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 www.koala.com.au is 104.18.60.21 and 104.18.61.21.

In my opinion, I think there are mainly two reasons of having several IP addresses as an output. The first reason is to avoid bursty data. Since there are several IP addresses, while bursty traffic happened, the data may be solved by these different addresses. Another reason is to avoid accident. If some accidents happened and make one of the IP addresses unavailable, there would be some other IP addresses to handle the situation.

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

The name of 127.0.0.1 is localhost.

As I know, all computers use 127.0.0.1 as their own IP address. Although each computer has their own private IP address, they still use 127.0.0.1 to express the computer. In other words, the computer will use the special IP address assigned to them to communicate with other devices, but they will use 127.0.0.1 to mean themselves.

Exercise 2: Use ping to test host reachability

Are the following hosts reachable from your machine by using ping:

www.unsw.edu.au

www.getfittest.com.au

www.mit.edu

www.intel.com.au

www.tpg.com.au

www.hola.hp

www.amazon.com

www.tsinghua.edu.cn

www.kremlin.ru

8.8.8.8

If you observe that some hosts are not reachable, then can you explain why? Check if the addresses unreachable by the ping command are reachable from the Web browser.

www.getfittest.com.au not reachable, cannot find the server, it may not exist. Also unreachable from web browser

www.hola.hp not reachable, cannot find the server, it may not exist. Also unreachable from web browser

www.kremlin.ru can be found and packets can be sent to this IP, however, no packets can be received. I think it's because the government block the ping command for security issue. It can be reached by web browser.

All other hosts are reachable from my machine by using ping.

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.

There are 22 routers between my workstation and www.columbia.edu.

The first 5 routers along the path are part of the UNSW.

Between the 7th to 10th router, the packets cross the Pacific Ocean.

The packets go from 113.197.15.149 to 113.197.15.99, which seems a router in Honolulu. Then go to 113.197.15.201, which seems a router in Seattle.

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/

The first two routers of these 3 paths are same, then these paths diverge. Therefore I would say theses paths diverge at the second router, which is 129.94.39.17.

After using whois command, I found this router is belong to UNSW, and we can send email to hostmaster@unsw.edu.au to contact this router.

I think the number of hops on each path is not proportional the physical distance. It is clear that the physical distance between Australia and Japan is shorter than the physical distance between Australia and United States. Although we can just trace the first 15 routers to www.u-tokyo.ac.jp and the first 14 routers to www.ucla.edu, we can still see that the packet go through 15 routers is in in Japan and the packet go through 14 routers is in the United States. Therefore I think the number of hops on each path is not proportional the physical distance.

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?

The two servers that I have chosen is http://www.speedtest.com.sg/tr.php and https://www.telstra.net/cgi-bin/trace. Their IP addresses is 202.150.221.170 and 203.50.5.178.

The reverse path doesn't go through the same routers as the forward path. Although I didn't observe same routers, I think it is possible to observe same routers with different IP addresses. The reason is that the traceroute command shows the IP addresses of routers' interface. As a result, a router can have several IP addresses. For example. I observed some really closed IP addresses, 138.44.5.1 and 138.44.5.0. It is reasonable to doubt these two IP addresses belong to same router.

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, Manila 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?

According to the Google Maps, the distance between UNSW to these three cities are 920.4km, 6270km and 16090km.

The shortest possible times T for a packet to reach these locations from UNSW are 16.653ms, 318.376ms, 287.431ms.

Therefore, 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 are 5.43, 15.23 and 5.36.

The first reason I can think that why the y-axis values are greater than 2 is that the light always go straight. However, in the real world, the packets cannot always go straight, so these value should be greater than 2. The second reason is that, since the packets are go from routers to routers, the real distance the packets go through should be larger than the distance we got from Google Maps. In other words, in the real word, the packets will detour. Another reason I can think is the physical network. Since it is hard to guarantee the speed of the physical network in the real world, I think speed of the packet is slower than 3 x 10 8 m/s. The last reason I can think is that there are four types of delays in the real world. For example, the queueing delay will effect the speed of the packet. I believe other delays will also influence the result.

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

The delay to the destinations vary over time. Since these packets are send by the same device through the same network, I think there are basically two reasons caused the delay to destinations vary., The first reason is that the size of the packets will effect the delay. If the packet is large, the transmission delay will increase, and the packet will spend longer time to arrive its destination. Another reason is that the number of users who are using the network will influence the delay. If many people uses the internet at the same time, then there may be a congestion happened and the delay to the destination will vary.

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

The IP of www.epfl,ch is 104.20.228.42 and 104.20.229.42. It belongs to an organisation called Cloudfare. These IP addresses are not in Switzerland but located in the United States.

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?

In my opinion, the propagation delay and the queuing delay are not depend on the packet size, but the transmission delay and the processing delay are depend on the packet size.

Since the processing delay happened when check bit errors and determine output link, it is clear that the packet size will influence the processing delay.

The queueing delay is due to the time waiting at output link for transmission and it depends on congestion level of router, so the queueing delay should not depend on the packet size.

The transmission delay is decided by the packet length and the link bandwidth, therefore it is depend on the packet size.

Because of the propagation delay is decided by the length of physical link and the propagation speed in medium, it is not depend on the packet size.