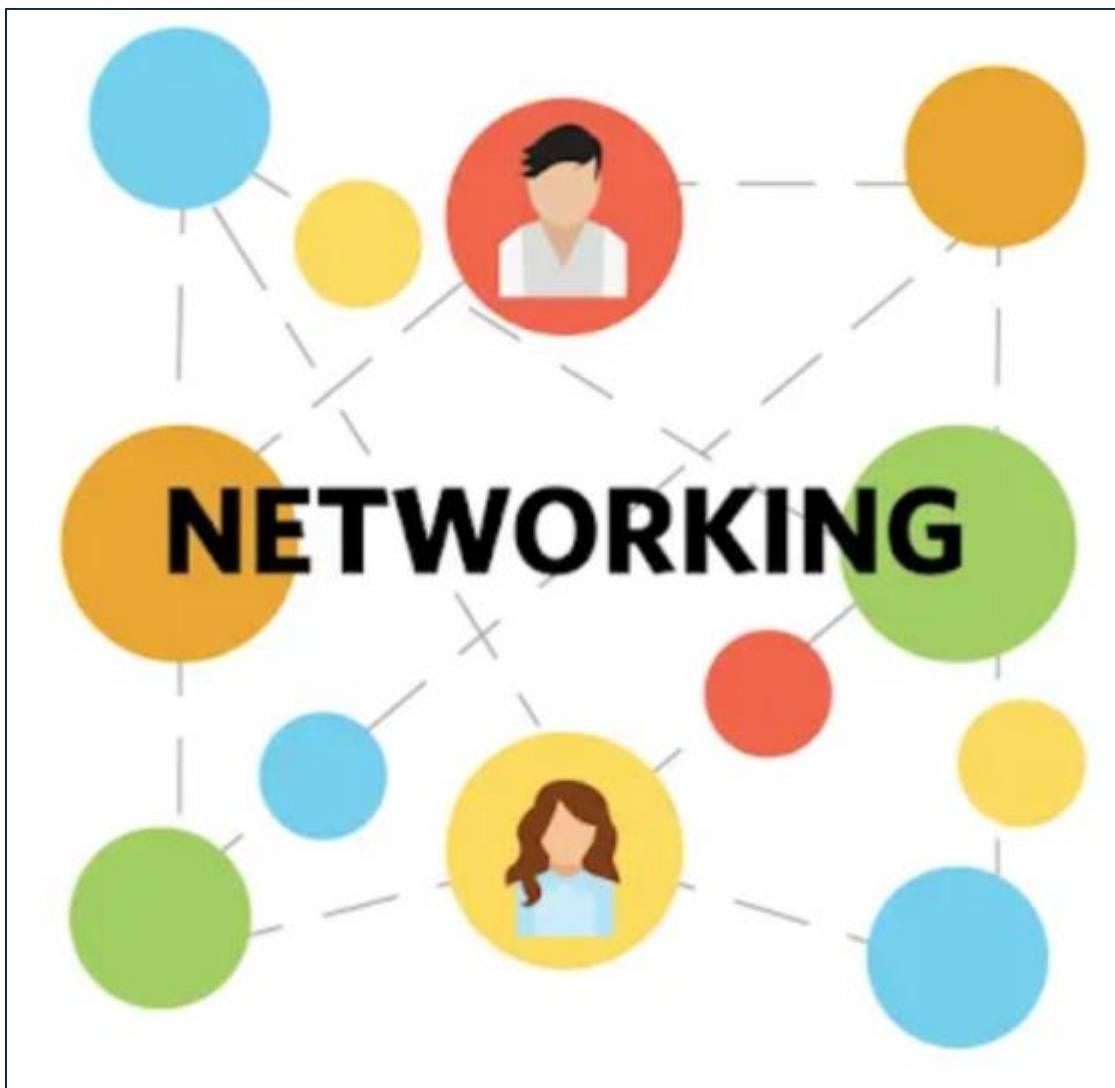


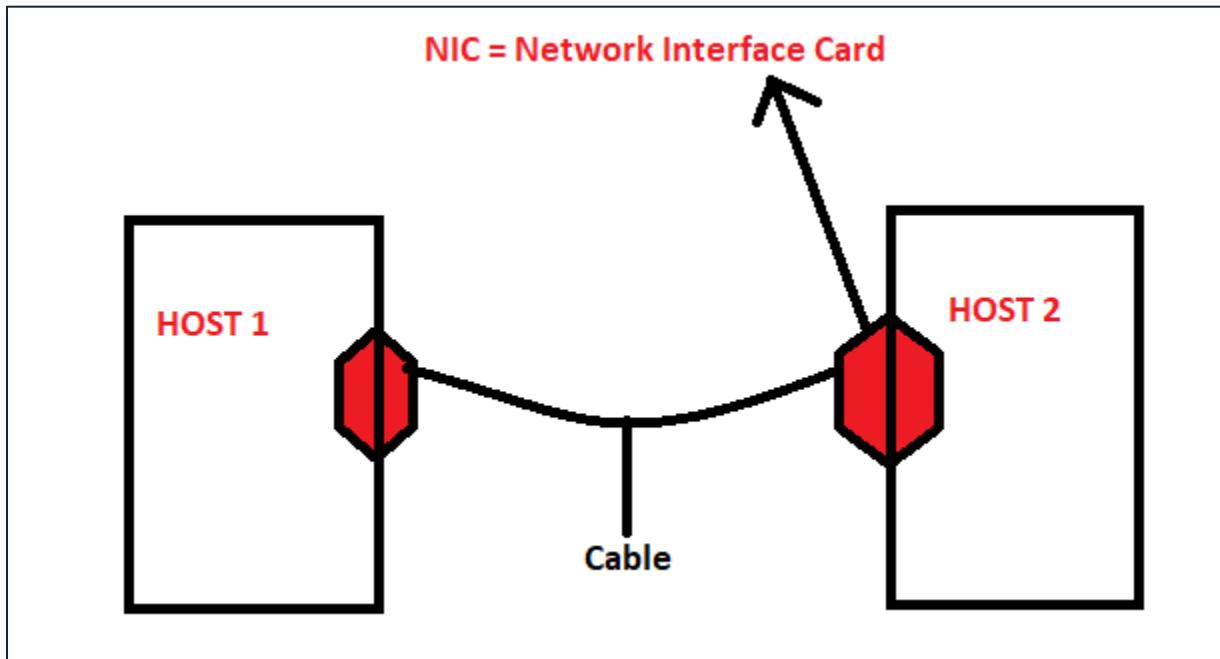
LINUX



- Computer Networking refers to interconnected computing devices that can exchange date and share resource with each other.

Hardware Requirements

