

## Exercise 1: nslookup

1.

> ip addresses of www.google.com

203.5.76.212#53; 203.5.76.213#53; 203.5.76.214#53; 203.5.76.215#53; 203.5.76.216#53;  
203.5.76.217#53; 203.5.76.218#53; 203.5.76.219#53; 203.5.76.208#53; 203.5.76.209#53;  
203.5.76.210#53; 203.5.76.211#53

Different servers can be access through different IP addresses. Using more servers makes website load balancing.

2.

Name is localhost.

It points to local computer itself.

## Exercise 2: ifconfig

1.

Eth0:

Ipv4 addr:129.94.242.19

Ipv6 addr:fe80::250:56ff:fe8f:a9/64

Eth1:

inet6 addr: fe80::250:56ff:fe8f:790a/64 Scope:Link

inet6 addr: 2001:388:c:4193:129:94:242:19/64 Scope:Global

2.

Eth1, eth2, lo

## Exercise 3: netstat

1.

Proto	Recv-Q	Send-Q	Local Address	Foreign Address	State
tcp	0	0	oboe02.orchestra.:57155	14.17.42.125:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:48918	cache.google.com:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:54343	syd15s01-in-f14.1:https	ESTABLISHED
tcp	1	0	oboe02.orchestra.:57314	bandleader.orchest:ldap	CLOSE_WAIT
tcp	1	0	oboe02.orchestra.:57330	bandleader.orchest:ldap	CLOSE_WAIT
tcp	398	0	oboe02.orchestra.:48917	cache.google.com:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:48596	151.101.100.133:https	ESTABLISHED
tcp	1	0	oboe02.orchestra.:57327	bandleader.orchest:ldap	CLOSE_WAIT

tcp	0	0	oboe02.orchestra.:39574	103.7.30.100:https	ESTABLISHED
tcp	1	0	oboe02.orchestra.:57337	bandleader.orchest:ldap	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:48597	151.101.100.133:https	ESTABLISHED
tcp	1	0	oboe02.orchestra.:57304	bandleader.orchest:ldap	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:43586	oboe02.orchestra.cs:x11	TIME_WAIT
tcp	1	0	oboe02.orchestra.:57084	bandleader.orchest:ldap	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:44458	tj-in-f188.1e100.n:5228	ESTABLISHED
tcp	1	0	oboe02.orchestra.:57352	bandleader.orchest:ldap	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:59175	103.7.30.100:www	TIME_WAIT
tcp	0	0	oboe02.orchestra.:60170	syd10s01-in-f14.1:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:52730	103.7.30.66:https	TIME_WAIT
tcp	1	0	oboe02.orchestra.:57338	bandleader.orchest:ldap	CLOSE_WAIT
tcp	1	0	oboe02.orchestra.:57319	bandleader.orchest:ldap	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:57362	bandleader.orchest:ldap	ESTABLISHED
tcp	1	0	oboe02.orchestra.:57346	bandleader.orchest:ldap	CLOSE_WAIT
tcp	1	0	oboe02.orchestra.:57320	bandleader.orchest:ldap	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:48598	151.101.100.133:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:46225	203.205.151.215:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:42917	113.108.11.37:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:48599	151.101.100.133:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:39582	14.18.245.239:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:39581	14.18.245.239:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:49450	59.37.96.191:https	ESTABLISHED
tcp	1	0	oboe02.orchestra.:57350	bandleader.orchest:ldap	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:53738	203.205.150.121:https	ESTABLISHED
tcp	1	0	oboe02.orchestra.:59174	103.7.30.100:www	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:48591	151.101.100.133:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:60209	syd10s01-in-f14.1:https	ESTABLISHED
tcp	1	0	oboe02.orchestra.:57318	bandleader.orchest:ldap	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:43893	163.177.71.148:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:54355	syd15s01-in-f14.1:https	ESTABLISHED
tcp	0	0	oboe02.orchestra.:59657	syd09s01-in-f3.1e:https	ESTABLISHED
tcp	1	0	oboe02.orchestra.:57344	bandleader.orchest:ldap	CLOSE_WAIT
tcp	1	0	oboe02.orchestra.:57331	bandleader.orchest:ldap	CLOSE_WAIT
tcp	1	0	oboe02.orchestra.:57083	bandleader.orchest:ldap	CLOSE_WAIT
tcp	0	0	oboe02.orchestra.:42918	113.108.11.37:https	ESTABLISHED

