

Testing ping all- this shows host 1,2,3, and 5 able to ping each other but fails when for host 4 because traffic sent from host 4 is dropped

```
mininet@mininet-vm: ~
File Edit Tabs Help
'v': 4}
-----
IIIIIIIIIIIIIIIIIIIIIIIIIIIPPPPPPPPPPPPPPPPP
'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA'
65531
{'csum': 55567,
'dstip': IPAddr('123.45.67.89'),
'flags': 2,
'frag': 0,
'hl': 5,
'id': 37852,
'iplen': 84,
'next': <pox.lib.packet.icmp.icmp object at 0xb5c433cc>,
'parsed': True,
'prev': <pox.lib.packet.ethernet.ethernet object at 0xb5c43bcc>,
'protocol': 1,
'raw': 'E\x00\x00T\x93\xdc@\x00@\x01\xd9\x0f\n\x05\x052{-CY\x08\x00\x85\x9f\x10
P\x00\x018&\xeb]Q\x88\x02\x00\x08\t\n\x0b\x0c\r\x0e\x0f\x10\x11\x12\x13\x14\x15\
x16\x17\x18\x19\x1a\x1b\x1c\x1d\x1e\x1f !"#%&\'()*+,-./01234567',
'srcip': IPAddr('10.5.5.50'),
'tos': 0,
'ttl': 64,
'v': 4}
-----
File Edit Tabs Help
mininet@mininet-vm:~$ sudo python ~/final_skel.py
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3 X h5
h2 -> h1 h3 X h5
h3 -> h1 h2 X h5
h4 -> X X X X
h5 -> h1 h2 h3 X
*** Results: 40% dropped (12/20 received)
mininet> 
```

This section will show that all hosts of the company can send and receive information from each other(h1,h2,h3,h5)

Testing ping from h1 to h5 – shows IP and ICMP packets go through

```
IIIIIIIIIIIIIIIIIIIIIIIIIPPPPPPPPPPPPP
ICCCCCCCCCCCCCMMMMMMMMMMMMMMMMMMMMMMMP
'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA'
65531
{'csum': 29292,
 'dstip': IPAddr('10.1.1.10'),
 'flags': 0,
 'frag': 0,
 'hl': 5,
 'id': 60923,
 'iplen': 84,
 'next': <pox.lib.packet.icmp.icmp object at 0xb5ac43cc>,
 'parsed': True,
 'prev': <pox.lib.packet.ethernet.ethernet object at 0xb5c7c98c>,
 'protocol': 1,
 'raw': 'E\x00\x00T\xed\xfb\x00\x00@\x01rl\n\x05\x052\n\x01\x01\n\x01\x15\x81\x00\x01\xa8*\xeb]Nr\x04\x00\x08\t\n\x0b\x0c\r\x0e\x0f\x10\x14\x15\x16\x17\x18\x19\x1a\x1b\x1c\x1d\x1e\x1f !"#$%&'()*+,-./0123456789:;<=>?@A[B\C\D\E\F\G\H[I\J\K\L\M\N\O\P\Q\R\S\T\U\V\W\X\Y\Z[\]^_`a\b\c\d\
e\f\g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z{|}~\.\,:;\'\"'<
mininet> h1 ping -c 5 h5
PING 10.5.5.50 (10.5.5.50) 56(84) bytes of data.
64 bytes from 10.5.5.50: icmp_seq=1 ttl=64 time=66.3 ms
64 bytes from 10.5.5.50: icmp_seq=2 ttl=64 time=0.505 ms
64 bytes from 10.5.5.50: icmp_seq=3 ttl=64 time=0.050 ms
64 bytes from 10.5.5.50: icmp_seq=4 ttl=64 time=0.056 ms
64 bytes from 10.5.5.50: icmp_seq=5 ttl=64 time=0.068 ms

--- 10.5.5.50 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4001ms
rtt min/avg/max/mdev = 0.050/13.413/66.389/26.488 ms
mininet> □
```

