

Измерение производительности для трафика UDP

В [прошлой публикации](#) было рассмотрено измерение производительности сетевых операций для платы HiFive Unleashed с операционной системой Linux на [базе ядра 5.2.9](#) с помощью программы iperf3 и заданного по умолчанию протокола TCP. Измерения показали, что скорость сетевого обмена в значительной мере определяется возможностями платы и ядра Linux, а параметрами управления потоком данных в реализации протокола TCP. Поскольку для нас основной интерес представляют возможности процессоров Freedom U540, установленных на плате HiFive Unleashed и собранного специально для этой платы ядра Linux 5.2.9, было принято решение провести измерения скорости сетевого обмена по протоколу UDP.

В этом случае активного сетевого обмена между участвующими в тесте хостами не происходит. Хост-клиент генерирует трафик UDP с заданной в командной строке скоростью, а хост-сервер определяет скорость получения пакетов, а также число потерянных пакетов и по завершению каждого теста передает результаты клиенту по протоколу TCP. Трафик TCP невелик и существенного влияния на измерение производительности не оказывает.

В тесте применялась плата HiFive Unleashed с ОС Linux на базе специально собранного ядра версии 5.2.9 и хост x86_64 с двумя процессорами Xeon (суммарно 40 ядер). Сначала измерения проводились с клиентом HiFive и сервером x86_64, затем хосты менялись ролями

Клиент HiFive

Принятая по умолчанию скорость (1 Мбит/с)

```
root@freedom-u540:~# iperf3 -c 192.168.0.10 -u
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 52003 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec 129 KBytes   1.05 Mbits/sec 91
[ 5] 1.00-2.00    sec 127 KBytes   1.04 Mbits/sec 90
[ 5] 2.00-3.00    sec 129 KBytes   1.05 Mbits/sec 91
[ 5] 3.00-4.00    sec 127 KBytes   1.04 Mbits/sec 90
[ 5] 4.00-5.00    sec 129 KBytes   1.05 Mbits/sec 91
[ 5] 5.00-6.00    sec 127 KBytes   1.04 Mbits/sec 90
[ 5] 6.00-7.00    sec 129 KBytes   1.05 Mbits/sec 91
[ 5] 7.00-8.00    sec 127 KBytes   1.04 Mbits/sec 90
[ 5] 8.00-9.00    sec 129 KBytes   1.05 Mbits/sec 91
[ 5] 9.00-10.00   sec 127 KBytes   1.04 Mbits/sec 90
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec 1.25 MBytes   1.05 Mbits/sec 0.000 ms 0/905 (0%) sender
[ 5] 0.00-10.00   sec 1.25 MBytes   1.05 Mbits/sec 0.014 ms 0/905 (0%) receiver
iperf Done.
```

2 Мбит/с

```
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 45936 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec 245 KBytes   2.00 Mbits/sec 173
[ 5] 1.00-2.00    sec 245 KBytes   2.00 Mbits/sec 173
[ 5] 2.00-3.00    sec 243 KBytes   1.99 Mbits/sec 172
[ 5] 3.00-4.00    sec 245 KBytes   2.00 Mbits/sec 173
[ 5] 4.00-5.00    sec 245 KBytes   2.00 Mbits/sec 173
[ 5] 5.00-6.00    sec 243 KBytes   1.99 Mbits/sec 172
[ 5] 6.00-7.00    sec 245 KBytes   2.00 Mbits/sec 173
[ 5] 7.00-8.00    sec 245 KBytes   2.00 Mbits/sec 173
[ 5] 8.00-9.00    sec 243 KBytes   1.99 Mbits/sec 172
[ 5] 9.00-10.00   sec 245 KBytes   2.00 Mbits/sec 173
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec 2.38 MBytes   2.00 Mbits/sec 0.000 ms 0/1727 (0%) sender
[ 5] 0.00-10.00   sec 2.38 MBytes   2.00 Mbits/sec 0.019 ms 0/1727 (0%) receiver
iperf Done.
```

4 Мбит/с

```
root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 4M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 42367 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec 488 KBytes   3.99 Mbits/sec 345
[ 5] 1.00-2.00    sec 489 KBytes   4.01 Mbits/sec 346
[ 5] 2.00-3.00    sec 488 KBytes   4.00 Mbits/sec 345
[ 5] 3.00-4.00    sec 488 KBytes   4.00 Mbits/sec 345
[ 5] 4.00-5.00    sec 489 KBytes   4.01 Mbits/sec 346
[ 5] 5.00-6.00    sec 488 KBytes   4.00 Mbits/sec 345
[ 5] 6.00-7.00    sec 488 KBytes   4.00 Mbits/sec 345
[ 5] 7.00-8.00    sec 489 KBytes   4.01 Mbits/sec 346
[ 5] 8.00-9.00    sec 488 KBytes   4.00 Mbits/sec 345
[ 5] 9.00-10.00   sec 488 KBytes   4.00 Mbits/sec 345
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec 4.77 MBytes   4.00 Mbits/sec 0.000 ms 0/3453 (0%) sender
[ 5] 0.00-10.00   sec 4.77 MBytes   4.00 Mbits/sec 0.029 ms 0/3453 (0%) receiver
iperf Done.
```

8 Мбит/с

```

root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 8M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 41812 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  976 KBytes   7.98 Mbits/sec  690
[ 5] 1.00-2.00    sec  976 KBytes   7.99 Mbits/sec  690
[ 5] 2.00-3.00    sec  977 KBytes   8.00 Mbits/sec  691
[ 5] 3.00-4.00    sec  976 KBytes   7.99 Mbits/sec  690
[ 5] 4.00-5.00    sec  977 KBytes   8.00 Mbits/sec  691
[ 5] 5.00-6.00    sec  977 KBytes   8.00 Mbits/sec  691
[ 5] 6.00-7.00    sec  976 KBytes   7.99 Mbits/sec  690
[ 5] 7.00-8.00    sec  977 KBytes   8.00 Mbits/sec  691
[ 5] 8.00-9.00    sec  976 KBytes   7.99 Mbits/sec  690
[ 5] 9.00-10.00   sec  977 KBytes   8.00 Mbits/sec  691
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  9.54 MBytes   8.00 Mbits/sec  0.000 ms  0/6905 (0%)  sender
[ 5] 0.00-10.00   sec  9.54 MBytes   8.00 Mbits/sec  0.063 ms  0/6905 (0%)  receiver
iperf Done.

