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CSE 150
Final Project

ICMP Protocols:

Using the Pingall command, we can test ICMP and along with ARP packets between every host, which will be considered non-ip protocol, where successful pings equates to a reliable connection via ICMP.

```
mininet> pingall
*** Ping: testing ping reachability
h10 -> h20 h30 h40 X X X X hS hT X
h20 -> h10 h30 h40 X X X X hS hT X
h30 -> h10 h20 h40 X X X X hS hT X
h40 -> h10 h20 h30 X X X X hS hT X
h50 -> X X X X h60 h70 h80 hS X X
h60 -> X X X X h50 h70 h80 hS X X
h70 -> X X X X h50 h60 h80 hS X X
h80 -> X X X X h50 h60 h70 hS X X
hS -> h10 h20 h30 h40 h50 h60 h70 h80 X X
hT -> h10 h20 h30 h40 X X X X X X
hU -> X X X X X X X X X X
*** Results: 56% dropped (48/110 received)
```

Department A can't send ICMP messages to Department B and vice versa, as well as the trusted host can only send ICMP messages to Department A. The untrusted host won't be able to send anything because it can't send IP or ICMP to anywhere. Neither external host won't be able to get a successful ping because of blocked IP traffic.

Flow Table:

From the Pingall command, flow mods are installed on the table of each switch, based off of the rulings from above.

```
*** s1 -----
NXST FLOW reply (xid=0x4):
 cookie=0x0, duration=23.367s, table=0, n_packets=1, n_bytes=98, idle_timeout=30, hard_timeout=30, idle_age=23
, priority=50,icmp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:11,nw_src=106.44.82.103,nw_d
st=10.3.9.90,nw_tos=0,icmp_type=8,icmp_code=0 actions=drop
 cookie=0x0, duration=13.344s, table=0, n_packets=1, n_bytes=98, idle_timeout=30, hard_timeout=30, idle_age=13
, priority=50,icmp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:09,nw_src=106.44.82.103,nw_d
st=108.24.31.112,nw_tos=0,icmp_type=8,icmp_code=0 actions=drop
 cookie=0x0, duration=8.352s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=8
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:09,d_l_dst=00:00:00:00:00:10,arp_spa=108.24.31.112,arp_tpa
a=106.44.82.103,arp_op=2 actions=FLOOD
 cookie=0x0, duration=28.35s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=28
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:08,d_l_dst=00:00:00:00:00:10,arp_spa=10.2.8.80,arp_tpa=1
06.44.82.103,arp_op=2 actions=FLOOD
 cookie=0x0, duration=18.385s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=18
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:11,arp_spa=106.44.82.103,arp
tpa=10.3.9.90,arp_op=1 actions=FLOOD
 cookie=0x0, duration=18.379s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=18
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:11,d_l_dst=00:00:00:00:00:10,arp_spa=10.3.9.90,arp_tpa=
106.44.82.103,arp_op=2 actions=FLOOD
 cookie=0x0, duration=28.356s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=28
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:08,arp_spa=106.44.82.103,arp
tpa=10.2.8.80,arp_op=1 actions=FLOOD
 cookie=0x0, duration=8.357s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=8
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:09,arp_spa=106.44.82.103,arp_tpa
a=108.24.31.112,arp_op=1 actions=FLOOD
```

```
*** s2 -----
NXST FLOW reply (xid=0x4):
 cookie=0x0, duration=8.351s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=8
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:09,d_l_dst=00:00:00:00:00:10,arp_spa=108.24.31.112,arp_tpa
a=106.44.82.103,arp_op=2 actions=output:3,output:4
 cookie=0x0, duration=28.352s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=28
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:08,d_l_dst=00:00:00:00:00:10,arp_spa=10.2.8.80,arp_tpa=
106.44.82.103,arp_op=2 actions=output:3,output:4
 cookie=0x0, duration=18.385s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=18
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:11,arp_spa=106.44.82.103,arp
tpa=10.3.9.90,arp_op=1 actions=output:3,output:4
 cookie=0x0, duration=18.381s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=18
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:11,d_l_dst=00:00:00:00:00:10,arp_spa=10.3.9.90,arp_tpa=
106.44.82.103,arp_op=2 actions=output:3,output:4
 cookie=0x0, duration=28.357s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=28
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:08,arp_spa=106.44.82.103,arp
tpa=10.2.8.80,arp_op=1 actions=output:3,output:4
 cookie=0x0, duration=8.356s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=8
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:09,arp_spa=106.44.82.103,arp_tpa
a=108.24.31.112,arp_op=1 actions=output:3,output:4
```

```
*** s3 -----
NXST FLOW reply (xid=0x4):
 cookie=0x0, duration=8.357s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=8
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:09,d_l_dst=00:00:00:00:00:10,arp_spa=108.24.31.112,arp_tpa
a=106.44.82.103,arp_op=2 actions=output:3,output:4
 cookie=0x0, duration=28.354s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=28
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:08,d_l_dst=00:00:00:00:00:10,arp_spa=10.2.8.80,arp_tpa=
106.44.82.103,arp_op=2 actions=output:3,output:4
 cookie=0x0, duration=18.388s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=18
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:11,arp_spa=106.44.82.103,arp
tpa=10.3.9.90,arp_op=1 actions=output:3,output:4
 cookie=0x0, duration=18.383s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=18
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:11,d_l_dst=00:00:00:00:00:10,arp_spa=10.3.9.90,arp_tpa=
106.44.82.103,arp_op=2 actions=output:3,output:4
 cookie=0x0, duration=28.359s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=28
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:08,arp_spa=106.44.82.103,arp
tpa=10.2.8.80,arp_op=1 actions=output:3,output:4
 cookie=0x0, duration=8.358s, table=0, n_packets=1, n_bytes=42, idle_timeout=30, hard_timeout=30, idle_age=8
, priority=49,arp,vlan_tci=0x0000,d_l_src=00:00:00:00:00:10,d_l_dst=00:00:00:00:00:09,arp_spa=106.44.82.103,arp_tpa
a=108.24.31.112,arp_op=1 actions=output:3,output:4
*** s4 -----
```


Ip Other:

Using Iperf, we can test the other IP protocol access that was denied by the ping command via ICMP traffic control.

```
*** Iperf: testing TCP bandwidth between h5 and hT
^X^C
Interrupt
mininet> iperf h10 h40
*** Iperf: testing TCP bandwidth between h10 and h40
*** Results: ['25.1 Gbits/sec', '25.1 Gbits/sec']
mininet> iperf h20 h50
*** Iperf: testing TCP bandwidth between h20 and h50
*** Results: ['22.0 Gbits/sec', '22.0 Gbits/sec']
mininet> iperf h20 h80
*** Iperf: testing TCP bandwidth between h20 and h80
*** Results: ['23.4 Gbits/sec', '23.4 Gbits/sec']
mininet> iperf h20 hT
*** Iperf: testing TCP bandwidth between h20 and hT
*** Results: ['23.2 Gbits/sec', '23.3 Gbits/sec']
mininet> iperf h40 hT
*** Iperf: testing TCP bandwidth between h40 and hT
*** Results: ['27.6 Gbits/sec', '27.7 Gbits/sec']
mininet> iperf h50 hT
*** Iperf: testing TCP bandwidth between h50 and hT
*** Results: ['23.1 Gbits/sec', '23.1 Gbits/sec']
mininet> |
```

Here, we are able to create a connection between department A and department B computers. The trusted host is now able to send tcp packets to both departments instead of just department A.