Exercise 1:

1. IPv4 address: 65.8.134.9、65.8.134.89、65.8.134.70 和 65.8.134.47

what is the reason for having several IP addresses as an output?

This is similar to the Frequency Division Multiplexing mentioned in Lecture1 (FDM) has the same concept of resource allocation and utilization. The output of multiple IP addresses is usually because the website uses load balancing technology. Load balancing technology is used to distribute network traffic to different servers to improve performance, reliability, and scalability.

2.The name of IP address 127.0.0.1 is localhost.

What's special about this IP address is that it is the local loopback address used to route network traffic back to the local computer.

Exercise 2:

www.google.co.uk Yes. We Can Ping.

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping www.google.co.uk
PING www.google.co.uk (142.250.66.195) 56(84) bytes of data.
64 bytes from syd09s23-in-f3.1e100.net (142.250.66.195): icmp_seq=1 ttl=115 time=1.59 ms
64 bytes from syd09s23-in-f3.1e100.net (142.250.66.195): icmp_seq=2 ttl=115 time=1.55 ms
64 bytes from syd09s23-in-f3.1e100.net (142.250.66.195): icmp_seq=3 ttl=115 time=1.58 ms
64 bytes from syd09s23-in-f3.1e100.net (142.250.66.195): icmp_seq=4 ttl=115 time=1.54 ms
64 bytes from syd09s23-in-f3.1e100.net (142.250.66.195): icmp_seq=5 ttl=115 time=1.56 ms
64 bytes from syd09s23-in-f3.1e100.net (142.250.66.195): icmp_seq=6 ttl=115 time=1.59 ms
64 bytes from syd09s23-in-f3.1e100.net (142.250.66.195): icmp_seq=7 ttl=115 time=1.59 ms
```

www.columbia.edu Yes. We Can Ping.

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping www.columbia.edu
PING source.failover.cc.columbia.edu (128.59.105.24) 56(84) bytes of data.
64 bytes from p-i-r.org (128.59.105.24): icmp_seq=1 ttl=233 time=247 ms
64 bytes from p-i-r.org (128.59.105.24): icmp_seq=2 ttl=233 time=247 ms
64 bytes from p-i-r.org (128.59.105.24): icmp_seq=3 ttl=233 time=247 ms
64 bytes from p-i-r.org (128.59.105.24): icmp_seq=4 ttl=233 time=247 ms
64 bytes from p-i-r.org (128.59.105.24): icmp_seq=5 ttl=233 time=247 ms
```

www.wikipedia.org Yes. We Can Ping.

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping www.wikipedia.org
PING dyna.wikimedia.org (103.102.166.224) 56(84) bytes of data.
64 bytes from text-lb.eqsin.wikimedia.org (103.102.166.224): icmp_seq=1 ttl=56 time=91.9 ms
64 bytes from text-lb.eqsin.wikimedia.org (103.102.166.224): icmp_seq=2 ttl=56 time=92.0 ms
64 bytes from text-lb.eqsin.wikimedia.org (103.102.166.224): icmp_seq=3 ttl=56 time=92.0 ms
64 bytes from text-lb.eqsin.wikimedia.org (103.102.166.224): icmp_seq=4 ttl=56 time=92.0 ms
64 bytes from text-lb.eqsin.wikimedia.org (103.102.166.224): icmp_seq=5 ttl=56 time=91.9 ms
64 bytes from text-lb.eqsin.wikimedia.org (103.102.166.224): icmp_seq=6 ttl=56 time=92.0 ms
```

ec.ho No, we cant ping because Host/Web address does not exist.

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping ec.ho
ping: ec.ho: Name or service not known
```

hhh.gs Yes. We Can Ping.

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping hhh.gs
PING hhh.gs (103.120.80.144) 56(84) bytes of data.
64 bytes from 103.120.80.144: icmp_seq=1 ttl=50 time=212 ms
64 bytes from 103.120.80.144: icmp_seq=2 ttl=50 time=210 ms
64 bytes from 103.120.80.144: icmp_seq=3 ttl=50 time=216 ms
```

defence.gov.au No, we cant ping because firewall doesnt allow us to access.

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping defence.gov.au
PING defence.gov.au (103.29.195.64) 56(84) bytes of data.
```

yes.no Yes. We Can Ping.

