IPERF

PLANIFICACIÓN E INTEGRACIÓN DE SISTEMAS Y SERVICIOS

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APARTADO 1.a: Calidad del servicio

Definir qué son y como afectan a una conexión:

Latencia
- Definición:

  Tiempo que tarda un paquete en transmitirse dentro de una red.
- Conexión:

  Una latencia alta implica que la conexión es muy lenta y los paquetes que solicitamos tardan mucho en llegar.

Jitter
- Definición:

Es la variación en el tiempo en la que llega los paquetes al receptor.
- Conexión:

Esto produce que los paquetes lleguen más tarde de lo que deberían.

Troughput
- Definición:

Numero de datos que son transmitidos al receptor de manera correcta.
- Conexión:

Un throughput alto implica un alto porcentaje de de paquetes enviados sin fallos.

Perdida de Datagramas:
- Definición:

Cantidad de paquetes que se pierden desde el emisor al receptor.
- Conexión:

Si el numero significa que gran cantidad de los paquetes se están perdiendo.

Ancho de banda:
- Definición:

Cantidad de datos que se pueden transmitir en un tiempo determinado.
- Conexión:

Un alto ancho de banda permite que se puedan transmitir una gran cantidad de datos.

Webgrafía:
http://rcg-comunicaciones.com/optimizar-nuestra-red-mi-herramienta/
https://svcministry.org/es/dictionary/what-is-the-difference-between-jitter-and-ping/
https://www.intel.es/content/www/es/es/support/articles/000026190/network-and-i-o/wireless.html
https://es.wikipedia.org/wiki/Rendimiento_de_red
https://es.wikipedia.org/wiki/Jitter
http://www.voipforo.com/QoS/QoS_Jitter.php
https://cinglescomunicacions.com/es/que-es-la-latencia/

APARTADO 1.b: Herramienta iperf

➢ **Estudio de la herramienta iperf; propósito, uso y utilidad.**

Propósito:
Iperf es una herramienta cuya finalidad es medir el funcionamiento de una conexión red mediante la creación de flujos de datos que permiten definir el ancho de banda y el rendimiento de la conexión.

Uso:
Se utiliza mediante consola, aunque existe una interfaz gráfica de usuario (GUI) programado en java llamado jperf.

Utilidad:
Su utilidad reside en permitir al usuario ajustar varios parámetros con el fin de realizar pruebas en una red, u optimizar una red.

➢ **Documentar opciones utilizadas durante la práctica.**

En TCP:

-c <serverIp> para poder ejecutar en modo cliente

-s para la ejecución en modo servidor

En UDP:

-c -u <serverIp> para ejecutar en modo cliente

-s -u para ejecutar en modo servidor

En ambos protocolos:

-P poder determinar el número de procesos que se conectaran en paralelo al servidor

-w <tamañoVentana> para poder establecer el tamaño de la ventana/buffer

-b <numProcesos> poder indicar la cantidad de procesos que el cliente va a mandar al servidor

-B <ip> establecer la interfaz de la máquina donde se va a escuchar al servidor

➢ **Realizar diversas mediciones (variando el protocolo de transporte, el tamaño de ventana y el número de conexiones en paralelo) sobre el ancho de banda disponible entre.**

➤ Dos máquinas distintas.

Número de procesos 1, tamaño de ventana default

Servidor


```
graybastion@graybastion-Lenovo-ideapad-310-15ISK:~$ iperf -s 172.19.184.110 -p 5000
iperf: ignoring extra argument -- 172.19.184.110
------------------------------------------------------------
Server listening on TCP port 5000
TCP window size:  128 KByte (default)
------------------------------------------------------------
[  4] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50226
[ ID] Interval        Transfer      Bandwidth
[  4]  0.0-10.0 sec   22.0 MBytes   18.4 Mbits/sec
```

Cliente


```
root@rosa-VirtualBox:/home/rosa# iperf -c 172.19.184.110 -p 5000 -P 1
------------------------------------------------------------
Client connecting to 172.19.184.110, TCP port 5000
TCP window size: 85.0 KByte (default)
------------------------------------------------------------
[  3] local 192.168.1.4 port 52302 connected with 172.19.184.110 port 5000
[ ID] Interval        Transfer      Bandwidth
[  3]  0.0-10.0 sec   22.0 MBytes   18.5 Mbits/sec
```

Número de procesos 10, tamaño default

Servidor


```
graybastion@graybastion-Lenovo-ideapad-310-15ISK:~$ iperf -s 172.19.184.110 -p 5000
iperf: ignoring extra argument -- 172.19.184.110
------------------------------------------------------------
Server listening on TCP port 5000
TCP window size:  128 KByte (default)
------------------------------------------------------------
[  4] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50228
[  5] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50229
[  6] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50230
[  7] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50231
[  8] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50232
[ 10] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50234
[  9] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50233
[ 12] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50236
[ 13] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50237
[ 11] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50235
[ ID] Interval        Transfer      Bandwidth
[ 13]  0.0-10.3 sec   8.88 MBytes   7.26 Mbits/sec
[ 10]  0.0-10.3 sec   8.12 MBytes   6.64 Mbits/sec
[  4]  0.0-10.3 sec   8.50 MBytes   6.94 Mbits/sec
[  5]  0.0-10.3 sec   8.25 MBytes   6.73 Mbits/sec
[  7]  0.0-10.3 sec   13.4 MBytes   10.9 Mbits/sec
[ 11]  0.0-10.3 sec   13.8 MBytes   11.2 Mbits/sec
[ 12]  0.0-10.5 sec   7.62 MBytes   6.07 Mbits/sec
[  9]  0.0-10.6 sec   8.25 MBytes   6.54 Mbits/sec
[  6]  0.0-10.6 sec   5.50 MBytes   4.36 Mbits/sec
[  8]  0.0-10.6 sec   7.75 MBytes   6.14 Mbits/sec
[SUM]  0.0-10.6 sec   90.0 MBytes   71.3 Mbits/sec
```

Cliente

```
root@rosa-VirtualBox:/home/rosa# iperf -c 172.19.184.110 -p 5000 -P 10
------------------------------------------------------------
Client connecting to 172.19.184.110, TCP port 5000
TCP window size: 85.0 KByte (default)
------------------------------------------------------------
[ 12] local 192.168.1.4 port 52322 connected with 172.19.184.110 port 5000
[  5] local 192.168.1.4 port 52308 connected with 172.19.184.110 port 5000
[  3] local 192.168.1.4 port 52304 connected with 172.19.184.110 port 5000
[  9] local 192.168.1.4 port 52316 connected with 172.19.184.110 port 5000
[  4] local 192.168.1.4 port 52306 connected with 172.19.184.110 port 5000
[  7] local 192.168.1.4 port 52312 connected with 172.19.184.110 port 5000
[  6] local 192.168.1.4 port 52310 connected with 172.19.184.110 port 5000
[ 10] local 192.168.1.4 port 52318 connected with 172.19.184.110 port 5000
[ 11] local 192.168.1.4 port 52320 connected with 172.19.184.110 port 5000
[  8] local 192.168.1.4 port 52314 connected with 172.19.184.110 port 5000
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.2 sec  8.25 MBytes  6.81 Mbits/sec
[ 10]  0.0-10.2 sec  13.8 MBytes  11.4 Mbits/sec
[ 12]  0.0-10.2 sec  8.88 MBytes  7.33 Mbits/sec
[  3]  0.0-10.2 sec  8.50 MBytes  7.02 Mbits/sec
[  9]  0.0-10.2 sec  8.12 MBytes  6.70 Mbits/sec
[  6]  0.0-10.2 sec  13.4 MBytes  11.0 Mbits/sec
[ 11]  0.0-10.5 sec  7.62 MBytes  6.11 Mbits/sec
[  8]  0.0-10.5 sec  8.25 MBytes  6.61 Mbits/sec
[  5]  0.0-10.5 sec  5.50 MBytes  4.41 Mbits/sec
[  7]  0.0-10.5 sec  7.75 MBytes  6.21 Mbits/sec
[SUM]  0.0-10.5 sec  90.0 MBytes  72.1 Mbits/sec
```

Número de procesos 100, tamaño default

Servidor

```
graybastion@graybastion-Lenovo-ideapad-310-15ISK:~$ iperf -s 172.19.184.110 -p 5000
iperf: ignoring extra argument -- 172.19.184.110
------------------------------------------------------------
Server listening on TCP port 5000
TCP window size:  128 KByte (default)
------------------------------------------------------------
[  4] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50246
[  5] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50247
[  6] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50248
[  7] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50249
[  8] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50250
[  9] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50251
```

```
[101]  0.0-13.2 sec  1.50 MBytes  950 Kbits/sec
[ 94]  0.0-14.8 sec  217 KBytes  120 Kbits/sec
[ 84]  0.0-15.0 sec  883 KBytes  482 Kbits/sec
[ 75]  0.0-15.5 sec  227 KBytes  119 Kbits/sec
[ 77]  0.0-15.5 sec  217 KBytes  114 Kbits/sec
[ 82]  0.0-15.8 sec  234 KBytes  121 Kbits/sec
[SUM]  0.0-15.8 sec  108 MBytes  57.3 Mbits/sec
```

