

VM Assignment (12 Dec 2025)

Q1 - Create 2 VMs (NAT + Host-Only) & Test Connectivity

1. IP address of VM-1 (NAT): 10.0.2.15
2. IP address of VM-2 (Host-Only): 192.168.56.101
- 3a.

```
kaushal@kaushal-VirtualBox: ~/Desktop/Sunbeam/IIT-08-A-CySecurity/Day03
kaushal@kaushal-VirtualBox:~/Desktop/Sunbeam/IIT-08-A-CySecurity/Day03$ ping 192.168.56.101
PING 192.168.56.101 (192.168.56.101) 56(84) bytes of data:
64 bytes from 192.168.56.101: icmp_seq=1 ttl=255 time=1.23 ms
64 bytes from 192.168.56.101: icmp_seq=2 ttl=255 time=1.56 ms
64 bytes from 192.168.56.101: icmp_seq=3 ttl=255 time=5.78 ms
64 bytes from 192.168.56.101: icmp_seq=4 ttl=255 time=1.24 ms
64 bytes from 192.168.56.101: icmp_seq=5 ttl=255 time=1.15 ms
64 bytes from 192.168.56.101: icmp_seq=6 ttl=255 time=1.86 ms
^C
--- 192.168.56.101 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 11452ms
rtt min/avg/max/mdev = 1.152/2.135/5.784/1.649 ms
kaushal@kaushal-VirtualBox:~/Desktop/Sunbeam/IIT-08-A-CySecurity/Day03$
```

3b.

```
kaushal@kaushal-VirtualBox: ~
kaushal@kaushal-VirtualBox:~$ ping 10.0.2.15
ping: connect: Network is unreachable
kaushal@kaushal-VirtualBox:~$
```

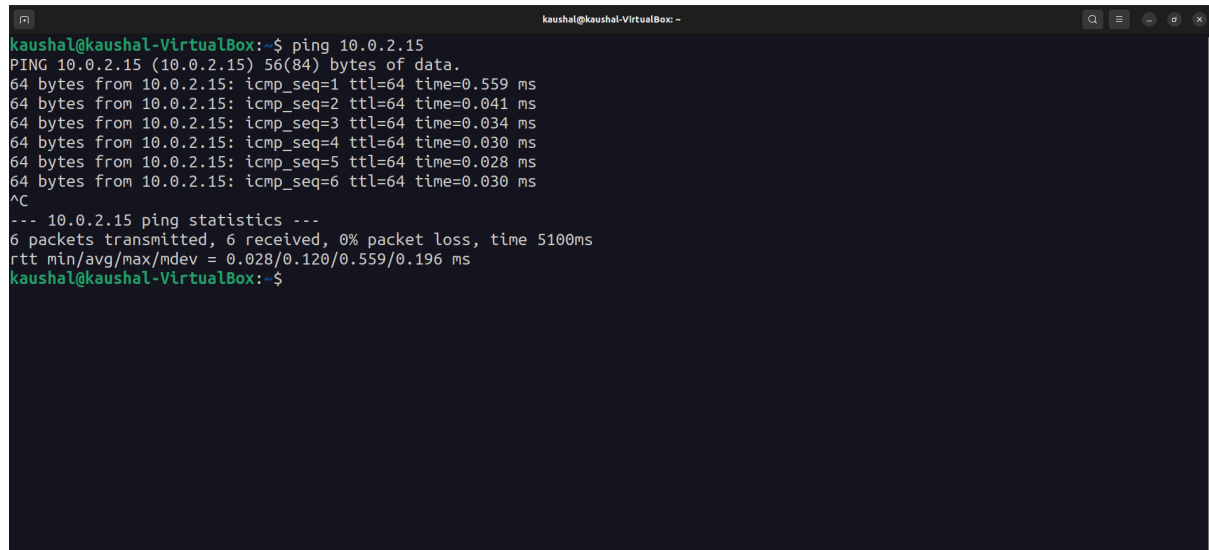
4. NAT and Host-only do not communicate with each other, because both have their different purpose and both are isolated, NAT (Network Address Transmission) uses private ip address to access the internet via host ip address and host-only creates an isolated network where only the host and VM can communicate.