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping yes.no
PING yes.no (162.241.218.145) 56(84) bytes of data.
64 bytes from box5569.bluehost.com (162.241.218.145): icmp_seq=1 ttl=51 time=281 ms
64 bytes from box5569.bluehost.com (162.241.218.145): icmp_seq=2 ttl=51 time=281 ms
64 bytes from box5569.bluehost.com (162.241.218.145): icmp_seq=3 ttl=51 time=282 ms
64 bytes from box5569.bluehost.com (162.241.218.145): icmp_seq=4 ttl=51 time=281 ms
64 bytes from box5569.bluehost.com (162.241.218.145): icmp_seq=5 ttl=51 time=281 ms
```

一. 一 . 一 . 一 No, we cant ping because Host/Web address is https://one.one.one.one/ (we can acess from web) not 一.一.一.一

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping 一.一.一.一
ping: 一.一.一.一: Name or service not known
```

theguardian.com Yes. We Can Ping.

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping theguardian.com
PING theguardian.com (151.101.65.111) 56(84) bytes of data.
64 bytes from 151.101.65.111 (151.101.65.111): icmp_seq=1 ttl=56 time=1.24 ms
64 bytes from 151.101.65.111 (151.101.65.111): icmp_seq=2 ttl=56 time=2.85 ms
64 bytes from 151.101.65.111 (151.101.65.111): icmp_seq=3 ttl=56 time=1.65 ms
```

xn--i-7iq.ws Yes. We Can Ping.

```
z5369144@vx10:~/Downloads/comp3331/week1$ ping xn--i-7iq.ws
PING i❤.ws (132.148.137.119) 56(84) bytes of data.
64 bytes from 119.137.148.132.host.secureserver.net (132.148.137.119): icmp_seq=1 ttl=48 time=267 ms
64 bytes from 119.137.148.132.host.secureserver.net (132.148.137.119): icmp_seq=2 ttl=48 time=268 ms
```

Exercise 3:

1.

1.

```
z5369144@vx10:~/Downloads/comp3331/week1$ 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)  0.045 ms  0.056 ms  0.043 ms
 2  129.94.39.17 (129.94.39.17)  0.916 ms  0.905 ms  0.865 ms
 3  172.17.31.154 (172.17.31.154)  1.466 ms  2.020 ms  1.993 ms
 4  172.17.17.45 (172.17.17.45)  1.039 ms 172.17.17.9 (172.17.17.9)  1.381 ms 172.17.17.45 (172.17.17.45)  1.057 ms
 5  172.17.17.110 (172.17.17.110)  2.972 ms  2.825 ms 172.17.17.102 (172.17.17.102)  2.739 ms
 6  138.44.5.0 (138.44.5.0)  7.216 ms  6.815 ms  6.797 ms
 7  et-1-1-0.pe1.rsby.nsw.aarnet.net.au (113.197.15.12)  1.671 ms  1.823 ms  1.722 ms
 8  xe-1-1-0.pe1.eskp.nsw.aarnet.net.au (113.197.15.199)  3.086 ms  2.874 ms  2.957 ms
 9  et-0-3-0.pe1.prka.sa.aarnet.net.au (113.197.15.42)  19.933 ms  20.182 ms  20.180 ms
10  et-0-3-0.pe1.knsg.wa.aarnet.net.au (113.197.15.45)  46.100 ms  46.419 ms  46.391 ms
11  et-1_0_5.bdr1.sing.sin.aarnet.net.au (113.197.15.231)  92.673 ms  92.679 ms  92.357 ms
12  138.44.226.7 (138.44.226.7)  256.008 ms  256.078 ms  256.012 ms
13  ae2.mx1.lon2.uk.geant.net (62.40.98.65)  271.493 ms  271.436 ms  271.391 ms
14  ae8.mx1.par.fr.geant.net (62.40.98.107)  263.955 ms  263.878 ms  263.292 ms
15  ae7.mx1.gen.ch.geant.net (62.40.98.238)  270.288 ms  270.277 ms  270.076 ms
16  swice1-100ge-0-3-0-1.switch.ch (62.40.124.22)  272.879 ms  274.075 ms  274.060 ms
17  swiLG2-400GE-0-0-0-0.switch.ch (130.59.38.70)  277.080 ms  277.349 ms  277.284 ms
18  swiLG1-B1.switch.ch (130.59.36.77)  275.714 ms  275.509 ms  275.091 ms
19  lu-pop1-bkb02-100g-1-0-48.usi.ch (195.176.176.210)  275.034 ms  275.029 ms  275.099 ms
20  ma-pop1-dcfw01.net.ti-edu.ch (195.176.176.34)  275.404 ms  275.404 ms  275.444 ms
21  selenio.ti-edu.ch (195.176.55.64)  275.365 ms  274.948 ms  275.602 ms
```

There are 21 routers between workstation and usi.ch.

There are 5 routers along the way that are part of the UNSW network. (we can use whois host command to check).

2. ae2.mx1.lon2.uk.geant.net (62.40.98.65) is the first router outside AU.