- Etherent Card, NIC, Interface, Lan Card
- Cables (wireless/wired)
- Networking Devices (HUB/Switch/Router)



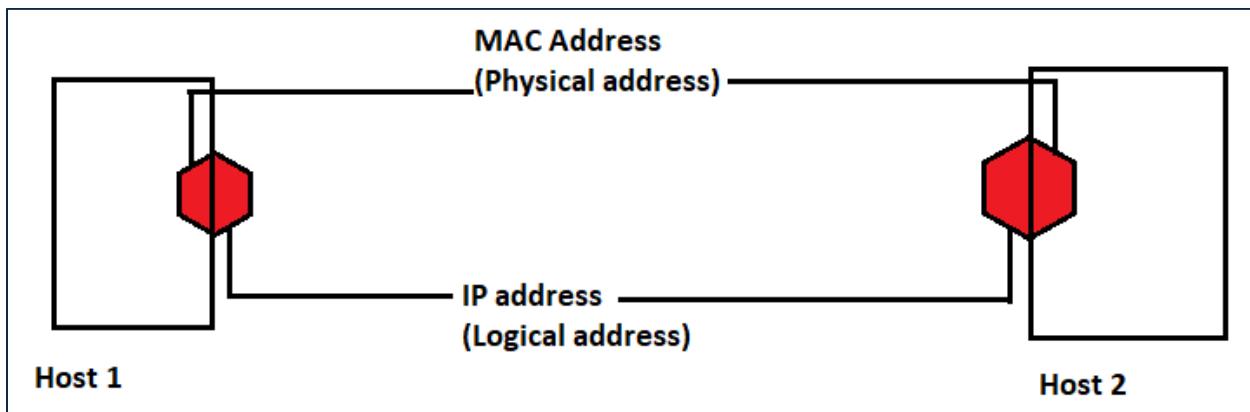
Logical Terms

- IP Address (Public,Private,static,Dynamic,Virtual)
- Mac Address
- Source & Destination Address