Testing ping from h2 to h3 - shows IP and ICMP packets go through

```
IIIIIIIIIIIIIIIIIIIIIPPPPPPPPPPPPPPPPPPP
ICCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA'
65531
{'csum': 17170,
 'dstip': IPAddr('10.2.2.20'),
 'flags': 0,
 'frag': 0,
 'hl': 5,
 'id': 7777,
 'iplen': 84,
 'next': <pox.lib.packet.icmp.icmp object at 0xb5c4724c>,
 'parsed': True,
 'prev': <pox.lib.packet.ethernet.ethernet object at 0xb5cb1dac>,
 'protocol': 1,
 'raw': 'E\x00\x00T\x1ea\x00\x00@\x01C\x12\n\x03\x03\x1e\n\x02\x02\x14
a0\xa9\x15l\x00\x01\xe4]\xeb\x8c\x99\x03\x00\x08\t\n\x0b\x0c\r\x0e\x0
x12\x13\x14\x15\x16\x17\x18\x19\x1a\x1b\x1c\x1d\x1e\x1f !"#%&\'()*+,-
,
'srcip': IPAddr('10.3.3.30'),
mininet@mininet-vm:~$ sudo python ~/final_skel.py
mininet> h2 ping -c 5 h3
PING 10.3.3.30 (10.3.3.30) 56(84) bytes of data.
64 bytes from 10.3.3.30: icmp_seq=1 ttl=64 time=124 ms
64 bytes from 10.3.3.30: icmp_seq=2 ttl=64 time=0.429 ms
64 bytes from 10.3.3.30: icmp_seq=3 ttl=64 time=0.064 ms
64 bytes from 10.3.3.30: icmp_seq=4 ttl=64 time=0.060 ms
64 bytes from 10.3.3.30: icmp_seq=5 ttl=64 time=0.055 ms

--- 10.3.3.30 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4000ms
rtt min/avg/max/mdev = 0.055/24.933/124.057/49.562 ms
mininet>
```

Testing iperf h1 to h5 - shows IP and TCP packets go through

```
IIIIIIIIIIIIIIIIIIIIIIIPPPPPPPPPPPPPPPPP  
TCCCCCCCCCCCCPPPPPPPPPPPPPPPPPPPPPP  
'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA'  
65531  
{'csum': 62910,  
  'dstip': IPAddr('10.1.1.10'),  
  'flags': 2,  
  'frag': 0,  
  'hl': 5,  
  'id': 10948,  
  'iplen': 52,  
  'next': <pox.lib.packet.tcp.tcp object at 0xb56e72cc>,  
  'parsed': True,  
  'prev': <pox.lib.packet.ethernet.ethernet object at 0xb5  
  'protocol': 6,  
  'raw': 'E\x00\x004*\xc4@\x00@\x06\xf5\xbe\n\x05\x052\n\x  
t\xb5s+P\xcd\x80\x10,\x9f\xff\x96\x00\x00\x01\x01\x08\n\x  
  'srcip': IPAddr('10.5.5.50'),  
  'tos': 0,  
  'ttl': 64,  
  'v': 4}  
  
mininet> iperf  
*** Iperf: testing TCP bandwidth between h1 and h5  
*** Results: ['3.79 Gbits/sec', '3.79 Gbits/sec']  
mininet>
```

Testing iperf h2 to h3- shows IP and TCP packets go through from h3 to h2

```
IIIIIIIIIIIIIIIIIIIIIIIIIPPPPPPPPPPPPPPP
TCCCCCCCCCCCCPPPPPPPPPPPPPPPPPP
'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA'
65531
{'csum': 8582,
 'dstip': IPAddr('10.2.2.20'),
 'flags': 2,
 'frag': 0,
 'hl': 5,
 'id': 0,
 'iplen': 60,
 'next': <pox.lib.packet.tcp.tcp object at 0xb5ac5b4c>,
 'parsed': True,
 'prev': <pox.lib.packet.ethernet.ethernet object at 0x...>,
 'protocol': 6,
 'raw': 'E\x00\x00<\x00\x00@\x00@\x06!\x86\n\x03\x03\x1
bd\xe8\xb2\xe600\xbd5\xd6\xec\xa0\x12q \xd0J\x00\x00\x0
\n\x00\x07\xb2\xbd\x00\x07\xb2\xb6\x01\x03\x03\t',
 'srcip': IPAddr('10.3.3.30'),
 'tos': 0,
 'ttl': 64,
 'v': 4}
Results: [ 5.75 Gbits/sec , 5.75 Gbits/sec ]
mininet> iperf h2 h3
*** Iperf: testing TCP bandwidth between h2 and h3
*** Results: ['6.09 Gbits/sec', '6.10 Gbits/sec']
mininet> 
```

