Computer Networks Lab (CS302)

Report Submission: CN Assignment Lab-6

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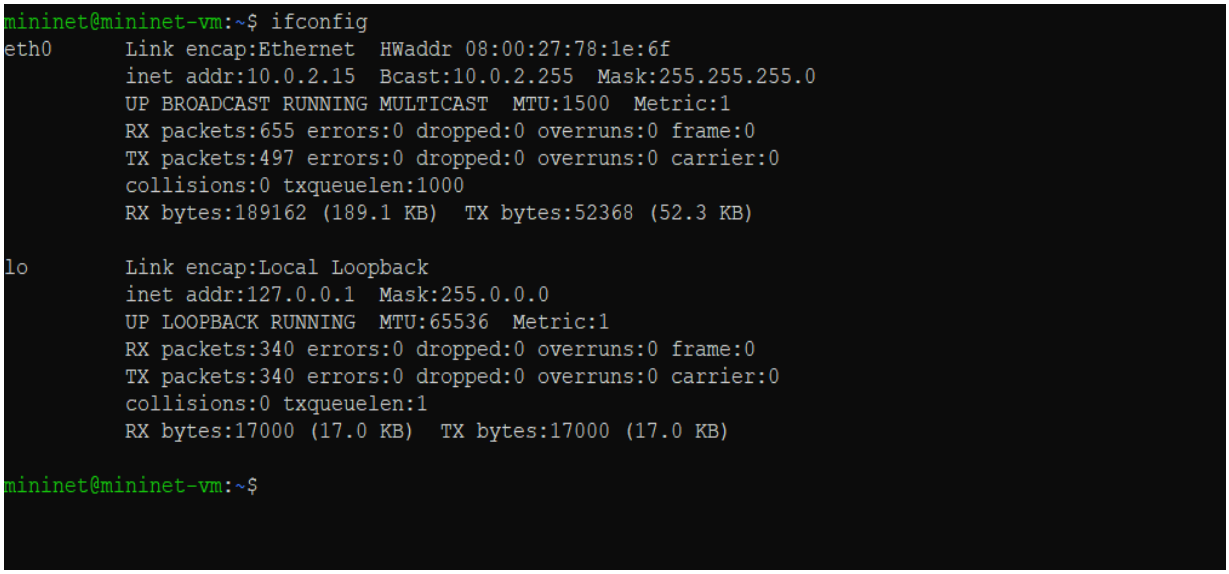
Part A

1) 1. Print the list of network interfaces, their MAC addresses and their assigned IP addresses, if any.

The diference between interfaces available in mininet VM are shown in below picture including their IP and MAC address



2. Calculate the latency between mininet vm and www.rutgers.edu for 10 packets. Repeat the result for stanford.edu and www.google.co.in and compare the difference in latency.

```
mininet@mininet-vm: ~
mininet@mininet-vm:~$ ping www.rutgers.edu -c 10
PING www.rutgers.edu (128.6.46.88) 56(84) bytes of data.
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=1 ttl=235 time=227 ms
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=2 ttl=235 time=293 ms
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=3 ttl=235 time=334 ms
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=4 ttl=235 time=221 ms
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=5 ttl=235 time=221 ms
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=6 ttl=235 time=229 ms
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=7 ttl=235 time=220 ms
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=8 ttl=235 time=221 ms
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=9 ttl=235 time=221 ms
64 bytes from www-new.rutgers.edu (128.6.46.88): icmp_seq=10 ttl=235 time=221 ms

--- www.rutgers.edu ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9016ms
rtt min/avg/max/mdev = 220.271/241.215/334.856/37.710 ms
mininet@mininet-vm:~$ ping www.stanford.edu -c 10
PING pantheon-systems.map.fastly.net (199.232.102.133) 56(84) bytes of data.
64 bytes from 199.232.102.133: icmp_seq=1 ttl=55 time=222 ms
64 bytes from 199.232.102.133: icmp_seq=2 ttl=55 time=52.2 ms
64 bytes from 199.232.102.133: icmp_seq=3 ttl=55 time=52.6 ms
64 bytes from 199.232.102.133: icmp_seq=4 ttl=55 time=52.8 ms
64 bytes from 199.232.102.133: icmp_seq=5 ttl=55 time=51.7 ms
64 bytes from 199.232.102.133: icmp_seq=6 ttl=55 time=51.3 ms
64 bytes from 199.232.102.133: icmp_seq=7 ttl=55 time=51.4 ms
64 bytes from 199.232.102.133: icmp_seq=8 ttl=55 time=52.4 ms
64 bytes from 199.232.102.133: icmp_seq=9 ttl=55 time=51.2 ms
64 bytes from 199.232.102.133: icmp_seq=10 ttl=55 time=51.8 ms

--- pantheon-systems.map.fastly.net ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9020ms
rtt min/avg/max/mdev = 51.206/69.059/222.758/51.235 ms
mininet@mininet-vm:~$ ping www.google.co.in -c 10
PING www.google.co.in (142.250.199.131) 56(84) bytes of data.
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=1 ttl=56 time=50.7 ms
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=2 ttl=56 time=33.1 ms
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=3 ttl=56 time=34.3 ms
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=4 ttl=56 time=33.0 ms
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=5 ttl=56 time=32.4 ms
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=6 ttl=56 time=45.3 ms
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=7 ttl=56 time=36.9 ms
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=8 ttl=56 time=36.7 ms
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=9 ttl=56 time=50.0 ms
64 bytes from bom07s36-in-f3.1e100.net (142.250.199.131): icmp_seq=10 ttl=56 time=33.5 ms

--- www.google.co.in ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9015ms
rtt min/avg/max/mdev = 32.426/38.630/50.712/6.870 ms
mininet@mininet-vm:~$
```

