

dpctl before pingall:

```
vagrant@ubuntu-focal:~$ sudo python ~/461_mininet/topos/part4.py
Unable to contact the remote controller at 127.0.0.1:6653
mininet> dpctl dump-flows
*** cores21 -----
*** dcs31 -----
cookie=0x0, duration=8.891s, table=0, n_packets=0, n_bytes=0, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=8.891s, table=0, n_packets=0, n_bytes=0, priority=4,ip,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=8.891s, table=0, n_packets=0, n_bytes=0, priority=1,ip actions=FLOOD
cookie=0x0, duration=8.891s, table=0, n_packets=0, n_bytes=0, priority=2,arp actions=FLOOD
*** s1 -----
cookie=0x0, duration=8.895s, table=0, n_packets=0, n_bytes=0, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=8.895s, table=0, n_packets=0, n_bytes=0, priority=1,ip actions=FLOOD
cookie=0x0, duration=8.895s, table=0, n_packets=0, n_bytes=0, priority=2,arp actions=FLOOD
*** s2 -----
cookie=0x0, duration=8.898s, table=0, n_packets=0, n_bytes=0, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=8.898s, table=0, n_packets=0, n_bytes=0, priority=1,ip actions=FLOOD
cookie=0x0, duration=8.898s, table=0, n_packets=0, n_bytes=0, priority=2,arp actions=FLOOD
*** s3 -----
cookie=0x0, duration=8.904s, table=0, n_packets=0, n_bytes=0, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=8.904s, table=0, n_packets=0, n_bytes=0, priority=1,ip actions=FLOOD
cookie=0x0, duration=8.904s, table=0, n_packets=0, n_bytes=0, priority=2,arp actions=FLOOD
mininet> █
```

after pingall:

```
mininet> dpctl dump-flows
*** cores21 -----
cookie=0x0, duration=407.659s, table=0, n_packets=0, n_bytes=0, priority=1,arp,arp_tpa=10.0.1.10 actions=mod_dl_dst:00:00:00:00:00:01,output:"cores21-eth1"
cookie=0x0, duration=407.659s, table=0, n_packets=748851, n_bytes=17288406982, priority=2,ip,nw_dst=10.0.1.10 actions=mod_dl_dst:00:00:00:00:00:01,output:"cores21-eth1"
cookie=0x0, duration=367.674s, table=0, n_packets=0, n_bytes=0, priority=3,arp,arp_tpa=10.0.2.20 actions=mod_dl_dst:00:00:00:00:00:02,output:"cores21-eth2"
cookie=0x0, duration=367.674s, table=0, n_packets=4, n_bytes=392, priority=4,ip,nw_dst=10.0.2.20 actions=mod_dl_dst:00:00:00:00:00:02,output:"cores21-eth2"
cookie=0x0, duration=337.658s, table=0, n_packets=0, n_bytes=0, priority=5,arp,arp_tpa=10.0.3.30 actions=mod_dl_dst:00:00:00:00:00:03,output:"cores21-eth3"
cookie=0x0, duration=337.657s, table=0, n_packets=4, n_bytes=392, priority=6,ip,nw_dst=10.0.3.30 actions=mod_dl_dst:00:00:00:00:00:03,output:"cores21-eth3"
cookie=0x0, duration=317.681s, table=0, n_packets=0, n_bytes=0, priority=7,arp,arp_tpa=172.16.10.100 actions=mod_dl_dst:00:00:00:00:00:05,output:"cores21-eth5"
cookie=0x0, duration=317.681s, table=0, n_packets=310533, n_bytes=20495226, priority=8,ip,nw_dst=172.16.10.100 actions=mod_dl_dst:00:00:00:00:00:05,output:"cores21-eth5"
cookie=0x0, duration=277.597s, table=0, n_packets=0, n_bytes=0, priority=9,arp,arp_tpa=10.0.4.10 actions=mod_dl_dst:00:00:00:00:00:04,output:"cores21-eth4"
cookie=0x0, duration=277.597s, table=0, n_packets=424435, n_bytes=18595541302, priority=10,ip,nw_dst=10.0.4.10 actions=mod_dl_dst:00:00:00:00:00:04,output:"cores21-eth4"
