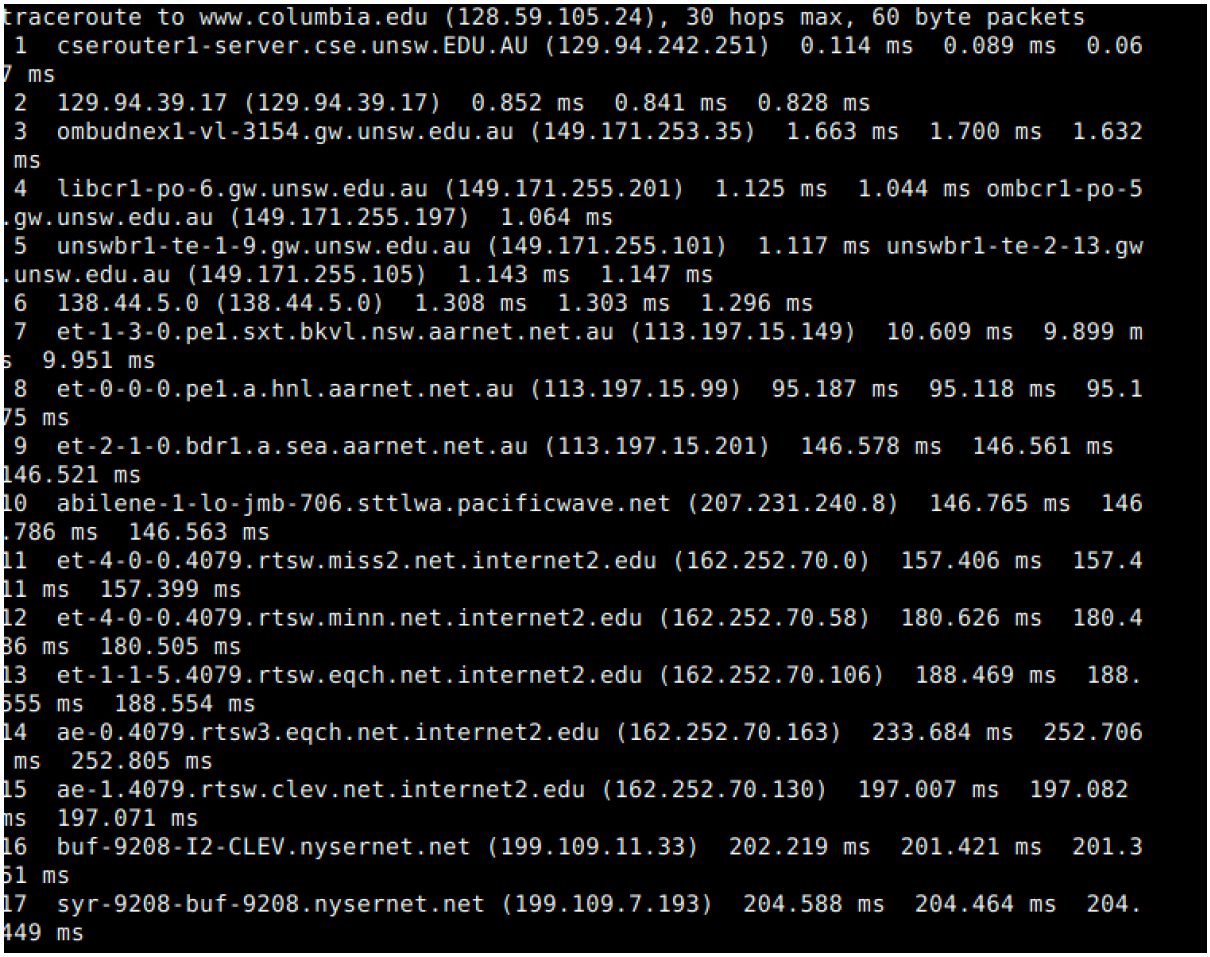
Ex1.

1. It has two IP addresses, 104.18.61.21 and 104.18.60.21. The merit of having several IP addresses: 1. Having multiple IP addresses on the same physical network can prevent traffic from congestion, reducing the load. 2. Users from all over the word can have the same good experience browsing the websites.

2. The name of the IP address 127.0.0.1 is localhost. It is a localhost and also is referred as loopback address.

Ex2. www.getfittest.com.au, www.kremlin.ru(100 % packet loss) and www.hola.hp are not reachable. It may be not a valid address, which means it doesn't know which host to contact. When testing by browser, www.getfittest.com.au and www.hola.hp are not reachable. If it can be opened from the web browser but cannot reach by using ping, means the site maybe blocked "using ping".

