

## Exercise 2

Domain	Reachable Ping	Reachable Web	Why Not?
www.google.co.uk	Yes	Yes	N/A
www.columbia.edu	Yes	Yes	N/A
www.wikipedia.org	Yes	Yes	N/A
ec.ho	No	No	possibly due to nonexistence, being blocked, or DNS resolution issues.
hhh.gs	Yes	Yes	N/A
defence.gov.au	No	Yes	possibly due to firewall configurations or network policy issues.
yes.no	Yes	Yes	N/A
one.one.one.one	Yes	Yes	N/A
theguardian.com	Yes	Yes	N/A
xn—i-7iq.ws	Yes	Yes	N/A

## Exercise 3

```

z5504665@vx15:~$ traceroute usi.ch
traceroute to usi.ch (195.176.55.64), 30 hops max, 60 byte packets
 1 cserouter1-server.orchestra.cse.unsw.EDU.AU (129.94.242.251)  0.046 ms  0.052 ms  0.040 ms
 2 129.94.39.17 (129.94.39.17)  0.886 ms  0.855 ms  0.809 ms
 3 172.17.31.154 (172.17.31.154)  1.924 ms  1.567 ms  1.538 ms
 4 172.17.17.9 (172.17.17.9)  1.021 ms  1.044 ms  1.034 ms
 5 172.17.17.110 (172.17.17.110)  1.097 ms  1.203 ms  172.17.17.102 (172.17.17.102)  1.149 ms
 6 138.44.5.0 (138.44.5.0)  1.451 ms  1.322 ms  1.339 ms
 7 et-1-1-0.pe1.rsby.nsw.aarnet.net.au (113.197.15.12)  1.689 ms  1.533 ms  1.533 ms
 8 xe-1-1-0.pe1.eskp.nsw.aarnet.net.au (113.197.15.199)  2.988 ms  3.035 ms  2.854 ms
 9 * et-0-3-0.pe1.prka.sa.aarnet.net.au (113.197.15.42)  19.900 ms  19.982 ms
10 et-0-3-0.pe1.knsg.wa.aarnet.net.au (113.197.15.45)  46.001 ms  45.987 ms  46.021 ms
11 et-1_0_5.bdr1.sing.sin.aarnet.net.au (113.197.15.231)  92.348 ms  92.415 ms  92.405 ms
12 138.44.226.7 (138.44.226.7)  257.230 ms  257.130 ms  257.117 ms
13 ae2.mx1.lon2.uk.geant.net (62.40.98.65)  271.303 ms  271.321 ms  271.328 ms
14 ae8.mx1.par.fr.geant.net (62.40.98.107)  263.147 ms  263.192 ms  263.546 ms
15 ae7.mx1.gen.ch.geant.net (62.40.98.238)  270.428 ms  270.302 ms  270.899 ms
16 swic1-100ge-0-3-0-1.switch.ch (62.40.124.22)  270.799 ms  272.616 ms  272.263 ms
17 swilG2-400GE-0-0-0-0.switch.ch (130.59.38.70)  278.178 ms  276.019 ms  275.941 ms
18 swilG1-B1.switch.ch (130.59.36.77)  274.894 ms  274.745 ms  275.050 ms
19 lu-pop1-bkb02-100g-1-0-48.usi.ch (195.176.176.210)  274.662 ms  274.664 ms  275.149 ms
20 ma-pop1-dcFW01.net.ti-edu.ch (195.176.176.34)  274.955 ms  274.967 ms  275.355 ms
21 selenio.ti-edu.ch (195.176.55.64)  275.705 ms  275.554 ms  276.038 ms

```

1.

1) There are 20 routers between my workstation and usi.ch, cause the first one is local router. And first 6 routers belong to UNSW network, cause these 6 routers are passed through to all destinations.

2) The no.11 the domain name include sing, and the delay is much higher than before.