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tcp    0    0 oboe02.orchestra.:38393 14.17.18.193:https    ESTABLISHED
tcp    1    0 oboe02.orchestra.:57351 bandleader.orchest:ldap CLOSE_WAIT
tcp    1    0 oboe02.orchestra.:57325 bandleader.orchest:ldap CLOSE_WAIT
tcp    0    0 oboe02.orchestra.:54683 cache.google.com:https ESTABLISHED
tcp    1    0 oboe02.orchestra.:47700 117.18.237.29:www     CLOSE_WAIT
tcp    0    0 oboe02.orchestra.:52731 103.7.30.66:https     TIME_WAIT
tcp    1    0 oboe02.orchestra.:57332 bandleader.orchest:ldap CLOSE_WAIT
tcp    1    0 oboe02.orchestra.:57303 bandleader.orchest:ldap CLOSE_WAIT
tcp    0    0 oboe02.orchestra.:49581 syd10s01-in-f109.:https ESTABLISHED
tcp    0    0 oboe02.orchestra.:43058 ec2-52-22-186-229:https ESTABLISHED
tcp    0    0 oboe02.orchestra.:43876 163.177.71.148:https  TIME_WAIT
tcp    1    0 oboe02.orchestra.:57339 bandleader.orchest:ldap CLOSE_WAIT
tcp    0    0 oboe02.orchestra.:48590 151.101.100.133:https ESTABLISHED
tcp    1    0 oboe02.orchestra.:57301 bandleader.orchest:ldap CLOSE_WAIT
tcp    0    0 oboe02.orchestra.:49451 59.37.96.191:https    TIME_WAIT
tcp    0    0 oboe02.orchestra.:60147 syd15s01-in-f10.1:https ESTABLISHED
tcp    0    0 oboe02.orchestra.:59682 syd09s01-in-f3.1e:https ESTABLISHED
tcp    1    0 oboe02.orchestra.:57357 bandleader.orchest:ldap CLOSE_WAIT
tcp    0    0 oboe02.orchestra.:48964 cache.google.com:https ESTABLISHED
tcp    0    0 oboe02.orchestra.:54342 syd15s01-in-f14.1:https ESTABLISHED
tcp    1    0 oboe02.orchestra.:57333 bandleader.orchest:ldap CLOSE_WAIT
tcp    0    0 oboe02.orchestra.:48603 151.101.100.133:https ESTABLISHED
tcp    0    0 oboe02.orchestra.:34490 syd10s01-in-f10.1:https ESTABLISHED
tcp    0    0 oboe02.orchestra.:39549 103.7.30.100:https     ESTABLISHED
tcp    1    0 oboe02.orchestra.:57334 bandleader.orchest:ldap CLOSE_WAIT
tcp    1    0 oboe02.orchestra.:57343 bandleader.orchest:ldap CLOSE_WAIT
tcp    1    0 oboe02.orchestra.:57324 bandleader.orchest:ldap CLOSE_WAIT
tcp    0    0 oboe02.orchestra.:38394 14.17.18.193:https    ESTABLISHED
tcp    1    0 oboe02.orchestra.:57340 bandleader.orchest:ldap CLOSE_WAIT

```

## Exercise 4: Using ping to test host reachability

Ping command for 'Compnet.epfl.ch' is not reachable. Using web browser cannot reach either.

8.8.8.8 is reachable.

The domain name cannot be resolved. Or the website has firewall.

## Exercise 5: Use traceroute to understand network topology

1.

