COMP3331 Lab1

Ruofei HUANG

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1 Exercise 1

1.1

129.94.242.2 More than one output is for DNS side of load balancing.

1.2

localhost All the connection to this device is actual to current computer. Every connection go through this address will go through a hardware loopback to this device.

2 Exercise 2

2.1 Ping Reachability

Reachable	Hostname	Reason
No	www.cse.unsw.edu.au	Host IP is setted to not answering the ping request.
No	www.getfittest.com.au	No result from dns.
Yes	www.mit.edu	
Yes	www.intel.com.au	
Yes	www.tpg.com.au	
No	www.hola.hp	Invalid domain name.
Yes	www.amazon.com	
Yes	www.tsinghua.edu.cn	
No	www.kremlin.ru	Host doesn't answer the request.
Yes	8.8.8.8	

2.2 Ping Unreachable Host, Test by Browser

Hostname	Web Reachable
www.cse.unsw.edu.au	Yes
www.getfittest.com.au	No
www.hola.hp	No
www.kremlin.ru	Yes

3 Exercise 3

3.1

21 routers.
3rd and 4th router

```
traceroute to www.columbia.edu (128.59.105.24), 30 hops max, 60 byte
packets
 1  _gateway (192.168.1.1)  0.724 ms  0.943 ms  0.982 ms
 2  103.210.24.1 (103.210.24.1)  4.897 ms  4.938 ms  4.932 ms
 3  49.255.42.221 (49.255.42.221)  6.858 ms  7.585 ms  7.569 ms
 4  BE-100.cor02.syd04.nsw.VOCUS.net.au (114.31.192.50)  156.059 ms
156.546 ms  156.617 ms
 5  bundle-200.cor01.sjc01.ca.vocus.net (49.255.255.10)  160.870 ms
160.934 ms  161.461 ms
 6  bundle-100.bdr01.sjc01.ca.vocus.net (49.255.255.19)  153.255 ms
150.141 ms  149.781 ms
 7  38.122.93.1 (38.122.93.1)  154.691 ms  158.624 ms  158.867 ms
 8  be2095.ccr22.sjc01.atlas.cogentco.com (154.54.3.137)  156.313 ms
147.443 ms  148.182 ms
 9  be3179.ccr22.sfo01.atlas.cogentco.com (154.54.43.149)  153.742 ms
159.945 ms  156.130 ms
10  be3110.ccr32.slc01.atlas.cogentco.com (154.54.44.142)  175.827 ms
167.080 ms  171.967 ms
11  be3038.ccr22.den01.atlas.cogentco.com (154.54.42.98)  186.619 ms
186.901 ms  178.129 ms
12  be3036.ccr22.mci01.atlas.cogentco.com (154.54.31.90)  196.846 ms
187.460 ms  196.777 ms
13  be2832.ccr42.ord01.atlas.cogentco.com (154.54.44.170)  209.363 ms
204.597 ms  200.123 ms
14  be2718.ccr22.cle04.atlas.cogentco.com (154.54.7.130)  212.787 ms
208.250 ms  213.612 ms
15  be2890.ccr42.jfk02.atlas.cogentco.com (154.54.82.246)  228.826 ms
224.732 ms  224.843 ms
16  be2897.rcr24.jfk01.atlas.cogentco.com (154.54.84.214)  220.839 ms
226.334 ms  221.691 ms
17  38.122.8.210 (38.122.8.210)  230.288 ms  230.127 ms  220.846 ms
18  nyser111-gw-1-x-nyser32-gw-1.net.columbia.edu (128.59.255.10)
226.605 ms  226.983 ms  227.575 ms
19  phi-core-1-x-nyser111-gw-1.net.columbia.edu (128.59.255.13)  228.602
ms  220.544 ms  228.819 ms
20  cc-conc-1-x-phi-core-1.net.columbia.edu (128.59.255.214)  224.039 ms
224.999 ms  225.010 ms
21  exeas.org (128.59.105.24)  220.409 ms  230.341 ms  230.588 ms
```