- Ports, Sockets
- Network Address, Broadcast Address

Mac address:- Mac address is the physical address , which uniquely identifies each devices on a given network. It's persistent.

IP address:- IP address stand for “Internet Protocol Address”. The internet protocol is a set of rule for communication over the internet.



- **Type of IP address**
 1. IPv4 (Internet Protocol Version 4)
 2. IPv6 (Internet Protocol Version 6)

IPv4 = 32 bit

IPv6 = 128 bit

Bit = 0,1

***IPv4 = 32 bit**

4 octets = 8.8.8.8

00000000.00000000.00000000.0000000 = 0.0.0.0 (all bit off)

11111111.11111111.11111111.1111111 = 255.255.255.255(all bit on)

IP Address Classes

CLASS	IP ADDRESS	NETWORK/HOST BIT
A	0-126	N.H.H.H
B	128-191	N.N.H.H
C	192-224	N.N.H.H
D	225-239	
E	240-255	

- Class D and E are reserved for research and multicasting.**

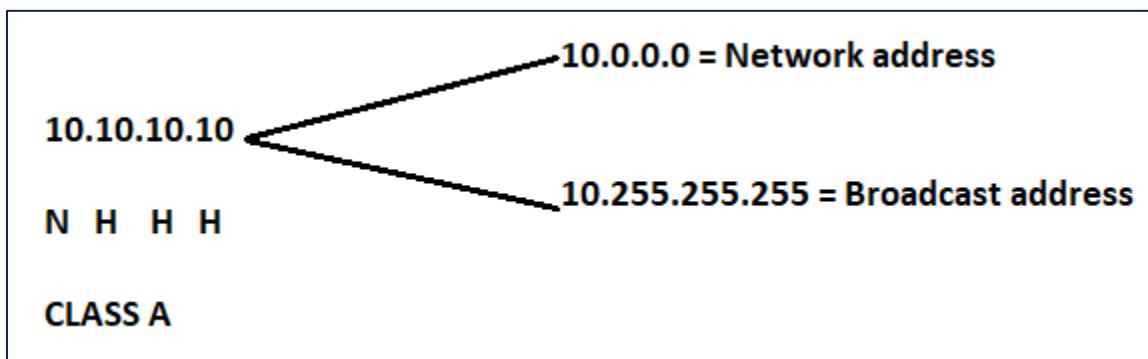
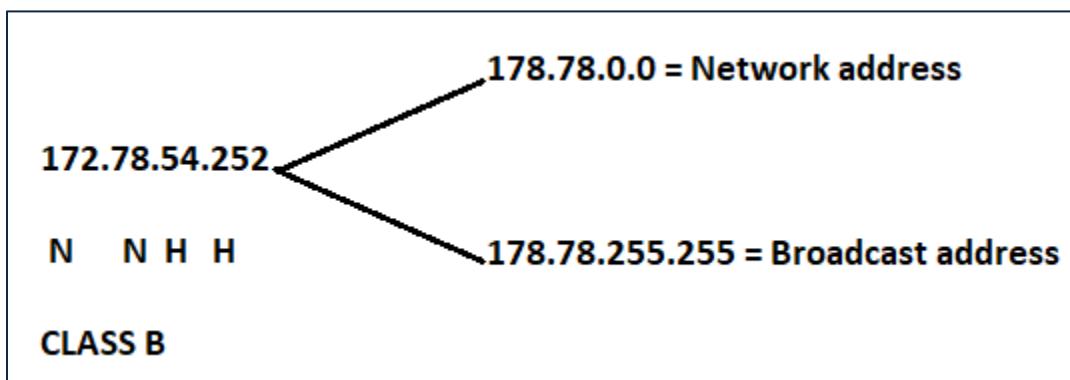
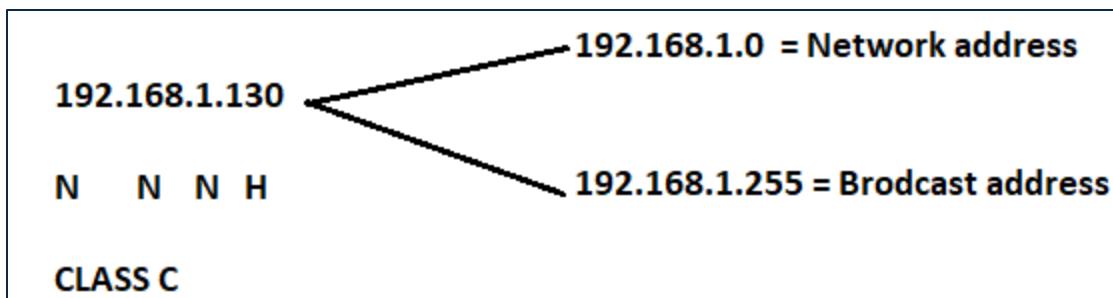
IP range of 127 is known as a Loopback address

