

Development Tools Assignment

Module 2 – Network Performance Measurement Tools

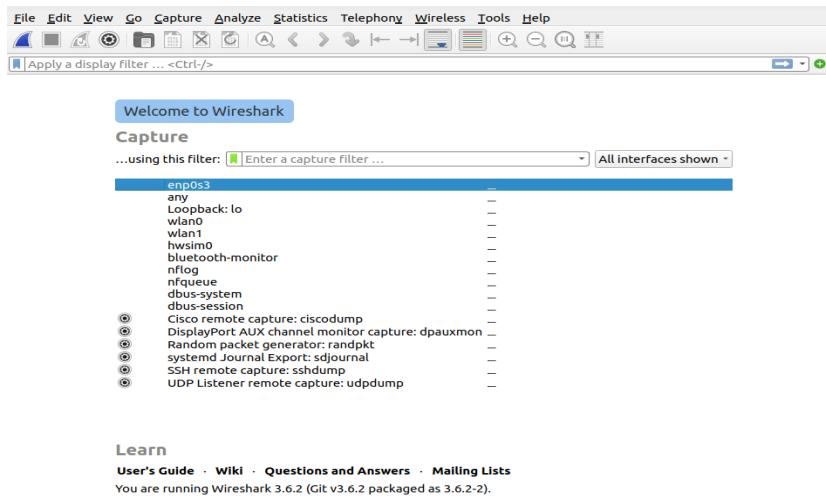
1) Install Wireshark, take capture on WiFi interface

