Devices are successfully created

This screenshot shows that the devices are successfully created because when I type in nodes, it shows that the available nodes are c0, h101, h102, h103, h104, h201, h202, h203, h204, h_server, h_trust, h_untrust, s1, s2, s3, s4, s5, and s6. The node, h_server, refers to the llm server. The switch, s5, refers to the core switch. The switch, s6, is the data center switch

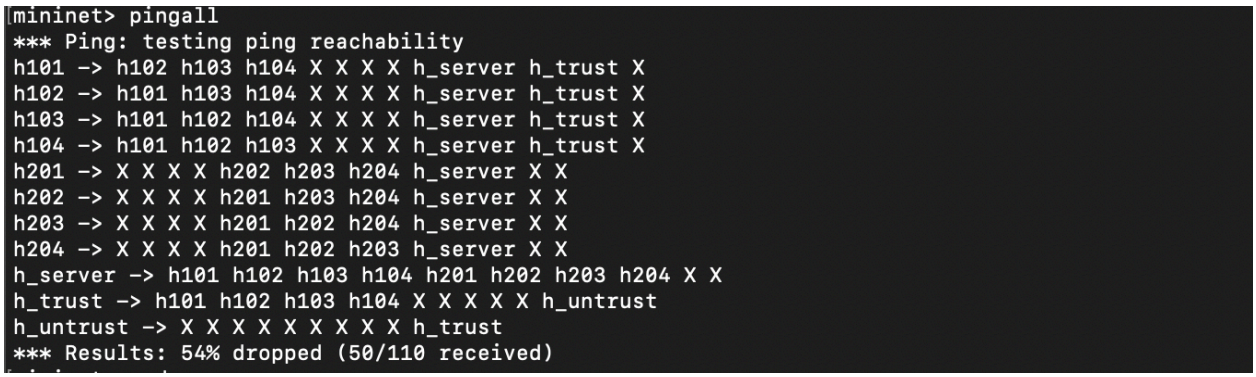
Links are successfully created

This screenshot shows that the links are successfully created because it shows what the pid and ip addresses are for each of the hosts. It also shows the pid and ip addresses for each of the Switches. This screenshot also shows that the IP addresses are correct because it shows the ip address of each
host.

POX Controller

Pingall

The result for the pingall is that it 54% dropped. The hosts can communicate with each other, since host 101 is connected to host 102, host 103, and host 104. The llm server is connected to host 101, host 102, host 103, host 104, host 201, host 202, host 203, and host 204. The untrusted host is connected to the trusted host. The llm server is connected to host 101, host 102, host 103, host 104, host 201, host 202, host 203, and host 204.



Hosts can communicate with each other

Hosts in floor 1 can communicate with each other, since 5 packets are transmitted from host 101 to host 102.

```
mininet> h101 ping -c 5 h102
PING 128.114.1.102 (128.114.1.102) 56(84) bytes of data.
64 bytes from 128.114.1.102: icmp_seq=1 ttl=64 time=18.8 ms
64 bytes from 128.114.1.102: icmp_seq=2 ttl=64 time=0.353 ms
64 bytes from 128.114.1.102: icmp_seq=3 ttl=64 time=0.038 ms
64 bytes from 128.114.1.102: icmp_seq=4 ttl=64 time=0.131 ms
64 bytes from 128.114.1.102: icmp_seq=5 ttl=64 time=0.041 ms

--- 128.114.1.102 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4285ms
rtt min/avg/max/mdev = 0.038/3.870/18.790/7.460 ms
```

Hosts in floor 2 can communicate with each other, since 5 packets are transmitted from host 201 to host 202.

```
mininet> h201 ping -c 5 h202
PING 128.114.2.202 (128.114.2.202) 56(84) bytes of data.
64 bytes from 128.114.2.202: icmp_seq=1 ttl=64 time=10.2 ms
64 bytes from 128.114.2.202: icmp_seq=2 ttl=64 time=0.259 ms
64 bytes from 128.114.2.202: icmp_seq=3 ttl=64 time=0.042 ms
64 bytes from 128.114.2.202: icmp_seq=4 ttl=64 time=0.082 ms
64 bytes from 128.114.2.202: icmp_seq=5 ttl=64 time=0.048 ms

--- 128.114.2.202 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4209ms
rtt min/avg/max/mdev = 0.042/2.125/10.195/4.035 ms
```

```
mininet> h201 ping -c 5 h204
PING 128.114.2.204 (128.114.2.204) 56(84) bytes of data.
64 bytes from 128.114.2.204: icmp_seq=1 ttl=64 time=7.23 ms
64 bytes from 128.114.2.204: icmp_seq=2 ttl=64 time=1.19 ms
64 bytes from 128.114.2.204: icmp_seq=3 ttl=64 time=0.051 ms
64 bytes from 128.114.2.204: icmp_seq=4 ttl=64 time=0.044 ms
64 bytes from 128.114.2.204: icmp_seq=5 ttl=64 time=0.043 ms

--- 128.114.2.204 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4218ms
rtt min/avg/max/mdev = 0.043/1.711/7.225/2.792 ms
```

Untrusted host cannot send ICMP traffic to 101-104

```
mininet> h_untrust ping -c 5 h104
PING 128.114.1.104 (128.114.1.104) 56(84) bytes of data.

--- 128.114.1.104 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4359ms
```

Since it shows that there is 100% packet loss when untrusted hosts send ICMP traffic, it means

that the untrusted host cannot send ICMP traffic to hosts 101-104.

