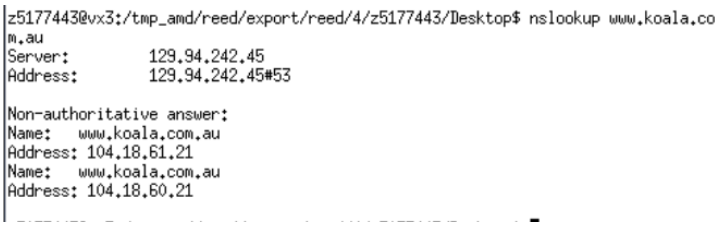
EXERCISE 1

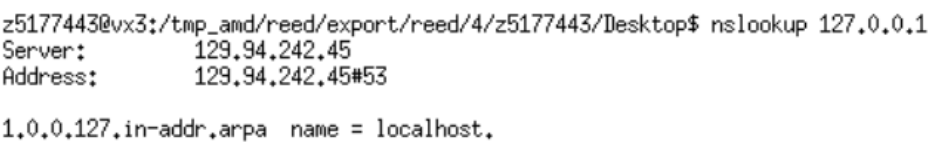
1.



The IP address of www.koala.com.au is 129.94.242.45.

We can know from the picture above is that this website only has one IP address, The reason of having serval IP addresses is the load-balancing technology. For example, One of the largest website in the world like www.youtube.com has 8 IP addresses to avoid overloading and increase availability. When people all over the world want to watch the videos from youtube at the same time, different IP can handle them well because there will be different servers to respond.

2.



The name of this IP address is localhost.

127.0.0.1 is loopback address which refers to local machine and usually is used to network testing. And IP will send message to itself when seeing localhost. And all IP addresses are the same which are 127.0.0.1.

EXERCISE 2

Not reachable:

www.getfittest.com.au

www.hola.hp

```
z5177443@vx3:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ ping www.getfittest.c
om.au
ping: unknown host www.getfittest.com.au

z5177443@vx3:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ ping www.hola.hp
ping: unknown host www.hola.hp
```

I think these two websites does not exist.

We can not access these website from our own machine.

www.kremlin.ru

We can access this website from our own machine so this website exists.

Therefore, I think this website refuses to respond the request form ping, which means that this machine disabled the ICMP protocol which is used by ping due to security reasons.

And all the other websites are reachable.

http://www.cse.unsw.edu.au

http://www.mit.edu

http://www.intel.com.au

www.tpg.com.au

http://www.telstra.com.au

www.amazon.com

http://www.wikileaks.org

www.tsinghua.edu.cn

http://www.tsinghua.edu.cn www.kremlin.rus

EXERCISE 3

1.

```
z5177443@vx3:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ 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)  0.098 ms  0.056 ms  0.051 ms
 2  129.94.39.17 (129.94.39.17)  0.837 ms  0.842 ms  0.815 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.665 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.572 ms  1.535 ms
 4  libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.060 ms ombcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.001 ms libcr1-po-6.gw.unsw.edu.au
(149.171.255.201)  1.066 ms
 5  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.103 ms unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.045 ms unswbr1-te-2-13.gw.u
nsw.edu.au (149.171.255.105)  1.091 ms
 6  138.44.5.0 (138.44.5.0)  1.245 ms  1.282 ms  1.236 ms
 7  et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149)  2.130 ms  1.969 ms  1.929 ms
 8  et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99)  95.065 ms  95.504 ms  95.493 ms
 9  et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201)  146.581 ms  146.543 ms  146.559 ms
10  abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8)  146.631 ms  146.619 ms  146.576 ms
11  et-4-0-0.4079.rtsw.miss2.net.internet2.edu (162.252.70.0)  157.347 ms  157.353 ms  157.394 ms
12  et-4-0-0.4079.rtsw.minn.net.internet2.edu (162.252.70.58)  180.611 ms  180.619 ms  180.635 ms
13  et-1-1-5.4079.rtsw.eqch.net.internet2.edu (162.252.70.106)  188.472 ms  188.396 ms  188.478 ms
14  ae-0.4079.rtsw3.eqch.net.internet2.edu (162.252.70.163)  188.390 ms  188.563 ms  188.570 ms
15  ae-1.4079.rtsw.clev.net.internet2.edu (162.252.70.130)  197.310 ms  196.957 ms  197.862 ms
16  buf-9208-I2-CLEV.nysernet.net (199.109.11.33)  201.324 ms  202.907 ms  202.901 ms
17  syr-9208-buf-9208.nysernet.net (199.109.7.193)  204.527 ms  204.551 ms  204.496 ms
18  nyc111-9204-syr-9208.nysernet.net (199.109.7.94)  213.643 ms  213.785 ms  213.943 ms
19  nyc-9208-nyc111-9204.nysernet.net (199.109.7.165)  213.853 ms  213.717 ms  213.750 ms
20  columbia.nyc-9208.nysernet.net (199.109.4.14)  213.730 ms  213.871 ms  213.621 ms
21  cc-core-1-x-nyser32-gw-1.net.columbia.edu (128.59.255.5)  214.317 ms  215.778 ms  214.011 ms
22  cc-conc-1-x-cc-core-1.net.columbia.edu (128.59.255.21)  214.200 ms  214.143 ms  214.249 ms
23  columbiauniversity.info (128.59.105.24)  213.980 ms  213.876 ms  213.953 ms
```

There are 23 routers between my workstation and www.columbia.edu.

