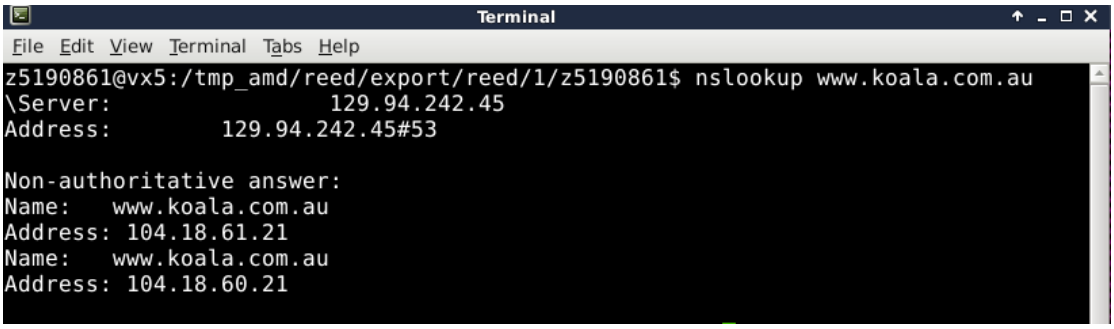
Lab1

Exercise 1

Question 1:

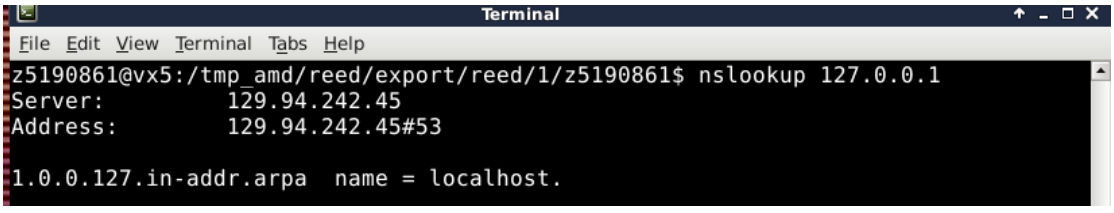


What is the reason of having several IP addresses as an output?

Answer:

Because of the load balancing. The request is usually dispatched by the Load Balancer and processed by the specified server process. The processing task is dispatched to different processes to reduce the load of a single process, so as to achieve the purpose of expanding the capacity at the level of processing capacity. In addition, in the system that implements load balancing, multiple server processes provide the same service. If one process is not available, the task will be dispatched to other available processes by the load balancer to achieve the purpose of high availability. So one host usually has several IP addresses.

Question 2:



The name of it is localhost.

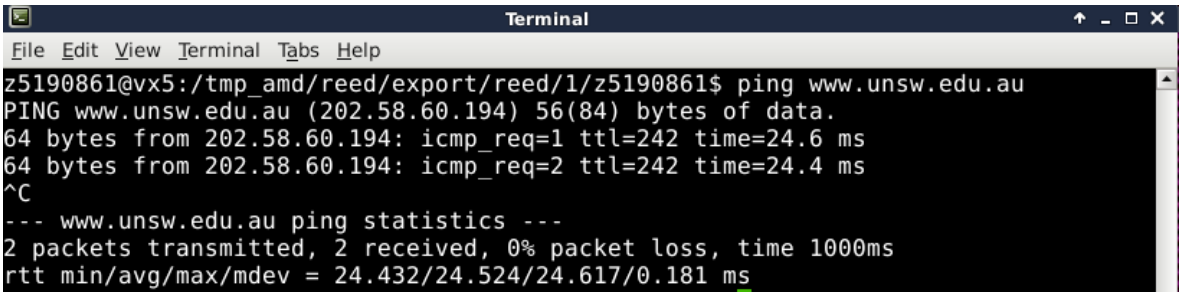
What is special about this IP address?

Answer:

Localhost is a domain name, a special DNS host name. And it represents to the computer you are on. It can send a packet to itself.

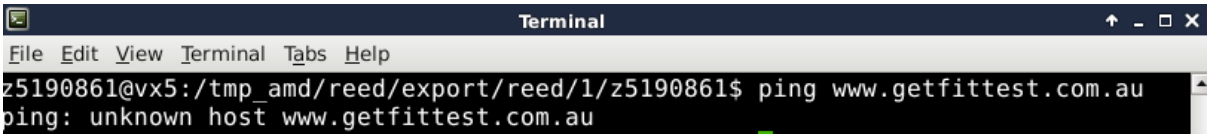
Exercise 2

1: www.unsw.edu.au



Both reachable

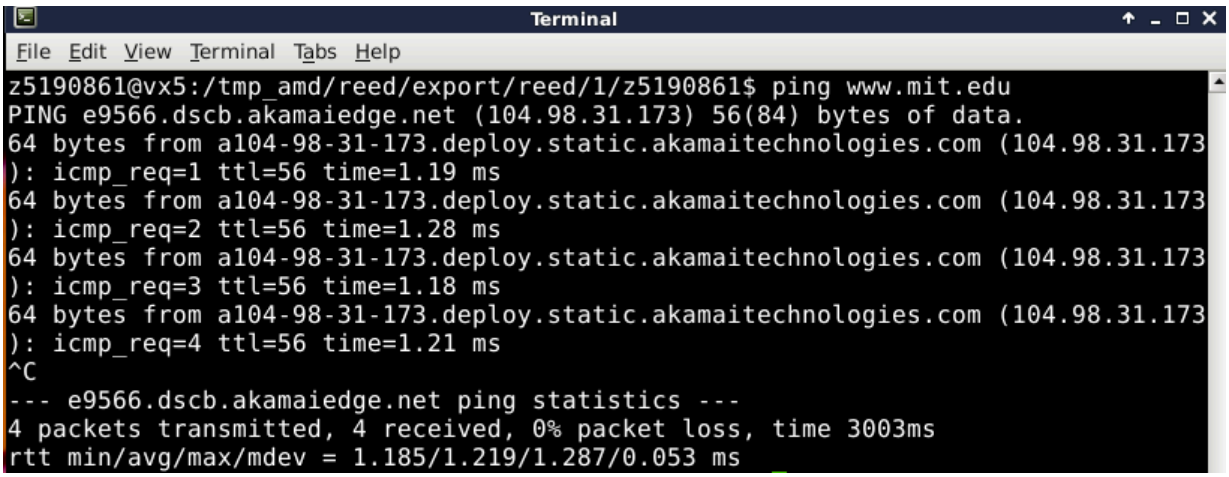
2: www.getfittest.com.au



This address is unreachable both by the ping command and the Web browser.