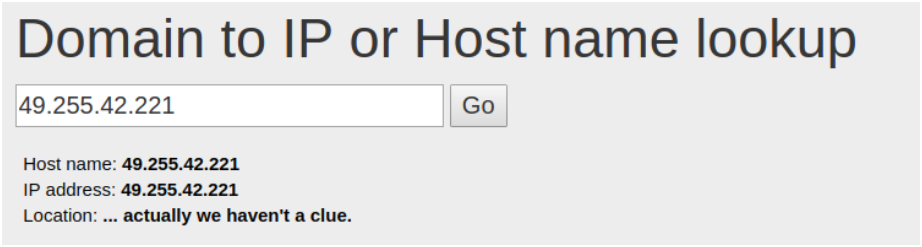
3.2

Diverage at 49.255.42.221
Or Diverage from a router group? BE-100.cor02.syd04.nsw.VOCUS.net.au
49.255.42.221 is belong to VOCUS PTY LTD
BE-100.cor02.syd04.nsw.VOCUS.net.au is belong to Vocus Communications Ltd

Both routers are belong to vocus Communications which is a ISP for small ISP, in my point of view. They're business is target to datacenter, ISP, etc. And they have national wide optical caples and cable go aboard.

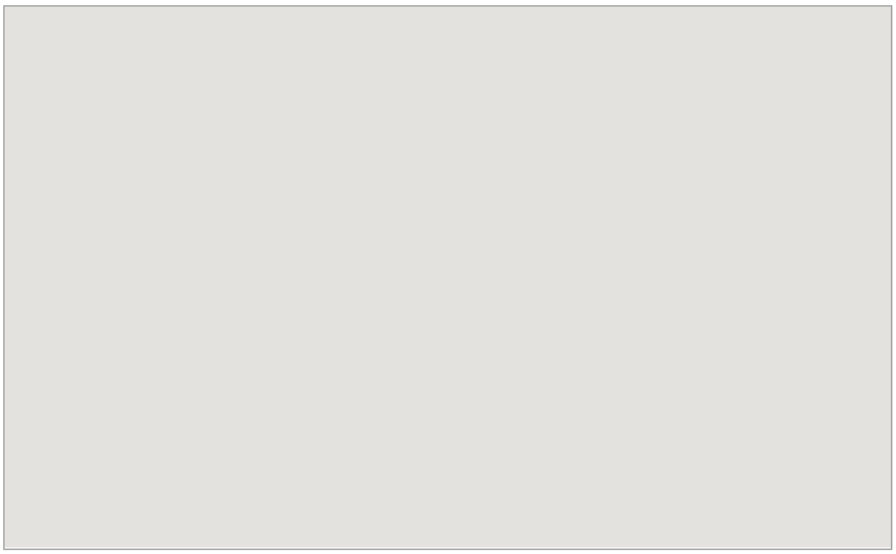
I couldn't find out the geological location about both network.

No, Uk is further than japan but I observed less hops in www.lancaster.ac.uk



Network Location Tool

approximate geophysical location



locate a network

Remote Address 49.255.42.221 Locate Unable to locate network.