3) The no.13 cause the domain name include UK, and the delay is much higher than before 2.

```
25504665@vx15: $ traceroute jhu.edu
traceroute to jhu.edu (128.220.192.230), 30 hops max, 60 byte packets
 1 cserouter1-server.orchestra.cse.unsw.EDU.AU (129.94.242.251) 0.044 ms 0.085 ms 0.075 ms
 2 129.94.39.17 (129.94.39.17) 0.830 ms 0.847 ms 0.836 ms
 3 172.17.31.154 (172.17.31.154) 1.552 ms 2.040 ms 2.012 ms
 4 172.17.17.45 (172.17.17.45) 1.057 ms 172.17.17.9 (172.17.17.9) 1.111 ms 172.17.17.45 (172.17.17.45) 1.061 ms
 5 * * *
 6 138.44.5.0 (138.44.5.0) 1.365 ms 1.293 ms 1.305 ms
 7 et-0-3-0.pe1.bkv1.nsw.aarnet.net.au (113.197.15.147) 1.732 ms 3.760 ms 3.727 ms
 8 113.197.15.151 (113.197.15.151) 71.359 ms 71.363 ms 71.315 ms
 9 138.44.228.5 (138.44.228.5) 186.452 ms 186.211 ms 185.805 ms
10 fourhundredge-0-0-0-2.4079.core2.salt.net.internet2.edu (163.253.1.115) 244.113 ms 244.058 ms 244.054 ms
11 fourhundredge-0-0-0-0.4079.core2.denv.net.internet2.edu (163.253.1.168) 245.304 ms 245.322 ms 245.284 ms
12 fourhundredge-0-0-0-0.4079.core2.kans.net.internet2.edu (163.253.1.251) 245.014 ms 245.003 ms 245.096 ms
13 fourhundredge-0-0-0-0.4079.core1.chic.net.internet2.edu (163.253.2.28) 243.701 ms 243.468 ms 245.084 ms
14 fourhundredge-0-0-0-0.4079.core1.eqch.net.internet2.edu (163.253.1.207) 244.381 ms 243.850 ms 243.000 ms
15 fourhundredge-0-0-0-0.4079.core1.clev.net.internet2.edu (163.253.1.210) 243.654 ms 245.437 ms 244.835 ms
16 fourhundredge-0-0-0-3.4079.core1.ashb.net.internet2.edu (163.253.1.122) 244.764 ms 244.933 ms 244.929 ms
17 et-0-1-8-1275.ashb-core.maxgigapop.net (206.196.177.2) 243.990 ms 243.461 ms 242.366 ms
18 206.196.178.141 (206.196.178.141) 242.219 ms 242.174 ms 242.260 ms
19 addr16212925332.testippl.jhmi.edu (162.129.253.32) 242.494 ms 242.489 ms addr16212925394.testippl.jhmi.edu (162.129.253.94) 242.316 ms
20 162.129.255.245 (162.129.255.245) 244.596 ms 244.751 ms 244.622 ms
21 * * *
22 * * *
23 * * *
24 * * *
25 collaborate.johnshopkins.edu (128.220.192.230) 246.378 ms 246.223 ms 246.172 ms
```

```
25504665@vx15: $ traceroute usp.br
traceroute to usp.br (200.144.248.41), 30 hops max, 60 byte packets
 1 cserouter1-server.orchestra.cse.unsw.EDU.AU (129.94.242.251) 0.040 ms 0.056 ms 0.060 ms
 2 129.94.39.17 (129.94.39.17) 0.847 ms 0.786 ms 0.864 ms
 3 * * *
 4 172.17.17.9 (172.17.17.9) 1.200 ms 1.190 ms 1.153 ms
 5 172.17.17.102 (172.17.17.102) 1.209 ms 1.171 ms 172.17.17.110 (172.17.17.110) 1.151 ms
 6 138.44.5.0 (138.44.5.0) 17.189 ms 16.739 ms 16.696 ms
 7 et-1-1-0.pe1.mcqp.nsw.aarnet.net.au (113.197.15.4) 2.872 ms 2.770 ms 3.511 ms
 8 et-0-0-2.bdr1.guam.gum.aarnet.net.au (113.197.14.137) 71.681 ms 71.691 ms 71.681 ms
 9 138.44.228.5 (138.44.228.5) 185.117 ms 187.147 ms 185.118 ms
10 fourhundredge-0-0-0-19.4079.core2.losa.net.internet2.edu (163.253.1.47) 232.060 ms 232.026 ms fourhundredge-0-0-0-20.4079.core2.losa.net.internet2.edu (163.253.1.49) 231.996 ms
11 fourhundredge-0-0-0-0.4079.core2.elpa.net.internet2.edu (163.253.1.202) 231.500 ms 232.035 ms 232.123 ms
12 fourhundredge-0-0-0-21.4079.core1.elpa.net.internet2.edu (163.253.1.70) 233.172 ms fourhundredge-0-0-0-22.4079.core1.elpa.net.internet2.edu (163.253.1.72) 233.000 ms fourhundredge-0-0-0-21.4079.core1.elpa.net.internet2.edu (163.253.1.70) 233.103 ms
13 fourhundredge-0-0-0-23.4079.core1.hous.net.internet2.edu (163.253.1.62) 230.945 ms fourhundredge-0-0-0-0.4079.core1.hous.net.internet2.edu (163.253.2.39) 233.276 ms 233.240 ms
14 fourhundredge-0-0-0-0.4079.core1.houh.net.internet2.edu (163.253.2.24) 232.409 ms 232.519 ms 232.470 ms
15 fourhundredge-0-0-0-0.4079.core1.pens.net.internet2.edu (163.253.2.35) 232.486 ms 231.965 ms 232.417 ms
16 fourhundredge-0-0-0-0.4079.core1.jack.net.internet2.edu (163.253.1.0) 233.585 ms 232.800 ms 231.298 ms
17 64.57.28.62 (64.57.28.62) 236.716 ms 236.834 ms 237.249 ms
18 mia2-mia1.bkb.rnp.br (200.143.252.26) 237.227 ms 237.009 ms 237.230 ms
19 cce2-mia2-monet.bkb.rnp.br (170.79.213.46) 301.438 ms 301.335 ms 301.494 ms
20 sp2-cce2-tisparkle.bkb.rnp.br (170.79.213.3) 341.579 ms 343.587 ms 341.670 ms
21 as28571.saopaulo.sp.ix.br (187.16.220.3) 344.835 ms 344.879 ms 344.940 ms
22 e72361-sp2-r06-nx-swc.uspnet.usp.br (143.107.249.38) 345.119 ms 345.193 ms 344.922 ms
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *
```

```

25504665@vx15:~$ traceroute ed.ac.uk
traceroute to ed.ac.uk (129.215.97.66), 30 hops max, 60 byte packets
 1 cserouter1-server.orchestra.cse.unsw.EDU.AU (129.94.242.251) 0.050 ms 0.052 ms 0.057 ms
 2 129.94.39.17 (129.94.39.17) 0.842 ms 0.855 ms 0.889 ms
 3 172.17.31.154 (172.17.31.154) 1.529 ms 1.932 ms 1.910 ms
 4 172.17.17.45 (172.17.17.45) 1.045 ms 172.17.17.9 (172.17.17.9) 1.014 ms 1.062 ms
 5 172.17.17.102 (172.17.17.102) 1.167 ms 172.17.17.110 (172.17.17.110) 1.221 ms 172.17.17.102 (172.17.17.102) 1.224 ms
 6 138.44.5.0 (138.44.5.0) 1.758 ms 1.368 ms 1.367 ms
 7 et-1-1-0.pe1.mcqp.nsw.aarnet.net.au (113.197.15.4) 1.786 ms 1.681 ms 1.816 ms
 8 et-0-3-0.pe1.eskp.nsw.aarnet.net.au (113.197.15.3) 3.234 ms 3.147 ms 3.023 ms
 9 et-0-3-0.pe1.prka.sa.aarnet.net.au (113.197.15.42) 19.919 ms 20.167 ms 20.201 ms
10 et-0-3-0.pe1.knsg.wa.aarnet.net.au (113.197.15.45) 46.596 ms 46.166 ms 46.267 ms
11 et-1_0_5.bdr1.sing.sin.aarnet.net.au (113.197.15.231) 92.547 ms 92.555 ms 92.566 ms
12 138.44.226.7 (138.44.226.7) 290.794 ms 290.739 ms 290.749 ms
13 ae2.mx1.lon2.uk.geant.net (62.40.98.65) 256.994 ms 256.965 ms 256.839 ms
14 janet-bckp-gw.mx1.lon2.uk.geant.net (62.40.125.58) 257.516 ms 257.596 ms 257.644 ms
15 ae31.erdiss-sbr2.ja.net (146.97.33.22) 261.565 ms 261.527 ms 261.580 ms
16 ae29.manckh-sbr2.ja.net (146.97.33.42) 263.123 ms 263.319 ms 263.319 ms
17 ae31.glasss-sbr1.ja.net (146.97.33.54) 271.282 ms 267.786 ms 267.725 ms
18 ae29.edinat-rbr2.ja.net (146.97.38.38) 268.939 ms 268.800 ms 268.916 ms
19 ae25.edinkb-rbr2.ja.net (146.97.74.34) 269.130 ms 275.564 ms 269.870 ms
20 university-of-edinburgh.ja.net (146.97.156.78) 269.668 ms 269.483 ms 269.526 ms
21 remote.net.ed.ac.uk (192.41.103.209) 269.148 ms 269.104 ms 269.115 ms
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *

```

1)The no.6, and here are the further detail below:

```

% Information related to '138.44.5.0/24AS7575'

route:      138.44.5.0/24
origin:     AS7575
descr:      Australian Academic and Research Network
            Building 9
            Banks Street
mnt-by:     MAINT-AARNET-AP
last-modified: 2019-04-03T03:55:51Z
source:     APNIC

% This query was served by the APNIC Whois Service version 1.88.25 (WHOIS-AU2)

```

2)No, it is not.