5 routers are part of UNSW network, which are the first five(1,2,3,4,5)number.

Between number 7th et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au(113.197.15.149) and number 8th et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99) these two routers, packets cross the pacific ocean, because there is a relatively huge delay increase which happened between these two routers, which may be caused by the distance. It spends more time when response to my station compared to the other. And I also find that No.10 IP is in America and No.9 IP is in Australia by using whois command. Maybe they cross the Pacific Ocean.

```
z5177443@vx1:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ ping 113.197.15.99
PING 113.197.15.99 (113.197.15.99) 56(84) bytes of data.
64 bytes from 113.197.15.99: icmp_req=1 ttl=57 time=95.1 ms
64 bytes from 113.197.15.99: icmp_req=2 ttl=57 time=94.8 ms
64 bytes from 113.197.15.99: icmp_req=3 ttl=57 time=94.9 ms
64 bytes from 113.197.15.99: icmp_req=4 ttl=57 time=94.9 ms
64 bytes from 113.197.15.99: icmp_req=5 ttl=57 time=94.8 ms
```

```
z5177443@vx3:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ ping 113.197.15.149
PING 113.197.15.149 (113.197.15.149) 56(84) bytes of data.
64 bytes from 113.197.15.149: icmp_req=1 ttl=58 time=2.02 ms
64 bytes from 113.197.15.149: icmp_req=2 ttl=58 time=2.00 ms
64 bytes from 113.197.15.149: icmp_req=3 ttl=58 time=2.09 ms
64 bytes from 113.197.15.149: icmp_req=4 ttl=58 time=1.94 ms
```

2

```
z5177443@vx1:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ traceroute www.ucla.edu
traceroute to www.ucla.edu (164.67.228.152), 30 hops max, 60 byte packets
 1  cserouter1-server.cse.unsw.EDU.AU (129.94.242.251)  0.117 ms  0.083 ms  0.067 ms
 2  129.94.39.17 (129.94.39.17)  0.867 ms  0.864 ms  0.861 ms
 3  ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.516 ms  1.517 ms libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.428 ms
 4  libcr1-po-6.gw.unsw.edu.au (149.171.255.201)  1.087 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.078 ms ombcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.071 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.119 ms  1.133 ms unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.198 ms
 6  138.44.5.0 (138.44.5.0)  1.277 ms  1.291 ms  1.281 ms
 7  et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149)  2.211 ms  2.150 ms  2.167 ms
 8  et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99)  101.410 ms  101.322 ms  101.247 ms
 9  et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201)  146.477 ms  146.513 ms  146.450 ms
10  cenichpr-1-is-jmb-778.snvaca.pacificwave.net (207.231.245.129)  163.766 ms  163.694 ms  163.645 ms
11  hpr-lax-hpr3--svl-hpr3-100ge.cenic.net (137.164.25.73)  160.026 ms  159.852 ms  160.607 ms
12  * * *
13  bd11f1.anderson--cr001.anderson.ucla.net (169.232.4.6)  202.191 ms bd11f1.anderson--cr00f2.csb1.ucla.net (169.232.4.4)  161.044 ms bd11f1.anderson--cr001.anderson.ucla.net (169.232.4.6)  160.365 ms
14  cr00f1.anderson--dr00f2.csb1.ucla.net (169.232.4.55)  160.935 ms  160.422 ms  160.423 ms
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

Traceroute to www.ucla.edu from my machine