Cliente

```
root@rosa-VirtualBox:/home/rosa# iperf -c 172.19.184.110 -p 5000 -P 100
------------------------------------------------------------
Client connecting to 172.19.184.110, TCP port 5000
TCP window size: 85.0 KByte (default)
------------------------------------------------------------
[102] local 192.168.1.4 port 52522 connected with 172.19.184.110 port 5000
[  3] local 192.168.1.4 port 52324 connected with 172.19.184.110 port 5000
[ 14] local 192.168.1.4 port 52346 connected with 172.19.184.110 port 5000
[ 46] local 192.168.1.4 port 52410 connected with 172.19.184.110 port 5000
[  4] local 192.168.1.4 port 52326 connected with 172.19.184.110 port 5000
[  5] local 192.168.1.4 port 52328 connected with 172.19.184.110 port 5000
[ 58]   0.0-12.4 sec   1.00 MBytes    676 Kbits/sec
[ 97]   0.0-12.4 sec   1.00 MBytes    676 Kbits/sec
[ 83]   0.0-12.5 sec    883 KBytes    577 Kbits/sec
[ 40]   0.0-12.7 sec    768 KBytes    497 Kbits/sec
[100]   0.0-13.2 sec   1.50 MBytes    953 Kbits/sec
[SUM]   0.0-13.2 sec    108 MBytes   68.5 Mbits/sec
```

Número de procesos 1, tamaño 42KB

Servidor

```
^Cgraybastion@graybastion-Lenovo-ideapad-310-15ISK:~$ iperf -s 172.19.184.110 -p 5000 -w 21KB
iperf: ignoring extra argument -- 172.19.184.110
------------------------------------------------------------
Server listening on TCP port 5000
TCP window size: 42.0 KByte (WARNING: requested 21.0 KByte)
------------------------------------------------------------
[  4] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50371
[ ID] Interval        Transfer      Bandwidth
[  4]  0.0-10.9 sec   2.25 MBytes   1.74 Mbits/sec
```

Cliente

```
root@rosa-VirtualBox:/home/rosa# iperf -c 172.19.184.110 -p 5000 -P 1
------------------------------------------------------------
Client connecting to 172.19.184.110, TCP port 5000
TCP window size:  144 KByte (default)
------------------------------------------------------------
[  3] local 192.168.1.4 port 52528 connected with 172.19.184.110 port 5000
[ ID] Interval        Transfer      Bandwidth
[  3]  0.0-10.3 sec   2.25 MBytes   1.83 Mbits/sec
```

Número de procesos 1, tamaño 20KB

Servidor

```
^Cgraybastion@graybastion-Lenovo-ideapad-310-15ISK:~$ iperf -s 172.19.184.110 -p 5000 -w 10KB
iperf: ignoring extra argument -- 172.19.184.110
------------------------------------------------------------
Server listening on TCP port 5000
TCP window size: 20.0 KByte (WARNING: requested 10.0 KByte)
------------------------------------------------------------
[  4] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 50378
[ ID] Interval        Transfer      Bandwidth
[  4]  0.0-10.6 sec   2.25 MBytes   1.77 Mbits/sec
```

Cliente

```
root@rosa-VirtualBox:/home/rosa# iperf -c 172.19.184.110 -p 5000 -P 1
------------------------------------------------------------
Client connecting to 172.19.184.110, TCP port 5000
TCP window size:  144 KByte (default)
------------------------------------------------------------
[  3] local 192.168.1.4 port 52530 connected with 172.19.184.110 port 5000
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.3 sec  2.25 MBytes  1.83 Mbits/sec
```

UDP

Número de procesos 1, tamaño default

Servidor

```
^Cgraybastion@graybastion-Lenovo-ideapad-310-15ISK:~$ iperf -s 172.19.184.110 -p
000 -u
iperf: ignoring extra argument -- 172.19.184.110
------------------------------------------------------------
Server listening on UDP port 5000
Receiving 1470 byte datagrams
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 172.19.184.110 port 5000 connected with 161.67.212.187 port 41463
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total Datagrams
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.331 ms    0/  893 (0%)
```

Cliente

```
root@rosa-VirtualBox:/home/rosa# iperf -c 172.19.184.110 -p 5000 -u
------------------------------------------------------------
Client connecting to 172.19.184.110, UDP port 5000
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 161.67.212.187 port 41463 connected with 172.19.184.110 port 5000
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  3] Sent 893 datagrams
[  3] Server Report:
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893 (0%)
root@rosa-VirtualBox:/home/rosa#
```

Probar conexión UDP desde cliente

Número de procesos 10, tamaño default

Servidor

Cliente

Número de procesos 100, tamaño default

Servidor

Cliente

Número de procesos 1, tamaño 104 KB

Servidor


```
^Cgraybastion@graybastion-Lenovo-ideapad-310-15ISK:~$ iperf -s 172.19.184.110 -p 5000 -u -w 52KB
iperf: ignoring extra argument -- 172.19.184.110
------------------------------------------------------------
Server listening on UDP port 5000
Receiving 1470 byte datagrams
UDP buffer size:  104 KByte (WARNING: requested 52.0 KByte)
------------------------------------------------------------
[  3] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 59373
[ ID] Interval        Transfer     Bandwidth        Jitter   Lost/Total Datagrams
[  3]  0.0- 9.9 sec   1.25 MBytes  1.06 Mbits/sec   0.312 ms    1/  893 (0.11%)
```

Cliente


```
root@rosa-VirtualBox:/home/rosa# iperf -c 172.19.184.110 -p 5000 -P 1 -u
------------------------------------------------------------
Client connecting to 172.19.184.110, UDP port 5000
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 192.168.1.4 port 43378 connected with 172.19.184.110 port 5000
[ ID] Interval        Transfer     Bandwidth
[  3]  0.0-10.0 sec   1.25 MBytes  1.05 Mbits/sec
[  3] Sent 893 datagrams
[  3] Server Report:
[  3]  0.0- 9.9 sec   1.25 MBytes  1.06 Mbits/sec   0.000 ms    1/  893 (0%)
```

Número de procesos 10, tamaño 52 KB

Servidor


```
^Cgraybastion@graybastion-Lenovo-ideapad-310-15ISK:~$ iperf -s 172.19.184.110 -p 5000 -u -w 26KB
iperf: ignoring extra argument -- 172.19.184.110
------------------------------------------------------------
Server listening on UDP port 5000
Receiving 1470 byte datagrams
UDP buffer size: 52.0 KByte (WARNING: requested 26.0 KByte)
------------------------------------------------------------
[  3] local 172.19.184.110 port 5000 connected with 172.19.159.142 port 57789
[ ID] Interval        Transfer     Bandwidth        Jitter   Lost/Total Datagrams
[  3]  0.0-10.0 sec   1.25 MBytes  1.05 Mbits/sec   0.215 ms    0/  893 (0%)
```

Cliente


```
root@rosa-VirtualBox:/home/rosa# iperf -c 172.19.184.110 -p 5000 -P 1 -u
------------------------------------------------------------
Client connecting to 172.19.184.110, UDP port 5000
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 192.168.1.4 port 38623 connected with 172.19.184.110 port 5000
[ ID] Interval        Transfer     Bandwidth
[  3]  0.0-10.0 sec   1.25 MBytes  1.05 Mbits/sec
[  3] Sent 893 datagrams
[  3] Server Report:
[  3]  0.0-10.0 sec   1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893 (0%)
```

➤ **Una misma máquina con dos interfaces.**

En este apartado hemos tenido que crear dos interfaces distintas dentro de una misma máquina. La primera de ellas es la que se corresponde con el servidor, y la segunda, la del cliente.

Para ello, hemos usado los siguientes comandos:

```
rosa@rosa-YOGA:~$ sudo ip link add type veth
[sudo] contraseña para rosa:
rosa@rosa-YOGA:~$ sudo ip addr add 100.100.1.2/24 dev veth0
rosa@rosa-YOGA:~$ sudo ip link set dev veth0 up
```

```
rosa@rosa-YOGA:~$ sudo ip link add type veth
[sudo] contraseña para rosa:
rosa@rosa-YOGA:~$ sudo ip addr add 100.100.1.3/24 dev veth1
rosa@rosa-YOGA:~$ sudo ip link set dev veth1 up
rosa@rosa-YOGA:~$ 
```

Webgrafía usada para la creación de las dos interfaces: https://man7.org/linux/man-pages/man4/veth.4.html https://linux.die.net/man/1/iperf https://iperf.fr/iperf-doc.php

Protocolo TCP.