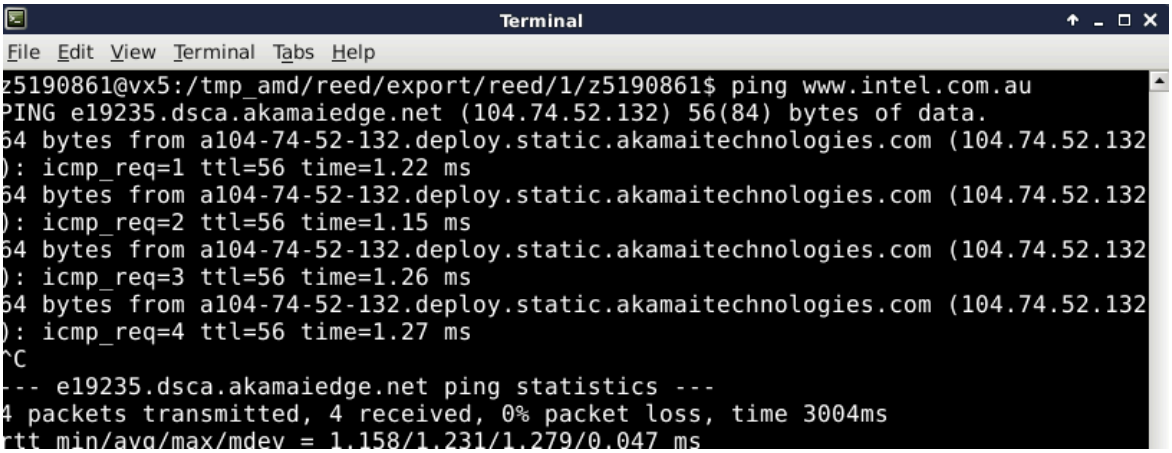
Both the ping command and the Web browser are unreachable which means that this host is not exist.

3: www.mit.edu



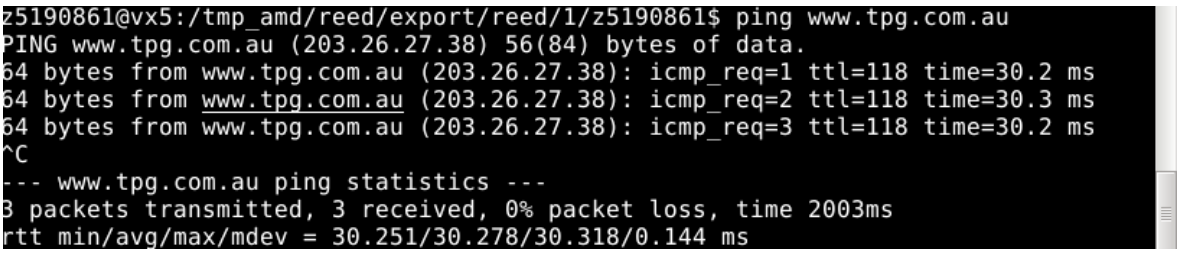
Both reachable

4: www.intel.com.au



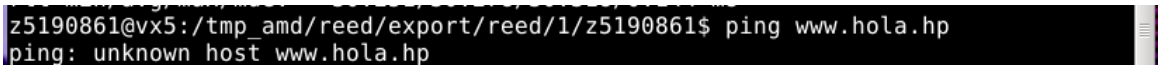
Both reachable

5: www.tpg.com.au



Both reachable

6: www.hola.hp



This address is unreachable both by the ping command and the Web browser.

Both the ping command and the Web browser are unreachable which means that this host is not exist.

7: www.amazon.com

```
z5190861@vx5:/tmp_amd/reed/export/reed/1/z5190861$ ping www.amazon.com
PING d3ag4hukkh62yn.cloudfront.net (13.224.182.228) 56(84) bytes of data.
64 bytes from server-13-224-182-228.syd1.r.cloudfront.net (13.224.182.228): icmp
_req=1 ttl=244 time=1.25 ms
64 bytes from server-13-224-182-228.syd1.r.cloudfront.net (13.224.182.228): icmp
_req=2 ttl=244 time=1.22 ms
64 bytes from server-13-224-182-228.syd1.r.cloudfront.net (13.224.182.228): icmp
_req=3 ttl=244 time=1.23 ms
64 bytes from server-13-224-182-228.syd1.r.cloudfront.net (13.224.182.228): icmp
_req=4 ttl=244 time=1.21 ms
64 bytes from server-13-224-182-228.syd1.r.cloudfront.net (13.224.182.228): icmp
_req=5 ttl=244 time=1.26 ms
^C
--- d3ag4hukkh62yn.cloudfront.net ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 1.216/1.240/1.262/0.042 ms
```

Both reachable

8: www.tsinghua.edu.cn

```
Terminal
File  Edit  View  Terminal  Tabs  Help
z5190861@vx5:/tmp_amd/reed/export/reed/1/z5190861$ ping www.tsinghua.edu.cn
PING www.tsinghua.edu.cn (166.111.4.100) 56(84) bytes of data.
64 bytes from www.tsinghua.edu.cn (166.111.4.100): icmp_req=1 ttl=44 time=247 ms
64 bytes from www.tsinghua.edu.cn (166.111.4.100): icmp_req=2 ttl=44 time=247 ms
64 bytes from www.tsinghua.edu.cn (166.111.4.100): icmp_req=3 ttl=44 time=247 ms
64 bytes from www.tsinghua.edu.cn (166.111.4.100): icmp_req=4 ttl=44 time=247 ms
^C
--- www.tsinghua.edu.cn ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3003ms
rtt min/avg/max/mdev = 247.470/247.523/247.593/0.610 ms
```