```
z5177443@vx1:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ traceroute www.u-tokyo.ac.jp
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)  0.101 ms  0.087 ms  0.077 ms
 2  129.94.39.17 (129.94.39.17)  0.818 ms  0.853 ms  0.858 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.725 ms  1.688 ms  1.699 ms
 4  libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.105 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.040 ms  1.052 ms
 5  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.070 ms  1.145 ms  1.074 ms
 6  138.44.5.0 (138.44.5.0)  1.315 ms  1.302 ms  1.296 ms
 7  et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147)  1.853 ms  1.722 ms  1.704 ms
 8  ge-4_0_0.bb1.a.pao.aarnet.net.au (202.158.194.177)  156.043 ms  156.098 ms  156.016 ms
 9  paloalto0.iij.net (198.32.176.24)  157.551 ms  157.577 ms  157.695 ms
10  osk004bb00.IIJ.Net (58.138.88.185)  288.047 ms osk004bb01.IIJ.Net (58.138.88.189)  270.596 ms  270.799 ms
11  osk004ip57.IIJ.Net (58.138.106.166)  279.669 ms osk004ip57.IIJ.Net (58.138.106.162)  279.592 ms  279.580 ms
12  210.130.135.130 (210.130.135.130)  270.885 ms  270.716 ms  270.668 ms
13  124.83.228.58 (124.83.228.58)  288.221 ms  279.710 ms  279.564 ms
14  124.83.252.178 (124.83.252.178)  276.568 ms  276.469 ms  285.202 ms
15  158.205.134.26 (158.205.134.26)  293.872 ms  285.164 ms  302.820 ms
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

Traceroute to www.u-tokyo.ac.jp from my machine

```
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)  0.073 ms  0.056 ms  0.053 ms
 2  129.94.39.17 (129.94.39.17)  0.826 ms  0.797 ms  0.755 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.823 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.162 ms libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.445 ms
 4  ombcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.125 ms  1.025 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.023 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.081 ms  1.071 ms  1.099 ms
 6  138.44.5.0 (138.44.5.0)  1.267 ms  1.215 ms  1.210 ms
 7  et-2-0-5.bdr1.sing.sin.aarnet.net.au (113.197.15.233)  92.502 ms  92.514 ms  92.501 ms
 8  138.44.226.7 (138.44.226.7)  256.208 ms  256.096 ms  256.048 ms
 9  janet-gw.mx1.lon.uk.geant.net (62.40.124.198)  256.139 ms  256.138 ms  256.116 ms
10  ae29.londpg-sbr2.ja.net (146.97.33.2)  256.824 ms  256.808 ms  256.665 ms
11  ae31.erdiss-sbr2.ja.net (146.97.33.22)  260.432 ms  260.400 ms  260.355 ms
12  ae29.manckh-sbr2.ja.net (146.97.33.42)  262.296 ms  262.457 ms  262.395 ms
13  ae24.lanclu-rbr1.ja.net (146.97.38.58)  264.612 ms  264.634 ms  264.600 ms
14  lancaster-university.ja.net (194.81.46.2)  278.780 ms  278.780 ms  278.751 ms
15  is-border01.bfw01.rtr.lancs.ac.uk (148.88.253.202)  265.091 ms  265.102 ms  265.128 ms
16  bfw01.iss-servers.is-core01.rtr.lancs.ac.uk (148.88.250.98)  269.999 ms  267.444 ms  267.419 ms
17  * * *
18  www.lancs.ac.uk (148.88.65.80)  265.409 ms !X  265.182 ms !X  265.308 ms !X
```

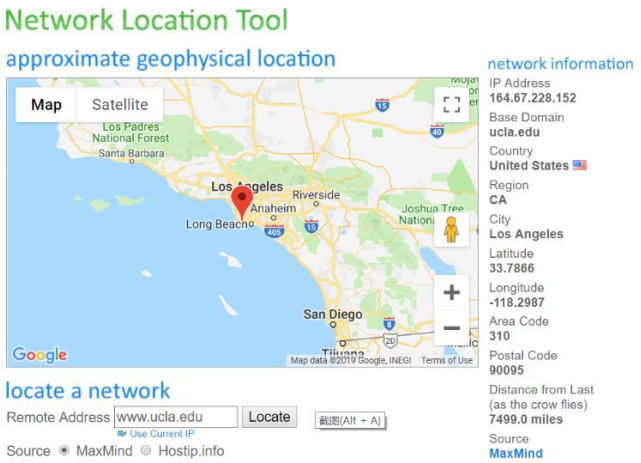
Traceroute to www.lancaster.ac.uk from my machine

```
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-AAAR1-AP
admin-c:        SM6-AP
tech-c:         ANOC-AP
notify:         irrcontact@aarnet.edu.au
mnt-by:         APNIC-HM
mnt-lower:      MAINT-AARNET-AP
mnt-routes:     MAINT-AARNET-AP
mnt-irt:        IRT-AARNET-AU
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:        -+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
last-modified:  2017-10-09T13:02:43Z
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

organisation:   ORG-AAAR1-AP
org-name:       Australian Academic and Research Network
country:        AU
address:        Building 9
address:        Banks Street
phone:          +61-2-6222-3530
fax-no:         +61-2-6222-3535
e-mail:         irrcontact@aarnet.edu.au
mnt-ref:        APNIC-HM
mnt-by:         APNIC-HM
last-modified:  2017-10-09T12:56:36Z
source:         APNIC
```

138.44.5.0 is the router which path starts to diverge and it is AARNet Network Operation Center in Australia. The picture above shows the details of this IP which I use ‘whois’ command.



