Trabalho Final Mininet

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1 - a) Criando topologia considerando endereço MAC padronizado, bw de 5Mbps e controlador do Mininet.

```
mininet@mininet-vm:~$ sudo mn --topo linear,6 --link tc,bw=5 --mac
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4 h5 h6
*** Adding switches:
s1 s2 s3 s4 s5 s6
*** Adding links:
(5.00Mbit) (5.00Mbit) (h1, s1) (5.00Mbit) (5.00Mbit) (h2, s2) (5.00Mbit) (5.00Mb
it) (h3, s3) (5.00Mbit) (5.00Mbit) (h4, s4) (5.00Mbit) (5.00Mbit) (h5, s5) (5.00
Mbit) (5.00Mbit) (h6, s6) (5.00Mbit) (5.00Mbit) (s2, s1) (5.00Mbit) (5.00Mbit) (
s3, s2) (5.00Mbit) (5.00Mbit) (s4, s3) (5.00Mbit) (5.00Mbit) (s5, s4) (5.00Mbit)
 (5.00Mbit) (s6, s5)
*** Configuring hosts
h1 h2 h3 h4 h5 h6
*** Starting controller
c0
*** Starting 6 switches
s1 s2 s3 s4 s5 s6 ...(5.00Mbit) (5.00Mbit) (5.00Mbit) (5.00Mbit) (5.00Mbit) (5.0
0Mbit) (5.00Mbit) (5.00Mbit) (5.00Mbit) (5.00Mbit) (5.00Mbit) (5.00Mbit) (5.00Mb
it) (5.00Mbit) (5.00Mbit) (5.00Mbit)
*** Starting CLI:
mininet>
```

1 - b) Inspecionando informações da interface, endereços MAC, IP e portas

```
mininet> dump
<Host h1: h1-eth0:10.0.0.1 pid=2141>
<Host h2: h2-eth0:10.0.0.2 pid=2143>
<Host h3: h3-eth0:10.0.0.3 pid=2145>
<Host h4: h4-eth0:10.0.0.4 pid=2147>
<Host h5: h5-eth0:10.0.0.5 pid=2149>
<Host h6: h6-eth0:10.0.0.6 pid=2151>
<OVSSwitch s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None pid=2156>
<OVSSwitch s2: lo:127.0.0.1,s2-eth1:None,s2-eth2:None,s2-eth3:None pid=2159>
<OVSSwitch s3: lo:127.0.0.1,s3-eth1:None,s3-eth2:None,s3-eth3:None pid=2162>
<OVSSwitch s4: lo:127.0.0.1,s4-eth1:None,s4-eth2:None,s4-eth3:None pid=2165>
<OVSSwitch s5: lo:127.0.0.1,s5-eth1:None,s5-eth2:None,s5-eth3:None pid=2168>
<OVSSwitch s6: lo:127.0.0.1,s6-eth1:None,s6-eth2:None pid=2171>
<Controller c0: 127.0.0.1:6653 pid=2134>
mininet>
```

1 - b) Inspecionando informações da interface, endereços MAC, IP e portas

```
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>
```

1 - b) Inspecionando informações da interface, endereços MAC, IP e portas

```
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>
```

1 - b) Inspecionando informações da interface, endereços MAC, IP e portas

```
mininet> h1 config
bash: config: command not found
mininet> h1 ifconfig
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>
```

1 - b) Inspecionando informações da interface, endereços MAC, IP e portas

```
mininet> h5 ifconfig
h5-eth0   Link encap:Ethernet  HWaddr 00:00:00:00:00:05
          inet addr:10.0.0.5  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>
```

1 - d) Testes de ping.

```
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>
```