Both reachable

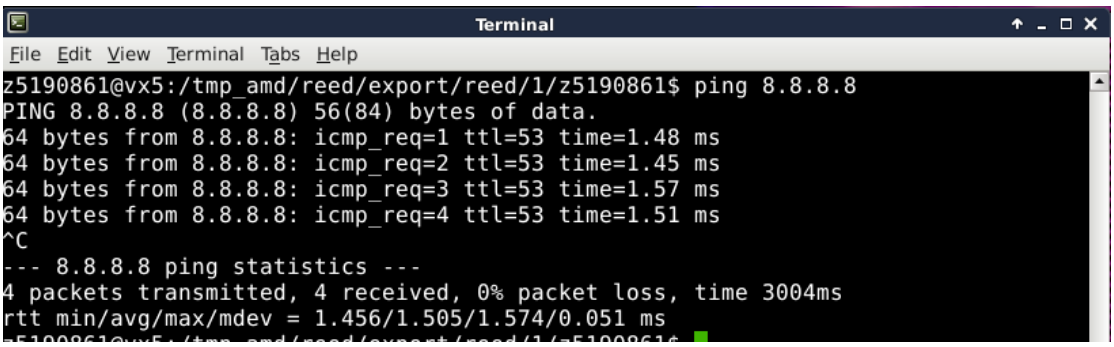
9: www.kremlin.ru

```
Terminal
File  Edit  View  Terminal  Tabs  Help
z5190861@vx5:/tmp_amd/reed/export/reed/1/z5190861$ ping www.kremlin.ru
PING www.kremlin.ru (95.173.136.72) 56(84) bytes of data.
```

This address is unreachable by the ping command but is reachable from the Web browser.

The condition above means that ICMP response is closed. So using the ping command cannot get any response.

10: 8.8.8.8



This address is reachable by the ping command but is not reachable from the Web browser.

Exercise 3

Question 1:

```
z5190861@vx5:/tmp_amd/reed/export/reed/1/z5190861$ 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)  0.128 ms  0.126 ms  0.11
5 ms
 2  129.94.39.17 (129.94.39.17)  0.859 ms  0.864 ms  0.872 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.360 ms ombudnex1-vl-315
4.gw.unsw.edu.au (149.171.253.35)  1.698 ms  1.421 ms
 4  libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.186 ms ombcr1-po-5.gw.unsw.e
du.au (149.171.255.197)  1.151 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165)
1.185 ms
 5  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.588 ms unswbr1-te-1-9.gw
.unsw.edu.au (149.171.255.101)  1.165 ms  1.176 ms
 6  138.44.5.0 (138.44.5.0)  1.842 ms  1.759 ms  1.759 ms
 7  et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149)  2.334 ms  2.105 ms
  2.753 ms
 8  et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99)  95.400 ms  95.445 ms  95.0
96 ms
 9  et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201)  147.368 ms  147.377 ms
147.353 ms
10  abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8)  147.108 ms  147
.106 ms  146.915 ms
11  ae-1.4079.rtsw.minn.net.internet2.edu (162.252.70.173)  180.114 ms  180.039
ms  180.121 ms
12  ae-1.4079.rtsw.eqch.net.internet2.edu (162.252.70.106)  189.095 ms  190.223
ms  188.517 ms
13  ae-0.4079.rtsw3.eqch.net.internet2.edu (162.252.70.163)  188.319 ms  187.693
 ms  189.084 ms
14  ae-1.4079.rtsw.clev.net.internet2.edu (162.252.70.130)  196.266 ms  196.487
ms  196.317 ms
15  buf-9208-I2-CLEV.nysernet.net (199.109.11.33)  200.718 ms  200.564 ms  200.5
17 ms
16  syr-9208-buf-9208.nysernet.net (199.109.7.193)  203.884 ms  204.187 ms  204.
113 ms
17  nyc111-9204-syr-9208.nysernet.net (199.109.7.94)  212.916 ms  212.964 ms  21
2.849 ms
18  nyc-9208-nyc111-9204.nysernet.net (199.109.7.165)  212.934 ms  213.200 ms  2
13.123 ms
19  columbia.nyc-9208.nysernet.net (199.109.4.14)  213.064 ms  212.991 ms  213.0
18 ms
20  cc-core-1-x-nyser32-gw-1.net.columbia.edu (128.59.255.5)  213.203 ms  213.37
7 ms  213.122 ms
21  cc-conc-1-x-cc-core-1.net.columbia.edu (128.59.255.21)  213.473 ms  213.405
ms  213.372 ms
22  ci.columbia.edu (128.59.105.24)  213.327 ms  213.220 ms  213.186 ms
```

How many routers are there between your workstation and www.columbia.edu ?

Answer: there are 21 routers.

How many routers along the path are part of the UNSW network?

