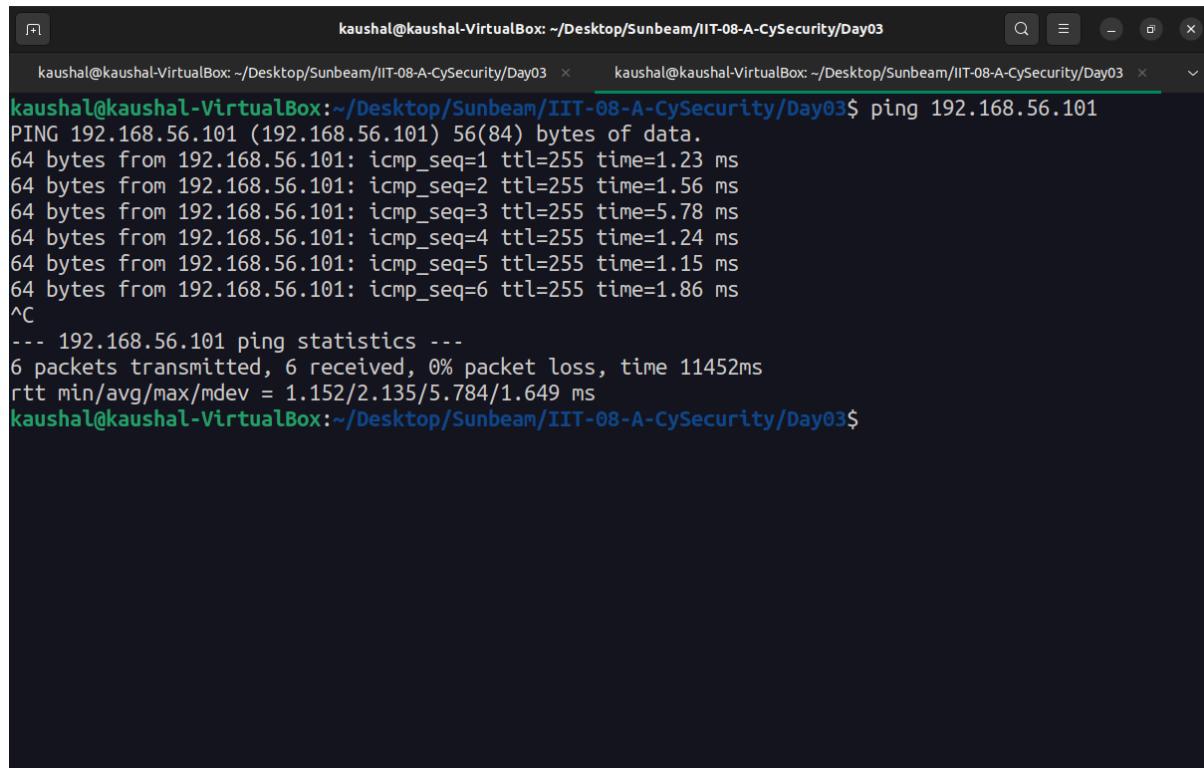


# VM Assignment (12 Dec 2025)

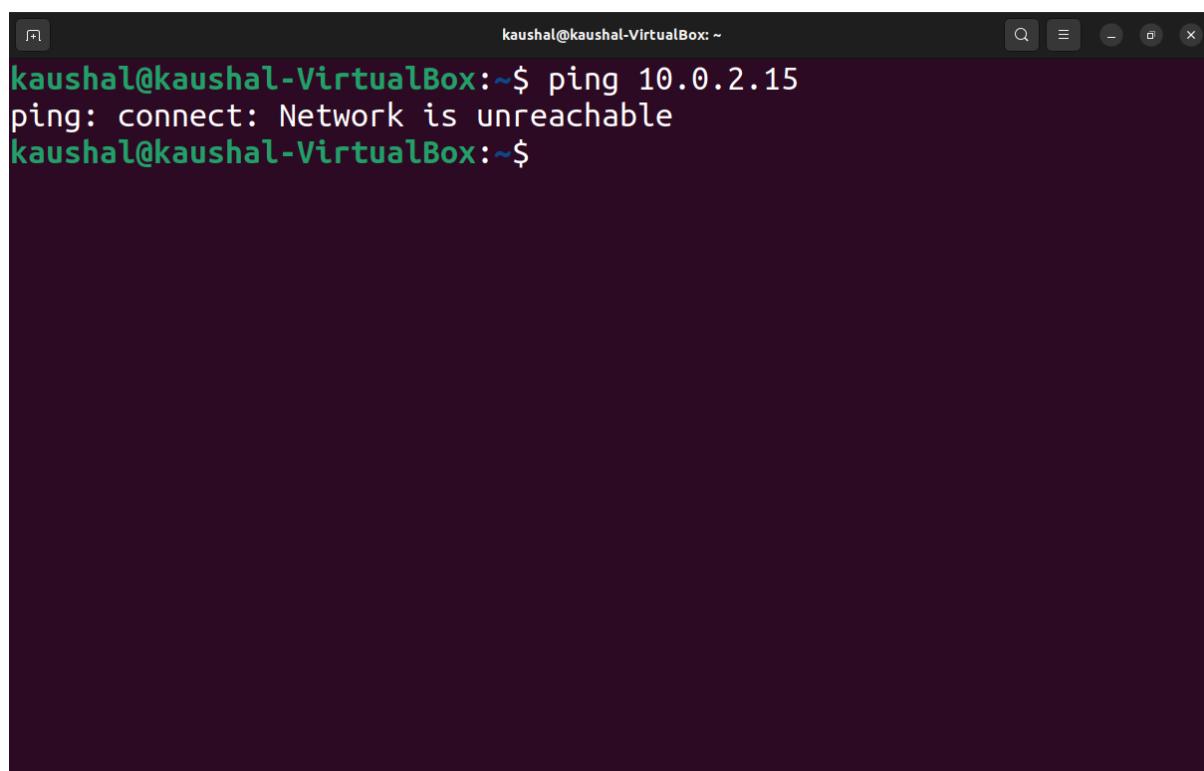
Q1 - Create 2 VMs (NAT + Host-Only) & Test Connectivity

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

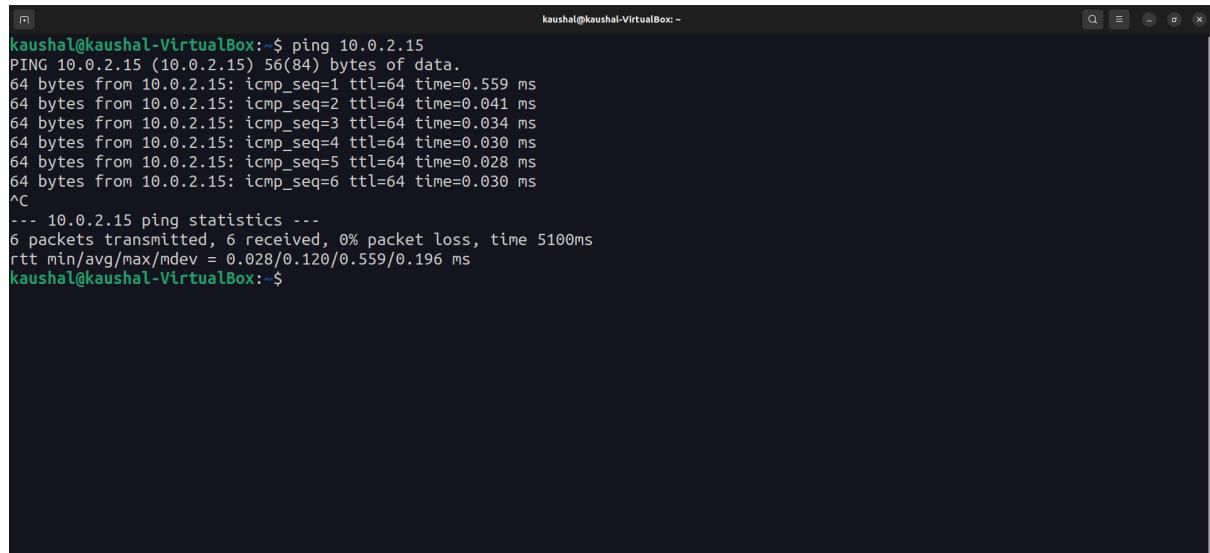
4. NAT and Host-only do not communicate with each other, because both have their different purpose and both are isolated, NAT (Network Address Transmission) uses private ip address to access the internet via host ip address and host-only creates an isolated network where only the host and VM can communicate.

