1.

```
mininet@mininet-vm:~$ sudo mn --topo=tree,depth=4,fanout=2 --mac --link tc,bw=25 --controller=defaul
t
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16
*** Adding switches:
s1 s2 s3 s4 s5 s6 s7 s8 s9 s10 s11 s12 s13 s14 s15
*** Adding links:
(25.00Mbit) (25.00Mbit) (s1, s2) (25.00Mbit) (25.00Mbit) (s1, s9) (25.00Mbit) (25.00Mbit) (s2, s3) (
25.00Mbit) (25.00Mbit) (s2, s6) (25.00Mbit) (25.00Mbit) (s3, s4) (25.00Mbit) (25.00Mbit) (s3, s5) (2
5.00Mbit) (25.00Mbit) (s4, h1) (25.00Mbit) (25.00Mbit) (s4, h2) (25.00Mbit) (25.00Mbit) (s5, h3) (25
.00Mbit) (25.00Mbit) (s5, h4) (25.00Mbit) (25.00Mbit) (s6, s7) (25.00Mbit) (25.00Mbit) (s6, s8) (25.
00Mbit) (25.00Mbit) (s7, h5) (25.00Mbit) (25.00Mbit) (s7, h6) (25.00Mbit) (25.00Mbit) (s8, h7) (25.0
0Mbit) (25.00Mbit) (s8, h8) (25.00Mbit) (25.00Mbit) (s9, s10) (25.00Mbit) (25.00Mbit) (s9, s13) (25.
00Mbit) (25.00Mbit) (s10, s11) (25.00Mbit) (25.00Mbit) (s10, s12) (25.00Mbit) (25.00Mbit) (s11, h9)
(25.00Mbit) (25.00Mbit) (s11, h10) (25.00Mbit) (25.00Mbit) (s12, h11) (25.00Mbit) (25.00Mbit) (s12,
h12) (25.00Mbit) (25.00Mbit) (s13, s14) (25.00Mbit) (25.00Mbit) (s13, s15) (25.00Mbit) (25.00Mbit) (
s14, h13) (25.00Mbit) (25.00Mbit) (s14, h14) (25.00Mbit) (25.00Mbit) (s15, h15) (25.00Mbit) (25.00Mb
it) (s15, h16)
*** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16
*** Starting controller
c0
*** Starting 15 switches
s1 s2 s3 s4 s5 s6 s7 s8 s9 s10 s11 s12 s13 s14 s15 ...(25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit
) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (2
5.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00
Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit
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5.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit) (25.00Mbit)
*** Starting CLI:
```

2.

```
mininet> dump
<Host h1: h1-eth0:10.0.0.1 pid=951>
<Host h2: h2-eth0:10.0.0.2 pid=954>
<Host h3: h3-eth0:10.0.0.3 pid=956>
<Host h4: h4-eth0:10.0.0.4 pid=958>
<Host h5: h5-eth0:10.0.0.5 pid=960>
<Host h6: h6-eth0:10.0.0.6 pid=962>
<Host h7: h7-eth0:10.0.0.7 pid=964>
<Host h8: h8-eth0:10.0.0.8 pid=966>
<Host h9: h9-eth0:10.0.0.9 pid=968>
<Host h10: h10-eth0:10.0.0.10 pid=970>
<Host h11: h11-eth0:10.0.0.11 pid=972>
<Host h12: h12-eth0:10.0.0.12 pid=974>
<Host h13: h13-eth0:10.0.0.13 pid=976>
<Host h14: h14-eth0:10.0.0.14 pid=978>
<Host h15: h15-eth0:10.0.0.15 pid=980>
<Host h16: h16-eth0:10.0.0.16 pid=982>
<OVSSwitch s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None pid=987>
<OVSSwitch s2: lo:127.0.0.1,s2-eth1:None,s2-eth2:None,s2-eth3:None pid=990>
<OVSSwitch s3: lo:127.0.0.1,s3-eth1:None,s3-eth2:None,s3-eth3:None pid=993>
<OVSSwitch s4: lo:127.0.0.1,s4-eth1:None,s4-eth2:None,s4-eth3:None pid=996>
<OVSSwitch s5: lo:127.0.0.1,s5-eth1:None,s5-eth2:None,s5-eth3:None pid=999>
<OVSSwitch s6: lo:127.0.0.1,s6-eth1:None,s6-eth2:None,s6-eth3:None pid=1002>
<OVSSwitch s7: lo:127.0.0.1,s7-eth1:None,s7-eth2:None,s7-eth3:None pid=1005>
<OVSSwitch s8: lo:127.0.0.1,s8-eth1:None,s8-eth2:None,s8-eth3:None pid=1008>
<OVSSwitch s9: lo:127.0.0.1,s9-eth1:None,s9-eth2:None,s9-eth3:None pid=1011>
<OVSSwitch s10: lo:127.0.0.1,s10-eth1:None,s10-eth2:None,s10-eth3:None pid=1014>
<OVSSwitch s11: lo:127.0.0.1,s11-eth1:None,s11-eth2:None,s11-eth3:None pid=1017>
<OVSSwitch s12: lo:127.0.0.1,s12-eth1:None,s12-eth2:None,s12-eth3:None pid=1020>
<OVSSwitch s13: lo:127.0.0.1,s13-eth1:None,s13-eth2:None,s13-eth3:None pid=1023>
<OVSSwitch s14: lo:127.0.0.1,s14-eth1:None,s14-eth2:None,s14-eth3:None pid=1026>
<OVSSwitch s15: lo:127.0.0.1,s15-eth1:None,s15-eth2:None,s15-eth3:None pid=1029>
<Controller c0: 127.0.0.1:6653 pid=944>
```