```
wagner % traceroute www.nyu.edu
traceroute to www.nyu.edu (128.122.119.202), 30 hops max, 40 byte packets
 1  vlan385.gasr1.gw.unsw.EDU.AU (129.94.242.1)  4.865 ms  5.010 ms  5.274 ms
 2  129.94.6.122 (129.94.6.122)  0.609 ms  0.610 ms  0.606 ms
 3  129.94.39.17 (129.94.39.17)  1.462 ms  1.497 ms  1.535 ms
 4  libudnex1-v1-3154.gw.unsw.edu.au (149.171.253.34)  2.231 ms  ombudnex1-v1-3154.gw.unsw.edu.au (149.171.253.34)  2.005 ms  libudnex1-v1-3154.gw.unsw.edu.au (149.171.253.34)  1.949 ms
 5  libcr1-po-6.gw.unsw.edu.au (149.171.255.201)  1.767 ms  4.292 ms  1.796 ms
 6  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.694 ms  unswbr1-te-1-13.gw.unsw.edu.au (149.171.255.101)  4.334 ms  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.941 ms
 7  138.44.5.0 (138.44.5.0)  4.497 ms  1.316 ms  1.318 ms
 8  et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149)  4.156 ms  1.817 ms  1.939 ms
 9  et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99)  145.308 ms  143.265 ms  145.167 ms
10  abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8)  158.391 ms  158.826 ms  158.787 ms
11  et-7-3-0.4070.rtsw.salt.net.internet2.edu (198.71.45.24)  174.608 ms  174.084 ms  174.595 ms
12  et-5-0-0.110.rtr.kans.net.internet2.edu (198.71.45.18)  194.314 ms  194.316 ms  194.336 ms
13  et-4-1-0.4070.rtsw.chic.net.internet2.edu (198.71.45.14)  205.138 ms  205.090 ms  205.167 ms
14  buf-9208-I2-CHIC.nysernet.net (199.109.11.37)  220.915 ms  219.850 ms  220.263 ms
15  syr-9208-buf-9208.nysernet.net (199.109.7.193)  223.629 ms  222.420 ms  222.355 ms
16  nyc-9208-syr-9208.nysernet.net (199.109.7.162)  228.766 ms  228.519 ms  230.255 ms
17  199.109.5.6 (199.109.5.6)  230.428 ms  230.390 ms  230.472 ms
18  DMZGWA-PTP-EXTGWA.NET.NYU.EDU (128.122.254.65)  230.740 ms  231.669 ms  231.708 ms
19  NYUGWA-PTP-DMZGWA.NET.NYU.EDU (128.122.254.88)  230.532 ms  230.578 ms  230.602 ms
20  WSQDCGWA-VL902.NET.NYU.EDU (128.122.1.38)  230.791 ms  230.735 ms  231.538 ms
```

There are 6 routers along the path of the UNSW network.

The 8<sup>th</sup> and 9<sup>th</sup> router cross the Pacific Ocean.

et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au and et-0-0-0.pe1.a.hnl.aarnet.net.au

2.

```
traceroute to www.ucla.edu (164.67.228.152), 30 hops max, 40 byte packets
 1  vlan380.gasr1.gw.unsw.EDU.AU (129.94.208.1)  1.282 ms  1.383 ms  1.578 ms
 2  129.94.6.122 (129.94.6.122)  0.240 ms  0.232 ms  0.206 ms
 3  129.94.39.17 (129.94.39.17)  1.962 ms  1.081 ms  1.065 ms
 4  ombudnex1-v1-3154.gw.unsw.edu.au (149.171.253.35)  2.273 ms  libudnex1-v1-3154.gw.unsw.edu.au (149.171.253.34)  2.349 ms  ombudnex1-v1-3154.gw.unsw.edu.au (149.171.253.35)  1.489 ms
 5  libcr1-po-6.gw.unsw.edu.au (149.171.255.201)  1.324 ms  libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.977 ms  libcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.201 ms
 6  unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105)  1.320 ms  unswbr1-te-1-13.gw.unsw.edu.au (149.171.255.101)  1.257 ms  1.833 ms
 7  138.44.5.0 (138.44.5.0)  1.389 ms  1.470 ms  1.452 ms
 8  et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149)  2.008 ms  2.143 ms  2.156 ms
 9  et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99)  143.561 ms  143.566 ms  143.549 ms
10  cenichpr-1-is-jmb-778.snva.pacificwave.net (207.231.245.129)  160.357 ms  160.386 ms  160.332 ms
11  hpr-lax-hpr3--svl-hpr3-100ge.cenic.net (137.164.25.73)  158.670 ms  158.540 ms  158.561 ms
12  * * *
13  bd1l1f1.anderson--cr00f2.csbl.ucla.net (169.232.4.4)  159.114 ms  159.166 ms  159.013 ms
14  cr0l1f1.anderson--dr00f2.csbl.ucla.net (169.232.4.55)  158.974 ms  159.029 ms  cr00f2.csbl--dr00f2.csbl.ucla.net (169.232.4.53)  158.989 ms
```