Loopback address:- the local host address of the machine. The loopback address of every machine is the same.

Network bit:- to identify the network

Host bit:- to identify the device on the network

Network address & Broadcast address



Subnetting

- Subnetting is a process where we can divide our network into small pieces.
- Logical distribution of the network in various logical parts are known as a subnetting.

255.0.0.0 --> A class

255.255.0.0 --> B class

255.255.255.0 --> C class

Subent value

192.168.10.15/255.0.0.0 --> A class

172.168.10.15/255.255.255 --> C class

CIDR = Classless Inetr Domain Rounting

/8

/16

/24

192.168.1.1/8 --> class A

192.168.10.5/16 --> class B

192.176.1.1/24 --> class C

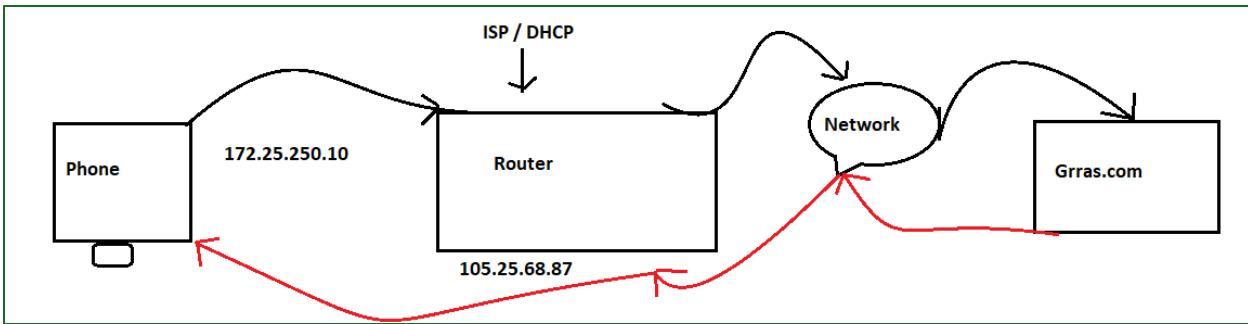
CIDR value	IP range
-------------------	-----------------

/16	65536
------------	--------------

/17	32768
------------	--------------

/18	16384
/19	8192
/20	4096
/21	2048
/22	1024
/23	512
/24	256
/25	128
/26	64
/27	32
/28	16
/29	8
/30	4
/31	2
/32	1

