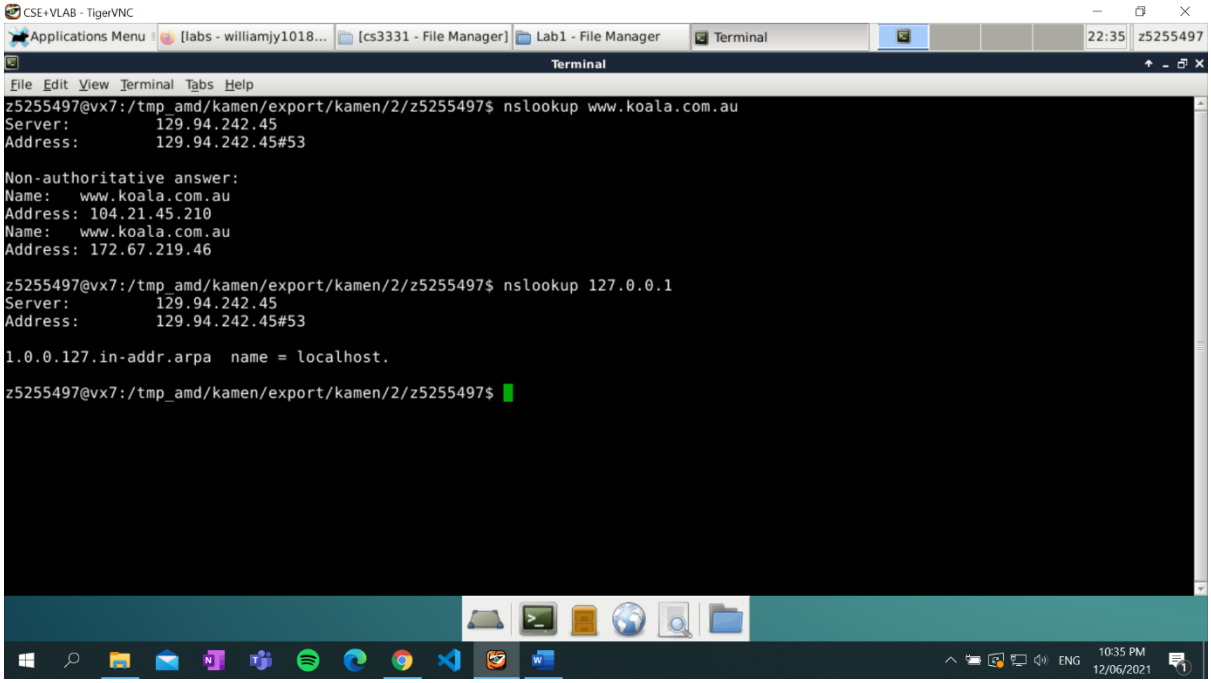
Exercise 1.1:

Address: 104.21.45.210

Address: 172.67.219.46

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



Exercise 1.2:

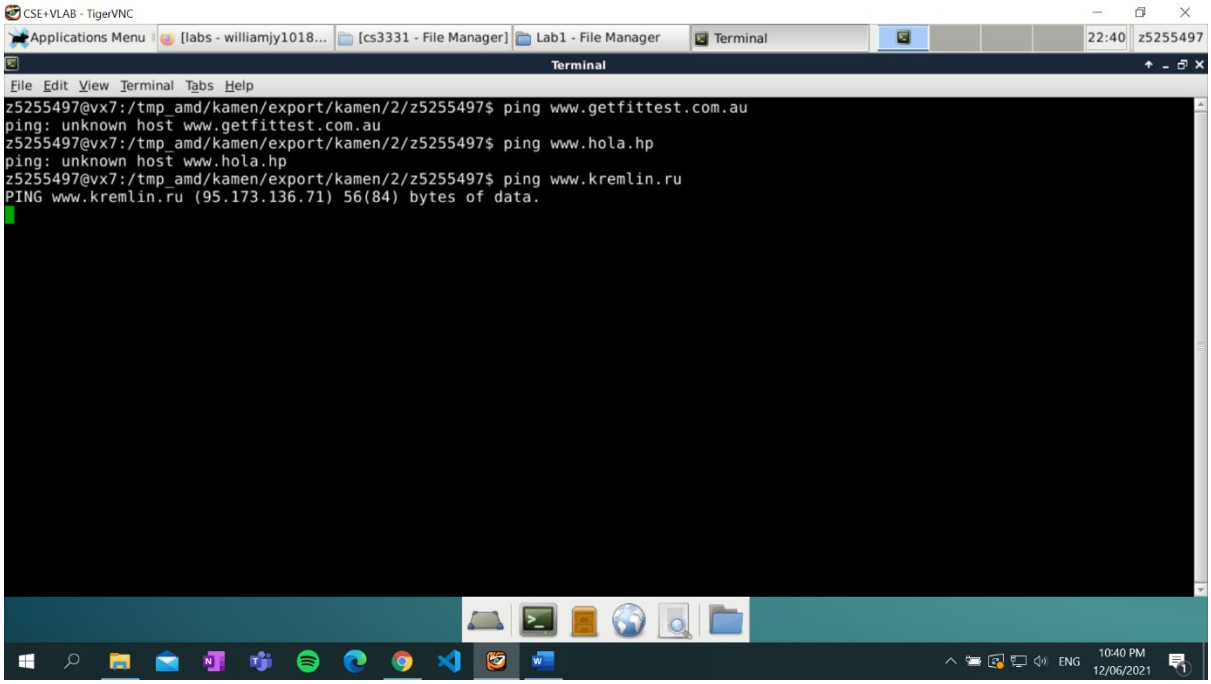
Localhost. It is special because send ping address to it is actually send to myself.