3.

```
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16
h2 -> h1 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16
h3 -> h1 h2 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16
h4 -> h1 h2 h3 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16
h5 -> h1 h2 h3 h4 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16
h6 -> h1 h2 h3 h4 h5 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16
h7 -> h1 h2 h3 h4 h5 h6 h8 h9 h10 h11 h12 h13 h14 h15 h16
h8 -> h1 h2 h3 h4 h5 h6 h7 h9 h10 h11 h12 h13 h14 h15 h16
h9 -> h1 h2 h3 h4 h5 h6 h7 h8 h10 h11 h12 h13 h14 h15 h16
h10 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 h11 h12 h13 h14 h15 h16
h11 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h12 h13 h14 h15 h16
h12 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h13 h14 h15 h16
h13 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h14 h15 h16
h14 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h15 h16
h15 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h16
h16 -> h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15
*** Results: 0% dropped (240/240 received)
```

4.

```
mininet> h1 iperf -s -p 5555
------------------------------------------------------------
Server listening on TCP port 5555
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
```

```
mininet> h2 iperf -c 10.0.0.1 -p 5555 -u -b 25M -t 10 -i 1
------------------------------------------------------------
Client connecting to 10.0.0.1, UDP port 5555
Sending 1470 byte datagrams, IPG target: 448.61 us (kalman adjust)
UDP buffer size:  208 KByte (default)
------------------------------------------------------------
[  3] local 10.0.0.2 port 49554 connected with 10.0.0.1 port 5555
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 1.0 sec   943 KBytes  7.73 Mbits/sec
[  3]  1.0- 2.0 sec  2.35 MBytes  19.7 Mbits/sec
[  3]  2.0- 3.0 sec  2.52 MBytes  21.2 Mbits/sec
[  3]  3.0- 4.0 sec  1.76 MBytes  14.8 Mbits/sec
[  3]  4.0- 5.0 sec  1.34 MBytes  11.2 Mbits/sec
[  3]  5.0- 6.0 sec  1.53 MBytes  12.9 Mbits/sec
[  3]  6.0- 7.0 sec  1.18 MBytes  9.90 Mbits/sec
[  3]  7.0- 8.0 sec  1.22 MBytes  10.2 Mbits/sec
[  3]  8.0- 9.0 sec  1.50 MBytes  12.6 Mbits/sec
read failed: Connection refused
[  3] WARNING: did not receive ack of last datagram after 5 tries.
[  3]  0.0-10.0 sec  15.4 MBytes  12.9 Mbits/sec
[  3] Sent 10988 datagrams
```