sudo apt update

sudo apt install wireshark

1. Identify the beacon frame using filter.

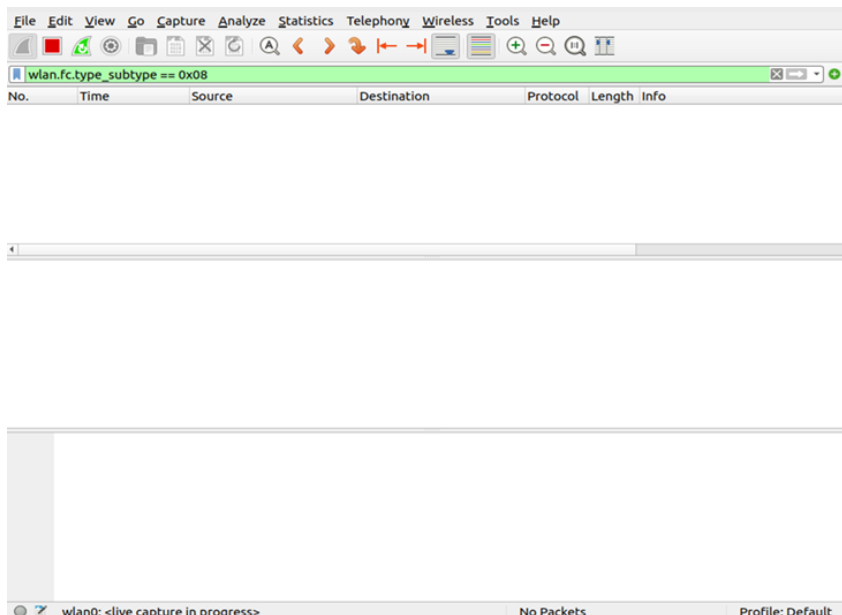
sudo wireshark



Ready to load or capture No Packets Profile: Default

2. Apply filters to view specific packet.

wlan.fc.type_subtype == 0x08



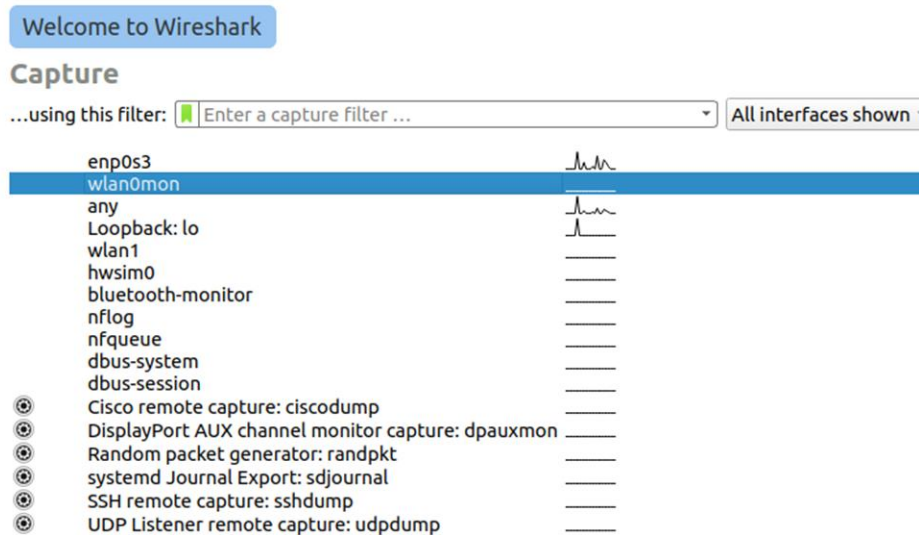
3. Decrypt the wireshark pcap using passphrase, to view the encrypted packets.

