



1º TRABALHO DE MININET

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```

mininet@mininet-vm:~$ sudo mn --mac --topo linear,4,bw=15
**** Creating network
**** Adding controller
**** Adding hosts:
h1 h2 h3 h4
**** Adding switches:
s1 s2 s3 s4
**** Adding links:
(h1, s1) (h2, s2) (h3, s3) (h4, s4) (s2, s1) (s3, s2) (s4, s3)
**** Configuring hosts
h1 h2 h3 h4
**** Starting controller
c0
**** Starting 4 switches
s1 s2 s3 s4 ...
**** Starting CLI:
mininet> net
h1 h1-eth0:s1-eth1
h2 h2-eth0:s2-eth1
h3 h3-eth0:s3-eth1
h4 h4-eth0:s4-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

```

A

Criação da topologia considerando o endereço map padronizado, larguras de banda bw de 15Mbps e o controlador sem ser especificado.

```
mininet> h1 ifconfig
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.1 netmask 255.0.0.0 broadcast 10.255.255.255
    ether 00:00:00:00:00:01 txqueuelen 1000 (Ethernet)
    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

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    loop txqueuelen 1000 (Local Loopback)
    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

mininet> h2 ifconfig
h2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
    ether 00:00:00:00:00:02 txqueuelen 1000 (Ethernet)
    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

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    loop txqueuelen 1000 (Local Loopback)
    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
```

B

Inspeção das informações da interfaces, endereços MAC, ip e portas através de linhas de comando.

```
mininet> h3 ifconfig
h3-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.3 netmask 255.0.0.0 broadcast 10.255.255.255
    ether 00:00:00:00:00:03 txqueuelen 1000 (Ethernet)
    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

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    loop txqueuelen 1000 (Local Loopback)
    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

mininet> h4 ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.4 netmask 255.0.0.0 broadcast 10.255.255.255
    ether 00:00:00:00:00:04 txqueuelen 1000 (Ethernet)
    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

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    loop txqueuelen 1000 (Local Loopback)
    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
```

B

Inspeção das informações da interfaces, endereços MAC, ip e portas através de linhas de comando.



```
mininet> net
h1 h1-eth0:s1-eth1
h2 h2-eth0:s2-eth1
h3 h3-eth0:s3-eth1
h4 h4-eth0:s4-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
c0
mininet> nodes
available nodes are:
c0 h1 h2 h3 h4 s1 s2 s3 s4
mininet> net
h1 h1-eth0:s1-eth1
h2 h2-eth0:s2-eth1
h3 h3-eth0:s3-eth1
h4 h4-eth0:s4-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
c0
mininet>
```

Inspeção das informações da interfaces, endereços MAC, ip e portas através de linhas de comando.

Host	Endereço IP	ENDEREÇO MAC
h1	10.0.0.1	00:00:00:00:00:01
H2	10.0.0.2	00:00:00:00:00:02
H3	10.0.0.3	00:00:00:00:00:03
H4	10.0.0.4	00:00:00:00:00:04



Criação de um desenho ilustrativo
da topologia com todas as
informações obtidas.

```
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

mininet> h1 ping 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=6.63 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.642 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.076 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.100 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.106 ms
64 bytes from 10.0.0.2: icmp_seq=6 ttl=64 time=0.077 ms
64 bytes from 10.0.0.2: icmp_seq=7 ttl=64 time=0.083 ms
64 bytes from 10.0.0.2: icmp_seq=8 ttl=64 time=0.077 ms
64 bytes from 10.0.0.2: icmp_seq=9 ttl=64 time=0.074 ms
64 bytes from 10.0.0.2: icmp_seq=10 ttl=64 time=0.100 ms
64 bytes from 10.0.0.2: icmp_seq=11 ttl=64 time=0.059 ms
64 bytes from 10.0.0.2: icmp_seq=12 ttl=64 time=0.120 ms
64 bytes from 10.0.0.2: icmp_seq=13 ttl=64 time=0.064 ms
64 bytes from 10.0.0.2: icmp_seq=14 ttl=64 time=0.182 ms
64 bytes from 10.0.0.2: icmp_seq=15 ttl=64 time=0.088 ms
64 bytes from 10.0.0.2: icmp_seq=16 ttl=64 time=0.153 ms
64 bytes from 10.0.0.2: icmp_seq=17 ttl=64 time=0.088 ms
64 bytes from 10.0.0.2: icmp_seq=18 ttl=64 time=0.057 ms
64 bytes from 10.0.0.2: icmp_seq=19 ttl=64 time=0.088 ms
64 bytes from 10.0.0.2: icmp_seq=20 ttl=64 time=0.086 ms
64 bytes from 10.0.0.2: icmp_seq=21 ttl=64 time=0.095 ms
^C
--- 10.0.0.2 ping statistics ---
21 packets transmitted, 21 received, 0% packet loss, time 20452ms
rtt min/avg/max/mdev = 0.057/0.430/6.631/1.391 ms
mininet>
```



Testes de ping entre os diferentes nós, além de mostrar os pacotes chegando nos nós.

