Lab Week1 (05-12-2023)

Objective: To understand basic network commands and to test the speed of the network

General Instructions:

- Students are expected to work Ubuntu OS based systems.
- If any command is not installed on your system, do install using **sudo apt-get install <relevant command_name>** on the Terminal
- To see more details about any command, type **man <command_name>** on the Terminal.
- Running **<command_name> -h** on your Terminal will display the help menu of that command.

Network Commands:

Run the following commands on your Terminal window.

1. **ping**

   The syntax of ping command is

   ping [...] destination

   where [...] is the set of options and destination is the domain name.
   destination could be IP address or URL of a website.

   Short for **Packet InterNet Groper,** the ping command is used to test the ability of your computer to reach a specified destination computer. The ping command is usually used as a simple way to verify that a computer can communicate over the network with another computer. The ping utility is commonly used to check for network errors, and works by sending **ICMP ECHO_REQUEST** to network hosts.

```
sivakumar@sivakumar:~$ ping gitam.edu
PING gitam.edu (172.21.255.12) 56(84) bytes of data.
64 bytes from hydadc1.gitam.edu (172.21.255.12): icmp_seq=1 ttl=126 time=2.07 ms
64 bytes from hydadc1.gitam.edu (172.21.255.12): icmp_seq=2 ttl=126 time=2.33 ms
64 bytes from hydadc1.gitam.edu (172.21.255.12): icmp_seq=3 ttl=126 time=3.16 ms
64 bytes from hydadc1.gitam.edu (172.21.255.12): icmp_seq=4 ttl=126 time=2.49 ms
^C
--- gitam.edu ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3004ms
rtt min/avg/max/mdev = 2.074/2.511/3.155/0.399 ms
```

   Subtasks:

   a) Ping two different machines, one within India and the other one outside India, and For Example: gitam.edu and cmu.edu
   b) Does ping makes any difference between www.gitam.edu and gitam.edu
   c) ping your nearby local machine by specifying IP address

2. **ifconfig**

   The syntax of ping command is

   ifconfig [options]

It is used to configure the kernel-resident networ interfaces. It is used at boot time to set up interfaces as necessary. After that, it is usually only needed when debugging or when system tuning is needed.

If no arguments are given, **ifconfig** displays the status of the currently active interfaces. If a single **interface** argument is given, it displays the status of the given interface only; if a single **-a** argument is given, it displays the status of all interfaces, even those that are down. Otherwise, it configures an interface.

Note: The below is tested on my laptop connected using college WIFI. Therefore, the output will be different as per the type of the interface that your system is connected with.

```
sivakumar@sivakumar:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.25.172.25  netmask 255.255.240.0  broadcast 172.25.175.255
        inet6 fe80::215:5dff:febb:5fb4  prefixlen 64  scopeid 0x20<link>
        ether 00:15:5d:bb:5f:b4  txqueuelen 1000  (Ethernet)
        RX packets 515  bytes 68863 (68.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 220  bytes 25616 (25.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

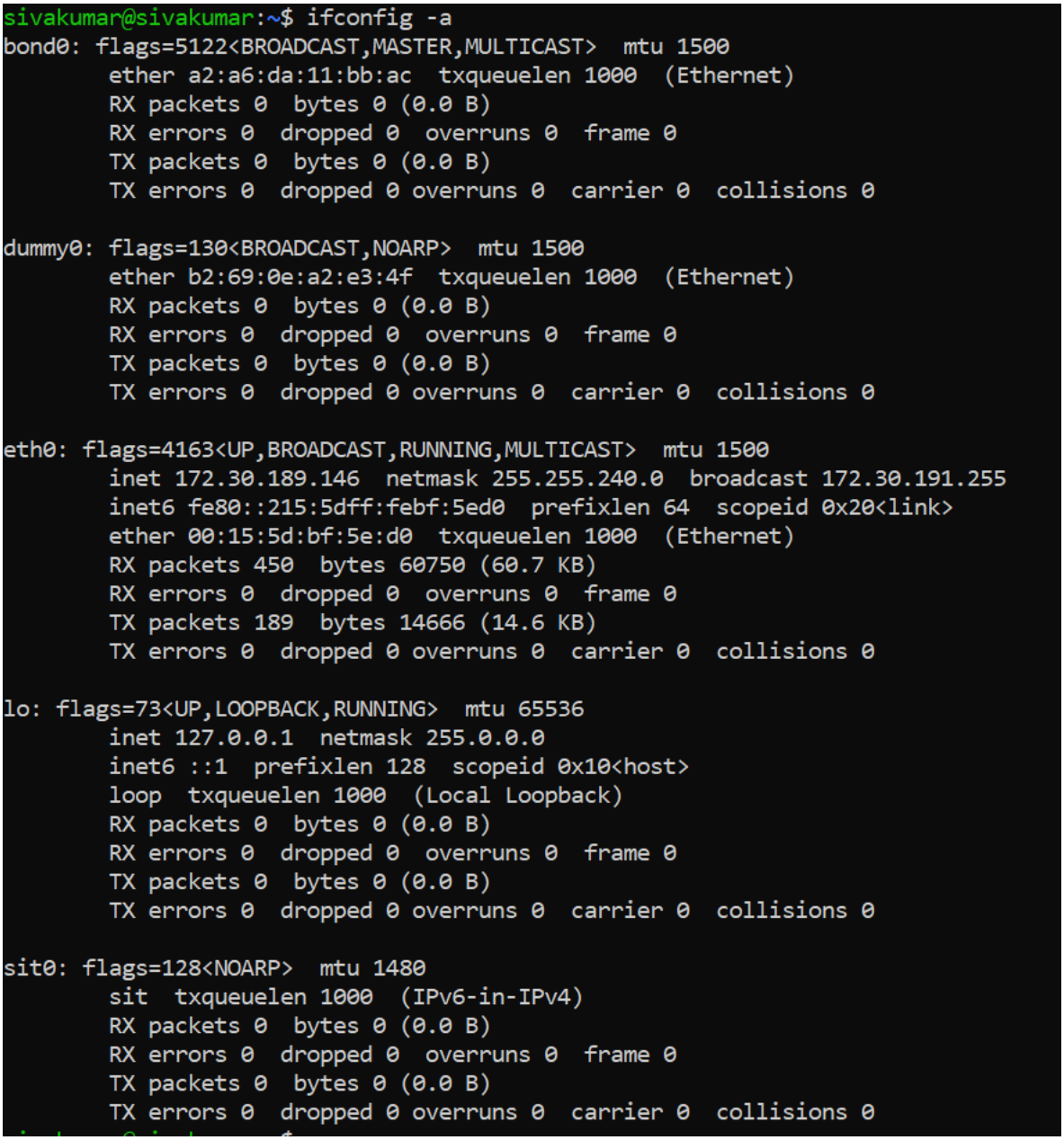
Subtaks:

a) What is the IPv4 address for your system?.
b) What is the MAC address/HW address of your NIC (Network Interface card)?.
c) What is the MAC address/HW address of your NIC card?
d) What is the subnet mask of your computer?.

If a single interface argument is given, it displays the status of the given interface only.