Ex3.



1. There are 21 routers between my work station and Columbia.edu. Five routers are part of the UNSW network. Between number nine and ten routers, because number nine is located in Australia but number ten is located in US.

2. At nsw.aarnet.net.au. The address of it is in Australia. And the role of it is AARNET Network Operation Centre.

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

% Information related to '113.197.15.0 - 113.197.15.255'

% Abuse contact for '113.197.15.0 - 113.197.15.255' is 'abuse@aarnet.e

inetnum:        113.197.15.0 - 113.197.15.255
netname:        IIPC
descr:          Customer Connection Network
country:        AU
admin-c:        ANOC-AP
tech-c:         ANOC-AP
status:         ASSIGNED NON-PORTABLE
remarks:        AARNet customer network
mnt-by:         MAINT-AARNET-AP
mnt-lower:      MAINT-AARNET-AP
mnt-routes:     MAINT-AARNET-AP
mnt-irt:        IRT-AARNET-AU
last-modified:  2011-10-20T08:36:39Z
source:         APNIC

irt:            IRT-AARNET-AU
address:        AARNet Pty Ltd
address:        26 Dick Perry Avenue
address:        Kensington, Western Australia
address:        Australia
e-mail:         abuse@aarnet.edu.au
abuse-mailbox:  abuse@aarnet.edu.au
admin-c:        SM6-AP
tech-c:         ANOC-AP
auth:           # Filtered
mnt-by:         MAINT-AARNET-AP
last-modified:  2010-11-08T08:02:43Z
source:         APNIC