Traceroute to ed.ac.uk, the ip geo location of destination is

 <b>IP:</b> 192.41.103.209	 <b>COUNTRY:</b> United Kingdom of Great Britain and Northern Ireland	 <b>COUNTRY ISO:</b> GB
 <b>STATE:</b> Scotland	 <b>CITY:</b> Edinburgh	 <b>POSTAL CODE:</b> EH2
 <b>LATITUDE:</b> 55.9520	 <b>LONGITUDE:</b> -3.1964	
 <b>ORGANIZATION:</b> The University of Edinburgh		
 <b>ISP:</b> The University of Edinburgh		
 <a href="#">view map</a>		

distance:16857km

hops:21

Traceroute to jnu.edu, the ip geo location of destination is

 **IP:** 128.220.192.230

 **COUNTRY:** United States of America

 **COUNTRY ISO:** US


 **STATE:** Maryland

 **CITY:** Baltimore

 **POSTAL CODE:** 21218

 **LATITUDE:** 39.3284

 **LONGITUDE:** -76.6020

 **ORGANIZATION:** Johns Hopkins University

 **ISP:** Johns Hopkins University

 [view map](#)

distance:15767km

hops:25


Traceroute to usp.br, the ip geo location of destination is

 **IP:** 143.107.249.38


 **COUNTRY:** Brazil


 **COUNTRY ISO:** BR


 **STATE:** Sao Paulo

 **CITY:** Sao Paulo

 **POSTAL CODE:** 05508-000

 **LATITUDE:** -23.5471

 **LONGITUDE:** -46.6371

 **ORGANIZATION:** Universidade de Sao Paulo

 **ISP:** Universidade de Sao Paulo

 [view map](#)

distance:13346km

hops:22

We can see the number of hops on each path is not proportional to the physical distance.

3.

1)

domain:www.as13030.net

domain:www.net.princeton.edu

address:213.144.137.198

address:128.112.128.55

```

z5504665@vx12:~$ nslookup www.as13030.net
Server:      129.94.242.2
Address:     129.94.242.2#53

Non-authoritative answer:
www.as13030.net canonical name = as13030.net.
Name:   as13030.net
Address: 213.144.137.198
Name:   as13030.net
Address: 2001:1620:2777:1a::2

z5504665@vx12:~$ nslookup www.net.princeton.edu
Server:      129.94.242.2
Address:     129.94.242.2#53

Non-authoritative answer:
Name:   www.net.princeton.edu
Address: 128.112.128.55
    
```

2)

domain: www.as13030.net

hops of reverse path:

CSE+VLAB - TigerVNC

Applications: Init7 - AS13030 — Mozilla... z5504665@vx12: ~

Init7 - AS13030 — Mozilla Firefox Traceroute

https://www.as13030.net/traceroute.php

# Init7

Info Tools

Looking Glass

IP Address Test

Traceroute

Traceroute, Tracert, Trace oder Tracepath meint immer das selbe: nämlich die Anzeige des "Wegs" von Datenpaketen durch das Internet. Dabei "hängelt" sich das Traceroute-Programm von Router zu Router, bis es schliesslich das Ziel (Target) erreicht.

Testen Sie den "Pfad" der Datenpakete von [www.init7.net](http://www.init7.net) zu Ihrem Computer. *Dies kann eine Weile dauern, haben Sie also bitte etwas Geduld.* Falls ab einem bestimmten Hop nur noch \* \* \* Sterne angezeigt werden, verhindert mutmasslich eine Firewall die weitere Anzeige.

### Traceroute Ausgabe

```
traceroute to 129.94.242.94 (129.94.242.94), 30 hops max, 60 byte packets
 1 r2win7.core.init7.net (213.144.137.193) [AS13030] 1.085 ms 1.344 ms 1.61
 2 rlwin1.core.init7.net (5.180.134.125) [AS13030] 0.901 ms 1.038 ms 1.314
 3 rlwin7.core.init7.net (5.180.134.122) [AS13030] 0.881 ms 1.172 ms 1.533
 4 rlwin9.core.init7.net (5.180.135.25) [AS13030] 0.830 ms 1.136 ms 1.425 r
 5 rlzrh10.core.init7.net (5.180.135.56) [AS13030] 1.256 ms 1.536 ms 1.849
 6 r1glb3.core.init7.net (5.180.135.59) [AS13030] 1.131 ms 1.205 ms 1.478 r
 7 r2zrh5.core.init7.net (5.180.135.69) [AS13030] 1.284 ms 1.557 ms 1.946 r
 8 r2zrh2.core.init7.net (5.180.135.232) [AS13030] 1.714 ms 1.964 ms 2.237
 9 r1fra3.core.init7.net (5.180.135.173) [AS13030] 7.053 ms 7.311 ms 7.701
10 xe-1-2-0.mpr1.fra4.de.above.net (80.81.194.26) [*] 6.398 ms 6.386 ms 6.4
11 ae12.cs1.fra6.de.eth.zayo.com (64.125.26.172) [*] 139.927 ms * *
12 * * ae2.cs1.ams17.nl.eth.zayo.com (64.125.29.59) [*] 139.814 ms
13 * * *
14 * * *
15 * * *
16 * * *
17 * * *
```

### Traceroute Ausgabe

```
14 * * *
15 * * *
16 * * *
17 * * *
18 ae2.cs1.sea1.us.eth.zayo.com (64.125.29.26) [*] 139.683 ms 141.219 ms 14
19 ae27.mpr1.sea1.us.zip.zayo.com (64.125.29.1) [*] 139.939 ms 139.920 ms 1
20 64.125.193.130.i223.above.net (64.125.193.130) [*] 152.151 ms 152.115 ms
21 et-10-0-5.170.pe1.brwy.nsw.aarnet.net.au (113.197.15.62) [AS7575] 279.522
22 138.44.5.1 (138.44.5.1) [AS7575] 279.622 ms 279.584 ms 279.617 ms
23 * * *
24 * * *
25 * * *
26 129.94.39.23 (129.94.39.23) [AS23859] 280.296 ms 280.278 ms 280.256 ms
27 * * *
28 * * *
29 * * *
30 * * *
```