Q2 - Create 2 VMs in NAT Mode & Test Connectivity

1a. IP address of VM-1 (NAT): 10.0.2.15

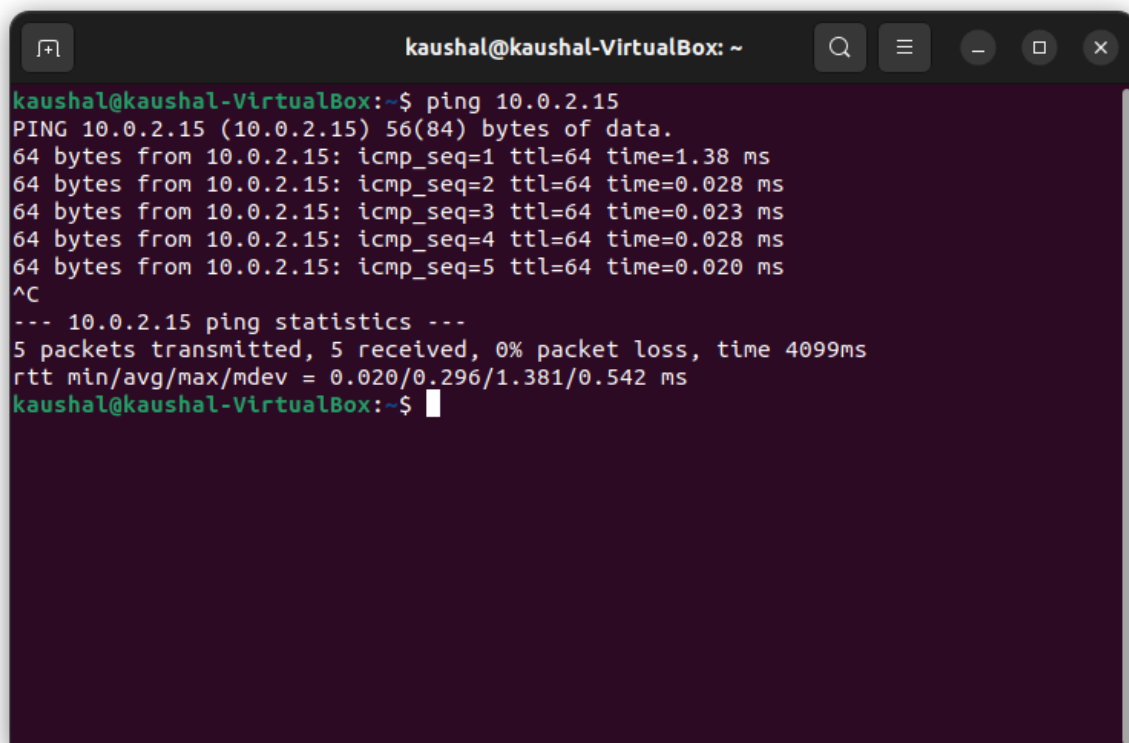
1b. IP address of VM-2 (NAT): 10.0.2.15

2a.



```
kaushal@kaushal-VirtualBox: ~  
$ ping 10.0.2.15  
PING 10.0.2.15 (10.0.2.15) 56(84) bytes of data:  
64 bytes from 10.0.2.15: icmp_seq=1 ttl=64 time=0.559 ms  
64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.041 ms  
64 bytes from 10.0.2.15: icmp_seq=3 ttl=64 time=0.034 ms  
64 bytes from 10.0.2.15: icmp_seq=4 ttl=64 time=0.030 ms  
64 bytes from 10.0.2.15: icmp_seq=5 ttl=64 time=0.028 ms  
64 bytes from 10.0.2.15: icmp_seq=6 ttl=64 time=0.030 ms  
^C  
--- 10.0.2.15 ping statistics ---  
6 packets transmitted, 6 received, 0% packet loss, time 5100ms  
rtt min/avg/max/mdev = 0.028/0.120/0.559/0.196 ms  
kaushal@kaushal-VirtualBox:~$
```