Testing iperf h3 to h5- shows IP and TCP packets go through from h5 to h3

```
IIIIIIIIIIIIIIIIIIIIIIIIIPPPPPPPPPPPPPPP
TCCCCCCCCCCCCPPPPPPPPPPPPPPPPPP
'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA'
65531
{'csum': 44699,
 'dstip': IPAddr('10.3.3.30'),
 'flags': 2,
 'frag': 0,
 'hl': 5,
 'id': 28625,
 'iplen': 52,
 'next': <pox.lib.packet.tcp.tcp object at 0xb5ac4e4c>,
 'parsed': True,
 'prev': <pox.lib.packet.ethernet.ethernet object at 0x...>,
 'protocol': 6,
 'raw': 'E\x00\x004o\xd1@\x00@\x06\xae\x9b\n\x05\x052\r
\xdfN\x8e\x85\xcb\xcc\x1c\x89\x80\x10\x03\\za\x00\x00\x
xbe\x00\x07\xe1\xbd',
 'srcip': IPAddr('10.5.5.50'),
 'tos': 0,
 'ttl': 64,
 'v': 4}
Results: ['5.91 Gbits/sec', '5.91 Gbits/sec']
mininet> iperf h3 h5
*** Iperf: testing TCP bandwidth between h3 and h5
*** Results: ['5.91 Gbits/sec', '5.91 Gbits/sec']
mininet> 
```

This section will show cases where incoming traffic from h4 is dropped

Testing ping from h1 to h4 – shows IP and ICMP from h4 to h1 does not succeed

```
IIIIIIIIIIIIIIIIIIIIIIIIIIIPPPPPPPPPPPPPPP
ICCCCCCCCCCCCCMMMMMMMMMMMMMMMMMMMMMMMMMP
{'csum': 4353,
 'dstip': IPAddr('10.1.1.10'),
 'flags': 0,
 'frag': 0,
 'hl': 5,
 'id': 40983,
 'iplen': 84,
 'next': <pox.lib.packet.icmp.icmp object at 0xb5c72e0c>,
 'parsed': True,
 'prev': <pox.lib.packet.ethernet.ethernet object at 0xb5c72fcc>,
 'protocol': 1,
 'raw': 'E\x00\x00T\xa0\x17\x00\x00@\x01\x11\x01{-CY\n\x01\x01\n\x00\
5\x8f\x00\x04\xdd*\xeb]\xdf\x15\x07\x00\x08\t\n\x0b\x0c\r\x0e\x0f\x10
3\x14\x15\x16\x17\x18\x19\x1a\x1b\x1c\x1d\x1e\x1f !"#&%&\'()*+,-./012
'srcip': IPAddr('123.45.67.89'),
mininet> h1 ping -c 5 h4
PING 123.45.67.89 (123.45.67.89) 56(84) bytes of data.

--- 123.45.67.89 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 3999ms

mininet> 
```

Testing iperf h4 to h2 – shows IP and TCP packets from h4 being dropped, iperf needs to be interrupted

```
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIPPPPPPPPPPPPPPPPP
TCCCCCCCCCCCCPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP
{'csum': 4416,
 'dstip': IPAddr('10.2.2.20'),
 'flags': 2,
 'frag': 0,
 'hl': 5,
 'id': 24272,
 'iplen': 60,
 'next': <pox.lib.packet.tcp.tcp object at 0xb5ac8b2c>,
 'parsed': True,
 'prev': <pox.lib.packet.ethernet.ethernet object at 0xb5ac8b2c>,
 'protocol': 6,
 'raw': 'E\x10\x00<^\xd0@\x00@\x06\x11@{-CY\n\x02\x02\x14\x02\x00\x00\x00\x00\xa0\x02r\x10\xa5"\x00\x00\x02\x04\x05\x08\x8e\xd6\x00\x00\x00\x00\x01\x03\x03\t',
 'srcip': IPAddr('123.45.67.89'),
 'tos': 16,
 'ttl': 64,
 'v': 4}
```

```
mininet> iperf h4 h2
*** Iperf: testing TCP bandwidth between h4 and h2
^C
Interrupt
mininet>
```


Testing iperf h3 to h4 - shows IP and TCP packets from h4 being dropped, iperf needs to be interrupted

```
IIIIIIIIIIIIIIIIIIIIIIIIIIIPPPPPPPPPPPPPPPPPPP
TCCCCCCCCCCCCPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP
{'csum': 28437,
 'dstip': IPAddr('10.3.3.30'),
 'flags': 2,
 'frag': 0,
 'hl': 5,
 'id': 0,
 'iplen': 60,
 'next': <pox.lib.packet.tcp.tcp object at 0xb5bc25cc>,
 'parsed': True,
 'prev': <pox.lib.packet.ethernet.ethernet object at 0xb5bc2aec>,
 'protocol': 6,
 'raw': 'E\x00\x00<\x00\x00@\x00@\x06o\x15{-CY\n\x03\x03\x1e\x15
8\xf6U\xd0\xa2\x05\xb8\xa0\x12q \xc55\x00\x00\x02\x04\x05\xb4\x0
x04\xab\x06\x00\x04\xa8\x17\x01\x03\x03\t',
 'srcip': IPAddr('123.45.67.89')},
mininet> iperf h3 h4
*** Iperf: testing TCP bandwidth between h3 and h4
^C
Interrupt
mininet> █
```