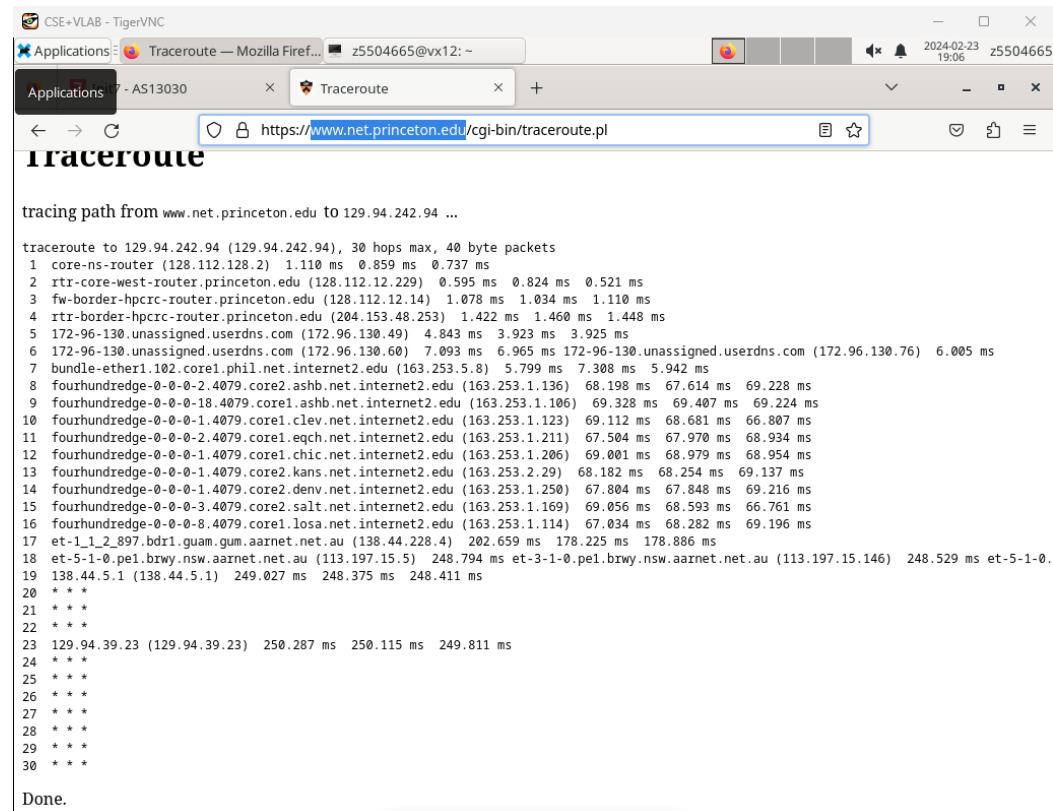
hops of forward path:

```
z5504665@vx12:~$ traceroute www.as13030.net
traceroute to www.as13030.net (213.144.137.198), 30 hops max, 60 byte packet
 1 cserouter1-server.orchestra.cse.unsw.EDU.AU (129.94.242.251) 0.042 ms 0.040 ms 0.040 ms
 2 129.94.39.17 (129.94.39.17) 0.849 ms 0.878 ms 0.835 ms
 3 172.17.31.154 (172.17.31.154) 1.777 ms 1.803 ms 2.040 ms
 4 172.17.17.45 (172.17.17.45) 1.247 ms 1.211 ms 172.17.17.9 (172.17.17.9) 1.096 ms
 5 172.17.17.102 (172.17.17.102) 22.140 ms 22.109 ms 172.17.17.110 (172.17.17.110) 22.188 ms
 6 138.44.5.0 (138.44.5.0) 1.381 ms 1.423 ms 1.429 ms
 7 et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147) 3.074 ms 3.321 ms 3.230 ms
 8 xe-0-2-5.bdr1.b.sea.aarnet.net.au (202.158.194.121) 142.288 ms 142.142.329 ms
 9 xe-4-1-1.mpr1.sea1.us.above.net (64.125.193.129) 140.869 ms 140.864 ms 140.655 ms
10 ae27.cs1.sea1.us.eth.zayo.com (64.125.29.0) 264.386 ms 264.490 ms
11 * * *
12 * * *
13 * * *
```

```
z5504665@vx12: ~
File Edit Tabs Help
10 ae27.cs1.sea1.us.eth.zayo.com (64.125.29.0) 264.386 ms 264.490 ms 264.499 ms
11 * * *
12 * * *
13 * * *
14 ae4.mpr1.lhr15.uk.zip.zayo.com (64.125.28.195) 262.941 ms 263.013 ms 263.101 ms
15 linx-1.init7.net (195.66.224.175) 263.775 ms 264.007 ms 264.277 ms
16 r2lon2.core.init7.net (5.180.135.248) 275.308 ms 278.285 ms 277.730 ms
17 r2fra3.core.init7.net (5.180.135.129) 275.034 ms 275.040 ms 275.122 ms
18 r1fra3.core.init7.net (80.81.192.67) 275.086 ms 274.996 ms 275.025 ms
19 r2zrh2.core.init7.net (5.180.135.172) 280.299 ms 280.380 ms 280.384 ms
20 r2zrh5.core.init7.net (5.180.135.233) 280.167 ms 280.224 ms 280.165 ms
21 r1glb3.core.init7.net (5.180.135.68) 280.633 ms 280.513 ms 280.499 ms
22 r1zrh10.core.init7.net (5.180.135.58) 281.020 ms 280.794 ms 280.819 ms
23 r1win9.core.init7.net (5.180.135.57) 280.732 ms 280.627 ms 280.599 ms
24 r1win7.core.init7.net (5.180.135.24) 280.787 ms 280.740 ms 280.960 ms
25 r1win1.core.init7.net (5.180.134.123) 280.809 ms 280.652 ms 280.715 ms
26 r2win7.core.init7.net (5.180.134.124) 280.919 ms 280.614 ms 280.702 ms
27 * * *
28 * * *
29 * * *
30 * * *
```

domain: www.net.princeton.edu

hops of reverse path:



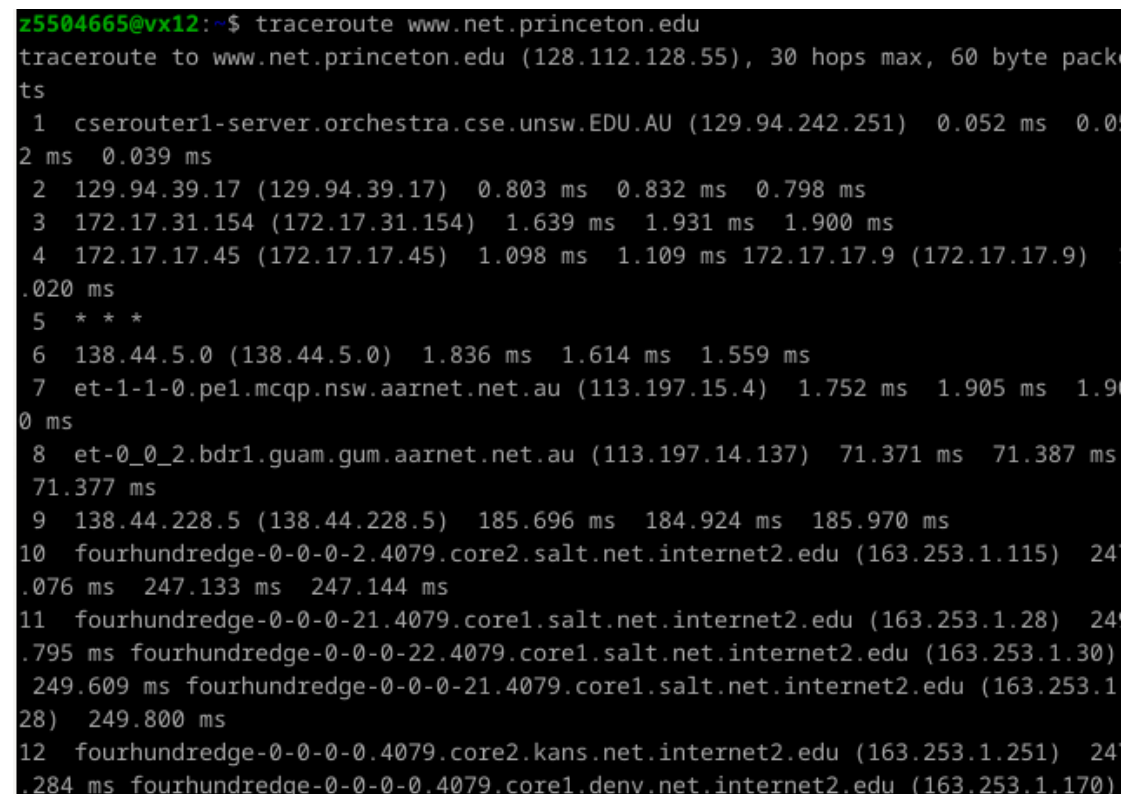
```
Traceroute

tracing path from www.net.princeton.edu to 129.94.242.94 ...

traceroute to 129.94.242.94 (129.94.242.94), 30 hops max, 40 byte packets
 1 core-ns-router (128.112.128.2)  1.110 ms  0.859 ms  0.737 ms
 2 rtr-core-west-router.princeton.edu (128.112.12.229)  0.595 ms  0.824 ms  0.521 ms
 3 fw-border-hpcrc-router.princeton.edu (128.112.12.14)  1.078 ms  1.034 ms  1.110 ms
 4 rtr-border-hpcrc-router.princeton.edu (204.153.48.253)  1.422 ms  1.460 ms  1.448 ms
 5 172-96-130.unassigned.userdns.com (172.96.130.49)  4.843 ms  3.923 ms  3.925 ms
 6 172-96-130.unassigned.userdns.com (172.96.130.60)  7.093 ms  6.965 ms  172-96-130.unassigned.userdns.com (172.96.130.76)  6.005 ms
 7 bundle-ether1.102.core1.phil.net.internet2.edu (163.253.5.8)  5.799 ms  7.308 ms  5.942 ms
 8 fourhundredge-0-0-0-2.4079.core2.ashb.net.internet2.edu (163.253.1.136)  68.198 ms  67.614 ms  69.228 ms
 9 fourhundredge-0-0-0-18.4079.core1.ashb.net.internet2.edu (163.253.1.106)  69.328 ms  69.407 ms  69.224 ms
10 fourhundredge-0-0-0-1.4079.core1.clev.net.internet2.edu (163.253.1.123)  69.112 ms  68.681 ms  66.807 ms
11 fourhundredge-0-0-0-2.4079.core1.eqch.net.internet2.edu (163.253.1.211)  67.504 ms  67.970 ms  68.934 ms
12 fourhundredge-0-0-0-1.4079.core1.chic.net.internet2.edu (163.253.1.206)  69.001 ms  68.979 ms  68.954 ms
13 fourhundredge-0-0-0-1.4079.core2.kans.net.internet2.edu (163.253.2.29)  68.182 ms  68.254 ms  69.137 ms
14 fourhundredge-0-0-0-1.4079.core2.denv.net.internet2.edu (163.253.1.250)  67.804 ms  67.848 ms  69.216 ms
15 fourhundredge-0-0-0-3.4079.core2.salt.net.internet2.edu (163.253.1.169)  69.056 ms  68.593 ms  66.761 ms
16 fourhundredge-0-0-0-8.4079.core1.losa.net.internet2.edu (163.253.1.114)  67.034 ms  68.282 ms  69.196 ms
17 et-5-1-0.pe1.brwy.nsw.aarnet.net.au (138.44.228.4)  202.659 ms  178.225 ms  178.886 ms
18 et-5-1-0.pe1.brwy.nsw.aarnet.net.au (113.197.15.5)  248.794 ms  et-3-1-0.pe1.brwy.nsw.aarnet.net.au (113.197.15.146)  248.529 ms  et-5-1-0.
19 138.44.5.1 (138.44.5.1)  249.027 ms  248.375 ms  248.411 ms
20 * * *
21 * * *
22 * * *
23 129.94.39.23 (129.94.39.23)  250.287 ms  250.115 ms  249.811 ms
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *

Done.
```

