COMP3331 – Lab01

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Exercise 1: nslookup

1. **Which is the IP address of the Google site (www.google.com)? In your opinion, what is the reason of having several IP addresses as an output?**

   The IP Address for www.google.com is 172.217.160.68. In my opinion, the reason of having several IP addresses is it helps to reduce traffic by spreading out the volume of deliveries and requests for a single IP address to multiple IP addresses. This is common for high traffic websites such as YouTube. Google however, and websites such as Facebook only display one IP address in nslookup for me due to the way my network is set up. This does not mean that they only have one IP address. Google, being one of the busiest websites will absolutely have multiple IP addresses to handle the traffic. What it does instead is it returns an IP address that is dependent on your geographic location, internet service provider and the DNS server being used.

2. **Find out name of the IP address 127.0.0.1. What is special about this IP address?**

   The name of IP address 127.0.0.1 is localhost. What is special about this IP address is that it's a loopback Internet protocol address and is used to establish IP connection to the same machine or computer being used by the end-user.

Exercise 2: Use ping to test host reachability

- www.cse.unsw.edu.au It's reachable.
- www.getfittest.com.au returned unknown host. Not reachable via web browser either. DNS not found.
- www.mit.edu is reachable
- www.intel.com.au is reachable
- www.tpg.com.au is reachable
- www.hola.hp returned unknown host. Not reachable via web browser either. DNS not found.
- www.amazon.com is reachable
- www.tsinghua.edu.cn is reachable
- www.kremlin.ru request timeout. Reachable via web browser. Probably blocked by a firewall to prevent DoS attacks.
- 8.8.8.8 reachable

Exercise 3: Use traceroute to understand network topology

1. Run traceroute on your machine to www.columbia.edu.
    a. How many routers are there between your workstation and www.columbia.edu? **22 routers in between.**
    b. How many routers along the path are part of the UNSW network? **5 routers from UNSW network before it went to an IP address owned by the AARNET.**
    c. Between which two routers do packets cross the Pacific Ocean? **Between the 9th and 10th routers. (between et-2-1-0.bdr1.a.sea.aarnet.net.au and abilene-1-lo-jmb-706.sttlwa.pacificwave.net)**

2. Run traceroute from your machine to the following destinations: (i)www.ucla.edu (ii) www.u-tokyo.ac.jp and (iii) www.lancaster.ac.uk .
    a. At which router do the paths from your machine to these three destinations diverge? **All diverge from 138.44.5.0 which is an IP address owned by the AARNET (Australia Academic and Research Network).**
    b. Is the number of hops on each path proportional to the physical distance? **No. UCLA was 13 hops, Tokyo 15 hops, and Lancaster 29 Hops. Tokyo has geographically the shortest distance from UNSW compared to UCLA which is physically further away but took less hops. This is likely due to lack of network infrastructure around the u-Tokyo website, thus less direct routes you can take.**

3. Run traceroute from both servers (i) http://www.speedtest.com.sg/tr.php and (ii)https://www.telstra.net/cgi-bin/trace.

Singapore → CSE machine from home laptop.

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traceroute to 129.94.242.19 (129.94.242.19), 30 hops max, 60 byte packets
 1  ge2-8.r01.sin01.ne.com.sg (202.150.221.169)  0.141 ms  0.144 ms  0.146 ms
 2  10.11.33.38 (10.11.33.38)  32.954 ms  32.982 ms  32.989 ms
 3  hutchcity3-10g.hkix.net (123.255.90.140)  34.485 ms  34.491 ms  34.551 ms
 4  d1-42-238-143-118-on-nets.com (118.143.238.42)  34.354 ms  34.457 ms  34.421 ms
 5  d1-2-224-143-118-on-nets.com (118.143.224.2)  183.005 ms d1-6-224-143-118-on-nets.com (118.143.22
 6  aarnet.as7575.any2ix.coresite.com (206.72.210.64)  179.068 ms  171.888 ms  179.156 ms
 7  xe-0-0-3.pe1.tkpa.akl.aarnet.net.au (202.158.194.172)  295.894 ms  294.638 ms  304.338 ms
 8  et-0-1-0.200.pe1.wnpa.akl.aarnet.net.au (113.197.15.68)  305.050 ms  303.724 ms  304.124 ms
 9  xe-1-2-1.pe1.msct.nsw.aarnet.net.au (113.197.15.66)  318.724 ms xe-0-2-2-204.pe1.alxd.nsw.aarnet.
10  et-8-1-0.pe1.brwy.nsw.aarnet.net.au (113.197.15.152)  339.504 ms  340.010 ms  343.041 ms
11  138.44.5.1 (138.44.5.1)  327.782 ms  327.814 ms  320.715 ms
12  ombcr1-te-1-5.gw.unsw.edu.au (149.171.255.106)  327.643 ms  326.243 ms  318.044 ms
13  libudnex1-po-2.gw.unsw.edu.au (149.171.255.198)  331.271 ms  338.458 ms  330.129 ms
14  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  329.407 ms  327.040 ms  326.977 ms
15  129.94.39.23 (129.94.39.23)  327.099 ms  327.175 ms  319.371 ms
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *

Traceroute Completed.
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CSE machine from home laptop → Singapore

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[wagner % traceroute www.speedtest.com.sg                                                    ]
traceroute to www.speedtest.com.sg (202.150.221.170), 30 hops max, 60 byte packets
 1  cserouter1-server.cse.unsw.EDU.AU (129.94.242.251)  0.120 ms  0.135 ms  0.115 ms
 2  129.94.39.17 (129.94.39.17)  1.079 ms  1.060 ms  0.982 ms
 3  ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35)  1.932 ms  1.512 ms libudnex1-vl-3154.gw.unsw.edu.au
(149.171.253.34)  1.358 ms
 4  libcr1-po-6.gw.unsw.edu.au (149.171.255.201)  1.370 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165)  1.
282 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169)  1.191 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.326 ms  1.255 ms unswbr1-te-2-13.gw.unsw.edu.au (149
.171.255.105)  1.310 ms
 6  138.44.5.0 (138.44.5.0)  1.461 ms  1.395 ms  1.581 ms
 7  et-0-3-0.pe1.alxd.nsw.aarnet.net.au (113.197.15.153)  1.855 ms  1.754 ms  1.702 ms
 8  xe-0-0-3.pe1.wnpa.akl.aarnet.net.au (113.197.15.67)  24.386 ms  24.382 ms xe-0-2-1-204.pe1.wnpa.alxd.aa
rnet.net.au (113.197.15.183)  24.320 ms
 9  et-0-1-0.200.pe1.tkpa.akl.aarnet.net.au (113.197.15.69)  24.677 ms  24.661 ms  24.682 ms
10  xe-0-2-6.bdr1.a.lax.aarnet.net.au (202.158.194.173)  147.972 ms  147.974 ms  147.936 ms
11  singtel.as7473.any2ix.coresite.com (206.72.210.63)  319.007 ms  310.343 ms  313.808 ms
12  203.208.158.29 (203.208.158.29)  328.981 ms 203.208.172.173 (203.208.172.173)  301.884 ms  306.081 ms
13  203.208.182.125 (203.208.182.125)  354.951 ms 203.208.182.77 (203.208.182.77)  327.238 ms 203.208.182.4
1 (203.208.182.41)  337.630 ms
14  203.208.182.45 (203.208.182.45)  344.246 ms 202-150-221-170.rev.ne.com.sg (202.150.221.170)  339.469 ms
  327.505 ms
```

Telstra → CSE machine from home laptop

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 1  gigabitethernet3-3.exi2.melbourne.telstra.net (203.50.77.53)  0.272 ms  0.201 ms  0.410 ms
 2  bundle-ether3-100.win-core10.melbourne.telstra.net (203.50.80.129)  0.940 ms  1.475 ms  2.116 ms
 3  bundle-ether12.ken-core10.sydney.telstra.net (203.50.11.122)  12.732 ms  12.096 ms  12.859 ms
 4  bundle-ether1.ken-edge901.sydney.telstra.net (203.50.11.95)  11.985 ms  11.969 ms  11.978 ms
 5  aarnet6.lnk.telstra.net (139.130.0.78)  11.607 ms  11.596 ms  11.606 ms
 6  ge-6-0-0.bb1.a.syd.aarnet.net.au (202.158.202.17)  11.857 ms  11.845 ms  11.736 ms
 7  ae9.pe2.brwy.nsw.aarnet.net.au (113.197.15.56)  12.094 ms  12.097 ms  12.107 ms
 8  et-3-1-0.pe1.brwy.nsw.aarnet.net.au (113.197.15.146)  12.317 ms  12.344 ms  12.357 ms
 9  138.44.5.1 (138.44.5.1)  12.605 ms  12.600 ms  12.609 ms
10  libcr1-te-1-5.gw.unsw.edu.au (149.171.255.102)  12.606 ms  12.600 ms  14.235 ms
11  libudnex1-po-1.gw.unsw.edu.au (149.171.255.166)  12.855 ms
12  ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36)  13.268 ms  13.225 ms  13.233 ms
13  129.94.39.23 (129.94.39.23)  13.354 ms  13.354 ms  13.357 ms
```
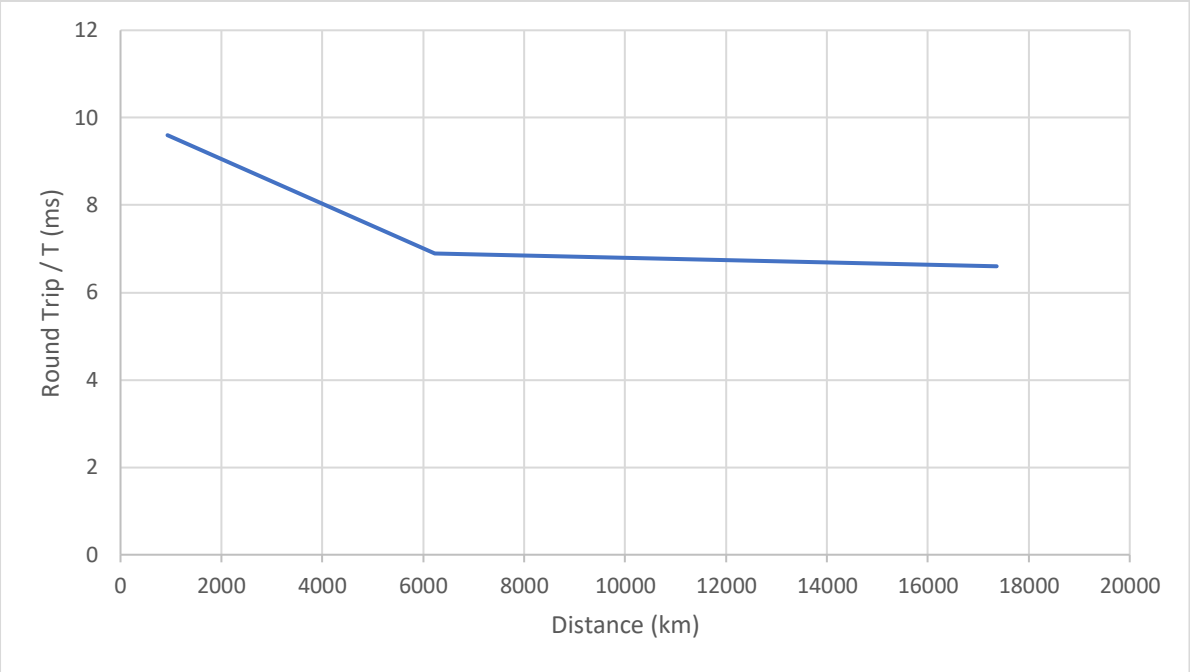