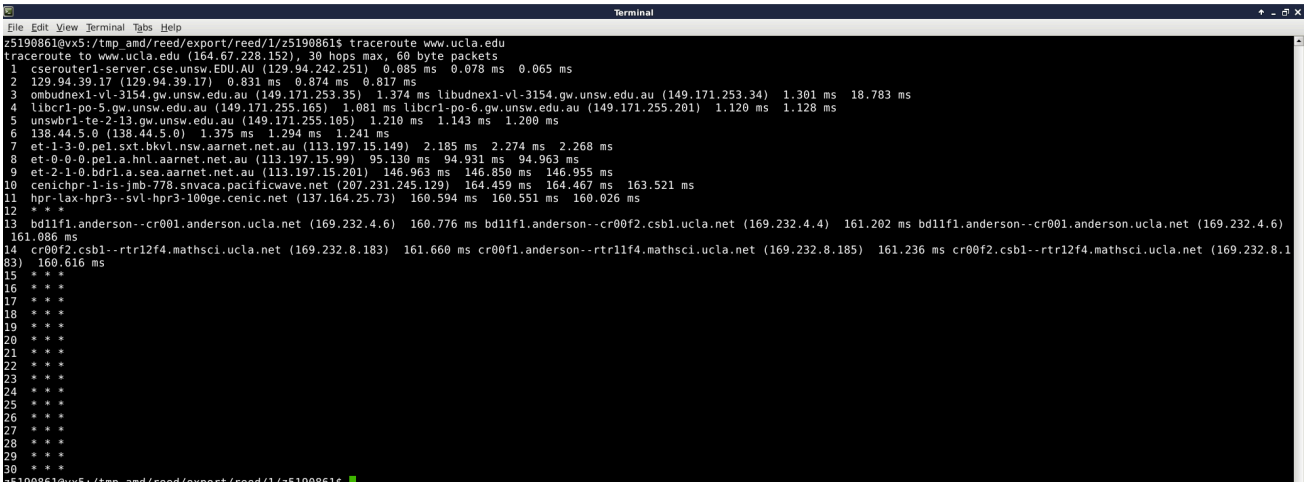
Answer: 5 routers from the 1st to 5th.

Between which two routers do packets cross the Pacific Ocean?

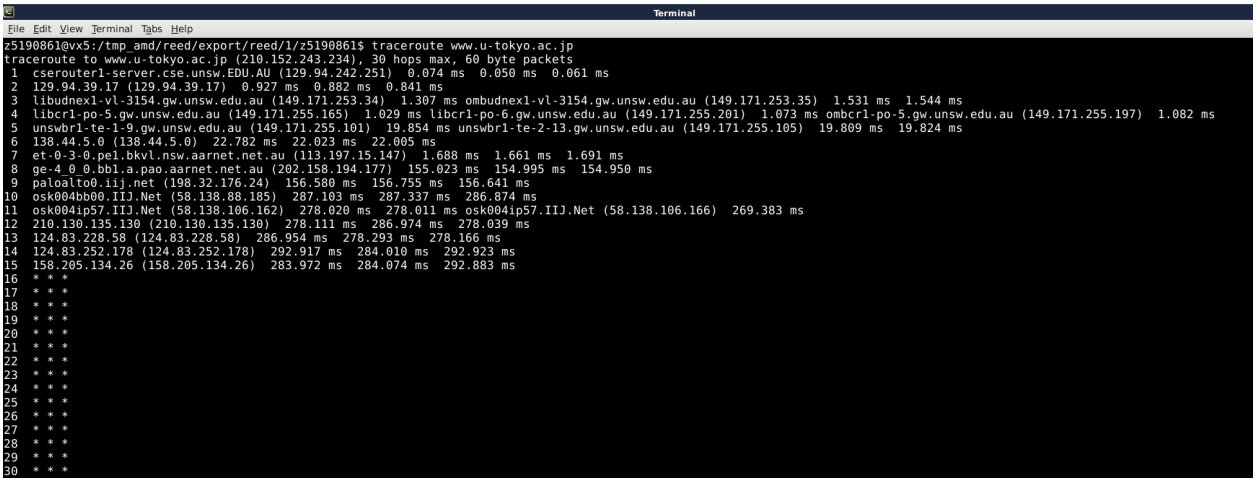
Answer: the 7th and 8th. Because the time difference is biggest between the 7th and 8th.

Question 2:

1: www.ucla.edu



2: www.u-tokyo.ac.jp



3: www.lancaster.ac.uk

```
Terminal
File  Edit  View  Terminal  Tabs  Help
z5190861@vx5:/tmp_amd/reed/export/reed/1/z5190861$ 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)  0.094 ms  0.085 ms  0.074 ms
 2  129.94.39.17 (129.94.39.17)  0.834 ms  0.882 ms  0.838 ms
 3  ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.379 ms libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.467 ms  1.473 ms
 4  ombcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.086 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.106 ms libcr1-po-6.gw.unsw.edu.au (149.171.255.201)  1.129 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.204 ms  1.223 ms  1.255 ms
 6  138.44.5.0 (138.44.5.0)  1.418 ms  1.281 ms  1.276 ms
 7  et-2-0-5.bdr1.sing.sin.aarnet.net.au (113.197.15.233)  92.656 ms  92.562 ms  92.513 ms
 8  138.44.226.7 (138.44.226.7)  259.926 ms  259.917 ms  259.922 ms
 9  janet-gw.mx1.lon.uk.geant.net (62.40.124.198)  276.443 ms  276.399 ms  276.432 ms
10  ae29.londpg-sbr2.ja.net (146.97.33.2)  260.454 ms  260.410 ms  260.447 ms
11  ae31.erdiss-sbr2.ja.net (146.97.33.22)  264.266 ms  265.310 ms  265.263 ms
12  ae29.manckh-sbr2.ja.net (146.97.33.42)  266.156 ms  266.329 ms  266.222 ms
13  ae24.lanclu-rbr1.ja.net (146.97.38.58)  268.492 ms  268.613 ms  268.572 ms
14  lancaster-university.ja.net (194.81.46.2)  282.267 ms  282.006 ms  281.955 ms
15  is-border01.bfw01.rtr.lancs.ac.uk (148.88.253.202)  269.001 ms  268.922 ms  268.906 ms
16  bfw01.iss-servers.is-core01.rtr.lancs.ac.uk (148.88.250.98)  274.492 ms  273.986 ms  271.181 ms
17  * * *
18  www.lancs.ac.uk (148.88.65.80)  269.010 ms !X  268.971 ms !X  269.242 ms !X
```