hops of forward path:



```
z5504665@vx12:~$ traceroute www.net.princeton.edu
traceroute to www.net.princeton.edu (128.112.128.55), 30 hops max, 60 byte packets
 1 cserouter1-server.orchestra.cse.unsw.EDU.AU (129.94.242.251)  0.052 ms  0.052 ms  0.039 ms
 2 129.94.39.17 (129.94.39.17)  0.803 ms  0.832 ms  0.798 ms
 3 172.17.31.154 (172.17.31.154)  1.639 ms  1.931 ms  1.900 ms
 4 172.17.17.45 (172.17.17.45)  1.098 ms  1.109 ms  172.17.17.9 (172.17.17.9)  1.020 ms
 5 * * *
 6 138.44.5.0 (138.44.5.0)  1.836 ms  1.614 ms  1.559 ms
 7 et-1-1-0.pe1.mcqp.nsw.aarnet.net.au (113.197.15.4)  1.752 ms  1.905 ms  1.900 ms
 8 et-0_0_2.bdr1.guam.gum.aarnet.net.au (113.197.14.137)  71.371 ms  71.387 ms  71.377 ms
 9 138.44.228.5 (138.44.228.5)  185.696 ms  184.924 ms  185.970 ms
10 fourhundredge-0-0-0-2.4079.core2.salt.net.internet2.edu (163.253.1.115)  24.076 ms  247.133 ms  247.144 ms
11 fourhundredge-0-0-0-21.4079.core1.salt.net.internet2.edu (163.253.1.28)  24.795 ms  fourhundredge-0-0-0-22.4079.core1.salt.net.internet2.edu (163.253.1.30)  249.609 ms  fourhundredge-0-0-0-21.4079.core1.salt.net.internet2.edu (163.253.1.28)  249.800 ms
12 fourhundredge-0-0-0-0.4079.core2.kans.net.internet2.edu (163.253.1.251)  24.284 ms  fourhundredge-0-0-0-0.4079.core1.denv.net.internet2.edu (163.253.1.170)
```



```
z5504665@vx12: ~
File Edit Tabs Help
247.846 ms 247.801 ms
13 fourhundredge-0-0-0-0.4079.core1.kans.net.internet2.edu (163.253.1.243) 248
.416 ms 248.133 ms 248.117 ms
14 fourhundredge-0-0-0-3.4079.core2.chic.net.internet2.edu (163.253.1.244) 248
.278 ms 248.158 ms fourhundredge-0-0-0-22.4079.core2.chic.net.internet2.edu (16
3.253.1.97) 248.139 ms
15 fourhundredge-0-0-0-3.4079.core2.eqch.net.internet2.edu (163.253.2.19) 248.
439 ms 248.389 ms 248.341 ms
16 fourhundredge-0-0-0-0.4079.core2.clev.net.internet2.edu (163.253.2.16) 247.
553 ms 247.286 ms 249.208 ms
17 fourhundredge-0-0-0-3.4079.core2.ashb.net.internet2.edu (163.253.1.138) 248
.620 ms 248.132 ms 249.220 ms
18 fourhundredge-0-0-0-1.4079.core1.phil.net.internet2.edu (163.253.1.137) 247
.910 ms 247.380 ms 247.066 ms
19 163.253.5.9 (163.253.5.9) 249.037 ms 248.858 ms 249.050 ms
20 172.96.130.54 (172.96.130.54) 247.263 ms 247.167 ms 247.090 ms
21 fw-border-87-router.princeton.edu (204.153.48.2) 247.521 ms 247.517 ms 24
7.565 ms
22 rtr-core-east-router.princeton.edu (128.112.12.9) 248.184 ms 247.992 ms 2
48.115 ms
23 core-ns-router.princeton.edu (128.112.12.226) 248.640 ms 248.566 ms 248.4
19 ms
24 www.net.princeton.edu (128.112.128.55) 247.798 ms 247.890 ms 247.953 ms
```

Answer:

I notice that some routers between forward path and reverse path are the same.

3)

Answer:

For paths of [www.net.princeton.edu](http://www.net.princeton.edu), we can find [rtr-core-east-router.princeton.edu](http://rtr-core-east-router.princeton.edu) in both paths, but it has different ip address in these two paths.

This can occur due to Network Address Translation (NAT) or dynamic address allocation.

## Exercise 4

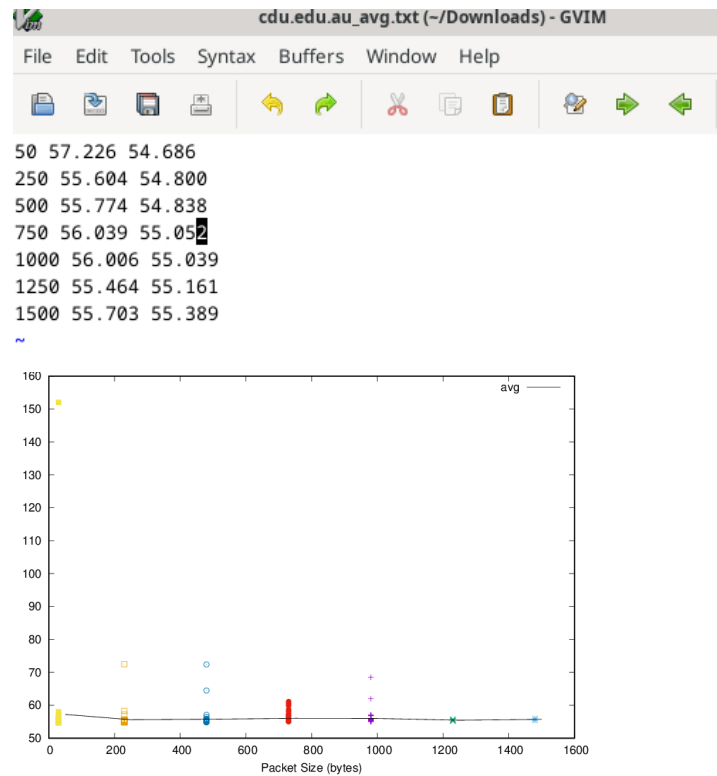
1.

Domain	Location	Distance from UNSW	Shortest possible time
cdu.edu.au	Charles Darwin University, Darwin, Australia	3148.98 km	10.4ms
usp.br	Universidade de São Paulo (USP), Sao Paulo, Brazil	13490.89 km	44.9ms
ed.ac.uk	The University of Edinburgh - Edinburgh, Scotland, UK	16880.66 km	56.2ms

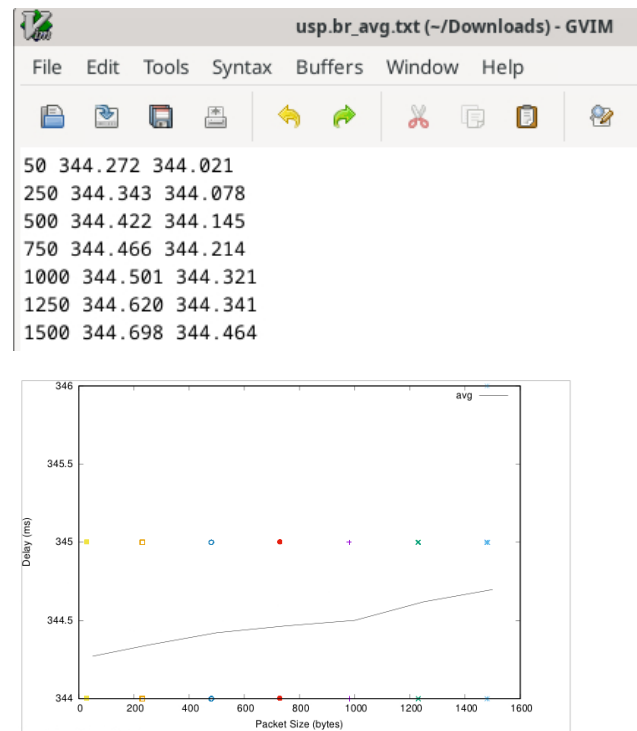


2.

