

SETUP

(Only for Virtual Box Config when using a shared directory where .py files are located)

```
$ sudo mkdir /media/shared
```

```
$ sudo mount -t vboxsf shared /media/shared
```

```
$ sudo apt install python3-pip
```

```
$ pip install mininet
```

```
$ sudo apt-get install mininet
```

```
$ sudo apt-get install xterm
```

```
$ sudo apt-get install -y openvswitch-testcontroller
```

```
$ sudo mn -c
```

```
$ sudo fuser -k 6653/tcp
```

```
$ sudo python3 portfolio-topology.py
```

```
vm@vm-VirtualBox: /media/windows
vm@vm-VirtualBox: /media/windows$ sudo fuser -k 6653/tcp
6653/tcp:
1007
vm@vm-VirtualBox: /media/windows$ sudo python3 portfolio-topology.py
*** Ping: testing ping reachability
h1 -> X X h4 h5 h6 h7 h8 h9 r1 r2 r3 r4
h2 -> h1 h3 h4 h5 h6 h7 h8 h9 r1 r2 r3 r4
h3 -> h1 h2 h4 h5 h6 h7 h8 h9 r1 r2 r3 r4
h4 -> h1 h2 h3 h5 h6 h7 h8 h9 r1 r2 r3 r4
h5 -> h1 h2 h3 h4 h6 h7 h8 h9 r1 r2 r3 r4
h6 -> h1 h2 h3 h4 h5 h7 h8 h9 r1 r2 r3 r4
h7 -> h1 h2 h3 h4 h5 h6 h8 h9 r1 r2 r3 r4
h8 -> h1 h2 h3 h4 h5 h6 h7 h9 r1 r2 r3 r4
h9 -> h1 h2 h3 h4 h5 h6 h7 h8 r1 r2 r3 r4
r1 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 r2 r3 r4
r2 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 r1 r3 r4
r3 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 r1 r2 r4
r4 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 r1 r2 r3
*** Results: 1% dropped (154/156 received)
mininet>
```

TEST Case 1: Measuring bandwidth with iperf in UDP mode

iperf tests with udp mode (h1->h4)

```
mininet> xterm h4
```

```
# ifconfig
```

```
# iperf -s -B 10.0.5.2 -u > throughput_udp_iperf_h1-h4.txt
```

```
mininet> xterm h1
```

```
# iperf -c 10.0.5.2 -b 10M -u
```

```
"Node: h4"
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::7850:3ff:fe97:d77e prefixlen 64 scopeid 0x20<link>
    ether 7a:90:03:97:d7:7e txqueuelen 1000 (Ethernet)
    RX packets 36764 bytes 55541672 (55.5 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 109 bytes 12354 (12.3 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# iperf -s -B 10.0.5.2 -u > throughput_udp_iperf_h1-h4.txt
[ 5] WARNING: ack of last datagram failed.

"Node: h1"
root@vm-VirtualBox:/media/windows# iperf -c 10.0.5.2 -b 10M -u
Client connecting to 10.0.5.2, UDP port 5001
Sending 1470 byte datagrams, IPG target: 1121.52 us (kalman adjust)
UDP buffer size: 208 KByte (default)

[ 1] local 10.0.0.2 port 69799 connected with 10.0.5.2 port 5001
[ ID] Interval Transfer Bandwidth
[ 1] 0.0000-10.0009 sec 12.5 MBytes 10.5 Mbits/sec
[ 1] Sent 8920 datagrams
[ 1] Server Report:
[ ID] Interval Transfer Bandwidth Jitter Lost/Total Datagrams
[ 1] 0.0000-10.0113 sec 12.5 MBytes 10.5 Mbits/sec 1.943 ms 0/8919 (0%)
[ 1] 0.0000-10.0113 sec 4 datagrams received out-of-order
root@vm-VirtualBox:/media/windows#
```

iperf tests with udp mode (h1->h9)

```
mininet> xterm h9
```

```
# ifconfig
```

```
# iperf -s -B 10.0.7.2 -u > throughput_udp_iperf_h1-h9.txt
```

```
mininet> xterm h1
```

```
# iperf -c 10.0.7.2 -b 10M -u
```

```
"Node: h9"
root@vm-VirtualBox:/media/windows# ifconfig
h9-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.7.2 netmask 255.255.255.0 broadcast 10.0.7.255
    inet6 fe80::d00d:3ff:fe51:db97 prefixlen 64 scopeid 0x20<link>
    ether de:cd:b4:a5:db:97 txqueuelen 1000 (Ethernet)
    RX packets 39609 bytes 53738846 (53.7 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 85 bytes 9838 (9.8 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# iperf -s -B 10.0.7.2 -u > throughput_udp_iperf_h1-h9.txt
[ 5] WARNING: ack of last datagram failed.
[ 6] WARNING: ack of last datagram failed.

"Node: h1"
root@vm-VirtualBox:/media/windows# iperf -c 10.0.7.2 -b 10M -u
Client connecting to 10.0.7.2, UDP port 5001
Sending 1470 byte datagrams, IPG target: 1121.52 us (kalman adjust)
UDP buffer size: 208 KByte (default)

[ 1] local 10.0.0.2 port 42050 connected with 10.0.7.2 port 5001
[ ID] Interval Transfer Bandwidth
[ 1] 0.0000-10.0021 sec 12.5 MBytes 10.5 Mbits/sec
[ 1] Sent 8921 datagrams
[ 1] Server Report:
[ ID] Interval Transfer Bandwidth Jitter Lost/Total Datagrams
[ 1] 0.0000-10.0669 sec 11.8 MBytes 9.80 Mbits/sec 3.263 ms 531/8920 (6%)
root@vm-VirtualBox:/media/windows#
```

iperf tests with udp mode (h7->h9)

```
mininet> xterm h9
# ifconfig
# iperf -s -B 10.0.7.2 -u > throughput_udp_iperf_h7-h9.txt
```

```
mininet> xterm h7
# iperf -c 10.0.7.2 -b 10M -u
```

iperf tests with udp mode (h7->h9)

```
"Node: h9"
root@vm-VirtualBox:/media/windows# ifconfig
h9-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.7.2 netmask 255.255.255.0 broadcast 10.0.7.255
    inet6 fe80::d0cd:baff:fea5:db37 prefixlen 64 scopeid 0x20<link>
    ether d0:cd:b:a5:db:37 txqueuelen 1000 (Ethernet)
    RX packets 44018 bytes 65442430 (66.4 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 98 bytes 11732 (11.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# iperf -s -B 10.0.7.2 -u > throughput_udp_iperf_h7-h9.txt
[ 5] WARNING: ack of last datagram failed.

"Node: h7"
root@vm-VirtualBox:/media/windows# iperf -c 10.0.7.2 -b 10M -u
Client connecting to 10.0.7.2, UDP port 5001
Sending 1470 byte datagrams, IPG target: 1121.52 us (kalman adjust)
UDP buffer size: 208 KByte (default)

[ 1] local 10.0.2.2 port 42635 connected with 10.0.7.2 port 5001
[ ID] Interval Transfer Bandwidth
[ 1] 0.0000-10.0019 sec 12.5 MBytes 10.5 Mb/s/sec
[ 1] Sent 8821 datagrams
[ 1] Server Report:
[ ID] Interval Transfer Bandwidth Jitter Lost/Total Datagrams
[ 1] 0.0000-9.9987 sec 12.5 MBytes 10.5 Mb/s/sec 0.915 ms 0/8920 (0%)
root@vm-VirtualBox:/media/windows#
```

TEST Case 2: Link Latency and Throughput

Link Latency and Throughput for L1:

```
mininet> xterm r2
# ifconfig

mininet> xterm r1
# ping 10.0.1.2 -c 25 | tee latency_L1.txt
```

```
"Node: r2"
root@vm-VirtualBox:/media/windows# ifconfig
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

r2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.1.2 netmask 255.255.255.0 broadcast 10.0.1.255
    inet6 fe80::9020:3aff:fela:76e3 prefixlen 64 scopeid 0x20<link>
    ether 92:20:3a:1a:76:e3 txqueuelen 1000 (Ethernet)
    RX packets 1694581 bytes 2485410262 (2.4 GB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 864432 bytes 295482236 (295.4 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

r2-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.2.1 netmask 255.255.255.0 broadcast 10.0.2.255
    inet6 fe80::cc24:3fff:feb3:7fff prefixlen 64 scopeid 0x20<link>
    ether ce:24:3f:b3:07:ff txqueuelen 1000 (Ethernet)
    RX packets 44 bytes 3732 (3.7 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 43 bytes 3722 (3.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

r2-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.3.1 netmask 255.255.255.0 broadcast 10.0.3.255
    inet6 fe80::84e5:9bff:fe2a:7251 prefixlen 64 scopeid 0x20<link>
    ether 8e:e5:9b:2a:72:51 txqueuelen 1000 (Ethernet)
    RX packets 43881 bytes 2698834 (2.6 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 86924 bytes 131417157 (131.4 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows#

"Node: r1"
root@vm-VirtualBox:/media/windows# ping 10.0.1.2 -c 25 | tee latency_L1.txt
PING 10.0.1.2 (10.0.1.2) 56(84) bytes of data.
64 bytes from 10.0.1.2: icmp_seq=1 ttl=64 time=56.9 ms
64 bytes from 10.0.1.2: icmp_seq=2 ttl=64 time=21.0 ms
64 bytes from 10.0.1.2: icmp_seq=3 ttl=64 time=20.8 ms
64 bytes from 10.0.1.2: icmp_seq=4 ttl=64 time=20.6 ms
64 bytes from 10.0.1.2: icmp_seq=5 ttl=64 time=20.7 ms
64 bytes from 10.0.1.2: icmp_seq=6 ttl=64 time=20.5 ms
64 bytes from 10.0.1.2: icmp_seq=7 ttl=64 time=20.9 ms
64 bytes from 10.0.1.2: icmp_seq=8 ttl=64 time=20.8 ms
64 bytes from 10.0.1.2: icmp_seq=9 ttl=64 time=20.9 ms
64 bytes from 10.0.1.2: icmp_seq=10 ttl=64 time=21.3 ms
64 bytes from 10.0.1.2: icmp_seq=11 ttl=64 time=20.9 ms
64 bytes from 10.0.1.2: icmp_seq=12 ttl=64 time=20.4 ms
64 bytes from 10.0.1.2: icmp_seq=13 ttl=64 time=20.8 ms
64 bytes from 10.0.1.2: icmp_seq=14 ttl=64 time=21.3 ms
64 bytes from 10.0.1.2: icmp_seq=15 ttl=64 time=20.7 ms
64 bytes from 10.0.1.2: icmp_seq=16 ttl=64 time=20.4 ms
64 bytes from 10.0.1.2: icmp_seq=17 ttl=64 time=20.5 ms
64 bytes from 10.0.1.2: icmp_seq=18 ttl=64 time=20.9 ms
64 bytes from 10.0.1.2: icmp_seq=19 ttl=64 time=20.5 ms
64 bytes from 10.0.1.2: icmp_seq=20 ttl=64 time=21.2 ms
64 bytes from 10.0.1.2: icmp_seq=21 ttl=64 time=20.4 ms
64 bytes from 10.0.1.2: icmp_seq=22 ttl=64 time=20.6 ms
64 bytes from 10.0.1.2: icmp_seq=23 ttl=64 time=20.7 ms
64 bytes from 10.0.1.2: icmp_seq=24 ttl=64 time=22.9 ms
64 bytes from 10.0.1.2: icmp_seq=25 ttl=64 time=20.7 ms

--- 10.0.1.2 ping statistics ---
25 packets transmitted, 25 received, 0% packet loss, time 2404ms
rtt min/avg/max/mdev = 20.387/22.299/56.914/7.082 ms
root@vm-VirtualBox:/media/windows#
```

```
# script throughput_L1.txt
# python3 simpleperf.py -s -b 10.0.1.2
(Press Ctrl+C and Ctrl+D after measuring)
```

```
# python3 simpleperf.py -c -I 10.0.1.2 -t 25 -i 5
```

```
"Node: r2"
root@vm-VirtualBox:/media/windows# script throughput_L1.txt
Script started, output log file is 'throughput_L1.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.1.2
A simpleperf server is listening on port 8088

A simpleperf client with 10.0.1.1:36370 is connected with 10.0.1.2:8088

ID          Interval      Received      Rate
10.0.1.1:36370 0.0 - 25.3    118 MB        37.44 Mbps
^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#

"Node: r1"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.1.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.1.2, port 8088

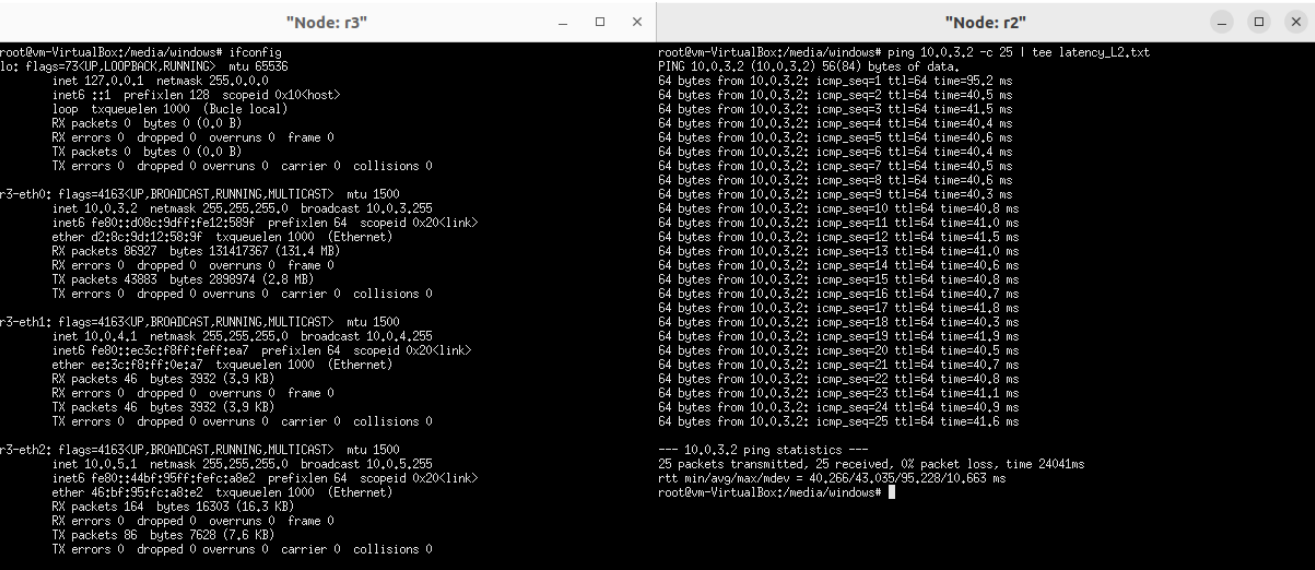
Client ip 10.0.1.1:36370 connected with server 10.0.1.2 port 8088

ID          Interval      Transfer      Bandwidth
10.0.1.1:36370 0.0 - 5.0      25 MB         39.74 Mbps
10.0.1.1:36370 5.0 - 10.0    22 MB         36.79 Mbps
10.0.1.1:36370 10.0 - 15.0   24 MB         37.96 Mbps
10.0.1.1:36370 15.0 - 20.0   24 MB         38.03 Mbps
10.0.1.1:36370 20.0 - 25.0   24 MB         37.95 Mbps

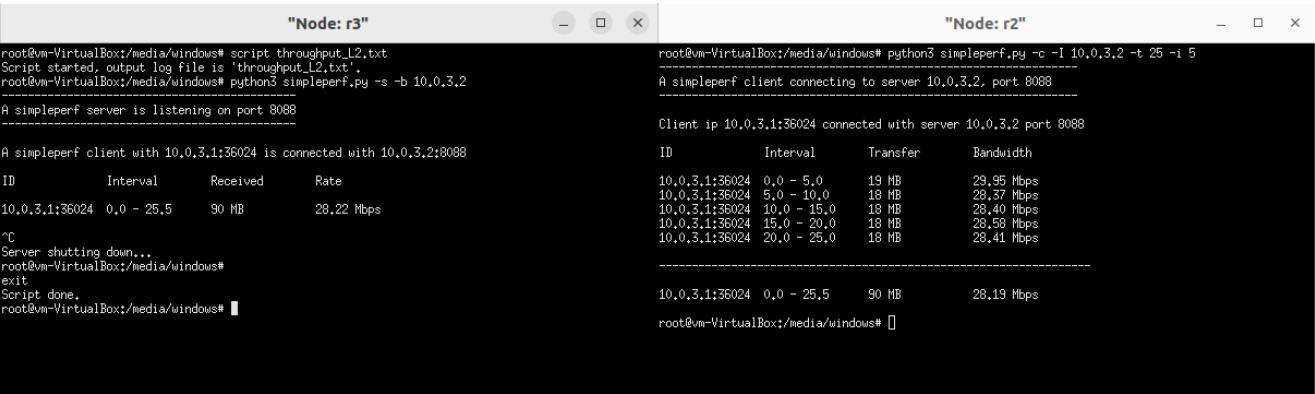
-----
10.0.1.1:36370 0.0 - 25.3    118 MB        37.43 Mbps
root@vm-VirtualBox:/media/windows#
```