```

16 Мбит/с

```

root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 16M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 52891 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  1.90 MBytes  15.9 Mbits/sec  1377
[ 5] 1.00-2.00    sec  1.91 MBytes  16.0 Mbits/sec  1381
[ 5] 2.00-3.00    sec  1.91 MBytes  16.0 Mbits/sec  1382
[ 5] 3.00-4.00    sec  1.91 MBytes  16.0 Mbits/sec  1381
[ 5] 4.00-5.00    sec  1.91 MBytes  16.0 Mbits/sec  1381
[ 5] 5.00-6.00    sec  1.91 MBytes  16.0 Mbits/sec  1381
[ 5] 6.00-7.00    sec  1.91 MBytes  16.0 Mbits/sec  1381
[ 5] 7.00-8.00    sec  1.91 MBytes  16.0 Mbits/sec  1382
[ 5] 8.00-9.00    sec  1.91 MBytes  16.0 Mbits/sec  1381
[ 5] 9.00-10.00   sec  1.91 MBytes  16.0 Mbits/sec  1381
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  19.1 MBytes  16.0 Mbits/sec  0.000 ms  0/13808 (0%)  sender
[ 5] 0.00-10.00   sec  19.1 MBytes  16.0 Mbits/sec  0.074 ms  0/13808 (0%)  receiver
iperf Done.

```

32 Мбит/с

```

root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 32M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 34927 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  3.81 MBytes  31.9 Mbits/sec  2760
[ 5] 1.00-2.00    sec  3.81 MBytes  32.0 Mbits/sec  2762
[ 5] 2.00-3.00    sec  3.82 MBytes  32.0 Mbits/sec  2763
[ 5] 3.00-4.00    sec  3.81 MBytes  32.0 Mbits/sec  2762
[ 5] 4.00-5.00    sec  3.82 MBytes  32.0 Mbits/sec  2763
[ 5] 5.00-6.00    sec  3.82 MBytes  32.0 Mbits/sec  2763
[ 5] 6.00-7.00    sec  3.81 MBytes  32.0 Mbits/sec  2762
[ 5] 7.00-8.00    sec  3.81 MBytes  32.0 Mbits/sec  2762
[ 5] 8.00-9.00    sec  3.82 MBytes  32.0 Mbits/sec  2763
[ 5] 9.00-10.00   sec  3.81 MBytes  32.0 Mbits/sec  2761
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  38.1 MBytes  32.0 Mbits/sec  0.000 ms  0/27621 (0%)  sender
[ 5] 0.00-10.00   sec  38.1 MBytes  32.0 Mbits/sec  0.060 ms  0/27621 (0%)  receiver
iperf Done.

```

64 Мбит/с

```

root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 64M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 39289 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  7.62 MBytes  63.9 Mbits/sec  5516
[ 5] 1.00-2.00    sec  7.62 MBytes  64.0 Mbits/sec  5521
[ 5] 2.00-3.00    sec  7.62 MBytes  63.9 Mbits/sec  5516
[ 5] 3.00-4.00    sec  7.65 MBytes  64.1 Mbits/sec  5538
[ 5] 4.00-5.00    sec  7.64 MBytes  64.1 Mbits/sec  5531
[ 5] 5.00-6.00    sec  7.63 MBytes  64.0 Mbits/sec  5522
[ 5] 6.00-7.00    sec  7.62 MBytes  64.0 Mbits/sec  5521
[ 5] 7.00-8.00    sec  7.64 MBytes  64.1 Mbits/sec  5532
[ 5] 8.00-9.00    sec  7.61 MBytes  63.8 Mbits/sec  5509
[ 5] 9.00-10.00   sec  7.65 MBytes  63.9 Mbits/sec  5539
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  76.3 MBytes  64.0 Mbits/sec  0.000 ms  0/55245 (0%)  sender
[ 5] 0.00-10.00   sec  76.3 MBytes  64.0 Mbits/sec  0.073 ms  0/55245 (0%)  receiver
iperf Done.

```

128 Мбит/с

```

root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 128M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 49324 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  10.6 MBytes  88.6 Mbits/sec  7650
[ 5] 1.00-2.00    sec  10.6 MBytes  88.7 Mbits/sec  7658
[ 5] 2.00-3.00    sec  10.6 MBytes  89.1 Mbits/sec  7689
[ 5] 3.00-4.00    sec  10.6 MBytes  88.6 Mbits/sec  7645
[ 5] 4.00-5.00    sec  10.5 MBytes  88.3 Mbits/sec  7623
[ 5] 5.00-6.00    sec  10.5 MBytes  87.9 Mbits/sec  7590
[ 5] 6.00-7.00    sec  10.4 MBytes  87.6 Mbits/sec  7563
[ 5] 7.00-8.00    sec  10.4 MBytes  87.4 Mbits/sec  7549
[ 5] 8.00-9.00    sec  10.7 MBytes  90.0 Mbits/sec  7766
[ 5] 9.00-10.00   sec  10.7 MBytes  90.0 Mbits/sec  7771
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  106 MBytes  88.6 Mbits/sec  0.000 ms  0/76504 (0%) sender
[ 5] 0.00-10.00   sec  106 MBytes  88.6 Mbits/sec  0.077 ms  0/76504 (0%) receiver
iperf Done.

```

256 Мбит/с

```

root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 256M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 50317 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  10.6 MBytes  88.6 Mbits/sec  7650
[ 5] 1.00-2.00    sec  10.6 MBytes  88.7 Mbits/sec  7660
[ 5] 2.00-3.00    sec  10.6 MBytes  88.9 Mbits/sec  7676
[ 5] 3.00-4.00    sec  10.7 MBytes  89.4 Mbits/sec  7718
[ 5] 4.00-5.00    sec  10.6 MBytes  89.0 Mbits/sec  7687
[ 5] 5.00-6.00    sec  10.6 MBytes  88.9 Mbits/sec  7673
[ 5] 6.00-7.00    sec  10.6 MBytes  88.9 Mbits/sec  7678
[ 5] 7.00-8.00    sec  10.7 MBytes  89.8 Mbits/sec  7752
[ 5] 8.00-9.00    sec  10.7 MBytes  89.7 Mbits/sec  7741
[ 5] 9.00-10.00   sec  10.7 MBytes  89.5 Mbits/sec  7725
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  106 MBytes  89.1 Mbits/sec  0.000 ms  0/76960 (0%) sender
[ 5] 0.00-10.00   sec  106 MBytes  89.1 Mbits/sec  0.083 ms  0/76960 (0%) receiver
iperf Done.

