Computer Networks

Assignment 4

Assignment given on: 08-02-2021

Due Date: 15-02-2021, on Moodle

All the experiments need to be performed on a Unix/Linux-based computer

Questions:

Q1. The Internet Ping command bounces a small packet(s) to test network communications, and then shows how long this packet(s) took to make the round trip. The Internet Ping program works much like a sonar echo-location, sending a small packet of information containing an ICMP ECHO_REQUEST to a specified computer, which then sends an ECHO_REPLY packet in return. Explore more about the *ping* command and answer the following questions (Unix or GNU/Linux version only):

a) What is the option required to specify the number of echo requests to send with *ping* command?
b) What is the option required to set time interval (in seconds), rather than the default one second interval, between two successive ping ECHO_REQUESTs?
c) What is the command to send ECHO_REQUEST packets to the destination one after another without waiting for a reply? What is the limit for sending such ECHO_REQUEST packets by normal users (not super user)?
d) What is the command to set the ECHO_REQUEST packet size (in bytes)? If the PacketSize is set to 64 bytes, what will be the total packet size?

Q2. Select five hosts of your choice in the Internet (mention the list in your report) and experiment with pinging each host 20 times at three different hours of the day. Check if there exist cases, which shows packet loss greater than 0% and provide reasoning. Find out average RTT for each host and explain whether measured RTTs are strongly or weakly correlated with the geographical distance of the hosts. Pick one of the above used hosts and repeat the experiment with different packet sizes ranging from 64 bytes to 2048 bytes. Plot the average RTT(x-axis: Packet size, y-axis: Avg RTT), and explain how change in packet size and time of the day impact RTT. You can use the following online tools for this experiment:
i) http://www.spfld.com/ping.html
ii) https://www.subnetonline.com/pages/network-tools/online-ping-ipv4.php

Use the following link to find the geolocation using ip address.
https://ipinfo.io/

Output format:

Domain name	IP Address	Geolocation	Avg. RTT1	Avg. RTT2	Avg. RTT3	Total Avg. RTT

	64	128	256	512	1024	1576	2048
Avg. RTT1							
Avg. RTT2							
Avg. RTT3							

Q3. Select an IP address (e.g., 163.53.78.110) of your choice (mention the address in your report). Capture the outcome of 1,000 pings in two separate files by executing the following *ping* commands.

- ping -n <IP Address>
- ping -p ff00 <IP Address>

Come up with a method to read and analyse the observations captured in the files and answer the following questions. You are free to look for a tool, programming/scripting language that is best suitable for the task and learn just enough of it to get the analysis done.
a) What was the packet loss rate for each command?
b) What was the minimum, maximum, mean, and median latency of the pings that succeeded? Ignore pings that failed in the calculation.
c) Plot graphs to visualise the normal distribution of the ping latencies. The goal here is to find a method to present the data in a way that is clear and easy to understand. (x- Latency, y- frequency)
d) Describe the significant network behaviour you observed between the two experiments. The two scenarios were set up to be very similar except for two aspects. Describe your answer precisely, as best as you can.

Output format:

Command	Packets Sent	Packets Received	Packet Loss Rate	Min. Latency	Max. Latency	Mean Latency	Median Latency
ping -n <IPAddress>							
ping -p ff00 <IPAddress>							

Q4. Capture the output of *ifconfig* command with necessary options, and identify and explain as much of what is printed as you can. Explain the output of *route* command and its options. (Screenshot required)

Q5. What is *netstat* and what is it used for? What parameters for *netstat* should you use to show all the TCP connections established? Include a printout(screenshot required) of this list for your machine and explain all the fields. What does "*netstat –r*" show? Explain all the fields of output. What option of *netstat* can be used to display network interface status? By using *netstat*, figure out the number of interfaces on your machine. Show and explain the function of loopback interface.

Q6. Perform traceroute experiment (with same hosts used in **Q2**) at three different hours of the day to determine the routes used, and then answer the questions below. Use any one of following online tools for this experiment:
http://network-tools.com; http://ping.eu; http://www.cogentco.com/en/network/looking-glass
a) List out the hop counts for each host in each time slot. Determine the common hops between two routes if they exist.
b) Check and explain the reason if route to same host changes at different times of the day.
c) Inspect the cases when traceroute does not find complete paths to some hosts and provide reasoning.
d) Is it possible to find the route to certain hosts which fail to respond with ping experiment? Give reasoning.

Output format:

	<Website1>	<website2>	<website3>	<website4>	<website5>

Hop count1					
Hop count2					
Hop count3					

Q7. How do you show the full ARP table for your machine? Explain each column of the ARP table. Check and explain what happens if you try and use the *arp* command to add or delete an entry to the ARP table. Find out how to add, delete or change entries in the ARP table. Use this mechanism to add at least two new hosts to the ARP table and include a printout(screenshot required). How long do entries stay cached in the ARP table? Describe a trial-and-error method to discover the timeout value. What will happen if two IP addresses map to the same Ethernet address? Be specific on how all hosts on the subnet operate.

Report

Solve the questions individually. Submit a soft copy of the report, preferably PDF, on all these experiments. If report size exceeds more than 25MB, reduce the images size. (online website: http://www.simpleimageresizer.com/)

Grading: (100%)

Q1 – 5%
a) – 1% b) – 1% c) – 1.5% d) 1.5%
Q2 – 20%
Q3 – 15% Output format(5%)
a) - 1% b) – 1% c) %5 d) 3 %
Q4 – 10%
Q5 – 10%
Q6 – 20% Output (5%)
a) 5% b)5% c) 2.5% d) 2.5%
Q7 – 20%

Note:

a. 10% penalty for 1 day late submission, 25% penalty for more than 1 day.
b. Found copied, plagiarism fails, 0 marks

Submission Details:

1. Please read the questions carefully and complete it.
2. The report file name should start with <Your_Roll_Number> and submit it on moodle.
3. Submit only through moodle and well in advance. Any hiccups in the moodle/Internet at the last minute is never acceptable as an excuse for late submission. Submissions through email will be ignored.
4. Submit to moodle on or before 15-02-2021 (23:55 PM)
5. Any queries related to the assignment send an email to Tas well in advance

priyash@iitdh.ac.in - Roll Number: 18001001 to 180010025,160010021,170010020
chandrashekar.s@ittdh.ac.in - 18001026 to Remaining