

## Trabalho Mininet: Topologia linear com 6 switches

## 0) Preparar o ambiente

```
mininet@mininet-vm: ~  
mininet@mininet-vm:~$ sudo mn --topo=linear,6 --mac --link tc,bw=25  
*** Creating network  
*** Adding controller  
*** Adding hosts:  
h1 h2 h3 h4 h5 h6  
*** Adding switches:  
s1 s2 s3 s4 s5 s6  
*** Adding links:  
(25.00Mbit) (25.00Mbit) (h1, s1) (25.00Mbit) (25.00Mbit) (h2, s2) (25.00Mbit) (2  
5.00Mbit) (h3, s3) (25.00Mbit) (25.00Mbit) (h4, s4) (25.00Mbit) (25.00Mbit) (h5,  
s5) (25.00Mbit) (25.00Mbit) (h6, s6) (25.00Mbit) (25.00Mbit) (s2, s1) (25.00Mbi  
t) (25.00Mbit) (s3, s2) (25.00Mbit) (25.00Mbit) (s4, s3) (25.00Mbit) (25.00Mbit)  
(s5, s4) (25.00Mbit) (25.00Mbit) (s6, s5)  
*** Configuring hosts  
h1 h2 h3 h4 h5 h6  
*** Starting controller  
c0  
*** Starting 6 switches  
s1 s2 s3 s4 s5 s6 ... (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit)  
(25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00M  
bit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit)  
*** Starting CLI:  
mininet>
```

1) Criar a topologia linear com 6 switches, MAC padronizado e 25 Mbps

```
mininet@mininet-vm: ~
mininet> nodes
available nodes are:
c0 h1 h2 h3 h4 h5 h6 s1 s2 s3 s4 s5 s6
mininet> net
h1 h1-eth0:s1-eth1
h2 h2-eth0:s2-eth1
h3 h3-eth0:s3-eth1
h4 h4-eth0:s4-eth1
h5 h5-eth0:s5-eth1
h6 h6-eth0:s6-eth1
s1 lo: s1-eth1:h1-eth0 s1-eth2:s2-eth2
s2 lo: s2-eth1:h2-eth0 s2-eth2:s1-eth2 s2-eth3:s3-eth2
s3 lo: s3-eth1:h3-eth0 s3-eth2:s2-eth3 s3-eth3:s4-eth2
s4 lo: s4-eth1:h4-eth0 s4-eth2:s3-eth3 s4-eth3:s5-eth2
s5 lo: s5-eth1:h5-eth0 s5-eth2:s4-eth3 s5-eth3:s6-eth2
s6 lo: s6-eth1:h6-eth0 s6-eth2:s5-eth3
c0
mininet> dump
<Host h1: h1-eth0:10.0.0.1 pid=1987>
<Host h2: h2-eth0:10.0.0.2 pid=1989>
<Host h3: h3-eth0:10.0.0.3 pid=1991>
<Host h4: h4-eth0:10.0.0.4 pid=1993>
<Host h5: h5-eth0:10.0.0.5 pid=1995>
<Host h6: h6-eth0:10.0.0.6 pid=1997>
<OVSSwitch s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None pid=2002>
<OVSSwitch s2: lo:127.0.0.1,s2-eth1:None,s2-eth2:None,s2-eth3:None pid=2005>
<OVSSwitch s3: lo:127.0.0.1,s3-eth1:None,s3-eth2:None,s3-eth3:None pid=2008>
<OVSSwitch s4: lo:127.0.0.1,s4-eth1:None,s4-eth2:None,s4-eth3:None pid=2011>
<OVSSwitch s5: lo:127.0.0.1,s5-eth1:None,s5-eth2:None,s5-eth3:None pid=2014>
<OVSSwitch s6: lo:127.0.0.1,s6-eth1:None,s6-eth2:None pid=2017>
<Controller c0: 127.0.0.1:6653 pid=1980>
mininet>
```

2) Inspecionar interfaces, MAC, IP e porta:

```
mininet@mininet-vm: ~
mininet> h1 ifconfig -a
h1-eth0  Link encap:Ethernet  HWaddr 00:00:00:00:00:01
         inet addr:10.0.0.1  Bcast:10.255.255.255  Mask:255.0.0.0
         UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
         RX packets:0 errors:0 dropped:0 overruns:0 frame:0
         TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:1000
         RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo       Link encap:Local Loopback
         inet addr:127.0.0.1  Mask:255.0.0.0
         UP LOOPBACK RUNNING  MTU:65536  Metric:1
         RX packets:0 errors:0 dropped:0 overruns:0 frame:0
         TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:0
         RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