Q2 - Create 2 VMs in NAT Mode & Test Connectivity

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

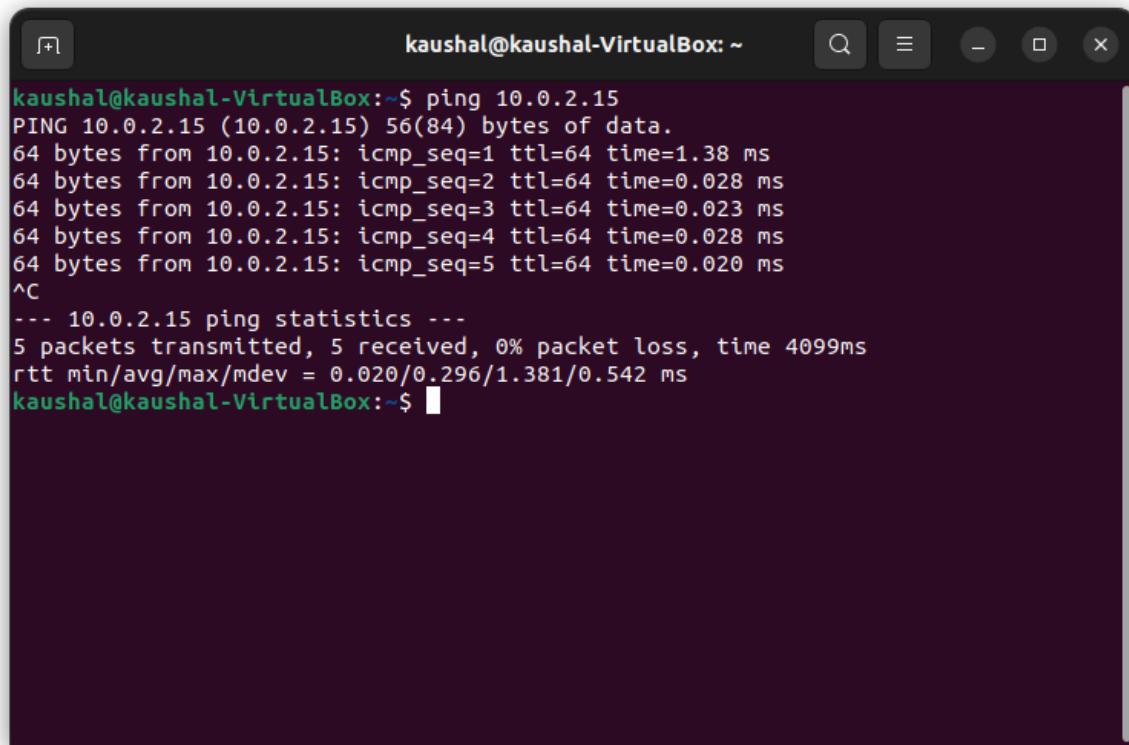
1b. IP address of VM-2 (NAT): 10.0.2.15

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.