role:           AARNet Network Operations Centre
remarks:
address:        AARNet Pty Ltd
address:        GPO Box 1559
address:        Canberra
address:        ACT  2601
country:        AU
phone:          +61 1300 275 662
phone:          +61 2 6222 3555
remarks:
e-mail:         noc@aarnet.edu.au
remarks:
remarks:        Send abuse reports to abuse@aarnet.edu.au
remarks:        Please include timestamps and offset to UTC in logs
remarks:        Peering requests to peering@aarnet.edu.au
remarks:
```

Hops to UCLA: 14

Hops to u-tokyo: 15

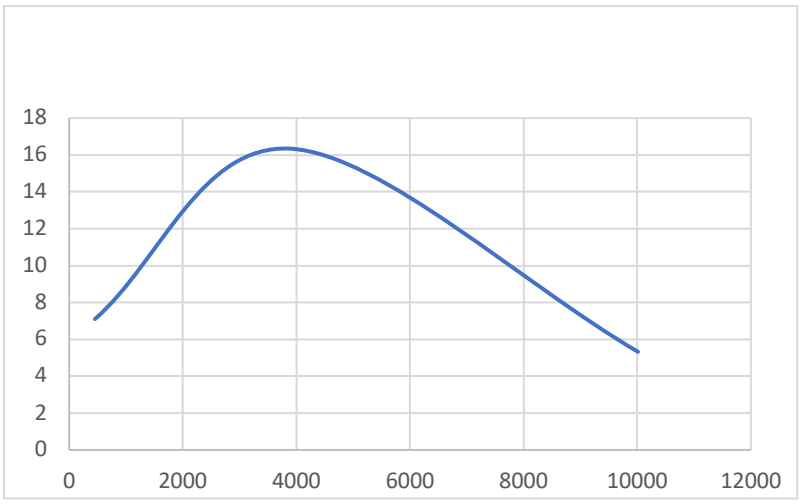
Hops to Lancaster: 26

From the distance info of the website and the number of hops we find above, we can say that the number of hops on each path is not proportional the physical distance.

3. I choose speedtest.com.sg and telstra.net. Not all taking the same routes. There are some common routers, but their IP address are different. Because for packet switching, each packet is independent, which means each packet can be sent in a different direction, but eventually they will arrive at the same destination.

Ex4. Use ping to gain insights into network performance

1.



UNSW => uq : 454.3miles

=> (1609.344* 454.3) / (3 * 10 ^ 8) = 0.002437s

RTT = 17.3ms = 0.0173s

y-axis => RTT/0.02437 = 7.10