Link Latency and Throughput for L2:

```
mininet> xterm r3
# ifconfig
```

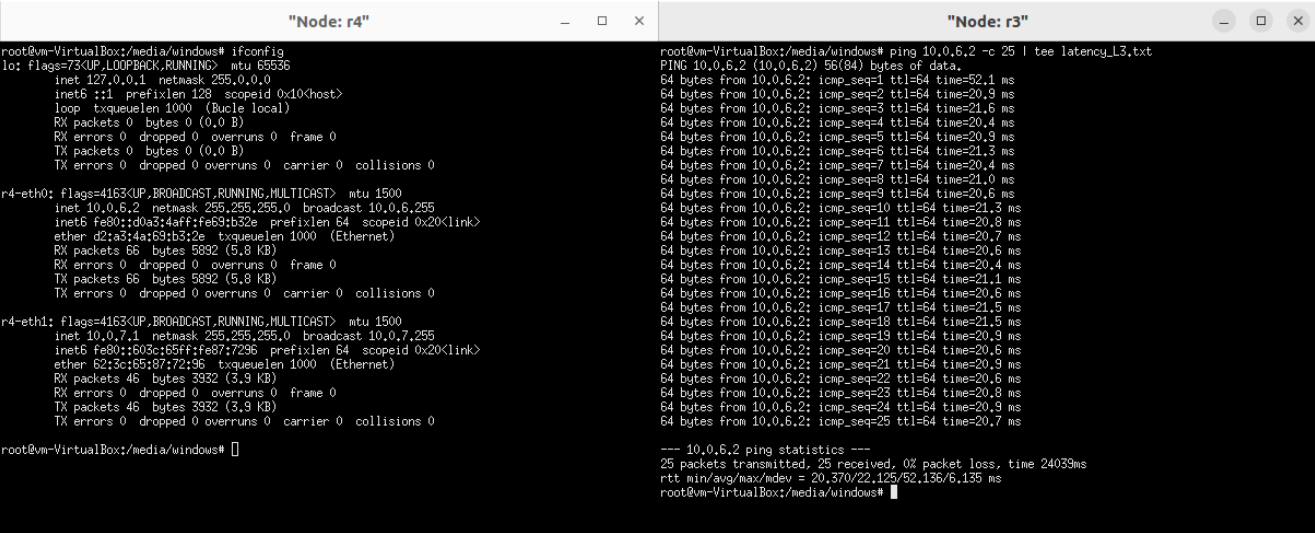


```
# script throughput_L2.txt
# python3 simpleperf.py -s -b 10.0.3.2
(Press Ctrl+C and Ctrl+D after measuring)
```



Link Latency and Throughput for L3:

```
mininet> xterm r4
# ifconfig
```



```
mininet> xterm r2
# ping 10.0.3.2 -c 25 | tee latency_L2.txt
```

```
# python3 simpleperf.py -c -I 10.0.3.2 -t 25 -i 5
```

```
mininet> xterm r3
# ping 10.0.6.2 -c 25 | tee latency_L3.txt
```

```
# script throughput_L3.txt
# python3 simpleperf.py -s -b 10.0.6.2
(Press Ctrl+C and Ctrl+D after measuring)
```

```
"Node: r4"
root@vm-VirtualBox:/media/windows# script throughput_L3.txt
Script started, output log file is 'throughput_L3.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.6.2
A simpleperf server is listening on port 8088

A simpleperf client with 10.0.6.1:57894 is connected with 10.0.6.2:8088

ID          Interval    Received    Rate
10.0.6.1:57894  0.0 - 25.3    60 MB      18.92 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#

"Node: r3"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.6.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.6.2, port 8088

Client ip 10.0.6.1:57894 connected with server 10.0.6.2 port 8088

ID          Interval    Transfer    Bandwidth
10.0.6.1:57894  0.0 - 5.0      12 MB      19.89 Mbps
10.0.6.1:57894  5.0 - 10.0     12 MB      19.00 Mbps
10.0.6.1:57894  10.0 - 15.0    12 MB      18.82 Mbps
10.0.6.1:57894  15.0 - 20.0    12 MB      19.01 Mbps
10.0.6.1:57894  20.0 - 25.0    12 MB      18.92 Mbps

-----

10.0.6.1:57894  0.0 - 25.3    60 MB      18.91 Mbps

root@vm-VirtualBox:/media/windows#
```

TEST Case 3: Path Latency and Throughput

Path Latency and Throughput for h1->h4:

```
mininet> xterm h4
```

```
# ifconfig
```

```
"Node: h4"
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::c04c:8dff:fe40:9f3f prefixlen 64 scopeid 0x20<link>
    ether c2:4c:8d:40:9f:3f txqueuelen 1000 (Ethernet)
    RX packets 86 bytes 8804 (8.8 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 43 bytes 3510 (3.5 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows#

"Node: h1"
root@vm-VirtualBox:/media/windows# ping 10.0.5.2 -c 25 | tee latency_h1-h4.txt
PING 10.0.5.2 (10.0.5.2) 56(84) bytes of data:
64 bytes from 10.0.5.2: icmp_seq=1 ttl=61 time=65.4 ms
64 bytes from 10.0.5.2: icmp_seq=2 ttl=61 time=64.6 ms
64 bytes from 10.0.5.2: icmp_seq=3 ttl=61 time=62.0 ms
64 bytes from 10.0.5.2: icmp_seq=4 ttl=61 time=62.2 ms
64 bytes from 10.0.5.2: icmp_seq=5 ttl=61 time=62.4 ms
64 bytes from 10.0.5.2: icmp_seq=6 ttl=61 time=66.7 ms
64 bytes from 10.0.5.2: icmp_seq=7 ttl=61 time=62.9 ms
64 bytes from 10.0.5.2: icmp_seq=8 ttl=61 time=61.6 ms
64 bytes from 10.0.5.2: icmp_seq=9 ttl=61 time=61.0 ms
64 bytes from 10.0.5.2: icmp_seq=10 ttl=61 time=61.1 ms
64 bytes from 10.0.5.2: icmp_seq=11 ttl=61 time=61.4 ms
64 bytes from 10.0.5.2: icmp_seq=12 ttl=61 time=62.4 ms
64 bytes from 10.0.5.2: icmp_seq=13 ttl=61 time=62.0 ms
64 bytes from 10.0.5.2: icmp_seq=14 ttl=61 time=61.5 ms
64 bytes from 10.0.5.2: icmp_seq=15 ttl=61 time=61.9 ms
64 bytes from 10.0.5.2: icmp_seq=16 ttl=61 time=63.1 ms
64 bytes from 10.0.5.2: icmp_seq=17 ttl=61 time=61.0 ms
64 bytes from 10.0.5.2: icmp_seq=18 ttl=61 time=61.1 ms
64 bytes from 10.0.5.2: icmp_seq=19 ttl=61 time=63.5 ms
64 bytes from 10.0.5.2: icmp_seq=20 ttl=61 time=61.6 ms
64 bytes from 10.0.5.2: icmp_seq=21 ttl=61 time=60.9 ms
64 bytes from 10.0.5.2: icmp_seq=22 ttl=61 time=61.5 ms
64 bytes from 10.0.5.2: icmp_seq=23 ttl=61 time=63.0 ms
64 bytes from 10.0.5.2: icmp_seq=24 ttl=61 time=62.0 ms
64 bytes from 10.0.5.2: icmp_seq=25 ttl=61 time=61.9 ms

--- 10.0.5.2 ping statistics ---
25 packets transmitted, 25 received, 0% packet loss, time 24035ms
rtt min/avg/max/ndev = 60.872/62.347/66.694/1.391 ms
root@vm-VirtualBox:/media/windows#
```

```
# script throughput_h1-h4.txt
# python3 simpleperf.py -s -b 10.0.5.2
(Press Ctrl+C and Ctrl+D after measuring)
```

```
"Node: h4"
root@vm-VirtualBox:/media/windows# script throughput_h1-h4.txt
Script started, output log file is 'throughput_h1-h4.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2
A simpleperf server is listening on port 8088

A simpleperf client with 10.0.0.2:51108 is connected with 10.0.5.2:8088

ID          Interval    Received    Rate
10.0.0.2:51108  0.0 - 25.3    83 MB      26.14 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#

"Node: h1"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.5.2, port 8088

Client ip 10.0.0.2:51108 connected with server 10.0.5.2 port 8088

ID          Interval    Transfer    Bandwidth
10.0.0.2:51108  0.0 - 5.0      14 MB      22.57 Mbps
10.0.0.2:51108  5.0 - 10.0     17 MB      27.32 Mbps
10.0.0.2:51108  10.0 - 15.0    17 MB      27.95 Mbps
10.0.0.2:51108  15.0 - 20.0    18 MB      28.48 Mbps
10.0.0.2:51108  20.0 - 25.0    16 MB      25.86 Mbps

-----

10.0.0.2:51108  0.0 - 25.4    83 MB      26.07 Mbps

root@vm-VirtualBox:/media/windows#
```

```
# python3 simpleperf.py -c -I 10.0.6.2 -t 25 -i 5
```

