```
vboxuser@Ramakrishna:~$ iperf3 -c 192.168.56.101 -P 4 -t 30
Connecting to host 192.168.56.101, port 5201
[  5] local 192.168.56.101 port 45450 connected to 192.168.56.101 port 5201
[  7] local 192.168.56.101 port 45462 connected to 192.168.56.101 port 5201
[  9] local 192.168.56.101 port 45476 connected to 192.168.56.101 port 5201
[ 11] local 192.168.56.101 port 45482 connected to 192.168.56.101 port 5201
[ ID] Interval           Transfer     Bitrate         Retr  Cwnd
[  5]   0.00-1.00   sec  5.51 GBytes  47.3 Gbits/sec    1   3.50 MBytes
[  7]   0.00-1.01   sec  5.37 GBytes  45.6 Gbits/sec    0   6.56 MBytes
[  9]   0.00-1.01   sec  5.27 GBytes  44.7 Gbits/sec    0   4.25 MBytes
[ 11]   0.00-1.01   sec  4.75 GBytes  40.2 Gbits/sec    0   4.18 MBytes
[SUM]   0.00-1.00   sec  20.9 GBytes   179 Gbits/sec    1
^C- - - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   1.00-1.63   sec  3.63 GBytes  49.2 Gbits/sec    0   3.81 MBytes
[  7]   1.01-1.64   sec  3.44 GBytes  47.5 Gbits/sec    0   6.56 MBytes
[  9]   1.01-1.64   sec  3.43 GBytes  47.4 Gbits/sec    0   4.25 MBytes
[ 11]   1.01-1.64   sec  2.48 GBytes  34.3 Gbits/sec    1   4.18 MBytes
[SUM]   1.00-1.63   sec  13.0 GBytes   176 Gbits/sec    1
- - - - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate         Retr
[  5]   0.00-1.63   sec  9.17 GBytes  48.2 Gbits/sec    1             sender
[  5]   0.00-1.63   sec  0.00 Bytes   0.00 bits/sec                   receiver
[  7]   0.00-1.63   sec  8.82 GBytes  46.3 Gbits/sec    0             sender
[  7]   0.00-1.63   sec  0.00 Bytes   0.00 bits/sec                   receiver
[  9]   0.00-1.63   sec  8.71 GBytes  45.8 Gbits/sec    0             sender
[  9]   0.00-1.63   sec  0.00 Bytes   0.00 bits/sec                   receiver
[ 11]   0.00-1.63   sec  7.23 GBytes  38.0 Gbits/sec    1             sender
[ 11]   0.00-1.63   sec  0.00 Bytes   0.00 bits/sec                   receiver
[SUM]   0.00-1.63   sec  33.9 GBytes   178 Gbits/sec    2             sender
[SUM]   0.00-1.63   sec  0.00 Bytes   0.00 bits/sec                   receiver
iperf3: interrupt - the client has terminated
vboxuser@Ramakrishna:~$
```

```
vboxuser@Ramakrishna:~$ 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=0.067 ms
64 bytes from 192.168.56.101: icmp_seq=2 ttl=64 time=0.024 ms
64 bytes from 192.168.56.101: icmp_seq=3 ttl=64 time=0.065 ms
64 bytes from 192.168.56.101: icmp_seq=4 ttl=64 time=0.631 ms
64 bytes from 192.168.56.101: icmp_seq=5 ttl=64 time=0.108 ms
64 bytes from 192.168.56.101: icmp_seq=6 ttl=64 time=0.079 ms
64 bytes from 192.168.56.101: icmp_seq=7 ttl=64 time=0.110 ms
^C
--- 192.168.56.101 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 7745ms
rtt min/avg/max/mdev = 0.024/0.154/0.631/0.196 ms
```

```
vboxuser@Ramakrishna:~$ iperf3 -c 192.168.56.101 -P 4 -t 30
Connecting to host 192.168.56.101, port 5201
[  5] local 192.168.56.101 port 34954 connected to 192.168.56.101 port 5201
[  7] local 192.168.56.101 port 34958 connected to 192.168.56.101 port 5201
[  9] local 192.168.56.101 port 34964 connected to 192.168.56.101 port 5201