```

traceroute to www.u-tokyo.ac.jp (210.152.135.178), 30 hops max, 40 byte packets
 1 vlan380.gaszzrl.gw.unsw.EDU.AU (129.94.208.1) 0.990 ms 1.112 ms 1.291 ms
 2 129.94.6.122 (129.94.6.122) 0.225 ms 0.224 ms 0.214 ms
 3 129.94.39.17 (129.94.39.17) 1.035 ms 1.100 ms 1.088 ms
 4 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.988 ms 1.720 ms 1.809 ms
 5 ombcr1-po-5.gw.unsw.edu.au (149.171.255.197) 1.215 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165)
   1.200 ms libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.332 ms
 6 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.320 ms unswbr1-te-1-13.gw.unsw.edu.au (149.171.255.101)
   1.817 ms 1.293 ms
 7 138.44.5.0 (138.44.5.0) 1.347 ms 3.218 ms 3.113 ms
 8 et-0-3-0.pel.bkvl.nsw.aarnet.net.au (113.197.15.147) 2.100 ms 2.087 ms 2.076 ms
 9 ge-4 0 0.bb1.a.pao.aarnet.net.au (202.158.194.177) 157.924 ms 157.242 ms 157.171 ms
10 paloalto0.iij.net (198.32.176.24) 158.809 ms 158.775 ms 158.771 ms
11 osk004bb00.IIJ.Net (58.138.88.185) 281.056 ms osk004bb01.IIJ.Net (58.138.88.189) 272.187 ms 272.158 ms
12 osk004ix51.IIJ.Net (58.138.107.170) 277.036 ms osk004ix51.IIJ.Net (58.138.107.174) 271.841 ms
   osk004ix51.IIJ.Net (58.138.107.214) 281.351 ms
13 210.130.135.130 (210.130.135.130) 276.201 ms 276.956 ms 280.588 ms
14 124.83.128.33 (124.83.128.33) 281.306 ms 276.276 ms 276.227 ms
15 124.83.228.198 (124.83.228.198) 276.284 ms 271.974 ms 271.972 ms
16 ae1.ostcr01.idc.jp (158.205.134.30) 276.549 ms 278.013 ms 277.989 ms
17 ae0.ostcr02.idc.jp (158.205.192.174) 263.425 ms 263.354 ms 263.316 ms
18 te3-4.ostag02.idc.jp (158.205.192.198) 273.813 ms 278.073 ms 273.798 ms
19 * * *
20 * * *
21 ae0-111.fklcr01.idc.jp (158.205.121.253) 284.030 ms 284.041 ms 283.762 ms
22 po2.1321.fkl.eg.idc.jp (158.205.121.250) 283.753 ms 283.880 ms 283.793 ms

traceroute to www.lancaster.ac.uk (148.88.2.80), 30 hops max, 40 byte packets
 1 vlan380.gaszzrl.gw.unsw.EDU.AU (129.94.208.1) 0.995 ms 1.091 ms 1.302 ms
 2 129.94.6.122 (129.94.6.122) 0.211 ms 0.216 ms 0.207 ms
 3 129.94.39.17 (129.94.39.17) 1.092 ms 1.087 ms 1.122 ms
 4 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.580 ms libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34) 1.572 ms 1.782 ms
 5 libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.331 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169) 1.258 ms
   libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.307 ms
 6 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.383 ms unswbr1-te-1-13.gw.unsw.edu.au (149.171.255.101) 1.295 ms 1.329 ms
 7 138.44.5.0 (138.44.5.0) 1.486 ms 1.825 ms 1.701 ms
 8 et-1-3-0.pel.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149) 3.289 ms 3.282 ms 2.155 ms
 9 et-0-0-0.pel.a.hnl.aarnet.net.au (113.197.15.99) 143.453 ms 143.845 ms 143.769 ms
10 abilene-1-is-jmb-776.lsanca.pacificwave.net (207.231.241.131) 158.553 ms 158.582 ms 158.577 ms
11 et-1-0-0.111.rtr.hous.net.internet2.edu (198.71.45.20) 191.201 ms 191.174 ms 191.184 ms
12 et-10-0-0.105.rtr.atla.net.internet2.edu (198.71.45.12) 215.221 ms 215.208 ms 215.161 ms
13 et-9-0-0.104.rtr.wash.net.internet2.edu (198.71.45.7) 227.944 ms 227.959 ms 227.953 ms
14 internet2.mx1.fra.de.geant.net (62.40.125.17) 398.620 ms 327.771 ms 324.594 ms
15 ae1.mx1.ams.nl.geant.net (62.40.98.129) 319.010 ms 331.304 ms 331.279 ms
16 ae2.mx1.lon.uk.geant.net (62.40.98.80) 327.168 ms 314.729 ms 317.801 ms
17 janet-gw.mx1.lon.uk.geant.net (62.40.124.198) 317.817 ms 327.027 ms 314.595 ms
18 ae29.londpg-sbr2.ja.net (146.97.33.2) 314.885 ms 314.889 ms 327.698 ms
19 ae31.erdiss-sbr1.ja.net (146.97.33.22) 321.865 ms 322.208 ms 322.181 ms
20 ae29.manckh-sbr1.ja.net (146.97.33.42) 320.799 ms 333.364 ms 323.899 ms
21 cnl.manckh-sbr1.ja.net (146.97.41.54) 322.988 ms 326.092 ms 335.569 ms
22 lancaster-university.ja.net (194.81.46.2) 335.889 ms * *
23 ismx-issrx.rtr.lancs.ac.uk (148.88.255.17) 327.205 ms 324.422 ms 336.928 ms
24 dc.iss.srv.rtrcloud.lancs.ac.uk (148.88.253.3) 341.566 ms 332.037 ms 331.951 ms

```

at 7th 138.44.5.0 (138.44.5.0) three destinations diverge.