```

512 Мбит/с

```

root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 512M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 44858 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  8.35 MBytes  70.0 Mbits/sec  6046
[ 5] 1.00-2.00    sec  8.50 MBytes  71.3 Mbits/sec  6152
[ 5] 2.00-3.00    sec  8.45 MBytes  70.9 Mbits/sec  6122
[ 5] 3.00-4.00    sec  7.75 MBytes  65.0 Mbits/sec  5615
[ 5] 4.00-5.00    sec  7.66 MBytes  64.3 Mbits/sec  5548
[ 5] 5.00-6.00    sec  7.64 MBytes  64.1 Mbits/sec  5530
[ 5] 6.00-7.00    sec  7.62 MBytes  63.9 Mbits/sec  5517
[ 5] 7.00-8.00    sec  7.77 MBytes  65.2 Mbits/sec  5627
[ 5] 8.00-9.00    sec  7.77 MBytes  65.1 Mbits/sec  5624
[ 5] 9.00-10.00   sec  7.72 MBytes  64.8 Mbits/sec  5594
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  79.2 MBytes  66.5 Mbits/sec  0.000 ms  0/57375 (0%) sender
[ 5] 0.00-10.00   sec  79.2 MBytes  66.5 Mbits/sec  0.021 ms  0/57375 (0%) receiver
iperf Done.

```

1000 Мбит/с

```

root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 1000M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 56734 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  7.69 MBytes  64.5 Mbits/sec  5571
[ 5] 1.00-2.00    sec  7.69 MBytes  64.5 Mbits/sec  5570
[ 5] 2.00-3.00    sec  7.69 MBytes  64.6 Mbits/sec  5572
[ 5] 3.00-4.00    sec  7.67 MBytes  64.3 Mbits/sec  5554
[ 5] 4.00-5.00    sec  7.67 MBytes  64.3 Mbits/sec  5555
[ 5] 5.00-6.00    sec  7.63 MBytes  64.0 Mbits/sec  5527
[ 5] 6.00-7.00    sec  7.62 MBytes  63.9 Mbits/sec  5520
[ 5] 7.00-8.00    sec  7.68 MBytes  64.5 Mbits/sec  5565
[ 5] 8.00-9.00    sec  7.65 MBytes  64.2 Mbits/sec  5540
[ 5] 9.00-10.00   sec  7.63 MBytes  64.0 Mbits/sec  5522
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  76.6 MBytes  64.3 Mbits/sec  0.000 ms  0/55496 (0%) sender
[ 5] 0.00-10.00   sec  76.6 MBytes  64.3 Mbits/sec  0.033 ms  0/55496 (0%) receiver
iperf Done.

```

Вывод на стороне клиента (и сервера тоже) потери пакетов не показывал, поскольку скоростные ограничения возникали на стороне генерирующего трафик клиента, а сеть между клиентом и сервером не была загружена и в ней пакеты не терялись. Производительности сервера в этом тесте было достаточно для обработки пакетов со скоростью среды.

Из приведённых результатов и графика (Рисунок 1) видно, что в диапазоне скоростей передачи трафика клиентом HiFive между 64 и 128 Мбит/с наступает насыщение, а затем даже некоторое снижение определяемой iperf3 скорости и числа переданных дейтаграмм. Исследуем интервал скоростей 64-256 Мбит/с более подробно.

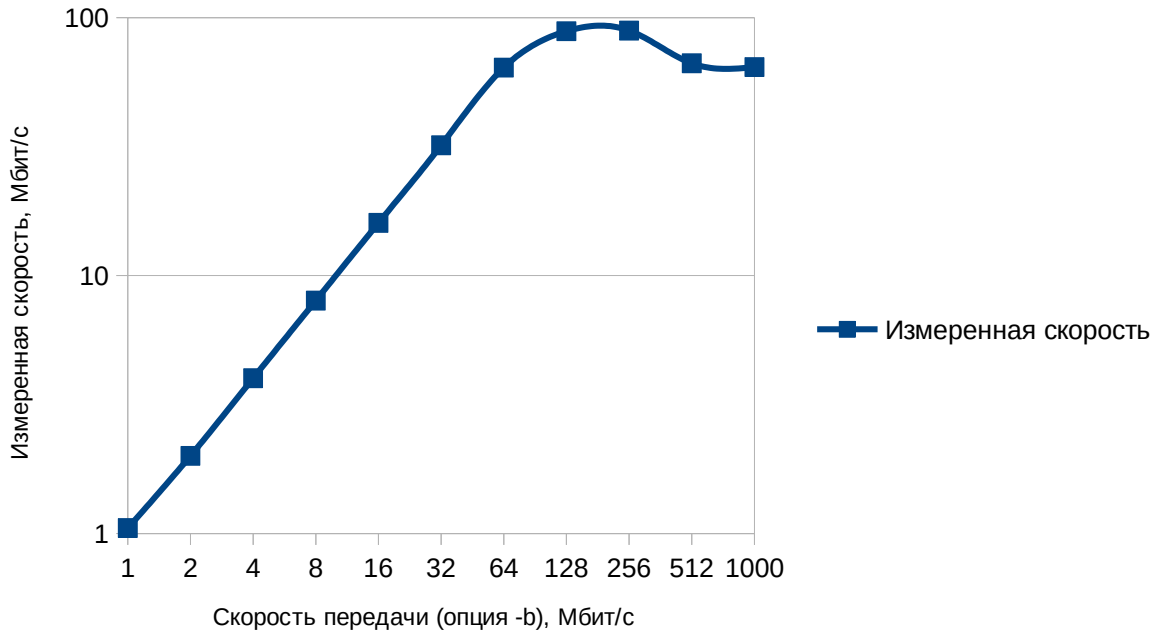


Рисунок 1. Зависимость измеренной скорости от значения опции iperf3 -b.

Поведение в интервале скоростей 64 — 128 Мбит/с

При скорости 70 Мбит/с скорость передачи, заданная в iperf3 еще совпадает с измеренной скоростью, как можно видеть из приведенного ниже вывода

```
root@freedom-u540:~# iperf3 -c 192.168.0.10 -u -b 70M
Connecting to host 192.168.0.10, port 5201
[ 5] local 192.168.0.3 port 39737 connected to 192.168.0.10 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec 8.33 MBytes  69.8 Mbits/sec 6030
[ 5] 1.00-2.00    sec 8.33 MBytes  69.9 Mbits/sec 6032
[ 5] 2.00-3.00    sec 8.34 MBytes  70.0 Mbits/sec 6043
[ 5] 3.00-4.00    sec 8.36 MBytes  70.2 Mbits/sec 6055
[ 5] 4.00-5.00    sec 8.35 MBytes  70.0 Mbits/sec 6049
[ 5] 5.00-6.00    sec 8.34 MBytes  70.0 Mbits/sec 6040
[ 5] 6.00-7.00    sec 8.32 MBytes  69.8 Mbits/sec 6027
[ 5] 7.00-8.00    sec 8.35 MBytes  70.0 Mbits/sec 6044
[ 5] 8.00-9.00    sec 8.37 MBytes  70.2 Mbits/sec 6059
[ 5] 9.00-10.00   sec 8.35 MBytes  70.1 Mbits/sec 6048

[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec 83.4 MBytes  70.0 Mbits/sec 0.000 ms    0/60427 (0%) sender
[ 5] 0.00-10.00   sec 83.4 MBytes  70.0 Mbits/sec 0.072 ms    0/60427 (0%) receiver
```

iperf Done.