Dpctl dump-flows – continues but unable to screen shoot all

```
mininet> dpctl dump-flows
*** s1 *****
NOST Flow reply (xid=0x4):
cookie=0x0, duration=60.115, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=60, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:02,d_l_dst=00:00:00:00:00:01,mw_src=10.2.2.20,mw_dst=10.1.1.10,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=53.598, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=53, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:05,d_l_dst=00:00:00:00:00:02,mw_src=10.5.5.50,mw_dst=10.2.2.20,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=56.793, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=56, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:01,d_l_dst=00:00:00:00:00:03,mw_src=10.1.1.10,mw_dst=10.3.3.30,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=63.287, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=63, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:03,d_l_dst=00:00:00:00:00:01,mw_src=10.3.3.30,mw_dst=10.1.1.10,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=59.974, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=59, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:02,d_l_dst=00:00:00:00:00:03,mw_src=10.2.2.20,mw_dst=10.3.3.30,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=56.839, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=56, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:02,d_l_dst=00:00:00:00:00:05,mw_src=10.2.2.20,mw_dst=10.5.5.50,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=63.305, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=63, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:01,d_l_dst=00:00:00:00:00:03,mw_src=10.1.1.10,mw_dst=10.3.3.30,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=60.088, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=60, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:01,d_l_dst=00:00:00:00:00:02,mw_src=10.1.1.10,mw_dst=10.2.2.20,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=53.666, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=53, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:01,d_l_dst=00:00:00:00:00:05,mw_src=10.3.3.30,mw_dst=10.5.5.50,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=100.354, table=0, n_packets=2, n_bytes=196, idle_timeout=100, hard_timeout=600, idle_age=63, priority=65535,icmp,in_port=1,vlan_tci=0x0000,d_l_src=00:00:00:00:00:01,d_l_dst=00:00:00:00:00:02,mw_src=10.1.1.10,mw_dst=10.2.2.20,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=53.566, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=53, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:03,d_l_dst=00:00:00:00:00:05,mw_src=10.3.3.30,mw_dst=10.5.5.50,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=53.572, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=53, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:05,d_l_dst=00:00:00:00:00:03,mw_src=10.5.5.50,mw_dst=10.3.3.30,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=53.615, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=53, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:01,d_l_dst=00:00:00:00:00:05,mw_src=10.1.1.10,mw_dst=10.5.5.50,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=56.785, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=56, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:02,d_l_dst=00:00:00:00:00:03,mw_src=10.2.2.20,mw_dst=10.3.3.30,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=59.956, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=59, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:03,d_l_dst=00:00:00:00:00:02,mw_src=10.3.3.30,mw_dst=10.2.2.20,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=53.621, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=53, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:05,d_l_dst=00:00:00:00:00:01,mw_src=10.5.5.50,mw_dst=10.1.1.10,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=56.801, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=56, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:03,d_l_dst=00:00:00:00:00:01,mw_src=10.3.3.30,mw_dst=10.1.1.10,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=56.818, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=56, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:02,d_l_dst=00:00:00:00:00:01,mw_src=10.5.5.50,mw_dst=10.2.2.20,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=100.321, table=0, n_packets=2, n_bytes=196, idle_timeout=100, hard_timeout=600, idle_age=63, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:01,d_l_dst=00:00:00:00:00:02,mw_src=10.2.2.20,mw_dst=10.1.1.10,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=60.193, table=0, n_packets=1, n_bytes=98, idle_timeout=100, hard_timeout=600, idle_age=60, priority=65535,icmp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:05,d_l_dst=00:00:00:00:00:01,mw_src=10.5.5.50,mw_dst=10.1.1.10,mw_tos=0,icmp_type=8,icmp_code=0 actions=FL000
cookie=0x0, duration=104.318, table=0, n_packets=79939, n_bytes=4904376, idle_timeout=100, hard_timeout=600, idle_age=99, priority=65535,tcp,in_port=11,vlan_tci=0x0000,d_l_src=00:00:00:00:00:05,d_l_dst=00:00:00:00:00:01,mw_src=10.5.5.50,
```