1 - d) Testes de ping.

```
mininet> h1 ping h4
PING 10.0.0.4 (10.0.0.4) 56(84) bytes of data.
64 bytes from 10.0.0.4: icmp_seq=1 ttl=64 time=0.387 ms
64 bytes from 10.0.0.4: icmp_seq=2 ttl=64 time=0.051 ms
64 bytes from 10.0.0.4: icmp_seq=3 ttl=64 time=0.047 ms
64 bytes from 10.0.0.4: icmp_seq=4 ttl=64 time=0.078 ms
64 bytes from 10.0.0.4: icmp_seq=5 ttl=64 time=0.509 ms
^C
--- 10.0.0.4 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4000ms
rtt min/avg/max/mdev = 0.047/0.214/0.509/0.195 ms
mininet>
```

1 - e) t = 15s bw = 5

"Node: h1"

```
root@mininet-vm:~# iperf -s -p 5555 -i 1
------------------------------------------------------------
Server listening on TCP port 5555
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[ 32] local 10.0.0.1 port 5555 connected with 10.0.0.2 port 36674
[ ID] Interval       Transfer     Bandwidth
[ 32]  0.0- 1.0 sec   587 KBytes  4.81 Mbits/sec
[ 32]  1.0- 2.0 sec   585 KBytes  4.80 Mbits/sec
[ 32]  2.0- 3.0 sec   581 KBytes  4.76 Mbits/sec
[ 32]  3.0- 4.0 sec   585 KBytes  4.80 Mbits/sec
[ 32]  4.0- 5.0 sec   585 KBytes  4.80 Mbits/sec
[ 32]  5.0- 6.0 sec   581 KBytes  4.76 Mbits/sec
[ 32]  6.0- 7.0 sec   585 KBytes  4.80 Mbits/sec
[ 32]  7.0- 8.0 sec   581 KBytes  4.76 Mbits/sec
[ 32]  8.0- 9.0 sec   585 KBytes  4.80 Mbits/sec
[ 32]  9.0-10.0 sec   585 KBytes  4.80 Mbits/sec
[ 32] 10.0-11.0 sec   581 KBytes  4.76 Mbits/sec
[ 32] 11.0-12.0 sec   585 KBytes  4.80 Mbits/sec
[ 32] 12.0-13.0 sec   581 KBytes  4.76 Mbits/sec
[ 32] 13.0-14.0 sec   585 KBytes  4.80 Mbits/sec
[ 32] 14.0-15.0 sec   585 KBytes  4.80 Mbits/sec
[ 32]  0.0-15.6 sec  8.88 MBytes  4.78 Mbits/sec
```

"Node: h2"

```
root@mininet-vm:~# 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)
------------------------------------------------------------
[ 31] local 10.0.0.2 port 36674 connected with 10.0.0.1 port 5555
[ ID] Interval       Transfer     Bandwidth
[ 31]  0.0- 1.0 sec   896 KBytes  7.34 Mbits/sec
[ 31]  1.0- 2.0 sec   640 KBytes  5.24 Mbits/sec
[ 31]  2.0- 3.0 sec   512 KBytes  4.19 Mbits/sec
[ 31]  3.0- 4.0 sec   640 KBytes  5.24 Mbits/sec
[ 31]  4.0- 5.0 sec   640 KBytes  5.24 Mbits/sec
[ 31]  5.0- 6.0 sec   512 KBytes  4.19 Mbits/sec
[ 31]  6.0- 7.0 sec   640 KBytes  5.24 Mbits/sec
[ 31]  7.0- 8.0 sec   512 KBytes  4.19 Mbits/sec
[ 31]  8.0- 9.0 sec   640 KBytes  5.24 Mbits/sec
[ 31]  9.0-10.0 sec   640 KBytes  5.24 Mbits/sec
[ 31] 10.0-11.0 sec   384 KBytes  3.15 Mbits/sec
[ 31] 11.0-12.0 sec   640 KBytes  5.24 Mbits/sec
[ 31] 12.0-13.0 sec   512 KBytes  4.19 Mbits/sec
[ 31] 13.0-14.0 sec   640 KBytes  5.24 Mbits/sec
[ 31] 14.0-15.0 sec   512 KBytes  4.19 Mbits/sec
[ 31]  0.0-15.2 sec  8.88 MBytes  4.89 Mbits/sec
root@mininet-vm:~#
```