Заметное насыщение начинается в интервале скоростей 71 - 72 Мбит/с. Не будем загромождать текст подробным выводом измерений в диапазоне и покажем лишь график усредненных по нескольким измерениям значений скорости в зависимости параметра -b в команде iperf3. Отметим, что при скорости передачи выше 70 Мбит/с утилита top показывала близкую к 100% загрузку процессора, поэтому результаты iperf3 отличались от измерения к измерению и на графике (Рисунок 2) приведены усреднённые значения.

С момента насыщения, как можно видеть из приведённого выше вывода для скоростей выше 64 Мбит/с измеренная скорость в каждом интервале iperf3 колеблется в значительных пределах. Это обусловлено тем, что генерация пакетов iperf3 практически полностью загружает процессоры, поэтому реальная скорость генерации зависит от текущей загрузки процессоров фоновыми задачами с высоким приоритетом (системные процессы).

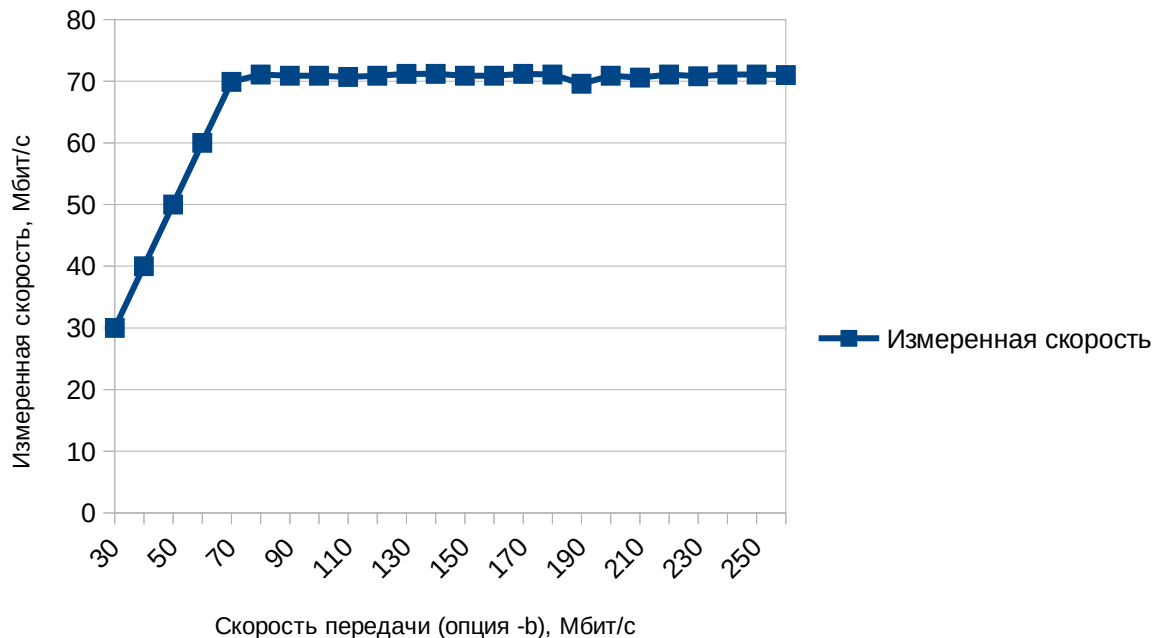


Рисунок 2. Насыщение скорости передачи трафика UDP.

Сервер HiFive

Принятая по умолчанию скорость (1 Мбит/с)

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 42358 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer    Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec      129 KBytes  1.05 Mbits/sec  91
[ 5] 1.00-2.00    sec      127 KBytes  1.04 Mbits/sec  90
[ 5] 2.00-3.00    sec      129 KBytes  1.05 Mbits/sec  91
[ 5] 3.00-4.00    sec      127 KBytes  1.04 Mbits/sec  90
[ 5] 4.00-5.00    sec      129 KBytes  1.05 Mbits/sec  91
[ 5] 5.00-6.00    sec      129 KBytes  1.05 Mbits/sec  91
[ 5] 6.00-7.00    sec      127 KBytes  1.04 Mbits/sec  90
[ 5] 7.00-8.00    sec      129 KBytes  1.05 Mbits/sec  91
[ 5] 8.00-9.00    sec      127 KBytes  1.04 Mbits/sec  90
[ 5] 9.00-10.00   sec      129 KBytes  1.05 Mbits/sec  91
-----
[ ID] Interval      Transfer    Bitrate      Jitter    Lost/Total Datagrams
[ 5] 0.00-10.00   sec      1.25 MBytes  1.05 Mbits/sec  0.000 ms  0/906 (0%) sender
[ 5] 0.00-10.00   sec      1.25 MBytes  1.05 Mbits/sec  0.005 ms  0/906 (0%) receiver
```

iperf Done.
2 Мбит/с

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 2M
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 37942 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer    Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec      245 KBytes  2.00 Mbits/sec  173
[ 5] 1.00-2.00    sec      245 KBytes  2.00 Mbits/sec  173
[ 5] 2.00-3.00    sec      243 KBytes  1.99 Mbits/sec  172
[ 5] 3.00-4.00    sec      245 KBytes  2.00 Mbits/sec  173
[ 5] 4.00-5.00    sec      245 KBytes  2.00 Mbits/sec  173
[ 5] 5.00-6.00    sec      243 KBytes  1.99 Mbits/sec  172
[ 5] 6.00-7.00    sec      245 KBytes  2.00 Mbits/sec  173
[ 5] 7.00-8.00    sec      245 KBytes  2.00 Mbits/sec  173
[ 5] 8.00-9.00    sec      243 KBytes  1.99 Mbits/sec  172
[ 5] 9.00-10.00   sec      245 KBytes  2.00 Mbits/sec  173
-----
[ ID] Interval      Transfer    Bitrate      Jitter    Lost/Total Datagrams
[ 5] 0.00-10.00   sec      2.38 MBytes  2.00 Mbits/sec  0.000 ms  0/1727 (0%) sender
[ 5] 0.00-10.00   sec      2.38 MBytes  2.00 Mbits/sec  0.006 ms  0/1727 (0%) receiver
```