```
% Information related to '62.40.96.0/19AS20965'

route:          62.40.96.0/19
descr:          GEANT European Backbone
origin:         AS20965
mnt-by:         DANTE-MNT
created:        2005-07-14T14:05:45Z
last-modified:  2005-07-14T14:05:45Z
source:         RIPE

% This query was served by the RIPE Database Query Service version 1.109.1 (ABERDEEN)
```

3. ae2.mx1.lon2.uk.geant.net (62.40.98.65) is the first router in Europe.


```
% Information related to '62.40.96.0/19AS20965'

route:          62.40.96.0/19
descr:          GEANT European Backbone
origin:         AS20965
mnt-by:         DANTE-MNT
created:        2005-07-14T14:05:45Z
last-modified:  2005-07-14T14:05:45Z
source:         RIPE

% This query was served by the RIPE Database Query Service version 1.109.1 (ABERDEEN)
```


2.

jhu.edu

```
z5369144@vx10:~/Downloads/comp3331/week1$ 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)  0.050 ms  0.055 ms  0.044 ms
 2  129.94.39.17 (129.94.39.17)  0.854 ms  0.823 ms  0.856 ms
 3  172.17.31.154 (172.17.31.154)  2.086 ms  2.054 ms  1.609 ms
 4  172.17.17.9 (172.17.17.9)  1.040 ms  1.112 ms 172.17.17.45 (172.17.17.45)  1.273 ms
 5  172.17.17.102 (172.17.17.102)  1.127 ms 172.17.17.110 (172.17.17.110)  1.175 ms 172.17.17.102 (172.17.17.102)  1.201 ms
 6  138.44.5.0 (138.44.5.0)  3.801 ms  3.430 ms  3.395 ms
 7  et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147)  1.979 ms  1.798 ms  1.890 ms
 8  113.197.15.151 (113.197.15.151)  71.562 ms  71.381 ms  71.305 ms
 9  138.44.228.5 (138.44.228.5)  185.580 ms  185.438 ms  185.654 ms
10  fourhundredge-0-0-0-2.4079.core2.salt.net.internet2.edu (163.253.1.115)  242.761 ms  242.481 ms  243.999 ms
11  fourhundredge-0-0-0-0.4079.core2.denv.net.internet2.edu (163.253.1.168)  245.263 ms  245.268 ms  245.298 ms
12  fourhundredge-0-0-0-0.4079.core2.kans.net.internet2.edu (163.253.1.251)  244.091 ms  245.508 ms  245.474 ms
13  fourhundredge-0-0-0-0.4079.core1.chic.net.internet2.edu (163.253.2.28)  242.986 ms  243.565 ms  243.518 ms
14  fourhundredge-0-0-0-0.4079.core1.eqch.net.internet2.edu (163.253.1.207)  244.511 ms  243.764 ms  243.755 ms
15  fourhundredge-0-0-0-0.4079.core1.clev.net.internet2.edu (163.253.1.210)  244.497 ms  244.183 ms  244.203 ms
16  fourhundredge-0-0-0-3.4079.core1.ashb.net.internet2.edu (163.253.1.122)  243.713 ms  244.967 ms  244.662 ms
17  et-0-1-8-1275.ashb-core.maxgigapop.net (206.196.177.2)  292.686 ms  292.645 ms  292.696 ms
18  206.196.178.141 (206.196.178.141)  242.380 ms  242.327 ms  242.202 ms
19  addr16212925394.testippl.jhmi.edu (162.129.253.94)  242.474 ms  242.394 ms  242.314 ms
20  162.129.255.245 (162.129.255.245)  244.818 ms  244.758 ms  244.873 ms
21  * * *
22  * * *
23  * * *
24  * * *
25  collaborate.johnshopkins.edu (128.220.192.230)  248.399 ms  248.159 ms  248.484 ms
```

usp.br