1 - e) t = 15s bw = 2

"Node: h1"

```
root@mininet-vm:~# iperf -s -p 5555 -i 1
------------------------------------------------------------
Server listening on TCP port 5555
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[ 32] local 10.0.0.1 port 5555 connected with 10.0.0.2 port 36730
[ ID] Interval       Transfer     Bandwidth
[ 32]  0.0- 1.0 sec   236 KBytes  1.93 Mbits/sec
[ 32]  1.0- 2.0 sec   235 KBytes  1.92 Mbits/sec
[ 32]  2.0- 3.0 sec   232 KBytes  1.90 Mbits/sec
[ 32]  3.0- 4.0 sec   233 KBytes  1.91 Mbits/sec
[ 32]  4.0- 5.0 sec   235 KBytes  1.92 Mbits/sec
[ 32]  5.0- 6.0 sec   232 KBytes  1.90 Mbits/sec
[ 32]  6.0- 7.0 sec   233 KBytes  1.91 Mbits/sec
[ 32]  7.0- 8.0 sec   235 KBytes  1.92 Mbits/sec
[ 32]  8.0- 9.0 sec   235 KBytes  1.92 Mbits/sec
[ 32]  9.0-10.0 sec   233 KBytes  1.91 Mbits/sec
[ 32] 10.0-11.0 sec   232 KBytes  1.90 Mbits/sec
[ 32] 11.0-12.0 sec   235 KBytes  1.92 Mbits/sec
[ 32] 12.0-13.0 sec   233 KBytes  1.91 Mbits/sec
[ 32] 13.0-14.0 sec   232 KBytes  1.90 Mbits/sec
[ 32] 14.0-15.0 sec   235 KBytes  1.92 Mbits/sec
[ 32] 15.0-16.0 sec   233 KBytes  1.91 Mbits/sec
[ 32]  0.0-17.0 sec  3.88 MBytes  1.91 Mbits/sec
```

"Node: h2"

```
root@mininet-vm:~# 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)
------------------------------------------------------------
[ 31] local 10.0.0.2 port 36730 connected with 10.0.0.1 port 5555
[ ID] Interval       Transfer     Bandwidth
[ 31]  0.0- 1.0 sec   512 KBytes  4.19 Mbits/sec
[ 31]  1.0- 2.0 sec   256 KBytes  2.10 Mbits/sec
[ 31]  2.0- 3.0 sec   256 KBytes  2.10 Mbits/sec
[ 31]  3.0- 4.0 sec   256 KBytes  2.10 Mbits/sec
[ 31]  4.0- 5.0 sec   256 KBytes  2.10 Mbits/sec
[ 31]  5.0- 6.0 sec   128 KBytes  1.05 Mbits/sec
[ 31]  6.0- 7.0 sec   256 KBytes  2.10 Mbits/sec
[ 31]  7.0- 8.0 sec   256 KBytes  2.10 Mbits/sec
[ 31]  8.0- 9.0 sec   256 KBytes  2.10 Mbits/sec
[ 31]  9.0-10.0 sec   256 KBytes  2.10 Mbits/sec
[ 31] 10.0-11.0 sec   256 KBytes  2.10 Mbits/sec
[ 31] 11.0-12.0 sec   128 KBytes  1.05 Mbits/sec
[ 31] 12.0-13.0 sec   256 KBytes  2.10 Mbits/sec
[ 31] 13.0-14.0 sec   256 KBytes  2.10 Mbits/sec
[ 31] 14.0-15.0 sec   256 KBytes  2.10 Mbits/sec
[ 31]  0.0-15.9 sec  3.88 MBytes  2.04 Mbits/sec
root@mininet-vm:~#
```