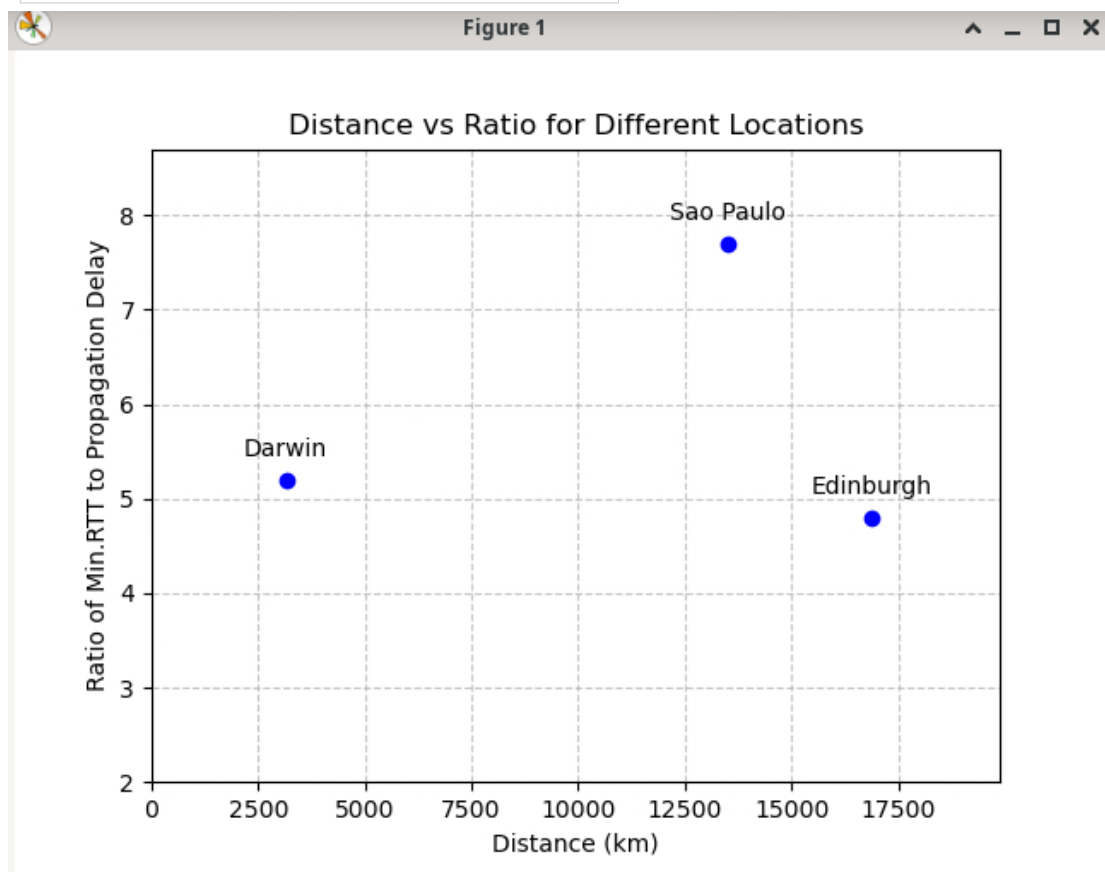
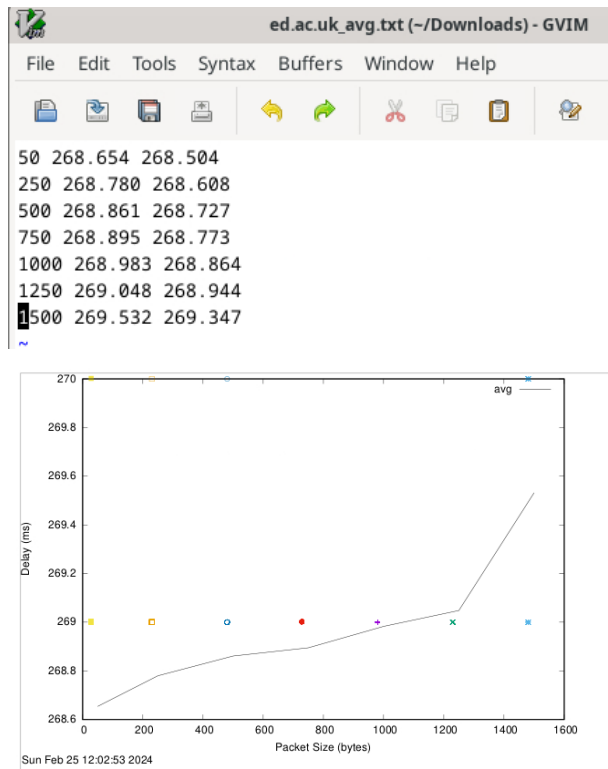
cdu.edu.au RTT:54ms



usp.br RTT:344ms



ed.ac.uk RTT:269ms



3.