Tamaño de ventana dado por defecto y número de procesos 1

```
rosa@rosa-YOGA:~$ sudo ip link add type veth
[sudo] contraseña para rosa:
rosa@rosa-YOGA:~$ sudo ip addr add 100.100.1.2/24 dev veth0
rosa@rosa-YOGA:~$ sudo ip link set dev veth0 up
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 1
------------------------------------------------------------
Server listening on TCP port 5001
Binding to local address 100.100.1.3
TCP window size:  128 KByte (default)
------------------------------------------------------------
[  4] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 49973
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.0 sec  43.6 GBytes  37.5 Gbits/sec
rosa@rosa-YOGA:~$ 
```

```
rosa@rosa-YOGA:~$ sudo ip link add type veth
[sudo] contraseña para rosa:
rosa@rosa-YOGA:~$ sudo ip addr add 100.100.1.3/24 dev veth1
rosa@rosa-YOGA:~$ sudo ip link set dev veth1 up
rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 1
------------------------------------------------------------
Client connecting to 100.100.1.3, TCP port 5001
Binding to local address 100.100.1.2
TCP window size: 2.50 MByte (default)
------------------------------------------------------------
[  3] local 100.100.1.2 port 49973 connected with 100.100.1.3 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  43.6 GBytes  37.5 Gbits/sec
rosa@rosa-YOGA:~$ 
```

Tamaño de ventana 42 Kbytes y número de procesos 1

```
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 1 -w 21KB
------------------------------------------------------------
Server listening on TCP port 5001
Binding to local address 100.100.1.3
TCP window size: 42.0 KByte (WARNING: requested 21.0 KByte)
------------------------------------------------------------
[  4] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 42259
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.0 sec  22.4 GBytes  19.3 Gbits/sec
rosa@rosa-YOGA:~$ 
```

```
rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 1
------------------------------------------------------------
Client connecting to 100.100.1.3, TCP port 5001
Binding to local address 100.100.1.2
TCP window size: 2.50 MByte (default)
------------------------------------------------------------
[  3] local 100.100.1.2 port 42259 connected with 100.100.1.3 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  22.4 GBytes  19.3 Gbits/sec
rosa@rosa-YOGA:~$ 
```

Tamaño de ventana 20 KB y número de procesos 1

```
[ 4] 0.0-10.0 sec  22.4 GBytes  19.3 Gbits/sec           [ 3] 0.0-10.0 sec  22.4 GBytes  19.3 Gbits/sec
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 1 -w 10KB   rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 1
------------------------------------------------------   connect failed: Connection refused
Server listening on TCP port 5001                        rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 1
Binding to local address 100.100.1.3                     ------------------------------------------------------
TCP window size: 20.0 KByte (WARNING: requested 10.0 KByte)  Client connecting to 100.100.1.3, TCP port 5001
------------------------------------------------------   Binding to local address 100.100.1.2
[ 4] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 55617  TCP window size: 2.50 MByte (default)
[ ID] Interval       Transfer     Bandwidth             ------------------------------------------------------
[ 4]  0.0-10.0 sec  13.1 GBytes  11.2 Gbits/sec         [ 3] local 100.100.1.2 port 55617 connected with 100.100.1.3 port 5001
rosa@rosa-YOGA:~$                                        [ ID] Interval       Transfer     Bandwidth
                                                         [ 3]  0.0-10.0 sec  13.1 GBytes  11.2 Gbits/sec
                                                         rosa@rosa-YOGA:~$
```

Como podemos ver en esta captura, encontramos el mensaje *connect failed: Connection refused*. Esto ha sucedido porque hemos establecido primero una conexión entre el cliente y el servidor cuando el servidor aún no estaba escuchando.

A continuación, hemos realizado pruebas de conexión manteniendo los tamaños de ventana anteriores, pero variando el número de procesos a 10.

Tamaño de ventana dado por defecto y número de procesos 10

```
rosa@rosa-YOGA:~$                                        rosa@rosa-YOGA:~$
rosa@rosa-YOGA:~$                                        rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 10
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 10          ------------------------------------------------------
------------------------------------------------------   Client connecting to 100.100.1.3, TCP port 5001
Server listening on TCP port 5001                        Binding to local address 100.100.1.2
Binding to local address 100.100.1.3                     TCP window size: 2.50 MByte (default)
TCP window size:  128 KByte (default)                    ------------------------------------------------------
------------------------------------------------------   [ 12] local 100.100.1.2 port 45655 connected with 100.100.1.3 port 5001
[ 4] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 49633  [ 11] local 100.100.1.2 port 34645 connected with 100.100.1.3 port 5001
[ 5] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 34715  [ 3] local 100.100.1.2 port 34715 connected with 100.100.1.3 port 5001
[ 6] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 57691  [ 4] local 100.100.1.2 port 45765 connected with 100.100.1.3 port 5001
[ 8] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 49117  [ 7] local 100.100.1.2 port 49117 connected with 100.100.1.3 port 5001
[ 9] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 52993  [ 9] local 100.100.1.2 port 52993 connected with 100.100.1.3 port 5001
[ 7] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 45765  [ 6] local 100.100.1.2 port 57691 connected with 100.100.1.3 port 5001
[ 10] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 42331  [ 10] local 100.100.1.2 port 35343 connected with 100.100.1.3 port 5001
[ 11] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 35343  [ 5] local 100.100.1.2 port 49633 connected with 100.100.1.3 port 5001
[ 13] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 45655  [ 8] local 100.100.1.2 port 42331 connected with 100.100.1.3 port 5001
[ 12] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 34645  [ ID] Interval       Transfer     Bandwidth
[ ID] Interval       Transfer     Bandwidth             [ 11]  0.0-10.0 sec  3.47 GBytes  2.98 Gbits/sec
[ 4]  0.0-10.0 sec  3.71 GBytes  3.19 Gbits/sec         [ 4]  0.0-10.0 sec  3.64 GBytes  3.12 Gbits/sec
[ 8]  0.0-10.0 sec  3.79 GBytes  3.25 Gbits/sec         [ 7]  0.0-10.0 sec  3.79 GBytes  3.25 Gbits/sec
[ 7]  0.0-10.0 sec  3.64 GBytes  3.12 Gbits/sec         [ 10]  0.0-10.0 sec  3.35 GBytes  2.88 Gbits/sec
[ 5]  0.0-10.0 sec  3.89 GBytes  3.34 Gbits/sec         [ 5]  0.0-10.0 sec  3.71 GBytes  3.19 Gbits/sec
[ 9]  0.0-10.0 sec  4.05 GBytes  3.47 Gbits/sec         [ 3]  0.0-10.0 sec  3.89 GBytes  3.34 Gbits/sec
[ 10]  0.0-10.0 sec  3.66 GBytes  3.14 Gbits/sec        [ 9]  0.0-10.0 sec  4.05 GBytes  3.47 Gbits/sec
[ 11]  0.0-10.0 sec  3.35 GBytes  2.87 Gbits/sec        [ 6]  0.0-10.0 sec  4.08 GBytes  3.50 Gbits/sec
[ 12]  0.0-10.0 sec  3.47 GBytes  2.97 Gbits/sec        [ 8]  0.0-10.0 sec  3.66 GBytes  3.14 Gbits/sec
[ 6]  0.0-10.0 sec  4.08 GBytes  3.49 Gbits/sec         [ 12]  0.0-10.0 sec  3.81 GBytes  3.27 Gbits/sec
[ 13]  0.0-10.0 sec  3.81 GBytes  3.27 Gbits/sec        [SUM]  0.0-10.0 sec  37.4 GBytes  32.1 Gbits/sec
rosa@rosa-YOGA:~$                                        rosa@rosa-YOGA:~$
```