Exercise 2:

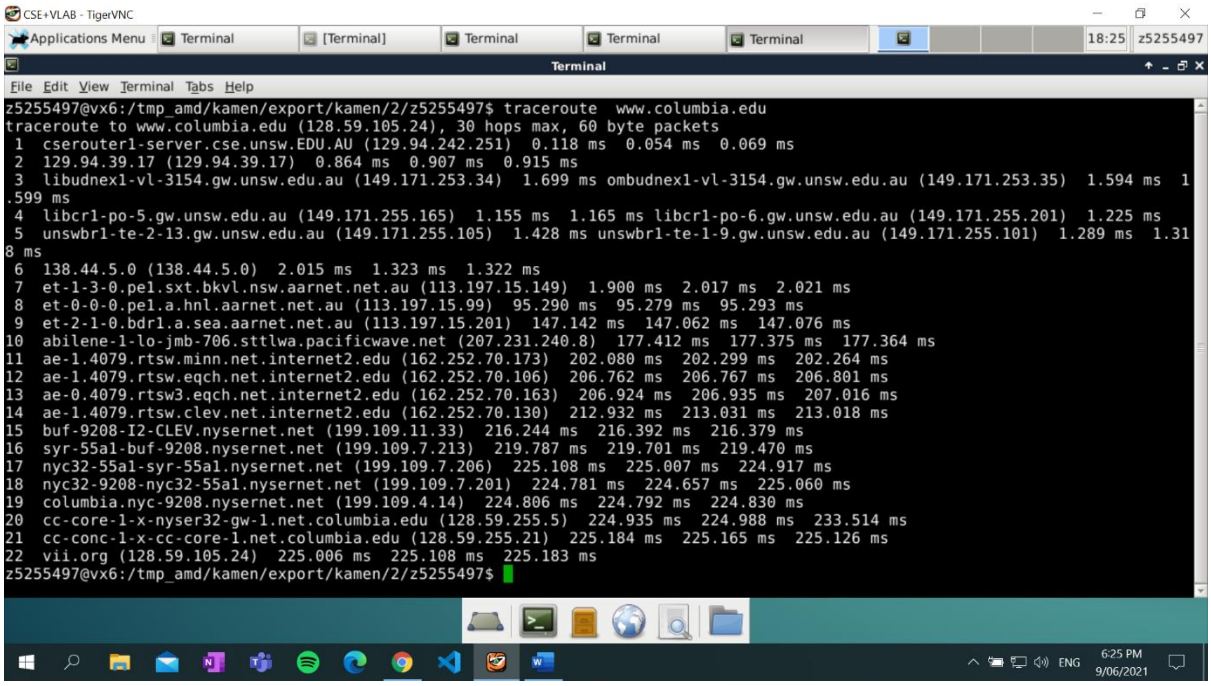
www.getfittest.com.au: Unreachable from the ping command and the web browser because the website is invalid.

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.



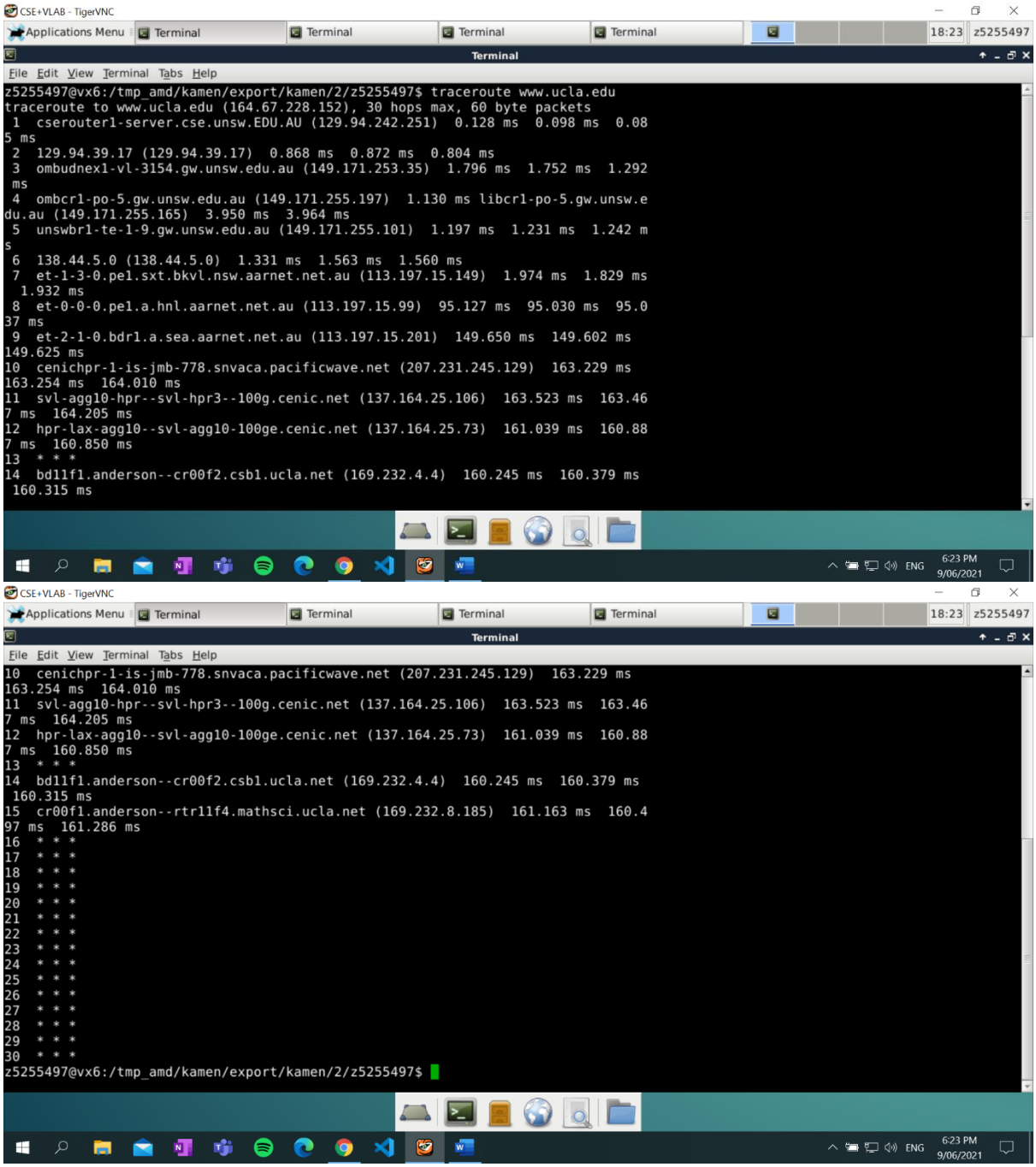
Exercise 3.1:



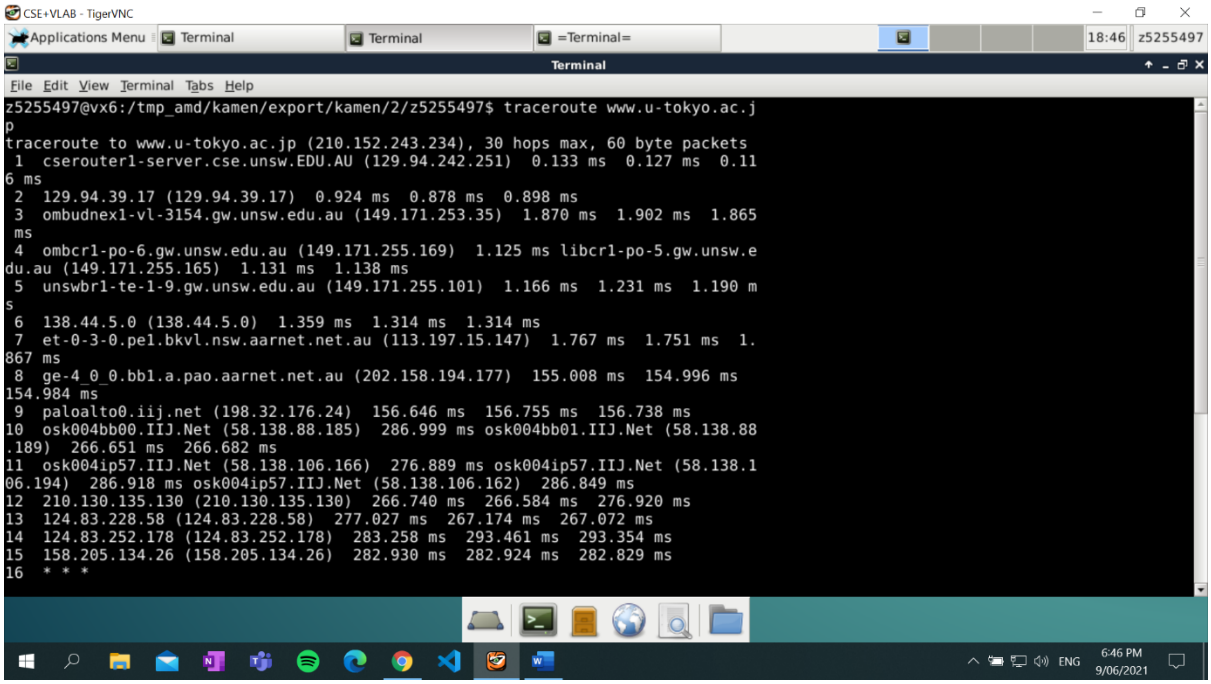
21 routers are between the workstation and www.columbia.edu. 4 routers along the path are part of the UNSW network. Between 7th and 9th routers the packets cross the Pacific Ocean.

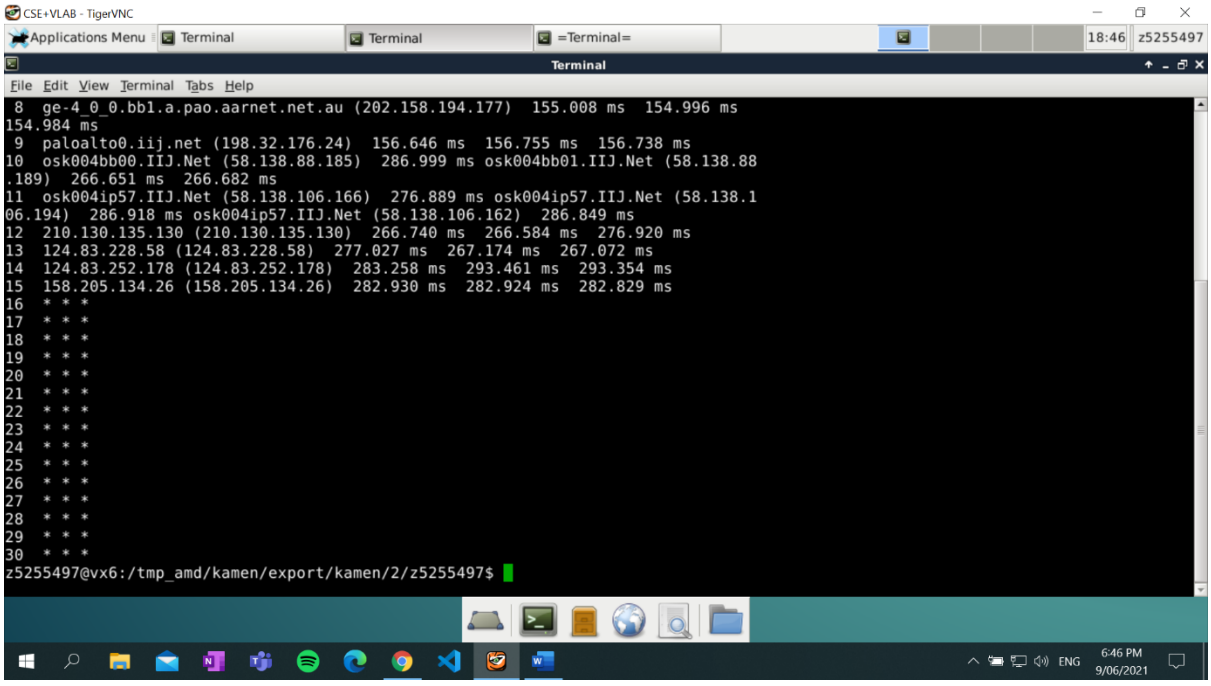
Exercise 3.2:

www.ucla.edu:

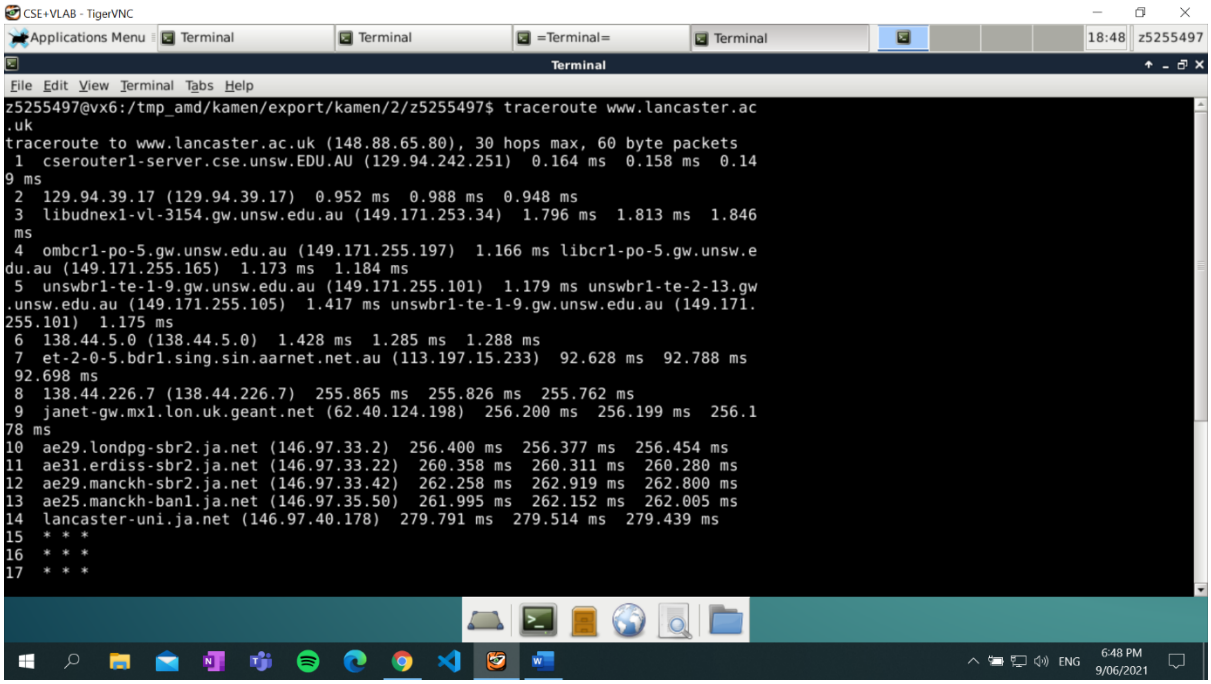


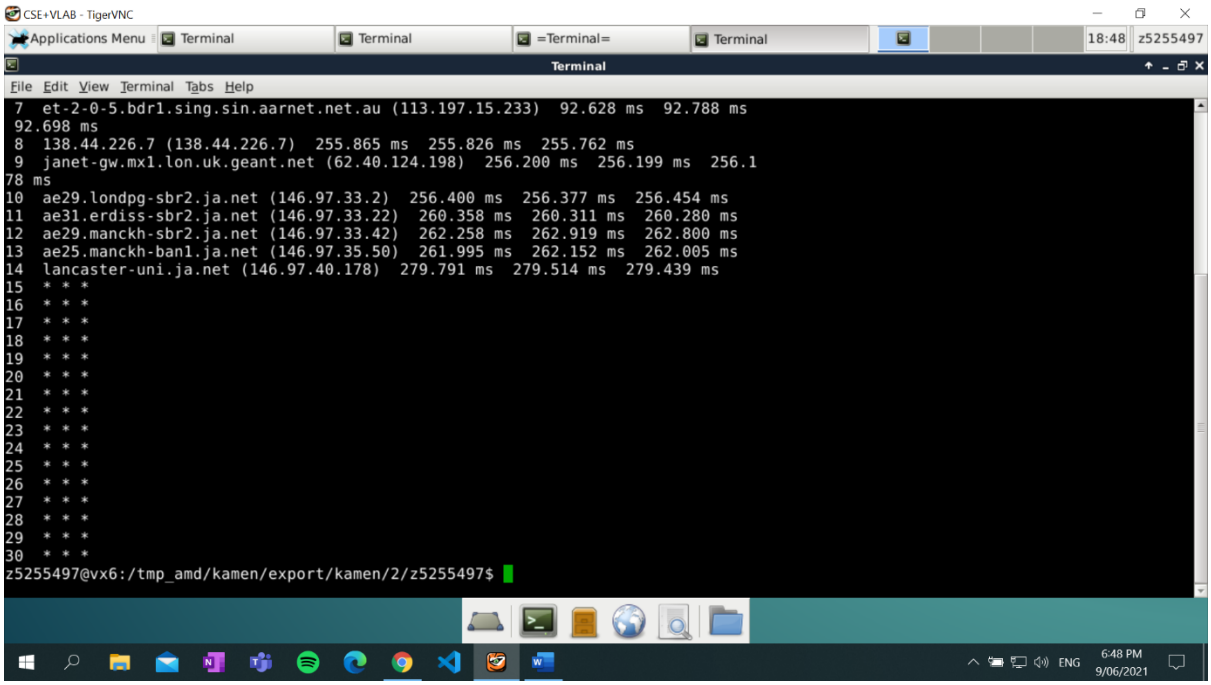
www.u-tokyo.ac.jp:


CSE+VLAB - TigerVNC
Applications Menu
Terminal
Terminal
=Terminal=
18:46
z5255497
Terminal
File Edit View Terminal Tabs Help
z5255497@vx6:/tmp_amd/kamen/export/kamen/2/z5255497$ traceroute www.u-tokyo.ac.j
p
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 0.11
6 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.e
du.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 m
s
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.iij.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 (58.138.1
06.194) 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 * * *
ENG
6:46 PM
9/06/2021


CSE+VLAB - TigerVNC
Applications Menu
Terminal
Terminal
=Terminal=
18:46
z5255497
Terminal
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.iij.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 (58.138.1
06.194) 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$
ENG
6:46 PM
9/06/2021

www.lancaster.ac.uk





The router is 138.44.5.0.

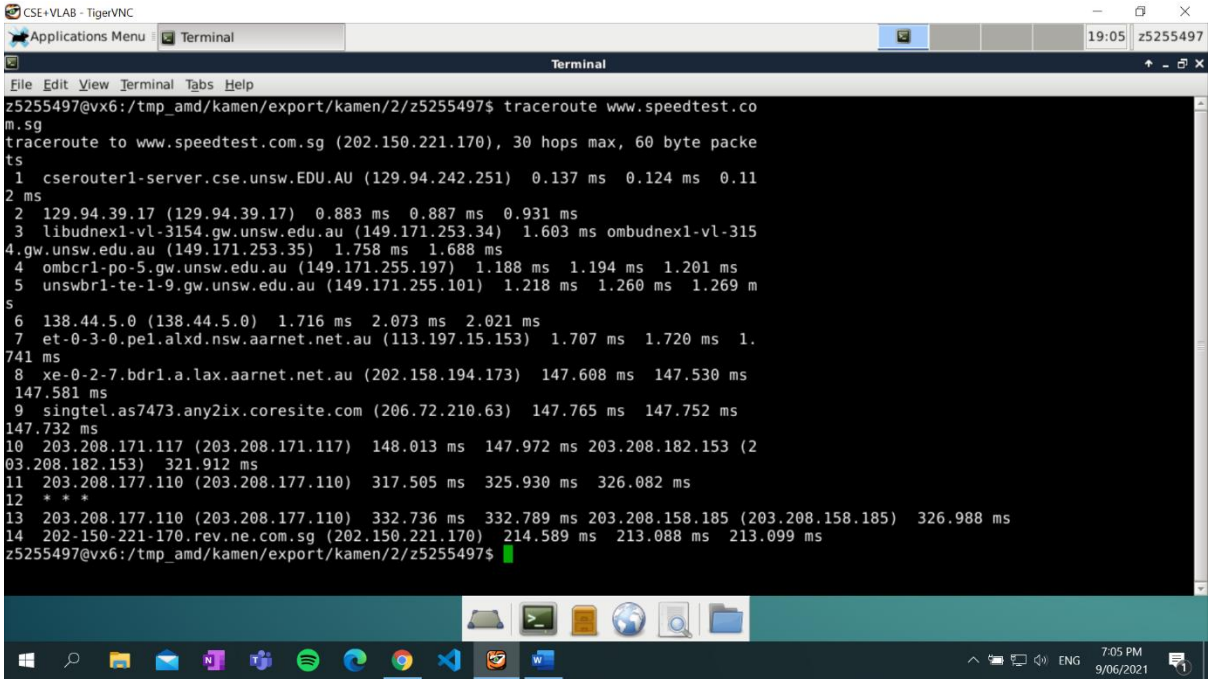
The router is at Australian Academic and Research Network, Building 9, Banks Street.

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

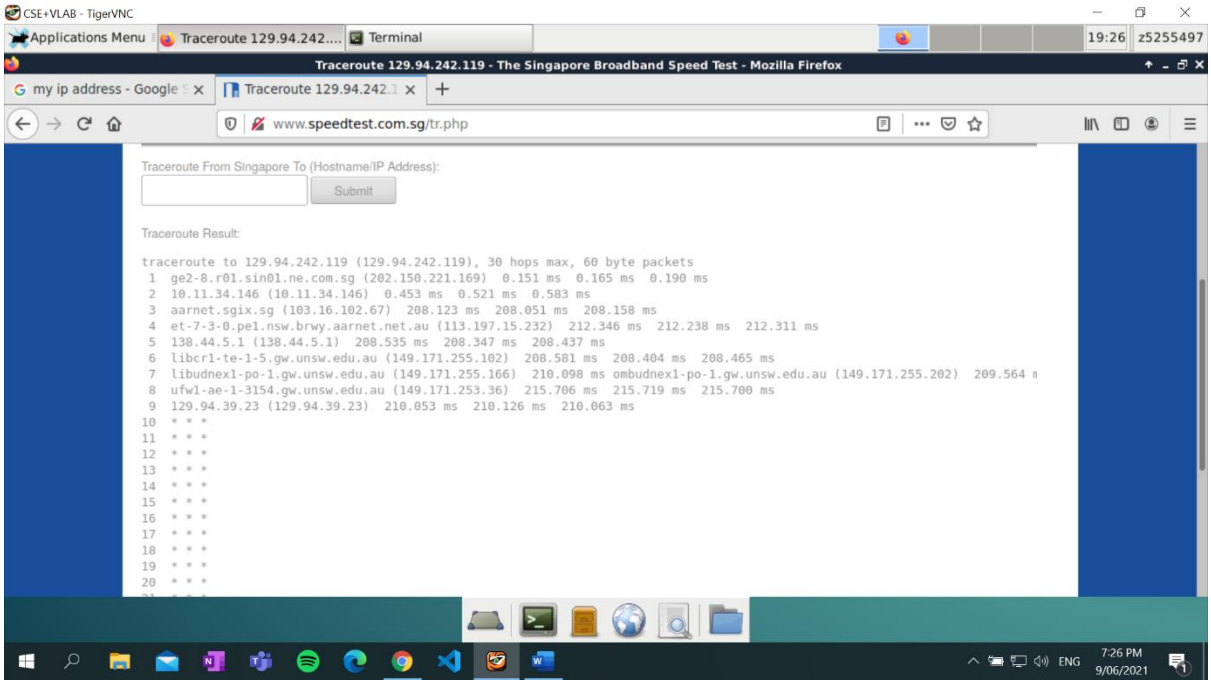
The number of hops on each path is not proportional to the physical distance.