```
mininet> h2 ping 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=2.90 ms
64 bytes from 10.0.0.3: icmp_seq=2 ttl=64 time=0.437 ms
64 bytes from 10.0.0.3: icmp_seq=3 ttl=64 time=0.063 ms
64 bytes from 10.0.0.3: icmp_seq=4 ttl=64 time=0.168 ms
64 bytes from 10.0.0.3: icmp_seq=5 ttl=64 time=0.091 ms
64 bytes from 10.0.0.3: icmp_seq=6 ttl=64 time=0.117 ms
64 bytes from 10.0.0.3: icmp_seq=7 ttl=64 time=0.066 ms
64 bytes from 10.0.0.3: icmp_seq=8 ttl=64 time=0.077 ms
^C
--- 10.0.0.3 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7134ms
rtt min/avg/max/mdev = 0.063/0.490/2.904/0.919 ms
mininet>
```

D

Testes de ping entre os diferentes nós, além de mostrar os pacotes chegando nos nós.


```
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=3.41 ms  
64 bytes from 10.0.0.4: icmp_seq=2 ttl=64 time=0.382 ms  
64 bytes from 10.0.0.4: icmp_seq=3 ttl=64 time=0.085 ms  
64 bytes from 10.0.0.4: icmp_seq=4 ttl=64 time=0.084 ms  
64 bytes from 10.0.0.4: icmp_seq=5 ttl=64 time=0.090 ms  
64 bytes from 10.0.0.4: icmp_seq=6 ttl=64 time=0.139 ms  
64 bytes from 10.0.0.4: icmp_seq=7 ttl=64 time=0.077 ms  
^C  
--- 10.0.0.4 ping statistics ---  
7 packets transmitted, 7 received, 0% packet loss, time 6119ms  
rtt min/avg/max/mdev = 0.077/0.609/3.406/1.146 ms  
mininet>
```

D

Testes de ping entre os diferentes nós, além de mostrar os pacotes chegando nos nós.

```
mininet> h4 ping h1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.
64 bytes from 10.0.0.1: icmp_seq=1 ttl=64 time=7.31 ms
64 bytes from 10.0.0.1: icmp_seq=2 ttl=64 time=0.618 ms
64 bytes from 10.0.0.1: icmp_seq=3 ttl=64 time=0.105 ms
64 bytes from 10.0.0.1: icmp_seq=4 ttl=64 time=0.118 ms
64 bytes from 10.0.0.1: icmp_seq=5 ttl=64 time=0.150 ms
64 bytes from 10.0.0.1: icmp_seq=6 ttl=64 time=0.129 ms
64 bytes from 10.0.0.1: icmp_seq=7 ttl=64 time=0.092 ms
^C
--- 10.0.0.1 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6119ms
rtt min/avg/max/mdev = 0.092/1.217/7.311/2.493 ms
mininet>
```

D

Testes de ping entre os diferentes nós, além de mostrar os pacotes chegando nos nós.

```

mininet@mininet-vm:~$ sudo mn --topo linear,4,bw=1 --mac
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (h4, s4) (s2, s1) (s3, s2) (s4, s3)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
mininet> h1 iperf -s -p 5555 &
mininet> h2 iperf -c 10.0.0.1 -p 5555 -t 10 -i 1
-----
Client connecting to 10.0.0.1, TCP port 5555
TCP window size: 416 KByte (default)
-----
[  3] local 10.0.0.2 port 42462 connected with 10.0.0.1 port 5555
[ ID] Interval      Transfer    Bandwidth
[  3] 0.0- 1.0 sec   2.05 GBytes 17.6 Gbits/sec
[  3] 1.0- 2.0 sec   2.11 GBytes 18.2 Gbits/sec
[  3] 2.0- 3.0 sec   1.95 GBytes 16.8 Gbits/sec
[  3] 3.0- 4.0 sec   2.00 GBytes 17.2 Gbits/sec
[  3] 4.0- 5.0 sec   1.92 GBytes 16.5 Gbits/sec
[  3] 5.0- 6.0 sec   1.97 GBytes 17.0 Gbits/sec
[  3] 6.0- 7.0 sec   1.99 GBytes 17.1 Gbits/sec
[  3] 7.0- 8.0 sec   2.02 GBytes 17.3 Gbits/sec
^C[  3] 0.0- 8.4 sec 16.7 GBytes 17.2 Gbits/sec

```

E

Especifique que o host 1 na porta 5555 vai ser um servidor TCP e o host 2 um cliente e execute testes de iperf, considere um relatório por segundo com teste de 10 segundos. Faça os testes para larguras de banda bw de 1, 3, 12 e 18Mbps


