

Lab Assignment 1

COL 334/672

Due Date: **Aug 17, 2018**

Team **Size: 1**

Note: Solve all problems on your own. Approach the instructor/TA for clarifications. Your solutions must be submitted as a PDF report (you can choose to use Word, Latex etc. to create the report). Upload the report along with your programming code to Moodle according to the instructions given at the end of the assignment.

PART A

1. From a machine in your hostel or favourite lab check your download and upload speed using <http://www.testmyspeed.com/>. What are the download and upload speeds you get? Compare these to the results you get from www.speedtest.net. Are the results more or less the same? If not, suggest reasons for why they are different.
2. Learn about the networking utility **ping**, together with different optional parameters
 - (a) Write a one-paragraph description of it in your own words. You should mention what protocol it uses and the method used to generate echo packets from the remote host.
 - (b) Use the **ping** command to determine the RTT to www.google.com, www.harvard.edu, and www.iitd.ac.in. Mention the IP addresses of these web servers along with the RTT to them in ms. Which of the three servers is closest in terms of RTT. Which is farthest in terms of RTT? Why do you think is the reason for this?
3. Run the **ifconfig** (on Windows use **ipconfig** or **netsh**) command to get information about various interfaces on your machine.
 - (a) List the IP addresses (IPv4) of all interfaces. What is the IP address, MAC address, Subnet mask and Gateway of your system?
 - (b) A few interfaces might have Ethernet addresses (ether ..). List the names of these interfaces, their Ethernet addresses, along with the mtu for those interfaces. What does MTU refer to?
 - (c) Some interfaces may have IPv6 addresses listed against them? List these out, if any. How many bits does an IPv6 address have?
4. Trace route is a networking diagnostic tool which gives the IP addresses of routers on a path to a given destination and the RTTs to each router.
 - (a) Run **tracert** to www.iitd.ac.in and www.cse.iitd.ac.in. Discuss the differences in the list of routers (how many are common and how many different) on both paths. In theory the RTT to routers further along the path should be larger than for those closer to the source (your machine running **tracert**). Is this always the case in your experiments? If not, suggest why.

5. The Address Resolution Protocol (ARP) is a communication protocol used for discovering the link layer address, such as a MAC address, associated with a given network layer address, typically an IPv4 address. Use the **ARP** command to find the MAC address of your default gateway
6. Give a short (1 para) description of **DNS** - why & how it is used.
 - (a) What is the url corresponding to the IP address 128.42.204.11?
 - (b) List some of the public DNS providers.
7. **nmap**: This is a handy network diagnostics tool that you can use to discover which hosts are online in the network, ports open on these hosts, etc.
 - (a) Query your LAN using **nmap** to discover which hosts are online. Use a command such as: **nmap -n -sP 10.208.26.0/24** Write a script that you can run repeatedly at different times of the day, and finds the number of hosts online. Do it for at least 5 days. Plot a graph against time to see if there are any hourly trends to when computers are switched ON or OFF in your hostels.
 - (b) Find out what servers are running in your LAN. Use a command such as: **nmap -n 10.208.26.0/24** You can even find out what OS is running on these computers: **nmap -n -O 10.208.26.135** You need not query all hosts in your LAN, a small sample will be sufficient to get an idea. For example, you can discover hosts using **nmap -sP** on a /16 block and then do more detailed **nmap -O** etc on specific hosts or smaller IP address blocks.

PART B

In this question, you are required to install **Mininet**, build different custom topologies and analyse the impacts of various parameters like Bandwidth, Delay, Loss and Queue size over different links in these custom topologies.

Mininet is a network emulator that runs a collection of end-hosts, switches, router, and links on the single Linux kernel and gives virtualization of a network on a single system.

For more detail, you can visit <https://github.com/mininet/mininet/wiki/Introduction-to-Mininet>

1. For installation of Mininet, you can visit <https://github.com/mininet/mininet/wiki/Mininet-VM-Image>

Note: For windows user, you can install via. Virtual Box. Visit the link <https://www.virtualbox.org/wiki/Downloads>

2. Build the following custom topologies: Linear, Ring, Mesh and Star using 10 nodes as hosts.
3. Try various commands like **ping**, **iperf**, **ifconfig**, **route**, **traceroute** and **nslookup** from different hosts in the network and store their results in a file.

4. Try setting various parameters for the links and nodes in the network like bandwidth, delay, loss and queue size. Give the insights on what changes you observe by changing various parameters.

Comment your programming code well.

Upload a single zip file on moodle with name "ENTRYNUMBER-LAB1.zip" (e.g.: 2016CS10100-LAB1.zip) containing :

(i) A PDF report, containing details and insights pertaining to each part.

(ii) For Part B, the code (python files) used for creating custom topologies and setting link parameters.