Exercise 3.3:

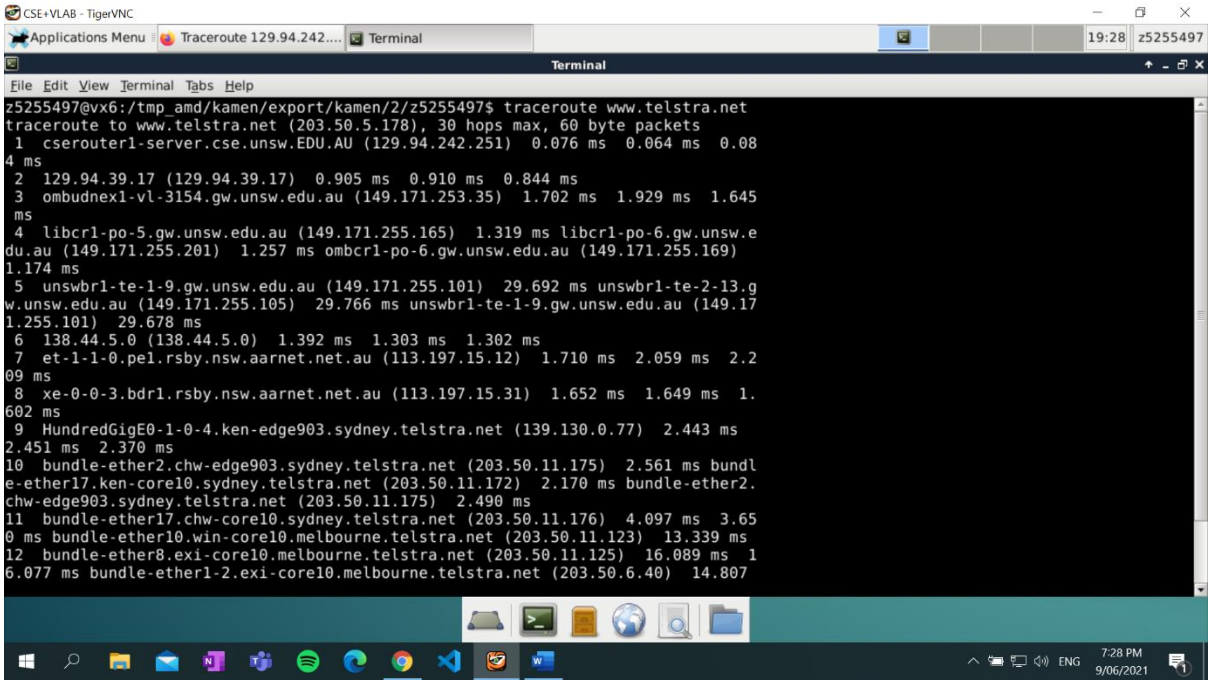
To www.speedtest.com.sg:

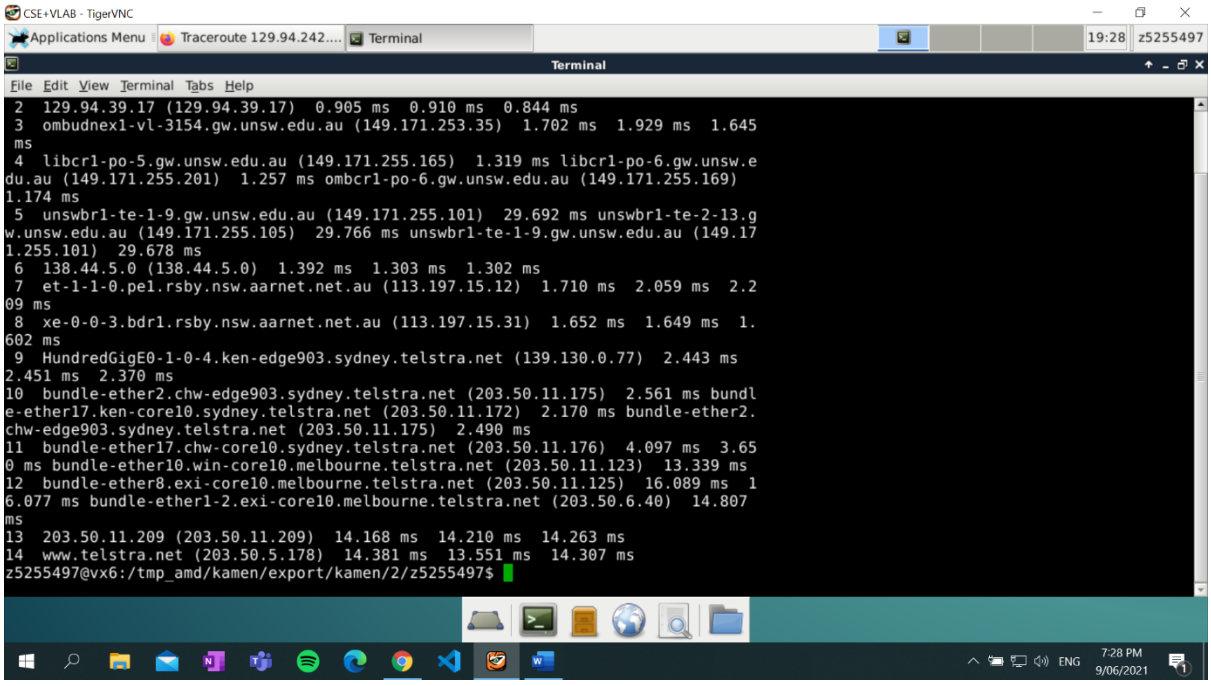


From www.speedtest.com.sg:

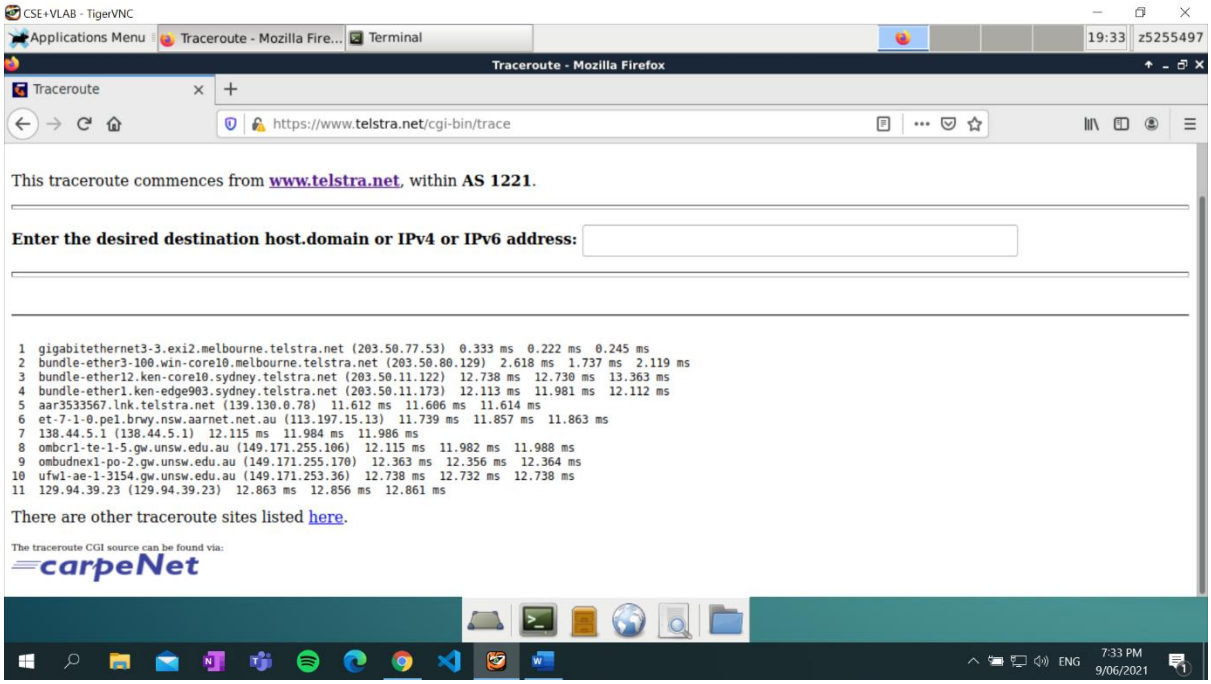


To www.telstra.net:





From www.telstra.net:



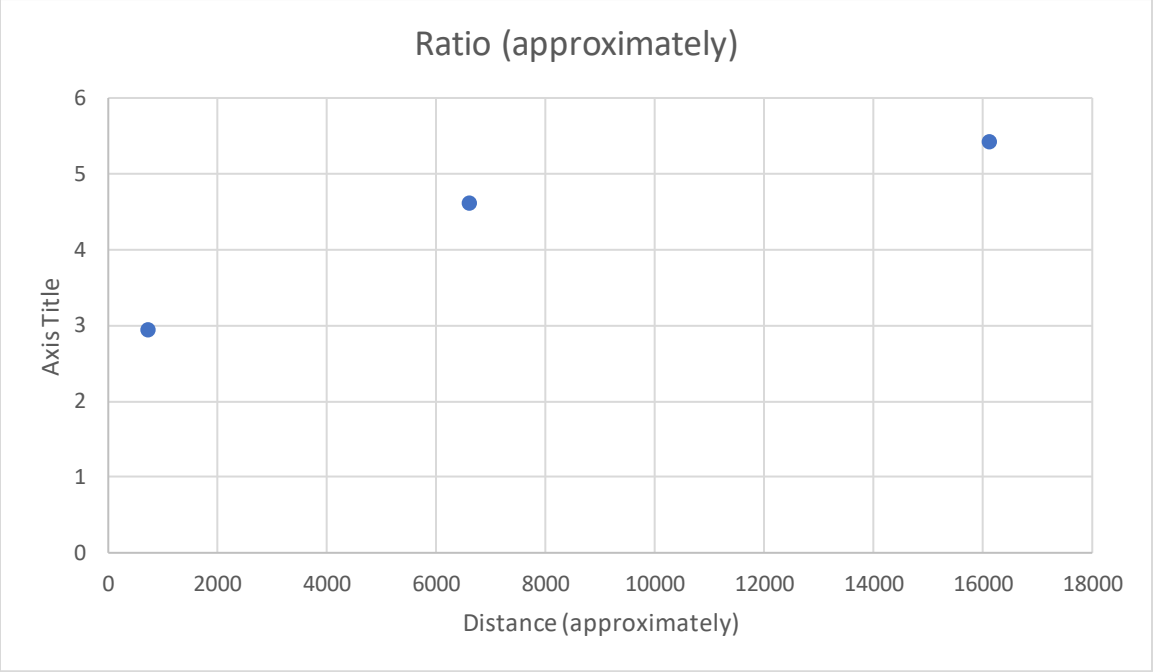
www.speedtest.com.sg (202.150.221.170).