Public IP



ISP --> Internet Service Provider

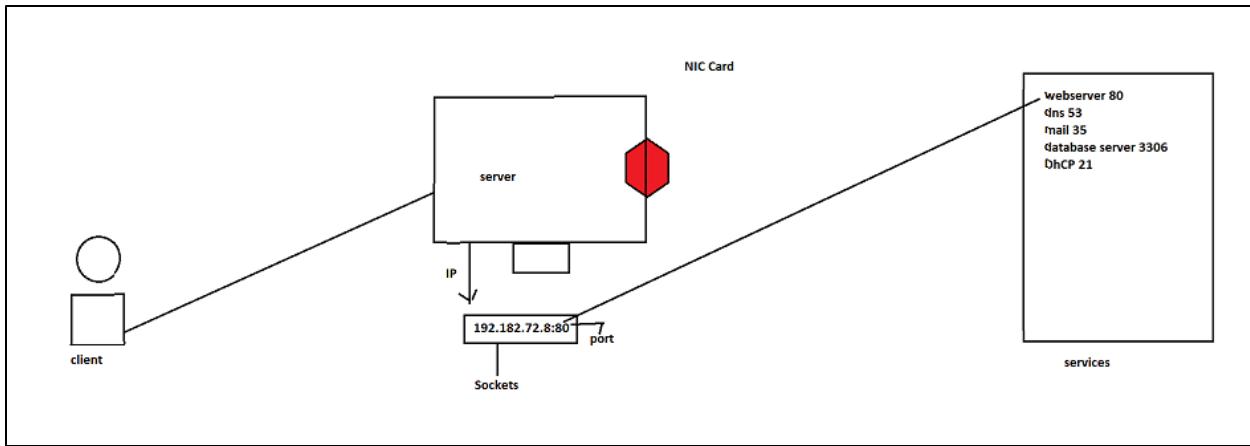
DHCP --> Dynamic Host Control Protocol

Router

- **Communication between different network.**
- **It provide best routes to our packet.**

Server-Client Model

- **Server serves services to client.**
- **Clients are the hosts are using services provided by the server.**
- **Request sent by client to any server are in the form of socket.**
- **Sockets are the combination of IP address and ports.**
- **Socket = IP address:ports**



Ports

- Ports can be understandable as the address of services running over the server.
- Requests sent by clients over the server where multiple services are served can be identified by the ports they are listening on.
- Total number of ports we are having is 65535.
- Out of the above ports few ports are reserved for specific services.

Naming of Ethernet card

Prefix	Meaning	Example
enthN	Ethernet interface traditional naming	eth0, eth1, eth2
enoN	Onboard ethernet interface	eno0, eno1, eno2
ensN	Solt based ethernet interface	ens100, ens223
wlanN	Wireless lan interface	wlan0, wlan1, wlan2

Commnads

ping --> to check any host health

Ip a/ifconfig/ip addr ---> to check server IP

nslookup --> to check domain IP

netstat --> to check open ports

nmcli device status --> Shows the current status of all network devices

nmcli connection show --> Lists all saved network connection profiles on the system

**nmcli con add con-name manish type etherent ifname ens224
ipv4.method auto --> to connected ethernet card for CLI Method**

nmcli connection down manish --> Disconnects the specified network connection.

nmcli connection up manish --> Connects (activates) the specified network profile.

nmcli connection delete manish --> Deletes (forgets) the specified saved network connection.

Ping Command

```
[root@manish ~]# ping google.com
PING google.com (127.0.0.1) 56(84) bytes of data.
64 bytes from localhost.localhost (127.0.0.1): icmp_seq=1 ttl=64 time=0.232 ms
64 bytes from localhost.localhost (127.0.0.1): icmp_seq=2 ttl=64 time=0.124 ms
64 bytes from localhost.localhost (127.0.0.1): icmp_seq=3 ttl=64 time=0.631 ms
64 bytes from localhost.localhost (127.0.0.1): icmp_seq=4 ttl=64 time=0.110 ms
64 bytes from localhost.localhost (127.0.0.1): icmp_seq=5 ttl=64 time=0.363 ms
64 bytes from localhost.localhost (127.0.0.1): icmp_seq=6 ttl=64 time=0.106 ms
```