```
mininet@mininet-vm: ~  
UP LOOPBACK RUNNING MTU:65536 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:0  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
mininet> sl ifconfig -a  
eth0      Link encap:Ethernet  HWaddr 08:00:27:7e:0f:24  
          inet addr:192.168.56.104 Bcast:192.168.56.255 Mask:255.255.255.0  
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
          RX packets:397 errors:0 dropped:0 overruns:0 frame:0  
          TX packets:401 errors:0 dropped:0 overruns:0 carrier:0  
          collisions:0 txqueuelen:1000  
          RX bytes:34782 (34.7 KB) TX bytes:55555 (55.5 KB)  
  
eth1      Link encap:Ethernet  HWaddr 08:00:27:a7:c9:40  
          inet addr:10.0.2.15 Bcast:10.0.2.255 Mask:255.255.255.0  
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
          RX packets:282 errors:0 dropped:0 overruns:0 frame:0  
          TX packets:284 errors:0 dropped:0 overruns:0 carrier:0  
          collisions:0 txqueuelen:1000  
          RX bytes:26531 (26.5 KB) TX bytes:25147 (25.1 KB)  
  
lo        Link encap:Local Loopback  
          inet addr:127.0.0.1 Mask:255.0.0.0  
          UP LOOPBACK RUNNING MTU:65536 Metric:1  
          RX packets:1265 errors:0 dropped:0 overruns:0 frame:0  
          TX packets:1265 errors:0 dropped:0 overruns:0 carrier:0  
          collisions:0 txqueuelen:0  
          RX bytes:74772 (74.7 KB) TX bytes:74772 (74.7 KB)  
  
ovs-system Link encap:Ethernet  HWaddr 0e:c3:ac:0c:eb:12  
          BROADCAST MULTICAST MTU:1500 Metric:1  
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
          collisions:0 txqueuelen:0  
          RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
```

```
mininet@mininet-vm: ~  
RX bytes:28497 (28.4 KB) TX bytes:27097 (27.0 KB)  
  
lo      Link encap:Local Loopback  
        inet addr:127.0.0.1  Mask:255.0.0.0  
        UP LOOPBACK RUNNING  MTU:65536  Metric:1  
        RX packets:2021 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:2021 errors:0 dropped:0 overruns:0 carrier:0  
        collisions:0 txqueuelen:0  
        RX bytes:118116 (118.1 KB)  TX bytes:118116 (118.1 KB)  
  
ovs-system Link encap:Ethernet  HWaddr 0e:c3:ac:0c:eb:12  
          BROADCAST MULTICAST  MTU:1500  Metric:1  
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
          collisions:0 txqueuelen:0  
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)  
  
s1      Link encap:Ethernet  HWaddr 2a:04:5b:6a:d4:4f  
        UP BROADCAST RUNNING  MTU:1500  Metric:1  
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
        collisions:0 txqueuelen:0  
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)  
  
s2      Link encap:Ethernet  HWaddr de:7f:85:1c:05:4a  
        UP BROADCAST RUNNING  MTU:1500  Metric:1  
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
        collisions:0 txqueuelen:0  
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)  
  
s3      Link encap:Ethernet  HWaddr 62:eb:1f:a2:09:47  
        UP BROADCAST RUNNING  MTU:1500  Metric:1  
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
        collisions:0 txqueuelen:0  
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)  
  
s4      Link encap:Ethernet  HWaddr c6:d5:06:85:bc:4a
```

```
mininet@mininet-vm: ~  
s4      Link encap:Ethernet  HWaddr c6:d5:06:85:bc:4a  
        UP BROADCAST RUNNING MTU:1500 Metric:1  
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
        collisions:0 txqueuelen:0  
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)  
  
s5      Link encap:Ethernet  HWaddr a6:af:61:7f:8d:46  
        UP BROADCAST RUNNING MTU:1500 Metric:1  
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
        collisions:0 txqueuelen:0  
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)  
  
s6      Link encap:Ethernet  HWaddr e6:dd:a8:65:76:4d  
        UP BROADCAST RUNNING MTU:1500 Metric:1  
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
        collisions:0 txqueuelen:0  
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)  
  
s1-eth1 Link encap:Ethernet  HWaddr 06:1f:10:db:77:54  
        UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
        collisions:0 txqueuelen:1000  
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)  
  
s1-eth2 Link encap:Ethernet  HWaddr 86:46:4b:3d:86:c7  
        UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
        collisions:0 txqueuelen:1000  
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)  
  
s2-eth1 Link encap:Ethernet  HWaddr 6a:fe:63:c6:7f:ec  
        UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
```

