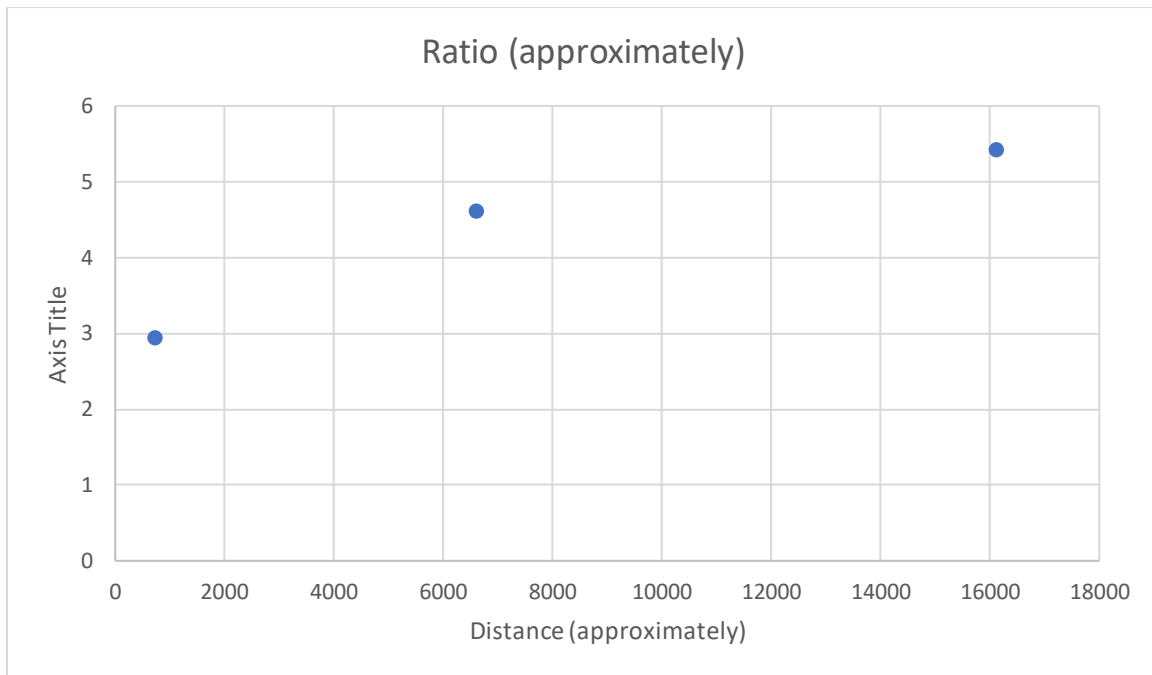
www.speedtest.com.sg (202.150.221.170).

www.telstra.net (203.50.5.178).

The reverse paths are different from the forward paths. For the common routers on the forward and reverse path, they have a different IP address, for example 129.94.39.17 and 129.94.39.23. This is because they are smaller port and are part of the larger router.

Exercise 4.1

Destination	Straight-line distance (approximately)	Shortest possible time (ms)	Actual minimum delay (ms)	Ratio (approximately)
UQ	735 km	$735 * 1000 / (3 * 10^8) * 1000 = 2.45$	17.000	$17.000 / 2.45 = 2.939$
UPM	6607 km	$6607 * 1000 / (3 * 10^8) * 1000 = 22.023$	101.584	$101.584 / 22.023 = 4.613$
TU-Berlin	16105 km	$16105 * 1000 / (3 * 10^8) * 1000 = 53.683$	291.290	$291.290 / 53.683 = 5.426$



1. The estimated distance is a straight-line distance, but the real network is not a straight line.
2. The transmission delay caused by push all packet's bits into the cable.

(Because the size of submission must less than 3MB, I included other plots in the folder)