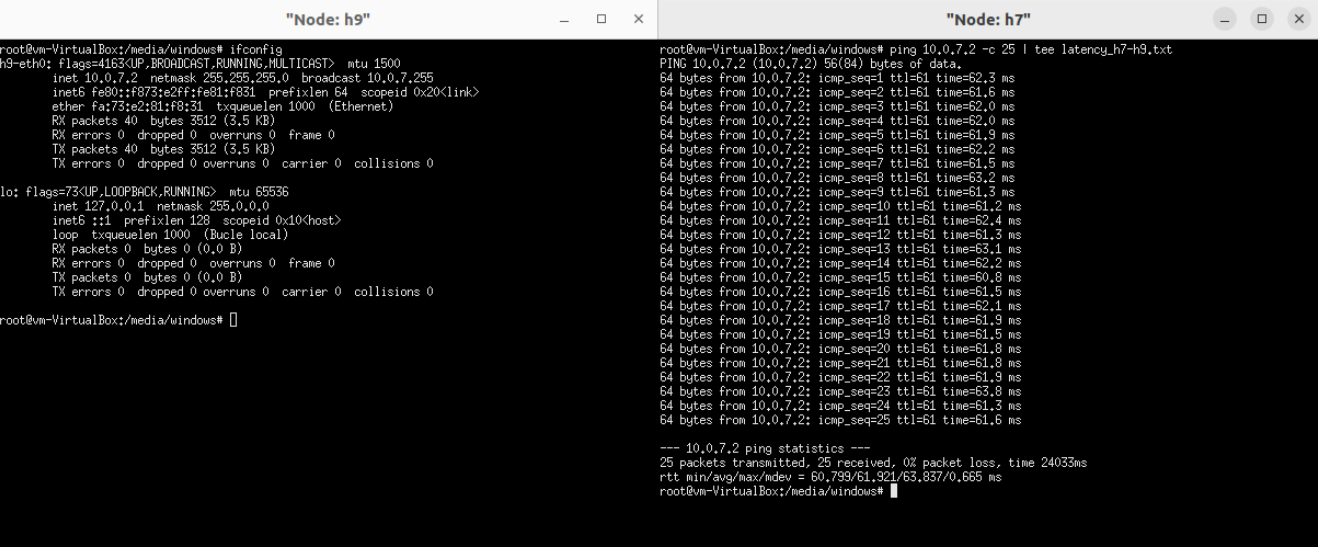
```
mininet> xterm h1
```

```
# ping 10.0.5.2 -c 25 | tee latency_h1-h4.txt
```

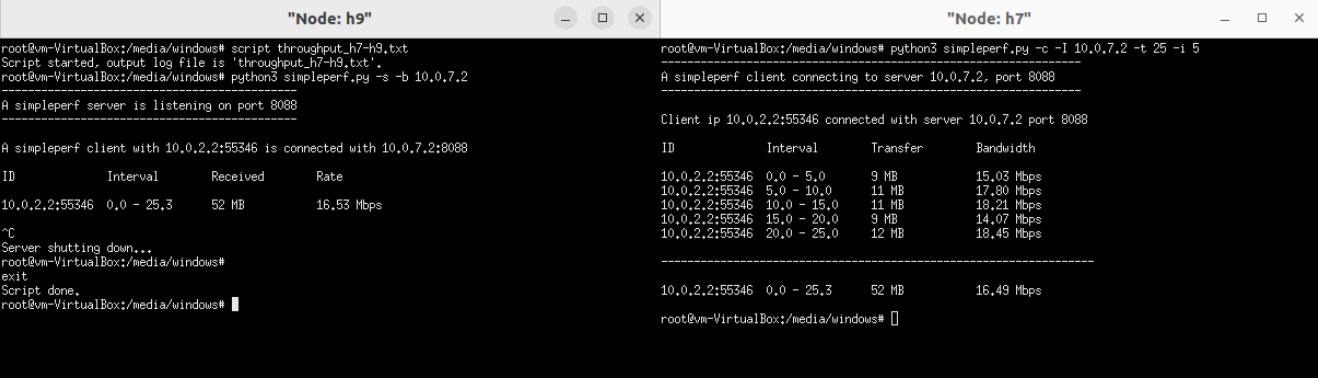
```
# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5
```

Path Latency and Throughput for h7-h9:

mininet> xterm h9
ifconfig

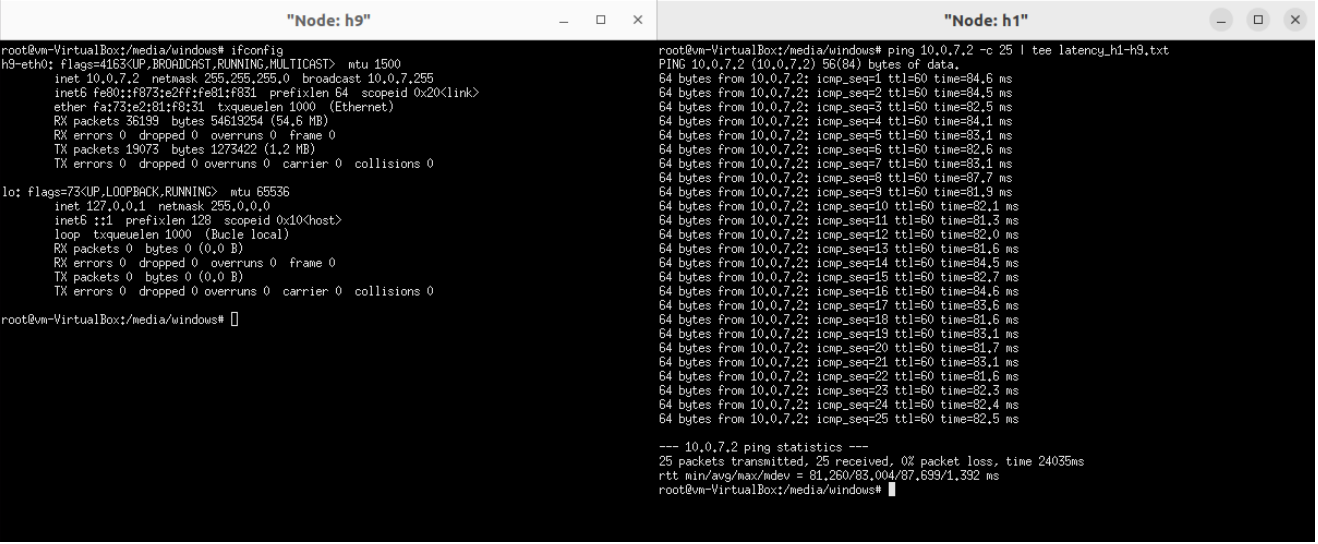


script throughput_h7-h9.txt
python3 simpleperf.py -s -b 10.0.7.2
(Press Ctrl+C and Ctrl+D after measuring)



Path Latency and Throughput for h1-h9:

mininet> xterm h9
ifconfig



mininet> xterm h7
ping 10.0.7.2 -c 25 | tee latency_h7-h9.txt

python3 simpleperf.py -c -I 10.0.7.2 -t 25 -i 5

mininet> xterm h1
ping 10.0.7.2 -c 25 | tee latency_h1-h9.txt

```
# script throughput_h1-h9.txt
# python3 simpleperf.py -s -b 10.0.7.2
(Press Ctrl+C and Ctrl+D after measuring)
```

```
# python3 simpleperf.py -c -l 10.0.7.2 -t 25 -i 5
```

"Node: h9"

```
root@vm-VirtualBox:/media/windows# script throughput_h1-h9.txt
Script started, output log file is 'throughput_h1-h9.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.7.2
A simpleperf server is listening on port 8088

A simpleperf client with 10.0.0.2:54438 is connected with 10.0.7.2:8088

ID          Interval    Received    Rate
10.0.0.2:54438 0.0 - 25.3    50 MB      15.94 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#
```

"Node: h1"

```
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -l 10.0.7.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.7.2, port 8088

Client ip 10.0.0.2:54438 connected with server 10.0.7.2 port 8088

ID          Interval    Transfer    Bandwidth
10.0.0.2:54438 0.0 - 5.0      7 MB        11.46 Mbps
10.0.0.2:54438 5.0 - 10.0    10 MB       15.38 Mbps
10.0.0.2:54438 10.0 - 15.0    11 MB       17.43 Mbps
10.0.0.2:54438 15.0 - 20.0    11 MB       17.40 Mbps
10.0.0.2:54438 20.0 - 25.0    12 MB       18.85 Mbps

10.0.0.2:54438 0.0 - 25.3    50 MB       15.90 Mbps

root@vm-VirtualBox:/media/windows#
```

TEST Case 4: Effects of Multiplexing and Latency

Path Latency and Throughput for h1->h4, h2->h5:

```
mininet> xterm h4
# ifconfig
# script throughput_h1-h4-1.txt
# python3 simpleperf.py -s -b 10.0.5.2
```

```
mininet> xterm h5
# ifconfig
# script throughput_h2-h5-1.txt
# python3 simpleperf.py -s -b 10.0.5.3
```

"Node: h4"

```
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::c04c:8dff:fe40:9f3f prefixlen 64 scopeid 0x20<link>
    ether c2:4c:8d:40:9f:3f txqueuelen 1000 (Ethernet)
    RX packets 57192 bytes 86395375 (86.3 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 28635 bytes 1894988 (1.8 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h1-h4-1.txt
Script started, output log file is 'throughput_h1-h4-1.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2
A simpleperf server is listening on port 8088


```

"Node: h5"

```
root@vm-VirtualBox:/media/windows# ifconfig
h5-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.3 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::e019:60ff:fe57:9ed9 prefixlen 64 scopeid 0x20<link>
    ether e2:19:60:57:9e:d9 txqueuelen 1000 (Ethernet)
    RX packets 102 bytes 10351 (10.3 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 46 bytes 3820 (3.8 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h2-h5-1.txt
Script started, output log file is 'throughput_h2-h5-1.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.3
A simpleperf server is listening on port 8088


```

```
mininet> xterm h1
# python3 simpleperf.py -c -l 10.0.5.2 -t 25 -i 5 (wait)
```

```
mininet> xterm h2
# python3 simpleperf.py -c -l 10.0.5.3 -t 25 -i 5 (wait)
```

(open new xterm to measure latency while running simpleperf)

```
mininet> xterm h1
# ping 10.0.5.2 -c 25 | tee latency_h1-h4-1.txt (wait)
```

```
mininet> xterm h2
# ping 10.0.5.3 -c 25 | tee latency_h2-h5-1.txt (wait)
```

Execute the commands one after other.

"Node: h1"

root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5

A simpleperf client connecting to server 10.0.5.2, port 8088

Client ip 10.0.0.2:59574 connected with server 10.0.5.2 port 8088

ID	Interval	Transfer	Bandwidth
10.0.0.2:59574	0.0 - 5.0	8 MB	12.53 Mbps
10.0.0.2:59574	5.0 - 10.0	6 MB	10.36 Mbps

"Node: h2"

root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.3 -t 25 -i 5

A simpleperf client connecting to server 10.0.5.3, port 8088

Client ip 10.0.0.3:40800 connected with server 10.0.5.3 port 8088

ID	Interval	Transfer	Bandwidth
10.0.0.3:40800	0.0 - 5.0	5 MB	7.74 Mbps
10.0.0.3:40800	5.0 - 10.0	5 MB	7.54 Mbps

"Node: h1"

root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5

A simpleperf client connecting to server 10.0.5.2, port 8088

Client ip 10.0.0.2:59574 connected with server 10.0.5.2 port 8088

ID	Interval	Transfer	Bandwidth
10.0.0.2:59574	0.0 - 5.0	8 MB	12.53 Mbps
10.0.0.2:59574	5.0 - 10.0	6 MB	10.36 Mbps
10.0.0.2:59574	10.0 - 15.0	5 MB	7.84 Mbps
10.0.0.2:59574	15.0 - 20.0	7 MB	11.73 Mbps
10.0.0.2:59574	20.0 - 25.0	7 MB	10.78 Mbps

ID	Interval	Transfer	Bandwidth
10.0.0.2:59574	0.0 - 25.8	33 MB	10.31 Mbps

root@vm-VirtualBox:/media/windows#

"Node: h2"

root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.3 -t 25 -i 5

A simpleperf client connecting to server 10.0.5.3, port 8088

Client ip 10.0.0.3:40800 connected with server 10.0.5.3 port 8088

ID	Interval	Transfer	Bandwidth
10.0.0.3:40800	0.0 - 5.0	5 MB	7.74 Mbps
10.0.0.3:40800	5.0 - 10.0	5 MB	7.54 Mbps
10.0.0.3:40800	10.0 - 15.0	6 MB	9.33 Mbps
10.0.0.3:40800	15.0 - 20.0	10 MB	15.43 Mbps
10.0.0.3:40800	20.0 - 25.0	9 MB	13.98 Mbps