2b.



```
kaushal@kaushal-VirtualBox: ~  
$ ping 10.0.2.15  
PING 10.0.2.15 (10.0.2.15) 56(84) bytes of data:  
64 bytes from 10.0.2.15: icmp_seq=1 ttl=64 time=1.38 ms  
64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.028 ms  
64 bytes from 10.0.2.15: icmp_seq=3 ttl=64 time=0.023 ms  
64 bytes from 10.0.2.15: icmp_seq=4 ttl=64 time=0.028 ms  
64 bytes from 10.0.2.15: icmp_seq=5 ttl=64 time=0.020 ms  
^C  
--- 10.0.2.15 ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 4099ms  
rtt min/avg/max/mdev = 0.020/0.296/1.381/0.542 ms  
kaushal@kaushal-VirtualBox:~$
```

3. In NAT mode, VMs cannot communicate with each other by default within the virtual network

Q3 - Create 2 VMs in Host-Only Mode

1a. IP address of VM-1 (Host-only): 192.168.56.102

1b. IP address of VM-2 (Host-only): 192.168.56.101

1c. IP address of Host: 192.168.56.1

2a. Ping VM1 -> VM2

```
kaushal@kaushal-VirtualBox:~$ ping 192.168.56.101
PING 192.168.56.101 (192.168.56.101) 56(84) bytes of data:
64 bytes from 192.168.56.101: icmp_seq=1 ttl=64 time=4.28 ms
64 bytes from 192.168.56.101: icmp_seq=2 ttl=64 time=1.66 ms
64 bytes from 192.168.56.101: icmp_seq=3 ttl=64 time=0.735 ms
64 bytes from 192.168.56.101: icmp_seq=4 ttl=64 time=2.67 ms
64 bytes from 192.168.56.101: icmp_seq=5 ttl=64 time=0.825 ms
64 bytes from 192.168.56.101: icmp_seq=6 ttl=64 time=1.67 ms
^C
--- 192.168.56.101 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5061ms
rtt min/avg/max/mdev = 0.735/1.974/4.282/1.214 ms
kaushal@kaushal-VirtualBox:~$
```

2b. Ping VM1 -> Host

```
kaushal@kaushal-VirtualBox:~$ ping 192.168.56.1
PING 192.168.56.1 (192.168.56.1) 56(84) bytes of data:
From 192.168.56.102 icmp_seq=1 Destination Host Unreachable
From 192.168.56.102 icmp_seq=2 Destination Host Unreachable
From 192.168.56.102 icmp_seq=3 Destination Host Unreachable
From 192.168.56.102 icmp_seq=4 Destination Host Unreachable
From 192.168.56.102 icmp_seq=5 Destination Host Unreachable
From 192.168.56.102 icmp_seq=6 Destination Host Unreachable
^C
--- 192.168.56.1 ping statistics ---
9 packets transmitted, 0 received, +6 errors, 100% packet loss, time 8206ms
pipe 3
kaushal@kaushal-VirtualBox:~$
```

2c. Ping VM2 -> VM1

```
kaushal@kaushal-VirtualBox: ~  
kaushal@kaushal-VirtualBox:~$ ping 192.168.56.102  
PING 192.168.56.102 (192.168.56.102) 56(84) bytes of data.  
64 bytes from 192.168.56.102: icmp_seq=1 ttl=64 time=2.39 ms  
64 bytes from 192.168.56.102: icmp_seq=2 ttl=64 time=0.818 ms  
64 bytes from 192.168.56.102: icmp_seq=3 ttl=64 time=1.04 ms  
64 bytes from 192.168.56.102: icmp_seq=4 ttl=64 time=1.31 ms  
64 bytes from 192.168.56.102: icmp_seq=5 ttl=64 time=1.20 ms  
^C  
--- 192.168.56.102 ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 4009ms  
rtt min/avg/max/mdev = 0.818/1.352/2.392/0.545 ms  
kaushal@kaushal-VirtualBox:~$
```