UNSW => dlsu: 3900.74 miles

=> (1609.344*3900.74) / (3*10^8) = 0.02093s

RTT = 342.154ms = 0.342s

y-axis => RTT/0.02093 = 16.34

UNSW => tuber-lin: 10013.1 miles

=> (1609.344 * 10013) / (3 * 10 ^ 8) = 0.05317s

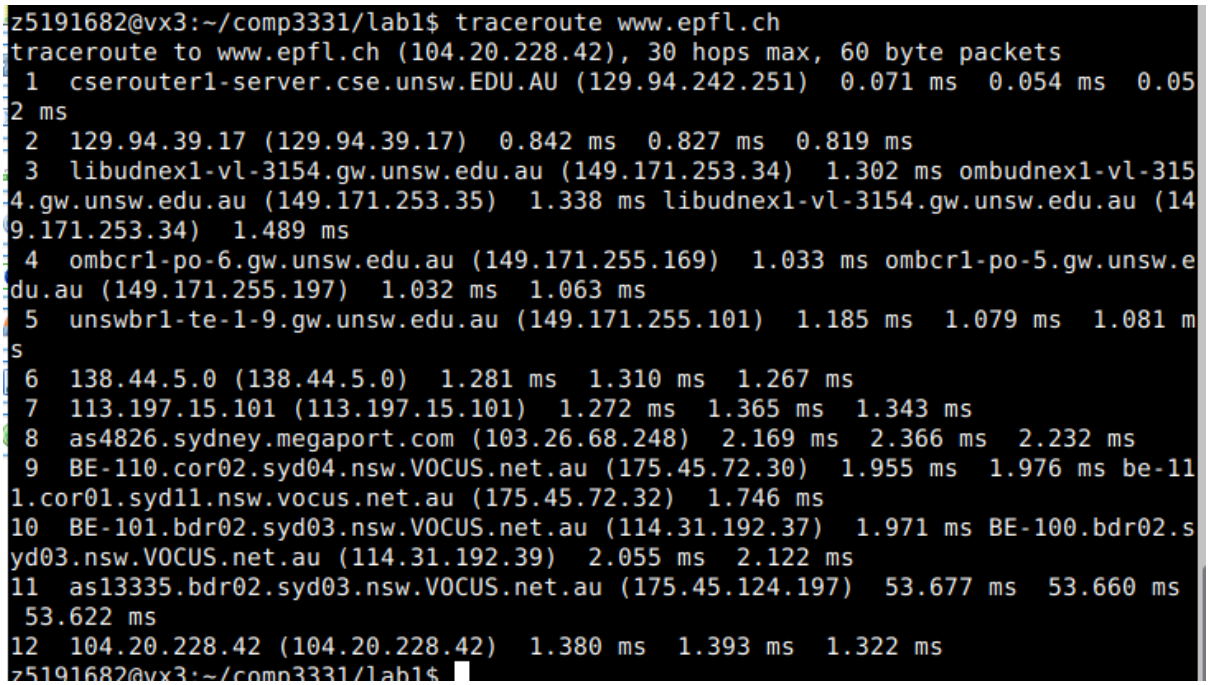
RTT = 283ms = 0.283s

y-axis => RTT/0.5317 = 5.323

Reasons about y-axis greater than 2: 1. The speed would be faster than that of light, which is impossible. 2. The min-delay is just one trip to the destination while the RTT is the total delay it has gone through (go and back to home).

2. The delay varies over time. Because they may choose different paths and some other delay such as propagation delay and processing delay or queuing delay may not be the same.

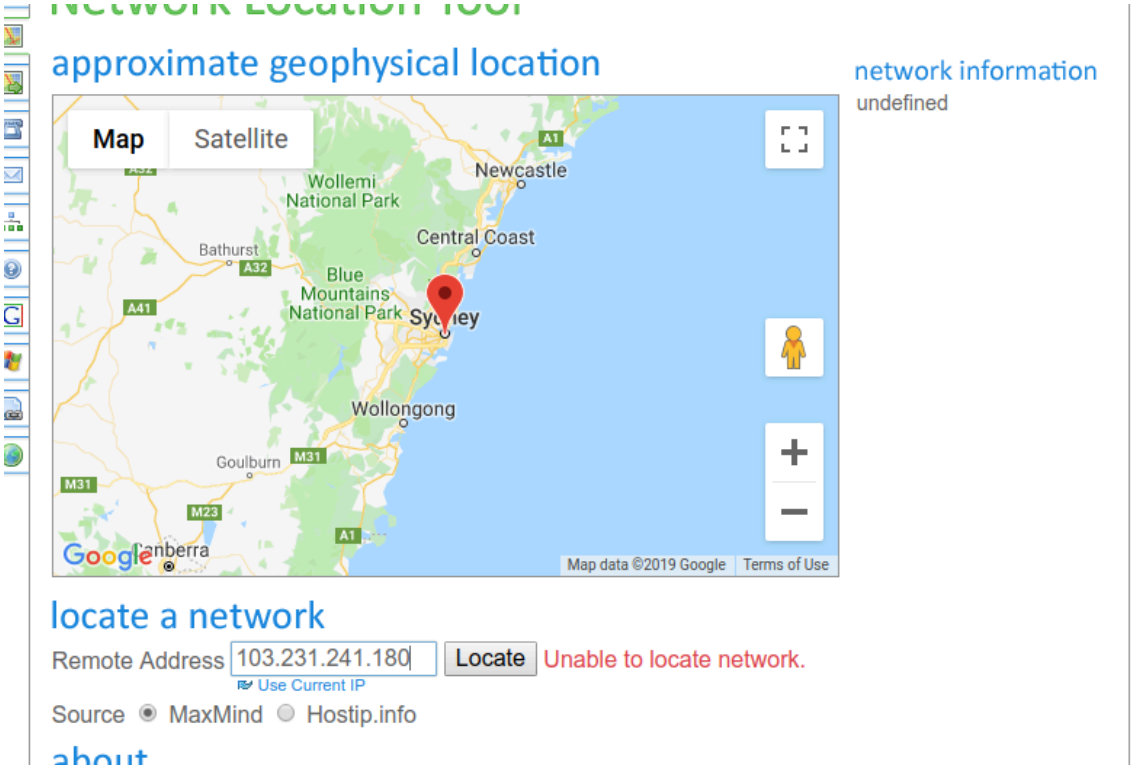
3. No it is not in switzerland. My guess is still in Sydney.



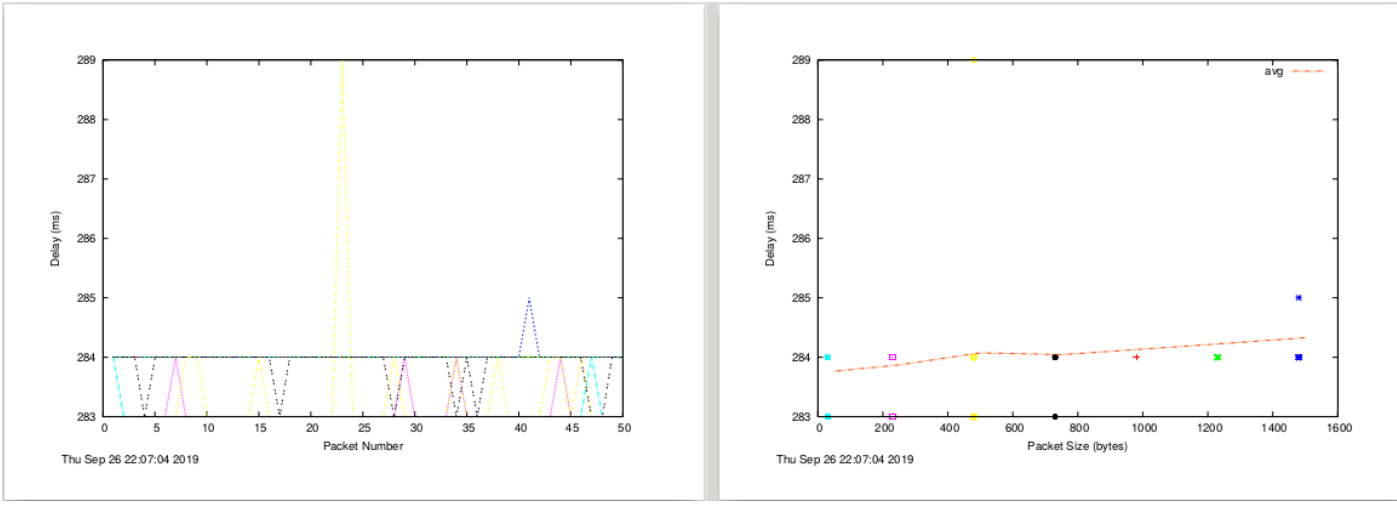
```
z5191682@vx3:~/comp3331/lab1$ traceroute www.epfl.ch
traceroute to www.epfl.ch (104.20.228.42), 30 hops max, 60 byte packets
 1  cserouter1-server.cse.unsw.EDU.AU (129.94.242.251)  0.071 ms  0.054 ms  0.05
2 ms
 2  129.94.39.17 (129.94.39.17)  0.842 ms  0.827 ms  0.819 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.302 ms ombudnex1-vl-315
4.gw.unsw.edu.au (149.171.253.35)  1.338 ms libudnex1-vl-3154.gw.unsw.edu.au (14
9.171.253.34)  1.489 ms