ID	Interval	Transfer	Bandwidth
10.0.0.3:40800	0.0 - 25.4	34 MB	10.75 Mbps

root@vm-VirtualBox:/media/windows#

"Node: h1"

64 bytes from 10.0.5.2: icmp_seq=10 ttl=61 time=192 ms
64 bytes from 10.0.5.2: icmp_seq=11 ttl=61 time=62.8 ms
64 bytes from 10.0.5.2: icmp_seq=12 ttl=61 time=62.4 ms
64 bytes from 10.0.5.2: icmp_seq=13 ttl=61 time=62.6 ms
64 bytes from 10.0.5.2: icmp_seq=14 ttl=61 time=62.2 ms
64 bytes from 10.0.5.2: icmp_seq=15 ttl=61 time=64.5 ms
64 bytes from 10.0.5.2: icmp_seq=16 ttl=61 time=70.2 ms
64 bytes from 10.0.5.2: icmp_seq=17 ttl=61 time=68.9 ms
64 bytes from 10.0.5.2: icmp_seq=18 ttl=61 time=73.9 ms
64 bytes from 10.0.5.2: icmp_seq=19 ttl=61 time=62.5 ms
64 bytes from 10.0.5.2: icmp_seq=20 ttl=61 time=69.8 ms
64 bytes from 10.0.5.2: icmp_seq=21 ttl=61 time=74.9 ms
64 bytes from 10.0.5.2: icmp_seq=22 ttl=61 time=69.7 ms
64 bytes from 10.0.5.2: icmp_seq=23 ttl=61 time=63.4 ms
64 bytes from 10.0.5.2: icmp_seq=24 ttl=61 time=61.0 ms
64 bytes from 10.0.5.2: icmp_seq=25 ttl=61 time=61.0 ms

--- 10.0.5.2 ping statistics ---
25 packets transmitted, 25 received, 0% packet loss, time 24025ms
rtt min/avg/max/ndev = 60.954/88.631/311.711/59.225 ms
root@vm-VirtualBox:/media/windows#

"Node: h2"

64 bytes from 10.0.5.3: icmp_seq=10 ttl=61 time=160 ms
64 bytes from 10.0.5.3: icmp_seq=11 ttl=61 time=61.4 ms
64 bytes from 10.0.5.3: icmp_seq=12 ttl=61 time=61.7 ms
64 bytes from 10.0.5.3: icmp_seq=13 ttl=61 time=62.3 ms
64 bytes from 10.0.5.3: icmp_seq=14 ttl=61 time=68.6 ms
64 bytes from 10.0.5.3: icmp_seq=15 ttl=61 time=69.8 ms
64 bytes from 10.0.5.3: icmp_seq=16 ttl=61 time=68.1 ms
64 bytes from 10.0.5.3: icmp_seq=17 ttl=61 time=76.1 ms
64 bytes from 10.0.5.3: icmp_seq=18 ttl=61 time=63.1 ms
64 bytes from 10.0.5.3: icmp_seq=19 ttl=61 time=70.2 ms
64 bytes from 10.0.5.3: icmp_seq=20 ttl=61 time=74.3 ms
64 bytes from 10.0.5.3: icmp_seq=21 ttl=61 time=61.5 ms
64 bytes from 10.0.5.3: icmp_seq=22 ttl=61 time=61.8 ms
64 bytes from 10.0.5.3: icmp_seq=23 ttl=61 time=60.6 ms
64 bytes from 10.0.5.3: icmp_seq=24 ttl=61 time=62.9 ms
64 bytes from 10.0.5.3: icmp_seq=25 ttl=61 time=62.9 ms

--- 10.0.5.3 ping statistics ---
25 packets transmitted, 25 received, 0% packet loss, time 24063ms
rtt min/avg/max/ndev = 60.605/90.244/289.717/60.306 ms
root@vm-VirtualBox:/media/windows#

Press Ctrl+C and Ctrl+D after measuring:

Press Ctrl+C and Ctrl+D after measuring:

```
"Node: h4"
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::c04c:8dff:fe40:9f3f prefixlen 64 scopeid 0x20<link>
    ether c2:4c:8d:40:9f:3f txqueuelen 1000 (Ethernet)
    RX packets 126739 bytes 191633930 (191.6 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 64523 bytes 4291898 (4.2 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h1-h4-1.txt
Script started, output log file is 'throughput_h1-h4-1.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2
-----
A simpleperf server is listening on port 8088
-----

A simpleperf client with 10.0.0.2:55406 is connected with 10.0.5.2:8088

ID          Interval    Received    Rate
10.0.0.2:55406  0.0 - 25.7    32 MB       9.88 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#

"Node: h5"
root@vm-VirtualBox:/media/windows# ifconfig
h5-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.3 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::e019:60ff:fe57:9ed9 prefixlen 64 scopeid 0x20<link>
    ether e2:19:60:57:9e:d9 txqueuelen 1000 (Ethernet)
    RX packets 67940 bytes 102578123 (102.5 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 34631 bytes 2325126 (2.3 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h2-h5-1.txt
Script started, output log file is 'throughput_h2-h5-1.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.3
-----
A simpleperf server is listening on port 8088
-----

A simpleperf client with 10.0.0.3:52322 is connected with 10.0.5.3:8088

ID          Interval    Received    Rate
10.0.0.3:52322  0.0 - 25.3    29 MB       9.30 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#
```

Path Latency and Throughput for h1->h4, h2->h5, h3->h6

mininet> xterm h4

ifconfig

script throughput_h1-h4-2.txt

python3 simpleperf.py -s -b 10.0.5.2

mininet> xterm h5

ifconfig

script throughput_h2-h5-2.txt

python3 simpleperf.py -s -b 10.0.5.3

mininet> xterm h6

ifconfig

script throughput_h3-h6-2.txt

python3 simpleperf.py -s -b 10.0.5.4

```
"Node: h4"
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::c04c:8dff:fe40:9f3f prefixlen 64 scopeid 0x2
    O<link>
    ether c2:4c:8d:40:9f:3f txqueuelen 1000 (Ethernet)
    RX packets 148760 bytes 224837789 (224.8 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 75568 bytes 5044744 (5.0 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h1-h4-2.txt
Script started, output log file is 'throughput_h1-h4-2.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2
-----
A simpleperf server is listening on port 8088
-----

"Node: h5"
root@vm-VirtualBox:/media/windows# ifconfig
h5-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.3 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::e019:60ff:fe57:9ed9 prefixlen 64 scopeid 0x2
    O<link>
    ether e2:19:60:57:9e:d9 txqueuelen 1000 (Ethernet)
    RX packets 88276 bytes 133318232 (133.3 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 45032 bytes 3015636 (3.0 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h2-h5-2.txt
Script started, output log file is 'throughput_h2-h5-2.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.3
-----
A simpleperf server is listening on port 8088
-----

"Node: h6"
root@vm-VirtualBox:/media/windows# ifconfig
h6-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.4 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::80c7:1dfff:fe0b:2bc7 prefixlen 64 scopeid 0x2
    O<link>
    ether 82:c7:1d:f0:b2:bc:7 txqueuelen 1000 (Ethernet)
    RX packets 113 bytes 11278 (11.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 46 bytes 3820 (3.8 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h3-h6-2.txt
Script started, output log file is 'throughput_h3-h6-2.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.4
-----
A simpleperf server is listening on port 8088
-----
```

mininet> xterm h1

python3 simpleperf.py -c -l 10.0.5.2 -t 25 -i 5

mininet> xterm h2

python3 simpleperf.py -c -l 10.0.5.3 -t 25 -i 5

mininet> xterm h3

python3 simpleperf.py -c -l 10.0.5.4 -t 25 -i 5

(open new xterm to measure latency while running simpleperf)

mininet> xterm h1

ping 10.0.5.2 -c 25 | tee latency_h1-h4-2.txt

mininet> xterm h2

ping 10.0.5.3 -c 25 | tee latency_h2-h5-2.txt

mininet> xterm h3

ping 10.0.5.4 -c 25 | tee latency_h3-h6-2.txt

Execute the commands one after other.

"Node: h1" - □ ×

root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5

A simpleperf client connecting to server 10.0.5.2, port 8088

Client ip 10.0.0.2:37588 connected with server 10.0.5.2 port 8088

ID	Interval	Transfer	Bandwidth
10.0.0.2:37588	0.0 - 5.0	4 MB	6.03 Mbps
10.0.0.2:37588	5.0 - 10.0	4 MB	6.23 Mbps

"Node: h2" - □ ×

root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.3 -t 25 -i 5

A simpleperf client connecting to server 10.0.5.3, port 8088

Client ip 10.0.0.3:38500 connected with server 10.0.5.3 port 8088

ID	Interval	Transfer	Bandwidth
10.0.0.3:38500	0.0 - 5.0	1 MB	2.29 Mbps
10.0.0.3:38500	5.0 - 10.0	3 MB	5.11 Mbps

"Node: h3" - □ ×

root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.4 -t 25 -i 5

A simpleperf client connecting to server 10.0.5.4, port 8088

Client ip 10.0.0.4:53982 connected with server 10.0.5.4 port 8088

ID	Interval	Transfer	Bandwidth
10.0.0.4:53982	0.0 - 5.0	2 MB	3.38 Mbps

"Node: h1" - □ ×

root@vm-VirtualBox:/media/windows# ping 10.0.5.2 -c 25 | tee late_ncy_h1-h4-2.txt

PING 10.0.5.2 (10.0.5.2) 56(84) bytes of data:

64 bytes from 10.0.5.2: icmp_seq=1 ttl=61 time=106 ms

64 bytes from 10.0.5.2: icmp_seq=2 ttl=61 time=162 ms

64 bytes from 10.0.5.2: icmp_seq=3 ttl=61 time=74.8 ms

64 bytes from 10.0.5.2: icmp_seq=4 ttl=61 time=208 ms

64 bytes from 10.0.5.2: icmp_seq=5 ttl=61 time=62.7 ms

64 bytes from 10.0.5.2: icmp_seq=6 ttl=61 time=61.3 ms

64 bytes from 10.0.5.2: icmp_seq=7 ttl=61 time=66.9 ms

64 bytes from 10.0.5.2: icmp_seq=8 ttl=61 time=63.6 ms

64 bytes from 10.0.5.2: icmp_seq=9 ttl=61 time=63.0 ms

"Node: h2" - □ ×

root@vm-VirtualBox:/media/windows# ping 10.0.5.3 -c 25 | tee late_ncy_h2-h5-2.txt

PING 10.0.5.3 (10.0.5.3) 56(84) bytes of data:

64 bytes from 10.0.5.3: icmp_seq=1 ttl=61 time=219 ms

64 bytes from 10.0.5.3: icmp_seq=2 ttl=61 time=63.6 ms

64 bytes from 10.0.5.3: icmp_seq=3 ttl=61 time=34.3 ms

64 bytes from 10.0.5.3: icmp_seq=4 ttl=61 time=63.8 ms

64 bytes from 10.0.5.3: icmp_seq=5 ttl=61 time=63.2 ms

64 bytes from 10.0.5.3: icmp_seq=6 ttl=61 time=63.0 ms

64 bytes from 10.0.5.3: icmp_seq=7 ttl=61 time=61.6 ms

"Node: h3" - □ ×

root@vm-VirtualBox:/media/windows# ping 10.0.5.4 -c 25 | tee late_ncy_h3-h6-2.txt

PING 10.0.5.4 (10.0.5.4) 56(84) bytes of data:

64 bytes from 10.0.5.4: icmp_seq=1 ttl=61 time=130 ms

64 bytes from 10.0.5.4: icmp_seq=2 ttl=61 time=62.3 ms

64 bytes from 10.0.5.4: icmp_seq=3 ttl=61 time=61.6 ms

64 bytes from 10.0.5.4: icmp_seq=4 ttl=61 time=63.8 ms

64 bytes from 10.0.5.4: icmp_seq=5 ttl=61 time=60.9 ms

64 bytes from 10.0.5.4: icmp_seq=6 ttl=61 time=65.2 ms

"Node: h1"	"Node: h2"	"Node: h3"
root@vm-VirtualBox:/media/windows# ping 10.0.5.2 -c 25 tee late ncy_h1-h4-2.txt	root@vm-VirtualBox:/media/windows# ping 10.0.5.3 -c 25 tee late ncy_h2-h5-2.txt	root@vm-VirtualBox:/media/windows# ping 10.0.5.4 -c 25 tee late ncy_h3-h6-2.txt
PING 10.0.5.2 (10.0.5.2) 56(84) bytes of data, 64 bytes from 10.0.5.2: icmp_seq=1 ttl=61 time=106 ms	PING 10.0.5.3 (10.0.5.3) 56(84) bytes of data, 64 bytes from 10.0.5.3: icmp_seq=1 ttl=61 time=219 ms	PING 10.0.5.4 (10.0.5.4) 56(84) bytes of data, 64 bytes from 10.0.5.4: icmp_seq=1 ttl=61 time=130 ms
64 bytes from 10.0.5.2: icmp_seq=2 ttl=61 time=162 ms	64 bytes from 10.0.5.3: icmp_seq=2 ttl=61 time=63.6 ms	64 bytes from 10.0.5.4: icmp_seq=2 ttl=61 time=62.9 ms
64 bytes from 10.0.5.2: icmp_seq=3 ttl=61 time=74.8 ms	64 bytes from 10.0.5.3: icmp_seq=3 ttl=61 time=94.3 ms	64 bytes from 10.0.5.4: icmp_seq=3 ttl=61 time=61.6 ms
64 bytes from 10.0.5.2: icmp_seq=4 ttl=61 time=208 ms	64 bytes from 10.0.5.3: icmp_seq=4 ttl=61 time=63.8 ms	64 bytes from 10.0.5.4: icmp_seq=4 ttl=61 time=63.8 ms
64 bytes from 10.0.5.2: icmp_seq=5 ttl=61 time=62.7 ms	64 bytes from 10.0.5.3: icmp_seq=5 ttl=61 time=63.2 ms	64 bytes from 10.0.5.4: icmp_seq=5 ttl=61 time=60.9 ms
64 bytes from 10.0.5.2: icmp_seq=6 ttl=61 time=61.3 ms	64 bytes from 10.0.5.3: icmp_seq=6 ttl=61 time=63.0 ms	64 bytes from 10.0.5.4: icmp_seq=6 ttl=61 time=60.2 ms
64 bytes from 10.0.5.2: icmp_seq=7 ttl=61 time=66.9 ms		
64 bytes from 10.0.5.2: icmp_seq=8 ttl=61 time=63.6 ms		
64 bytes from 10.0.5.2: icmp_seq=9 ttl=61 time=63.0 ms		

<div>"Node: h1" - □ ×</div> <div>root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5</div> <div>A simpleperf client connecting to server 10.0.5.2, port 8088</div> <div>Client ip 10.0.0.2:37588 connected with server 10.0.5.2 port 8088</div> <table><thead><tr><th>ID</th><th>Interval</th><th>Transfer</th><th>Bandwidth</th></tr></thead><tbody><tr><td>10.0.0.2:37588</td><td>0.0 - 5.0</td><td>4 MB</td><td>6.03 Mbps</td></tr><tr><td>10.0.0.2:37588</td><td>5.0 - 10.0</td><td>4 MB</td><td>6.29 Mbps</td></tr><tr><td>10.0.0.2:37588</td><td>10.0 - 15.0</td><td>6 MB</td><td>9.79 Mbps</td></tr><tr><td>10.0.0.2:37588</td><td>15.0 - 20.0</td><td>6 MB</td><td>9.95 Mbps</td></tr><tr><td>10.0.0.2:37588</td><td>20.0 - 25.0</td><td>5 MB</td><td>7.98 Mbps</td></tr></tbody></table> <div>10.0.0.2:37588 0.0 - 25.7 25 MB 7.79 Mbps</div> <div>root@vm-VirtualBox:/media/windows#</div> <div>"Node: h1" - □ ×</div> <div>64 bytes from 10.0.5.2: icmp_seq=9 ttl=61 time=63.0 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=10 ttl=61 time=75.3 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=11 ttl=61 time=66.8 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=12 ttl=61 time=75.8 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=13 ttl=61 time=69.7 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=14 ttl=61 time=77.4 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=15 ttl=61 time=69.1 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=16 ttl=61 time=61.1 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=17 ttl=61 time=62.6 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=18 ttl=61 time=67.1 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=19 ttl=61 time=62.3 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=20 ttl=61 time=71.6 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=21 ttl=61 time=68.9 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=22 ttl=61 time=62.2 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=23 ttl=61 time=76.9 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=24 ttl=61 time=60.8 ms</div> <div>64 bytes from 10.0.5.2: icmp_seq=25 ttl=61 time=66.0 ms</div> <div>--- 10.0.5.2 ping statistics ---</div> <div>25 packets transmitted, 25 received, 0% packet loss, time 24044ms</div> <div>rtt min/avg/max/mdev = 60.834/78.510/208.404/33.467 ms</div> <div>root@vm-VirtualBox:/media/windows#</div>	ID	Interval	Transfer	Bandwidth	10.0.0.2:37588	0.0 - 5.0	4 MB	6.03 Mbps	10.0.0.2:37588	5.0 - 10.0	4 MB	6.29 Mbps	10.0.0.2:37588	10.0 - 15.0	6 MB	9.79 Mbps	10.0.0.2:37588	15.0 - 20.0	6 MB	9.95 Mbps	10.0.0.2:37588	20.0 - 25.0	5 MB	7.98 Mbps	<div>"Node: h2" - □ ×</div> <div>root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.3 -t 25 -i 5</div> <div>A simpleperf client connecting to server 10.0.5.3, port 8088</div> <div>Client ip 10.0.0.3:38500 connected with server 10.0.5.3 port 8088</div> <table><thead><tr><th>ID</th><th>Interval</th><th>Transfer</th><th>Bandwidth</th></tr></thead><tbody><tr><td>10.0.0.3:38500</td><td>0.0 - 5.0</td><td>1 MB</td><td>2.29 Mbps</td></tr><tr><td>10.0.0.3:38500</td><td>5.0 - 10.0</td><td>3 MB</td><td>5.11 Mbps</td></tr><tr><td>10.0.0.3:38500</td><td>10.0 - 15.0</td><td>5 MB</td><td>8.41 Mbps</td></tr><tr><td>10.0.0.3:38500</td><td>15.0 - 20.0</td><td>6 MB</td><td>9.01 Mbps</td></tr><tr><td>10.0.0.3:38500</td><td>20.0 - 25.0</td><td>6 MB</td><td>9.19 Mbps</td></tr></tbody></table> <div>10.0.0.3:38500 0.0 - 25.3 21 MB 6.72 Mbps</div> <div>root@vm-VirtualBox:/media/windows#</div> <div>"Node: h2" - □ ×</div> <div>64 bytes from 10.0.5.3: icmp_seq=9 ttl=61 time=70.2 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=10 ttl=61 time=68.7 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=11 ttl=61 time=74.4 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=12 ttl=61 time=70.6 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=13 ttl=61 time=76.6 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=14 ttl=61 time=73.5 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=15 ttl=61 time=61.0 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=16 ttl=61 time=63.6 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=17 ttl=61 time=68.6 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=18 ttl=61 time=65.6 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=19 ttl=61 time=73.0 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=20 ttl=61 time=70.2 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=21 ttl=61 time=61.1 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=22 ttl=61 time=62.4 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=23 ttl=61 time=61.1 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=24 ttl=61 time=61.7 ms</div> <div>64 bytes from 10.0.5.3: icmp_seq=25 ttl=61 time=61.4 ms</div> <div>--- 10.0.5.3 ping statistics ---</div> <div>25 packets transmitted, 25 received, 0% packet loss, time 24037ms</div> <div>rtt min/avg/max/mdev = 61.001/73.471/219.119/30.588 ms</div> <div>root@vm-VirtualBox:/media/windows#</div>	ID	Interval	Transfer	Bandwidth	10.0.0.3:38500	0.0 - 5.0	1 MB	2.29 Mbps	10.0.0.3:38500	5.0 - 10.0	3 MB	5.11 Mbps	10.0.0.3:38500	10.0 - 15.0	5 MB	8.41 Mbps	10.0.0.3:38500	15.0 - 20.0	6 MB	9.01 Mbps	10.0.0.3:38500	20.0 - 25.0	6 MB	9.19 Mbps	<div>"Node: h3" - □ ×</div> <div>root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.4 -t 25 -i 5</div> <div>A simpleperf client connecting to server 10.0.5.4, port 8088</div> <div>Client ip 10.0.0.4:53982 connected with server 10.0.5.4 port 8088</div> <table><thead><tr><th>ID</th><th>Interval</th><th>Transfer</th><th>Bandwidth</th></tr></thead><tbody><tr><td>10.0.0.4:53982</td><td>0.0 - 5.0</td><td>2 MB</td><td>3.38 Mbps</td></tr><tr><td>10.0.0.4:53982</td><td>5.0 - 10.0</td><td>5 MB</td><td>7.50 Mbps</td></tr><tr><td>10.0.0.4:53982</td><td>10.0 - 15.0</td><td>5 MB</td><td>7.68 Mbps</td></tr><tr><td>10.0.0.4:53982</td><td>15.0 - 20.0</td><td>5 MB</td><td>8.52 Mbps</td></tr><tr><td>10.0.0.4:53982</td><td>20.0 - 25.0</td><td>6 MB</td><td>9.81 Mbps</td></tr></tbody></table> <div>10.0.0.4:53982 0.0 - 25.3 23 MB 7.30 Mbps</div> <div>root@vm-VirtualBox:/media/windows#</div> <div>"Node: h3" - □ ×</div> <div>64 bytes from 10.0.5.4: icmp_seq=9 ttl=61 time=74.2 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=10 ttl=61 time=63.5 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=11 ttl=61 time=73.7 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=12 ttl=61 time=66.4 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=13 ttl=61 time=62.1 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=14 ttl=61 time=63.7 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=15 ttl=61 time=63.8 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=16 ttl=61 time=62.7 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=17 ttl=61 time=70.7 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=18 ttl=61 time=76.8 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=19 ttl=61 time=61.3 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=20 ttl=61 time=60.7 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=21 ttl=61 time=60.9 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=22 ttl=61 time=61.8 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=23 ttl=61 time=61.4 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=24 ttl=61 time=61.5 ms</div> <div>64 bytes from 10.0.5.4: icmp_seq=25 ttl=61 time=62.6 ms</div> <div>--- 10.0.5.4 ping statistics ---</div> <div>25 packets transmitted, 25 received, 0% packet loss, time 24036ms</div> <div>rtt min/avg/max/mdev = 60.655/67.310/130.433/13.603 ms</div> <div>root@vm-VirtualBox:/media/windows#</div>	ID	Interval	Transfer	Bandwidth	10.0.0.4:53982	0.0 - 5.0	2 MB	3.38 Mbps	10.0.0.4:53982	5.0 - 10.0	5 MB	7.50 Mbps	10.0.0.4:53982	10.0 - 15.0	5 MB	7.68 Mbps	10.0.0.4:53982	15.0 - 20.0	5 MB	8.52 Mbps	10.0.0.4:53982	20.0 - 25.0	6 MB	9.81 Mbps
ID	Interval	Transfer	Bandwidth																																																																							
10.0.0.2:37588	0.0 - 5.0	4 MB	6.03 Mbps																																																																							
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10.0.0.4:53982	20.0 - 25.0	6 MB	9.81 Mbps																																																																							

Press Ctrl+C and Ctrl+D after measuring:

Press Ctrl+C and Ctrl+D after measuring:

Press Ctrl+C and Ctrl+D after measuring:

```
"Node: h4" - □ × "Node: h5" - □ × "Node: h6" - □ ×
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::c04c:8d4c:9f3f:txqueuelen 1000 (Ethernet)
    RX packets 148760 bytes 224837789 (224.8 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 75558 bytes 5044744 (5.0 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h1-h4-2.txt
Script started, output log file is 'throughput_h1-h4-2.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10
.0,5,2
-----
A simpleperf server is listening on port 8088
-----
A simpleperf client with 10.0.0.2:37588 is connected with 10.0.5.2
:8088

ID          Interval      Received      Rate
10.0.0.2:37588 0.0 - 25.6      25 MB        7.82 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#

root@vm-VirtualBox:/media/windows# ifconfig
h5-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.3 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::e019:60ff:fe57:9ed3 prefixlen 64 scopeid 0x2
    RX packets 88276 bytes 133318232 (133.3 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 45032 bytes 3015636 (3.0 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h2-h5-2.txt
Script started, output log file is 'throughput_h2-h5-2.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10
.0,5,3
-----
A simpleperf server is listening on port 8088
-----
A simpleperf client with 10.0.0.3:38500 is connected with 10.0.5.3
:8088

ID          Interval      Received      Rate
10.0.0.3:38500 0.0 - 25.1      21 MB        6.77 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#

root@vm-VirtualBox:/media/windows# ifconfig
h6-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.4 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::80c7:1d0b:2bc7:txqueuelen 1000 (Ethernet)
    RX packets 113 bytes 11278 (11.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 46 bytes 3820 (3.8 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h3-h6-2.txt
Script started, output log file is 'throughput_h3-h6-2.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10
.0,5,4
-----
A simpleperf server is listening on port 8088
-----
A simpleperf client with 10.0.0.4:53982 is connected with 10.0.5.4
:8088

ID          Interval      Received      Rate
10.0.0.4:53982 0.0 - 25.0      23 MB        7.37 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#
```