Tamaño de ventana por defecto y número de procesos 100

```
rosa@rosa-YOGA:~$ sudo ip addr add 100.100.1.2/24 dev veth0   rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 100
rosa@rosa-YOGA:~$ sudo ip link set dev veth0                 ------------------------------------------------------
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 100            Client connecting to 100.100.1.3, TCP port 5001
------------------------------------------------------      Binding to local address 100.100.1.2
Server listening on TCP port 5001                           TCP window size: 2.50 MByte (default)
Binding to local address 100.100.1.3                        ------------------------------------------------------
TCP window size:  128 KByte (default)                       [103] local 100.100.1.2 port 51527 connected with 100.100.1.3 port 5001
------------------------------------------------------      [ 4] local 100.100.1.2 port 59301 connected with 100.100.1.3 port 5001
[ 4] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 43835   [ 3] local 100.100.1.2 port 43835 connected with 100.100.1.3 port 5001
[ 5] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 59301   [ 5] local 100.100.1.2 port 52617 connected with 100.100.1.3 port 5001
[ 6] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 52617   [ 10] local 100.100.1.2 port 52445 connected with 100.100.1.3 port 5001
[ 7] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 35081   [ 9] local 100.100.1.2 port 42781 connected with 100.100.1.3 port 5001
[ 8] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 32919   [ 12] local 100.100.1.2 port 44119 connected with 100.100.1.3 port 5001
[ 10] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 52445  [ 14] local 100.100.1.2 port 59783 connected with 100.100.1.3 port 5001
[ 9] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 44119   [ 15] local 100.100.1.2 port 55439 connected with 100.100.1.3 port 5001
[ 12] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 47473  [ 18] local 100.100.1.2 port 39955 connected with 100.100.1.3 port 5001
```

```
[100] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 46357 [ 93] local 100.100.1.2 port 57997 connected with 100.100.1.3 port 5001
[101] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 37073 [ 98] local 100.100.1.2 port 46357 connected with 100.100.1.3 port 5001
[102] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 47021 [ ID] Interval       Transfer     Bandwidth
[103] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 51527 [ 20]  0.0-10.1 sec   652 MBytes   542 Mbits/sec
[ ID] Interval       Transfer     Bandwidth                              [ 55]  0.0-10.1 sec   403 MBytes   335 Mbits/sec
[ 19]  0.0-10.1 sec   652 MBytes   540 Mbits/sec                         [ 32]  0.0-10.1 sec   490 MBytes   407 Mbits/sec
[100]  0.0-10.1 sec   152 MBytes   126 Mbits/sec                         [ 98]  0.0-10.1 sec   152 MBytes   127 Mbits/sec
[ 10]  0.0-10.1 sec   714 MBytes   591 Mbits/sec                         [ 24]  0.0-10.1 sec   619 MBytes   513 Mbits/sec
[ 26]  0.0-10.1 sec   614 MBytes   508 Mbits/sec                         [ 23]  0.0-10.1 sec   614 MBytes   510 Mbits/sec
```

EN UDP:

Tamaño del buffer por defecto (default) y número de procesos 1

```
rosa@rosa-YOGA:~$ sudo tp tthk set dev vetho up            rosa@rosa-YOGA:~$ sudo tp tthk set dev veth1 up
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 1 -u          rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 1 -u
------------------------------------------------           ------------------------------------------------
Server listening on UDP port 5001                          Client connecting to 100.100.1.3, UDP port 5001
Binding to local address 100.100.1.3                       Binding to local address 100.100.1.2
Receiving 1470 byte datagrams                              Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)                      UDP buffer size:  208 KByte (default)
------------------------------------------------           ------------------------------------------------
[ 3] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 33592  [ 3] local 100.100.1.2 port 33592 connected with 100.100.1.3 port 5001
[ ID] Interval       Transfer     Bandwidth       Jitter   Lost/Total    [ ID] Interval       Transfer     Bandwidth
Datagrams                                                                 [ 3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[ 3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.006 ms   0/  893     [ 3] Sent 893 datagrams
(0%)                                                                      [ 3] Server Report:
rosa@rosa-YOGA:~$                                                         [ 3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms   0/  893
rosa@rosa-YOGA:~$                                                         (0%)
```

Tamaño del buffer 104 KB y número de procesos 1

```
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 1 -u -w 52KB
------------------------------------------------
Server listening on UDP port 5001
Binding to local address 100.100.1.3
Receiving 1470 byte datagrams
UDP buffer size:  104 KByte (WARNING: requested 52.0 KByte)
------------------------------------------------
[ 3] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 55880
[ ID] Interval       Transfer     Bandwidth       Jitter   Lost/Total
Datagrams
[ 3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.002 ms   0/  893
(0%)
```

```
rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 1 -u
------------------------------------------------
Client connecting to 100.100.1.3, UDP port 5001
Binding to local address 100.100.1.2
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------
[ 3] local 100.100.1.2 port 55880 connected with 100.100.1.3 port 5001
[ ID] Interval       Transfer     Bandwidth
[ 3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[ 3] Sent 893 datagrams
[ 3] Server Report:
[ 3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms   0/  893
(0%)
```

Tamaño del buffer 52 KB y número de procesos 1

```
Datagrams
[  3]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.002 ms    0/  893
(0%)
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 1 -u -w 26KB
------------------------------------------------------------
Server listening on UDP port 5001
Binding to local address 100.100.1.3
Receiving 1470 byte datagrams
UDP buffer size: 52.0 KByte (WARNING: requested 26.0 KByte)
------------------------------------------------------------
[  3] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 35407
[ ID] Interval        Transfer      Bandwidth        Jitter   Lost/Total
Datagrams
[  3]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.002 ms    0/  893
(0%)
rosa@rosa-YOGA:~$ ▯
```

```
(0%)
rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 1 -u
------------------------------------------------------------
Client connecting to 100.100.1.3, UDP port 5001
Binding to local address 100.100.1.2
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 100.100.1.2 port 35407 connected with 100.100.1.3 port 5001
[ ID] Interval        Transfer      Bandwidth
[  3]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec
[  3] Sent 893 datagrams
[  3] Server Report:
[  3]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.000 ms    0/  893
(0%)
rosa@rosa-YOGA:~$ ▯
```

Tamaño del buffer por defecto (default) y número de procesos 10

```
[  3] 0.00-6.34 sec   3 datagrams received out-of-order
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 10 -u
------------------------------------------------------------
Server listening on UDP port 5001
Binding to local address 100.100.1.3
Receiving 1470 byte datagrams
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 45043
[  4] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 53862
[  5] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 57010
[  6] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 37853
[  7] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 56776
[  8] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 56789
[  9] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 52616
[ 10] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 44700
[ 11] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 36232
[ 12] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 55809
[ ID] Interval        Transfer      Bandwidth        Jitter   Lost/Total
Datagrams
[  3]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.006 ms    0/  893
(0%)
[  3] 0.00-10.02 sec   1 datagrams received out-of-order
[  5]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.006 ms    0/  893
(0%)
[  5] 0.00-10.03 sec   1 datagrams received out-of-order
[  6]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.005 ms    1/  893
```

```
read failed: Connection refused
[ 10] WARNING: did not receive ack of last datagram after 1 tries.
rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 10 -u
------------------------------------------------------------
Client connecting to 100.100.1.3, UDP port 5001
Binding to local address 100.100.1.2
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[ 12] local 100.100.1.2 port 45043 connected with 100.100.1.3 port 5001
[  3] local 100.100.1.2 port 37853 connected with 100.100.1.3 port 5001
[  5] local 100.100.1.2 port 56789 connected with 100.100.1.3 port 5001
[  9] local 100.100.1.2 port 52616 connected with 100.100.1.3 port 5001
[ 10] local 100.100.1.2 port 44700 connected with 100.100.1.3 port 5001
[  7] local 100.100.1.2 port 55809 connected with 100.100.1.3 port 5001
[  4] local 100.100.1.2 port 53862 connected with 100.100.1.3 port 5001
[  6] local 100.100.1.2 port 57010 connected with 100.100.1.3 port 5001
[ 11] local 100.100.1.2 port 56776 connected with 100.100.1.3 port 5001
[  8] local 100.100.1.2 port 36232 connected with 100.100.1.3 port 5001
[ ID] Interval        Transfer      Bandwidth
[ 12]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec
[ 12] Sent 893 datagrams
[  3]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec
[  3] Sent 893 datagrams
[  5]  0.0-10.0 sec   1.44 KBytes   1.17 Kbits/sec
[  5] Sent 1 datagrams
[  9]  0.0-10.0 sec   1.44 KBytes   1.17 Kbits/sec
```

```
(0.11%)
[  7]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.006 ms    1/  893
(0.11%)
[  8]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.008 ms    1/  893
(0.11%)
[  9]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.028 ms    1/  893
(0.11%)
[ 10]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.010 ms    0/  893
(0%)
[ 10] 0.00-10.02 sec   2 datagrams received out-of-order
[ 12]  0.0-10.0 sec   1.25 MBytes   1.04 Mbits/sec    0.005 ms    3/  893
(0.34%)
[  4]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.004 ms    0/  893
(0%)
[ 11]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.011 ms    1/  893
(0.11%)
rosa@rosa-YOGA:~$ ▯
```

```
[  3] Server Report:
[  3]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.004 ms    1/  893
(0.11%)
[ 12] Server Report:
[ 12]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.000 ms    0/  893
(0%)
[ 12] 0.00-10.02 sec   1 datagrams received out-of-order
[  5] Server Report:
[  5]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.007 ms    1/  893
(0.11%)
[  4] Server Report:
[  4]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.004 ms    0/  893
(0%)
[  8] Server Report:
[  8]  0.0-10.0 sec   1.25 MBytes   1.05 Mbits/sec    0.011 ms    1/  893
(0.11%)
rosa@rosa-YOGA:~$ ▯
```