Ip a Command

```
[root@manish ~]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:0c:29:74:a5:c6 brd ff:ff:ff:ff:ff:ff
    altname enp3s0
    inet 192.168.102.128/24 brd 192.168.102.255 scope global dynamic noprefixroute ens160
        valid_lft 1130sec preferred_lft 1130sec
    inet6 fe80::20c:29ff:fe74:a5c6/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
[root@manish ~]#
```

nslookup Command

```
[root@manish ~]# nslookup google.com
Server:      192.168.102.2
Address:     192.168.102.2#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.193.110
Name:   google.com
Address: 2404:6800:4002:803::200e

[root@manish ~]# nslookup instagram.com
Server:      192.168.102.2
Address:     192.168.102.2#53

Non-authoritative answer:
Name:   instagram.com
Address: 57.144.146.34
Name:   instagram.com
Address: 2a03:2880:f28a:e0:face:b00c:0:4420

[root@manish ~]#
```

Netstat Command

```
[root@manish ~]# netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
udp      0      0 manish:bootpc          192.168.102.254:bootps ESTABLISHED

Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type      State         I-Node  Path
unix    2      [ ]        DGRAM           30908   /run/user/1000/systemd/notify
unix    4      [ ]        DGRAM           14698   /run/systemd/notify
unix   21      [ ]        DGRAM           14711   /run/systemd/journal/dev-log
unix    9      [ ]        DGRAM           14713   /run/systemd/journal/socket
unix    2      [ ]        DGRAM           25674   /run/chrony/chronyd.sock
unix    2      [ ]        DGRAM           33119
unix    3      [ ]        STREAM           30780
unix    3      [ ]        STREAM           33890
unix    3      [ ]        STREAM           23514
unix    3      [ ]        STREAM           34108
unix    2      [ ]        DGRAM           30886
unix    3      [ ]        STREAM           35044
unix    3      [ ]        STREAM           33826
unix    3      [ ]        STREAM           31697   /run/systemd/journal/stdout
unix    2      [ ]        DGRAM           28133
```

Netstat -tulpn Command

```
[root@manish ~]# netstat -tulpn
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State      PID/Program name
tcp     0      0 127.0.0.1:631            0.0.0.0:*           LISTEN    1034/cupsd
tcp     0      0 0.0.0.0:22              0.0.0.0:*           LISTEN    1037/sshd: /usr/sbi
tcp6    0      0 ::1:631                ::*:*                LISTEN    1034/cupsd
tcp6    0      0 ::::22                 ::*:*                LISTEN    1037/sshd: /usr/sbi
udp     0      0 0.0.0.0:5353            0.0.0.0:*           LISTEN    832/avahi-daemon: r
udp     0      0 127.0.0.1:323            0.0.0.0:*           LISTEN    879/chrony
udp     0      0 0.0.0.0:51652           0.0.0.0:*           LISTEN    832/avahi-daemon: r
udp6    0      0 ::::58927              ::*:*                LISTEN    832/avahi-daemon: r
udp6    0      0 ::::5353               ::*:*                LISTEN    832/avahi-daemon: r
udp6    0      0 ::1:323                ::*:*                LISTEN    879/chrony
[root@manish ~]#
```

Nmcli device status

```
[root@manish ~]# nmcli device status
DEVICE  TYPE      STATE                CONNECTION
ens160  ethernet  connected           ens160
lo      loopback  connected (externally) lo
[root@manish ~]#
```

Nmcli connection show Command

```
[root@manish ~]# nmcli connection show
NAME           UUID                                  TYPE      DEVICE
ens160         a80964ed-2964-379e-aafa-fced273023aa  ethernet  ens160
lo             c88f5867-f84d-49cd-a51d-185cfa6e47e8  loopback  lo
Wired connection 1  72773035-2738-4d31-a8f3-b53525cb2469  ethernet  --
[root@manish ~]#
```

**nmcli con add con-name manish type etherent ifname ens160
ipv4.method auto**

```
[root@manish ~]# nmcli connection add con-name manish type ethernet ifname ens160 ipv4.method auto
Connection 'manish' (0606c8e7-d2be-4410-b961-656776eb4e26) successfully added.
[root@manish ~]#
```

```
[root@manish ~]# nmcli connection show
NAME           UUID                                  TYPE      DEVICE
ens160         a80964ed-2964-379e-aafa-fced273023aa  ethernet  ens160
lo             c88f5867-f84d-49cd-a51d-185cfa6e47e8  loopback  lo
manish         0606c8e7-d2be-4410-b961-656776eb4e26  ethernet  --
Wired connection 1  72773035-2738-4d31-a8f3-b53525cb2469  ethernet  --
[root@manish ~]#
```