```
z5369144@vx10:~/Downloads/comp3331/week1$ 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)  0.041 ms  0.051 ms  0.040 ms
 2  129.94.39.17 (129.94.39.17)  0.828 ms  0.844 ms  0.789 ms
 3  172.17.31.154 (172.17.31.154)  1.948 ms  1.956 ms  1.470 ms
 4  172.17.17.9 (172.17.17.9)  1.069 ms  1.027 ms  1.047 ms
 5  172.17.17.102 (172.17.17.102)  1.080 ms  1.027 ms  1.109 ms
 6  138.44.5.0 (138.44.5.0)  1.318 ms  1.473 ms  1.482 ms
 7  et-1-1-0.pe1.mcqp.nsw.aarnet.net.au (113.197.15.4)  1.931 ms  1.879 ms  2.078 ms
 8  et-0_0_2.bdr1.guam.gum.aarnet.net.au (113.197.14.137)  71.627 ms  71.635 ms  71.644 ms
 9  138.44.228.5 (138.44.228.5)  186.039 ms  186.052 ms  186.079 ms
10  fourhundredge-0-0-0-19.4079.core2.losa.net.internet2.edu (163.253.1.47)  232.485 ms fourhundredge-0-0-0-21.4079.core2.losa.net.internet2.e
du (163.253.1.51)  232.400 ms  232.442 ms
11  fourhundredge-0-0-0-0.4079.core2.elpa.net.internet2.edu (163.253.1.202)  232.038 ms  232.055 ms  232.092 ms
12  fourhundredge-0-0-0-23.4079.core1.elpa.net.internet2.edu (163.253.1.74)  232.829 ms  232.733 ms fourhundredge-0-0-0-22.4079.core1.elpa.net
.internet2.edu (163.253.1.72)  232.697 ms
13  fourhundredge-0-0-0-22.4079.core1.hous.net.internet2.edu (163.253.1.60)  231.984 ms fourhundredge-0-0-0-0.4079.core1.hous.net.internet2.ed
u (163.253.2.39)  231.089 ms  231.065 ms
14  fourhundredge-0-0-0-0.4079.core1.houh.net.internet2.edu (163.253.2.24)  233.017 ms  232.332 ms  232.276 ms
15  fourhundredge-0-0-0-0.4079.core1.pens.net.internet2.edu (163.253.2.35)  231.737 ms  232.677 ms  232.622 ms
16  fourhundredge-0-0-0-0.4079.core1.jack.net.internet2.edu (163.253.1.0)  233.093 ms  233.026 ms  232.850 ms
17  64.57.28.62 (64.57.28.62)  236.999 ms  237.126 ms  236.962 ms
18  mia2-mia1.bkb.rnp.br (200.143.252.26)  237.041 ms  237.052 ms  237.338 ms
19  cce2-mia2-monet.bkb.rnp.br (170.79.213.46)  301.005 ms  301.148 ms  302.049 ms
20  sp2-cce2-tisparkle.bkb.rnp.br (170.79.213.3)  343.359 ms  343.412 ms  343.480 ms
21  as28571.saopaulo.sp.ix.br (187.16.220.3)  344.335 ms  344.656 ms  344.370 ms
22  e72361-sp2-r06-nx-swc.uspnet.usp.br (143.107.249.38)  344.598 ms  345.340 ms  345.025 ms
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