Tamaño de ventana por defecto y número de procesos 100


```
rosa@rosa-YOGA:~$ iperf -B 100.100.1.3 -s -P 100 -u                    rosa@rosa-YOGA:~$ iperf -B 100.100.1.2 -c 100.100.1.3 -P 100 -u
------------------------------------------------------------          ------------------------------------------------------------
Server listening on UDP port 5001                                     Client connecting to 100.100.1.3, UDP port 5001
Binding to local address 100.100.1.3                                  Binding to local address 100.100.1.2
Receiving 1470 byte datagrams                                         Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)                                 UDP buffer size:  208 KByte (default)
------------------------------------------------------------          ------------------------------------------------------------
[  3] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 50861   [102] local 100.100.1.2 port 50861 connected with 100.100.1.3 port 5001
[  4] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 57260   [101] local 100.100.1.2 port 43168 connected with 100.100.1.3 port 5001
[  5] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 51281   [ 61] local 100.100.1.2 port 43522 connected with 100.100.1.3 port 5001
[  6] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 58369   [ 12] local 100.100.1.2 port 35224 connected with 100.100.1.3 port 5001
[  7] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 45783   [  3] local 100.100.1.2 port 38646 connected with 100.100.1.3 port 5001
[  8] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 50081   [ 16] local 100.100.1.2 port 53090 connected with 100.100.1.3 port 5001
[ 10] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 40510   [ 59] local 100.100.1.2 port 58162 connected with 100.100.1.3 port 5001
[ 11] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 50118   [ 21] local 100.100.1.2 port 60398 connected with 100.100.1.3 port 5001
[ 12] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 36053   [ 80] local 100.100.1.2 port 38561 connected with 100.100.1.3 port 5001
[  9] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 46149   [ 15] local 100.100.1.2 port 60654 connected with 100.100.1.3 port 5001
[ 13] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 34222   [ 68] local 100.100.1.2 port 49289 connected with 100.100.1.3 port 5001
[ 14] local 100.100.1.3 port 5001 connected with 100.100.1.2 port 43168   [ 35] local 100.100.1.2 port 35477 connected with 100.100.1.3 port 5001
```

```
[ 91]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.022 ms    9/  893    [ 11] 0.00-10.01 sec   1 datagrams received out-of-order
(1%)                                                                       [ 74] Server Report:
[ 93]  0.0-10.2 sec  1.24 MBytes  1.02 Mbits/sec   0.026 ms    9/  893    [ 74] 0.00-10.10 sec  1.25 MBytes  1.04 Mbits/sec   0.086 ms    3/  893
(1%)                                                                       (0.34%)  0.000/ 0.000/ 0.000/ 0.000 ms 4140357220335526818298645699622
[ 94]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.071 ms   10/  893    974726596193194288642684616704 pps
(1.1%)                                                                     [ 74] 0.00-10.10 sec   1 datagrams received out-of-order
[ 95]  0.0-10.0 sec  1.24 MBytes  1.03 Mbits/sec   0.009 ms   10/  893    [ 37] Server Report:
(1.1%)                                                                     [ 37]  0.0-10.2 sec  1.25 MBytes  1.03 Mbits/sec   0.000 ms    1/  893
[ 96]  0.0-10.1 sec  1.25 MBytes  1.03 Mbits/sec   0.026 ms    4/  893    (0%)
(0.45%)                                                                    [ 53] Server Report:
[ 96] 0.00-10.13 sec  6 datagrams received out-of-order                   [ 53] 0.00-10.04 sec  1.24 MBytes  1.03 Mbits/sec   0.030 ms   12/  893
[ 97]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.061 ms   12/  893    (1.3%)  0.000/ 0.000/ 0.000/ 0.000 ms 4140357220335526818298645996229
(1.3%)                                                                     74726596193194288642684616704 pps
[ 98]  0.0-10.0 sec  1.24 MBytes  1.03 Mbits/sec   0.030 ms   12/  893    [ 18] Server Report:
(1.3%)                                                                     [ 18] 0.00-10.03 sec  1.25 MBytes  1.04 Mbits/sec   0.020 ms    2/  892
[ 99]  0.0-10.0 sec  1.24 MBytes  1.04 Mbits/sec   0.017 ms   11/  893    (0.22%)  0.000/ 0.000/ 0.000/ 0.000 ms 4140357220335526818298645699622
(1.2%)                                                                     974726596193194288642684616704 pps
[100]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.007 ms   10/  893    [ 36] Server Report:
(1.1%)                                                                     [ 36] 0.00-10.08 sec  1.25 MBytes  1.04 Mbits/sec   0.005 ms    1/  893
[100] 0.00-10.11 sec  2 datagrams received out-of-order                   (0.11%)  0.000/ 0.000/ 0.000/ 0.000 ms 4140357220335526818298645699622
[101]  0.0-10.1 sec  1.23 MBytes  1.03 Mbits/sec   0.007 ms   13/  893    974726596193194288642684616704 pps
(1.5%)                                                                     [ 23] Server Report:
[102]  0.0-10.0 sec  1.23 MBytes  1.03 Mbits/sec   0.013 ms   15/  893    [ 23] 0.00-10.05 sec  1.25 MBytes  1.05 Mbits/sec   0.044 ms    0/  892
```

> ➢ **Loopback local.**

Para realizar estas mediciones nos hemos basado en las siguientes páginas web: https://www.redeszone.net/redes/iperf-manual-para-medir-ancho-de-banda-entre-dos-ordenadores-en-lan/ y https://openmaniak.com/es/iperf.php

En TCP:

Abrimos como siempre dos terminales, una para el Servidor y otra que corresponda al Cliente. Cuando usamos el tamaño de ventana Default y número de procesos 1, ocurre la siguiente conexión:

- Servidor


```
rosa@rosa-YOGA:~$ iperf -s -P 1
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size:  128 KByte (default)
------------------------------------------------------------
[  4] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49830
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.0 sec  48.4 GBytes  41.5 Gbits/sec
rosa@rosa-YOGA:~$
```

- Cliente

```
rosa@rosa-YOGA:~$ iperf -c 127.0.0.1 -P 1
-----------------------------------------------------------
Client connecting to 127.0.0.1, TCP port 5001
TCP window size: 2.50 MByte (default)
-----------------------------------------------------------
[  3] local 127.0.0.1 port 49830 connected with 127.0.0.1 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  48.4 GBytes  41.5 Gbits/sec
rosa@rosa-YOGA:~$
```

Sin embargo, si el tamaño de ventana lo establecemos en 42 Bytes y número de procesos 1, ocurre lo siguiente:

- Servidor

```
rosa@rosa-YOGA:~$ iperf -s -P 1 -w 21KB
-----------------------------------------------------------
Server listening on TCP port 5001
TCP window size: 42.0 KByte (WARNING: requested 21.0 KByte)
-----------------------------------------------------------
[  4] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49856
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.0 sec  21.2 GBytes  18.2 Gbits/sec
rosa@rosa-YOGA:~$
```

- Cliente

```
rosa@rosa-YOGA:~$ iperf -c 127.0.0.1 -P 1
-----------------------------------------------------------
Client connecting to 127.0.0.1, TCP port 5001
TCP window size: 2.50 MByte (default)
-----------------------------------------------------------
[  3] local 127.0.0.1 port 49856 connected with 127.0.0.1 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  21.2 GBytes  18.2 Gbits/sec
rosa@rosa-YOGA:~$
```

Una última prueba que hemos realizado ha sido la de insertar como tamaño de ventana 20 Kbyte manteniendo el número de procesos 1.