[ 11] local 192.168.56.101 port 34966 connected to 192.168.56.101 port 5201
[ ID] Interval           Transfer     Bitrate         Retr  Cwnd
[  5]   0.00-1.00   sec  5.60 GBytes  48.1 Gbits/sec    0   4.18 MBytes
[  7]   0.00-1.00   sec  5.57 GBytes  47.8 Gbits/sec    2   4.18 MBytes
[  9]   0.00-1.01   sec  4.34 GBytes  37.0 Gbits/sec    1   4.12 MBytes
[ 11]   0.00-1.01   sec  5.47 GBytes  46.6 Gbits/sec    0   4.12 MBytes
[SUM]   0.00-1.00   sec  21.0 GBytes   180 Gbits/sec    3
- - - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   1.00-2.00   sec  5.50 GBytes  47.3 Gbits/sec    1   4.18 MBytes
[  7]   1.00-2.00   sec  5.45 GBytes  46.6 Gbits/sec    0   4.18 MBytes
[  9]   1.01-2.01   sec  4.40 GBytes  37.8 Gbits/sec    0   4.12 MBytes
[ 11]   1.01-2.01   sec  5.00 GBytes  42.8 Gbits/sec    2   4.12 MBytes
[SUM]   1.00-2.00   sec  20.4 GBytes   175 Gbits/sec    3
^C- - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   2.00-2.06   sec   105 MBytes  15.8 Gbits/sec    0   4.18 MBytes
[  7]   2.00-2.06   sec   174 MBytes  28.3 Gbits/sec    0   4.18 MBytes
[  9]   2.01-2.06   sec   129 MBytes  21.3 Gbits/sec    0   4.12 MBytes
[ 11]   2.01-2.06   sec  99.4 MBytes  18.3 Gbits/sec    0   4.12 MBytes
[SUM]   2.00-2.06   sec   507 MBytes  76.1 Gbits/sec    0
- - - - - - - - - - - - - - - - - - - - - - - - - - -
```

```
vboxuser@Ramakrishna:~$ iperf3 -c 192.168.56.101 -P 4 -t 30
Connecting to host 192.168.56.101, port 5201
[  5] local 192.168.56.101 port 42174 connected to 192.168.56.101 port 52
[  7] local 192.168.56.101 port 42190 connected to 192.168.56.101 port 52
[  9] local 192.168.56.101 port 42202 connected to 192.168.56.101 port 52
[ 11] local 192.168.56.101 port 42216 connected to 192.168.56.101 port 52
[ ID] Interval           Transfer     Bitrate         Retr  Cwnd
[  5]   0.00-1.00   sec  5.24 GBytes  45.0 Gbits/sec    0   4.18 MBytes
[  7]   0.00-1.00   sec  4.36 GBytes  37.4 Gbits/sec    0   4.18 MBytes
[  9]   0.00-1.00   sec  5.05 GBytes  43.2 Gbits/sec    0   4.12 MBytes
[ 11]   0.00-1.00   sec  5.50 GBytes  47.1 Gbits/sec    0   4.12 MBytes
[SUM]   0.00-1.00   sec  20.2 GBytes   173 Gbits/sec    0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   1.00-2.00   sec  5.34 GBytes  45.9 Gbits/sec    0   4.18 MBytes
[  7]   1.00-2.01   sec  4.10 GBytes  34.8 Gbits/sec    0   4.18 MBytes
[  9]   1.00-2.02   sec  5.12 GBytes  43.2 Gbits/sec    0   4.12 MBytes
[ 11]   1.00-2.02   sec  5.01 GBytes  42.3 Gbits/sec    0   4.12 MBytes
[SUM]   1.00-2.00   sec  19.6 GBytes   168 Gbits/sec    0
```

```
vboxuser@Ramakrishna:~$ 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=0.099 ms
64 bytes from 192.168.56.101: icmp_seq=2 ttl=64 time=0.061 ms
64 bytes from 192.168.56.101: icmp_seq=3 ttl=64 time=0.077 ms
64 bytes from 192.168.56.101: icmp_seq=4 ttl=64 time=0.070 ms
64 bytes from 192.168.56.101: icmp_seq=5 ttl=64 time=0.078 ms
64 bytes from 192.168.56.101: icmp_seq=6 ttl=64 time=0.083 ms
64 bytes from 192.168.56.101: icmp_seq=7 ttl=64 time=0.027 ms