 4  ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.033 ms ombcr1-po-5.gw.unsw.e
du.au (149.171.255.197)  1.032 ms  1.063 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.185 ms  1.079 ms  1.081 m
s
 6  138.44.5.0 (138.44.5.0)  1.281 ms  1.310 ms  1.267 ms
 7  113.197.15.101 (113.197.15.101)  1.272 ms  1.365 ms  1.343 ms
 8  as4826.sydney.megaport.com (103.26.68.248)  2.169 ms  2.366 ms  2.232 ms
 9  BE-110.cor02.syd04.nsw.VOCUS.net.au (175.45.72.30)  1.955 ms  1.976 ms be-11
1.cor01.syd11.nsw.vocus.net.au (175.45.72.32)  1.746 ms
10  BE-101.bdr02.syd03.nsw.VOCUS.net.au (114.31.192.37)  1.971 ms BE-100.bdr02.s
yd03.nsw.VOCUS.net.au (114.31.192.39)  2.055 ms  2.122 ms
11  as13335.bdr02.syd03.nsw.VOCUS.net.au (175.45.124.197)  53.677 ms  53.660 ms
 53.622 ms
12  104.20.228.42 (104.20.228.42)  1.380 ms  1.393 ms  1.322 ms
z5191682@vx3:~/comp3331/lab1$
```

4. The transmission delay depends on the packet size while the other doesn't. (though processing delay may depend on the package time).

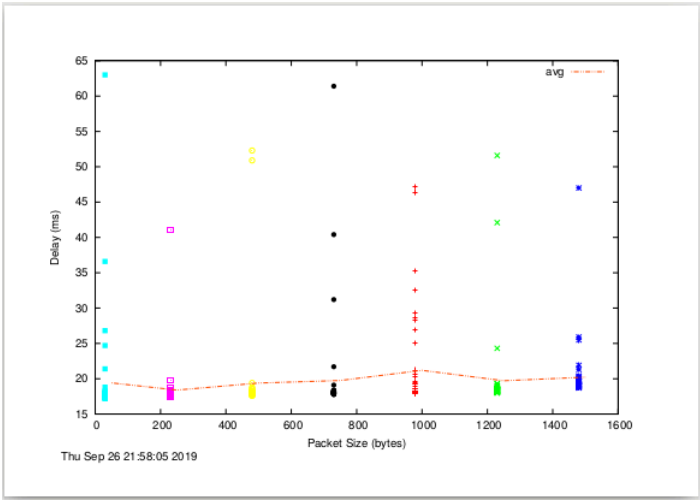
Finding the geophysical distance from UNSW to uq

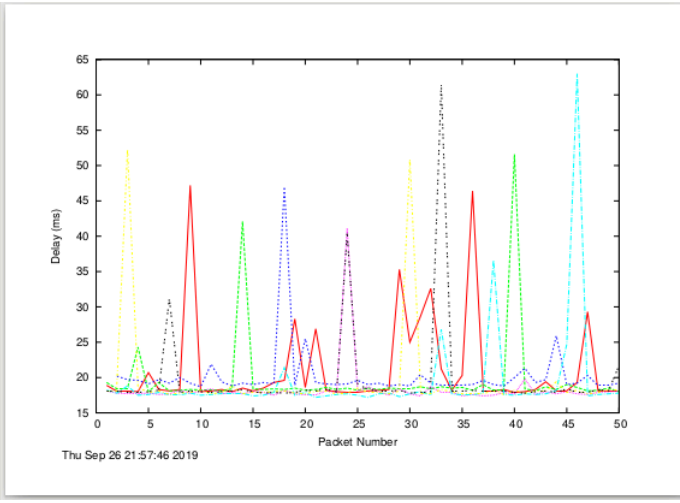


UNSW -> UQ



UNSW -> tu-berlin


avg
Delay (ms)
Packet Size (bytes)
Thu Sep 26 21:58:05 2019


Delay (ms)
Packet Number
Thu Sep 26 21:57:46 2019