`sudo airmon-ng start wlan0`

`sudo tcpdump -i wlan0 -s 0 -w capture.pcap`

`sudo dumpcap -i wlan0 -w capture.pcap`

`wireshark capture.pcap`



Learn

Installation of airmon-ng

`sudo apt update`

`sudo apt install aircrack-ng`

`iwconfig`

`sudo airmon-ng start wlan0`

```
Terminal
user@user-VirtualBox:~$ sudo ip link set wlan0 down
[sudo] password for user:
user@user-VirtualBox:~$ sudo ip link set wlan0 up
user@user-VirtualBox:~$
user@user-VirtualBox:~$ sudo airmon-ng start wlan0
sudo: airmon-ng: command not found
user@user-VirtualBox:~$ sudo apt update
Hit:1 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Get:3 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Hit:4 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
Fetched 257 kB in 2s (138 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.
user@user-VirtualBox:~$ sudo apt install aircrack-ng
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  hwloc ieee-data libhwloc-plugins libhwloc15 libixnvcrt10
Suggested packages:
```

```
Terminal
The following additional packages will be installed:
  hwloc ieee-data libhwloc-plugins libhwloc15 libxnvctrl0
Suggested packages:
  gpsd libhwloc-contrib-plugins
The following NEW packages will be installed:
  aircrack-ng hwloc ieee-data libhwloc-plugins libhwloc15 libxnvctrl0
0 upgraded, 6 newly installed, 0 to remove and 3 not upgraded.
Need to get 2,812 kB of archives.
After this operation, 15.5 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 libhwloc1
5 amd64 2.7.0-2ubuntu1 [159 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 hwloc amd
64 2.7.0-2ubuntu1 [223 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu jammy/universe amd64 aircrack-ng amd64
1:1.6+git20210130.91820bc-2 [516 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 ieee-data all 2021060
5.1 [1,887 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 libxnvctrl0 amd64 510
.47.03-0ubuntu1 [11.5 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 libhwloc-
plugins amd64 2.7.0-2ubuntu1 [15.6 kB]
Fetched 2,812 kB in 4s (743 kB/s)
Selecting previously unselected package libhwloc15:amd64.
```

```
Terminal
The following additional packages will be installed:
  hwloc ieee-data libhwloc-plugins libhwloc15 libxnvctrl0
Suggested packages:
  gpsd libhwloc-contrib-plugins
The following NEW packages will be installed:
  aircrack-ng hwloc ieee-data libhwloc-plugins libhwloc15 libxnvctrl0
0 upgraded, 6 newly installed, 0 to remove and 3 not upgraded.
Need to get 2,812 kB of archives.
After this operation, 15.5 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 libhwloc1
5 amd64 2.7.0-2ubuntu1 [159 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 hwloc amd
64 2.7.0-2ubuntu1 [223 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu jammy/universe amd64 aircrack-ng amd64
1:1.6+git20210130.91820bc-2 [516 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 ieee-data all 2021060
5.1 [1,887 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 libxnvctrl0 amd64 510
.47.03-0ubuntu1 [11.5 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 libhwloc-
plugins amd64 2.7.0-2ubuntu1 [15.6 kB]
Fetched 2,812 kB in 4s (743 kB/s)
Selecting previously unselected package libhwloc15:amd64.
```



```
Terminal
Preparing to unpack .../2-aircrack-ng_1%3a1.6+git20210130.91820bc-2_amd64.deb ...
Unpacking aircrack-ng (1:1.6+git20210130.91820bc-2) ...