- Servidor

```
rosa@rosa-YOGA:~$ iperf -s -P 1 -w 10KB
-----------------------------------------------------------
Server listening on TCP port 5001
TCP window size: 20.0 KByte (WARNING: requested 10.0 KByte)
-----------------------------------------------------------
[  4] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49882
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.0 sec  12.4 GBytes  10.6 Gbits/sec
rosa@rosa-YOGA:~$
```

- Cliente

```
rosa@rosa-YOGA:~$ iperf -c 127.0.0.1 -P 1
------------------------------------------------------------
Client connecting to 127.0.0.1, TCP port 5001
TCP window size: 2.50 MByte (default)
------------------------------------------------------------
[  3] local 127.0.0.1 port 49882 connected with 127.0.0.1 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  12.4 GBytes  10.6 Gbits/sec
rosa@rosa-YOGA:~$
```

Tamaño de ventana dado por defecto (default) y número de procesos 10

```
[  4]  0.0-10.0 sec  12.4 GBytes  10.6 Gbits/sec
rosa@rosa-YOGA:~$ iperf -s -P 10
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size:  128 KByte (default)
------------------------------------------------------------
[  5] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49968
[  4] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49966
[  6] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49970
[  7] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49972
[  8] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49974
[ 11] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49980
[  9] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49976
[ 10] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49978
[ 12] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49982
[ 13] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49984
[ ID] Interval       Transfer     Bandwidth
[ 11]  0.0-10.0 sec  4.09 GBytes  3.50 Gbits/sec
[  6]  0.0-10.1 sec  4.09 GBytes  3.49 Gbits/sec
[  7]  0.0-10.1 sec  4.44 GBytes  3.79 Gbits/sec
[  8]  0.0-10.1 sec  4.16 GBytes  3.55 Gbits/sec
[ 12]  0.0-10.1 sec  3.94 GBytes  3.37 Gbits/sec
[  5]  0.0-10.1 sec  4.52 GBytes  3.86 Gbits/sec
[  4]  0.0-10.1 sec  4.21 GBytes  3.60 Gbits/sec
[  9]  0.0-10.1 sec  4.01 GBytes  3.43 Gbits/sec
[ 10]  0.0-10.1 sec  4.69 GBytes  4.00 Gbits/sec
[ 13]  0.0-10.1 sec  4.24 GBytes  3.62 Gbits/sec
rosa@rosa-YOGA:~$
```

```
rosa@rosa-YOGA:~$ iperf -c 127.0.0.1 -P 10
------------------------------------------------------------
Client connecting to 127.0.0.1, TCP port 5001
TCP window size: 2.50 MByte (default)
------------------------------------------------------------
[  3] local 127.0.0.1 port 49966 connected with 127.0.0.1 port 5001
[  4] local 127.0.0.1 port 49968 connected with 127.0.0.1 port 5001
[  7] local 127.0.0.1 port 49974 connected with 127.0.0.1 port 5001
[  6] local 127.0.0.1 port 49972 connected with 127.0.0.1 port 5001
[ 12] local 127.0.0.1 port 49984 connected with 127.0.0.1 port 5001
[  5] local 127.0.0.1 port 49970 connected with 127.0.0.1 port 5001
[  9] local 127.0.0.1 port 49978 connected with 127.0.0.1 port 5001
[  8] local 127.0.0.1 port 49976 connected with 127.0.0.1 port 5001
[ 10] local 127.0.0.1 port 49980 connected with 127.0.0.1 port 5001
[ 11] local 127.0.0.1 port 49982 connected with 127.0.0.1 port 5001
[ ID] Interval       Transfer     Bandwidth
[  7]  0.0-10.0 sec  4.16 GBytes  3.56 Gbits/sec
[  5]  0.0-10.0 sec  4.09 GBytes  3.49 Gbits/sec
[  9]  0.0-10.0 sec  4.69 GBytes  4.01 Gbits/sec
[ 10]  0.0-10.0 sec  4.09 GBytes  3.50 Gbits/sec
[ 11]  0.0-10.0 sec  3.94 GBytes  3.37 Gbits/sec
[  4]  0.0-10.0 sec  4.52 GBytes  3.86 Gbits/sec
[  6]  0.0-10.0 sec  4.44 GBytes  3.79 Gbits/sec
[  8]  0.0-10.0 sec  4.01 GBytes  3.43 Gbits/sec
[  3]  0.0-10.1 sec  4.21 GBytes  3.60 Gbits/sec
[ 12]  0.0-10.1 sec  4.24 GBytes  3.62 Gbits/sec
[SUM]  0.0-10.1 sec  42.4 GBytes  36.2 Gbits/sec
rosa@rosa-YOGA:~$
```

Tamaño de ventana dada por defecto y número de procesos 100

```
[  7]  0.0-10.0 sec  2.53 GBytes  2.17 Gbits/sec
[  9]  0.0-10.0 sec  2.58 GBytes  2.20 Gbits/sec
[ 12]  0.0-10.0 sec  2.41 GBytes  2.06 Gbits/sec
rosa@rosa-YOGA:~$ iperf -s -P 100
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size:  128 KByte (default)
------------------------------------------------------------
[  4] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50042
[  5] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50044
[  6] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50046
[  9] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50052
[ 10] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50054
[  8] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50050
[  7] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50048
[ 12] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50058
[ 11] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50056
```

```
rosa@rosa-YOGA:~$ iperf -c 127.0.0.1 -P 100
------------------------------------------------------------
Client connecting to 127.0.0.1, TCP port 5001
TCP window size: 2.50 MByte (default)
------------------------------------------------------------
[102] local 127.0.0.1 port 50240 connected with 127.0.0.1 port 5001
[  3] local 127.0.0.1 port 50042 connected with 127.0.0.1 port 5001
[  4] local 127.0.0.1 port 50044 connected with 127.0.0.1 port 5001
[  5] local 127.0.0.1 port 50046 connected with 127.0.0.1 port 5001
[  8] local 127.0.0.1 port 50050 connected with 127.0.0.1 port 5001
[  9] local 127.0.0.1 port 50052 connected with 127.0.0.1 port 5001
[  6] local 127.0.0.1 port 50054 connected with 127.0.0.1 port 5001
[ 11] local 127.0.0.1 port 50058 connected with 127.0.0.1 port 5001
[ 10] local 127.0.0.1 port 50056 connected with 127.0.0.1 port 5001
[ 13] local 127.0.0.1 port 50060 connected with 127.0.0.1 port 5001
[ 12] local 127.0.0.1 port 50062 connected with 127.0.0.1 port 5001
[ 16] local 127.0.0.1 port 50066 connected with 127.0.0.1 port 5001
```

```
[100] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50234
[100]  0.0-10.3 sec  2.50 MBytes  2.03 Mbits/sec
[ 99]  0.0-10.5 sec  2.50 MBytes  2.00 Mbits/sec
[101] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50236
[101]  0.0-10.4 sec  2.50 MBytes  2.02 Mbits/sec
[ 20] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50240
[ 20]  0.0-10.5 sec  2.50 MBytes  2.00 Mbits/sec
[ 12] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50238
[ 12]  0.0-10.5 sec  2.50 MBytes  2.00 Mbits/sec
rosa@rosa-YOGA:~$
```

```
[100]  0.0-10.3 sec  2.50 MBytes  2.03 Mbits/sec
[ 47]  0.0-10.3 sec   456 MBytes   371 Mbits/sec
[ 58]  0.0-10.3 sec   288 MBytes   235 Mbits/sec
[ 46]  0.0-10.3 sec   424 MBytes   344 Mbits/sec
[ 88]  0.0-10.3 sec  61.2 MBytes  49.7 Mbits/sec
[ 99]  0.0-10.4 sec  2.50 MBytes  2.02 Mbits/sec
[101]  0.0-10.4 sec  2.50 MBytes  2.02 Mbits/sec
[ 98]  0.0-10.4 sec  2.50 MBytes  2.02 Mbits/sec
[SUM]  0.0-10.4 sec  39.6 GBytes  32.7 Gbits/sec
rosa@rosa-YOGA:~$
```

En UDP:

Tamaño del buffer dado por defecto (default) y número de procesos 1

```
rosa@rosa-YOGA:~$ iperf -s -u -P 1
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 60575
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total
Datagrams
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.003 ms    0/  893
(0%)
rosa@rosa-YOGA:~$
```

```
rosa@rosa-YOGA:~$ iperf -c 127.0.1 -u -P 1
------------------------------------------------------------
Client connecting to 127.0.1, UDP port 5001
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 127.0.0.1 port 60575 connected with 127.0.0.1 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  3] Sent 893 datagrams
[  3] Server Report:
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
rosa@rosa-YOGA:~$
```

Tamaño del buffer 104KB y número de procesos 1

```
rosa@rosa-YOGA:~$ iperf -s -u -P 1 -w 52KB
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size:  104 KByte (WARNING: requested 52.0 KByte)
------------------------------------------------------------
[  3] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 34625
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total
Datagrams
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.010 ms    0/  893
(0%)
rosa@rosa-YOGA:~$
```

```
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
rosa@rosa-YOGA:~$ iperf -c 127.0.0.1 -u -P 1
------------------------------------------------------------
Client connecting to 127.0.0.1, UDP port 5001
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 127.0.0.1 port 34625 connected with 127.0.0.1 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  3] Sent 893 datagrams
[  3] Server Report:
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
rosa@rosa-YOGA:~$
```