64 bytes from 192.168.56.101: icmp_seq=8 ttl=64 time=0.102 ms
64 bytes from 192.168.56.101: icmp_seq=9 ttl=64 time=0.068 ms
64 bytes from 192.168.56.101: icmp_seq=10 ttl=64 time=0.036 ms
64 bytes from 192.168.56.101: icmp_seq=11 ttl=64 time=0.081 ms
^C
--- 192.168.56.101 ping statistics ---
11 packets transmitted, 11 received, 0% packet loss, time 10874ms
rtt min/avg/max/mdev = 0.027/0.071/0.102/0.022 ms
vboxuser@Ramakrishna:~$
```

```
vboxuser@Ramakrishna:~$ iperf3 -c 192.168.56.101 -P 4 -t 30
Connecting to host 192.168.56.101, port 5201
[  5] local 192.168.56.101 port 59414 connected to 192.168.56.101 port 5201
[  7] local 192.168.56.101 port 59424 connected to 192.168.56.101 port 5201
[  9] local 192.168.56.101 port 59438 connected to 192.168.56.101 port 5201
[ 11] local 192.168.56.101 port 59440 connected to 192.168.56.101 port 5201
[ ID] Interval           Transfer     Bitrate         Retr  Cwnd
[  5]   0.00-1.00   sec  5.24 GBytes  45.0 Gbits/sec    0   4.18 MBytes
[  7]   0.00-1.01   sec  5.01 GBytes  42.7 Gbits/sec    0   4.12 MBytes
[  9]   0.00-1.01   sec  4.02 GBytes  34.3 Gbits/sec    0   4.25 MBytes
[ 11]   0.00-1.02   sec  5.00 GBytes  42.3 Gbits/sec    0   4.18 MBytes
[SUM]   0.00-1.00   sec  19.3 GBytes   165 Gbits/sec    0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   1.00-2.00   sec  5.31 GBytes  45.6 Gbits/sec    1   2.87 MBytes
[  7]   1.01-2.00   sec  5.46 GBytes  47.2 Gbits/sec    0   4.12 MBytes
[  9]   1.01-2.00   sec  3.90 GBytes  33.7 Gbits/sec    0   4.25 MBytes
[ 11]   1.02-2.02   sec  4.91 GBytes  42.2 Gbits/sec    2   4.18 MBytes
[SUM]   1.00-2.00   sec  19.6 GBytes   168 Gbits/sec    3
^C- - - - - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   2.00-2.58   sec  3.09 GBytes  46.0 Gbits/sec    1   2.87 MBytes
[  7]   2.00-2.58   sec  3.02 GBytes  45.2 Gbits/sec    0   4.12 MBytes
[  9]   2.00-2.58   sec  2.49 GBytes  37.2 Gbits/sec    0   4.25 MBytes
[ 11]   2.02-2.58   sec  3.13 GBytes  47.9 Gbits/sec    0   4.18 MBytes
```

```
vboxuser@Ramakrishna:~$ cat /proc/interrupts
           CPU0      CPU1      CPU2      CPU3      CPU4      CPU5      CPU6      CPU7
  0:        136         0         0         0         0         0         0         0   IO-APIC    2-edge      time
r
  1:          0         0         0         0         0         0         0        71   IO-APIC    1-edge      i804
2
  8:          0         0         0         0         0         0         0         0   IO-APIC    8-edge      rtc0
  9:          0         0         0         0         0         0         0         0   IO-APIC    9-fasteoi   acpi
 12:          0         0         0         0         0         1       189         0   IO-APIC   12-edge      i804
2
 14:          0         0       211         0         0         0         0         0   IO-APIC   14-edge      ata_
piix
 15:          0         0         0         0         0         0         0         0   IO-APIC   15-edge      ata_
piix
 18:          0         0         0         2         0         0         0         0   IO-APIC   18-fasteoi   vmwg
fx