```

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
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:          -+-+-+-+-+
changed:           hostmaster@arin.net 20021122
changed:           hm-changed@apnic.net 19900131
changed:           hm-changed@apnic.net 20140904
source:           APNIC

```

14 - 7500miles

22 - 5558miles

24 - 5797miles

No

3.

from speedtest singapore to my machine:

Traceroute Result:

```

traceroute to 129.94.211.132 (129.94.211.132), 30 hops max, 60 byte packets
 1  ge2-8.r01.sin01.ne.com.sg (202.150.221.169)  0.261 ms  0.265 ms  0.331 ms
 2  10.11.34.2 (10.11.34.2)  0.257 ms  0.286 ms  0.326 ms
 3  as7575.singapore.megaport.com (103.41.12.24)  236.938 ms  236.936 ms  236.913 ms
 4  so-4-1-0.bbl.b.syd.aarnet.net.au (202.158.194.244)  229.921 ms  229.937 ms  230.072 ms
 5  ge-0-0-0.bbl.a.syd.aarnet.net.au (202.158.194.197)  240.054 ms  240.094 ms  240.033 ms
 6  ae9.pe2.brwy.nsw.aarnet.net.au (113.197.15.56)  249.406 ms  249.491 ms  249.492 ms
 7  et-3-1-0.pel.brwy.nsw.aarnet.net.au (113.197.15.146)  230.304 ms  230.279 ms  230.285 ms
 8  138.44.5.1 (138.44.5.1)  242.495 ms  242.587 ms  242.568 ms
 9  ombcrl1-te-1-5.gw.unsw.edu.au (149.171.255.106)  242.562 ms  242.557 ms  242.621 ms
10  ombudnex1-po-2.gw.unsw.edu.au (149.171.255.170)  242.593 ms  238.094 ms  238.087 ms
11  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  246.311 ms  246.289 ms  246.331 ms
12  129.94.39.21 (129.94.39.21)  243.314 ms  243.290 ms  243.301 ms

```

from my machine to www.speedtest.com.sg