nmcli connection up Command

```
[root@manish ~]# nmcli connection up manish
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/3)
[root@manish ~]# nmcli connection show
NAME           UUID                                  TYPE      DEVICE
manish         0606c8e7-d2be-4410-b961-656776eb4e26  ethernet  ens160
lo             c88f5867-f84d-49cd-a51d-185cfa6e47e8  loopback  lo
ens160         a80964ed-2964-379e-aafa-fced273023aa  ethernet  --
Wired connection 1 72773035-2738-4d31-a8f3-b53525cb2469  ethernet  --
[root@manish ~]#
```

Nmcli connection down Command

```
[root@manish ~]# nmcli connection down manish
Connection 'manish' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/3)
[root@manish ~]# nmcli connection show
NAME           UUID                                  TYPE      DEVICE
ens160         a80964ed-2964-379e-aafa-fced273023aa  ethernet  ens160
lo             c88f5867-f84d-49cd-a51d-185cfa6e47e8  loopback  lo
manish         0606c8e7-d2be-4410-b961-656776eb4e26  ethernet  --
Wired connection 1 72773035-2738-4d31-a8f3-b53525cb2469  ethernet  --
[root@manish ~]#
```

Nmcli connection delete Command

```
[root@manish ~]# nmcli connection delete manish
Connection 'manish' (0606c8e7-d2be-4410-b961-656776eb4e26) successfully deleted.
[root@manish ~]# nmcli connection show
NAME           UUID                                  TYPE      DEVICE
ens160         a80964ed-2964-379e-aafa-fced273023aa  ethernet  ens160
lo             c88f5867-f84d-49cd-a51d-185cfa6e47e8  loopback  lo
Wired connection 1 72773035-2738-4d31-a8f3-b53525cb2469  ethernet  --
[root@manish ~]#
```

Note :-

2 network files

1. /etc/hosts

2. /etc/resolv.conf

/etc/hosts --> Ping command find such names in hosts file of your system.

/etc/resolv.conf --> If no entry is found in /etc/hosts then this search transferred to “/etc/resolv.conf” file which is having entry of the name server.

```
[root@manish ~]# cat /etc/hosts
127.0.0.1    localhost.localhost localhost.localdomain localhost.localdomain4 localhost.localdomain4.localdomain4
::1          localhost.localhost localhost.localdomain localhost.localdomain6 localhost.localdomain6.localdomain6
127.0.0.1    google.com
[root@manish ~]#
```

```
[root@manish ~]# cat /etc/resolv.conf
# Generated by NetworkManager
search localdomain
nameserver 192.168.102.2
[root@manish ~]#
```

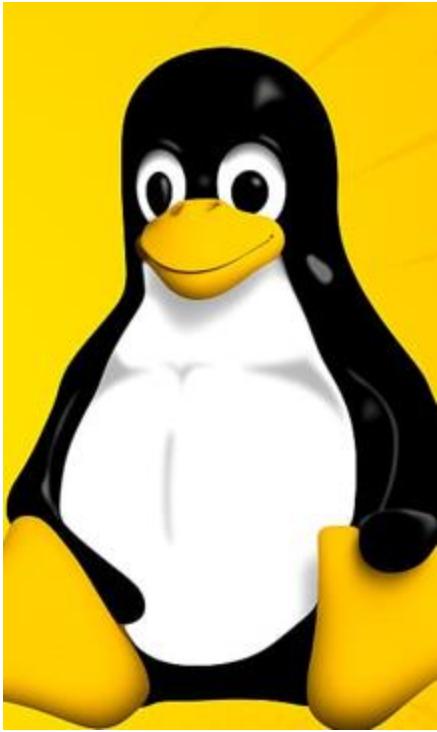
I have a question for all of you:-

On which protocol does the ping command work?

Give the answer in the comment box.

COMPLETE NETWORKING

LINUX



THANK YOU 😊

Perpared by : MANISH SAINI 😎