Selecting previously unselected package ieee-data.
Preparing to unpack .../3-ieee-data_20210605.1_all.deb ...
Unpacking ieee-data (20210605.1) ...
Selecting previously unselected package libxnvctrl0:amd64.
Preparing to unpack .../4-libxnvctrl0_510.47.03-0ubuntu1_amd64.deb ...
Unpacking libxnvctrl0:amd64 (510.47.03-0ubuntu1) ...
Selecting previously unselected package libhwloc-plugins:amd64.
Preparing to unpack .../5-libhwloc-plugins_2.7.0-2ubuntu1_amd64.deb ...
Unpacking libhwloc-plugins:amd64 (2.7.0-2ubuntu1) ...
Setting up libxnvctrl0:amd64 (510.47.03-0ubuntu1) ...
Setting up libhwloc15:amd64 (2.7.0-2ubuntu1) ...
Setting up hwloc (2.7.0-2ubuntu1) ...
Setting up ieee-data (20210605.1) ...
Setting up libhwloc-plugins:amd64 (2.7.0-2ubuntu1) ...
Setting up aircrack-ng (1:1.6+git20210130.91820bc-2) ...
Processing triggers for desktop-file-utils (0.26-1ubuntu3) ...
Processing triggers for gnome-menus (3.36.0-1ubuntu3) ...
Processing triggers for libc-bin (2.35-0ubuntu3.8) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for mailcap (3.70+nmu1ubuntu1) ...
user@user-VirtualBox:~$ iwconfig
```

```
Terminal
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for mailcap (3.70+nmu1ubuntu1) ...
user@user-VirtualBox:~$ iwconfig
lo        no wireless extensions.

enp0s3    no wireless extensions.

wlan0     IEEE 802.11  ESSID:off/any
          Mode:Managed  Access Point: Not-Associated   Tx-Power=20 dBm
          Retry short limit:7   RTS thr:off   Fragment thr:off
          Power Management:off

wlan1     IEEE 802.11  ESSID:off/any
          Mode:Managed  Access Point: Not-Associated   Tx-Power=20 dBm
          Retry short limit:7   RTS thr:off   Fragment thr:off
          Power Management:off

hwsim0    no wireless extensions.

user@user-VirtualBox:~$ sudo airmon-ng start wlan0

Found 4 processes that could cause trouble.
Kill them using 'airmon-ng check kill' before putting
the card in monitor mode, they will interfere by changing channels
```

```
Terminal
and sometimes putting the interface back in managed mode

PID Name
547 avahi-daemon
558 NetworkManager
612 wpa_supplicant
629 avahi-daemon

Requested device "WLAN0" does not exist.
Run /usr/sbin/airmon-ng without any arguments to see available interfaces
user@user-VirtualBox:~$ sudo airmon-ng start wlan0

Found 4 processes that could cause trouble.
Kill them using 'airmon-ng check kill' before putting
the card in monitor mode, they will interfere by changing channels
and sometimes putting the interface back in managed mode

PID Name
547 avahi-daemon
558 NetworkManager
612 wpa_supplicant
629 avahi-daemon

PHY      Interface      Driver      Chipset
```

```
Terminal
629 avahi-daemon

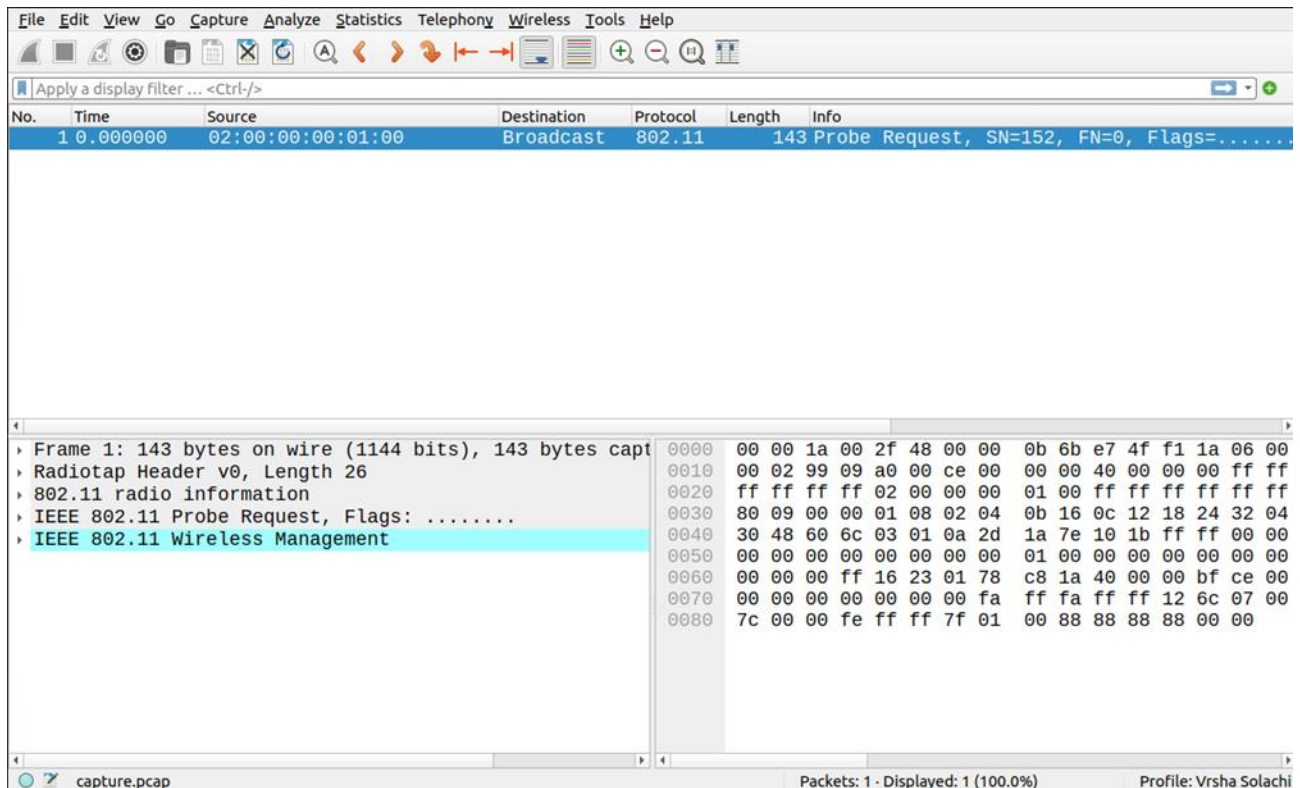
PHY      Interface      Driver      Chipset
phy0     wlan0           mac80211_hwsim  Software simulator of 802.11 radio(s) for mac80211
(mon)    (mac80211 monitor mode vif enabled for [phy0]wlan0 on [phy0]wlan0mon)
phy1     wlan1           mac80211_hwsim  Software simulator of 802.11 radio(s) for mac80211
(mon)    (mac80211 station mode vif disabled for [phy0]wlan0)

user@user-VirtualBox:~$ sudo tcpdump -i wlan0mon -s 0 -w capture.pcap
tcpdump: listening on wlan0mon, link-type IEEE802_11_RADIO (802.11 plus radiotap header), snapshot length 262144 bytes

^C1 packet captured
1 packet received by filter
0 packets dropped by kernel
user@user-VirtualBox:~$ wireshark capture.pcap

^[[3~^[[3~
```