This is the location of www.ucla.edu which I get from Network Location Tool website, and the rest of these two are similar.

10569.8 miles www.lancaster.ac.uk

7499.0 miles www.ucla.edu

4908.7 miles www.u-tokyo.ac.jp

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

3.

http://www.speedtest.com.sg/tr.php

IP：209.15.13.134

```
z5177443@vx2:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ nslookup www.speedtes
t.com
Server:         129.94.242.2
Address:        129.94.242.2#53

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

```
z5177443@vx2:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ 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)  0.125 ms  0.081 ms  0.061 ms
 2  129.94.39.17 (129.94.39.17)  0.878 ms  0.867 ms  0.847 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.643 ms  1.637 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.236 ms
 4  libcr1-po-6.gw.unsw.edu.au (149.171.255.201)  1.106 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.064 ms libcr1-po-6.gw.unsw.edu.au (149.171.255.201)  1.021 ms
 5  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.086 ms  1.095 ms  1.122 ms
 6  138.44.5.0 (138.44.5.0)  1.255 ms  1.269 ms  1.249 ms
 7  et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147)  1.755 ms  1.835 ms  1.826 ms
 8  xe-0-2-5.bdr1.b.sea.aarnet.net.au (202.158.194.121)  143.914 ms  143.808 ms  143.811 ms
 9  xe-0-0-23-2.a01.sttlwa01.us.bb.gin.ntt.net (198.104.202.61)  144.337 ms  144.359 ms  144.314 ms
10  ae-2.r04.sttlwa01.us.bb.gin.ntt.net (129.250.5.85)  144.036 ms  144.116 ms  144.069 ms
11  sea-b2-link.telia.net (213.248.70.12)  144.047 ms  144.048 ms  144.062 ms
12  chi-b21-link.telia.net (62.115.117.49)  200.270 ms  200.443 ms  200.202 ms
13  toro-b1-link.telia.net (62.115.118.231)  209.899 ms  210.347 ms  210.098 ms
14  peer1-ic-309065-toro-b1.c.telia.net (213.248.103.86)  206.349 ms  206.207 ms  206.186 ms
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

截图(Alt + A)

Traceroute Result:

```
traceroute to 129.94.242.251 (129.94.242.251), 30 hops max, 60 byte packets
 1  ge2-8.r01.sin01.ne.com.sg (202.150.221.169)  0.201 ms  0.207 ms  0.209 ms
 2  10.15.62.210 (10.15.62.210)  0.257 ms  0.300 ms  0.310 ms
 3  aarnet.sgix.sg (103.16.102.67)  211.317 ms  211.326 ms  211.330 ms
 4  et-7-3-0.pe1.nsw.brwy.aarnet.net.au (113.197.15.232)  209.071 ms  209.130 ms  209.151 ms
 5  138.44.5.1 (138.44.5.1)  204.356 ms  204.515 ms  204.427 ms
 6  ombcr1-te-1-5.gw.unsw.edu.au (149.171.255.106)  209.025 ms  208.877 ms  208.857 ms
 7  libudnex1-po-2.gw.unsw.edu.au (149.171.255.198)  208.874 ms  208.914 ms  209.668 ms
 8  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  209.483 ms  209.570 ms  209.556 ms
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

https://www.telstra.net/cgi-bin/trace

IP:203.36.190.8

```
z5177443@vx2:/tmp_amd/reed/export/reed/4/z5177443/Desktop$ traceroute www.telstra.net
traceroute to www.telstra.net (203.50.5.178), 30 hops max, 60 byte packets
 1  cserouter1-server.cse.unsw.EDU.AU (129.94.242.251)  0.097 ms  0.068 ms  0.062 ms
 2  129.94.39.17 (129.94.39.17)  0.906 ms  0.867 ms  0.857 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.439 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1
.588 ms  2.145 ms
 4  libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.021 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.051 ms om
bcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.073 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.144 ms unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.13
5 ms  1.152 ms
 6  138.44.5.0 (138.44.5.0)  1.366 ms  1.244 ms  1.238 ms
 7  xe-0-0-0.bdr1.rsby.nsw.aarnet.net.au (113.197.15.33)  1.424 ms  1.488 ms  1.438 ms
 8  gigabitethernet3-11.ken37.sydney.telstra.net (139.130.0.77)  2.215 ms  2.244 ms  2.151 ms
 9  bundle-ether2.chw-edge901.sydney.telstra.net (203.50.11.103)  2.517 ms  2.146 ms bundle-ether13.ken-core10.sydne
y.telstra.net (203.50.11.94)  2.680 ms
10  bundle-ether10.win-core10.melbourne.telstra.net (203.50.11.123)  14.507 ms bundle-ether13.chw-core10.sydney.tels
tra.net (203.50.11.98)  4.155 ms bundle-ether10.win-core10.melbourne.telstra.net (203.50.11.123)  14.390 ms
11  bundle-ether8.exi-core10.melbourne.telstra.net (203.50.11.125)  14.168 ms 203.50.6.40 (203.50.6.40)  15.162 ms
15.115 ms
12  bundle-ether2.exi-ncprouter101.melbourne.telstra.net (203.50.11.209)  13.441 ms  13.456 ms  13.234 ms
13  www.telstra.net (203.50.5.178)  12.641 ms  12.622 ms  12.599 ms
```