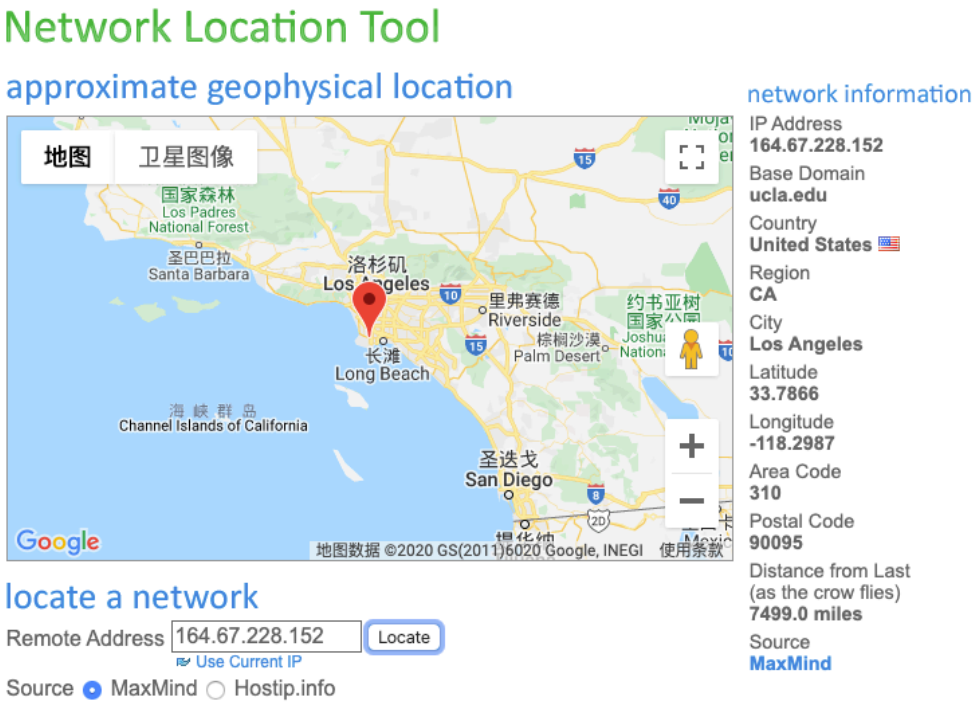
At which router do the paths from your machine to these three destinations diverge?

Answer: the 7th router of these three hosts is different.

Is the number of hops on each path proportional the physical distance?

Answer: No

Distance: www.ucla.edu



Distance: www.u-tokyo.ac.jp

Network Location Tool

approximate geophysical location

locate a network

Remote Address 210.152.243.234 Locate

Use Current IP

Source MaxMind Hostip.info

network information

IP Address
210.152.243.234

Base Domain
idcfcloud.com

Country
Japan

Region
Unknown

City
Unknown

Latitude
36

Longitude
138

Area Code
Unknown

Postal Code
Unknown

Distance from Last (as the crow flies)
5558.0 miles

Source
MaxMind

Distance: www.lancaster.ac.uk

Network Location Tool

approximate geophysical location

locate a network

Remote Address 148.88.65.80 Locate

Use Current IP

Source MaxMind Hostip.info

network information

IP Address
148.88.65.80

Base Domain
ac.uk

Country
United Kingdom

Region
H2

City
Lancaster

Latitude
54.0667

Longitude
-2.8333

Area Code
Unknown

Postal Code
Unknown

Distance from Last (as the crow flies)
5797.1 miles

Source
MaxMind

Distance: 1 > 3 > 2

But Amount of hops: 3 > 2 > 1

Question 3:

```
z5190861@vx5:/tmp_amd/reed/export/reed/1/z5190861$ nslookup www.speedtest.com
Server:         129.94.242.45
Address:        129.94.242.45#53

Non-authoritative answer:
Name:   www.speedtest.com
Address: 209.15.13.134

z5190861@vx5:/tmp_amd/reed/export/reed/1/z5190861$ nslookup www.telstra.net
Server:         129.94.242.45
Address:        129.94.242.45#53

Non-authoritative answer:
Name:   www.telstra.net
Address: 203.50.5.178
```

My IP address is 129.94.242.45

www.speedtest.com : IP address is 209.15.13.134

www.telstra.net: IP address is 203.50.5.178

From me to www.speedtest.com:

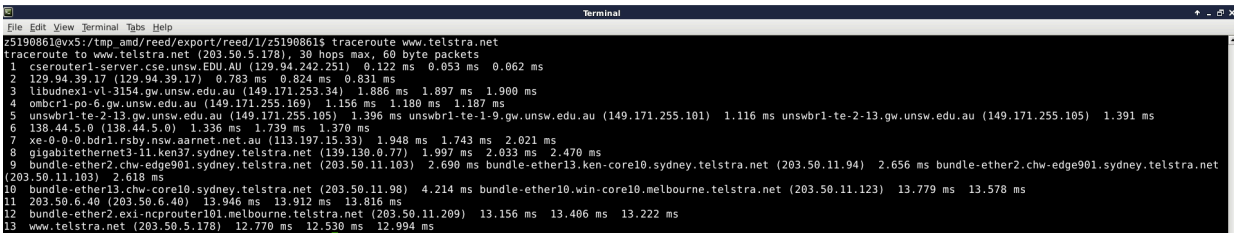
```
z5190861@vx5:/tmp_amd/reed/export/reed/1/z5190861$ traceroute www.speedtest.com
traceroute to www.speedtest.com (209.15.13.134), 30 hops max, 60 byte packets
 1  cserouter1-server.cse.unsw.EDU.AU (129.94.242.251)  0.078 ms  0.050 ms  0.053 ms
 2  129.94.39.17 (129.94.39.17)  0.803 ms  0.815 ms  0.836 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.380 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.558 ms  1.568 ms
 4  libcr1-po-6.gw.unsw.edu.au (149.171.255.201)  1.229 ms  1.180 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  23.424 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  41.588 ms  41.601 ms  41.597 ms
 6  138.44.5.0 (138.44.5.0)  1.293 ms  1.317 ms  1.316 ms
 7  et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147)  1.780 ms  1.698 ms  1.764 ms
 8  xe-0-2-5.bdr1.b.sea.aarnet.net.au (202.158.194.121)  144.132 ms  144.088 ms  144.166 ms
 9  xe-0-0-23-2.a01.sttlwa01.us.bb.gin.ntt.net (198.104.202.61)  144.584 ms  144.613 ms  144.582 ms
10  ae-2.r04.sttlwa01.us.bb.gin.ntt.net (129.250.5.85)  144.545 ms  144.693 ms  144.704 ms
11  sea-b2-link.telia.net (213.248.70.12)  144.394 ms  144.220 ms  144.192 ms
12  chi-b21-link.telia.net (62.115.117.49)  200.338 ms  200.230 ms  200.238 ms
13  toro-b2-link.telia.net (62.115.118.101)  198.293 ms  198.627 ms  198.486 ms
14  toro-b3-link.telia.net (62.115.117.228)  196.447 ms  196.593 ms  196.435 ms
15  toro-b1-link.telia.net (62.115.116.181)  209.818 ms  209.768 ms  209.686 ms
16  peer1-ic-309065-toro-b1.c.telia.net (213.248.103.86)  209.811 ms  209.700 ms  209.683 ms
17  100ge.et-7-0-2.tor-20plops-dis-1.peer1.net (216.187.113.178)  201.093 ms 100ge.et-2-0-2.tor-20plops-dis-2.peer1.net (216.187.113.180)  200.855 ms 100ge.et-7-0-2.tor-20plops-dis-1.peer1.n
et (216.187.113.178)  201.164 ms
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

From www.speedtest.com to me:

```
traceroute to 129.94.242.45 (129.94.242.45), 30 hops max, 60 byte packets
 1  ge2-8.r01.sin01.ne.com.sg (202.150.221.169)  0.189 ms  0.229 ms  0.253 ms
 2  10.15.62.210 (10.15.62.210)  0.263 ms  0.282 ms  0.299 ms
 3  aarnet.sgix.sg (103.16.102.67)  209.010 ms  209.026 ms  209.034 ms
 4  et-7-3-0.pe1.nsw.brwy.aarnet.net.au (113.197.15.232)  208.149 ms  208.105 ms  208.156 ms
 5  138.44.5.1 (138.44.5.1)  209.329 ms  209.311 ms  209.374 ms
 6  libcr1-te-1-5.gw.unsw.edu.au (149.171.255.102)  209.233 ms  209.204 ms  209.214 ms
 7  libudnex1-po-1.gw.unsw.edu.au (149.171.255.166)  209.491 ms ombudnex1-po-1.gw.unsw.edu.au (149.171.255.202)  208.699 m
 8  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  212.181 ms  212.200 ms  212.176 ms
 9  129.94.39.23 (129.94.39.23)  210.021 ms  210.006 ms  209.966 ms
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *

Traceroute Completed.
```

From me to www.telstra.net:



From www.telstra.net to me:

```
 1  gigabitethernet3-3.exi2.melbourne.telstra.net (203.50.77.53)  68.309 ms  1.203 ms  5.116 ms
 2  bundle-ether3-100.win-core10.melbourne.telstra.net (203.50.80.129)  1.363 ms  1.728 ms  1.992 ms
 3  bundle-ether12.ken-core10.sydney.telstra.net (203.50.11.122)  12.733 ms  12.098 ms  12.863 ms
 4  bundle-ether1.ken-edge901.sydney.telstra.net (203.50.11.95)  12.107 ms  11.847 ms  11.986 ms
 5  aarnet6.lnk.telstra.net (139.130.0.78)  11.859 ms  11.600 ms  11.611 ms
 6  xe-5-2-2.pe1.brwy.nsw.aarnet.net.au (113.197.15.32)  11.859 ms  11.850 ms  11.984 ms
 7  138.44.5.1 (138.44.5.1)  12.112 ms  11.977 ms  11.985 ms
 8  ombcr1-te-1-5.gw.unsw.edu.au (149.171.255.106)  11.984 ms  11.977 ms  11.983 ms
 9  ombudnex1-po-2.gw.unsw.edu.au (149.171.255.170)  12.237 ms  12.473 ms  12.611 ms
10  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  12.735 ms  12.722 ms  12.609 ms
11  129.94.39.23 (129.94.39.23)  12.861 ms  12.851 ms  12.861 ms
```

Does the reverse path go through the same routers as the forward path?

Answer: obviously no.

If you observe common routers between the forward and the reverse path, do you also observe the same IP addresses? Why or Why not?

Answer:

I observe common routers but don’t observe the same IP addresses.

Reason: Load balancing, so there is no guarantee that there will be the same route when transporting to the target host and coming back.

Exercise 4:

Question 1:

1: www.uq.edu.au

The physical distance from Unsw to Brisbane is about 922km.

T = 922 km / (3 * 10^8 m/s) = 3.07 ms

Y-axis ratio: 16.804 / 3.07 = 5.47

2: www.upm.edu.my

The physical distance from Unsw to Kuala Lumpur is about 6140km.