CSE machine from home laptop → Telstra

```
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)  0.184 ms  0.176 ms  0.159 ms
 2  129.94.39.17 (129.94.39.17)  1.129 ms  1.110 ms  1.045 ms
 3  libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34)  1.535 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.2
53.35)  1.715 ms  1.672 ms
 4  ombcr1-po-5.gw.unsw.edu.au (149.171.255.197)  1.232 ms  1.238 ms libcr1-po-6.gw.unsw.edu.au (149.171.25
5.201)  1.189 ms
 5  unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101)  1.266 ms unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.1
05)  1.201 ms  1.252 ms
 6  138.44.5.0 (138.44.5.0)  1.363 ms  1.471 ms  1.472 ms
 7  et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147)  1.685 ms  1.694 ms  1.631 ms
 8  ae9.bb1.a.syd.aarnet.net.au (113.197.15.57)  2.063 ms  2.015 ms  2.074 ms
 9  gigabitethernet1-1.pe1.b.syd.aarnet.net.au (202.158.202.18)  2.190 ms  2.211 ms  2.244 ms
10  gigabitethernet3-11.ken37.sydney.telstra.net (139.130.0.77)  3.118 ms  2.854 ms  3.108 ms
11  bundle-ether13.ken-core10.sydney.telstra.net (203.50.11.94)  4.014 ms  3.506 ms  3.981 ms
12  bundle-ether10.win-core10.melbourne.telstra.net (203.50.11.123)  14.235 ms  14.030 ms  13.955 ms
13  gigabitethernet5-0.exi-service2.melbourne.telstra.net (203.50.80.132)  13.984 ms  13.884 ms  14.117 ms
```

a. Does the reverse path go through the same routers as the forward path?
   From the output we can see the reverse path does not go through the same routers as the forward path.
b. If you observe common routers between the forward and the reverse path, do you also observe the same IP addresses? Why or why not? **n/a**

Exercise 4: Use ping to gain insights into network performance



Can you think of at least two reasons why the y-axis values that you plot are greater than 2?
Round Trip Time counts the time it takes for a packet to travel from the source to the destination and receive a response i.e. back again to the source. T is shortest time is takes to just reach the destination, so RTT is more than double the size of T and why plots are greater than 2.

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

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?
Transmission delay depends on packet size as it measures how long it takes to transmit a whole packet of a certain size. (Packet length / data rate)
Propagation, processing and queueing delay do not depend on packet size. Propagation delay is the time it takes a bit to propagate from one router to the next. Processing delay checks for bit-level errors in the packet that occurred during transmission and where the packet's next destination is. Queuing delay is the time taken for the packet to wait for transmission.