```
 1  gigabitethernet3-3.exi2.melbourne.telstra.net (203.50.77.53)  0.369 ms  0.326 ms  0.244 ms
 2  bundle-ether3-100.win-core10.melbourne.telstra.net (203.50.80.129)  2.111 ms  1.228 ms  2.115 ms
 3  bundle-ether12.ken-core10.sydney.telstra.net (203.50.11.122)  12.237 ms  12.223 ms  12.861 ms
 4  bundle-ether1.ken-edge901.sydney.telstra.net (203.50.11.95)  11.984 ms  11.849 ms  12.734 ms
 5  aarnet6.lnk.telstra.net (139.130.0.78)  11.610 ms  11.849 ms  11.860 ms
 6  xe-5-2-2.pe1.brwy.nsw.aarnet.net.au (113.197.15.32)  11.857 ms  11.973 ms  11.736 ms
 7  138.44.5.1 (138.44.5.1)  11.988 ms  11.976 ms  11.984 ms
 8  ombcr1-te-1-5.gw.unsw.edu.au (149.171.255.106)  12.112 ms  13.348 ms  11.985 ms
 9  libudnex1-po-2.gw.unsw.edu.au (149.171.255.198)  12.361 ms  12.723 ms  12.360 ms
10  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  12.608 ms  12.599 ms  12.611 ms
```