4. Point out ethernet and 802.11 frames.



2) Install Iperf on client and server device

1. Run TCP traffic

Server

```
user@user-VirtualBox:~$ sudo apt install iperf3
[sudo] password for user:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
iperf3 is already the newest version (3.9-1+deb11u1build0.22.04.1).
The following packages were automatically installed and are no longer required:
  libwpe-1.0-1 libwpebackend-fdo-1.0-1
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 8 not upgraded.
user@user-VirtualBox:~$ iperf3 -s
-----
Server listening on 5201
-----
Accepted connection from 127.0.0.1, port 57932
[ 5] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 57944
[ ID] Interval           Transfer     Bitrate
[ 5] 0.00-1.00 sec      5.28 GBytes  45.3 Gbits/sec
[ 5] 1.00-2.00 sec      5.49 GBytes  47.2 Gbits/sec
[ 5] 2.00-3.00 sec      4.69 GBytes  40.3 Gbits/sec
[ 5] 3.00-4.00 sec      3.96 GBytes  34.0 Gbits/sec
[ 5] 4.00-5.00 sec      3.91 GBytes  33.6 Gbits/sec
[ 5] 5.00-6.00 sec      3.91 GBytes  33.6 Gbits/sec
[ 5] 6.00-7.00 sec      3.73 GBytes  32.1 Gbits/sec
[ 5] 7.00-8.00 sec      3.85 GBytes  33.0 Gbits/sec
[ 5] 8.00-9.00 sec      3.84 GBytes  33.0 Gbits/sec
[ 5] 9.00-10.00 sec     3.87 GBytes  33.2 Gbits/sec
[ 5] 10.00-10.04 sec    149 MBytes  28.0 Gbits/sec
-----
[ ID] Interval           Transfer     Bitrate
[ 5] 0.00-10.04 sec    42.7 GBytes  36.5 Gbits/sec
-----
Server listening on 5201
[ 5]
```


Client

```
user@user-VirtualBox:~$ iperf3 -c 192.168.151.65
iperf3: error - unable to send control message: Bad file descriptor
user@user-VirtualBox:~$ iperf3 -c localhost
Connecting to host localhost, port 5201
[ 5] local 127.0.0.1 port 57944 connected to 127.0.0.1 port 5201
[ ID] Interval           Transfer     Bitrate      Retr  Cwnd
[ 5] 0.00-1.00      sec  5.51 GBytes  47.3 Gbits/sec    0   5.00 MBytes
[ 5] 1.00-2.00      sec  5.48 GBytes  47.1 Gbits/sec    2   5.00 MBytes
[ 5] 2.00-3.00      sec  4.63 GBytes  39.8 Gbits/sec    2   3.50 MBytes
[ 5] 3.00-4.00      sec  3.96 GBytes  34.0 Gbits/sec    3   3.50 MBytes
[ 5] 4.00-5.00      sec  3.94 GBytes  33.8 Gbits/sec   12   3.50 MBytes
[ 5] 5.00-6.00      sec  3.89 GBytes  33.4 Gbits/sec    7   3.50 MBytes
[ 5] 6.00-7.00      sec  3.71 GBytes  31.9 Gbits/sec   14   3.50 MBytes
[ 5] 7.00-8.00      sec  3.87 GBytes  33.2 Gbits/sec    9   3.50 MBytes
[ 5] 8.00-9.00      sec  3.81 GBytes  32.7 Gbits/sec    2   3.50 MBytes
[ 5] 9.00-10.00     sec  3.89 GBytes  33.4 Gbits/sec   11   3.50 MBytes
-----
[ ID] Interval           Transfer     Bitrate      Retr
[ 5] 0.00-10.00      sec  42.7 GBytes  36.7 Gbits/sec    62
[ 5] 0.00-10.04      sec  42.7 GBytes  36.5 Gbits/sec
                                     sender
                                     receiver

iperf Done.
user@user-VirtualBox:~$
```