Tamaño del buffer 52KB y número de procesos 1

```
rosa@rosa-YOGA:~$ iperf -s -u -P 1 -w 26KB
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 52.0 KByte (WARNING: requested 26.0 KByte)
------------------------------------------------------------
[  3] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 51391
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total
Datagrams
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.001 ms    0/  893
(0%)
rosa@rosa-YOGA:~$
```

```
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
rosa@rosa-YOGA:~$ iperf -c 127.0.0.1 -u -P 1
------------------------------------------------------------
Client connecting to 127.0.0.1, UDP port 5001
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 127.0.0.1 port 51391 connected with 127.0.0.1 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  3] Sent 893 datagrams
[  3] Server Report:
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
rosa@rosa-YOGA:~$
```

Tamaño del buffer Default y número de procesos 10

```
rosa@rosa-YOGA:~$ iperf -s -u -P 10
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49903
[  4] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 37440
[  5] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 39927
[  6] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 33452
[  7] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50566
[  8] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 44967
[  9] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 52559
[ 10] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 33991
[ 11] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 32772
[ 12] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 33268
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total
Datagrams
[  4]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.006 ms    0/  893
(0%)
[  6]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.015 ms    0/  893
(0%)
[ 10]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.016 ms    2/  893
(0.22%)
[ 11]  0.0-10.0 sec  1.25 MBytes  1.04 Mbits/sec   0.043 ms    4/  893
(0.45%)
[  5]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.007 ms    0/  893
(0%)
[  7]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.011 ms    0/  893
(0%)
[  7] 0.00-10.02 sec  2 datagrams received out-of-order
[  8]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.009 ms    1/  893
(0.11%)
[  9]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.012 ms    1/  893
(0.11%)
[ 12]  0.0-10.0 sec  1.25 MBytes  1.04 Mbits/sec   0.005 ms    4/  893
(0.45%)
```

```
(0%)
rosa@rosa-YOGA:~$ iperf -c 127.0.0.1 -u -P 10
------------------------------------------------------------
Client connecting to 127.0.0.1, UDP port 5001
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[ 11] local 127.0.0.1 port 49903 connected with 127.0.0.1 port 5001
[  3] local 127.0.0.1 port 50566 connected with 127.0.0.1 port 5001
[ 12] local 127.0.0.1 port 33452 connected with 127.0.0.1 port 5001
[  9] local 127.0.0.1 port 33991 connected with 127.0.0.1 port 5001
[  8] local 127.0.0.1 port 32772 connected with 127.0.0.1 port 5001
[  5] local 127.0.0.1 port 37440 connected with 127.0.0.1 port 5001
[  7] local 127.0.0.1 port 33268 connected with 127.0.0.1 port 5001
[  4] local 127.0.0.1 port 39927 connected with 127.0.0.1 port 5001
[  6] local 127.0.0.1 port 44967 connected with 127.0.0.1 port 5001
[ 10] local 127.0.0.1 port 52559 connected with 127.0.0.1 port 5001
[ ID] Interval       Transfer     Bandwidth
[ 11]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[ 11] Sent 893 datagrams
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  3] Sent 893 datagrams
[ 12]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[ 12] Sent 893 datagrams
[  9]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
[  9] Sent 1 datagrams
[  8]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
[  8] Sent 1 datagrams
[  5]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  5] Sent 893 datagrams
[  7]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
[  7] Sent 1 datagrams
[  4]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  4] Sent 893 datagrams
[  6]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
[  6] Sent 1 datagrams
[ 10]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
```

```
Receiving 1470 byte datagrams
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49903
[  4] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 37440
[  5] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 39927
[  6] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 33452
[  7] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50566
[  8] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 44967
[  9] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 52559
[ 10] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 33991
[ 11] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 32772
[ 12] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 33268
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total
Datagrams
[  4]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.006 ms    0/  893
(0%)
[  6]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.015 ms    0/  893
(0%)
[ 10]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.016 ms    2/  893
(0.22%)
[ 11]  0.0-10.0 sec  1.25 MBytes  1.04 Mbits/sec   0.043 ms    4/  893
(0.45%)
[  5]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.007 ms    0/  893
(0%)
[  7]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.011 ms    0/  893
(0%)
[  7] 0.00-10.02 sec  2 datagrams received out-of-order
[  8]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.009 ms    1/  893
(0.11%)
[  9]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.012 ms    1/  893
(0.11%)
[ 12]  0.0-10.0 sec  1.25 MBytes  1.04 Mbits/sec   0.005 ms    4/  893
(0.45%)
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   2.152 ms    0/  893
(0%)
[  3] 0.00-10.05 sec  2 datagrams received out-of-order
rosa@rosa-YOGA:~$
```

```
[  6] Sent 1 datagrams
[ 10]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
[ 10] Sent 1 datagrams
[SUM]  0.0-10.0 sec  6.27 MBytes  5.24 Mbits/sec
[SUM] Sent 4470 datagrams
[  9] Server Report:
[  9]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    2/  893
(0%)
[  5] Server Report:
[  5]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
[ 12] Server Report:
[ 12]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
[  8] Server Report:
[  8]  0.0-10.0 sec  1.25 MBytes  1.04 Mbits/sec   0.000 ms    4/  893
(0%)
[  4] Server Report:
[  4]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
[  3] Server Report:
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
[  3] 0.00-10.02 sec  2 datagrams received out-of-order
[  7] Server Report:
[  7]  0.0-10.0 sec  1.25 MBytes  1.04 Mbits/sec   0.000 ms    4/  893
(0%)
[ 10] Server Report:
[ 10]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    1/  893
(0%)
[  6] Server Report:
[  6]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    1/  893
(0%)
[ 11] Server Report:
[ 11]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.000 ms    0/  893
(0%)
[ 11] 0.00-10.05 sec  2 datagrams received out-of-order
rosa@rosa-YOGA:~$
```