Use Current IP

Source MaxMind Hostip.info

about

3.2.1 Source Data

```
traceroute to www.ucla.edu (164.67.228.152), 30 hops max, 60 byte packets
 1  _gateway (192.168.1.1)  0.566 ms  0.849 ms  1.071 ms
 2  103.210.24.1 (103.210.24.1)  4.988 ms  4.988 ms  5.021 ms
 3  49.255.42.221 (49.255.42.221)  6.020 ms  6.252 ms  6.716 ms
 4  BE-100.cor02.syd04.nsw.VOCUS.net.au (114.31.192.50)  156.461 ms
157.034 ms  157.227 ms
 5  bundle-201.cor02.sjc01.ca.vocus.net (49.255.255.12)  161.225 ms
161.666 ms  157.508 ms
 6  bundle-101.bdr02.sjc01.ca.vocus.net (49.255.255.25)  164.492 ms
153.909 ms  153.912 ms
 7  10ge3-9.core1.sjc1.he.net (64.71.184.45)  149.770 ms  149.863 ms
154.120 ms
 8  10ge14-4.core1.pao1.he.net (72.52.92.113)  159.081 ms  159.211 ms
155.558 ms
 9  198.32.251.69 (198.32.251.69)  151.275 ms  153.988 ms *
10  dc-svl-agg4--paix-px1-10g.cenic.net (137.164.47.173)  162.887 ms
167.487 ms 137.164.11.29 (137.164.11.29)  169.038 ms
11  137.164.11.20 (137.164.11.20)  164.437 ms 137.164.11.29
(137.164.11.29)  164.462 ms 137.164.11.20 (137.164.11.20)  164.623 ms
12  137.164.11.26 (137.164.11.26)  162.658 ms 137.164.11.20
(137.164.11.20)  160.243 ms  159.144 ms
13  137.164.11.34 (137.164.11.34)  162.990 ms * 137.164.11.6
(137.164.11.6)  167.140 ms
14  bd11f1.anderson--cr00f2.csb1.ucla.net (169.232.4.4)  163.824 ms
163.921 ms  167.551 ms
15  cr00f2.csb1--dr00f2.csb1.ucla.net (169.232.4.53)  233.262 ms
bd11f1.anderson--cr001.anderson.ucla.net (169.232.4.6)  163.708 ms
cr00f1.anderson--dr00f2.csb1.ucla.net (169.232.4.55)  236.604 ms
16  * cr00f2.csb1--dr00f2.csb1.ucla.net (169.232.4.53)  233.280 ms *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
traceroute to www.u-tokyo.ac.jp (210.152.243.234), 30 hops max, 60 byte
packets
 1  _gateway (192.168.1.1)  0.712 ms  0.672 ms  0.808 ms
 2  103.210.24.1 (103.210.24.1)  4.588 ms  4.626 ms  4.601 ms
 3  49.255.42.221 (49.255.42.221)  5.269 ms  5.567 ms  5.638 ms
 4  BE-100.cor02.syd04.nsw.VOCUS.net.au (114.31.192.50)  166.908 ms
167.349 ms  167.364 ms
 5  Te-2-1-0.bdr01.hkg01.hkg.VOCUS.net (119.161.84.20)  166.993 ms
167.347 ms Te-1-0-0.bdr01.hkg01.hkg.VOCUS.net (119.161.84.30)  143.282 ms