T = 6140 km / (3 * 10^8 m/s) = 20.47 ms

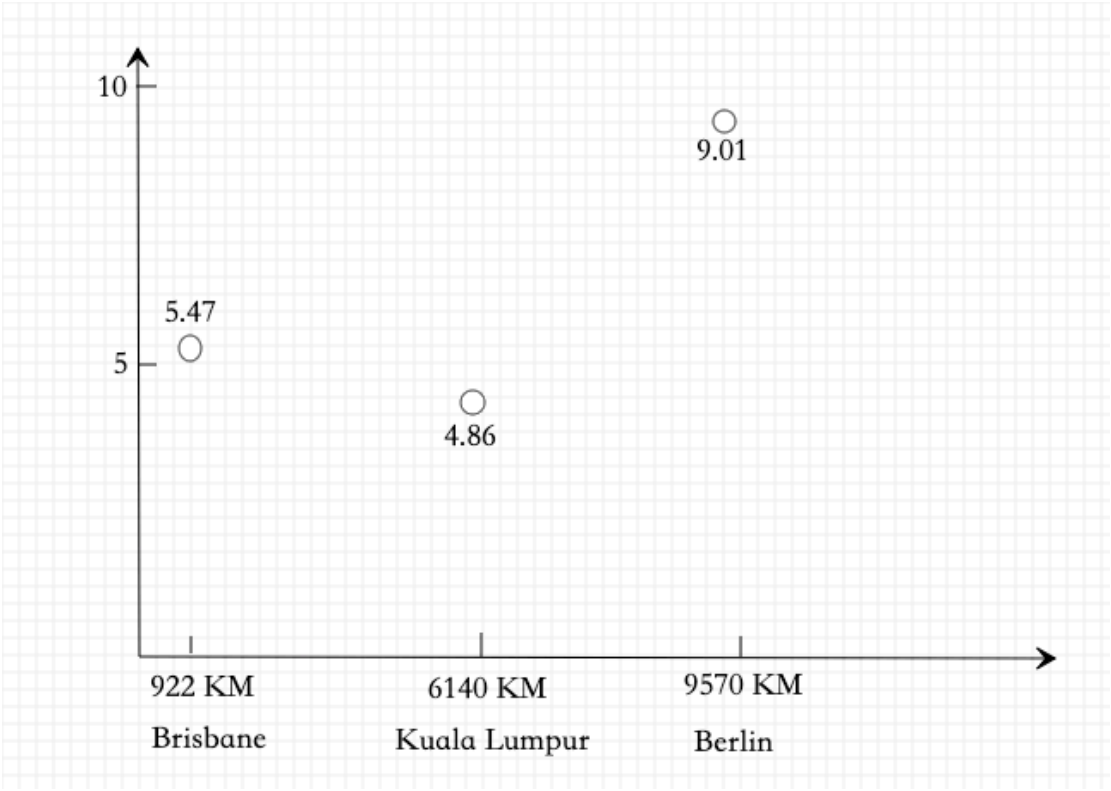
Y-axis ratio: 99.514 / 20.47 = 4.86

3: www.tu-berlin.de

The physical distance from Unsw to Berlin is about 9570km.

T = 9570 km / (3 * 10^8 m/s) = 31.9 ms

Y-axis ratio: 287.498 / 31.9 = 9.01



Can you think of at least two reasons why the y-axis values that you plot are greater than 2?

Answer:

1: Use the speed of light (3 * 10^8)

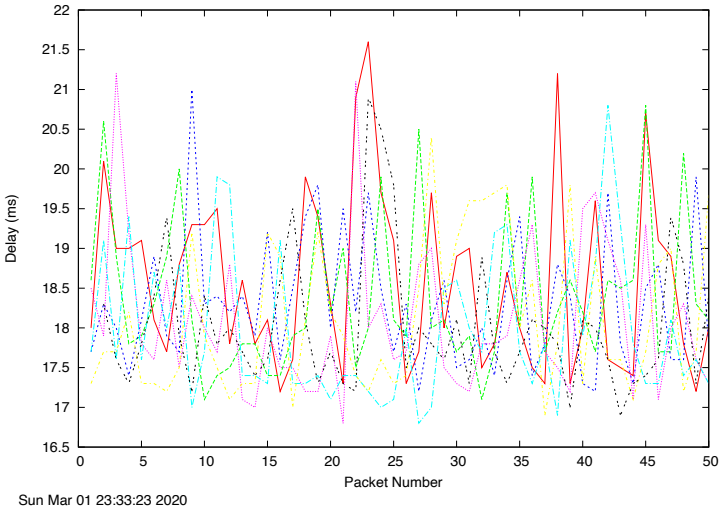
Usually, due to the influence of external factors, the speed of can not be equal to this.

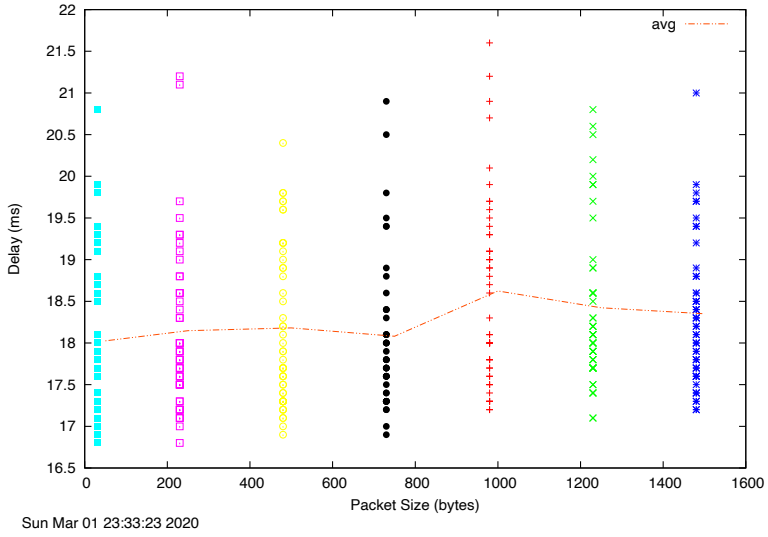
2: the distance

Usually, there is no ideal straight line distance between two places.

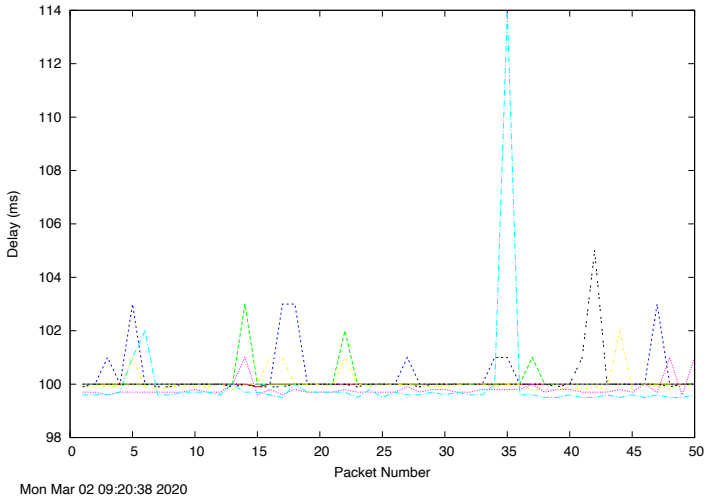
Question 2:

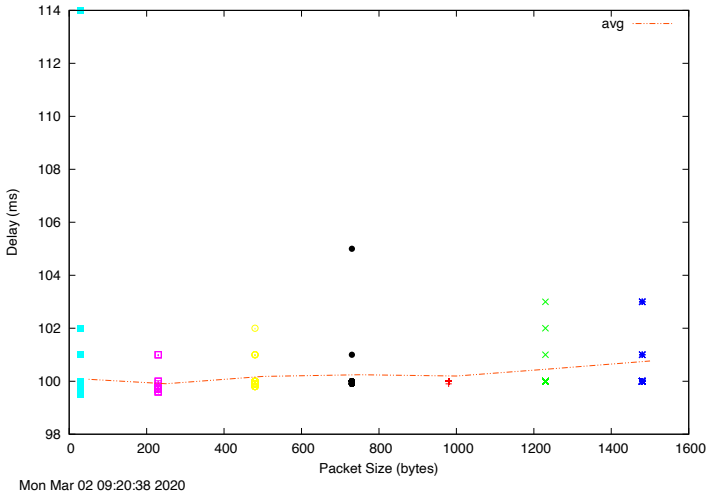
1: www.uq.edu.au



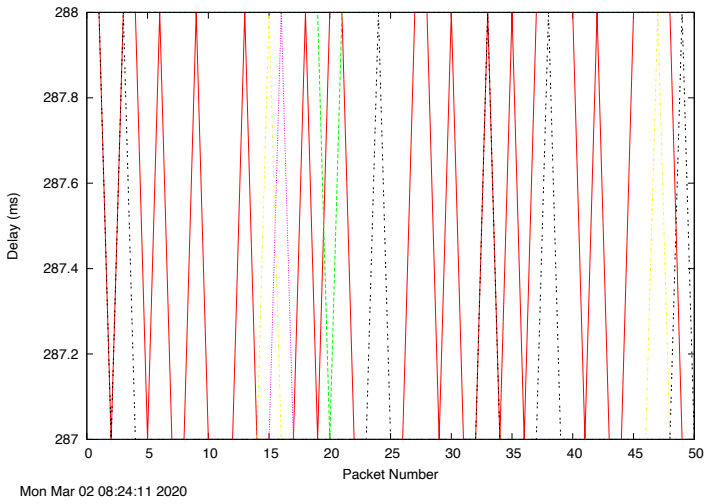


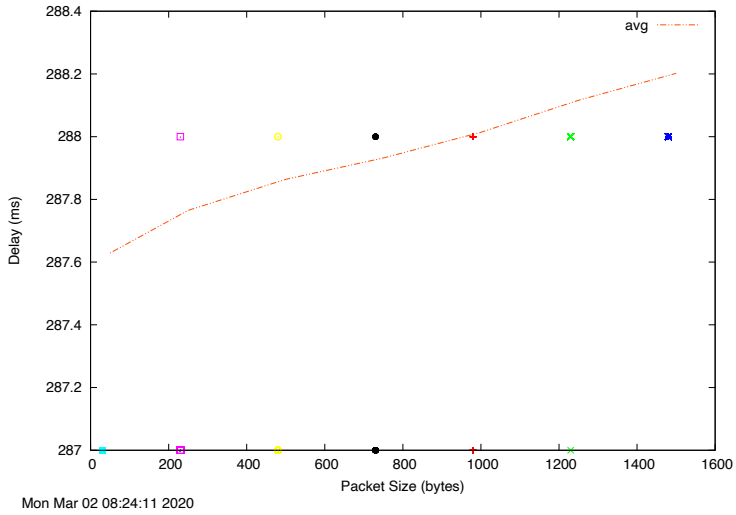
2: www.upm.edu.my





3: www.tu-berlin.de





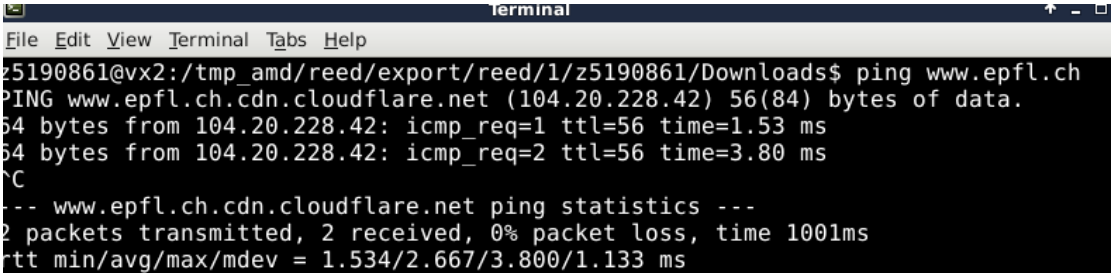
Is the delay to the destinations constant or does it vary over time? Explain why.

Delay to the destinations varies over time.

Answer:

Question 3:

Explore where the website for www.epfl.ch is hosted. Is it in Switzerland?



Answer: No, it is in US.

Question 4:

The measured delay (i.e., the delay you can see in the graphs) is composed of propagation delay, transmission delay, processing delay and queuing delay. Which of these delays depend on the packet size and which do not?

Answer:
The propagation delay does not depend on the packet size.
The transmission delay depends on the packet length.
The processing delay depends on the packet size.
The queuing delay does not depend on the packet size.