2d. Ping VM2 -> Host

```
kaushal@kaushal-VirtualBox: ~  
kaushal@kaushal-VirtualBox:~$ ping 192.168.56.1  
PING 192.168.56.1 (192.168.56.1) 56(84) bytes of data.  
From 192.168.56.101 icmp_seq=1 Destination Host Unreachable  
From 192.168.56.101 icmp_seq=2 Destination Host Unreachable  
From 192.168.56.101 icmp_seq=3 Destination Host Unreachable  
From 192.168.56.101 icmp_seq=4 Destination Host Unreachable  
^C  
--- 192.168.56.1 ping statistics ---  
7 packets transmitted, 0 received, +4 errors, 100% packet loss, time 6162ms  
pipe 4  
kaushal@kaushal-VirtualBox:~$
```

Q4 - Internet Connectivity Test (Different Modes)

1a. IP address of VM-1 (NAT): 10.0.2.15

1b. IP address of VM-2 (Host-only): 192.168.56.101

2a. VM1

```
kaushal@kaushal-VirtualBox:~$ 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: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:f6:df:ed brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86400sec preferred_lft 86400sec
    inet6 fe80::8272:b6a7:7e48:f639/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
kaushal@kaushal-VirtualBox:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=255 time=11.4 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=255 time=6.23 ms
^C
--- 8.8.8.8 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1008ms
rtt min/avg/max/mdev = 6.232/8.792/11.352/2.560 ms
kaushal@kaushal-VirtualBox:~$ ping google.com
PING google.com (142.250.67.174) 56(84) bytes of data.
64 bytes from bom12s07-in-f14.1e100.net (142.250.67.174): icmp_seq=1 ttl=255 time=12.3 ms
64 bytes from bom12s07-in-f14.1e100.net (142.250.67.174): icmp_seq=2 ttl=255 time=7.17 ms
^C
--- google.com ping statistics ---
```

2b. VM2

```
kaushal@kaushal-VirtualBox:~$ 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: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:3a:75:90 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.101/24 brd 192.168.56.255 scope global dynamic noprefixroute enp0s3
        valid_lft 302sec preferred_lft 302sec
    inet6 fd00::9acc:246c:2b15:785e/64 scope global temporary dynamic
        valid_lft 86068sec preferred_lft 14068sec
    inet6 fd00::b24:7083:2b8e:303b/64 scope global dynamic mngtmpaddr noprefixroute
        valid_lft 86068sec preferred_lft 14068sec
    inet6 fe80::1de4:170e:4a80:62a3/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
kaushal@kaushal-VirtualBox:~$ ping 8.8.8.8
ping: connect: Network is unreachable
kaushal@kaushal-VirtualBox:~$ ping google.com
ping: google.com: Temporary failure in name resolution
kaushal@kaushal-VirtualBox:~$
```

3. No Internet for Host-only Adapter

Q5 - Install Basic Utility Packages

1a.

```
kaushal@kaushal-VirtualBox:~$ sudo apt update
[sudo] password for kaushal:
Hit:1 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu jammy-updates/main amd64 DEP-11 Metadata [112 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 DEP-11 Metadata [212 B]
Get:7 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 DEP-11 Metadata [360 kB]
Get:8 http://security.ubuntu.com/ubuntu jammy-security/main amd64 DEP-11 Metadata [54.6 kB]
Get:9 http://in.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 DEP-11 Metadata [940 B]
Get:10 http://in.archive.ubuntu.com/ubuntu jammy-backports/main amd64 DEP-11 Metadata [7,160 B]
Get:11 http://in.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 DEP-11 Metadata [212 B]
Get:12 http://in.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 DEP-11 Metadata [9,696 B]
Get:13 http://in.archive.ubuntu.com/ubuntu jammy-backports/multiverse amd64 DEP-11 Metadata [212 B]
Get:14 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 DEP-11 Metadata [208 B]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 DEP-11 Metadata [125 kB]
Get:16 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 DEP-11 Metadata [208 B]
Fetched 1,054 kB in 3s (368 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
3 packages can be upgraded. Run 'apt list --upgradable' to see them.
kaushal@kaushal-VirtualBox:~$
```