Tamaño de ventana default y número de procesos 100

```
(0.78%)
rosa@rosa-YOGA:~$ iperf -s -u -P 100
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 37793
[  4] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 37881
[  6] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 49552
[  8] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 45318
[  7] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 47824
[  5] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 44718
[  9] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 54665
[ 10] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 44096
[ 11] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 51993
[ 12] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 33056
[ 13] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 47276
[ 14] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 40517
[ 15] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 57050
[ 16] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 52078
[ 17] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 39072
[ 18] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 44608
[ 19] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 53162
[ 20] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 36007
[ 21] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 48880
[ 22] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 55711
[ 23] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 54051
[ 24] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 55758
[ 25] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 33892
[ 26] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 43715
[ 27] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 35699
[ 28] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 50387
[ 29] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 60357
[ 30] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 39584
[ 31] local 127.0.0.1 port 5001 connected with 127.0.0.1 port 45692
```

```
(0%)
rosa@rosa-YOGA:~$ iperf -c 127.0.0.1 -u -P 100
------------------------------------------------------------
Client connecting to 127.0.0.1, UDP port 5001
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[101] local 127.0.0.1 port 37793 connected with 127.0.0.1 port 5001
[  3] local 127.0.0.1 port 55758 connected with 127.0.0.1 port 5001
[  4] local 127.0.0.1 port 50037 connected with 127.0.0.1 port 5001
[  5] local 127.0.0.1 port 36385 connected with 127.0.0.1 port 5001
[  9] local 127.0.0.1 port 38080 connected with 127.0.0.1 port 5001
[  7] local 127.0.0.1 port 37881 connected with 127.0.0.1 port 5001
[  8] local 127.0.0.1 port 33892 connected with 127.0.0.1 port 5001
[ 10] local 127.0.0.1 port 51108 connected with 127.0.0.1 port 5001
[ 13] local 127.0.0.1 port 33602 connected with 127.0.0.1 port 5001
[ 15] local 127.0.0.1 port 56299 connected with 127.0.0.1 port 5001
[ 14] local 127.0.0.1 port 44718 connected with 127.0.0.1 port 5001
[ 11] local 127.0.0.1 port 45081 connected with 127.0.0.1 port 5001
[ 12] local 127.0.0.1 port 33574 connected with 127.0.0.1 port 5001
[ 16] local 127.0.0.1 port 51838 connected with 127.0.0.1 port 5001
[ 17] local 127.0.0.1 port 43715 connected with 127.0.0.1 port 5001
[ 18] local 127.0.0.1 port 49552 connected with 127.0.0.1 port 5001
[ 20] local 127.0.0.1 port 35699 connected with 127.0.0.1 port 5001
[ 22] local 127.0.0.1 port 41198 connected with 127.0.0.1 port 5001
[ 23] local 127.0.0.1 port 50387 connected with 127.0.0.1 port 5001
[ 24] local 127.0.0.1 port 47824 connected with 127.0.0.1 port 5001
[ 27] local 127.0.0.1 port 45318 connected with 127.0.0.1 port 5001
[ 26] local 127.0.0.1 port 60532 connected with 127.0.0.1 port 5001
[ 34] local 127.0.0.1 port 54665 connected with 127.0.0.1 port 5001
[ 35] local 127.0.0.1 port 60357 connected with 127.0.0.1 port 5001
[ 33] local 127.0.0.1 port 60097 connected with 127.0.0.1 port 5001
[ 25] local 127.0.0.1 port 60836 connected with 127.0.0.1 port 5001
[ 36] local 127.0.0.1 port 59828 connected with 127.0.0.1 port 5001
[ 32] local 127.0.0.1 port 44096 connected with 127.0.0.1 port 5001
[ 37] local 127.0.0.1 port 47074 connected with 127.0.0.1 port 5001
```

```
(0.67%)
read failed: Connection refused
[ 88]  0.0-10.1 sec  1.25 MBytes  1.04 Mbits/sec   0.012 ms    4/  893
(0.45%)
[ 88] 0.00-10.07 sec   1 datagrams received out-of-order
[ 89]  0.0-10.0 sec  1.24 MBytes  1.04 Mbits/sec   0.018 ms    5/  893
(0.56%)
[ 90]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.017 ms    6/  893
(0.67%)
read failed: Connection refused
[ 91]  0.0-10.1 sec  1.25 MBytes  1.04 Mbits/sec   0.237 ms    1/  893
(0.11%)
[ 91] 0.00-10.05 sec   4 datagrams received out-of-order
[ 92]  0.0-10.0 sec  1.24 MBytes  1.04 Mbits/sec   0.004 ms    5/  893
(0.56%)
[ 93]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.011 ms    7/  893
(0.78%)
[ 94]  0.0-10.0 sec  1.24 MBytes  1.04 Mbits/sec   0.110 ms    6/  893
(0.67%)
[ 95]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.078 ms    7/  893
(0.78%)
[ 96]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.035 ms    6/  893
(0.67%)
read failed: Connection refused
[ 98]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.058 ms    7/  893
(0.78%)
read failed: Connection refused
read failed: Connection refused
[ 97]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.024 ms    7/  893
(0.78%)
[ 99]  0.0-10.1 sec  1.24 MBytes  1.03 Mbits/sec   0.017 ms    5/  893
(0.56%)
[ 99] 0.00-10.13 sec   1 datagrams received out-of-order
[100]  0.0-10.1 sec  1.24 MBytes  1.04 Mbits/sec   0.131 ms    7/  893
(0.78%)
[102]  0.0-10.3 sec  1.24 MBytes  1.01 Mbits/sec   0.024 ms    8/  893
(0.9%)
```

```
[ 73] local 127.0.0.1 port 59173 connected with 127.0.0.1 port 5001
[ ID] Interval        Transfer     Bandwidth
[101]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[101] Sent 893 datagrams
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  3] Sent 893 datagrams
[  4]  0.0-10.0 sec  2.87 KBytes  2.35 Kbits/sec
[  4] Sent 2 datagrams
[  5]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
[  5] Sent 1 datagrams
[  7]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  7] Sent 893 datagrams
[  8]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  8] Sent 893 datagrams
[ 10]  0.0-10.0 sec  4.31 KBytes  3.52 Kbits/sec
[ 10] Sent 3 datagrams
[ 13]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
[ 13] Sent 1 datagrams
[ 15]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
[ 15] Sent 1 datagrams
[ 14]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[ 14] Sent 893 datagrams
[ 11]  0.0-10.0 sec  2.87 KBytes  2.35 Kbits/sec
[ 11] Sent 2 datagrams
[ 12]  0.0-10.0 sec  2.87 KBytes  2.35 Kbits/sec
[ 12] Sent 2 datagrams
[ 16]  0.0-10.0 sec  2.87 KBytes  2.35 Kbits/sec
[ 16] Sent 2 datagrams
[ 17]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[ 17] Sent 893 datagrams
[ 18]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[ 18] Sent 893 datagrams
[ 20]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[ 20] Sent 893 datagrams
[ 22]  0.0-10.0 sec  1.44 KBytes  1.17 Kbits/sec
[ 22] Sent 1 datagrams
[ 23]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[ 23] Sent 893 datagrams
```

> ➢ **Identificar el cuello de botella de la conexión**

El cuello de botella lo podemos observar comparando los resultados que se han obtenido en el caso de las **dos máquinas** y cuando se realizan las conexiones en una misma máquina.

Para el caso en el que realizamos las conexiones **TCP** desde dos ordenadores diferentes, podemos observar como la pérdida se produce por el uso de máquinas virtuales y el cable de red que ha sido utilizado, pero el cuello de botella que hemos encontrado ha sido pequeño (6 Mbps). Sin embargo, en **UDP**, el cuello de botella es el protocolo de transporte porque está orientado a conexión, por lo que no está aprovechando el ancho de banda.

Por otro lado, en el caso de las conexiones dentro de **una misma máquina y el *loopback***, podemos ver como en **TCP** se tiene un ancho de banda mayor que cuando usábamos dos computadores diferentes porque las transferencias se están haciendo dentro del propio ordenador. En **UDP**, ocurre lo mismo que cuando hemos usado los dos ordenadores ya que el protocolo sigue son aprovechar el ancho de banda.

> ➢ **Documentar las conclusiones sobre los resultados obtenidos**.

Realizando las diferentes pruebas que se nos planteaban en el enunciado, hemos podido observar que es preferible usar el protocolo de transporte **TCP** porque el aprovechamiento que hace del ancho de banda es mayor que el que hace el protocolo UDP. Además, TCP tiene una mayor fiabilidad a la hora de enviar o recibir paquetes y está orientado a conexión, es decir, está directamente relacionado con el control de flujo.

Por otro lado, también hemos observado que la variación que sufren los tamaños de ventana en el protocolo TCP provocan un cambio en el ancho de banda de manera que, si se aumenta el tamaño de ventana en las conexiones dentro de una misma máquina o *loopback* aumenta de manera proporcional el ancho de banda, y viceversa. Sin embargo, cuando en UDP reducimos el tamaño del buffer no afecta al ancho de banda. Pero, cuando modificamos el número de procesos, en TCP podemos ver que no afecta al ancho de banda; pero en UDP, al aumentar el número de procesos aumenta también el ancho de banda debido a que el buffer se llena con menor frecuencia.

2. ATM

- Configuración

Para poder empezar a configurar ATM, debemos instalar sus paquetes a través del siguiente comando:

```
rosa@rosa-VirtualBox:~$ sudo apt-get install atm-tools
rosa@rosa-VirtualBox:~$ sudo apt-get install br2684ctl
```

Ya tenemos los paquetes instalados y podemos empezar a trabajar, pero para ello debemos de parar el network-manager porque pueden surgir diversos conflictos.

```
rosa@rosa-VirtualBox:~$ sudo service network-manager stop
```

Ahora hemos cargado el módulo **atmtcp**:

```
root@ubuntu-18-04-server-lts-amd64:~# modprobe atmtcp
root@ubuntu-18-04-server-lts-amd64:~# lsmod | grep atmtcp
atmtcp                 16384  0
atm                    61440  4 clip,atmtcp
root@ubuntu-18-04-server-lts-amd64:~# _
```

```
root@rosa-VirtualBox:/home/rosa# modprobe atmtcp
root@rosa-VirtualBox:/home/rosa# lsmod | grep atmtcp
atmtcp                 16384  0
atm                    61440  4 clip,atmtcp
```

La imagen en lugar de ser del pc de Rosa es del otro pc con el que se ha intentado establecer la conexión para mostrar que tanto en una como en otra el módulo se ejecuta correctamente.

A continuación, se establece un pc como servidor y otro como cliente para intentar realizar la conexión tcp.

```
root@ubuntu-18-04-server-lts-amd64:~# atmtcp virtual listen
Link 0: virtual interface 0
_
```

```
root@rosa-VirtualBox:/home/rosa# atmtcp virtual connect 127.0.0.1
Link 0: virtual interface 0
connect: Connection refused
```

Como se puede en las imágenes la conexión entre las *ips* es rechazada. He intentado hacerlo con otros rangos de ip, pero me sale que son inalcanzables.

```
root@rosa-VirtualBox:/home/rosa# atmtcp virtual connect 192.168.56.1
Link 0: virtual interface 0
connect: Network is unreachable
```

```
root@rosa-VirtualBox:/home/rosa# atmtcp virtual connect 10.0.2.15
Link 0: virtual interface 0
connect: Network is unreachable  _
```