1 - e) t = 15s bw = 10

"Node: h1"

```
root@mininet-vm:~# iperf -s -p 5555 -i 1
------------------------------------------------------------
Server listening on TCP port 5555
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[ 32] local 10.0.0.1 port 5555 connected with 10.0.0.2 port 36754
[ ID] Interval       Transfer     Bandwidth
[ 32]  0.0- 1.0 sec  1.15 MBytes  9.64 Mbits/sec
[ 32]  1.0- 2.0 sec  1.14 MBytes  9.55 Mbits/sec
[ 32]  2.0- 3.0 sec  1.14 MBytes  9.58 Mbits/sec
[ 32]  3.0- 4.0 sec  1.14 MBytes  9.55 Mbits/sec
[ 32]  4.0- 5.0 sec  1.14 MBytes  9.58 Mbits/sec
[ 32]  5.0- 6.0 sec  1.14 MBytes  9.55 Mbits/sec
[ 32]  6.0- 7.0 sec  1.14 MBytes  9.58 Mbits/sec
[ 32]  7.0- 8.0 sec  1.14 MBytes  9.59 Mbits/sec
[ 32]  8.0- 9.0 sec  1.13 MBytes  9.50 Mbits/sec
[ 32]  9.0-10.0 sec  1.15 MBytes  9.63 Mbits/sec
[ 32] 10.0-11.0 sec  1.14 MBytes  9.56 Mbits/sec
[ 32] 11.0-12.0 sec  1.14 MBytes  9.57 Mbits/sec
[ 32] 12.0-13.0 sec  1.14 MBytes  9.55 Mbits/sec
[ 32] 13.0-14.0 sec  1.14 MBytes  9.55 Mbits/sec
[ 32] 14.0-15.0 sec  1.14 MBytes  9.58 Mbits/sec
[ 32]  0.0-15.6 sec  17.8 MBytes  9.57 Mbits/sec
```

"Node: h2"

```
root@mininet-vm:~# 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)
------------------------------------------------------------
[ 31] local 10.0.0.2 port 36754 connected with 10.0.0.1 port 5555
[ ID] Interval       Transfer     Bandwidth
[ 31]  0.0- 1.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31]  1.0- 2.0 sec  1.00 MBytes  8.39 Mbits/sec
[ 31]  2.0- 3.0 sec  1.25 MBytes  10.5 Mbits/sec
[ 31]  3.0- 4.0 sec  1.00 MBytes  8.39 Mbits/sec
[ 31]  4.0- 5.0 sec  1.25 MBytes  10.5 Mbits/sec
[ 31]  5.0- 6.0 sec  1.25 MBytes  10.5 Mbits/sec
[ 31]  6.0- 7.0 sec  1.00 MBytes  8.39 Mbits/sec
[ 31]  7.0- 8.0 sec  1.12 MBytes  9.44 Mbits/sec
[ 31]  8.0- 9.0 sec  1.25 MBytes  10.5 Mbits/sec
[ 31]  9.0-10.0 sec  1.00 MBytes  8.39 Mbits/sec
[ 31] 10.0-11.0 sec  1.25 MBytes  10.5 Mbits/sec
[ 31] 11.0-12.0 sec  1.00 MBytes  8.39 Mbits/sec
[ 31] 12.0-13.0 sec  1.25 MBytes  10.5 Mbits/sec
[ 31] 13.0-14.0 sec  1.25 MBytes  10.5 Mbits/sec
[ 31] 14.0-15.0 sec  1.00 MBytes  8.39 Mbits/sec
[ 31]  0.0-15.1 sec  17.8 MBytes  9.89 Mbits/sec
root@mininet-vm:~#
```