1b.

```
kaushal@kaushal-VirtualBox:~$ sudo apt install tree curl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  curl tree
0 upgraded, 2 newly installed, 0 to remove and 3 not upgraded.
Need to get 242 kB of archives.
After this operation, 570 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu jammy-updates/main amd64 curl amd64 7.81.0-1ubuntu1.21 [194 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu jammy/universe amd64 tree amd64 2.0.2-1 [47.9 kB]
Fetched 242 kB in 1s (185 kB/s)
Selecting previously unselected package curl.
(Reading database ... 211300 files and directories currently installed.)
Preparing to unpack .../curl_7.81.0-1ubuntu1.21_amd64.deb ...
Unpacking curl (7.81.0-1ubuntu1.21) ...
Selecting previously unselected package tree.
Preparing to unpack .../tree_2.0.2-1_amd64.deb ...
Unpacking tree (2.0.2-1) ...
Setting up tree (2.0.2-1) ...
Setting up curl (7.81.0-1ubuntu1.21) ...
Processing triggers for man-db (2.10.2-1) ...
kaushal@kaushal-VirtualBox:~$
```

2.

```
kaushal@kaushal-VirtualBox:~$ curl --version
curl 7.81.0 (x86_64-pc-linux-gnu) libcurl/7.81.0 OpenSSL/3.0.2 zlib/1.2.11 brotli/1.0.9 zstd/1.4.8 libidn2/2.3.2 libpsl/0.
21.0 (+libidn2/2.3.2) libssh/0.9.6/openssl/zlib nghttp2/1.43.0 librtmp/2.3 OpenLDAP/2.5.19
Release-Date: 2022-01-05
Protocols: dict file ftp ftps gopher gophers http https imap imaps ldap ldaps mqtt pop3 pop3s rtmp rtsp scp sftp smb smbs
smtp smtps telnet tftp
Features: alt-svc AsynchDNS brotli GSS-API HSTS HTTP2 HTTPS-proxy IDN IPv6 Kerberos Largefile libz NTLM NTLM_WB PSL SPNEGO
SSL TLS-SRP UnixSockets zstd
kaushal@kaushal-VirtualBox:~$ tree --version
tree v2.0.2 (c) 1996 - 2022 by Steve Baker, Thomas Moore, Francesc Rocher, Florian Sesser, Kyosuke Tokoro
kaushal@kaushal-VirtualBox:~$
```

Q6 - Install a Package

1.

```
kaushal@kaushal-VirtualBox:~$ sudo apt install htop
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Suggested packages:
  lm-sensors
The following NEW packages will be installed:
  htop
0 upgraded, 1 newly installed, 0 to remove and 3 not upgraded.
Need to get 128 kB of archives.
After this operation, 342 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 htop amd64 3.0.5-7build2 [128 kB]
Fetched 128 kB in 1s (100 kB/s)
Selecting previously unselected package htop.
(Reading database ... 211315 files and directories currently installed.)
Preparing to unpack ../htop_3.0.5-7build2_amd64.deb ...
Unpacking htop (3.0.5-7build2) ...
Setting up htop (3.0.5-7build2) ...
Processing triggers for mailcap (3.70+nmu1ubuntu1) ...
Processing triggers for desktop-file-utils (0.26-1ubuntu3) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for gnome-menus (3.36.0-1ubuntu3) ...
Processing triggers for man-db (2.10.2-1) ...
kaushal@kaushal-VirtualBox:~$
```