 6  103.203.158.96 (103.203.158.96)  144.117 ms  141.281 ms  116.478 ms
 7  * * *
 8  101.102.204.246 (101.102.204.246)  193.256 ms  168.880 ms  194.031 ms
 9  124.83.228.54 (124.83.228.54)  169.149 ms  202.203 ms  168.444 ms
10  124.83.252.170 (124.83.252.170)  203.568 ms  203.764 ms  179.458 ms
11  158.205.134.22 (158.205.134.22)  224.260 ms  224.521 ms  200.194 ms
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
```

```
traceroute to www.lancaster.ac.uk (148.88.65.80), 30 hops max, 60 byte
packets
 1  _gateway (192.168.1.1)  0.630 ms  0.840 ms  1.051 ms
 2  103.210.24.1 (103.210.24.1)  4.937 ms  4.957 ms  4.969 ms
 3  49.255.42.221 (49.255.42.221)  5.779 ms  6.138 ms  6.162 ms
 4  BE-100.cor02.syd04.nsw.VOCUS.net.au (114.31.192.50)  155.987 ms
156.567 ms  156.581 ms
 5  bundle-200.cor01.sjc01.ca.vocus.net (49.255.255.10)  160.943 ms
161.393 ms  157.164 ms
 6  bundle-100.bdr01.sjc01.ca.vocus.net (49.255.255.19)  153.625 ms
154.165 ms  144.666 ms
 7  sjo-b21-link.telia.net (62.115.166.80)  159.666 ms  160.763 ms
150.057 ms
 8  nyk-bb4-link.telia.net (62.115.119.228)  298.267 ms  294.310 ms nyk-
bb3-link.telia.net (213.155.130.128)  298.204 ms
 9  ldn-bb4-link.telia.net (62.115.112.245)  289.011 ms ldn-bb4-
link.telia.net (62.115.136.184)  289.107 ms ldn-bb4-link.telia.net
(62.115.112.245)  296.745 ms
10  ldn-b5-link.telia.net (213.155.132.197)  292.959 ms  292.972 ms
289.082 ms
11  jisc-ic-318436-ldn-b5.c.telia.net (62.115.148.161)  293.923 ms
294.113 ms  294.009 ms
12  ae24.londtt-sbr1.ja.net (146.97.35.193)  287.537 ms  297.401 ms
296.980 ms
13  ae27.erdiss-sbr2.ja.net (146.97.33.14)  282.594 ms  282.654 ms
285.266 ms
14  ae29.manckh-sbr2.ja.net (146.97.33.42)  296.639 ms  299.598 ms
300.140 ms
15  ae24.lanclu-rbr1.ja.net (146.97.38.58)  321.093 ms  321.225 ms
321.228 ms
16  lancaster-university.ja.net (194.81.46.2)  315.278 ms  325.824 ms
315.290 ms
17  * * *
18  ismx-issrx.rtr.lancs.ac.uk (148.88.255.17)  301.196 ms  293.995 ms
289.020 ms
19  dc.iss.srv.rtrcloud.lancs.ac.uk (148.88.253.3)  315.986 ms  315.783
ms  315.851 ms
20  www.lancs.ac.uk (148.88.65.80)  303.534 ms !X  303.562 ms !X  295.318
ms !X
```