```
traceroute to www.speedtest.com.sg (202.150.221.170), 30 hops max, 40 byte packets
 1 vlan380.gasr1.gw.unsw.EDU.AU (129.94.208.1) 1.775 ms 1.871 ms 2.072 ms
 2 129.94.6.122 (129.94.6.122) 0.404 ms 0.406 ms 0.392 ms
 3 129.94.39.17 (129.94.39.17) 9.887 ms 9.825 ms 9.910 ms
 4 libudnex1-v1-3154.gw.unsw.edu.au (149.171.253.34) 11.273 ms ombudnex1-v1-3154.gw.unsw.edu.au (149.171.253.35) 11.327 ms 11.317 ms
 5 ombcr1-po-6.gw.unsw.edu.au (149.171.255.169) 10.810 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 10.650 ms
 6 ombcr1-po-5.gw.unsw.edu.au (149.171.255.197) 10.756 ms
 7 unswbr1-te-1-13.gw.unsw.edu.au (149.171.255.101) 10.877 ms
 8 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 12.604 ms 12.455 ms
 9 138.44.5.0 (138.44.5.0) 13.891 ms 12.675 ms 12.691 ms
10 et-0-3-0.pe1.alxd.nsw.aarnet.net.au (113.197.15.153) 11.452 ms 10.859 ms 10.844 ms
11 xe-0-0-3.pe1.wnpa.akl.aarnet.net.au (113.197.15.67) 32.027 ms 32.162 ms 32.023 ms
12 et-0-1-0.200.pe1.tkpa.akl.aarnet.net.au (113.197.15.69) 32.156 ms 32.165 ms 32.158 ms
13 xe-1-0-0.bb1.a.lax.aarnet.net.au (202.158.194.173) 158.453 ms 158.417 ms 157.923 ms
14 singtel.as7473.any2ix.coresite.com (206.72.210.63) 303.069 ms 305.261 ms 307.245 ms
15 203.208.171.117 (203.208.171.117) 357.318 ms 203.208.172.173 (203.208.172.173) 311.902 ms
16 203.208.171.117 (203.208.171.117) 310.916 ms
17 203.208.151.233 (203.208.151.233) 325.252 ms 203.208.149.25 (203.208.149.25) 312.643 ms
18 203.208.171.234 (203.208.171.234) 310.509 ms
19 203.208.171.198 (203.208.171.198) 341.331 ms 203.208.151.98 (203.208.151.98) 349.733 ms 348.965 ms
20 203.208.183.153 (203.208.183.153) 344.224 ms 203.208.171.201 (203.208.171.201) 343.444 ms
21 203.208.177.110 (203.208.177.110) 234.653 ms
22 * * 203.208.171.198 (203.208.171.198) 342.567 ms
23 203.208.177.110 (203.208.177.110) 244.538 ms 246.570 ms *
```

from telstra.net to my machine

```
 1 gigabitethernet3-3.exi2.melbourne.telstra.net (203.50.77.53) 0.366 ms 0.204 ms 0.243 ms
 2 bundle-ether3-100.win-core10.melbourne.telstra.net (203.50.80.129) 2.864 ms 1.354 ms 2.117 ms
 3 bundle-ether12.ken-core10.sydney.telstra.net (203.50.11.122) 12.483 ms 12.225 ms 12.610 ms
 4 bundle-ether1.ken-edge901.sydney.telstra.net (203.50.11.95) 11.859 ms 11.848 ms 11.861 ms
 5 aarnet6.lnk.telstra.net (139.130.0.78) 11.610 ms 11.599 ms 11.611 ms
 6 ge-6-0-0.bb1.a.syd.aarnet.net.au (202.158.202.17) 11.861 ms 11.725 ms 11.734 ms
 7 ae9.pe2.brwy.nsw.aarnet.net.au (113.197.15.56) 12.109 ms 11.973 ms 12.112 ms
 8 et-3-1-0.pe1.brwy.nsw.aarnet.net.au (113.197.15.146) 12.358 ms 12.347 ms 12.610 ms
 9 138.44.5.1 (138.44.5.1) 12.609 ms 12.599 ms 12.611 ms
10 ombcr1-te-1-5.gw.unsw.edu.au (149.171.255.106) 12.611 ms 12.599 ms 12.609 ms
11 ombudnex1-po-2.gw.unsw.edu.au (149.171.255.170) 27.602 ms 12.848 ms 12.861 ms
12 ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36) 12.982 ms 12.972 ms 12.984 ms
13 129.94.39.21 (129.94.39.21) 13.110 ms 13.101 ms 13.109 ms
```

from my machine to telstra.net:

```
traceroute to www.telstra.net (203.50.5.178), 30 hops max, 40 byte packets
 1 vlan380.gasr1.gw.unsw.EDU.AU (129.94.208.1) 6.476 ms 6.540 ms 6.776 ms
 2 129.94.6.122 (129.94.6.122) 0.208 ms 0.207 ms 0.195 ms
 3 129.94.39.17 (129.94.39.17) 1.518 ms 1.485 ms 1.542 ms
 4 ombudnex1-v1-3154.gw.unsw.edu.au (149.171.253.35) 9.088 ms 8.916 ms
 5 libudnex1-v1-3154.gw.unsw.edu.au (149.171.253.34) 1.938 ms
 6 libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.460 ms
 7 libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 2.240 ms 1.519 ms
 8 unswbr1-te-1-13.gw.unsw.edu.au (149.171.255.101) 1.593 ms 1.538 ms
 9 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.342 ms
10 138.44.5.0 (138.44.5.0) 1.709 ms 1.617 ms 1.616 ms
11 et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147) 1.707 ms 1.891 ms 1.825 ms
12 ae9.bb1.a.syd.aarnet.net.au (113.197.15.57) 2.101 ms 2.065 ms 1.973 ms
13 gigabitethernet1-1.pe1.b.syd.aarnet.net.au (202.158.202.18) 2.370 ms 2.331 ms 2.205 ms
14 gigabitethernet3-11.ken37.sydney.telstra.net (139.130.0.77) 2.787 ms 2.948 ms 2.903 ms
15 bundle-ether13.ken-core10.sydney.telstra.net (203.50.11.94) 4.890 ms 5.141 ms 4.890 ms
16 bundle-ether12.win-core10.melbourne.telstra.net (203.50.11.123) 14.036 ms 14.019 ms 15.655 ms
17 gigabitethernet5-0.exi-service2.melbourne.telstra.net (203.50.80.132) 14.113 ms 13.970 ms 13.908 ms
```

Name: cogentco.com  
Address: 38.100.128.10  
<https://www.telstra.net/cgi-bin/trace>  
address: 203.50.5.178

from telstra to cogentco:

```
 1 gigabitethernet3-3.exi1.melbourne.telstra.net (203.50.77.49) 0.341 ms 0.285 ms 0.245 ms
 2 bundle-ether3-100.exi-core10.melbourne.telstra.net (203.50.80.1) 2.118 ms 1.549 ms 1.995 ms
 3 bundle-ether12.chw-core10.sydney.telstra.net (203.50.11.124) 16.862 ms 16.416 ms 16.861 ms
 4 bundle-ether1.oxf-gw11.sydney.telstra.net (203.50.6.93) 16.360 ms 16.542 ms 17.236 ms
 5 bundle-ether1.sydo-core03.sydney.reach.com (203.50.13.98) 16.735 ms 16.416 ms 17.235 ms
 6 i-0-1-0-16.sydo-core04.bi.telstraglobal.net (202.84.222.58) 16.860 ms
 7 i-44.1wlt-core01.bx.telstraglobal.net (202.84.144.82) 157.212 ms 159.333 ms 160.029 ms
 8 i-0-4-0-3.eqla01.bi.telstraglobal.net (202.40.149.246) 157.779 ms
 9 be4637.ccr23.lax05.atlas.cogentco.com (154.54.10.133) 157.279 ms 157.586 ms 158.276 ms
10 be2179.ccr22.lax01.atlas.cogentco.com (154.54.41.81) 157.778 ms
11 be2931.ccr21.phx02.atlas.cogentco.com (154.54.44.85) 174.824 ms 169.828 ms 169.771 ms
12 be2929.ccr21.elp01.atlas.cogentco.com (154.54.42.66) 177.519 ms *
```