Path Latency and Throughput for h1->h4, h7->h9:

```
mininet> xterm h4
# ifconfig
# script throughput_h1-h4-3.txt
# python3 simpleperf.py -s -b 10.0.5.2
```

```
mininet> xterm h9
# ifconfig
# script throughput_h7-h9-3.txt
# python3 simpleperf.py -s -b 10.0.7.2
```

```
"Node: h4" - □ × "Node: h9" - □ ×
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    ether c2:4c:8d4c:9f3f:txqueuelen 1000 (Ethernet)
    RX packets 131586 bytes 283573079 (289.5 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 96924 bytes 6474360 (6.4 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h1-h4-3.txt
Script started, output log file is 'throughput_h1-h4-3.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2
-----
A simpleperf server is listening on port 8088
-----

root@vm-VirtualBox:/media/windows#

root@vm-VirtualBox:/media/windows# ifconfig
h9-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.7.2 netmask 255.255.255.0 broadcast 10.0.7.255
    ether fa:73:e2f8:f831:txqueuelen 1000 (Ethernet)
    RX packets 94010 bytes 142046320 (142.0 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 48861 bytes 3260702 (3.2 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h7-h9-3.txt
Script started, output log file is 'throughput_h7-h9-3.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.7.2
-----
A simpleperf server is listening on port 8088
-----

root@vm-VirtualBox:/media/windows#
```

```
mininet> xterm h1
# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5 (wait)
```

```
mininet> xterm h7
# python3 simpleperf.py -c -I 10.0.7.2 -t 25 -i 5 (wait)
```

(open new xterm to measure latency while running simpleperf)

```
mininet> xterm h1
# ping 10.0.5.2 -c 25 | tee latency_h1-h4-3.txt (wait)
```

```
mininet> xterm h7
# ping 10.0.7.2 -c 25 | tee latency_h7-h9-3.txt (wait)
```

Execute the commands one after other.

```
"Node: h1"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.5.2, port 8088

Client ip 10.0.0.2:60554 connected with server 10.0.5.2 port 8088

ID      Interval      Transfer      Bandwidth
10.0.0.2:60554  0.0 - 5.0      6 MB          10.38 Mbps
10.0.0.2:60554  5.0 - 10.0     7 MB          11.93 Mbps
10.0.0.2:60554  10.0 - 15.0    7 MB          11.55 Mbps
[]

"Node: h7"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.7.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.7.2, port 8088

Client ip 10.0.2.2:53236 connected with server 10.0.7.2 port 8088

ID      Interval      Transfer      Bandwidth
10.0.2.2:53236  0.0 - 5.0      6 MB          10.04 Mbps
10.0.2.2:53236  5.0 - 10.0     9 MB          14.62 Mbps
10.0.2.2:53236  10.0 - 15.0    10 MB         15.61 Mbps
[]

"Node: h1"
root@vm-VirtualBox:/media/windows# ping 10.0.5.2 -c 25 | tee latency_h1-h4-3.txt
PING 10.0.5.2 (10.0.5.2) 56(84) bytes of data:
64 bytes from 10.0.5.2: icmp_seq=1 ttl=61 time=229 ms
64 bytes from 10.0.5.2: icmp_seq=2 ttl=61 time=107 ms
64 bytes from 10.0.5.2: icmp_seq=3 ttl=61 time=60.6 ms
64 bytes from 10.0.5.2: icmp_seq=4 ttl=61 time=62.6 ms
64 bytes from 10.0.5.2: icmp_seq=5 ttl=61 time=65.3 ms
64 bytes from 10.0.5.2: icmp_seq=6 ttl=61 time=61.0 ms
64 bytes from 10.0.5.2: icmp_seq=7 ttl=61 time=66.1 ms
64 bytes from 10.0.5.2: icmp_seq=8 ttl=61 time=74.4 ms
64 bytes from 10.0.5.2: icmp_seq=9 ttl=61 time=73.2 ms
64 bytes from 10.0.5.2: icmp_seq=10 ttl=61 time=89.7 ms
64 bytes from 10.0.5.2: icmp_seq=11 ttl=61 time=64.3 ms
64 bytes from 10.0.5.2: icmp_seq=12 ttl=61 time=71.7 ms
64 bytes from 10.0.5.2: icmp_seq=13 ttl=61 time=76.1 ms
64 bytes from 10.0.5.2: icmp_seq=14 ttl=61 time=64.6 ms
64 bytes from 10.0.5.2: icmp_seq=15 ttl=61 time=89.4 ms
[]

"Node: h7"
root@vm-VirtualBox:/media/windows# ping 10.0.7.2 -c 25 | tee latency_h7-h9-3.txt
PING 10.0.7.2 (10.0.7.2) 56(84) bytes of data:
64 bytes from 10.0.7.2: icmp_seq=1 ttl=61 time=152 ms
64 bytes from 10.0.7.2: icmp_seq=2 ttl=61 time=130 ms
64 bytes from 10.0.7.2: icmp_seq=3 ttl=61 time=62.4 ms
64 bytes from 10.0.7.2: icmp_seq=4 ttl=61 time=69.4 ms
64 bytes from 10.0.7.2: icmp_seq=5 ttl=61 time=64.6 ms
64 bytes from 10.0.7.2: icmp_seq=6 ttl=61 time=75.5 ms
64 bytes from 10.0.7.2: icmp_seq=7 ttl=61 time=76.2 ms
64 bytes from 10.0.7.2: icmp_seq=8 ttl=61 time=84.9 ms
64 bytes from 10.0.7.2: icmp_seq=9 ttl=61 time=77.0 ms
64 bytes from 10.0.7.2: icmp_seq=10 ttl=61 time=65.0 ms
64 bytes from 10.0.7.2: icmp_seq=11 ttl=61 time=76.1 ms
64 bytes from 10.0.7.2: icmp_seq=12 ttl=61 time=80.2 ms
64 bytes from 10.0.7.2: icmp_seq=13 ttl=61 time=71.3 ms
64 bytes from 10.0.7.2: icmp_seq=14 ttl=61 time=78.5 ms
[]
```

```
"Node: h1"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.5.2, port 8088

Client ip 10.0.0.2:60554 connected with server 10.0.5.2 port 8088

ID      Interval      Transfer      Bandwidth
10.0.0.2:60554  0.0 - 5.0      6 MB          10.38 Mbps
10.0.0.2:60554  5.0 - 10.0     7 MB          11.93 Mbps
10.0.0.2:60554  10.0 - 15.0    7 MB          11.55 Mbps
10.0.0.2:60554  15.0 - 20.0    8 MB          13.30 Mbps
10.0.0.2:60554  20.0 - 25.0    9 MB          14.76 Mbps

10.0.0.2:60554  0.0 - 25.6    39 MB         12.10 Mbps
root@vm-VirtualBox:/media/windows# []

"Node: h7"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.7.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.7.2, port 8088

Client ip 10.0.2.2:53236 connected with server 10.0.7.2 port 8088

ID      Interval      Transfer      Bandwidth
10.0.2.2:53236  0.0 - 5.0      6 MB          10.04 Mbps
10.0.2.2:53236  5.0 - 10.0     9 MB          14.62 Mbps
10.0.2.2:53236  10.0 - 15.0    10 MB         15.61 Mbps
10.0.2.2:53236  15.0 - 20.0    8 MB          12.57 Mbps
10.0.2.2:53236  20.0 - 25.0    6 MB          10.21 Mbps

10.0.2.2:53236  0.0 - 25.4    39 MB         12.40 Mbps
root@vm-VirtualBox:/media/windows# []

"Node: h1"
64 bytes from 10.0.5.2: icmp_seq=10 ttl=61 time=89.7 ms
64 bytes from 10.0.5.2: icmp_seq=11 ttl=61 time=64.3 ms
64 bytes from 10.0.5.2: icmp_seq=12 ttl=61 time=71.7 ms
64 bytes from 10.0.5.2: icmp_seq=13 ttl=61 time=76.1 ms
64 bytes from 10.0.5.2: icmp_seq=14 ttl=61 time=64.6 ms
64 bytes from 10.0.5.2: icmp_seq=15 ttl=61 time=89.4 ms
64 bytes from 10.0.5.2: icmp_seq=16 ttl=61 time=67.6 ms
64 bytes from 10.0.5.2: icmp_seq=17 ttl=61 time=71.5 ms
64 bytes from 10.0.5.2: icmp_seq=18 ttl=61 time=77.2 ms
64 bytes from 10.0.5.2: icmp_seq=19 ttl=61 time=76.5 ms
64 bytes from 10.0.5.2: icmp_seq=20 ttl=61 time=86.0 ms
64 bytes from 10.0.5.2: icmp_seq=21 ttl=61 time=64.0 ms
64 bytes from 10.0.5.2: icmp_seq=22 ttl=61 time=67.1 ms
64 bytes from 10.0.5.2: icmp_seq=23 ttl=61 time=63.9 ms
64 bytes from 10.0.5.2: icmp_seq=24 ttl=61 time=64.8 ms
64 bytes from 10.0.5.2: icmp_seq=25 ttl=61 time=71.2 ms

--- 10.0.5.2 ping statistics ---
25 packets transmitted, 25 received, 0% packet loss, time 24034ms
rtt min/avg/max/mdev = 60.584/78.414/223.132/32.480 ms
root@vm-VirtualBox:/media/windows# []

"Node: h7"
64 bytes from 10.0.7.2: icmp_seq=10 ttl=61 time=65.0 ms
64 bytes from 10.0.7.2: icmp_seq=11 ttl=61 time=76.1 ms
64 bytes from 10.0.7.2: icmp_seq=12 ttl=61 time=80.2 ms
64 bytes from 10.0.7.2: icmp_seq=13 ttl=61 time=71.3 ms
64 bytes from 10.0.7.2: icmp_seq=14 ttl=61 time=78.5 ms
64 bytes from 10.0.7.2: icmp_seq=15 ttl=61 time=70.0 ms
64 bytes from 10.0.7.2: icmp_seq=16 ttl=61 time=77.0 ms
64 bytes from 10.0.7.2: icmp_seq=17 ttl=61 time=78.2 ms
64 bytes from 10.0.7.2: icmp_seq=18 ttl=61 time=98.6 ms
64 bytes from 10.0.7.2: icmp_seq=19 ttl=61 time=96.5 ms
64 bytes from 10.0.7.2: icmp_seq=20 ttl=61 time=57.8 ms
64 bytes from 10.0.7.2: icmp_seq=21 ttl=61 time=78.4 ms
64 bytes from 10.0.7.2: icmp_seq=22 ttl=61 time=75.5 ms
64 bytes from 10.0.7.2: icmp_seq=23 ttl=61 time=97.3 ms
64 bytes from 10.0.7.2: icmp_seq=24 ttl=61 time=68.3 ms
64 bytes from 10.0.7.2: icmp_seq=25 ttl=61 time=63.6 ms

--- 10.0.7.2 ping statistics ---
25 packets transmitted, 25 received, 0% packet loss, time 24074ms
rtt min/avg/max/mdev = 62.360/81.346/151.564/20.207 ms
root@vm-VirtualBox:/media/windows# []
```

Press Ctrl+C and Ctrl+D after measuring:

Press Ctrl+C and Ctrl+D after measuring:

"Node: h4"

```
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::c04c:8dff:fe40:9f3f prefixlen 64 scopeid 0x20<link>
    ether c2:4c:8d:40:9f:3f txqueuelen 1000 (Ethernet)
    RX packets 191586 bytes 289573079 (289.5 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 96924 bytes 6474360 (6.4 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h1-h4-3.txt
Script started, output log file is 'throughput_h1-h4-3.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2
-----
A simpleperf server is listening on port 8088

A simpleperf client with 10.0.0.2:60554 is connected with 10.0.5.2:8088

ID          Interval    Received    Rate
10.0.0.2:60554  0.0 - 25.5    39 MB      12.14 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#
```

"Node: h9"

```
root@vm-VirtualBox:/media/windows# ifconfig
h9-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.7.2 netmask 255.255.255.0 broadcast 10.0.7.255
    inet6 fe80::f873:e2ff:fe81:f831 prefixlen 64 scopeid 0x20<link>
    ether fa:73:e2:81:f8:31 txqueuelen 1000 (Ethernet)
    RX packets 94010 bytes 142045320 (142.0 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 48861 bytes 3260702 (3.2 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h7-h9-3.txt
Script started, output log file is 'throughput_h7-h9-3.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.7.2
-----
A simpleperf server is listening on port 8088

A simpleperf client with 10.0.2.2:53236 is connected with 10.0.7.2:8088

ID          Interval    Received    Rate
10.0.2.2:53236  0.0 - 25.3    39 MB      12.46 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows#
```

Path Latency and Throughput for h1->h4, h8->h9:

```
mininet> xterm h4
# ifconfig
# script throughput_h1-h4-4.txt
# python3 simpleperf.py -s -b 10.0.5.2
```

```
mininet> xterm h9
# ifconfig
# script throughput_h8-h9-4.txt
# python3 simpleperf.py -s -b 10.0.7.2
```