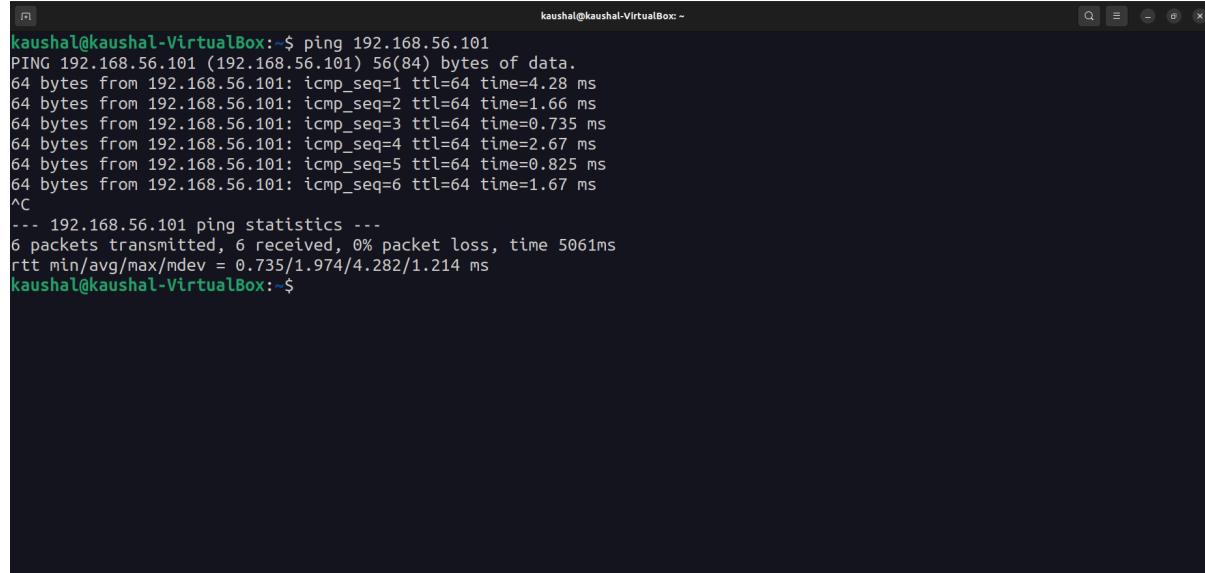
```
kaushal@kaushal-VirtualBox:~$ ping 10.0.2.15
PING 10.0.2.15 (10.0.2.15) 56(84) bytes of data.
64 bytes from 10.0.2.15: icmp_seq=1 ttl=64 time=1.38 ms
64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.028 ms
64 bytes from 10.0.2.15: icmp_seq=3 ttl=64 time=0.023 ms
64 bytes from 10.0.2.15: icmp_seq=4 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

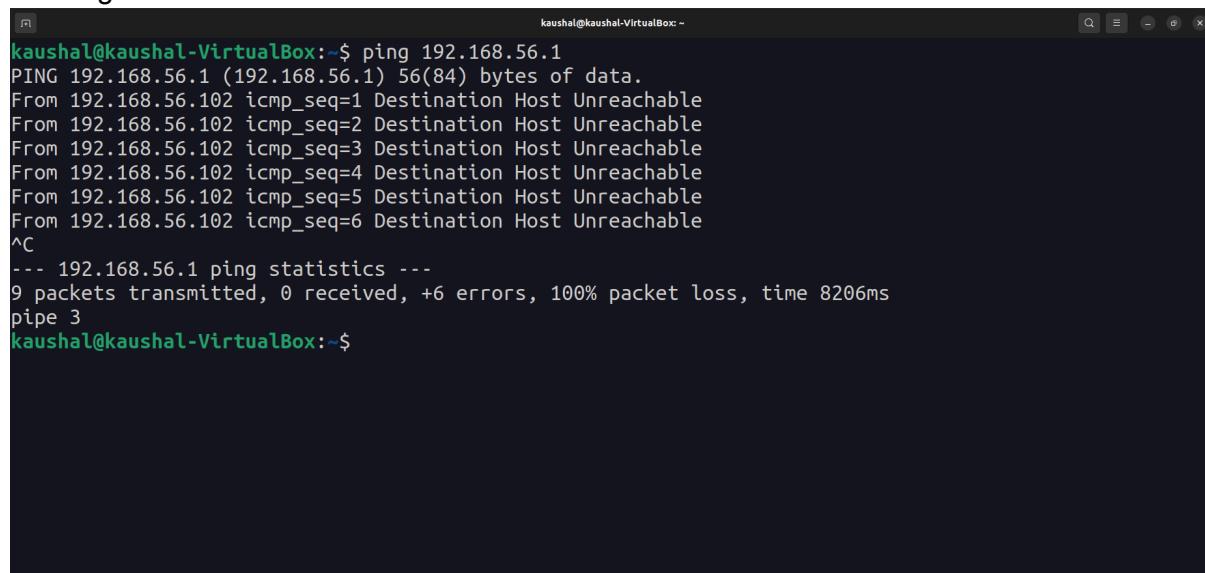
- 1a. IP address of VM-1 (Host-only): 192.168.56.102