1 - e) t = 15s bw = 15

"Node: h1"

```
root@mininet-vm:~# iperf -s -p 5555 -i 1
------------------------------------------------------------
Server listening on TCP port 5555
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[ 32] local 10.0.0.1 port 5555 connected with 10.0.0.2 port 36778
[ ID] Interval       Transfer     Bandwidth
[ 32]  0.0- 1.0 sec  1.72 MBytes  14.4 Mbits/sec
[ 32]  1.0- 2.0 sec  1.71 MBytes  14.4 Mbits/sec
[ 32]  2.0- 3.0 sec  1.71 MBytes  14.3 Mbits/sec
[ 32]  3.0- 4.0 sec  1.71 MBytes  14.4 Mbits/sec
[ 32]  4.0- 5.0 sec  1.71 MBytes  14.4 Mbits/sec
[ 32]  5.0- 6.0 sec  1.71 MBytes  14.3 Mbits/sec
[ 32]  6.0- 7.0 sec  1.71 MBytes  14.4 Mbits/sec
[ 32]  7.0- 8.0 sec  1.71 MBytes  14.4 Mbits/sec
[ 32]  8.0- 9.0 sec  1.71 MBytes  14.3 Mbits/sec
[ 32]  9.0-10.0 sec  1.71 MBytes  14.4 Mbits/sec
[ 32] 10.0-11.0 sec  1.71 MBytes  14.4 Mbits/sec
[ 32] 11.0-12.0 sec  1.71 MBytes  14.3 Mbits/sec
[ 32] 12.0-13.0 sec  1.71 MBytes  14.4 Mbits/sec
[ 32] 13.0-14.0 sec  1.71 MBytes  14.3 Mbits/sec
[ 32] 14.0-15.0 sec  1.71 MBytes  14.4 Mbits/sec
[ 32]  0.0-15.2 sec  26.0 MBytes  14.3 Mbits/sec
```

"Node: h2"

```
root@mininet-vm:~# 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)
------------------------------------------------------------
[ 31] local 10.0.0.2 port 36778 connected with 10.0.0.1 port 5555
[ ID] Interval       Transfer     Bandwidth
[ 31]  0.0- 1.0 sec  2.00 MBytes  16.8 Mbits/sec
[ 31]  1.0- 2.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31]  2.0- 3.0 sec  1.62 MBytes  13.6 Mbits/sec
[ 31]  3.0- 4.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31]  4.0- 5.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31]  5.0- 6.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31]  6.0- 7.0 sec  1.50 MBytes  12.6 Mbits/sec
[ 31]  7.0- 8.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31]  8.0- 9.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31]  9.0-10.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31] 10.0-11.0 sec  1.62 MBytes  13.6 Mbits/sec
[ 31] 11.0-12.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31] 12.0-13.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31] 13.0-14.0 sec  1.75 MBytes  14.7 Mbits/sec
[ 31] 14.0-15.0 sec  1.62 MBytes  13.6 Mbits/sec
[ 31]  0.0-15.1 sec  26.0 MBytes  14.5 Mbits/sec
root@mininet-vm:~#
```