 19:          0         0         0         0         0       297         0         0   IO-APIC   19-fasteoi   ehci
_hcd:usb2, enp0s3
 20:          0         0       470         0         0         0         0         0   IO-APIC   20-fasteoi   vbox
guest
 21:          0     14050         0         0         0         0         0         0   IO-APIC   21-fasteoi   ahci
[0000:00:0d.0], snd_intel8x0
 22:          0         0         0         0        27         0         0         0   IO-APIC   22-fasteoi   ohci
_hcd:usb1
NMI:          0         0         0         0         0         0         0         0   Non-maskable interrupts
LOC:      15433     15149     16146     17630     15451     16786     42624     17209   Local timer interrupts
SPU:          0         0         0         0         0         0         0         0   Spurious interrupts
PMI:          0         0         0         0         0         0         0         0   Performance monitoring in
terrupts
IWI:          0         0         0         1         0         0         0         1   IRQ work interrupts
RTR:          0         0         0         0         0         0         0         0   APIC ICR read retries
RES:        539       428       631       572       536       517       494       567   Rescheduling interrupts
CAL:      11420      8042     10204     10419      9466      8277     10207      9256   Function call interrupts
```

```
vboxuser@Ramakrishna:~$ 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=0.087 ms
64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.039 ms
64 bytes from 10.0.2.15: icmp_seq=3 ttl=64 time=0.088 ms
64 bytes from 10.0.2.15: icmp_seq=4 ttl=64 time=0.026 ms
64 bytes from 10.0.2.15: icmp_seq=5 ttl=64 time=0.053 ms
64 bytes from 10.0.2.15: icmp_seq=6 ttl=64 time=0.051 ms
64 bytes from 10.0.2.15: icmp_seq=7 ttl=64 time=0.063 ms
64 bytes from 10.0.2.15: icmp_seq=8 ttl=64 time=0.030 ms
64 bytes from 10.0.2.15: icmp_seq=9 ttl=64 time=0.082 ms
64 bytes from 10.0.2.15: icmp_seq=10 ttl=64 time=0.043 ms
64 bytes from 10.0.2.15: icmp_seq=11 ttl=64 time=0.021 ms
64 bytes from 10.0.2.15: icmp_seq=12 ttl=64 time=0.037 ms
64 bytes from 10.0.2.15: icmp_seq=13 ttl=64 time=0.083 ms
64 bytes from 10.0.2.15: icmp_seq=14 ttl=64 time=0.024 ms
64 bytes from 10.0.2.15: icmp_seq=15 ttl=64 time=0.024 ms
64 bytes from 10.0.2.15: icmp_seq=16 ttl=64 time=0.081 ms
64 bytes from 10.0.2.15: icmp_seq=17 ttl=64 time=0.066 ms
^C
--- 10.0.2.15 ping statistics ---
17 packets transmitted, 17 received, 0% packet loss, time 16486ms
rtt min/avg/max/mdev = 0.021/0.052/0.088/0.023 ms
```

```
vboxuser@Ramakrishna:~$ cat /proc/interrupts
           CPU0       CPU1       CPU2       CPU3
  0:        117          0          0          0   IO-APIC    2-edge      timer
  1:          0          0          0        343   IO-APIC    1-edge      i8042
  8:          0          0          0          0   IO-APIC    8-edge      rtc0
  9:          0          0          0          0   IO-APIC    9-fasteoi   acpi
 12:          0          0        290          0   IO-APIC   12-edge      i8042