- 1b. IP address of VM-2 (Host-only): 192.168.56.101
- 1c. IP address of Host: 192.168.56.1

2a. Ping VM1 -> VM2



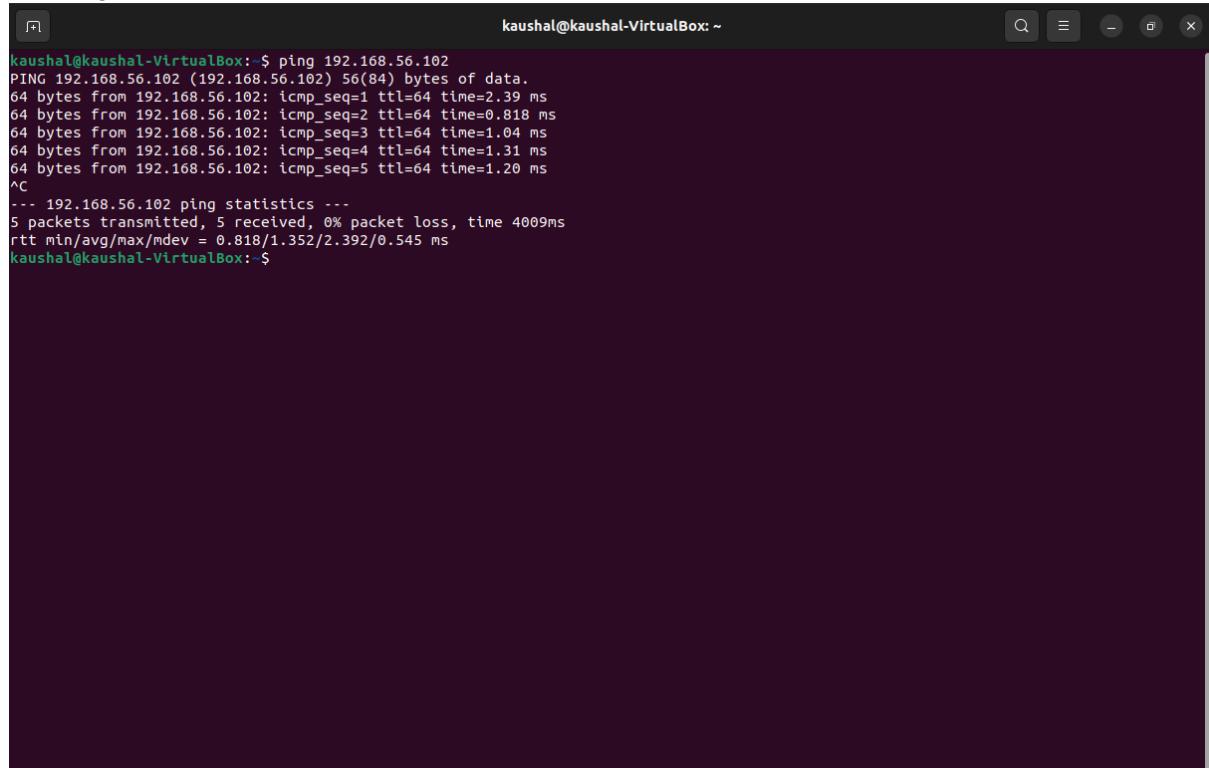
```
kaushal@kaushal-VirtualBox:~$ ping 192.168.56.101
PING 192.168.56.101 (192.168.56.101) 56(84) bytes of data.
64 bytes from 192.168.56.101: icmp_seq=1 ttl=64 time=4.28 ms
64 bytes from 192.168.56.101: icmp_seq=2 ttl=64 time=1.66 ms
64 bytes from 192.168.56.101: icmp_seq=3 ttl=64 time=0.735 ms
64 bytes 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



