

CS212 : Computer Networks Lab

Assignment 1

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1 Question 1 - Ping

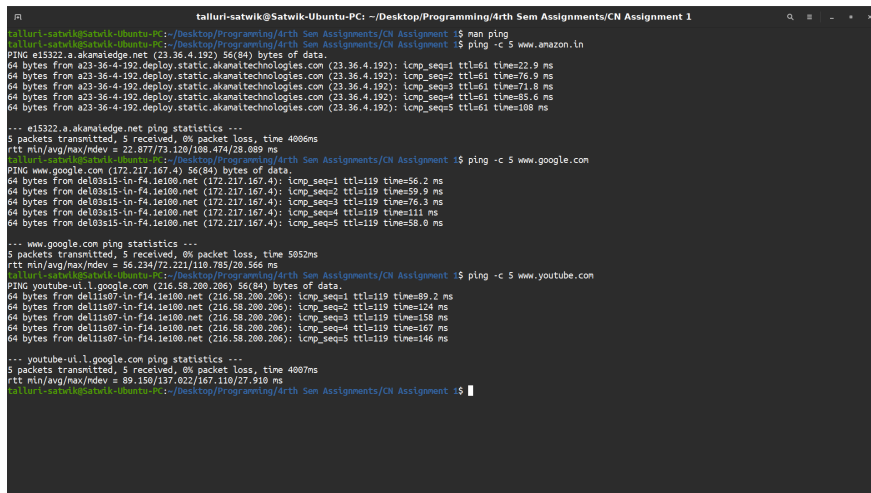
1.1 Part a

I Have obtained the results as shown in Figure 1, for each website we can see the IP Address corresponding to the domain name in the first line. In each subsequent , the data corresponding to a packet is given. The size of data(In bytes), the icmp-seq(which gives the order/index of the packet), the TTL(total time to live) and the time i.e the RTT(Round trip time) are given. In the last section we can see the number of packets sent, number of packets received, packet loss and total time. We also get the statistical information like min, max and average of the RTT.

Note : I have used -c attribute to send specify the number of packets.

1.2 Part b

The RTT values obtained are different for each website, as it depends on various factors such as traffic levels, server response times, distance etc. As we can see the RTT's for amazon.in and google.com are nearly same and it is different for youtube.com, hence RTT's maybe different for different servers. We should also note that the RTT's are in the order of milliseconds, and hence a normal user may not be able to perceive a difference while using these services.



```
in
talluri-satwik@Satwik-Ubuntu-PC: ~/Desktop/Programming/4rth Sem Assignments/CN Assignment 1
talluri-satwik@Satwik-Ubuntu-PC:~/Desktop/Programming/4rth Sem Assignments/CN Assignment 1$ ping
PING e15322.a.akanadedge.net (23.36.4.192) 56(84) bytes of data:
64 bytes from a23-36-4-192.deploy.static.akamaitechnologies.com (23.36.4.192): icmp_seq=1 ttl=61 time=22.9 ms
64 bytes from a23-36-4-192.deploy.static.akamaitechnologies.com (23.36.4.192): icmp_seq=2 ttl=61 time=76.9 ms
64 bytes from a23-36-4-192.deploy.static.akamaitechnologies.com (23.36.4.192): icmp_seq=3 ttl=61 time=71.8 ms
64 bytes from a23-36-4-192.deploy.static.akamaitechnologies.com (23.36.4.192): icmp_seq=4 ttl=61 time=83.6 ms
64 bytes from a23-36-4-192.deploy.static.akamaitechnologies.com (23.36.4.192): icmp_seq=5 ttl=61 time=108 ms

--- e15322.a.akanadedge.net ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4086ms
rtt min/avg/max/mdev = 22.877/73.120/108.474/28.889 ms

talluri-satwik@Satwik-Ubuntu-PC:~/Desktop/Programming/4rth Sem Assignments/CN Assignment 1$ ping -c 5 www.google.com
PING www.google.com (172.217.167.4) 56(84) bytes of data:
64 bytes from del03s15-in-f4.1e100.net (172.217.167.4): icmp_seq=1 ttl=119 time=56.2 ms
64 bytes from del03s15-in-f4.1e100.net (172.217.167.4): icmp_seq=2 ttl=119 time=59.9 ms
64 bytes from del03s15-in-f4.1e100.net (172.217.167.4): icmp_seq=3 ttl=119 time=76.3 ms
64 bytes from del03s15-in-f4.1e100.net (172.217.167.4): icmp_seq=4 ttl=119 time=111 ms
64 bytes from del03s15-in-f4.1e100.net (172.217.167.4): icmp_seq=5 ttl=119 time=58.0 ms

--- www.google.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 5952ms
rtt min/avg/max/mdev = 56.234/72.221/110.785/20.566 ms

talluri-satwik@Satwik-Ubuntu-PC:~/Desktop/Programming/4rth Sem Assignments/CN Assignment 1$ ping -c 5 www.youtube.com
PING youtube-ui.l.google.com (216.58.200.206) 56(84) bytes of data:
64 bytes from del11s07-in-f14.1e100.net (216.58.200.206): icmp_seq=1 ttl=119 time=89.2 ms
64 bytes from del11s07-in-f14.1e100.net (216.58.200.206): icmp_seq=2 ttl=119 time=124 ms
64 bytes from del11s07-in-f14.1e100.net (216.58.200.206): icmp_seq=3 ttl=119 time=158 ms
64 bytes from del11s07-in-f14.1e100.net (216.58.200.206): icmp_seq=4 ttl=119 time=167 ms
64 bytes from del11s07-in-f14.1e100.net (216.58.200.206): icmp_seq=5 ttl=119 time=146 ms

--- youtube-ui.l.google.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4807ms
rtt min/avg/max/mdev = 89.150/137.022/167.110/27.910 ms
talluri-satwik@Satwik-Ubuntu-PC:~/Desktop/Programming/4rth Sem Assignments/CN Assignment 1$
```