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



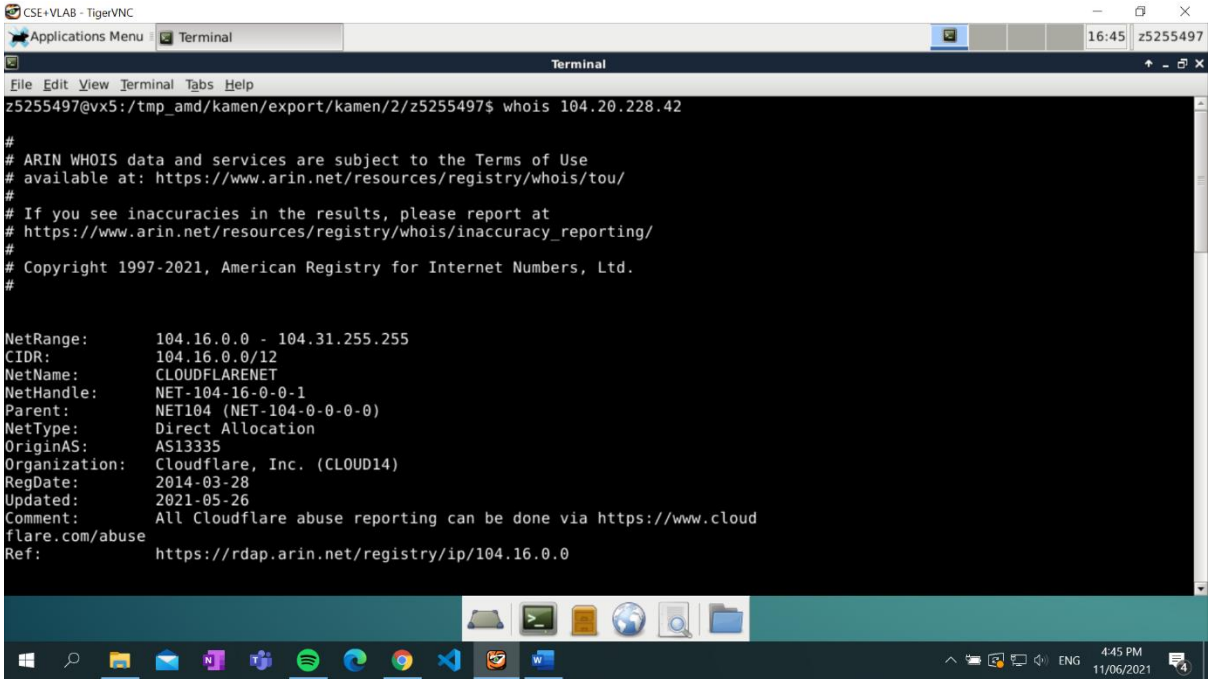
1. The estimated distance is a straight-line distance, but the real network is not a straight line.
2. The transmission delay caused by push all packet's bits into the cable.

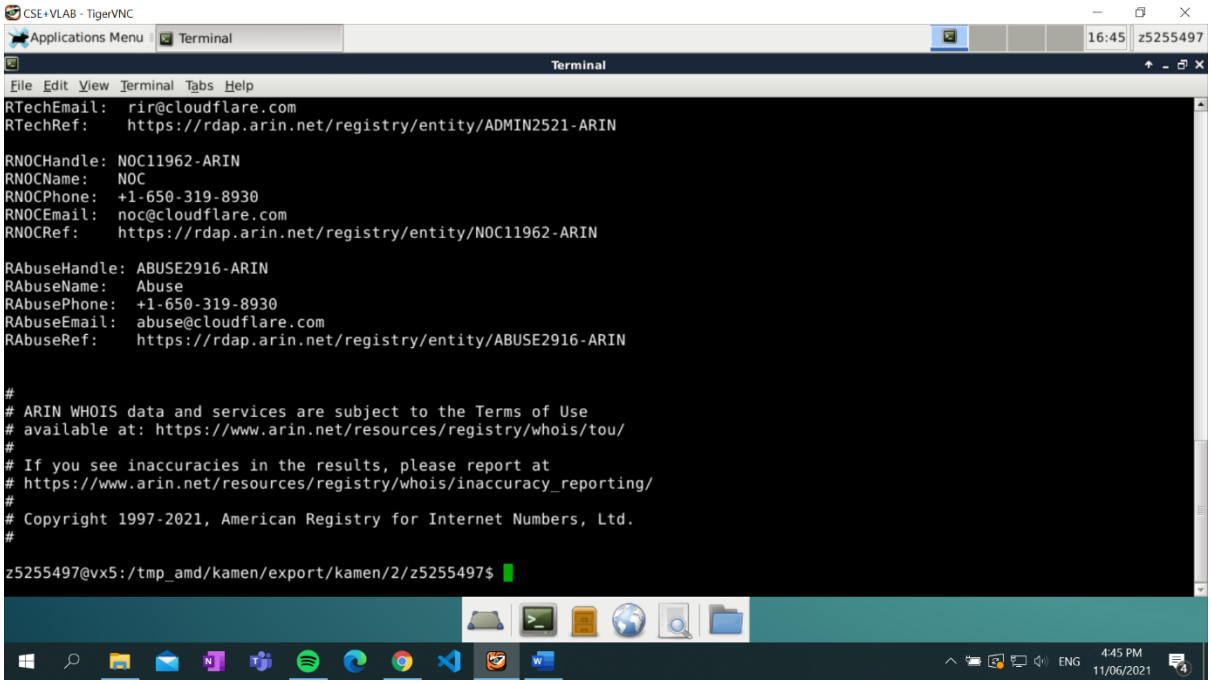
(Because the size of submission must less than 3MB, I included other plots in the folder)

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





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.