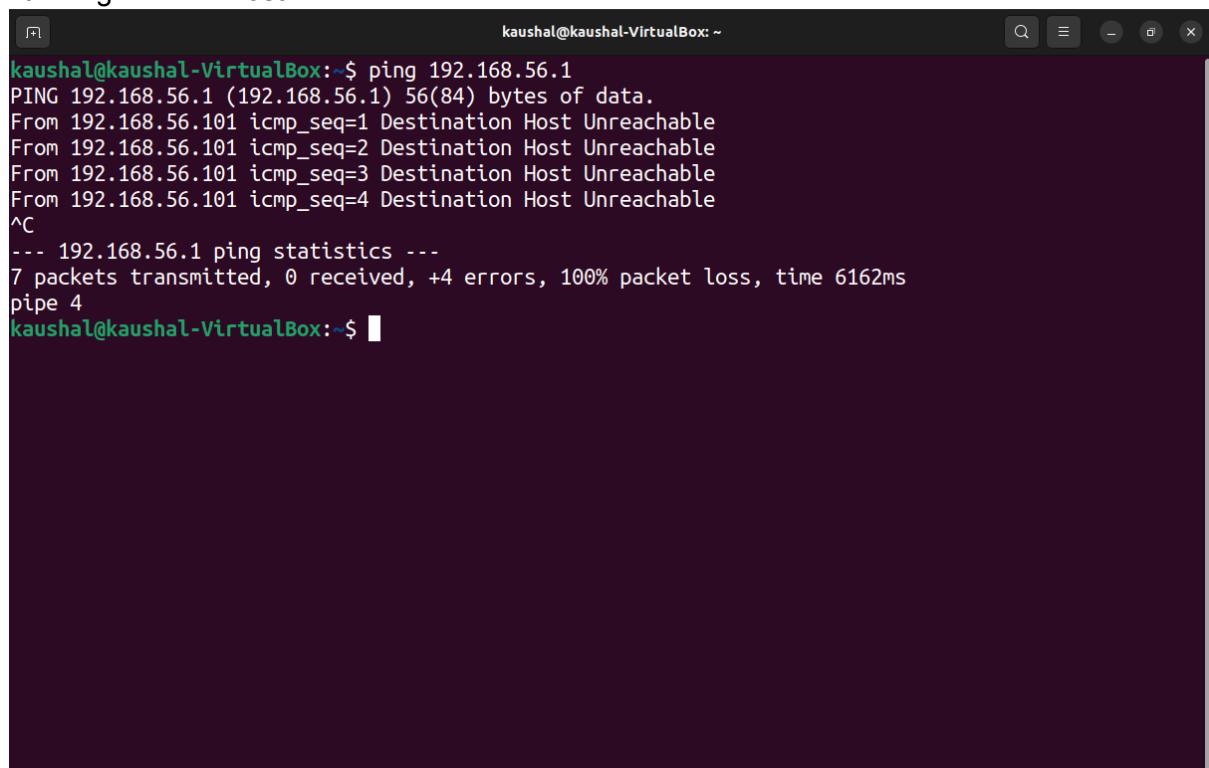
```
kaushal@kaushal-VirtualBox:~$ ping 192.168.56.1
PING 192.168.56.1 (192.168.56.1) 56(84) bytes of data.
From 192.168.56.102 icmp_seq=1 Destination Host Unreachable
From 192.168.56.102 icmp_seq=2 Destination Host Unreachable
From 192.168.56.102 icmp_seq=3 Destination Host Unreachable
From 192.168.56.102 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:~$ 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:~$ 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 ---
2 packets transmitted, 2 received, 0% packet loss, time 1008ms
rtt min/avg/max/mdev = 7.170/12.300/12.300/4.130 ms
```