Figure 1: Terminal Window for Q1

2 Question 2 - TraceRoute

2.1 Part a

The network map is drawn for `www.google.com` as follows, (the terminal screenshot is shown in Figure 2)

192.168.1.1(Default IP address of my router) → 223.230.16.1 → 182.79.198.5 → 72.14.216.192 → 108.170.253.97 → 108.170.253.105 → 72.14.239.10 → 108.170.251.97 → 72.14.233.31 → 172.217.167.4(`www.google.com`)

These values represent the IP address of each router in the intermediate steps(hop addresses).

The network map is drawn for `www.youtube.com` as follows,

192.168.1.1(Default IP address of my router) → 223.230.16.1 → 116.119.57.201 → 72.14.208.234 → 72.14.239.61 → 108.170.236.197 → 216.58.197.78(`www.youtube.com`)

The network map is drawn for `www.amazon.in` as follows,

192.168.1.1(Default IP address of my router) → 223.230.16.1 → 116.119.35.171 → 23.36.4.192 (`www.amazon.in`)

2.2 Part b

We can set the maximum number of hops, by using the `-m` attribute. The command for it is :

\$ `tracert -m 5 www.google.com`, which sets the max number of hops to be 5.

2.3 Part c

For each hop, we send 3 separate signal packets, and the timestamps corresponds to the RTTs for each packet. This is done to display consistency in the route and check how much the RTT values change.

2.4 Part d

TTL field is useful for ICMP packets, because it helps to terminate the trace if it stuck in a loop. TTL values specify the number of hops a packet can travel before it is dropped off, and hence we can specify a termination condition. We can also calculate the number of hops or distance between a server and the router.

```
talluri-satwik@Satwik-Ubuntu-PC: ~  
talluri-satwik@Satwik-Ubuntu-PC:~$ traceroute -I www.google.com  
traceroute to www.google.com (172.217.167.4), 64 hops max  
1 192.168.1.1 1.151ms 0.832ms 0.543ms  
2 223.230.16.1 8.888ms 59.144.94.157 12.961ms 11.413ms  
3 182.79.198.5 19.768ms 22.825ms 23.115ms  
4 72.14.216.192 20.740ms 28.132ms 20.692ms  
5 108.170.253.97 23.353ms 21.681ms 21.888ms  
6 108.170.253.105 32.417ms 22.651ms 22.426ms  
7 72.14.239.10 55.194ms 56.230ms 55.498ms  
8 108.170.251.97 160.445ms 56.377ms 54.252ms  
9 72.14.233.31 55.622ms 55.853ms 55.515ms  
10 172.217.167.4 62.930ms 64.685ms 60.139ms  
talluri-satwik@Satwik-Ubuntu-PC:~$ traceroute -I www.youtube.com  
traceroute to youtube-ui.l.google.com (216.58.197.78), 64 hops max  
1 192.168.1.1 0.614ms 0.638ms 0.598ms  
2 223.230.16.1 8.499ms 59.144.94.157 8.491ms 8.650ms  
3 116.119.57.201 24.883ms 58.422ms 61.899ms  
4 72.14.208.234 24.537ms 22.348ms 20.606ms  
5 72.14.239.61 24.033ms 24.313ms 23.686ms  
6 108.170.236.197 22.177ms 23.379ms 23.221ms  
7 216.58.197.78 22.715ms 24.199ms 23.942ms  
talluri-satwik@Satwik-Ubuntu-PC:~$ traceroute -I www.amazon.in  
traceroute to e15322.a.akamaiedge.net (23.36.4.192), 64 hops max  
1 192.168.1.1 2.936ms 16.423ms 6.231ms  
2 223.230.16.1 14.643ms 59.144.94.165 10.479ms 9.479ms  
3 116.119.35.171 35.400ms 37.763ms 27.483ms  
4 23.36.4.192 22.995ms 21.787ms 21.678ms  
talluri-satwik@Satwik-Ubuntu-PC:~$ ^C  
talluri-satwik@Satwik-Ubuntu-PC:~$
```

Figure 2: Terminal Window for Q2

3 Question 3 - Network Config Files

3.1 Part a

Machine's hostname: Satwik-Ubuntu-PC

IP address: 192.168.1.12

I got this information by using the following commands:

\$ cat /etc/hostname and \$ ip addr respectively

3.2 Part b

Next Hop router's IP address: 192.168.1.1

Next Hop router's MAC address: b8:c1:ac:7f:5e:e4

I got this information by using the arp table, we can see the next hop IP address in the traceroute, then using ip address I looked up the MAC address of the router from the ARP table using, \$ arp -a 192.168.1.1 command.

3.3 Part c

local DNS server's IP address: 127.0.0.53

I got this information by using the following command:

\$ cat /etc/resolv.conf

3.4 Part d

The number in /etc/protocols represents the protocol in the layer above the IP to which the data should be passed.

3.5 Part e

Port numbers corresponding to the following services are:

ssh : 22/tcp

ftp : 21/tcp

nfs : 2049/tcp or 2049/udp

smtp : 25/tcp

I got this info by using the command :

\$ cat /etc/services

This displays the table of services, where the second column specifies the port number.