iperf Done.
4 Мбит/с

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 4M
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 54584 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer    Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec      488 KBytes  4.00 Mbits/sec  345
[ 5] 1.00-2.00    sec      489 KBytes  4.01 Mbits/sec  346
[ 5] 2.00-3.00    sec      488 KBytes  4.00 Mbits/sec  345
[ 5] 3.00-4.00    sec      488 KBytes  4.00 Mbits/sec  345
[ 5] 4.00-5.00    sec      489 KBytes  4.01 Mbits/sec  346
[ 5] 5.00-6.00    sec      488 KBytes  4.00 Mbits/sec  345
[ 5] 6.00-7.00    sec      488 KBytes  4.00 Mbits/sec  345
[ 5] 7.00-8.00    sec      489 KBytes  4.01 Mbits/sec  346
[ 5] 8.00-9.00    sec      488 KBytes  4.00 Mbits/sec  345
[ 5] 9.00-10.00   sec      488 KBytes  4.00 Mbits/sec  345
-----
[ ID] Interval      Transfer    Bitrate      Jitter    Lost/Total Datagrams
[ 5] 0.00-10.00   sec      4.77 MBytes  4.00 Mbits/sec  0.000 ms  0/3453 (0%) sender
[ 5] 0.00-10.00   sec      4.77 MBytes  4.00 Mbits/sec  0.023 ms  0/3453 (0%) receiver
```

iperf Done.

8 Мбит/с

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 8M
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 42485 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  976 KBytes   7.99 Mb/s    690
[ 5] 1.00-2.00    sec  977 KBytes   8.00 Mb/s    691
[ 5] 2.00-3.00    sec  977 KBytes   8.00 Mb/s    691
[ 5] 3.00-4.00    sec  976 KBytes   7.99 Mb/s    690
[ 5] 4.00-5.00    sec  977 KBytes   8.00 Mb/s    691
[ 5] 5.00-6.00    sec  977 KBytes   8.00 Mb/s    691
[ 5] 6.00-7.00    sec  976 KBytes   7.99 Mb/s    690
[ 5] 7.00-8.00    sec  977 KBytes   8.00 Mb/s    691
[ 5] 8.00-9.00    sec  976 KBytes   7.99 Mb/s    690
[ 5] 9.00-10.00   sec  977 KBytes   8.00 Mb/s    691
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  9.54 MBytes  8.00 Mb/s    0.000 ms   0/6906 (0%) sender
[ 5] 0.00-10.00   sec  9.54 MBytes  8.00 Mb/s    0.005 ms   0/6906 (0%) receiver

iperf Done.
```

16 Мбит/с

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 16M
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 51701 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  1.91 MBytes  16.0 Mb/s    1380
[ 5] 1.00-2.00    sec  1.91 MBytes  16.0 Mb/s    1382
[ 5] 2.00-3.00    sec  1.91 MBytes  16.0 Mb/s    1381
[ 5] 3.00-4.00    sec  1.91 MBytes  16.0 Mb/s    1381
[ 5] 4.00-5.00    sec  1.91 MBytes  16.0 Mb/s    1381
[ 5] 5.00-6.00    sec  1.91 MBytes  16.0 Mb/s    1382
[ 5] 6.00-7.00    sec  1.91 MBytes  16.0 Mb/s    1381
[ 5] 7.00-8.00    sec  1.91 MBytes  16.0 Mb/s    1381
[ 5] 8.00-9.00    sec  1.91 MBytes  16.0 Mb/s    1381
[ 5] 9.00-10.00   sec  1.91 MBytes  16.0 Mb/s    1381
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  19.1 MBytes  16.0 Mb/s    0.000 ms   0/13811 (0%) sender
[ 5] 0.00-10.00   sec  19.1 MBytes  16.0 Mb/s    0.027 ms   0/13811 (0%) receiver

iperf Done.
```

32 Мбит/с

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 32M
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 59259 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  3.81 MBytes  32.0 Mb/s    2761
[ 5] 1.00-2.00    sec  3.81 MBytes  32.0 Mb/s    2762
[ 5] 2.00-3.00    sec  3.81 MBytes  32.0 Mb/s    2762
[ 5] 3.00-4.00    sec  3.82 MBytes  32.0 Mb/s    2763
[ 5] 4.00-5.00    sec  3.81 MBytes  32.0 Mb/s    2762
[ 5] 5.00-6.00    sec  3.82 MBytes  32.0 Mb/s    2763
[ 5] 6.00-7.00    sec  3.81 MBytes  32.0 Mb/s    2762
[ 5] 7.00-8.00    sec  3.82 MBytes  32.0 Mb/s    2763
[ 5] 8.00-9.00    sec  3.81 MBytes  32.0 Mb/s    2762
[ 5] 9.00-10.00   sec  3.81 MBytes  32.0 Mb/s    2762
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  38.1 MBytes  32.0 Mb/s    0.000 ms   0/27622 (0%) sender
[ 5] 0.00-10.00   sec  38.1 MBytes  32.0 Mb/s    0.058 ms   0/27622 (0%) receiver

iperf Done.
```

64 Мбит/с

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 64M
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 54983 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  7.62 MBytes  63.9 Mb/s    5521
[ 5] 1.00-2.00    sec  7.63 MBytes  64.0 Mb/s    5525
[ 5] 2.00-3.00    sec  7.63 MBytes  64.0 Mb/s    5524
[ 5] 3.00-4.00    sec  7.63 MBytes  64.0 Mb/s    5525
[ 5] 4.00-5.00    sec  7.63 MBytes  64.0 Mb/s    5525
[ 5] 5.00-6.00    sec  7.63 MBytes  64.0 Mb/s    5525
[ 5] 6.00-7.00    sec  7.63 MBytes  64.0 Mb/s    5525
[ 5] 7.00-8.00    sec  7.63 MBytes  64.0 Mb/s    5525
[ 5] 8.00-9.00    sec  7.63 MBytes  64.0 Mb/s    5524
[ 5] 9.00-10.00   sec  7.63 MBytes  64.0 Mb/s    5525
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  76.3 MBytes  64.0 Mb/s    0.000 ms   0/55244 (0%) sender
[ 5] 0.00-10.00   sec  76.3 MBytes  64.0 Mb/s    0.066 ms   0/55244 (0%) receiver