1 - e) t = 15s bw = 20

"Node: h1"

```
root@mininet-vm:~# iperf -s -p 5555 -i 1
------------------------------------------------------------
Server listening on TCP port 5555
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[ 32] local 10.0.0.1 port 5555 connected with 10.0.0.2 port 36802
[ ID] Interval       Transfer     Bandwidth
[ 32]  0.0- 1.0 sec  2.28 MBytes  19.1 Mbits/sec
[ 32]  1.0- 2.0 sec  2.29 MBytes  19.2 Mbits/sec
[ 32]  2.0- 3.0 sec  2.27 MBytes  19.1 Mbits/sec
[ 32]  3.0- 4.0 sec  2.28 MBytes  19.1 Mbits/sec
[ 32]  4.0- 5.0 sec  2.28 MBytes  19.1 Mbits/sec
[ 32]  5.0- 6.0 sec  2.28 MBytes  19.1 Mbits/sec
[ 32]  6.0- 7.0 sec  2.28 MBytes  19.1 Mbits/sec
[ 32]  7.0- 8.0 sec  2.27 MBytes  19.1 Mbits/sec
[ 32]  8.0- 9.0 sec  2.29 MBytes  19.2 Mbits/sec
[ 32]  9.0-10.0 sec  2.27 MBytes  19.1 Mbits/sec
[ 32] 10.0-11.0 sec  2.28 MBytes  19.1 Mbits/sec
[ 32] 11.0-12.0 sec  2.28 MBytes  19.1 Mbits/sec
[ 32] 12.0-13.0 sec  2.28 MBytes  19.1 Mbits/sec
[ 32] 13.0-14.0 sec  2.27 MBytes  19.1 Mbits/sec
[ 32] 14.0-15.0 sec  2.28 MBytes  19.1 Mbits/sec
[ 32]  0.0-15.2 sec  34.6 MBytes  19.1 Mbits/sec
```

"Node: h2"

```
root@mininet-vm:~# 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)
------------------------------------------------------------
[ 31] local 10.0.0.2 port 36802 connected with 10.0.0.1 port 5555
[ ID] Interval       Transfer     Bandwidth
[ 31]  0.0- 1.0 sec  2.62 MBytes  22.0 Mbits/sec
[ 31]  1.0- 2.0 sec  2.25 MBytes  18.9 Mbits/sec
[ 31]  2.0- 3.0 sec  2.12 MBytes  17.8 Mbits/sec
[ 31]  3.0- 4.0 sec  2.38 MBytes  19.9 Mbits/sec
[ 31]  4.0- 5.0 sec  2.25 MBytes  18.9 Mbits/sec
[ 31]  5.0- 6.0 sec  2.25 MBytes  18.9 Mbits/sec
[ 31]  6.0- 7.0 sec  2.38 MBytes  19.9 Mbits/sec
[ 31]  7.0- 8.0 sec  2.25 MBytes  18.9 Mbits/sec
[ 31]  8.0- 9.0 sec  2.38 MBytes  19.9 Mbits/sec
[ 31]  9.0-10.0 sec  2.25 MBytes  18.9 Mbits/sec
[ 31] 10.0-11.0 sec  2.25 MBytes  18.9 Mbits/sec
[ 31] 11.0-12.0 sec  2.38 MBytes  19.9 Mbits/sec
[ 31] 12.0-13.0 sec  2.12 MBytes  17.8 Mbits/sec
[ 31] 13.0-14.0 sec  2.25 MBytes  18.9 Mbits/sec
[ 31] 14.0-15.0 sec  2.38 MBytes  19.9 Mbits/sec
[ 31]  0.0-15.1 sec  34.6 MBytes  19.2 Mbits/sec
root@mininet-vm:~#
```

2 - a) Criando topologia customizada.

leticiamoreiram Updated topology

Code | Blame | 41 lines (35 loc) · 1.21 KB

```python
from mininet.topo import Topo

class MyTopo( Topo ):
    def __init__(self):
        "Create custom topo."

        # Initialize topology
        Topo.__init__(self)

        # Add hosts
        host1 = self.addHost('h1')
        host2 = self.addHost('h2')
        host3 = self.addHost('h3')
        host4 = self.addHost('h4')
        host5 = self.addHost('h5')
        host6 = self.addHost('h6')
        host7 = self.addHost('h7')
        host8 = self.addHost('h8')
        host9 = self.addHost('h9')

        # Add switches
        switch1 = self.addSwitch('s1')
        switch2 = self.addSwitch('s2')
        switch3 = self.addSwitch('s3')
        switch4 = self.addSwitch('s4')

        # Add links
        self.addLink(host1, switch1)
        self.addLink(host2, switch1)
        self.addLink(switch2, switch1)
        self.addLink(host3, switch2)
        self.addLink(host4, switch2)
        self.addLink(switch3, switch2)
        self.addLink(host5, switch3)
        self.addLink(host6, switch3)
        self.addLink(switch4, switch3)
        self.addLink(host7, switch4)
        self.addLink(host8, switch4)
        self.addLink(host9, switch4)

topos = { 'mytopo': ( lambda: MyTopo() ) }
```