```
mininet@mininet-vm: ~  
  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s2-eth1 Link encap:Ethernet HWaddr 6a:fe:63:c6:7f:ec  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s2-eth2 Link encap:Ethernet HWaddr c2:dd:07:a6:0e:f4  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s2-eth3 Link encap:Ethernet HWaddr 86:31:09:bd:18:cb  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s3-eth1 Link encap:Ethernet HWaddr e2:bc:46:a6:30:eb  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s3-eth2 Link encap:Ethernet HWaddr 76:7d:9d:e6:00:43  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s3-eth3 Link encap:Ethernet HWaddr e2:2f:24:bf:a6:9e  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
```

```
mininet@mininet-vm: ~
s3-eth3  Link encap:Ethernet  HWaddr e2:2f:24:bf:a6:9e
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

s4-eth1  Link encap:Ethernet  HWaddr 1a:a1:3d:5f:46:4a
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

s4-eth2  Link encap:Ethernet  HWaddr 5e:6e:14:a0:c5:29
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

s4-eth3  Link encap:Ethernet  HWaddr 46:cd:3a:ea:b5:36
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

s5-eth1  Link encap:Ethernet  HWaddr d6:ac:ee:e5:05:c4
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

s5-eth2  Link encap:Ethernet  HWaddr 9a:95:ab:f1:a9:f7
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```



```
mininet@mininet-vm: ~  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s5-eth2 Link encap:Ethernet HWaddr 9a:95:ab:f1:a9:f7  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s5-eth3 Link encap:Ethernet HWaddr da:4c:ce:e1:7f:16  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s6-eth1 Link encap:Ethernet HWaddr 52:a2:6f:08:f0:52  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
s6-eth2 Link encap:Ethernet HWaddr c2:7b:60:e2:f1:e4  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)  
  
mininet>
```

```
mininet@mininet-vm: ~  
mininet> sh ovs-ofctl show s1  
OFPT_FEATURES_REPLY (xid=0x2): dpid:0000000000000001  
n_tables:254, n_buffers:256  
capabilities: FLOW_STATS TABLE_STATS PORT_STATS QUEUE_STATS ARP_MATCH_IP  
actions: OUTPUT SET_VLAN_VID SET_VLAN_PCP STRIP_VLAN SET_DL_SRC SET_DL_DST SET  
_NW_SRC SET_NW_DST SET_NW_TOS SET_TP_SRC SET_TP_DST ENQUEUE  
1(s1-eth1): addr:06:1f:10:db:77:54  
config: 0  
state: 0  
current: 10GB-FD COPPER  
speed: 10000 Mbps now, 0 Mbps max  
2(s1-eth2): addr:86:46:4b:3d:86:c7  
config: 0  
state: 0  
current: 10GB-FD COPPER  
speed: 10000 Mbps now, 0 Mbps max  
LOCAL(s1): addr:2a:04:5b:6a:d4:4f  
config: 0  
state: 0  
speed: 0 Mbps now, 0 Mbps max  
OFPT_GET_CONFIG_REPLY (xid=0x4): frags=normal miss_send_len=0  
mininet>
```