```
sivakumar@sivakumar:~$ ifconfig eth0
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.25.172.25  netmask 255.255.240.0  broadcast 172.25.175.255
        inet6 fe80::215:5dff:febb:5fb4  prefixlen 64  scopeid 0x20<link>
        ether 00:15:5d:bb:5f:b4  txqueuelen 1000  (Ethernet)
        RX packets 599  bytes 86599 (86.5 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 221  bytes 25686 (25.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

If a single **-a** argument is given, it displays the status of all interfaces (on my system), even those that are down.



Important Note:

sudo ifconfig eth0 down

The above command will bring the ethernet interface down, meaning, the system would be disconnected from the network.

sudo ifconfig eth0 up

This command will call DHCP service which is involved in obtaining an IP address. After this, your system will be connected to the network.

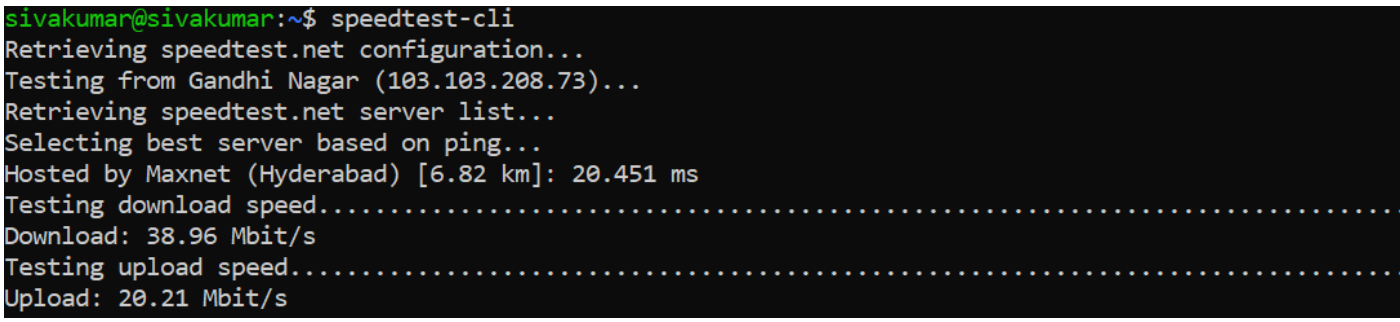
ifplugstatus

The above command will tell us whether a cable is plugged into a network interface or not. It isn't installed by default on Ubuntu, then you have to install it using **sudo**.

3. To test the speed of internet connection.
   Run the following commands on terminal for installing **speedtest-cli** package.
   sudo apt-get install python-pip
   sudo pip install speedtest-cli

   or
   sudo apt install speedtest-cli

After installation, type “speedtest-cli” in the Terminal and press enter. The output should be similar to the figure below.