3.3

I choose speedtest.com.sg and telstra.net No, they didn't go through same route. I haven't observe any ip is same, but it has a lots of router is belong to vocus. In my opinion, the router have load balancing. Furthermroe, the advantage of package routing is each package can choose the best route when they arrived torouter, which is one of the advantage of package switching.

3.3.1 Speed Test Data

```
traceroute to www.speedtest.com.sg (202.150.221.170), 30 hops max, 60
byte packets
 1  _gateway (192.168.1.1)  0.712 ms  0.816 ms  0.972 ms
 2  103.210.24.1 (103.210.24.1)  4.639 ms  4.678 ms  4.659 ms
 3  49.255.42.221 (49.255.42.221)  5.401 ms  5.633 ms  5.616 ms
 4  BE-100.cor02.syd04.nsw.VOCUS.net.au (114.31.192.50)  166.575 ms
BE-100.cor01.syd11.nsw.VOCUS.net.au (114.31.192.48)  142.451 ms
BE-100.cor02.syd04.nsw.VOCUS.net.au (114.31.192.50)  167.483 ms
 5  Te-1-0-0.bdr01.hkg01.hkg.VOCUS.net (119.161.84.30)  142.712 ms
142.722 ms  142.621 ms
 6  38001.hkg.equinix.com (119.27.63.60)  144.096 ms *  116.454 ms
 7  * * *
 8  * * *
 9  202-150-221-170.rev.ne.com.sg (202.150.221.170)  151.893 ms  127.408
ms *
```

```
traceroute to 103.210.24.81 (103.210.24.81), 30 hops max, 60 byte packets
 1  ge2-8.r01.sin01.ne.com.sg (202.150.221.169)  0.226 ms  0.254 ms  0.253 ms
 2  10.11.34.5 (10.11.34.5)  0.398 ms  0.446 ms  0.482 ms
 3  4826.sgw.equinix.com (27.111.228.74)  0.785 ms  0.933 ms  1.011 ms
 4  BE-200.cor01.per02.wa.VOCUS.net.au (114.31.206.92)  119.898 ms  119.309 ms  119.475 ms
 5  BE-102.cor01.syd11.nsw.VOCUS.net.au (114.31.206.128)  147.257 ms  143.455 ms  147.370 ms
 6  BE-101.bdr01.syd01.nsw.VOCUS.net.au (114.31.192.49)  122.663 ms  123.248 ms  119.539 ms
 7  49.255.42.222 (49.255.42.222)  143.479 ms  143.455 ms  144.200 ms
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

3.3.2 Telstra Data

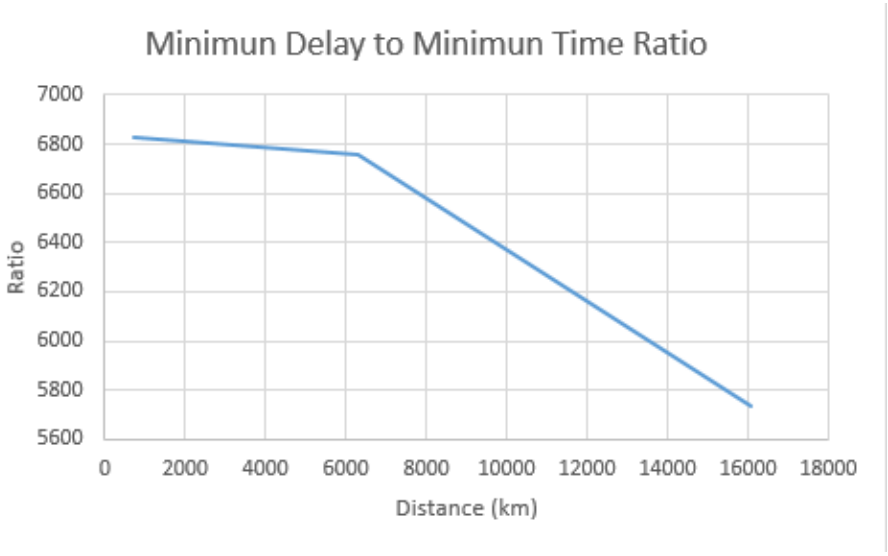
```
traceroute to www.telstra.net (203.50.5.178), 30 hops max, 60 byte packets
 1  _gateway (192.168.1.1)  0.707 ms  0.873 ms  1.049 ms
 2  103.210.24.1 (103.210.24.1)  4.706 ms  4.786 ms  4.785 ms
 3  49.255.42.221 (49.255.42.221)  5.932 ms  6.254 ms *
 4  BE-100.cor02.syd04.nsw.VOCUS.net.au (114.31.192.50)  5.950 ms  6.422
ms  6.501 ms
 5  bundle-101.bdr01.syd11.nsw.vocus.net.au (114.31.192.83)  6.584 ms
bundle-100.bdr01.syd11.nsw.vocus.net.au (114.31.192.81)  7.061 ms
bundle-101.bdr01.syd11.nsw.vocus.net.au (114.31.192.83)  7.179 ms
 6  * Bundle-Ether12.ken-edge903.sydney.telstra.net (203.27.185.57)
3.375 ms  4.200 ms
 7  * * bundle-ether2.chw-edge903.sydney.telstra.net (203.50.11.175)
4.926 ms
 8  bundle-ether17.chw-core10.sydney.telstra.net (203.50.11.176)  6.747
ms  6.742 ms bundle-ether10.win-core10.melbourne.telstra.net
(203.50.11.123)  18.385 ms
 9  203.50.6.40 (203.50.6.40)  18.019 ms  18.258 ms  18.275 ms
10  bundle-ether2.exi-ncprouter101.melbourne.telstra.net (203.50.11.209)
18.291 ms  18.260 ms  18.291 ms
11  www.telstra.net (203.50.5.178)  19.511 ms  15.467 ms *
```