Answer:

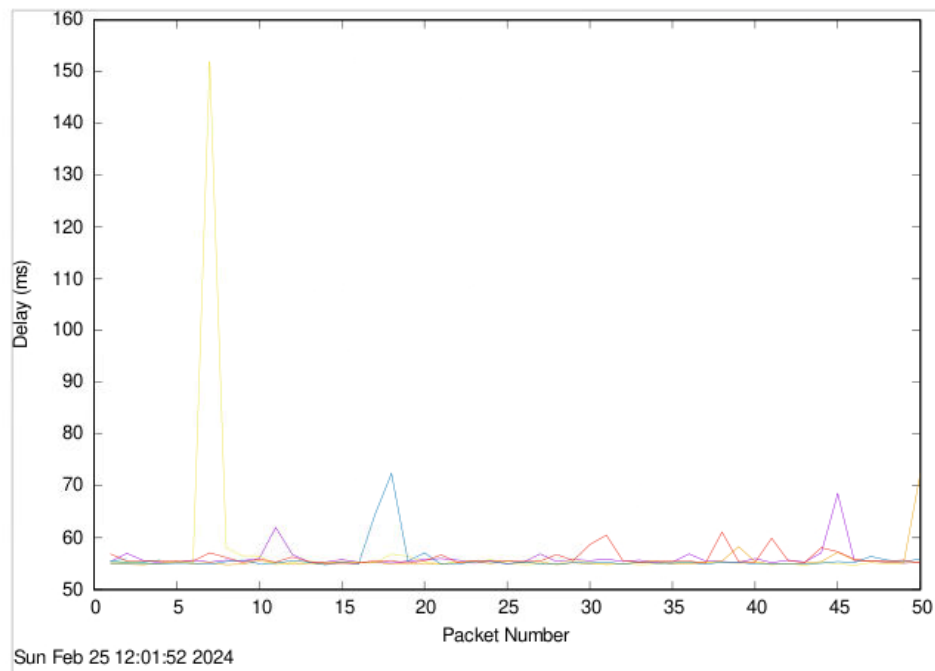
There has two possible reasons for why the y-axis values you plot are greater than 2

Network congestion: The actual RTT can be influenced by network congestion, routing inefficiencies, or other factors, causing it to be higher than the theoretical minimum.

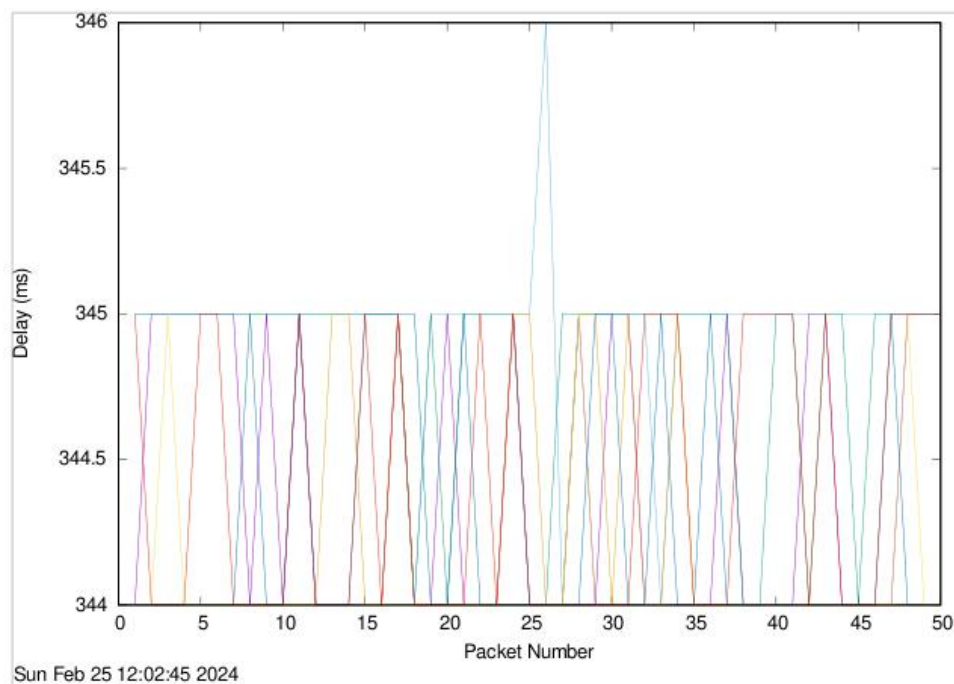
Packet processing time: In addition to the time it takes for the packet to travel the distance, there's also packet processing time at routers and other network devices, which adds to the overall delay.

4.

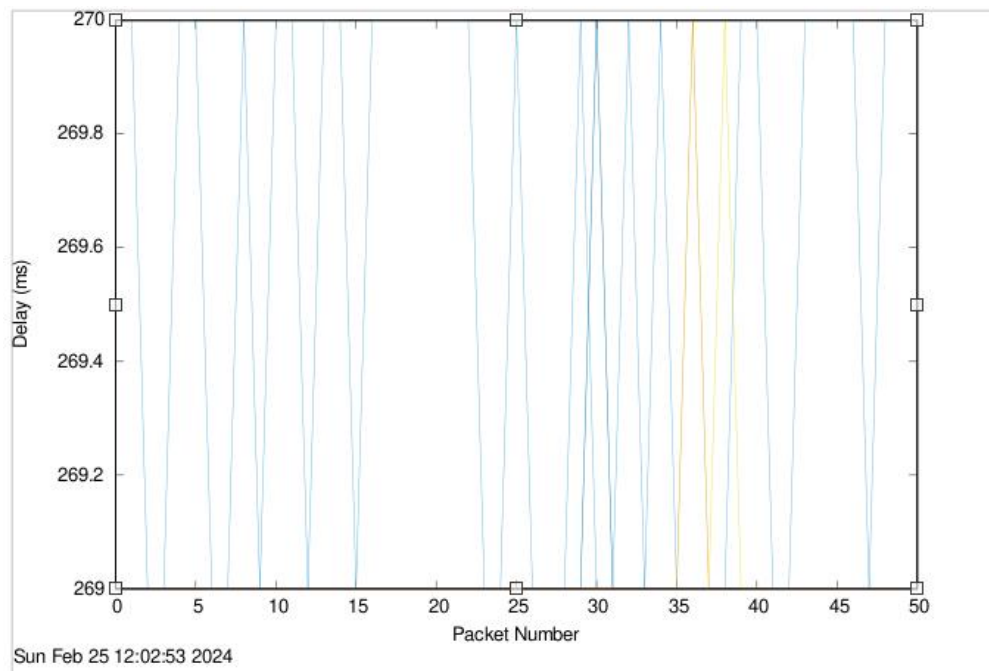
cdu.edu.au\_delay:



usp.br\_delay:



ed.ac.uk\_delay:



**Answer:**

From the pictures, We can see that the delay varies over time.

Because the delay in network communication is influenced by a complex interplay of factors, and variations over time are common due to the dynamic nature of network environments. For example, When there is a high volume of traffic on the network, routers and switches may become congested, causing delays as packets are queued up for transmission. This congestion can fluctuate throughout the day based on usage patterns and network conditions.

5.

**Answer:**

Propagation delay is independent of packet size, while transmission delay may vary with packet size due to the relationship between packet size and available bandwidth. Processing delay is generally not influenced by packet size, as it is more related to the internal operations of network devices. Queuing delay can be affected by packet size indirectly, as larger packets may contribute to congestion and longer wait times in network queues.