- 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

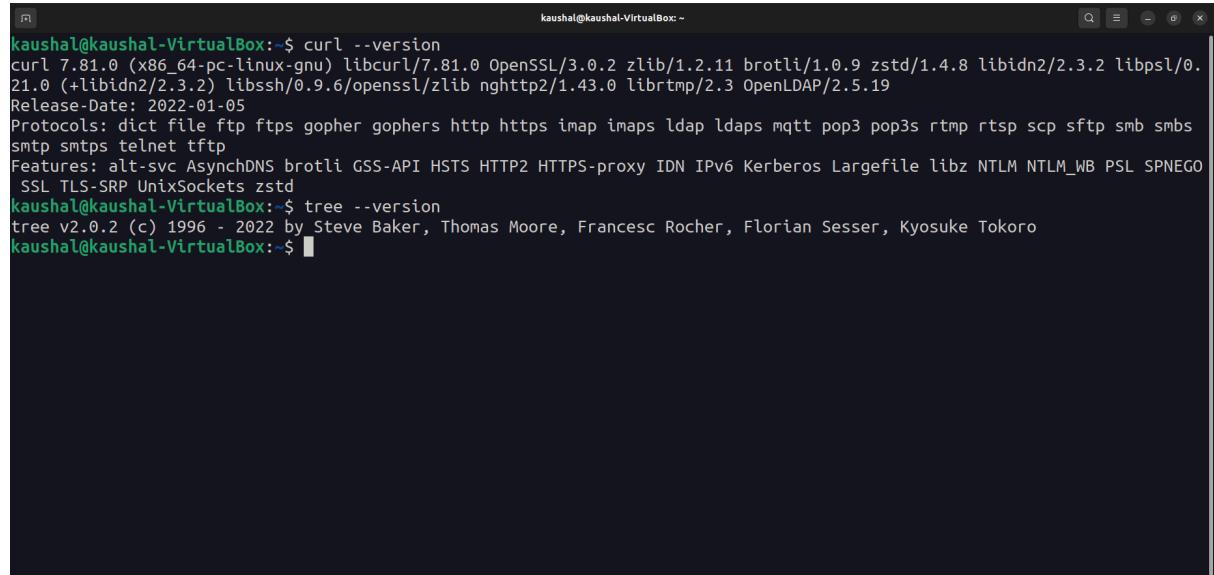
1a.

```
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 kB]
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 kB]
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 kB]
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:~$
```

