Exercise 1: nslookup

1. Which is the IP address of the website www.koala.com.au? In your opinion, what is the reason of having several IP addresses as an output?

   The IP address of the website www.koala.com.au is 129.94.242.2.The reason of having several IP addresses is Multiple servers deployed.

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

   The name of the IP address 127.0.0.1 is locolhost. This is the default local network address of the currently manipulated host

Exercise 2: Use ping to test host reachability

- www.unsw.edu.au

  YES

- www.getfittest.com.au

  NO: NXDOMAIN

  Because it can't be opened in the browser, it may be a domain name problem or the server has been shut down.

- www.mit.edu

  YES

- www.intel.com.au

  YES

- www.tpg.com.au

  YES

- www.hola.hp

  NO: NXDOMAIN

  Because it can't be opened in the browser, it may be a domain name problem or the server has been shut down.

- www.amazon.com

  YES

- www.tsinghua.edu.cn

  YES

- www.kremlin.ru

  YES

- 8.8.8.8

  YES

Exercise 3: Use traceroute to understand network topology

1. Run traceroute on your machine to www.columbia.edu . How many routers are there between your workstation and www.columbia.edu ? How many routers along the path are part of the UNSW network? Between which two routers do packets cross the Pacific Ocean? Hint: compare the round trip times from your machine to the routers using ping.

   23 routers are there between your workstation and www.columbia.edu. 5 routers along the path are part of the UNSW network(There is one with no domain name but it should be inferred from the IP address). Between et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201) and abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8) do packets cross the Pacific Ocean.

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 . At which router do the paths from your machine to these three destinations diverge? Find out further details about this router. (HINT: You can find out more about a router by running the Whois command: Whois router-IP-address). Is the number of hops on each path proportional the physical distance? HINT: You can find out the geographical location of a server using the following tool
   - http://www.yougetsignal.com/tools/network-location/

   138.44.5.0. It is in central Australia, so it should be proportional.

3. Several servers distributed around the world provide a web interface from which you can perform a traceroute to any other host in the Internet. Here are two examples: (i) http://www.speedtest.com.sg/tr.php and
   (ii) https://www.telstra.net/cgi-bin/trace . Run traceroute from both these servers towards your machine and in the reverse direction (i.e. From your machine to

these servers). You may also try other traceroute servers from the list at www.traceroute.org . What are the IP addresses of the two servers that you have chosen. Does the reverse path go through the same routers as the forward path? If you observe common routers between the forward and the reverse path, do you also observe the same IP addresses? Why or why not?

www.speedtest.com.sg (202.150.221.170) and www.telstra.net (203.50.5.178). The reverse path doesn't go through the same routers as the forward path. The common routers doesn't have the same IP addresses, because the ports should be random.

Exercise 4: Use ping to gain insights into network performance

1. For each of these locations find the (approximate) physical distance from UNSW using Google Maps and compute the shortest possible time T for a packet to reach that location from UNSW. You should assume that the packet moves (i.e. propagates) at the speed of light, 3 x 10 8 m/s. Note that the shortest possible time will simply be the distance divided by the propagation speed. Plot a graph where the x-axis represents the distance to each city (i.e. Brisbane, Serdang and Berlin), and the y-axis represents the ratio between the minimum delay (i.e. RTT) as measured by the ping program (select the values for 50 byte packets) and the shortest possible time T to reach that city from UNSW. (Note that the y-values are no smaller than 2 since it takes at least 2*T time for any packet to reach the destination from UNSW and get back). Can you think of at least two reasons why the y-axis values that you plot are greater than 2?

   www.uq.edu.au:

   physical distance 1951.24km, shortest possible time T: 0.0065s

   www.upm.edu.my:

   physical distance 6620.95km, shortest possible time T: 0.0221s

   www.tu-berlin.de:

   physical distance 16100.18km, shortest possible time T: 0.0537s

   The distance from the target server to the school server must not be a straight line.

   Server transfer information takes time to process

2. Is the delay to the destinations constant or does it vary over time? Explain why.

   There is no proportional relationship between the delay change and time, so in an ideal state, the delay should be constant on the timeline, but there are many interference factors such as network floating and server processing speed, so the delay may fluctuate on the timeline.

3. Explore where the website for www.epfl.ch is hosted. Is it in Switzerland?

   It’s in United States (CloudFlare's CDN node)

4. 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?

   propagation delay depends on the distance between the routers.

   transmission delay depends on the packet size.

   processing delay depends on the processing speed of the switch.

   queuing delay depends on the number of packet.