```

mininet@mininet-vm:~$ sudo mn --topo linear,4,bw=3 --mac
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (h4, s4) (s2, s1) (s3, s2) (s4, s3)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
mininet> h1 iperf -s -p 5555 &
mininet> h2 iperf -c 10.0.0.1 -p 5555 -t 10 -i 1
-----
Client connecting to 10.0.0.1, TCP port 5555
TCP window size: 1.13 MByte (default)
-----
[  3] local 10.0.0.2 port 42474 connected with 10.0.0.1 port 5555
[ ID] Interval      Transfer    Bandwidth
[  3]  0.0- 1.0 sec  2.07 GBytes 17.8 Gbits/sec
[  3]  1.0- 2.0 sec  2.03 GBytes 17.5 Gbits/sec
[  3]  2.0- 3.0 sec  2.06 GBytes 17.7 Gbits/sec
[  3]  3.0- 4.0 sec  1.93 GBytes 16.6 Gbits/sec
[  3]  4.0- 5.0 sec  1.99 GBytes 17.1 Gbits/sec
[  3]  5.0- 6.0 sec  2.01 GBytes 17.3 Gbits/sec
[  3]  6.0- 7.0 sec  2.07 GBytes 17.8 Gbits/sec
^C[  3]  0.0- 7.4 sec 15.1 GBytes 17.4 Gbits/sec
mininet>

```

E

Especifique que o host 1 na porta 5555 vai ser um servidor TCP e o host 2 um cliente e execute testes de iperf, considere um relatório por segundo com teste de 10 segundos. Faça os testes para larguras de banda bw de 1, 3, 12 e 18Mbps

```

*** Adding controller
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (h4, s4) (s2, s1) (s3, s2) (s4, s3)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
mininet> h1 iperf -s -p 5555 &
mininet> h2 iperf -c 10.0.0.1 -p 5555 -t 10 -i 1
-----
Client connecting to 10.0.0.1, TCP port 5555
TCP window size: 450 KByte (default)
-----
[  3] local 10.0.0.2 port 42486 connected with 10.0.0.1 port 5555
[ ID] Interval      Transfer    Bandwidth
[  3] 0.0- 1.0 sec   2.05 GBytes 17.6 Gbits/sec
[  3] 1.0- 2.0 sec   2.10 GBytes 18.1 Gbits/sec
[  3] 2.0- 3.0 sec   2.11 GBytes 18.2 Gbits/sec
[  3] 3.0- 4.0 sec   1.98 GBytes 17.0 Gbits/sec
[  3] 4.0- 5.0 sec   1.95 GBytes 16.8 Gbits/sec
[  3] 5.0- 6.0 sec   1.93 GBytes 16.5 Gbits/sec
[  3] 6.0- 7.0 sec   1.93 GBytes 16.5 Gbits/sec
[  3] 7.0- 8.0 sec   1.98 GBytes 17.0 Gbits/sec
[  3] 8.0- 9.0 sec   1.95 GBytes 16.7 Gbits/sec
[  3] 9.0-10.0 sec   2.04 GBytes 17.5 Gbits/sec

```

E

Especifique que o host 1 na porta 5555 vai ser um servidor TCP e o host 2 um cliente e execute testes de iperf, considere um relatório por segundo com teste de 10 segundos. Faça os testes para larguras de banda bw de 1, 3, 12 e 18Mbps

```

mininet@mininet-vm:~$ sudo mn --topo linear,4,bw=18 --mac
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (h4, s4) (s2, s1) (s3, s2) (s4, s3)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
mininet> h1 iperf -s -p 5555 &
mininet> h2 iperf -c 10.0.0.1 -p 5555 -t 10 -i 1
-----
Client connecting to 10.0.0.1, TCP port 5555
TCP window size: 612 KByte (default)
-----
[ 3] local 10.0.0.2 port 42498 connected with 10.0.0.1 port 5555
[ ID] Interval      Transfer    Bandwidth
[ 3]  0.0- 1.0 sec  1.99 GBytes 17.1 Gbits/sec
[ 3]  1.0- 2.0 sec  1.89 GBytes 16.2 Gbits/sec
[ 3]  2.0- 3.0 sec  2.03 GBytes 17.5 Gbits/sec
[ 3]  3.0- 4.0 sec  1.95 GBytes 16.7 Gbits/sec
[ 3]  4.0- 5.0 sec  2.06 GBytes 17.7 Gbits/sec
[ 3]  5.0- 6.0 sec  2.01 GBytes 17.2 Gbits/sec
[ 3]  6.0- 7.0 sec  1.97 GBytes 17.0 Gbits/sec
[ 3]  7.0- 8.0 sec  2.06 GBytes 17.7 Gbits/sec
[ 3]  8.0- 9.0 sec  2.08 GBytes 17.9 Gbits/sec
[ 3]  9.0-10.0 sec  2.09 GBytes 18.0 Gbits/sec
[ 3]  0.0-10.0 sec 20.1 GBytes 17.3 Gbits/sec
mininet>

```



Especifique que o host 1 na porta 5555 vai ser um servidor TCP e o host 2 um cliente e execute testes de iperf, considere um relatório por segundo com teste de 10 segundos. Faça os testes para larguras de banda bw de 1, 3, 12 e 18Mbps