ed.ac.uk

```
z5369144@vx10:~/Downloads/comp3331/week1$ 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)  0.040 ms  0.046 ms  0.036 ms
 2  129.94.39.17 (129.94.39.17)  0.880 ms  0.830 ms  0.862 ms
 3  172.17.31.154 (172.17.31.154)  1.520 ms  1.890 ms  1.480 ms
 4  172.17.17.9 (172.17.17.9)  1.149 ms 172.17.17.45 (172.17.17.45)  1.092 ms  1.107 ms
 5  172.17.17.102 (172.17.17.102)  1.129 ms 172.17.17.110 (172.17.17.110)  1.147 ms 172.17.17.102 (172.17.17.102)  1.126 ms
 6  138.44.5.0 (138.44.5.0)  1.568 ms  1.535 ms  1.541 ms
 7  et-1-1-0.pe1.mcqp.nsw.aarnet.net.au (113.197.15.4)  1.949 ms  1.727 ms  1.665 ms
 8  et-0-3-0.pe1.eskp.nsw.aarnet.net.au (113.197.15.3)  3.008 ms  3.065 ms  3.135 ms
 9  et-0-3-0.pe1.prka.sa.aarnet.net.au (113.197.15.42)  19.970 ms  19.846 ms  20.037 ms
10  et-0-3-0.pe1.knsg.wa.aarnet.net.au (113.197.15.45)  46.222 ms  46.245 ms  46.363 ms
11  et-1_0_5.bdr1.sing.sin.aarnet.net.au (113.197.15.231)  92.588 ms  92.578 ms  92.536 ms
12  138.44.226.7 (138.44.226.7)  257.268 ms  257.148 ms  257.089 ms
13  ae2.mx1.lon2.uk.geant.net (62.40.98.65)  256.918 ms  256.950 ms  256.923 ms
14  janet-bckp-gw.mx1.lon2.uk.geant.net (62.40.125.58)  271.942 ms  257.889 ms  257.869 ms
15  ae31.erdiss-sbr2.ja.net (146.97.33.22)  261.421 ms  261.529 ms  261.327 ms
16  ae29.manckh-sbr2.ja.net (146.97.33.42)  264.252 ms  265.832 ms  265.745 ms
17  ae31.glasss-sbr1.ja.net (146.97.33.54)  267.570 ms  267.647 ms  267.594 ms
18  ae29.edinat-rbr2.ja.net (146.97.38.38)  268.777 ms  268.767 ms  268.716 ms
19  ae25.edinkb-rbr2.ja.net (146.97.74.34)  268.952 ms  268.925 ms  268.987 ms
20  university-of-edinburgh.ja.net (146.97.156.78)  269.504 ms  269.362 ms  269.596 ms
21  remote.net.ed.ac.uk (192.41.103.209)  268.990 ms  268.902 ms  268.915 ms
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

138.44.5.0

It’s Australian Academic and Research Network，AARNet 's IP address

```
% [whois.apnic.net]
% Whois data copyright terms    http://www.apnic.net/db/dbcopyright.html

% Information related to '138.44.0.0 - 138.44.255.255'

% Abuse contact for '138.44.0.0 - 138.44.255.255' is 'abuse@aarnet.edu.au'

inetnum:        138.44.0.0 - 138.44.255.255
netname:        AARNET
descr:          Australian Academic and Research Network
descr:          Building 9
descr:          Banks Street
country:        AU
org:            ORG-AAR1-AP
admin-c:        SM6-AP
tech-c:         ANOC-AP
abuse-c:        AA1638-AP
status:         ALLOCATED PORTABLE
remarks:        -+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
remarks:        This object can only be updated by APNIC hostmasters.
remarks:        To update this object, please contact APNIC
remarks:        hostmasters and include your organisation's account
remarks:        name in the subject line.
remarks:        -+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
notify:         irrcontact@aarnet.edu.au
mnt-by:         APNIC-HM
mnt-lower:      MAINT-AARNET-AP
mnt-routes:     MAINT-AARNET-AP
mnt-irt:        IRT-AARNET-AU
last-modified:  2020-06-22T05:22:11Z
source:         APNIC

irt:            IRT-AARNET-AU
```

```
% 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. The relationship between hop count and physical distance is not a simple proportional relationship

Network topology, routing policies, traffic optimization and other factors will affect path selection,

so the relationship between hop count and physical distance is not linear. In some cases,

due to network optimization or other factors, the hop count may decrease rather than increase,

even as the physical distance increases.

