Assignment 1

COL334/672

Due date: 22nd August 11:00 PM

1   Networking Tools

This part is aimed to make you familiar with basic networking tools. Read the man pages of the tools *ifconfig (ipconfig)*, *ping*, *traceroute (tracert)*, and *nslookup*.

(a) Find the IP address of your machine. Try connecting to different service providers and notice the changes, if any, in the IP address of your machine.

(b) Find the IP address associated with www.google.com and www.facebook.com using *nslookup*. Change the DNS server (look for open DNS servers on the web) to use in the command and see how IP address of the above domains change.

(c) *ping* the IP address of www.iitd.ac.in. Send the *ping* packets with different packet sizes, TTL values, etc. What is the maximum size of ping packets that you are able to send? Is this size same for the domains mentioned in part (b)?

(d) Run *traceroute* via two or more service providers for www.iitd.ac.in. If your ISP blocks packets on the path to www.iitd.ac.in then try with a different destination like www.google.com, or www.facebook.com, etc. Report your observations, like if some paths default to `IPv6` then how you can force traceroute to use `IPv4`, any private IP addresses(`10.*.*.*` or `192.168.*.*`), routers that do not reply to requests, etc. What changes can you make to *traceroute* request for some of the missing routers to reply?

2   Packet Analysis

Install *wireshark* which is a very useful tool to sniff packets on the wire (or wireless medium). Sniffed data is parsed by *wireshark* and is presented in an easily readable format with details of the protocols being used at different layers. Use *wireshark* to grab all packets on your interface while visiting the website http://apache.org from your browser. Flush your local DNS cache before visiting the page. And also clear your browser cache. Report the following:

(a) Apply a "dns" filter on the packet trace. How long did it take for the DNS request-response to complete?

(b) Apply an "http" filter on the packet trace. Report the approximate number of HTTP requests that were generated. What does this tell about how web-pages are structured, and how browsers render complex pages with multiple images and files?

(c) Report the total time taken to download the entire webpage. It is the time between the first DNS request and the time when the last content object was received.

(d) Run a packet trace for http://www.cse.iitd.ac.in and filter for "http". Do you find any HTTP traffic? Why is it that you were able to do it easily earlier for http://apache.org?

3   Implement Traceroute using Ping

We studied about *ping* and *traceroute* in the first section. In this section, you need to write a program implementing *traceroute* using ping. In the program you may use the ping command available in Linux/Windows or send packets with varying TTL values. The program should also calculate RTT(round trip time) of each server on the way and plot the graph for RTT(y-axis) vs hop number (x-axis) i.e. if it took 10 hops to reach the destination then show RTT for 1st hop, then 2nd hop and so on.

Input: The program would take the domain name of destination as input, for example: www.iitd.ac.in
Output: Print the IP addresses of the hops on the way to the destination IP address on the screen and save the RTT vs hop plot as a png/jpeg file.

Include following in the report:

1. Attach a screenshot of the output showing IP addresses of all the hops.

2. Attach the plot of the RTT vs hop number.

Notes:

1. Languages allowed : Python, C, C++, Java

2. Do not hard-code any domain name in the program. The program should run on any public domain. You may use any public domain as destination while reporting, for instance www.iitd.ac.in

3. Remember that you must not use any module/library that directly outputs the result of *traceroute*, i.e. your program must proceed hop by hop.

What to Submit

1. A neat report in pdf. Please use the exact question numbering as above.

2. Code for part 3

3. Submit a zip file containing both pdf and the code and name it as `<Entry-Number>.zip`

This assignment has to be done individually. You will present your report over a viva with a TA, and also run your script to replicate the *traceroute* functionality.