

## 1) Networks: NAT, Bridged Connection, HOST Only

The image shows three vertically stacked screenshots of a Linux desktop environment, likely Ubuntu, demonstrating different network connection types in a terminal window.

**Top Screenshot (NAT):** The terminal window title is "ubuntu [Running] - Oracle VirtualBox". The output shows network interfaces and ping statistics:

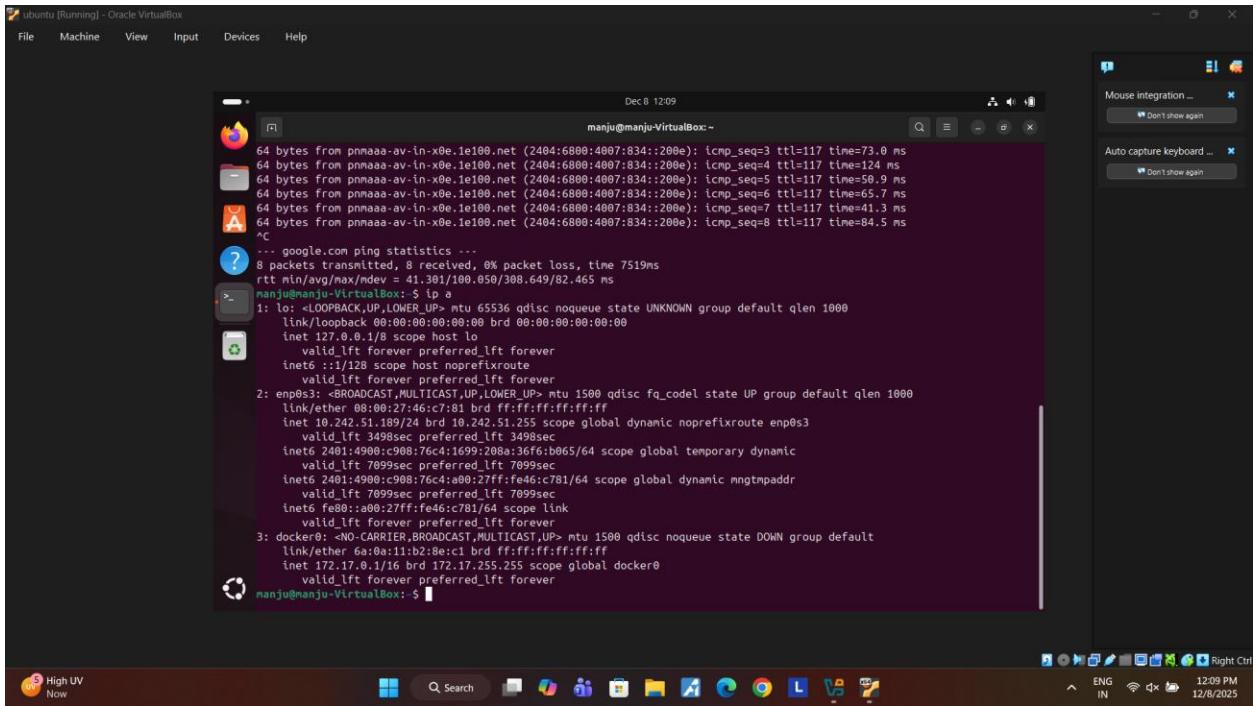
```
manju@manju-VirtualBox:~$ ping google.com
PING google.com (172.217.17.0) 56(84) bytes of data.
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=1 ttl=115 time=37.8 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=2 ttl=115 time=60.5 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=3 ttl=115 time=60.0 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=4 ttl=115 time=60.5 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=5 ttl=115 time=54.3 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=6 ttl=115 time=86.9 ms
^C
... google.com ping statistics ...
6 packets transmitted, 6 received, 0% packet loss, time 5563ms
rtt min/avg/max/mdev = 37.768/60.011/86.947/14.457 ms
```

**Middle Screenshot (Bridged Connection):** The terminal window title is "ubuntu [Running] - Oracle VirtualBox". The output shows network interfaces and ping statistics:

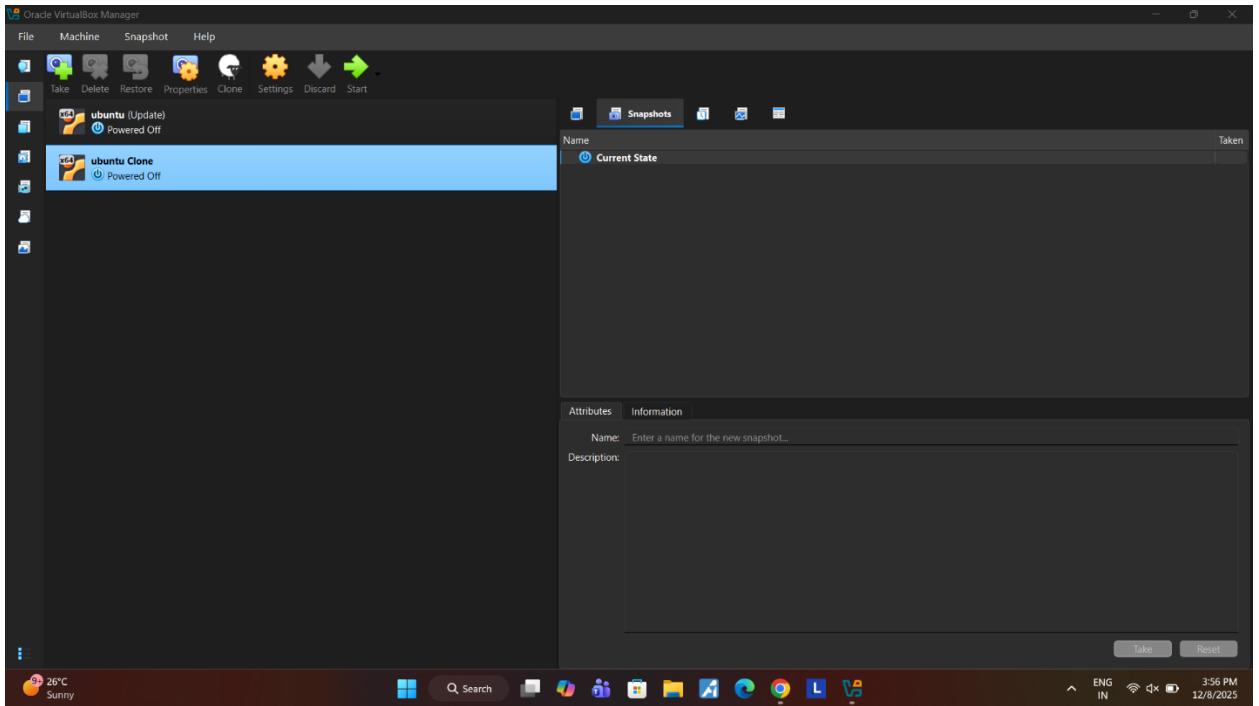
```
manju@manju-VirtualBox:~$ ping google.com
PING google.com (172.217.17.0) 56(84) bytes of data.
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=1 ttl=115 time=37.8 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=2 ttl=115 time=60.5 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=3 ttl=115 time=60.0 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=4 ttl=115 time=60.5 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=5 ttl=115 time=54.3 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=6 ttl=115 time=86.9 ms
^C
... google.com ping statistics ...
6 packets transmitted, 6 received, 0% packet loss, time 5563ms
rtt min/avg/max/mdev = 37.768/60.011/86.947/14.457 ms
```

**Bottom Screenshot (HOST Only):** The terminal window title is "ubuntu [Running] - Oracle VirtualBox". The output shows network interfaces and ping statistics:

```
manju@manju-VirtualBox:~$ ping google.com
PING google.com (172.217.17.0) 56(84) bytes of data.
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=1 ttl=115 time=37.8 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=2 ttl=115 time=60.5 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=3 ttl=115 time=60.0 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=4 ttl=115 time=60.5 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=5 ttl=115 time=54.3 ms
64 bytes from pnmaaa-at-in-x9e.1e100.net (2404:6800:4007:83f::200e): icmp_seq=6 ttl=115 time=86.9 ms
^C
... google.com ping statistics ...
6 packets transmitted, 6 received, 0% packet loss, time 5563ms
rtt min/avg/max/mdev = 37.768/60.011/86.947/14.457 ms
```



## 2) Clone VMs



3)

## Benchmarking

The image shows two screenshots of a Linux desktop environment running in Oracle VirtualBox. Both screenshots feature a dark theme with a top panel containing icons for weather (26°C Sunny), search, and system status (ENG IN, 5:40 PM, 12/8/2025). The desktop has a dock with various application icons.