"Node: h4"

```
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::c04c:8dff:fe40:9f3f prefixlen 64 scopeid 0x20<link>
    ether c2:4c:8d:40:9f:3f txqueuelen 1000 (Ethernet)
    RX packets 218348 bytes 330044160 (330.0 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 110269 bytes 7353634 (7.3 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h1-h4-4.txt
Script started, output log file is 'throughput_h1-h4-4.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2
-----
A simpleperf server is listening on port 8088


```

"Node: h9"

```
root@vm-VirtualBox:/media/windows# ifconfig
h9-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.7.2 netmask 255.255.255.0 broadcast 10.0.7.255
    inet6 fe80::f873:e2ff:fe81:f831 prefixlen 64 scopeid 0x20<link>
    ether fa:73:e2:81:f8:31 txqueuelen 1000 (Ethernet)
    RX packets 121252 bytes 183245080 (183.2 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 62835 bytes 4181022 (4.1 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h8-h9-4.txt
Script started, output log file is 'throughput_h8-h9-4.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.7.2
-----
A simpleperf server is listening on port 8088


```

```
mininet> xterm h1
# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5      (wait)
```

```
mininet> xterm h8
# python3 simpleperf.py -c -I 10.0.7.2 -t 25 -i 5      (wait)
```

(open new xterm to measure latency while running simpleperf)

```
mininet> xterm h1
# ping 10.0.5.2 -c 25 | tee latency_h1-h4-4.txt      (wait)
```

```
mininet> xterm h8
# ping 10.0.7.2 -c 25 | tee latency_h8-h9-4.txt      (wait)
```

Execute the commands one after other.

```
"Node: h1"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.5.2, port 8088

Client ip 10.0.0.2:53436 connected with server 10.0.5.2 port 8088

ID          Interval    Transfer    Bandwidth
10.0.0.2:53436 0.0 - 5.0      8 MB        13.06 Mbps
10.0.0.2:53436 5.0 - 10.0     13 MB        21.01 Mbps
10.0.0.2:53436 10.0 - 15.0    16 MB        26.14 Mbps
[]

"Node: h8"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.7.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.7.2, port 8088

Client ip 10.0.4.2:44096 connected with server 10.0.7.2 port 8088

ID          Interval    Transfer    Bandwidth
10.0.4.2:44096 0.0 - 5.0      7 MB        10.82 Mbps
10.0.4.2:44096 5.0 - 10.0     11 MB        17.01 Mbps
10.0.4.2:44096 10.0 - 15.0    11 MB        18.08 Mbps
[]

"Node: h1"
64 bytes from 10.0.5.2: icmp_seq=10 ttl=61 time=89.7 ms
root@vm-VirtualBox:/media/windows# ping 10.0.5.2 -c 25 | tee latency_h1-h4-4.txt
PING 10.0.5.2 (10.0.5.2) 56(84) bytes of data.
64 bytes from 10.0.5.2: icmp_seq=1 ttl=61 time=184 ms
64 bytes from 10.0.5.2: icmp_seq=2 ttl=61 time=109 ms
64 bytes from 10.0.5.2: icmp_seq=3 ttl=61 time=65.5 ms
64 bytes from 10.0.5.2: icmp_seq=4 ttl=61 time=61.9 ms
64 bytes from 10.0.5.2: icmp_seq=5 ttl=61 time=66.9 ms
64 bytes from 10.0.5.2: icmp_seq=6 ttl=61 time=67.6 ms
64 bytes from 10.0.5.2: icmp_seq=7 ttl=61 time=66.1 ms
64 bytes from 10.0.5.2: icmp_seq=8 ttl=61 time=63.4 ms
64 bytes from 10.0.5.2: icmp_seq=9 ttl=61 time=62.3 ms
64 bytes from 10.0.5.2: icmp_seq=10 ttl=61 time=64.5 ms
64 bytes from 10.0.5.2: icmp_seq=11 ttl=61 time=69.1 ms
64 bytes from 10.0.5.2: icmp_seq=12 ttl=61 time=77.8 ms
64 bytes from 10.0.5.2: icmp_seq=13 ttl=61 time=69.0 ms
64 bytes from 10.0.5.2: icmp_seq=14 ttl=61 time=61.7 ms
64 bytes from 10.0.5.2: icmp_seq=15 ttl=61 time=61.7 ms
64 bytes from 10.0.5.2: icmp_seq=16 ttl=61 time=63.3 ms
[]

"Node: h8"
root@vm-VirtualBox:/media/windows# ping 10.0.7.2 -c 25 | tee latency_h8-h9-4.txt
PING 10.0.7.2 (10.0.7.2) 56(84) bytes of data.
64 bytes from 10.0.7.2: icmp_seq=1 ttl=62 time=73.7 ms
64 bytes from 10.0.7.2: icmp_seq=2 ttl=62 time=21.4 ms
64 bytes from 10.0.7.2: icmp_seq=3 ttl=62 time=29.7 ms
64 bytes from 10.0.7.2: icmp_seq=4 ttl=62 time=20.5 ms
64 bytes from 10.0.7.2: icmp_seq=5 ttl=62 time=29.7 ms
64 bytes from 10.0.7.2: icmp_seq=6 ttl=62 time=23.3 ms
64 bytes from 10.0.7.2: icmp_seq=7 ttl=62 time=28.5 ms
64 bytes from 10.0.7.2: icmp_seq=8 ttl=62 time=24.4 ms
64 bytes from 10.0.7.2: icmp_seq=9 ttl=62 time=21.4 ms
64 bytes from 10.0.7.2: icmp_seq=10 ttl=62 time=27.2 ms
64 bytes from 10.0.7.2: icmp_seq=11 ttl=62 time=25.8 ms
64 bytes from 10.0.7.2: icmp_seq=12 ttl=62 time=28.2 ms
64 bytes from 10.0.7.2: icmp_seq=13 ttl=62 time=24.8 ms
64 bytes from 10.0.7.2: icmp_seq=14 ttl=62 time=31.1 ms
[]
```

```
"Node: h1"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.5.2, port 8088

Client ip 10.0.0.2:53436 connected with server 10.0.5.2 port 8088

ID          Interval    Transfer    Bandwidth
10.0.0.2:53436 0.0 - 5.0      8 MB        13.06 Mbps
10.0.0.2:53436 5.0 - 10.0     13 MB        21.01 Mbps
10.0.0.2:53436 10.0 - 15.0    16 MB        26.14 Mbps
10.0.0.2:53436 15.0 - 20.0    15 MB        23.38 Mbps
10.0.0.2:53436 20.0 - 25.0    13 MB        20.52 Mbps

10.0.0.2:53436 0.0 - 25.4      65 MB        20.48 Mbps
root@vm-VirtualBox:/media/windows# []

"Node: h8"
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.7.2 -t 25 -i 5
A simpleperf client connecting to server 10.0.7.2, port 8088

Client ip 10.0.4.2:44096 connected with server 10.0.7.2 port 8088

ID          Interval    Transfer    Bandwidth
10.0.4.2:44096 0.0 - 5.0      7 MB        10.82 Mbps
10.0.4.2:44096 5.0 - 10.0     11 MB        17.01 Mbps
10.0.4.2:44096 10.0 - 15.0    11 MB        18.08 Mbps
10.0.4.2:44096 15.0 - 20.0    11 MB        17.41 Mbps
10.0.4.2:44096 20.0 - 25.0    10 MB        16.64 Mbps

10.0.4.2:44096 0.0 - 25.2      50 MB        15.89 Mbps
root@vm-VirtualBox:/media/windows# []

"Node: h1"
64 bytes from 10.0.5.2: icmp_seq=9 ttl=61 time=62.3 ms
64 bytes from 10.0.5.2: icmp_seq=10 ttl=61 time=64.5 ms
64 bytes from 10.0.5.2: icmp_seq=11 ttl=61 time=69.1 ms
64 bytes from 10.0.5.2: icmp_seq=12 ttl=61 time=77.8 ms
64 bytes from 10.0.5.2: icmp_seq=13 ttl=61 time=69.0 ms
64 bytes from 10.0.5.2: icmp_seq=14 ttl=61 time=61.7 ms
64 bytes from 10.0.5.2: icmp_seq=15 ttl=61 time=61.7 ms
64 bytes from 10.0.5.2: icmp_seq=16 ttl=61 time=63.3 ms
64 bytes from 10.0.5.2: icmp_seq=17 ttl=61 time=62.6 ms
64 bytes from 10.0.5.2: icmp_seq=18 ttl=61 time=67.0 ms
64 bytes from 10.0.5.2: icmp_seq=19 ttl=61 time=61.3 ms
64 bytes from 10.0.5.2: icmp_seq=20 ttl=61 time=63.5 ms
64 bytes from 10.0.5.2: icmp_seq=21 ttl=61 time=61.6 ms
64 bytes from 10.0.5.2: icmp_seq=22 ttl=61 time=62.5 ms
64 bytes from 10.0.5.2: icmp_seq=23 ttl=61 time=65.0 ms
64 bytes from 10.0.5.2: icmp_seq=24 ttl=61 time=61.2 ms
64 bytes from 10.0.5.2: icmp_seq=25 ttl=61 time=62.0 ms

--- 10.0.5.2 ping statistics ---
25 packets transmitted, 25 received, 0% packet loss, time 24042ms
rtt min/avg/max/ndev = 61.205/71.208/184.153/24.864 ms
root@vm-VirtualBox:/media/windows# []

"Node: h8"
64 bytes from 10.0.7.2: icmp_seq=9 ttl=62 time=21.4 ms
64 bytes from 10.0.7.2: icmp_seq=10 ttl=62 time=27.2 ms
64 bytes from 10.0.7.2: icmp_seq=11 ttl=62 time=25.8 ms
64 bytes from 10.0.7.2: icmp_seq=12 ttl=62 time=28.2 ms
64 bytes from 10.0.7.2: icmp_seq=13 ttl=62 time=24.8 ms
64 bytes from 10.0.7.2: icmp_seq=14 ttl=62 time=31.1 ms
64 bytes from 10.0.7.2: icmp_seq=15 ttl=62 time=23.8 ms
64 bytes from 10.0.7.2: icmp_seq=16 ttl=62 time=23.6 ms
64 bytes from 10.0.7.2: icmp_seq=17 ttl=62 time=25.6 ms
64 bytes from 10.0.7.2: icmp_seq=18 ttl=62 time=21.5 ms
64 bytes from 10.0.7.2: icmp_seq=19 ttl=62 time=25.6 ms
64 bytes from 10.0.7.2: icmp_seq=20 ttl=62 time=27.3 ms
64 bytes from 10.0.7.2: icmp_seq=21 ttl=62 time=21.5 ms
64 bytes from 10.0.7.2: icmp_seq=22 ttl=62 time=26.6 ms
64 bytes from 10.0.7.2: icmp_seq=23 ttl=62 time=22.2 ms
64 bytes from 10.0.7.2: icmp_seq=24 ttl=62 time=20.8 ms
64 bytes from 10.0.7.2: icmp_seq=25 ttl=62 time=20.9 ms

--- 10.0.7.2 ping statistics ---
25 packets transmitted, 25 received, 0% packet loss, time 24042ms
rtt min/avg/max/ndev = 20.459/26.808/73.693/10.057 ms
root@vm-VirtualBox:/media/windows# []
```

Press Ctrl+C and Ctrl+D after measuring:

Press Ctrl+C and Ctrl+D after measuring:

```
"Node: h4"
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::c04c:8dff:fe40:9f3f prefixlen 64 scopeid 0x20<link>
    ether c2:4c:8d:40:9f:3f txqueuelen 1000 (Ethernet)
    RX packets 216949 bytes 330044160 (330.0 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 110269 bytes 7363694 (7.3 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h1-h4-4.txt
Script started, output log file is 'throughput_h1-h4-4.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2
-----
A simpleperf server is listening on port 8088

A simpleperf client with 10.0.0.2:53436 is connected with 10.0.5.2:8088

ID          Interval    Received    Rate
10.0.0.2:53436 0.0 - 25.4    65 MB       20.53 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows# "
```

```
"Node: h9"
root@vm-VirtualBox:/media/windows# ifconfig
h9-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.7.2 netmask 255.255.255.0 broadcast 10.0.7.255
    inet6 fe80::f873:e2ff:fe81:f831 prefixlen 64 scopeid 0x20<link>
    ether fa:73:e2:81:f8:31 txqueuelen 1000 (Ethernet)
    RX packets 421262 bytes 163249080 (163.2 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 62635 bytes 4181022 (4.1 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h8-h9-4.txt
Script started, output log file is 'throughput_h8-h9-4.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.7.2
-----
A simpleperf server is listening on port 8088

A simpleperf client with 10.0.4.2:44096 is connected with 10.0.7.2:8088

ID          Interval    Received    Rate
10.0.4.2:44096 0.0 - 25.1    50 MB       15.90 Mbps

^C
Server shutting down...
root@vm-VirtualBox:/media/windows#
exit
Script done.
root@vm-VirtualBox:/media/windows# "
```