2 - a) Criando topologia customizada.

```
mininet@mininet-vm:~/C115/TrabalhoFinalMininet/myTopo$ sudo mn --custom topologia.py --topo mytopo --mac --controll
er=remote,ip=127.0.0.1,port=6653
*** Creating network
*** Adding controller
Unable to contact the remote controller at 127.0.0.1:6653
*** Adding hosts:
h1 h2 h3 h4 h5 h6 h7 h8 h9
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s1) (h3, s2) (h4, s2) (h5, s3) (h6, s3) (h7, s4) (h8, s4) (h9, s4) (s2, s1) (s3, s2) (s4, s3)
*** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8 h9
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
mininet>
```

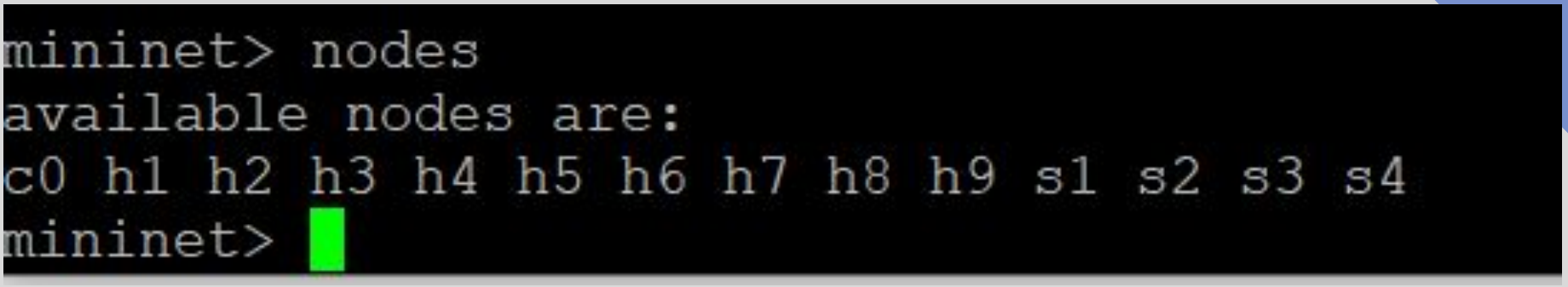
2 - b) Inspecionando dados de interfaces, endereços MAC, IP e portas através da linha de comando.

```
mininet> dump
<Host h1: h1-eth0:10.0.0.1 pid=2492>
<Host h2: h2-eth0:10.0.0.2 pid=2494>
<Host h3: h3-eth0:10.0.0.3 pid=2496>
<Host h4: h4-eth0:10.0.0.4 pid=2498>
<Host h5: h5-eth0:10.0.0.5 pid=2500>
<Host h6: h6-eth0:10.0.0.6 pid=2502>
<Host h7: h7-eth0:10.0.0.7 pid=2504>
<Host h8: h8-eth0:10.0.0.8 pid=2506>
<Host h9: h9-eth0:10.0.0.9 pid=2508>
<OVSSwitch s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None,s1-eth3:None pid=2513>
<OVSSwitch s2: lo:127.0.0.1,s2-eth1:None,s2-eth2:None,s2-eth3:None,s2-eth4:None pid=2516>
<OVSSwitch s3: lo:127.0.0.1,s3-eth1:None,s3-eth2:None,s3-eth3:None,s3-eth4:None pid=2519>
<OVSSwitch s4: lo:127.0.0.1,s4-eth1:None,s4-eth2:None,s4-eth3:None,s4-eth4:None pid=2522>
<RemoteController{'ip': '127.0.0.1', 'port': 6653} c0: 127.0.0.1:6653 pid=2486>
mininet>
```