*** dcs31 -----
cookie=0x0, duration=470.460s, table=0, n_packets=1, n_bytes=98, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=470.460s, table=0, n_packets=0, n_bytes=0, priority=4,ip,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=470.460s, table=0, n_packets=779250, n_bytes=18618959204, priority=1,ip actions=FLOOD
cookie=0x0, duration=470.460s, table=0, n_packets=4, n_bytes=168, priority=2,arp actions=FLOOD
*** s1 -----
cookie=0x0, duration=470.464s, table=0, n_packets=1, n_bytes=98, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=470.464s, table=0, n_packets=1483820, n_bytes=35904443608, priority=1,ip actions=FLOOD
cookie=0x0, duration=470.464s, table=0, n_packets=8, n_bytes=336, priority=2,arp actions=FLOOD
*** s2 -----
cookie=0x0, duration=470.467s, table=0, n_packets=1, n_bytes=98, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=470.467s, table=0, n_packets=9, n_bytes=882, priority=1,ip actions=FLOOD
cookie=0x0, duration=470.467s, table=0, n_packets=4, n_bytes=168, priority=2,arp actions=FLOOD
*** s3 -----
cookie=0x0, duration=470.469s, table=0, n_packets=1, n_bytes=98, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=470.470s, table=0, n_packets=8, n_bytes=784, priority=1,ip actions=FLOOD
cookie=0x0, duration=470.470s, table=0, n_packets=4, n_bytes=168, priority=2,arp actions=FLOOD
mininet> █
```

other commands:

```
mininet> pingall
*** Ping: testing ping reachability
h10 -> X X X X
h20 -> h10 X X X
h30 -> h10 h20 X X
hnotrust1 -> X X X X
serv1 -> h10 h20 h30 X
*** Results: 70% dropped (6/20 received)
mininet> iperf hnotrust1 h10
*** Iperf: testing TCP bandwidth between hnotrust1 and h10
*** Results: ['27.5 Gbits/sec', '27.6 Gbits/sec']
mininet> iperf h10 serv1
*** Iperf: testing TCP bandwidth between h10 and serv1
*** Results: ['29.6 Gbits/sec', '29.7 Gbits/sec']
mininet> █
```

Full:

```
vagrant@ubuntu-focal:~$ sudo python ~/461_mininet/topos/part4.py
Unable to contact the remote controller at 127.0.0.1:6653
mininet> dpctl dump-flows
*** cores21 -----
*** dcs31 -----
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cookie=0x0, duration=8.891s, table=0, n_packets=0, n_bytes=0, priority=4,ip,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=8.891s, table=0, n_packets=0, n_bytes=0, priority=1,ip actions=FLOOD
cookie=0x0, duration=8.891s, table=0, n_packets=0, n_bytes=0, priority=2,arp actions=FLOOD
*** s1 -----
cookie=0x0, duration=8.895s, table=0, n_packets=0, n_bytes=0, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=8.895s, table=0, n_packets=0, n_bytes=0, priority=1,ip actions=FLOOD
cookie=0x0, duration=8.895s, table=0, n_packets=0, n_bytes=0, priority=2,arp actions=FLOOD
*** s2 -----
cookie=0x0, duration=8.898s, table=0, n_packets=0, n_bytes=0, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=8.898s, table=0, n_packets=0, n_bytes=0, priority=1,ip actions=FLOOD
cookie=0x0, duration=8.898s, table=0, n_packets=0, n_bytes=0, priority=2,arp actions=FLOOD
*** s3 -----
cookie=0x0, duration=8.904s, table=0, n_packets=0, n_bytes=0, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=8.904s, table=0, n_packets=0, n_bytes=0, priority=1,ip actions=FLOOD