iperf Done.
```

128 Мбит/с

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 128M
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 47960 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  15.2 MBytes  128 Mbits/sec  11041
[ 5] 1.00-2.00    sec  15.3 MBytes  128 Mbits/sec  11049
[ 5] 2.00-3.00    sec  15.3 MBytes  128 Mbits/sec  11050
[ 5] 3.00-4.00    sec  15.3 MBytes  128 Mbits/sec  11051
[ 5] 4.00-5.00    sec  15.3 MBytes  128 Mbits/sec  11049
[ 5] 5.00-6.00    sec  15.3 MBytes  128 Mbits/sec  11050
[ 5] 6.00-7.00    sec  15.3 MBytes  128 Mbits/sec  11049
[ 5] 7.00-8.00    sec  15.3 MBytes  128 Mbits/sec  11050
[ 5] 8.00-9.00    sec  15.3 MBytes  128 Mbits/sec  11049
[ 5] 9.00-10.00   sec  15.3 MBytes  128 Mbits/sec  11051
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  153 MBytes   128 Mbits/sec  0.000 ms  0/110489 (0%)  sender
[ 5] 0.00-10.00   sec  153 MBytes   128 Mbits/sec  0.080 ms  0/110489 (0%)  receiver

iperf Done.
```

256 Мбит/с

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 256M
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 48766 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  30.5 MBytes  256 Mbits/sec  22084
[ 5] 1.00-2.00    sec  30.5 MBytes  256 Mbits/sec  22100
[ 5] 2.00-3.00    sec  30.5 MBytes  256 Mbits/sec  22099
[ 5] 3.00-4.00    sec  30.5 MBytes  256 Mbits/sec  22099
[ 5] 4.00-5.00    sec  30.5 MBytes  256 Mbits/sec  22098
[ 5] 5.00-6.00    sec  30.5 MBytes  256 Mbits/sec  22100
[ 5] 6.00-7.00    sec  30.5 MBytes  256 Mbits/sec  22098
[ 5] 7.00-8.00    sec  30.5 MBytes  256 Mbits/sec  22100
[ 5] 8.00-9.00    sec  30.5 MBytes  256 Mbits/sec  22101
[ 5] 9.00-10.00   sec  30.5 MBytes  256 Mbits/sec  22101
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  305 MBytes   256 Mbits/sec  0.000 ms  0/220980 (0%)  sender
[ 5] 0.00-10.00   sec  219 MBytes   183 Mbits/sec  0.127 ms  62608/220852 (28%) receiver

iperf Done.
```

Вывод сервера

```
-----
Server listening on 5201
-----
Accepted connection from 192.168.0.10, port 60266
[ 5] local 192.168.0.3 port 5201 connected to 192.168.0.10 port 48766
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-1.00    sec  21.9 MBytes  183 Mbits/sec  0.104 ms  6152/21982 (28%)
[ 5] 1.00-2.00    sec  21.9 MBytes  184 Mbits/sec  0.094 ms  6237/22078 (28%)
[ 5] 2.00-3.00    sec  21.9 MBytes  183 Mbits/sec  0.101 ms  6293/22117 (28%)
[ 5] 3.00-4.00    sec  21.8 MBytes  183 Mbits/sec  0.083 ms  6273/22092 (28%)
[ 5] 4.00-5.00    sec  21.8 MBytes  183 Mbits/sec  0.090 ms  6298/22099 (28%)
[ 5] 5.00-6.00    sec  21.9 MBytes  184 Mbits/sec  0.099 ms  6269/22110 (28%)
[ 5] 6.00-7.00    sec  21.9 MBytes  183 Mbits/sec  0.114 ms  6274/22098 (28%)
[ 5] 7.00-8.00    sec  21.9 MBytes  183 Mbits/sec  0.093 ms  6259/22100 (28%)
[ 5] 8.00-9.00    sec  21.8 MBytes  183 Mbits/sec  0.114 ms  6288/22099 (28%)
[ 5] 9.00-10.00   sec  21.8 MBytes  183 Mbits/sec  0.109 ms  6265/22076 (28%)
[ 5] 10.00-10.00  sec  1.41 KBytes  17.8 Mbits/sec  0.127 ms  0/1 (0%)
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  219 MBytes   183 Mbits/sec  0.127 ms  62608/220852 (28%)  receiver

512 Мбит/с
```

```
[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 512M
Connecting to host 192.168.0.3, port 5201
[ 5] local 192.168.0.10 port 40006 connected to 192.168.0.3 port 5201
[ ID] Interval      Transfer      Bitrate      Total Datagrams
[ 5] 0.00-1.00    sec  61.0 MBytes  512 Mbits/sec  44179
[ 5] 1.00-2.00    sec  61.0 MBytes  512 Mbits/sec  44195
[ 5] 2.00-3.00    sec  61.0 MBytes  512 Mbits/sec  44192
[ 5] 3.00-4.00    sec  61.0 MBytes  512 Mbits/sec  44197
[ 5] 4.00-5.00    sec  61.0 MBytes  512 Mbits/sec  44198
[ 5] 5.00-6.00    sec  61.0 MBytes  512 Mbits/sec  44207
[ 5] 6.00-7.00    sec  61.0 MBytes  512 Mbits/sec  44205
[ 5] 7.00-8.00    sec  61.0 MBytes  512 Mbits/sec  44194
[ 5] 8.00-9.00    sec  61.0 MBytes  512 Mbits/sec  44198
[ 5] 9.00-10.00   sec  61.0 MBytes  512 Mbits/sec  44194
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec  610 MBytes   512 Mbits/sec  0.000 ms  0/441959 (0%)  sender
[ 5] 0.00-10.02   sec  209 MBytes   175 Mbits/sec  0.075 ms  290265/441703 (66%) receiver