3.

1. www.linkwan.com www.telstra.net

```
z5369144@vx10:~/Downloads/comp3331/week1$ traceroute www.linkwan.com
traceroute to www.linkwan.com (114.142.153.138), 30 hops max, 60 byte packets
 1  cserouter1-server.orchestra.cse.unsw.EDU.AU (129.94.242.251)  0.049 ms  0.032 ms  0.056 ms
 2  129.94.39.17 (129.94.39.17)  0.853 ms  0.868 ms  0.937 ms
 3  172.17.31.154 (172.17.31.154)  1.640 ms  2.026 ms  2.034 ms
 4  172.17.17.9 (172.17.17.9)  1.198 ms 172.17.17.45 (172.17.17.45)  1.224 ms  1.185 ms
 5  172.17.17.110 (172.17.17.110)  1.239 ms 172.17.17.102 (172.17.17.102)  1.193 ms  1.183 ms
 6  138.44.5.0 (138.44.5.0)  1.538 ms  1.519 ms  1.485 ms
 7  et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147)  1.780 ms  1.857 ms  1.864 ms
 8  ge-4_0_0.bb1.a.pao.aarnet.net.au (202.158.194.177)  154.761 ms  154.775 ms  154.790 ms
 9  paloalto1.pao.seabone.net (198.32.176.70)  154.986 ms  155.004 ms  155.010 ms
10  195.22.223.178 (195.22.223.178)  298.679 ms  301.988 ms  301.996 ms
11  195.22.223.158 (195.22.223.158)  418.968 ms  419.032 ms  418.865 ms
```

```
z5369144@vx10:~/Downloads/comp3331/week1$ traceroute www.telstra.com
traceroute to www.telstra.com (203.36.148.12), 30 hops max, 60 byte packets
 1  cserouter1-server.orchestra.cse.unsw.EDU.AU (129.94.242.251)  0.220 ms  0.225 ms  0.214 ms
 2  129.94.39.17 (129.94.39.17)  1.289 ms  1.033 ms  1.051 ms
 3  172.17.31.154 (172.17.31.154)  2.361 ms  1.890 ms  3.086 ms
 4  172.17.17.45 (172.17.17.45)  1.654 ms 172.17.17.9 (172.17.17.9)  1.316 ms  1.328 ms
 5  172.17.17.102 (172.17.17.102)  1.832 ms 172.17.17.110 (172.17.17.110)  1.988 ms 172.17.17.102 (172.17.17.102)  1.828 ms
 6  138.44.5.0 (138.44.5.0)  1.976 ms  1.562 ms  1.506 ms
 7  et-1-1-0.pe1.rsby.nsw.aarnet.net.au (113.197.15.12)  1.593 ms  2.124 ms  2.127 ms
 8  xe-0-0-3.bdr1.rsby.nsw.aarnet.net.au (113.197.15.31)  1.701 ms  1.670 ms  1.631 ms
 9  139.130.0.77 (139.130.0.77)  2.493 ms  2.463 ms  2.414 ms
10  bundle-ether2.chw-edge903.sydney.telstra.net (203.50.11.175)  2.679 ms  3.039 ms  2.685 ms
11  bundle-ether3.cla-core30.melbourne.telstra.net (203.50.13.133)  13.287 ms bundle-ether12.stl-core30.sydney.telstra.net (203.50.11.176)  4.010 ms bundle-ether3.cla-core30.melbourne.telstra.net (203.50.13.1
33)  14.973 ms
12  bundle-ether2.exi-core30.melbourne.telstra.net (203.50.13.125)  14.457 ms bundle-ether3.win-core30.melbourne.telstra.net (203.50.13.131)  14.035 ms bundle-ether2.exi-core30.melbourne.telstra.net (203.50.1
3.125)  14.205 ms
13  bundle-ether1.win-edge901.melbourne.telstra.net (203.50.11.106)  12.790 ms bundle-ether1.lon-edge901.melbourne.telstra.net (203.50.11.108)  13.676 ms bundle-ether1.win-edge901.melbourne.telstra.net (203.5
0.11.106)  12.723 ms
14  139.130.39.114 (139.130.39.114)  12.866 ms  12.838 ms bundle-ether2.win-edge901.melbourne.telstra.net (203.50.11.114)  13.715 ms
15  139.130.39.114 (139.130.39.114)  13.152 ms  13.504 ms *
```