2 - b) Inspecionando dados de interfaces, endereços MAC, IP e portas através da linha de comando.

```
mininet> net
h1 h1-eth0:s1-eth1
h2 h2-eth0:s1-eth2
h3 h3-eth0:s2-eth2
h4 h4-eth0:s2-eth3
h5 h5-eth0:s3-eth2
h6 h6-eth0:s3-eth3
h7 h7-eth0:s4-eth2
h8 h8-eth0:s4-eth3
h9 h9-eth0:s4-eth4
s1 lo:  s1-eth1:h1-eth0 s1-eth2:h2-eth0 s1-eth3:s2-eth1
s2 lo:  s2-eth1:s1-eth3 s2-eth2:h3-eth0 s2-eth3:h4-eth0 s2-eth4:s3-eth1
s3 lo:  s3-eth1:s2-eth4 s3-eth2:h5-eth0 s3-eth3:h6-eth0 s3-eth4:s4-eth1
s4 lo:  s4-eth1:s3-eth4 s4-eth2:h7-eth0 s4-eth3:h8-eth0 s4-eth4:h9-eth0
c0
mininet>
```

2 - b) Inspecionando dados de interfaces, endereços MAC, IP e portas através da linha de comando.



2 - b) Inspecionando dados de interfaces, endereços MAC, IP e portas através da linha de comando.

```
mininet> h1 ifconfig
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> h2 ifconfig
h2-eth0   Link encap:Ethernet  HWaddr 00:00:00:00:00:02
          inet addr:10.0.0.2  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>
```

2 - d) Testes de ping:

```
mininet> h1 ping h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
From 10.0.0.1 icmp_seq=1 Destination Host Unreachable
From 10.0.0.1 icmp_seq=2 Destination Host Unreachable
From 10.0.0.1 icmp_seq=3 Destination Host Unreachable
From 10.0.0.1 icmp_seq=4 Destination Host Unreachable
From 10.0.0.1 icmp_seq=5 Destination Host Unreachable
From 10.0.0.1 icmp_seq=6 Destination Host Unreachable
From 10.0.0.1 icmp_seq=7 Destination Host Unreachable
From 10.0.0.1 icmp_seq=8 Destination Host Unreachable
From 10.0.0.1 icmp_seq=9 Destination Host Unreachable
^C
--- 10.0.0.2 ping statistics ---
10 packets transmitted, 0 received, +9 errors, 100% packet loss, time 9047ms
pipe 3
mininet>
```

2 - e) Novas regras:

```
root@mininet-vm:~/C115/TrabalhoFinalMininet/myTopo# sudo ovs-ofctl add-flow s1
dl_type=0x806,nw_proto=1,action=flood
root@mininet-vm:~/C115/TrabalhoFinalMininet/myTopo# sudo ovs-ofctl add-flow s2
dl_type=0x806,nw_proto=1,action=flood
root@mininet-vm:~/C115/TrabalhoFinalMininet/myTopo# sudo ovs-ofctl add-flow s3
dl_type=0x806,nw_proto=1,action=flood
root@mininet-vm:~/C115/TrabalhoFinalMininet/myTopo# sudo ovs-ofctl add-flow s4
dl_type=0x806,nw_proto=1,action=flood
root@mininet-vm:~/C115/TrabalhoFinalMininet/myTopo# sudo ovs-ofctl add-flow s1
dl_src=00:00:00:00:00:01,dl_dst=00:00:00:00:00:02,actions=output:2
root@mininet-vm:~/C115/TrabalhoFinalMininet/myTopo# sudo ovs-ofctl add-flow s1
dl_src=00:00:00:00:00:02,dl_dst=00:00:00:00:00:01,actions=output:1
root@mininet-vm:~/C115/TrabalhoFinalMininet/myTopo#
```