iperf Done.
```

Вывод сервера

Server listening on 5201

Accepted connection from 192.168.0.10, port 60312

[5] local 192.168.0.3 port 5201 connected to 192.168.0.10 port 40006

[ID]	Interval	Transfer	Bitrate	Jitter	Lost/Total Datagrams
[5]	0.00-1.00	sec 20.9 MBytes	175 Mbits/sec	0.131 ms	28013/43126 (65%)
[5]	1.00-2.00	sec 20.9 MBytes	175 Mbits/sec	0.068 ms	29032/44139 (66%)
[5]	2.00-3.00	sec 20.9 MBytes	175 Mbits/sec	0.077 ms	29134/44249 (66%)
[5]	3.00-4.00	sec 20.9 MBytes	175 Mbits/sec	0.123 ms	29107/44240 (66%)
[5]	4.00-5.00	sec 20.9 MBytes	175 Mbits/sec	0.100 ms	29067/44191 (66%)
[5]	5.00-6.00	sec 20.9 MBytes	175 Mbits/sec	0.085 ms	29008/44141 (66%)
[5]	6.00-7.00	sec 20.9 MBytes	175 Mbits/sec	0.129 ms	29117/44232 (66%)
[5]	7.00-8.00	sec 20.9 MBytes	175 Mbits/sec	0.129 ms	29130/44240 (66%)
[5]	8.00-9.00	sec 20.9 MBytes	175 Mbits/sec	0.119 ms	29083/44196 (66%)
[5]	9.00-10.00	sec 20.9 MBytes	175 Mbits/sec	0.077 ms	29024/44133 (66%)
[5]	10.00-10.02	sec 376 KBytes	172 Mbits/sec	0.075 ms	550/816 (67%)

[ID]	Interval	Transfer	Bitrate	Jitter	Lost/Total Datagrams
[5]	0.00-10.02	sec 209 MBytes	175 Mbits/sec	0.075 ms	290265/441703 (66%) receiver

1000 Мбит/с

[root@Lhotze ~]# iperf3 -c 192.168.0.3 -u -b 1000M

Connecting to host 192.168.0.3, port 5201

[5] local 192.168.0.10 port 50966 connected to 192.168.0.3 port 5201

[ID]	Interval	Transfer	Bitrate	Total Datagrams
[5]	0.00-1.00	sec 114 MBytes	956 Mbits/sec	82540
[5]	1.00-2.00	sec 114 MBytes	956 Mbits/sec	82564
[5]	2.00-3.00	sec 114 MBytes	956 Mbits/sec	82560
[5]	3.00-4.00	sec 114 MBytes	956 Mbits/sec	82564
[5]	4.00-5.00	sec 114 MBytes	956 Mbits/sec	82564
[5]	5.00-6.00	sec 114 MBytes	956 Mbits/sec	82564
[5]	6.00-7.00	sec 114 MBytes	956 Mbits/sec	82560
[5]	7.00-8.00	sec 114 MBytes	956 Mbits/sec	82571
[5]	8.00-9.00	sec 114 MBytes	956 Mbits/sec	82567
[5]	9.00-10.00	sec 114 MBytes	956 Mbits/sec	82563

[ID]	Interval	Transfer	Bitrate	Jitter	Lost/Total Datagrams
[5]	0.00-10.00	sec 1.11 GBytes	956 Mbits/sec	0.000 ms	0/825617 (0%) sender
[5]	0.00-10.02	sec 209 MBytes	175 Mbits/sec	0.097 ms	673764/825232 (82%) receiver

iperf Done.

Вывод сервера

Server listening on 5201

Accepted connection from 192.168.0.10, port 60354

[5] local 192.168.0.3 port 5201 connected to 192.168.0.10 port 50966

[ID]	Interval	Transfer	Bitrate	Jitter	Lost/Total Datagrams
[5]	0.00-1.00	sec 20.9 MBytes	175 Mbits/sec	0.172 ms	65460/80582 (81%)
[5]	1.00-2.00	sec 20.9 MBytes	175 Mbits/sec	0.085 ms	67393/82502 (82%)
[5]	2.00-3.00	sec 20.9 MBytes	175 Mbits/sec	0.104 ms	67515/82633 (82%)
[5]	3.00-4.00	sec 20.9 MBytes	175 Mbits/sec	0.074 ms	67355/82470 (82%)
[5]	4.00-5.00	sec 20.9 MBytes	175 Mbits/sec	0.116 ms	67487/82594 (82%)
[5]	5.00-6.00	sec 20.9 MBytes	175 Mbits/sec	0.156 ms	67488/82601 (82%)
[5]	6.00-7.00	sec 20.9 MBytes	175 Mbits/sec	0.076 ms	67307/82432 (82%)
[5]	7.00-8.00	sec 20.9 MBytes	175 Mbits/sec	0.077 ms	67422/82545 (82%)
[5]	8.00-9.00	sec 20.9 MBytes	175 Mbits/sec	0.110 ms	67564/82680 (82%)
[5]	9.00-10.00	sec 20.9 MBytes	175 Mbits/sec	0.097 ms	67450/82569 (82%)
[5]	10.00-10.02	sec 426 KBytes	168 Mbits/sec	0.097 ms	1323/1624 (81%)

[ID]	Interval	Transfer	Bitrate	Jitter	Lost/Total Datagrams
[5]	0.00-10.02	sec 209 MBytes	175 Mbits/sec	0.097 ms	673764/825232 (82%) receiver

Клиент x86_64 (2 процессора Xeon с общим числом ядер — 40) способен генерировать большой объем трафика, поэтому в этом тесте насыщение скорости определяется возможностями приёма пакетов сервером HiFive Unleashed и насыщение наступает в диапазоне скоростей 128-256 Мбит/с, как можно видеть из графика (Рисунок 3).

Как и для случая клиента HiFive рассмотрим область начала насыщения более подробно. На рисунке 4 представлена область насыщения измеренной скорости и кривая роста ошибок (отмеченных клиентом потерь пакетов в %).

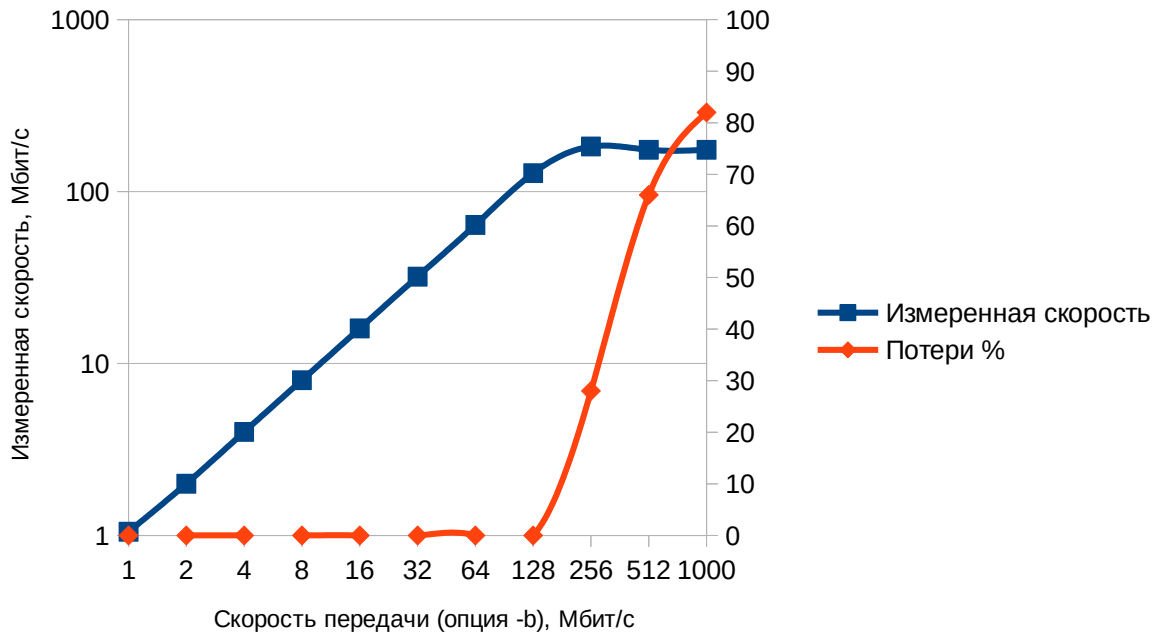


Рисунок 3. Зависимость измеренной скорости от скорости генерации пакетов клиентом x86_64 (опция iperf3 -b).

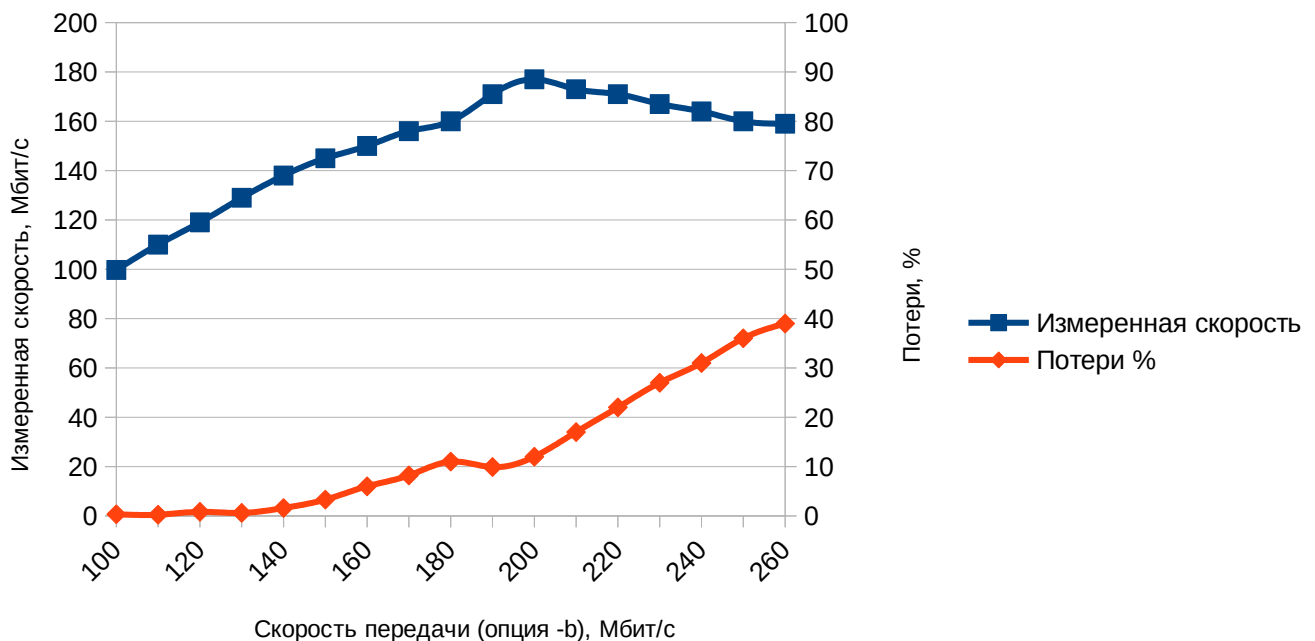


Рисунок 4. Насыщение скорости и рост числа потерянных пакетов

Здесь также программа iperf3 на стороне сервера HiFive Unleashed занимала практически все ресурсы процессора, поэтому измерение скорости и уровень потери в разных интервалах одного теста iperf3 менялись в широких пределах, как можно видеть из представленного ниже вывода для генерации тестовых пакетов клиентом со скоростью 160 Мбит/с. Это обусловлено нагрузкой на процессоры, создаваемой системными процессами, которые имеют более высокий приоритет, нежели задача iperf3.

Server listening on 5201

Accepted connection from 192.168.0.10, port 37206