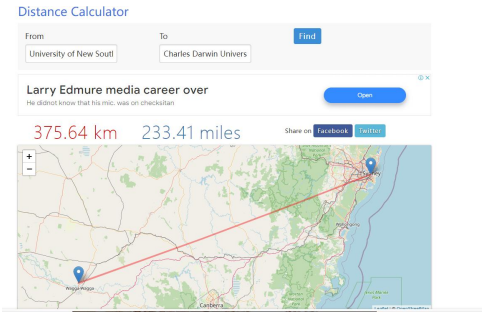
2. Both forward and reverse paths go through the same router node 138.44.5.0

3. The same IP address 138.44.5.0 was observed on both forward and reverse paths.

This indicates that packets pass through the same router nodes as they enter and leave your network.

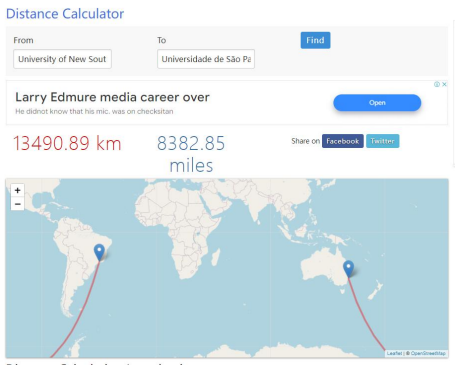
Exercise 4:

1.



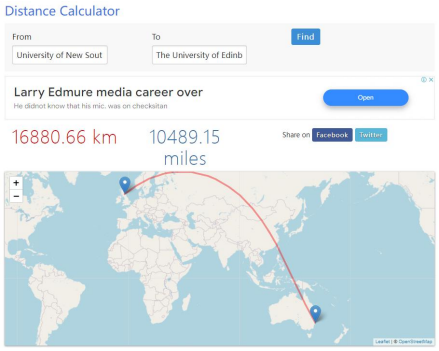
Physical distance from UNSW to Charles Darwin University, Darwin, Australia: 375.64 km 233.41 miles

time cost is : distance / speed of light = 375640 / (3*10^8) = 1.2521ms



Physical distance from UNSW to Universidade de São Paulo (USP),Sao Paulo,Brazil: 13490.89 km 8382.85 miles

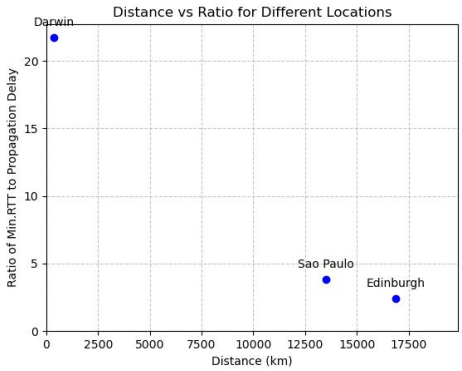
time cost is : distance / speed of light = 13490890 / (3*10^8) = 44.963ms



Physical distance from UNSW to The University of Edinburgh - Edinburgh, Scotland, UK: 16880.66 km10489.15 miles

time cost is : distance / speed of light = 16880660 / (3*10^-8) = 56.269ms

2.



3. Network congestion: During times of high network load, packets may take longer to reach their destination and return, resulting in increased latency.

   Network routing selection: Data packets may pass through multiple routing nodes during transmission. If the selected routing path is long or there is congestion, the transmission time of the data packet will be increased.

4. Delays to destinations often vary over time.

   Network congestion: When traffic in a network increases, such as during peak hours or during network outages,

   packets may experience longer wait times to reach their destination.

   Routing: Routers in a network may choose different paths to transmit packets based on current network conditions. Some paths may be more efficient than others, while others may cause

   increased latency.

5. depend on the packet size: Transmission Delay Processing Delay

   not depend on the packet size: Propagation Delay Queueing Delay