Report | Lab 4

CS378 - Computer Networks Lab

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1 Exercise 1

1.1

IPv4 : 10.130.154.32

Bits used to represent : 32

1.2

IPv6 : fe80::7c95:8a48:7a03:7b5b

Bits used to represent : 128

1.3

Hardware MAC : 40:8d:5c:e0:17:3e

Bits used to represent : 48

1.4

MTU : 1500

1.5

MTU is Maximum Transmission Unit meaning the maximum size of a packet that can be received.

Units : bytes

1.6

Transmit Queue Length : 1000

Units : no. of packets

2 Exercise 2

2.1

ICMP is Internet Control Message Protocol, used by network devices to diagnose network communication issues and mainly used to determine whether data is reaching its intended destination regularly.

2.2

If the 10th byte of the IP packet (of the protocol field) matches the ICMP protocol number 1, then the IP packet can be classified as ICMP packet.

2.3

Ping packets Size : 56 bytes (w/o IP header)

2.4

The avg RTT for the machines were:

- **10.130.154.31** : 0.344 ms
- **www.cse.iitb.ac.in** : 0.460 ms
- **www.ee.iitb.ac.in** : 0.609 ms

2.5

The TTL values observed were :

- **10.130.154.31** : 64
- **www.cse.iitb.ac.in** : 61
- **www.ee.iitb.ac.in** : 61

and hence different.

2.6

An echo request packet is sent to the specified address. Once the remote host gets the echo request, it responds with an echo reply packet. Each echo request's outcome is displayed. And we can formulate many things from the data packet received such as RTT, packet loss % etc.

2.7

There were no output when the `ping www.google.com` was run. And had a 100% packet loss. This may be due to no response from the destination to the ICMP packets sent from source.

2.8

IP Address shown on my device is : **103.21.125.76**

This is not same as the IPv4 shown using `ifconfig`.

One reason might be to allocate different IP address for a group of machines on same network (maybe assigned by ISP), and the other multiple different ones to the locally connected devices on the same respective network (private network).

2.9

- **www.google.com** :: TTL : 115 | RTT : 28.164 ms
- **www.iitd.ernet.in** :: TTL : 51 | RTT : 158.046 ms

3 Exercise 3

3.1

`traceroute` works by sending IP packets with incremental TTL until an ICMP reply is received from the destination.

TTL is decremented by the respective router after each hop. Whenever a TTL is expired after a hop, the router sends a TTL expired message to source. Source then sends another IP packet with incremented TTL. When the IP packet reaches gets the IP packet, it responds with ICMP packet. In this way we know what was the trace/path and number of hops to the destination.

3.2

This depends on destination but the expected number should be $\leq$30 since max hops is 30.

Each line contains `hop_number`, `router_name` (if available), `router_IP_address`, and 3 RTTs.

3.3

The number of hops for the three machines were:

- **10.130.154.31** : 1
- **www.cse.iitb.ac.in** : 4
- **www.ee.iitb.ac.in** : 4

The relation can be such that each ICMP IP packet had TTL as 64. And it was one hop for `10.130.154.31`, so the TTL stayed 64. The number of hops for `www.cse.iitb.ac.in` and `www.ee.iitb.ac.in` was 4, the TTL decremented by 3, hence 61.

3.4

The number of hops for `www.google.com` was 4 with last machine being :
`ifwb-201.iitb.ac.in (10.201.250.200)`

After that it gave '* * *', this could be due to no 'TTL exceeded' response from the routers after the last router. This **could** be due to firewall or prevention measures.

On running traceroute from `ping.eu`, we got '* * *' after 2 hops and saying no response for 5 hops and assumes a firewall prohibition.

4 Exercise 4

4.1

IPv4 addresses obtained were:

- **`www.mit.edu`** : `23.58.1.151`
- **`www.cs.mit.edu`** : `35.231.163.5`
- **`www.ee.mit.edu`** : `35.231.163.5`
- **`www.ece.rice.edu`** : `128.42.207.163`
- **`www.cs.rice.edu`** : `128.42.207.163`

4.2

The IP addresses are same within a domain. This could be due to the reasons that departments within the `.mit.edu` or `.rice.edu` could be hosted on the same servers and hence have same IP addresses within each similar parent domain.

4.3

A canonical name is a type of DNS database record that indicates that a domain name is the nickname or alias for another domain name.

Both the websites have same IP addresses as they are aliases of `mit.edu`.

5 Exercise 5

5.1

The bandwidth observed using loopback IP (`127.0.0.1`) was **37.9 Gbits/sec**.

5.2

The bandwidth observed using the client TCP (`10.130.154.31`) was **940 Mbits/sec**.

The bandwidth is so much higher in loopback (38x) than the other method as we are not using the network interface in loopback (we use network interface in the other one) and hence the speed is so much higher.

6 Exercise 6

6.1

The average of the last 10 measurements obtained was **191.167 Mbits/sec** and yes it is comparable with the total bandwidth with another machine, which too was in Mbits/sec.

6.2

The chirp packet train is a series of probe packets with varying (decreasing) package spacing which measures the congestion of the network and measure network properties from sender to receiver.