No. It is obvious that the reverse part does not go through the same routers.

Yes. And one website may have many IP address which aim to allocate different interfaces. For every route, it has its own rules and they are determined by default routing, neighbouring networks, metrics and so on. we can see the same IP address when observing common routers along the path. The other reason is that the path is different when trace back form these website to our IP.

EXERCISE 4

1.

Distance:

Brisbane 736 km

Manila: 6260km

Berlin: 16084km

Propagation delay:

T(Brisbane) = 736 * 1000 / 3 * 10^8 m/s = 2.45ms

T(Manila) = 6260 * 1000 / 3 * 10^8 m/s = 20.8ms

T(Berlin) =16084 * 1000 / 3 * 10^8 m/s = 53.6ms

From the corresponding *avg.txt files:

min RRT(Brisbane) = 17.431ms

min RRT(Manila) = 341.482ms

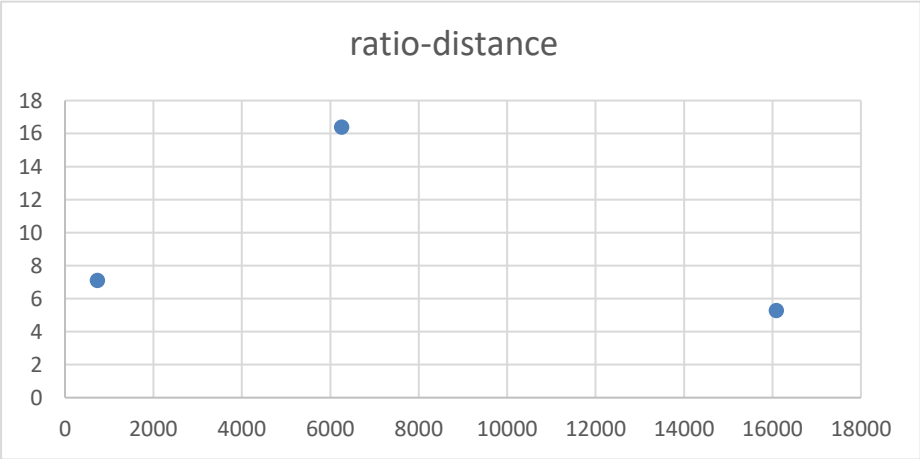
min RRT(Berlin) = 283.792ms

Ratios:

R(Brisbane) = 7.11

R(Manila) = 16.39

R(Berlin) = 5.29



This picture shows the y-axis values are greater than 2, which proves that there may be a congestion in the network and there are many routers along the path

The reason why this ratio is always > 2 is that the speed of packets traveling can not be full light speed because traveling passes through some medium. Another reason is that SP-level routing may not find the least cost path.

2

It will vary over time.

This is because each time the processing and queuing delay are different. This value is relatively random.

3

No, it is not in Switzerland.

We can get the IP address of this website which is 104.20.228.42 using the command ping.

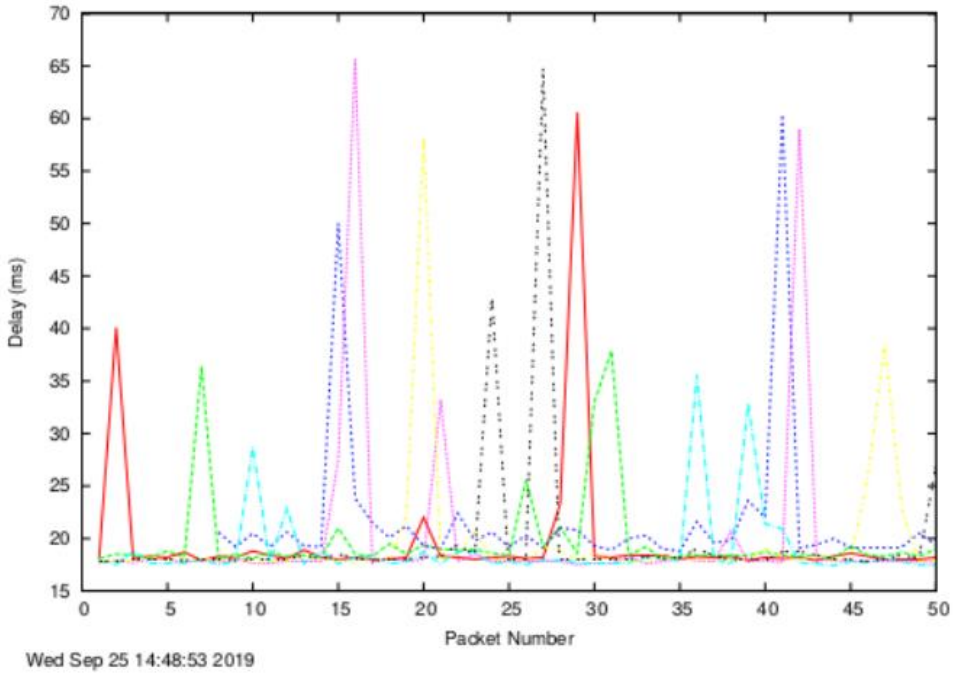
Then using the whois 104.20.228.42 command I get that this website does not from Switzerland but from CloudFlare Company which is a company form the United States.