### 3) Testes de ping

```
mininet@mininet-vm: ~  
mininet> pingall  
*** Ping: testing ping reachability  
h1 -> h2 h3 h4 h5 h6  
h2 -> h1 h3 h4 h5 h6  
h3 -> h1 h2 h4 h5 h6  
h4 -> h1 h2 h3 h5 h6  
h5 -> h1 h2 h3 h4 h6  
h6 -> h1 h2 h3 h4 h5  
*** Results: 0% dropped (30/30 received)  
mininet> h1 ping -c 5 h2  
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.  
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=0.255 ms  
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.072 ms  
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.055 ms  
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.058 ms  
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.060 ms  
  
--- 10.0.0.2 ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 3996ms  
rtt min/avg/max/mdev = 0.055/0.100/0.255/0.077 ms  
mininet> h1 ping -c 5 h3  
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.  
64 bytes from 10.0.0.3: icmp_seq=1 ttl=64 time=0.316 ms  
64 bytes from 10.0.0.3: icmp_seq=2 ttl=64 time=0.058 ms  
64 bytes from 10.0.0.3: icmp_seq=3 ttl=64 time=0.059 ms  
64 bytes from 10.0.0.3: icmp_seq=4 ttl=64 time=0.067 ms  
64 bytes from 10.0.0.3: icmp_seq=5 ttl=64 time=0.089 ms  
  
--- 10.0.0.3 ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 3997ms  
rtt min/avg/max/mdev = 0.058/0.117/0.316/0.100 ms  
mininet> █
```

### 4) iperf TCP (h1 = servidor, h2 = cliente, porta 5555, 1 s por 15

```
mininet@mininet-vm: ~
mininet> h1 iperf -s -p 5555 -i 1 &
mininet> h2 iperf -c 10.0.0.1 -p 5555 -i 1 -t 15
-----
Client connecting to 10.0.0.1, TCP port 5555
TCP window size: 85.3 KByte (default)
-----
[ 3] local 10.0.0.2 port 44034 connected with 10.0.0.1 port 5555
[ ID] Interval      Transfer    Bandwidth
[ 3] 0.0- 1.0 sec   3.25 MBytes 27.3 Mbits/sec
[ 3] 1.0- 2.0 sec   2.75 MBytes 23.1 Mbits/sec
[ 3] 2.0- 3.0 sec   3.00 MBytes 25.2 Mbits/sec
[ 3] 3.0- 4.0 sec   2.88 MBytes 24.1 Mbits/sec
[ 3] 4.0- 5.0 sec   2.75 MBytes 23.1 Mbits/sec
[ 3] 5.0- 6.0 sec   3.00 MBytes 25.2 Mbits/sec
[ 3] 6.0- 7.0 sec   2.75 MBytes 23.1 Mbits/sec
[ 3] 7.0- 8.0 sec   2.88 MBytes 24.1 Mbits/sec
[ 3] 8.0- 9.0 sec   2.75 MBytes 23.1 Mbits/sec
[ 3] 9.0-10.0 sec   3.00 MBytes 25.2 Mbits/sec
[ 3] 10.0-11.0 sec   2.75 MBytes 23.1 Mbits/sec
[ 3] 11.0-12.0 sec   2.88 MBytes 24.1 Mbits/sec
[ 3] 12.0-13.0 sec   2.75 MBytes 23.1 Mbits/sec
[ 3] 13.0-14.0 sec   3.00 MBytes 25.2 Mbits/sec
[ 3] 14.0-15.0 sec   2.75 MBytes 23.1 Mbits/sec
[ 3] 0.0-15.0 sec  43.2 MBytes 24.1 Mbits/sec
mininet>
```

## 5) Encerrar e limpar

```
mininet@mininet-vm: ~
mininet> exit
*** Stopping 1 controllers
c0
*** Stopping 11 links
*****
*** Stopping 6 switches
s1 s2 s3 s4 s5 s6
*** Stopping 6 hosts
h1 h2 h3 h4 h5 h6
*** Done
completed in 1571.141 seconds
mininet@mininet-vm:~$ sudo mn -c
*** Removing excess controllers/ofprotocols/ofdatapaths/pings/noxes
killall controller ofprotocol ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller udpbwtest mnexec ivs 2> /dev/null
killall -9 controller ofprotocol ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller udpbwtest mnexec ivs 2> /dev/null
pkill -9 -f "sudo mnexec"
*** Removing junk from /tmp
rm -f /tmp/vconn* /tmp/vlogs* /tmp/*.out /tmp/*.log
*** Removing old X11 tunnels
*** Removing excess kernel datapaths
ps ax | egrep -o 'dp[0-9]+' | sed 's/dp/nl:/'
*** Removing OVS datapaths
ovs-vsctl --timeout=1 list-br
ovs-vsctl --timeout=1 list-br
*** Removing all links of the pattern foo-ethX
ip link show | egrep -o '([_-[:alnum:]]+-eth[[:digit:]]+)'
ip link show
```