 14:          0          0        299          0   IO-APIC   14-edge      ata_piix
 15:          0          0          0          0   IO-APIC   15-edge      ata_piix
 18:          0          0          0          1   IO-APIC   18-fasteoi   vmwgfx
 19:        355          0          0          0   IO-APIC   19-fasteoi   ehci_hcd:usb1, enp0s3
 20:          0          0       3869          0   IO-APIC   20-fasteoi   vboxguest
 21:          0      15595          0          0   IO-APIC   21-fasteoi   ahci[0000:00:0d.0], snd_intel8x0
 22:          0         26          0          0   IO-APIC   22-fasteoi   ohci_hcd:usb2
NMI:          0          0          0          0   Non-maskable interrupts
LOC:      23116      25074      76369      24284   Local timer interrupts
SPU:          0          0          0          0   Spurious interrupts
PMI:          0          0          0          0   Performance monitoring interrupts
IWI:          5         15          0          6   IRQ work interrupts
RTR:          0          0          0          0   APIC ICR read retries
RES:        747        848        762       1079   Rescheduling interrupts
CAL:      27722      18200      19237      22007   Function call interrupts
TLB:       1205       1087       1111       1033   TLB shootdowns
TRM:          0          0          0          0   Thermal event interrupts
THR:          0          0          0          0   Threshold APIC interrupts
DFR:          0          0          0          0   Deferred Error APIC interrupts
MCE:          0          0          0          0   Machine check exceptions
MCP:          1          1          1          1   Machine check polls
ERR:          0
MIS:          5
PIN:          0          0          0          0   Posted-interrupt notification event
NPI:          0          0          0          0   Nested posted-interrupt event
PIW:          0          0          0          0   Posted-interrupt wakeup event
```

```
vboxuser@Ramakrishna:~$ ethtool -S enp0s3
NIC statistics:
        rx_packets: 9921
        tx_packets: 1146
        rx_bytes: 14230666
        tx_bytes: 94185
        rx_broadcast: 1
        tx_broadcast: 8
        rx_multicast: 4
        tx_multicast: 113
        rx_errors: 0
        tx_errors: 0
        tx_dropped: 0
        multicast: 4
        collisions: 0
        rx_length_errors: 0
        rx_over_errors: 0
        rx_crc_errors: 0
        rx_frame_errors: 0
        rx_no_buffer_count: 0
        rx_missed_errors: 0
        tx_aborted_errors: 0
        tx_carrier_errors: 0
        tx_fifo_errors: 0
        tx_heartbeat_errors: 0
        tx_window_errors: 0
        tx_abort_late_coll: 0
        tx_deferred_ok: 0
        tx_single_coll_ok: 0
        tx_multi_coll_ok: 0
        tx_timeout_count: 0
        tx_restart_queue: 0
        rx_long_length_errors: 0
```

```
vboxuser@Ramakrishna:~$ iperf3 -c 10.0.2.15 -t 20
Connecting to host 10.0.2.15, port 5201
[  5] local 10.0.2.15 port 46950 connected to 10.0.2.15 port 5201
[ ID] Interval           Transfer     Bitrate         Retr  Cwnd