```
1  gigabitethernet3-3.exi1.melbourne.telstra.net (203.50.77.49)  0.281 ms  0.284 ms  0.476 ms
2  bundle-ether3-100.exi-core10.melbourne.telstra.net (203.50.80.1)  1.841 ms  1.425 ms  2.102 ms
3  bundle-ether1.lon-edge902.melbourne.telstra.net (203.50.11.112)  1.091 ms  0.926 ms  0.852 ms
4  voc1255684.lnk.telstra.net (139.130.110.30)  1.092 ms  1.176 ms  1.103 ms
5  BE-151.cor02.mel07.vic.VOCUS.net.au (114.31.196.50)  11.966 ms
6  Hu-0-0-0-1.cor01.syd11.nsw.VOCUS.net.au (114.31.192.112)  12.241 ms
7  bundle-100.bdr01.syd01.nsw.VOCUS.net.au (114.31.192.51)  12.489 ms
8  49.255.42.222 (49.255.42.222)  12.240 ms  11.929 ms  12.240 ms
```

4 Exercise 4

4.1 Shortest Distance and Time

Hostname	Distance	Time (T) (ms)	Min. Delay
uq.edu.au	732.13km	0.002440433	16.669
nus.edu.sg	6309.72km	0.0210324	142.162
tu-berlin.de	16076.11km	0.053587033	307.132



4.1.1 Reasons

The phisycal wire couldn't be placed at the shortest path.
The light or signal in the transfer medium won't neccessary as fast as light (only could be slower than speed of light).
The Delay is the sum of {processing,queueing,transmission,propagation} dalay, no only the proprogation dalay, and all of the other dalay couldn't be 0.