**Screenshot 1 (Top): fio Benchmark Output**

```
fio: failed parsing rw=right1
manju@manju-VirtualBox: ~$ fio --name=write --rw=write --size=200M
write: (g=0): rw=write, bs=(R) 4096B-4096B, (W) 4096B-4096B, (T) 4096B-4096B, ioengine=psync, iodepth=1
fio-3.36
Starting 1 process
write: Laying out IO file (1 file / 200MiB)

write: (groupid=0, jobs=1): err= 0: pid=16454: Mon Dec  8 17:48:04 2025
        write: IOPS=231k, BW=901MB/s (945MB/s)(200MiB/222msc); 0 zone resets
        clat (usec): min=3, max=499, avg= 4.09, stddev= 7.39
        lat (usec): min=3, max=499, avg= 4.13, stddev= 7.39
        clat percentiles (usec):
                | 1.00th=[   4], 5.00th=[   4], 10.00th=[   4], 20.00th=[   4],
                | 30.00th=[   4], 40.00th=[   4], 50.00th=[   4], 60.00th=[   4],
                | 70.00th=[   4], 80.00th=[   4], 90.00th=[   5], 95.00th=[   6],
                | 99.00th=[  14], 99.50th=[  17], 99.90th=[ 110], 99.95th=[ 151],
                | 99.99th=[ 247]
        lat (usec) : 4=87.50%, 10=11.30%, 20=0.81%, 50=0.09%, 100=0.13%
        lat (usec) : 250=0.16%, 500=0.81%
        CPU          : user=9.05%, sys=90.95%, ctxt=0, majf=0, minf=13
        IO depths    : l=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
        submit       : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
        complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
        issued rwt: total=0, 512B=0, 8 short=0, 0, 0 dropped=0, 0, 0
        latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
        WRITE: bw=901MB/s (945MB/s), 901MB/s-901MB/s (945MB/s-945MB/s), io=200MB (210MB), run=222-222us

Disk stats (read/write):
        sda: los=44/19, sectors=1584/544, merge=30/49, ticks=35/25, in_queue=74, util=22.55%
manju@manju-VirtualBox: ~
```

**Screenshot 2 (Bottom): stress-ng Benchmark Output**

```
stress-ng: info: [16419] successful run completed in 10.71 secs
manju@manju-VirtualBox: ~$ sysbench memory run
sysbench 1.0.20 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 1
Initializing random number generator from current time

Running memory speed test with the following options:
block size: 1KiB
total size: 102400MiB
operation: write
scope: global

Initializing worker threads...
Threads started!

Total operations: 59360205 (5934995.27 per second)
57968.95 MiB transferred (5795.89 MiB/sec)

General statistics:
    total time:                      10.0004s
    total number of events:           59360205
    Latency (ms):
        min:                           0.00
        avg:                           0.00
        max:                           3.69
        95th percentile:               0.00
```

ubuntu (Snapshot 1) [Running] - Oracle VirtualBox

File Machine View Input Devices Help

Dec 8 17:34 manju@manju-VirtualBox:~

```
total time: 10.0000s
total number of events: 8702

Latency (ms):
min: 0.94
avg: 1.15
max: 6.82
95th percentile: 1.79
sum: 9993.73

Threads fairness:
events (avg/stddev): 8702.0000/0.00
execution time (avg/stddev): 9.9937/0.00

manju@manju-VirtualBox:~$ stress-ng --cpu 0 --timeout 60s
stress-ng: info: [16410] setting to a 1 min, 0 secs run per stressor
stress-ng: info: [16410] dispatching hogs: 8 cpu
^Cstress-ng: info: [16410] skipped: 0
stress-ng: info: [16410] passed: 8: cpu (8)
stress-ng: info: [16410] failed: 0
stress-ng: info: [16410] metrics untrustworthy: 0
stress-ng: info: [16410] successful run completed in 6.46 secs
manju@manju-VirtualBox:~$ stress-ng --cpu 0 --timeout 60s
stress-ng: info: [16419] setting to a 1 min, 0 secs run per stressor
stress-ng: info: [16419] dispatching hogs: 8 cpu
^Cstress-ng: info: [16419] skipped: 0
stress-ng: info: [16419] passed: 8: cpu (8)
stress-ng: info: [16419] failed: 0
stress-ng: info: [16419] metrics untrustworthy: 0
stress-ng: info: [16419] successful run completed in 10.71 secs
manju@manju-VirtualBox:~$
```

Sunset 5:52 pm ENG IN 5:34 PM 12/8/2025 Right Ctrl

ubuntu (Snapshot 1) [Running] - Oracle VirtualBox

File Machine View Input Devices Help

Dec 8 17:24 manju@manju-VirtualBox:~

```
sysbench 1.0.20 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 1
Initializing random number generator from current time

Prime numbers limit: 20000
Initializing worker threads...
Threads started!

CPU speed:
events per second: 869.66

General statistics:
total time: 10.0000s
total number of events: 8702

Latency (ms):
min: 0.94
avg: 1.15
max: 6.82
95th percentile: 1.79
sum: 9993.73

Threads fairness:
events (avg/stddev): 8702.0000/0.00
execution time (avg/stddev): 9.9937/0.00

Show Apps u-VirtualBox:~$ sysbench cpu --cpu-max-prime=20000 run
```

25°C Sunny 5:24 PM 12/8/2025 Right Ctrl