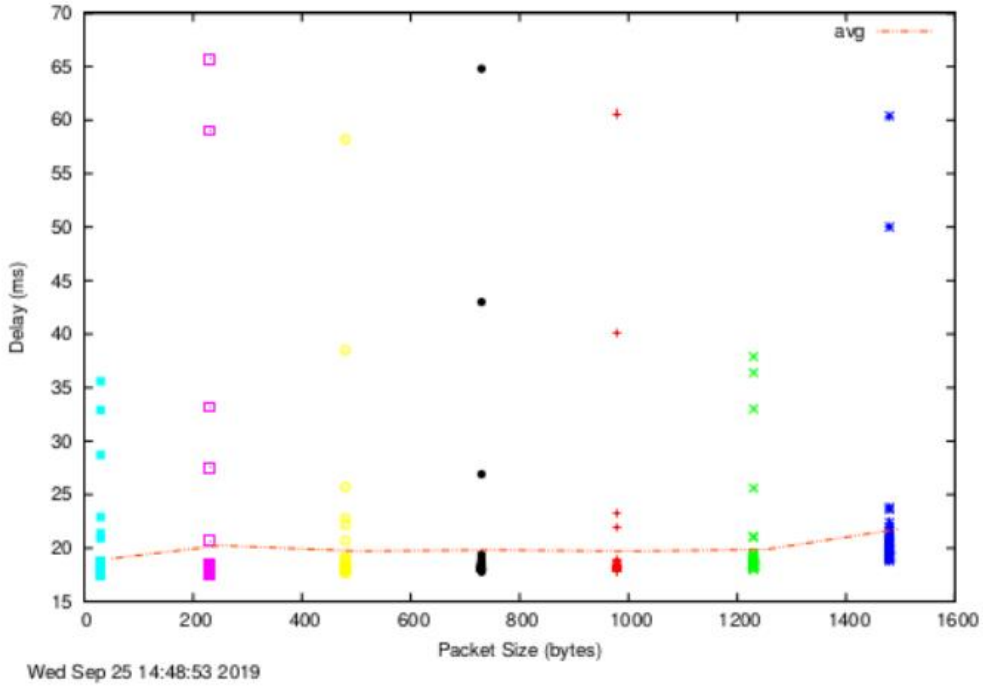
4.

Transmission delay and processing delay depend on the packet size, while other two do not rely on that. The link such as cable decides the propagation speed and the queuing delay depends on the congestion level. And it will increase along with more traffic in our network.

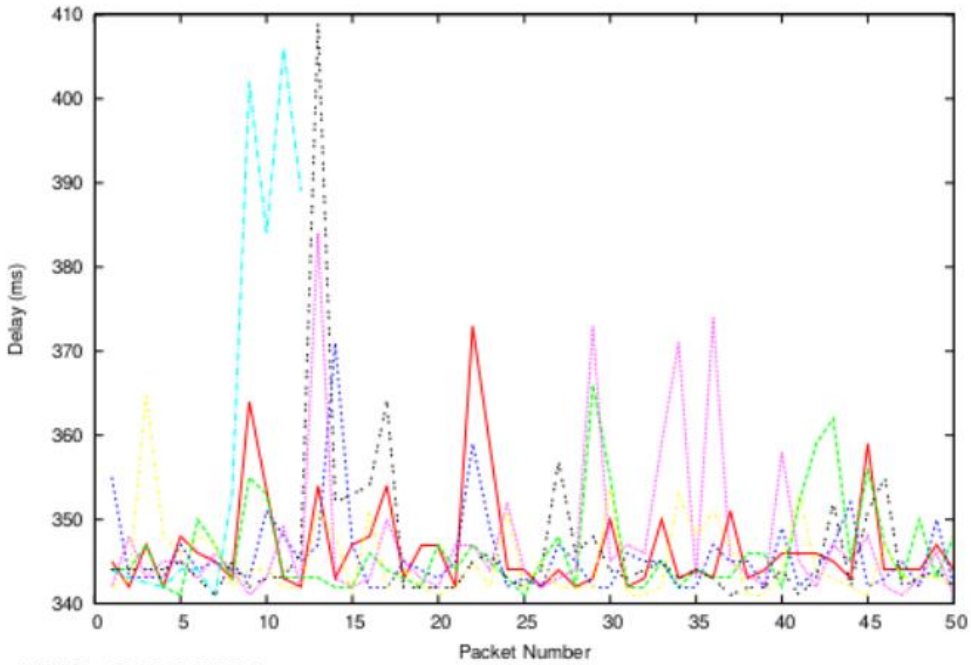
Processing delay depends on the speed of CPU and packages size.

Transmission delay depends is proportional to the package size and the R value(D = L/R).

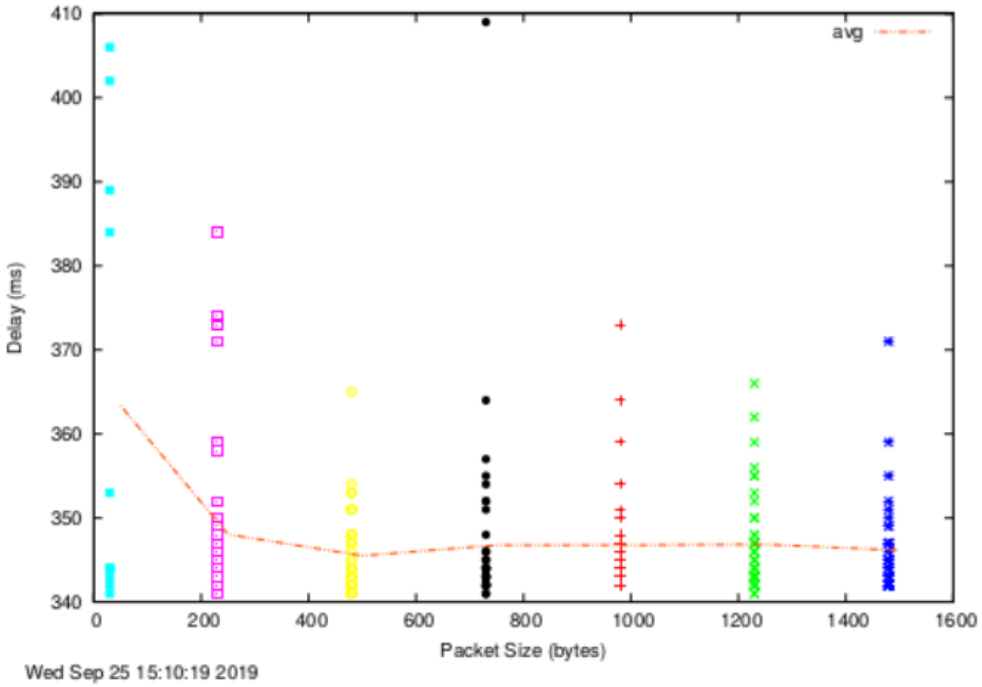




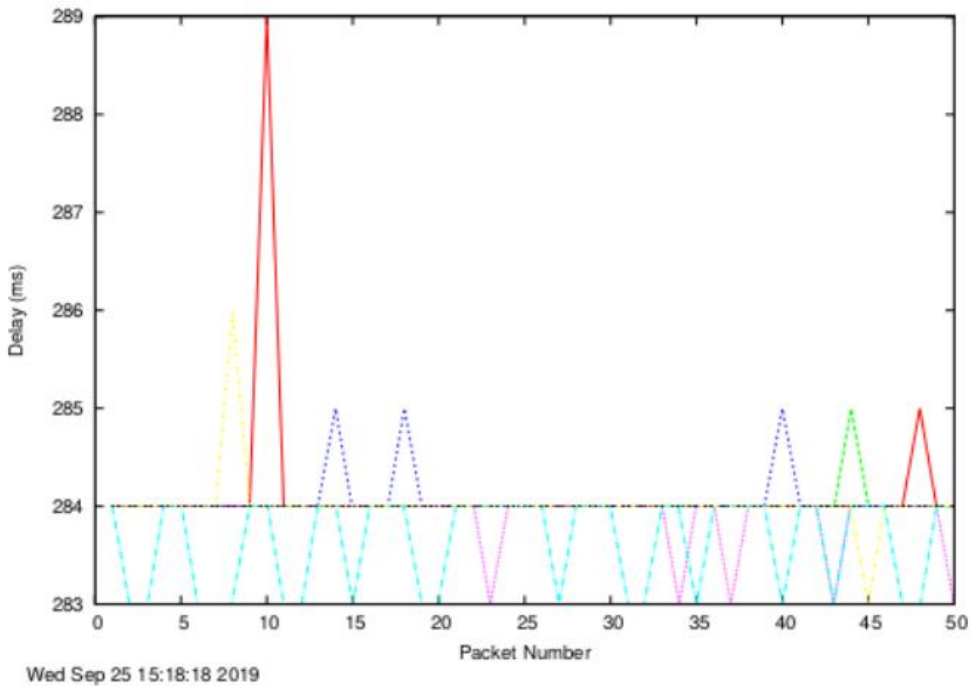
Wed Sep 25 14:48:53 2019



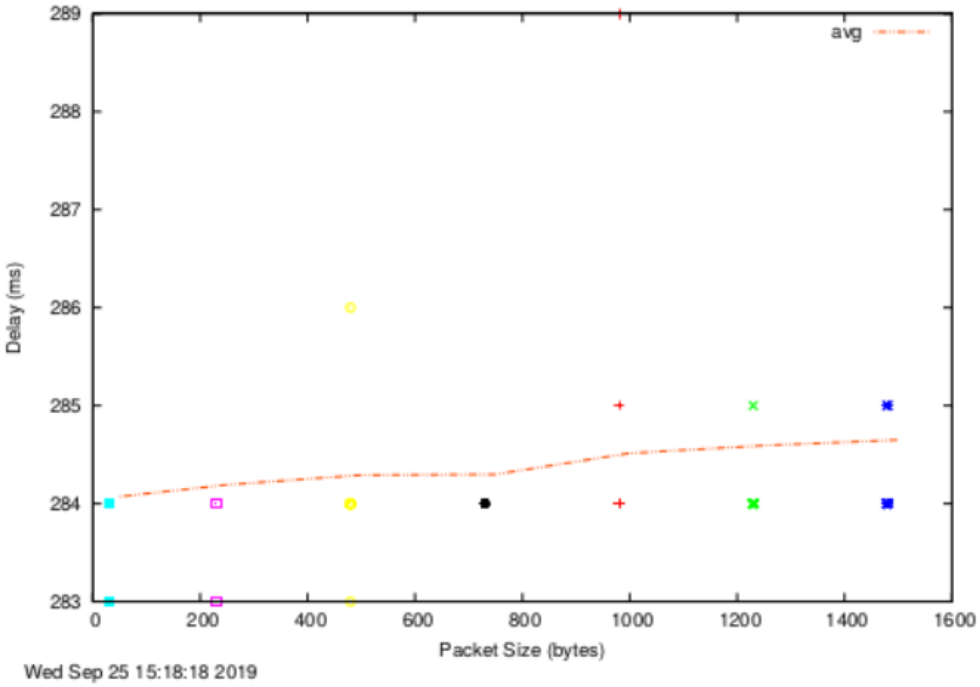
Wed Sep 25 15:10:19 2019



Wed Sep 25 15:10:19 2019



Wed Sep 25 15:18:18 2019


289
288
287
286
285
284
283
Delay (ms)
0
200
400
600
800
1000
1200
1400
1600
Packet Size (bytes)
avg
Wed Sep 25 15:18:18 2019