[  5]   0.00-1.00   sec  7.95 GBytes  68.2 Gbits/sec    0   4.12 MBytes
[  5]   1.00-2.03   sec  8.30 GBytes  69.4 Gbits/sec    0   4.12 MBytes
[  5]   2.03-3.01   sec  8.21 GBytes  72.1 Gbits/sec    0   4.12 MBytes
[  5]   3.01-4.00   sec  8.40 GBytes  72.5 Gbits/sec    0   4.12 MBytes
[  5]   4.00-5.00   sec  8.89 GBytes  76.5 Gbits/sec    0   4.12 MBytes
[  5]   5.00-6.00   sec  8.25 GBytes  70.8 Gbits/sec    0   4.12 MBytes
[  5]   6.00-8.15   sec  16.6 GBytes  66.4 Gbits/sec    2   4.12 MBytes
[  5]   8.15-9.33   sec  9.19 GBytes  66.9 Gbits/sec    1   4.12 MBytes
[  5]   9.33-10.00  sec  5.25 GBytes  67.2 Gbits/sec    0   4.12 MBytes
[  5]  10.00-11.02  sec  8.71 GBytes  73.7 Gbits/sec    0   4.12 MBytes
[  5]  11.02-12.00  sec  7.42 GBytes  64.7 Gbits/sec    0   4.12 MBytes
[  5]  12.00-13.20  sec  8.51 GBytes  61.1 Gbits/sec    0   4.12 MBytes
[  5]  13.20-15.68  sec  17.2 GBytes  59.5 Gbits/sec   65   3.31 MBytes
[  5]  15.68-15.68  sec   128 KBytes   452 Mbits/sec    0   3.31 MBytes
[  5]  15.68-16.93  sec  8.79 GBytes  60.5 Gbits/sec    8   4.12 MBytes
[  5]  16.93-17.11  sec  1.18 GBytes  56.6 Gbits/sec    3   4.12 MBytes
[  5]  17.11-18.44  sec  9.73 GBytes  62.8 Gbits/sec   15   4.12 MBytes
[  5]  18.44-19.16  sec  5.33 GBytes  63.8 Gbits/sec   17   4.12 MBytes
[  5]  19.16-20.42  sec  8.95 GBytes  61.0 Gbits/sec    3   4.12 MBytes
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate         Retr
[  5]   0.00-20.42  sec   157 GBytes  66.1 Gbits/sec  114          send
[  5]   0.00-20.42  sec   157 GBytes  66.1 Gbits/sec               rece

iperf Done.
```

```
ShmemHugePages:          0 kB
FileHugePages:           0 kB
HugePages_Total:         0
HugePages_Free:          0
HugePages_Rsvd:          0
HugePages_Surp:          0
Hugepagesize:         2048 kB
Hugetlb:                 0 kB
vboxuser@Ramakrishna:~$ ^C
vboxuser@Ramakrishna:~$ ^C
vboxuser@Ramakrishna:~$ echo 1024 | sudo tee /proc/sys/vm/nr_hugepages
[sudo] password for vboxuser:
1024
vboxuser@Ramakrishna:~$ grep Huge /proc/meminfo
AnonHugePages:           0 kB
ShmemHugePages:          0 kB
FileHugePages:           0 kB
HugePages_Total:      1024
HugePages_Free:       1024
HugePages_Rsvd:          0
HugePages_Surp:          0
Hugepagesize:         2048 kB
Hugetlb:           2097152 kB
```

```
vboxuser@Ramakrishna:~$ sudo dpdk-testpmd -l 0-1 -m 512 -- -i --forward-mode=io
EAL: Detected CPU lcores: 8
EAL: Detected NUMA nodes: 1
EAL: Detected shared linkage of DPDK
EAL: Multi-process socket /var/run/dpdk/rte/mp_socket
EAL: Selected IOVA mode 'PA'
testpmd: No probed ethernet devices
Interactive-mode selected
Set io packet forwarding mode
testpmd: create a new mbuf pool <mb_pool_0>: n=155456, size=2176, socket=0
testpmd: preferred mempool ops selected: ring_mp_mc
Done
testpmd> testpmd> start
Command not found
testpmd> start
io packet forwarding - ports=0 - cores=0 - streams=0 - NUMA support enabled, MP
allocation mode: native

  io packet forwarding packets/burst=32
  nb forwarding cores=1 - nb forwarding ports=0
testpmd>
```