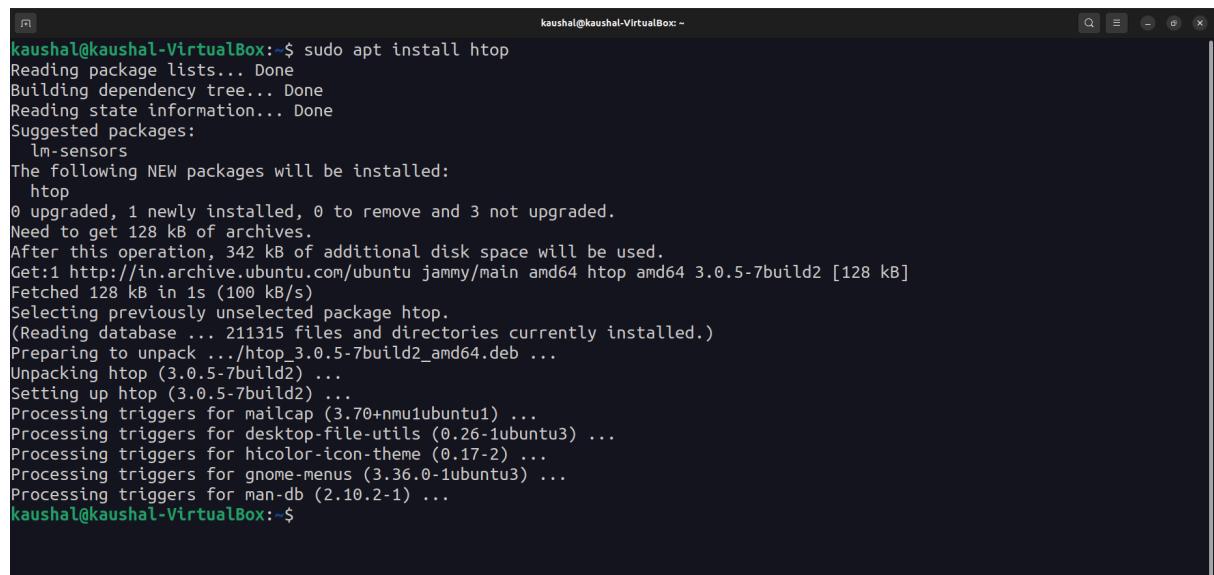
2.



```
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 librmp/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.

The screenshot shows the htop command running in a terminal window. At the top, there's a header with CPU usage (Tasks: 138, 565 thr; 1 running), load average (0.80 0.69 0.61), and uptime (02:19:59). Below this is a memory usage summary: Mem [██████████] 2.33G/3.73G and Swap [██████████] 386M/1.99G. The main part of the screen is a table listing processes. The columns include PID, USER, PRI, NI, VIRT, RES, SHR, S, CPU%, %MEM%, TIME+, and Command. Notable processes listed include /usr/bin/gnome-shell, /libexec/gnome-terminal-server, /usr/bin/VBoxDRMClient, and various systemd services like libsystemd-resolved and libsystemd-timesyncd. The bottom of the window has a menu bar with F1 through F10 keys.

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-udevd
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

## Q7 - Install Net-tools & Compare with ip Command

1 and 2.

The screenshot shows a terminal session. The user runs sudo apt install net-tools, which installs the package. Then, the user runs ifconfig to view network interface details. The output shows two interfaces: enp0s3 (Ethernet) and lo (loopback). The enp0s3 interface has an MTU of 1500, IP address 192.168.1.107, and various statistics for RX and TX traffic. The lo interface has an MTU of 65536, IP address 127.0.0.1, and similar statistics.

The screenshot shows a terminal session where the user runs ip a. The output compares the results from the previous net-tools installation and ifconfig command. It lists both the loopback (lo) and Ethernet (enp0s3) interfaces, showing their flags, MTU, queueing discipline (qdisc), link layer information, and various statistics for RX and TX traffic. The output is identical to the previous ifconfig command, demonstrating the compatibility between the two tools.

### 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