- The Avg latency of Rutgers.edu is 241.215 ms and The avg latency of Standford.edu is 69.059 ms and The Avg latency of google.co.in is 38.630 ms ..
- The difference between google.co.in and Rutgers.edu is 202.585 ms
- The difference between google.co.in and standford.edu is 30.429 ms

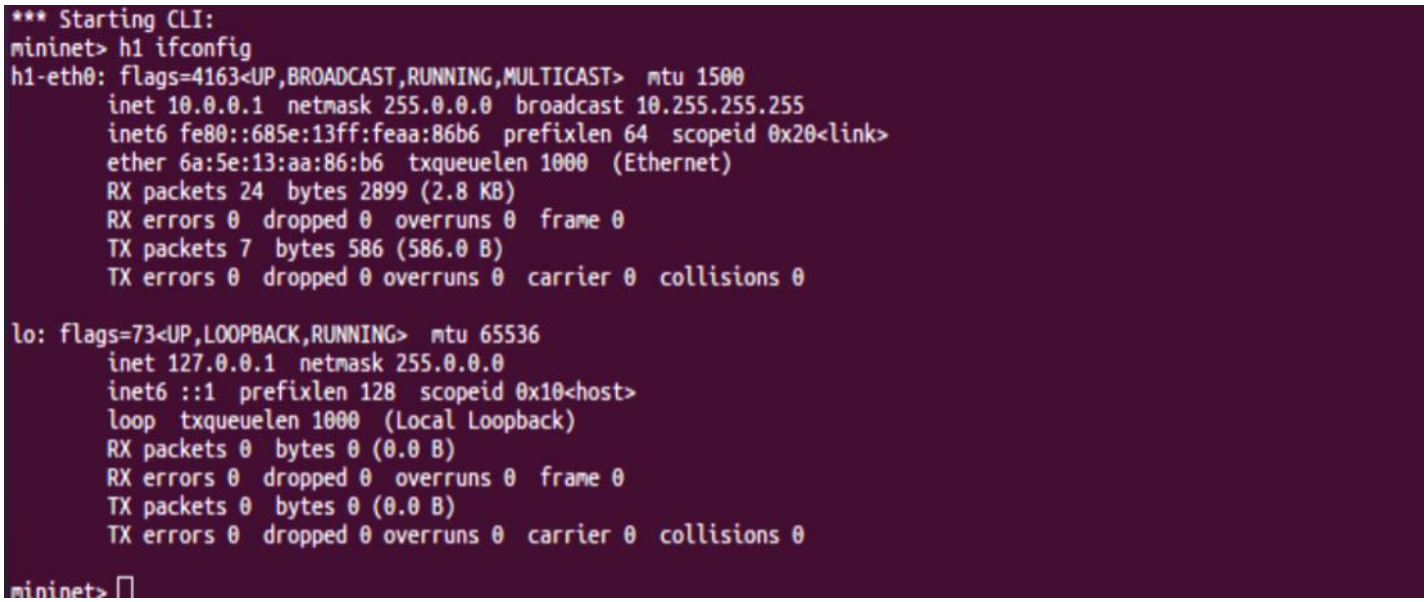
Part B

1. Create a simple two node network using "sudo mn" and do the following

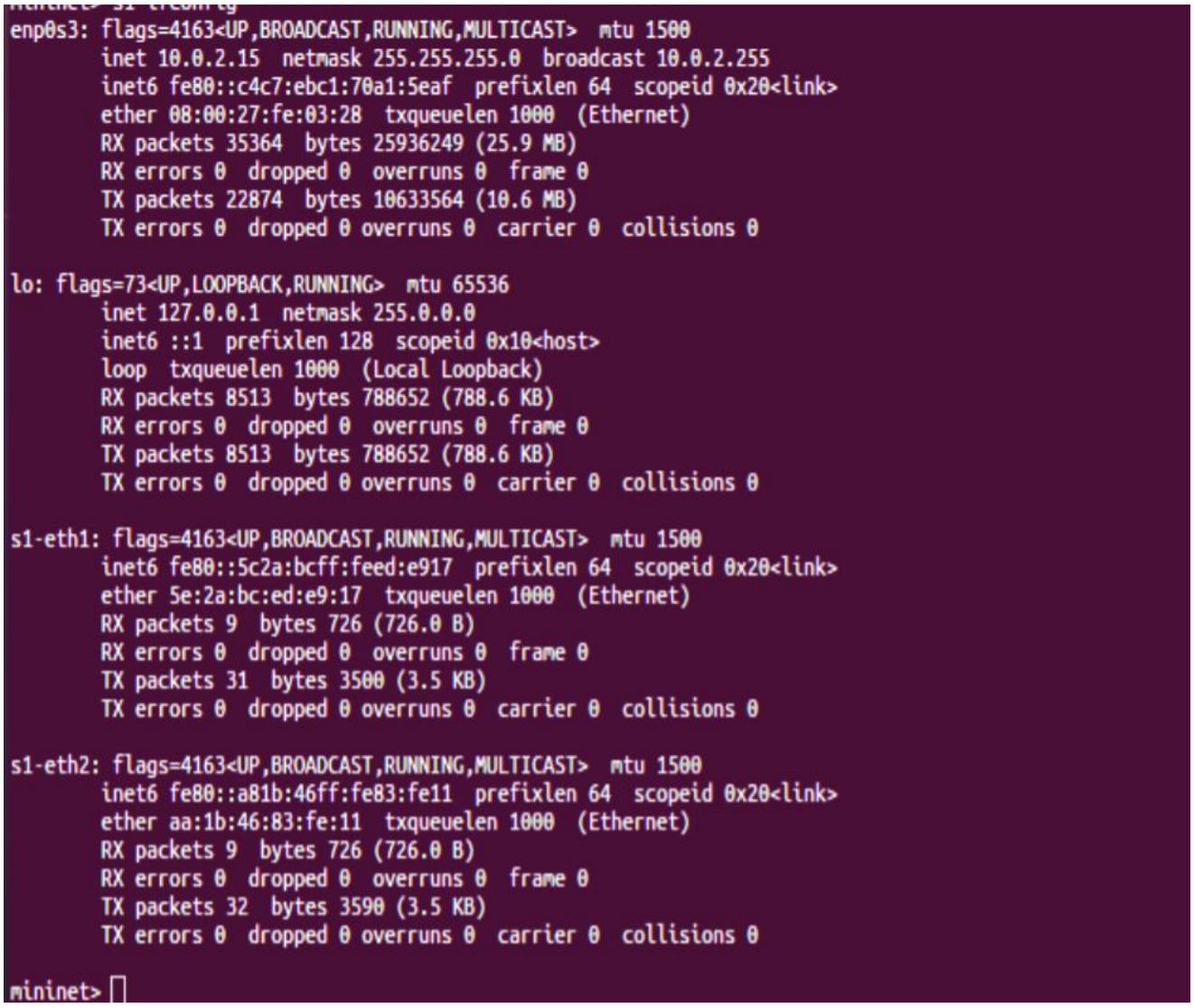
a. Print the MAC address of host h1. Print the MAC addresses of switch s1. Explain the different interfaces that s1 has.

On running command sudo mn in mininet two hosts (h1, h2) and a switch (s1) are created

MAC of h1 is 6a:5e:13:aa:86:b6 as shown in the below figure



MAC of s1 is 08:00:27:fe:03:28 as shown in the below figure



The different interfaces in the switch correspond to connection between h1 and switch, and the connection between h2 and switch. H1-s1 -> is s1-eth1 interface H2-s1 -> is s1-eth2 interface

b. Ping h1 from h2 and view the ARP entries stored at hosts h1 and h2

```
mininet> h1 ping -c 10 h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=0.531 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.087 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.072 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.091 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.102 ms
64 bytes from 10.0.0.2: icmp_seq=6 ttl=64 time=0.088 ms
64 bytes from 10.0.0.2: icmp_seq=7 ttl=64 time=0.087 ms
64 bytes from 10.0.0.2: icmp_seq=8 ttl=64 time=0.087 ms
64 bytes from 10.0.0.2: icmp_seq=9 ttl=64 time=0.086 ms
64 bytes from 10.0.0.2: icmp_seq=10 ttl=64 time=0.088 ms

--- 10.0.0.2 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9201ms
rtt min/avg/max/mdev = 0.072/0.131/0.531/0.133 ms
mininet>
```

c)Measuring TCP throughput from h1 to h2 usinng iperf

```
mininet> iperf h1 h2
*** Iperf: testing TCP bandwidth between h1 and h2
*** Results: ['11.6 Gbits/sec', '11.6 Gbits/sec']
mininet>
```