```
[ 5] local 192.168.0.3 port 5201 connected to 192.168.0.10 port 56421
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-1.00    sec 17.8 MBytes  149 Mbits/sec 0.078 ms    912/13801 (6.6%)
[ 5] 1.00-2.00    sec 19.1 MBytes  160 Mbits/sec 0.099 ms     0/13809 (0%)
[ 5] 2.00-3.00    sec 18.0 MBytes  151 Mbits/sec 0.172 ms    654/13696 (4.8%)
[ 5] 3.00-4.00    sec 12.8 MBytes  107 Mbits/sec 0.165 ms   4361/13638 (32%)
[ 5] 4.00-5.00    sec 18.5 MBytes  155 Mbits/sec 0.106 ms    681/14106 (4.8%)
[ 5] 5.00-6.00    sec 17.9 MBytes  150 Mbits/sec 0.131 ms    757/13699 (5.5%)
[ 5] 6.00-7.00    sec 13.4 MBytes  112 Mbits/sec 0.191 ms   4124/13804 (30%)
[ 5] 7.00-8.00    sec 16.4 MBytes  137 Mbits/sec 0.072 ms   2071/13933 (15%)
[ 5] 8.00-9.00    sec 14.7 MBytes  124 Mbits/sec 0.195 ms   3043/13705 (22%)
[ 5] 9.00-10.00   sec 13.3 MBytes  112 Mbits/sec 0.148 ms   4134/13793 (30%)
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.00   sec 162 MBytes  136 Mbits/sec 0.148 ms   20737/137984 (15%) receiver
```

Заключение

Проведённые измерения показывают, что максимальная скорость генерации трафика UDP программой iperf3 на плате HiFive Unleashed составляет приблизительно 80 Мбит/с, а максимальная скорость приёма той же программой примерно вдвое выше. Это задёт диапазон скоростей приёма и передачи пакетов, для которых целесообразно снять профили загрузки процессоров с целью получения более подробной информации об использовании системных ресурсов и узких местах системы.

Николай Малых

nmalykh@protokols.ru