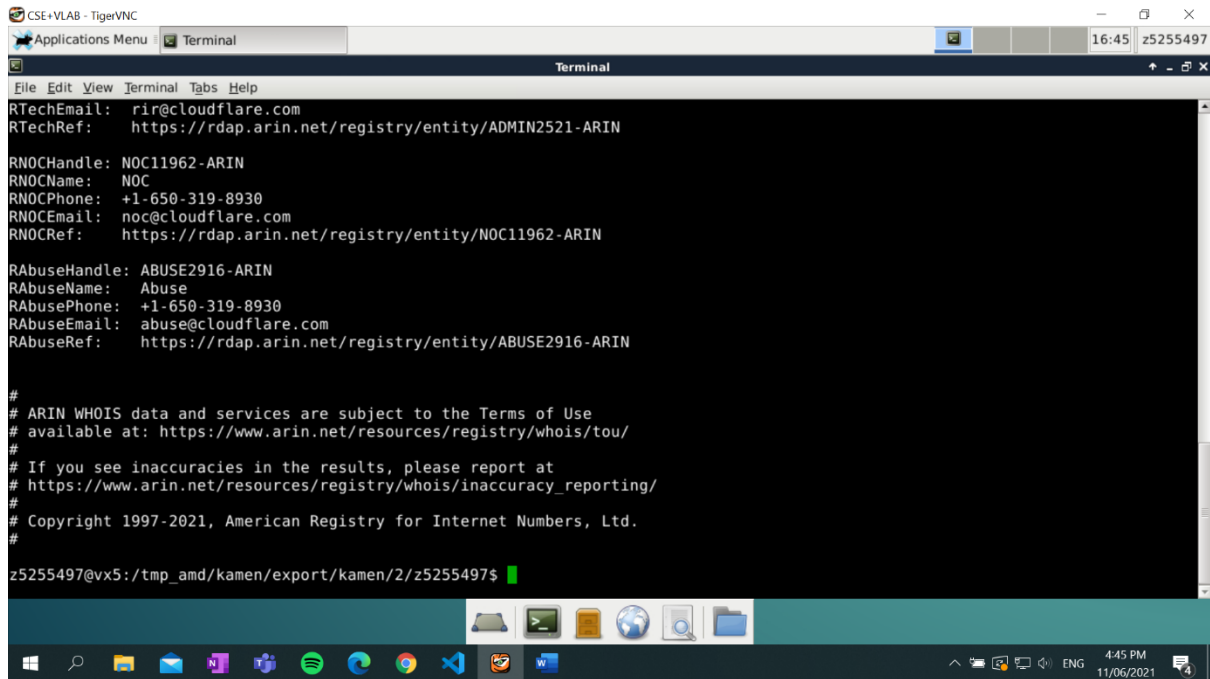
Exercise 4.2

It varies over time. This is because the nodal delay is the sum of processing delay, queueing delay, transmission delay and propagation delay, and the values of those delay vary over time.

Exercise 4.3

```
z5255497@vx5:/tmp_amd/kamen/export/kamen/2/z5255497$ whois 104.20.228.42
#
# ARIN WHOIS data and services are subject to the Terms of Use
# available at: https://www.arin.net/resources/registry/whois/tou/
#
# If you see inaccuracies in the results, please report at
# https://www.arin.net/resources/registry/whois/inaccuracy_reporting/
#
# Copyright 1997-2021, American Registry for Internet Numbers, Ltd.
#

NetRange: 104.16.0.0 - 104.31.255.255
CIDR: 104.16.0.0/12
NetName: CLOUDFLARENET
NetHandle: NET-104-16-0-1
Parent: NET104 (NET-104-0-0-0-0)
NetType: Direct Allocation
OriginAS: AS13335
Organization: Cloudflare, Inc. (CLOUD14)
RegDate: 2014-03-28
Updated: 2021-05-26
Comment: All Cloudflare abuse reporting can be done via https://www.cloudflare.com/abuse
Ref: https://rdap.arin.net/registry/ip/104.16.0.0
```



```
CSE+VLAB - TigerVNC
Applications Menu Terminal
16:45 z5255497

File Edit View Terminal Tabs Help
RTechEmail: rir@cloudflare.com
RTechRef: https://rdap.arin.net/registry/entity/ADMIN2521-ARIN

RNOCHandle: NOC11962-ARIN
RNOCHandle: NOC
RNOCHandle: +1-650-319-8930
RNOCHandle: noc@cloudflare.com
RNOCHandle: https://rdap.arin.net/registry/entity/NOC11962-ARIN

RAbuseHandle: ABUSE2916-ARIN
RAbuseHandle: Abuse
RAbuseHandle: +1-650-319-8930
RAbuseHandle: abuse@cloudflare.com
RAbuseHandle: https://rdap.arin.net/registry/entity/ABUSE2916-ARIN

#
# ARIN WHOIS data and services are subject to the Terms of Use
# available at: https://www.arin.net/resources/registry/whois/tou/
#
# If you see inaccuracies in the results, please report at
# https://www.arin.net/resources/registry/whois/inaccuracy_reporting/
#
# Copyright 1997-2021, American Registry for Internet Numbers, Ltd.
#

z5255497@vx5:/tmp_amd/kamen/export/kamen/2/z5255497$
```

No, it is hosted in United States. It is not in Switzerland.

Exercise 4.4

Only the transmission delay depends on the packet size. Propagation delay, queueing delay, processing delay are not affected by the packet size.