2. Run UDP traffic

Server

```
Accepted connection from 127.0.0.1, port 52812
[ 5] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 36020
[ ID] Interval           Transfer     Bitrate      Jitter    Lost/Total Datagrams
[ 5] 0.00-1.00      sec  128 KBytes  1.05 Mbits/sec  0.001 ms   0/4 (0%)
[ 5] 1.00-2.00      sec  128 KBytes  1.05 Mbits/sec  0.002 ms   0/4 (0%)
Terminal [ 5] 2.00-3.00      sec  128 KBytes  1.05 Mbits/sec  0.006 ms   0/4 (0%)
[ 5] 3.00-4.00      sec  128 KBytes  1.05 Mbits/sec  0.006 ms   0/4 (0%)
[ 5] 4.00-5.00      sec  128 KBytes  1.05 Mbits/sec  0.005 ms   0/4 (0%)
[ 5] 5.00-6.00      sec  128 KBytes  1.05 Mbits/sec  0.005 ms   0/4 (0%)
[ 5] 6.00-7.00      sec  128 KBytes  1.05 Mbits/sec  0.005 ms   0/4 (0%)
[ 5] 7.00-8.00      sec  128 KBytes  1.05 Mbits/sec  0.007 ms   0/4 (0%)
[ 5] 8.00-9.00      sec  128 KBytes  1.05 Mbits/sec  0.008 ms   0/4 (0%)
[ 5] 9.00-10.00     sec  128 KBytes  1.05 Mbits/sec  0.008 ms   0/4 (0%)
-----
[ ID] Interval           Transfer     Bitrate      Jitter    Lost/Total Datagrams
[ 5] 0.00-10.05      sec  1.25 MBytes  1.04 Mbits/sec  0.008 ms  0/40 (0%) receiver
-----
Server listening on 5201
-----
```

Client

```
user@user-VirtualBox:~$ iperf3 -c localhost -u
Connecting to host localhost, port 5201
[ 5] local 127.0.0.1 port 36020 connected to 127.0.0.1 port 5201
[ ID] Interval           Transfer     Bitrate        Total Datagrams
[ 5] 0.00-1.00 sec      128 KBytes  1.05 Mbits/sec  4
[ 5] 1.00-2.00 sec      128 KBytes  1.05 Mbits/sec  4
[ 5] 2.00-3.00 sec      128 KBytes  1.05 Mbits/sec  4
[ 5] 3.00-4.00 sec      128 KBytes  1.05 Mbits/sec  4
[ 5] 4.00-5.00 sec      128 KBytes  1.05 Mbits/sec  4
[ 5] 5.00-6.00 sec      128 KBytes  1.05 Mbits/sec  4
[ 5] 6.00-7.00 sec      128 KBytes  1.05 Mbits/sec  4
[ 5] 7.00-8.00 sec      128 KBytes  1.05 Mbits/sec  4
[ 5] 8.00-9.00 sec      128 KBytes  1.05 Mbits/sec  4
[ 5] 9.00-10.00 sec     128 KBytes  1.05 Mbits/sec  4
-----
[ ID] Interval           Transfer     Bitrate        Jitter    Lost/Total Datagrams
[ 5] 0.00-10.00 sec     1.25 MBytes  1.05 Mbits/sec  0.000 ms  0/40 (0%) sender
[ 5] 0.00-10.05 sec     1.25 MBytes  1.04 Mbits/sec  0.008 ms  0/40 (0%) receiver

iperf Done.
user@user-VirtualBox:~$
```

Check for the bandwidth and drops reported in the results.

```
user@user-VirtualBox:~$ iperf -s -p 1234
listener bind failed: Address already in use
user@user-VirtualBox:~$ iperf -s -p 1233
-----
Server listening on TCP port 1233
TCP window size: 128 KByte (default)
-----
[ 1] local 10.0.2.15 port 1233 connected with 10.0.2.15 port 38972
[ ID] Interval           Transfer     Bandwidth
[ 1] 0.0000-10.0015 sec  49.5 GBytes  42.5 Gbits/sec
```

```
user@user-VirtualBox:~$ iperf -c 10.0.2.15 -p 1233
-----
Client connecting to 10.0.2.15, TCP port 1233
TCP window size: 2.50 MByte (default)
-----
[ 1] local 10.0.2.15 port 38972 connected with 10.0.2.15 port 1233
[ ID] Interval           Transfer     Bandwidth
[ 1] 0.0000-10.0139 sec  49.5 GBytes  42.5 Gbits/sec
user@user-VirtualBox:~$
```