4.2

It vary over time, because there's a different waiting time (queueing delay) when the package go through a same router each time (because the load of the router is vary). So the sum of all the queueing dalay is vary from time to time.

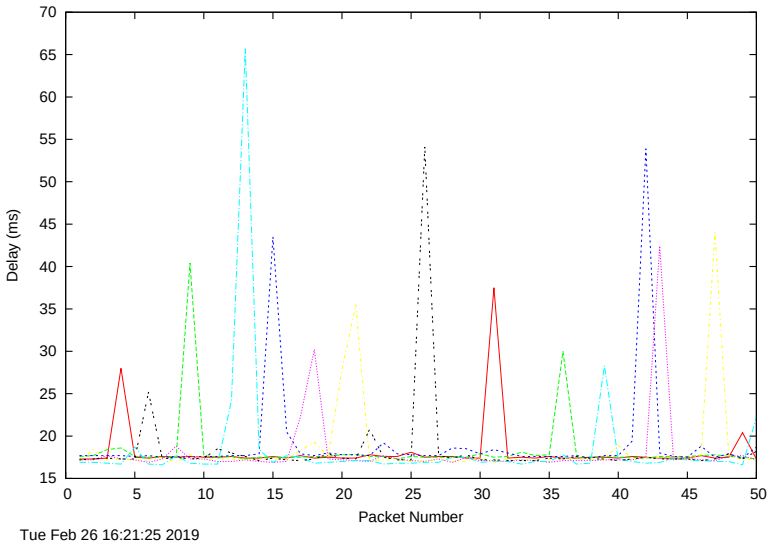
4.3

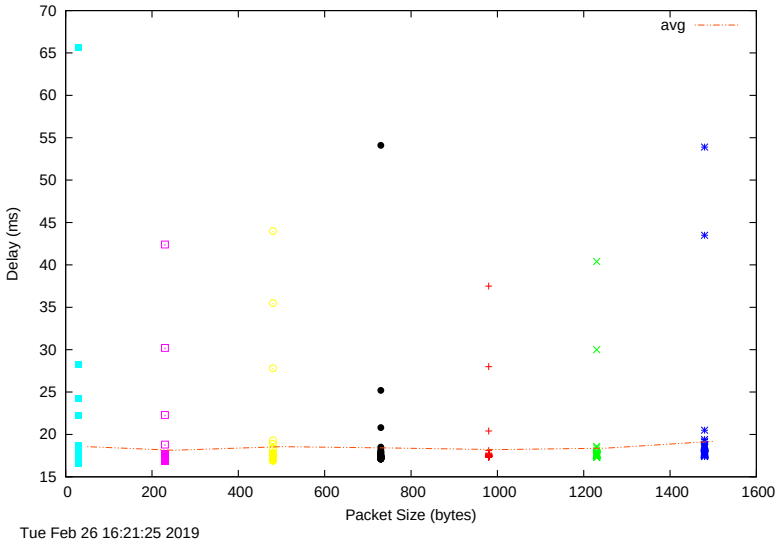
Depend on the package size	transmission delay
May depend on the package size	processing, if the processing is all base on software and has not accleration from hardware
Not depend on package size	queueing, propagation dalay

Further explain, such as checksum, if we all calculated in software, only the O(n) algorithm could be developed, so it will depend on the package size.

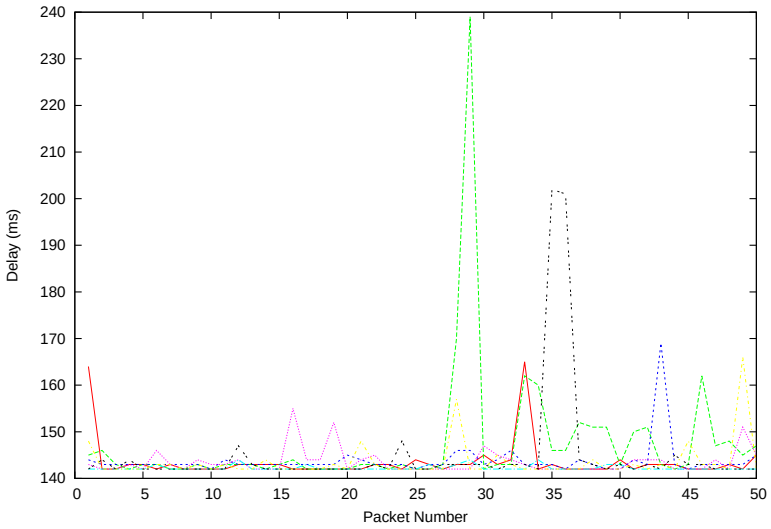
4.4 Graph from This Exercise

4.4.1 www.uq.edu.au

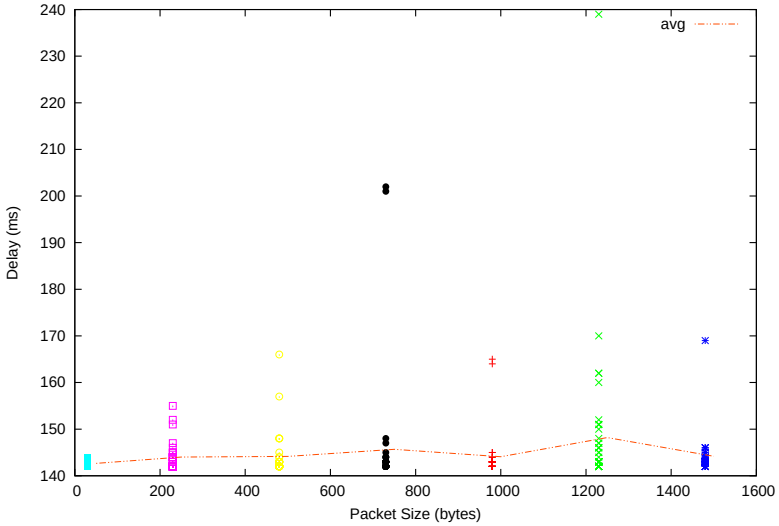




4.4.2 www.nus.edu.sg

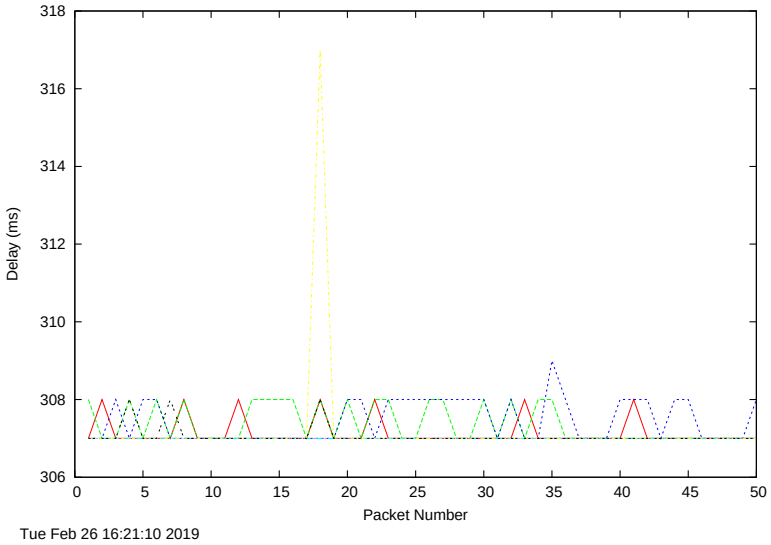


Tue Feb 26 16:21:18 2019

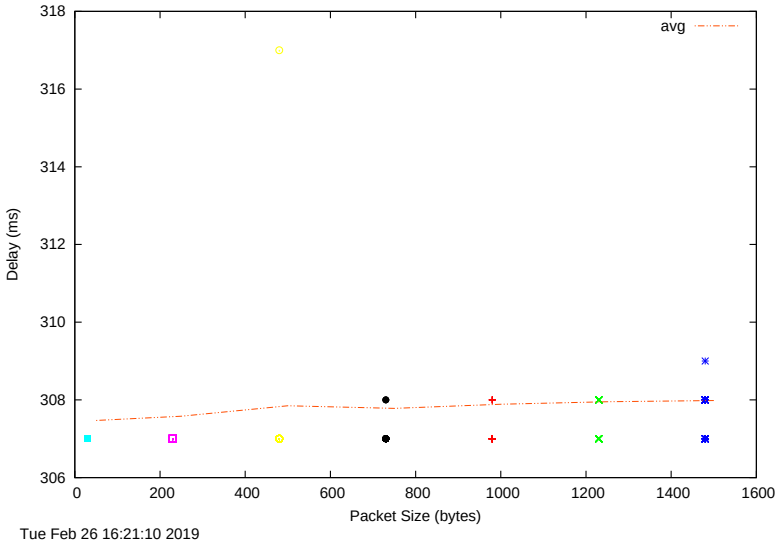


Tue Feb 26 16:21:18 2019

4.4.3 www.tu-berlin.de



Tue Feb 26 16:21:10 2019



Tue Feb 26 16:21:10 2019