```

from cogentco to telstra:
traceroute to 203.50.5.178 (203.50.5.178), 30 hops max, 60 byte packets
 1 gi0-0-0-19.6.agr11.vie01.atlas.cogentco.com (130.117.254.97)  1.325 ms  1.336 ms
 2 te0-6-0-15.ccr21.vie01.atlas.cogentco.com (154.54.56.117)  324.237 ms  324.262 ms
 3 be2974.ccr21.muc03.atlas.cogentco.com (154.54.58.5)  6.611 ms
 4 be2975.ccr22.muc03.atlas.cogentco.com (154.54.58.13)  6.811 ms
 5 be2960.ccr42.fra03.atlas.cogentco.com (154.54.36.253)  12.152 ms
 6 be2959.ccr41.fra03.atlas.cogentco.com (154.54.36.53)  12.331 ms
 7 * *
 8 be12194.ccr41.lon13.atlas.cogentco.com (154.54.56.93)  95.381 ms
 9 be12488.ccr42.lon13.atlas.cogentco.com (130.117.51.41)  98.890 ms
10 be2490.ccr42.jfk02.atlas.cogentco.com (154.54.42.85)  99.471 ms  99.536 ms
11 be2094.ccr41.jfk02.atlas.cogentco.com (154.54.30.13)  93.312 ms  93.292 ms
12 be2113.ccr42.atl01.atlas.cogentco.com (154.54.24.222)  109.100 ms
13 be2112.ccr41.atl01.atlas.cogentco.com (154.54.7.158)  113.664 ms
14 be2112.ccr41.atl01.atlas.cogentco.com (154.54.7.158)  112.366 ms
15 be2690.ccr22.iah01.atlas.cogentco.com (154.54.28.130)  123.478 ms
16 be2690.ccr22.iah01.atlas.cogentco.com (154.54.28.130)  124.469 ms
17 be2927.ccr21.elp01.atlas.cogentco.com (154.54.29.222)  141.669 ms
18 * be2927.ccr21.elp01.atlas.cogentco.com (154.54.29.222)  142.333 ms
19 be2931.ccr21.lax01.atlas.cogentco.com (154.54.44.86)  160.762 ms *
20 be2931.ccr21.lax01.atlas.cogentco.com (154.54.44.86)  161.573 ms
21 be2932.ccr22.lax01.atlas.cogentco.com (154.54.45.162)  159.344 ms
22 be2179.ccr23.lax05.atlas.cogentco.com (154.54.41.82)  160.063 ms
23 gblx.sjc03.atlas.cogentco.com (154.54.10.134)  166.216 ms
24 i-0-4-0-12.lwlt-core01.bi.telstraglobal.net (202.84.253.29)  162.951 ms
25 i-0-2-0-11.lwlt-core01.bi.telstraglobal.net (202.84.251.153)  166.353 ms
26 i-14.sydp-core03.bx.telstraglobal.net (202.84.136.37)  308.596 ms
27 i-0-4-0-11.lwlt-core01.bi.telstraglobal.net (202.84.253.25)  162.911 ms
28 i-14.sydp-core03.bx.telstraglobal.net (202.84.136.37)  307.981 ms
29 bundle-ether3.pad-gw10.sydney.telstra.net (203.50.13.85)  309.671 ms
30 bundle-ether3.chw-core10.sydney.telstra.net (203.50.6.56)  308.315 ms
31 bundle-ether3.pad-gw10.sydney.telstra.net (203.50.13.85)  312.193 ms
32 bundle-ether8.exi-core10.melbourne.telstra.net (203.50.11.125)  322.384 ms  323.277 ms
33 gigabitethernet5-0.exi-servicel.melbourne.telstra.net (203.50.80.7)  318.795 ms
34 bundle-ether8.exi-core10.melbourne.telstra.net (203.50.11.125)  320.608 ms
35 gigabitethernet5-0.exi-servicel.melbourne.telstra.net (203.50.80.7)  319.720 ms *

```

they do not use the same path.

## Exercise 6:

1.

[www.tu-berlin.de](http://www.tu-berlin.de):

distance:16114km      shortest time:53.7ms

[www.uq.edu.au](http://www.uq.edu.au):

distance:454km      shortest time:1.5ms

[www.nus.edu.sg](http://www.nus.edu.sg):

distance:6316km      shortest time:21.1ms



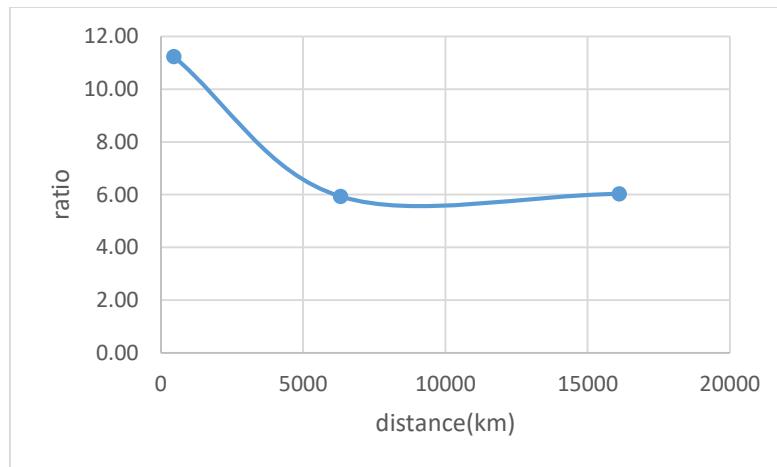


Fig.1 distance and time ratio

Reason:

1. The router is not arranged along a straight line. So the real distance is longer than the theory distance.
2. 3 kinds of delay. Processing delay, queue delay, transmission delay.

2.

The delay varies over the time. Because it related on current network condition. If the traffic is busy, the queue delay would be longer.

Singapore's delay depend on the size of the ping packets.

3.

Processing delay and transmission delay are depending on the packet size.

Propagation delay and queuing delay are not.