TEST Case 5: Effects of parallel connection

Servers:

```
mininet> xterm h4
# ifconfig
# script throughput_h1-h4.txt
# python3 simpleperf.py -s -b 10.0.5.2
```

```
mininet> xterm h5
# ifconfig
# script throughput_h2-h5.txt
# python3 simpleperf.py -s -b 10.0.5.3
```

```
mininet> xterm h6
# ifconfig
# script throughput_h3-h6.txt
# python3 simpleperf.py -s -b 10.0.5.4
```

```
"Node: h4"
root@vm-VirtualBox:/media/windows# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::c04c:8dff:fe40:9f3f prefixlen 64 scopeid 0x20<link>
    ether c2:4c:8d:40:9f:3f txqueuelen 1000 (Ethernet)
    RX packets 95 bytes 9561 (9.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 45 bytes 3750 (3.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h1-h4.txt
Script started, output log file is 'throughput_h1-h4.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2
-----
A simpleperf server is listening on port 8088

"
```

```
"Node: h5"
root@vm-VirtualBox:/media/windows# ifconfig
h5-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.3 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::94b9:3ff:fe57:9476 prefixlen 64 scopeid 0x20<link>
    ether 96:b9:03:57:94:76 txqueuelen 1000 (Ethernet)
    RX packets 95 bytes 9561 (9.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 45 bytes 3750 (3.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h2-h5.txt
Script started, output log file is 'throughput_h2-h5.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.3
-----
A simpleperf server is listening on port 8088

"
```

```
"Node: h6"
root@vm-VirtualBox:/media/windows# ifconfig
h6-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.5.4 netmask 255.255.255.0 broadcast 10.0.5.255
    inet6 fe80::4c3b:ddff:feeb:b413 prefixlen 64 scopeid 0x20<link>
    ether 4e:3b:dd:eb:b4:13 txqueuelen 1000 (Ethernet)
    RX packets 96 bytes 9770 (9.7 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 45 bytes 3750 (3.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Bucle local)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@vm-VirtualBox:/media/windows# script throughput_h3-h6.txt
Script started, output log file is 'throughput_h3-h6.txt'.
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.4
-----
A simpleperf server is listening on port 8088

"
```

```
mininet> xterm h1
# python3 simpleperf.py -c -l 10.0.5.2 -P 2 -t 25 -i 5
```

```
mininet> xterm h2
# python3 simpleperf.py -c -l 10.0.5.3 -t 25 -i 5
```

```
mininet> xterm h3
# python3 simpleperf.py -c -l 10.0.5.4 -t 25 -i 5
```

Execute the commands one after other.

"Node: h1"	"Node: h2"	"Node: h3"																																																												
root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.2 -P 2 -t 25	root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.3 -t 25 -i 5	root@vm-VirtualBox:/media/windows# python3 simpleperf.py -c -I 10.0.5.4 -t 25 -i 5																																																												
A simpleperf client connecting to server 10.0.5.2, port 8088	A simpleperf client connecting to server 10.0.5.3, port 8088	A simpleperf client connecting to server 10.0.5.4, port 8088																																																												
Client ip 10.0.0.2:38430 connected with server 10.0.5.2 port 8088 Client ip 10.0.0.2:38436 connected with server 10.0.5.2 port 8088	Client ip 10.0.0.3:34694 connected with server 10.0.5.3 port 8088	Client ip 10.0.0.4:59014 connected with server 10.0.5.4 port 8088																																																												
<table><tr><th>ID</th><th>Interval</th><th>Transfer</th><th>Bandwidth</th></tr><tr><td>10.0.0.2:38436</td><td>0.0 - 25.3</td><td>16 MB</td><td>4.92 Mbps</td></tr><tr><td>10.0.0.2:38430</td><td>0.0 - 26.0</td><td>21 MB</td><td>6.40 Mbps</td></tr></table>	ID	Interval	Transfer	Bandwidth	10.0.0.2:38436	0.0 - 25.3	16 MB	4.92 Mbps	10.0.0.2:38430	0.0 - 26.0	21 MB	6.40 Mbps	<table><tr><th>ID</th><th>Interval</th><th>Transfer</th><th>Bandwidth</th></tr><tr><td>10.0.0.3:34694</td><td>0.0 - 5.0</td><td>6 MB</td><td>10.36 Mbps</td></tr><tr><td>10.0.0.3:34694</td><td>5.0 - 10.0</td><td>6 MB</td><td>10.39 Mbps</td></tr><tr><td>10.0.0.3:34694</td><td>10.0 - 15.0</td><td>5 MB</td><td>8.28 Mbps</td></tr><tr><td>10.0.0.3:34694</td><td>15.0 - 20.0</td><td>4 MB</td><td>6.14 Mbps</td></tr><tr><td>10.0.0.3:34694</td><td>20.0 - 25.0</td><td>5 MB</td><td>7.80 Mbps</td></tr></table>	ID	Interval	Transfer	Bandwidth	10.0.0.3:34694	0.0 - 5.0	6 MB	10.36 Mbps	10.0.0.3:34694	5.0 - 10.0	6 MB	10.39 Mbps	10.0.0.3:34694	10.0 - 15.0	5 MB	8.28 Mbps	10.0.0.3:34694	15.0 - 20.0	4 MB	6.14 Mbps	10.0.0.3:34694	20.0 - 25.0	5 MB	7.80 Mbps	<table><tr><th>ID</th><th>Interval</th><th>Transfer</th><th>Bandwidth</th></tr><tr><td>10.0.0.4:59014</td><td>0.0 - 5.0</td><td>7 MB</td><td>10.68 Mbps</td></tr><tr><td>10.0.0.4:59014</td><td>5.0 - 10.0</td><td>4 MB</td><td>6.30 Mbps</td></tr><tr><td>10.0.0.4:59014</td><td>10.0 - 15.0</td><td>5 MB</td><td>8.20 Mbps</td></tr><tr><td>10.0.0.4:59014</td><td>15.0 - 20.0</td><td>5 MB</td><td>8.62 Mbps</td></tr><tr><td>10.0.0.4:59014</td><td>20.0 - 25.0</td><td>7 MB</td><td>10.54 Mbps</td></tr></table>	ID	Interval	Transfer	Bandwidth	10.0.0.4:59014	0.0 - 5.0	7 MB	10.68 Mbps	10.0.0.4:59014	5.0 - 10.0	4 MB	6.30 Mbps	10.0.0.4:59014	10.0 - 15.0	5 MB	8.20 Mbps	10.0.0.4:59014	15.0 - 20.0	5 MB	8.62 Mbps	10.0.0.4:59014	20.0 - 25.0	7 MB	10.54 Mbps
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root@vm-VirtualBox:/media/windows#	<table><tr><td>10.0.0.3:34694</td><td>0.0 - 25.7</td><td>27 MB</td><td>8.37 Mbps</td></tr></table> root@vm-VirtualBox:/media/windows#	10.0.0.3:34694	0.0 - 25.7	27 MB	8.37 Mbps	<table><tr><td>10.0.0.4:59014</td><td>0.0 - 25.4</td><td>28 MB</td><td>8.75 Mbps</td></tr></table> root@vm-VirtualBox:/media/windows#	10.0.0.4:59014	0.0 - 25.4	28 MB	8.75 Mbps																																																				
10.0.0.3:34694	0.0 - 25.7	27 MB	8.37 Mbps																																																											
10.0.0.4:59014	0.0 - 25.4	28 MB	8.75 Mbps																																																											

Press Ctrl+C and Ctrl+D after measuring:

Press Ctrl+C and Ctrl+D after measuring:

(Press Ctrl+C and Ctrl+D after measuring:

"Node: h4"	"Node: h5"	"Node: h6"																												
<pre>root@vm-VirtualBox:/media/windows# ifconfig h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500 inet 10.0.5.2 netmask 255.255.255.0 broadcast 10.0.5.255 inet6 fe80::50b0:ddff:fe7e:1251 prefixlen 64 scopeid 0x2 <Link> ether 62:b0:dd:7e:12:51 txqueuelen 1000 (Ethernet) RX packets 23956 bytes 45194237 (45.1 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 15463 bytes 1042166 (1.0 MB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536 inet 127.0.0.1 netmask 255.0.0.0 inet6 ::1 prefixlen 128 scopeid 0x10<host> loop txqueuelen 1000 (Bucle local) RX packets 0 bytes 0 (0.0 B) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 0 bytes 0 (0.0 B) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 root@vm-VirtualBox:/media/windows# script throughput_h4-h4.txt Script started, output log file is 'throughput_h4-h4.txt'. root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.2 A simpleperf server is listening on port 8088 A simpleperf client with 10.0.0.2:38430 is connected with 10.0.5.2 :8088 A simpleperf client with 10.0.0.2:38436 is connected with 10.0.5.2 :8088</pre>	<pre>root@vm-VirtualBox:/media/windows# ifconfig h5-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500 inet 10.0.5.3 netmask 255.255.255.0 broadcast 10.0.5.255 inet6 fe80::94b9:3fff:fe57:9476 prefixlen 64 scopeid 0x20 <Link> ether 96:b9:03:57:94:76 txqueuelen 1000 (Ethernet) RX packets 11870 bytes 17823729 (17.8 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 5997 bytes 400354 (400.3 KB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536 inet 127.0.0.1 netmask 255.0.0.0 inet6 ::1 prefixlen 128 scopeid 0x10<host> loop txqueuelen 1000 (Bucle local) RX packets 0 bytes 0 (0.0 B) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 0 bytes 0 (0.0 B) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 root@vm-VirtualBox:/media/windows# script throughput_h2-h5.txt Script started, output log file is 'throughput_h2-h5.txt'. root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.3 A simpleperf server is listening on port 8088 A simpleperf client with 10.0.0.3:34694 is connected with 10.0.5.3 :8088</pre>	<pre>root@vm-VirtualBox:/media/windows# ifconfig h6-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500 inet 10.0.5.4 netmask 255.255.255.0 broadcast 10.0.5.255 inet6 fe80::4c3b:ddff:feeb:b413 prefixlen 64 scopeid 0x2 <Link> ether 4e:3b:dd:fe:b4:13 txqueuelen 1000 (Ethernet) RX packets 19575 bytes 29489416 (29.4 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 10186 bytes 682628 (682.6 KB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536 inet 127.0.0.1 netmask 255.0.0.0 inet6 ::1 prefixlen 128 scopeid 0x10<host> loop txqueuelen 1000 (Bucle local) RX packets 0 bytes 0 (0.0 B) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 0 bytes 0 (0.0 B) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 root@vm-VirtualBox:/media/windows# script throughput_h3-h6.txt Script started, output log file is 'throughput_h3-h6.txt'. root@vm-VirtualBox:/media/windows# python3 simpleperf.py -s -b 10.0.5.4 A simpleperf server is listening on port 8088 A simpleperf client with 10.0.0.4:59014 is connected with 10.0.5.4 :8088</pre>																												
<table><thead><tr><th>ID</th><th>Interval</th><th>Received</th><th>Rate</th></tr></thead><tbody><tr><td>10.0.0.2:38436</td><td>0.0 - 25.3</td><td>16 MB</td><td>4.94 Mbps</td></tr><tr><td>10.0.0.2:38430</td><td>0.0 - 26.0</td><td>21 MB</td><td>6.42 Mbps</td></tr></tbody></table> <pre>^C Server shutting down... root@vm-VirtualBox:/media/windows# exit Script done. root@vm-VirtualBox:/media/windows#</pre>	ID	Interval	Received	Rate	10.0.0.2:38436	0.0 - 25.3	16 MB	4.94 Mbps	10.0.0.2:38430	0.0 - 26.0	21 MB	6.42 Mbps	<table><thead><tr><th>ID</th><th>Interval</th><th>Received</th><th>Rate</th></tr></thead><tbody><tr><td>10.0.0.3:34694</td><td>0.0 - 25.5</td><td>27 MB</td><td>8.43 Mbps</td></tr></tbody></table> <pre>^C Server shutting down... root@vm-VirtualBox:/media/windows# exit Script done. root@vm-VirtualBox:/media/windows#</pre>	ID	Interval	Received	Rate	10.0.0.3:34694	0.0 - 25.5	27 MB	8.43 Mbps	<table><thead><tr><th>ID</th><th>Interval</th><th>Received</th><th>Rate</th></tr></thead><tbody><tr><td>10.0.0.4:59014</td><td>0.0 - 25.1</td><td>28 MB</td><td>8.82 Mbps</td></tr></tbody></table> <pre>^C Server shutting down... root@vm-VirtualBox:/media/windows# exit Script done. root@vm-VirtualBox:/media/windows#</pre>	ID	Interval	Received	Rate	10.0.0.4:59014	0.0 - 25.1	28 MB	8.82 Mbps
ID	Interval	Received	Rate																											
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ID	Interval	Received	Rate																											
10.0.0.4:59014	0.0 - 25.1	28 MB	8.82 Mbps																											