2.

```

kaushal@kaushal-VirtualBox -

0[|||] 2.7%] Tasks: 138, 565 thr; 1 running
1[|] 1.4%] Load average: 0.80 0.69 0.61
2[|] 2.1%] Uptime: 02:19:59
Mem[|||||||||||||||||||||||||||||||||] 2.33G/3.73G
Swp[|||||||||] 386M/1.99G

  PID USER      PRI  NI  VIRT   RES   SHR  S  CPU% MEM%   TIME+  Command
1657 kaushal    20   0  5185M 460M   131M S  10.3  12.0  39:51.04 /usr/bin/gnome-shell
1682 kaushal    20   0  5185M 460M   131M S   2.1  12.0  11:38.51 /usr/bin/gnome-shell
1683 kaushal    20   0  5185M 460M   131M S   2.1  12.0  11:37.68 /usr/bin/gnome-shell
1684 kaushal    20   0  5185M 460M   131M S   2.1  12.0  11:44.95 /usr/bin/gnome-shell
6685 kaushal    20   0  548M  56628 43796 S   2.1   1.4   0:03.50 /usr/libexec/gnome-terminal-server
1114 root         20   0  347M  2688  2432 S   0.7   0.1   0:08.60 /usr/bin/VBoxDRMClient
1689 kaushal    20   0  5185M 460M   131M S   0.7  12.0   0:11.89 /usr/bin/gnome-shell
8025 kaushal    20   0  11640  5120  3584 R   0.7   0.1   0:00.14 htop
1 root         20   0  162M  11768  8184 S   0.0   0.3   0:03.82 /sbin/init splash
227 root        19  -1  81012 14720 13824 S   0.0   0.4   0:03.20 /lib/systemd/systemd-journald
276 root        20   0  27216  4096  3840 S   0.0   0.1   0:00.37 /lib/systemd/systemd-udev
457 systemd-o    20   0  14836  6272  6016 S   0.0   0.2   0:10.24 /lib/systemd/systemd-oomd
461 systemd-r    20   0  27520 10300  8832 S   0.0   0.3   0:03.03 /lib/systemd/systemd-resolved
522 systemd-t    20   0  89388  6912  6528 S   0.0   0.2   0:00.19 /lib/systemd/systemd-timesyncd
550 systemd-t    20   0  89388  6912  6528 S   0.0   0.2   0:00.00 /lib/systemd/systemd-timesyncd
561 root        20   0  234M  7104  6592 S   0.0   0.2   0:00.70 /usr/libexec/accounts-daemon
563 root        20   0  2816  1920  1792 S   0.0   0.0   0:00.43 /usr/sbin/acpid
F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice F8Nice F9Kill F10Quit

```

Q7 - Install Net-tools & Compare with ip Command
1 and 2.

```

kaushal@kaushal-VirtualBox -
kaushal@kaushal-VirtualBox:~$ sudo apt install net-tools
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
net-tools is already the newest version (1.60+git20181103.0eebece-1ubuntu5.4).
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.
kaushal@kaushal-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.107 netmask 255.255.255.0 broadcast 192.168.1.255
    inet6 fd00::5b80:d88f:2b75:7314 prefixlen 64 scopeid 0x0<global>
    inet6 fe80::8272:b6a7:7e48:f639 prefixlen 64 scopeid 0x20<link>
    inet6 fd00::2077:3fd1:9e84:5074 prefixlen 64 scopeid 0x0<global>
    ether 08:00:27:f6:df:ed txqueuelen 1000 (Ethernet)
    RX packets 73425 bytes 58165923 (58.1 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 47717 bytes 24671568 (24.6 MB)
    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 10279 bytes 1473487 (1.4 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 10279 bytes 1473487 (1.4 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

```

kaushal@kaushal-VirtualBox:~$ 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: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:f6:df:ed brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.107/24 brd 192.168.1.255 scope global dynamic noprefixroute enp0s3
        valid_lft 85948sec preferred_lft 85948sec
    inet6 fd00::2077:3fd1:9e84:5074/64 scope global temporary dynamic
        valid_lft 85723sec preferred_lft 13723sec
    inet6 fd00::5b80:d88f:2b75:7314/64 scope global dynamic mngtppaddr noprefixroute
        valid_lft 85723sec preferred_lft 13723sec
    inet6 fe80::8272:b6a7:7e48:f639/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
kaushal@kaushal-VirtualBox:~$

```


3. Difference

a. Interface Names:

- ifconfig: Shows interface enp0s3 and lo with additional flags
- ip a: Also shows enp0s3 and lo, with more detailed interface information

b. IPv4 Address:

- ifconfig: Displays inet 192.168.1.107 for enp0s3
- ip a: Displays inet 192.168.1.107/24 for enp0s3 (with CIDR notation)

c. IPv6 Addresses:

- ifconfig: Shows multiple inet6 addresses under enp0s3
- ip a: Lists the same inet6 addresses but with more detail on their types