cookie=0x0, duration=8.904s, table=0, n_packets=0, n_bytes=0, priority=2,arp actions=FLOOD
mininet> pingall
*** Ping: testing ping reachability
h10 -> X X X X
h20 -> h10 X X X
h30 -> h10 h20 X X
hnotrust1 -> X X X X
serv1 -> h10 h20 h30 X
*** Results: 70% dropped (6/20 received)
mininet> iperf hnotrust1 h10
*** Iperf: testing TCP bandwidth between hnotrust1 and h10
*** Results: ['27.5 Gbits/sec', '27.6 Gbits/sec']
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cookie=0x0, duration=407.659s, table=0, n_packets=748851, n_bytes=17288406982, priority=2,ip,nw_dst=10.0.1.10 actions=mod_d1_dst:00:00:00:00:00:01,output:"cores21-eth1"
cookie=0x0, duration=367.674s, table=0, n_packets=0, n_bytes=0, priority=3,arp,arp_tpa=10.0.2.20 actions=mod_d1_dst:00:00:00:00:00:02,output:"cores21-eth2"
cookie=0x0, duration=367.674s, table=0, n_packets=4, n_bytes=392, priority=4,ip,nw_dst=10.0.2.20 actions=mod_d1_dst:00:00:00:00:00:02,output:"cores21-eth2"
cookie=0x0, duration=337.658s, table=0, n_packets=0, n_bytes=0, priority=5,arp,arp_tpa=10.0.3.30 actions=mod_d1_dst:00:00:00:00:00:03,output:"cores21-eth3"
cookie=0x0, duration=337.657s, table=0, n_packets=4, n_bytes=392, priority=6,ip,nw_dst=10.0.3.30 actions=mod_d1_dst:00:00:00:00:00:03,output:"cores21-eth3"
cookie=0x0, duration=317.601s, table=0, n_packets=0, n_bytes=0, priority=7,arp,arp_tpa=172.16.10.100 actions=mod_d1_dst:00:00:00:00:00:05,output:"cores21-eth5"
cookie=0x0, duration=317.601s, table=0, n_packets=310533, n_bytes=20495226, priority=8,ip,nw_dst=172.16.10.100 actions=mod_d1_dst:00:00:00:00:00:05,output:"cores21-eth5"
cookie=0x0, duration=277.597s, table=0, n_packets=0, n_bytes=0, priority=9,arp,arp_tpa=10.0.4.10 actions=mod_d1_dst:00:00:00:00:00:04,output:"cores21-eth4"
cookie=0x0, duration=277.597s, table=0, n_packets=424435, n_bytes=18595541302, priority=10,ip,nw_dst=10.0.4.10 actions=mod_d1_dst:00:00:00:00:00:04,output:"cores21-eth4"
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cookie=0x0, duration=470.460s, table=0, n_packets=0, n_bytes=0, priority=4,ip,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=470.460s, table=0, n_packets=779250, n_bytes=18618959204, priority=1,ip actions=FLOOD
cookie=0x0, duration=470.460s, table=0, n_packets=4, n_bytes=168, priority=2,arp actions=FLOOD
*** s1 -----
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cookie=0x0, duration=470.464s, table=0, n_packets=1483820, n_bytes=35904443608, priority=1,ip actions=FLOOD
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cookie=0x0, duration=470.467s, table=0, n_packets=9, n_bytes=882, priority=1,ip actions=FLOOD
cookie=0x0, duration=470.467s, table=0, n_packets=4, n_bytes=168, priority=2,arp actions=FLOOD
*** s3 -----
cookie=0x0, duration=470.469s, table=0, n_packets=1, n_bytes=98, priority=5,icmp,nw_src=172.16.10.100 actions=drop
cookie=0x0, duration=470.470s, table=0, n_packets=8, n_bytes=784, priority=1,ip actions=FLOOD
cookie=0x0, duration=470.470s, table=0, n_packets=4, n_bytes=168, priority=2,arp actions=FLOOD
mininet> |
```