4. **nslookup**
   The syntax for nslookup command is
   nslookup [...] [server]
   where [...] is the set of options that must be preceded with **– (hyphen to be used non-interactive mode)** and [server] is the **domain name**.

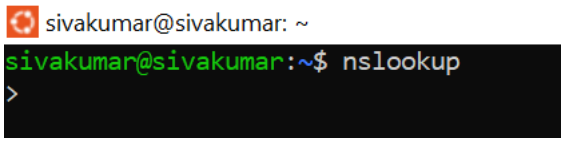
It is network administration command-line tool and it can be used to query Internet domain name servers (DNS) and for troubleshooting DNS related problems. DNS is a database which stores URL and its corresponding IPv4 addresses. The database also stores several other information.

Usecases of nsplookup:

- To find out the IP address of a host
- To find out the domain name of an IP address
- To find mail servers for a domain.
- To find name servers for a host.

Nslookup has two modes: interactive and non-interactive. Interactive mode allows the user to query name servers for information about various hosts and domains or to print a list of hosts in a domain. Non-interactive mode is used to print just the name and requested information for a host or domain.

a) To use interactive mode, type **nslookup** on terminal and press enter, then you will get nslookup command prompt



The above is nslookup command prompt. You can then get any information from DNSs related to any host.
For example: To get IP address of domain google.com

```
> google.co.in
Server:         172.30.176.1
Address:        172.30.176.1#53

Non-authoritative answer:
Name:   google.co.in
Address: 142.250.193.99
Name:   google.co.in
Address: 2404:6800:4007:81f::2003
```

In interactive mode, specify an option in a separate line before the query. Precede the option with **`set`**:

`set [option]`

```
> set type=ns
> google.co.in
Server:         172.30.176.1
Address:        172.30.176.1#53

Non-authoritative answer:
google.co.in    nameserver = ns1.google.com.
google.co.in    nameserver = ns2.google.com.
google.co.in    nameserver = ns3.google.com.
google.co.in    nameserver = ns4.google.com.

Authoritative answers can be found from:
```

To get the name servers of domain **gitam.edu**

```
> gitam.edu
Server:         172.30.176.1
Address:        172.30.176.1#53

Non-authoritative answer:
gitam.edu       nameserver = gurootadc.gitam.edu.
gitam.edu       nameserver = hydadc1.gitam.edu.
gitam.edu       nameserver = gudc.gitam.edu.
gitam.edu       nameserver = gurootdc.gitam.edu.
Name:   gurootadc.gitam.edu
Address: 192.168.23.11
Name:   hydadc1.gitam.edu
Address: 172.21.255.12
Name:   gudc.gitam.edu
Address: 192.168.23.12
Name:   gurootdc.gitam.edu
Address: 192.168.23.10
```

To exit interactive mode, type:

```
exit
```

b) Non-interactive mode

To get the IP address of **gitam.edu**

```
sivakumar@sivakumar:~$ nslookup gitam.edu
Server:         172.30.176.1
Address:        172.30.176.1#53

Non-authoritative answer:
Name:   gitam.edu
Address: 172.21.255.12
Name:   gitam.edu
Address: 192.168.23.10
Name:   gitam.edu
Address: 192.168.23.11
Name:   gitam.edu
Address: 192.168.23.12
```

To get the name servers of gitam.edu

```
sivakumar@sivakumar:~$ nslookup -type=ns gitam.edu
Server:         172.30.176.1
Address:        172.30.176.1#53

Non-authoritative answer:
gitam.edu       nameserver = gurootadc.gitam.edu.
gitam.edu       nameserver = hydadc1.gitam.edu.
gitam.edu       nameserver = gudc.gitam.edu.
gitam.edu       nameserver = gurootdc.gitam.edu.
Name:   gurootadc.gitam.edu
Address: 192.168.23.11
Name:   hydadc1.gitam.edu
Address: 172.21.255.12
Name:   gudc.gitam.edu
Address: 192.168.23.12
Name:   gurootdc.gitam.edu
Address: 192.168.23.10

Authoritative answers can be found from:
```

Reverse lookup example:

```
sivakumar@sivakumar:~$ nslookup gitam.edu
Server:         172.30.176.1
Address:        172.30.176.1#53

Non-authoritative answer:
Name:   gitam.edu
Address: 172.21.255.12
Name:   gitam.edu
Address: 192.168.23.11
Name:   gitam.edu
Address: 192.168.23.12
Name:   gitam.edu
Address: 192.168.23.10
```

```
sivakumar@sivakumar:~$ nslookup 172.21.255.12
12.255.21.172.in-addr.arpa      name = hydadc1.gitam.edu.

Authoritative answers can be found from:
```

Subtasks:

i) Find the IP addresses of the following:
   a) www.gitam.edu
   b) http://gevents.gitam.edu
   c) https://glearn.gitam.edu
   d) Can a website have more than one IP addresses?. Justify your answer.

Note: Submit solutions to the questions (subtasks) in a pdf file on moodle within the given deadline, i.e., 09-12-2023 11.59 PM .