Untrusted host cannot send ICMP traffic to 201-204

This screenshot shows that there is 100% packet loss when the untrusted server tries to send to h201 which is expected because the untrusted host cannot send ICMP traffic to 201-204.

```
mininet> h_untrust ping -c 5 h201
PING 128.114.2.201 (128.114.2.201) 56(84) bytes of data.

--- 128.114.2.201 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4194ms
```

```
mininet> h_untrust ping -c h204
ping: invalid argument: '128.114.2.204'
mininet> h_untrust ping -c 5 h204
PING 128.114.2.204 (128.114.2.204) 56(84) bytes of data.

--- 128.114.2.204 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4229ms
```

ICMP blocked from trust server and llm server

The screenshot shows that icmp is blocked from the llm server and trust server because when data is sent to the trusted host to the server host, there is a 100% packet loss.

```
mininet> h_trust ping -c 5 h_server
PING 128.114.3.178 (128.114.3.178) 56(84) bytes of data.

--- 128.114.3.178 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4178ms
```

Trusted host can send ICMP traffic to Host 101-104.

```
mininet> h_trust ping -c 5 h104
PING 128.114.1.104 (128.114.1.104) 56(84) bytes of data.
64 bytes from 128.114.1.104: icmp_seq=1 ttl=64 time=7.38 ms
64 bytes from 128.114.1.104: icmp_seq=2 ttl=64 time=0.478 ms
64 bytes from 128.114.1.104: icmp_seq=3 ttl=64 time=0.039 ms
64 bytes from 128.114.1.104: icmp_seq=4 ttl=64 time=0.038 ms
64 bytes from 128.114.1.104: icmp_seq=5 ttl=64 time=0.056 ms

--- 128.114.1.104 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4198ms
rtt min/avg/max/mdev = 0.038/1.597/7.375/2.893 ms
```

There is a 0% packet loss when the trusted server sends data to host 104. This indicates that the trusted server can send ICMP traffic to hosts 101-104.

ICMP blocked from floor 1 to floor 2

ICMP is blocked from floor 1 to floor 2 because there is a 100% packet loss when trying to transmit packets from host 204 to host 103. The same applies when transferring packets from host 101 to host 201.

```
mininet> h204 ping -c 5 h103
PING 128.114.1.103 (128.114.1.103) 56(84) bytes of data.

--- 128.114.1.103 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4312ms
```

```
mininet> h101 ping -c 3 h201
PING 128.114.2.201 (128.114.2.201) 56(84) bytes of data.

--- 128.114.2.201 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2141ms
```

Untrusted Host is not Connected to Server

There is a 100% packet loss from the untrusted host to the server host, so that indicates that the untrusted host is not connected to the server.

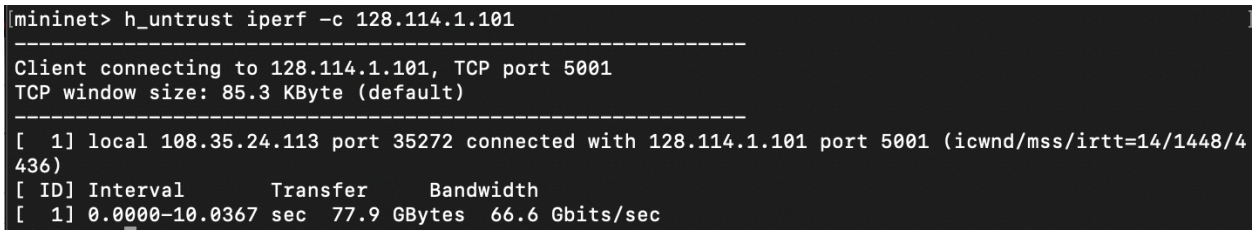
```
mininet> h_untrust ping -c 5 h_server
PING 128.114.3.178 (128.114.3.178) 56(84) bytes of data.

--- 128.114.3.178 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4199ms
```

Flow entries

The “dpctl dump-flows” command shows that the flow table rules are installed correctly because it shows which entries are ICMP packets.

Since the untrusted host is able to send tcp traffic successfully, it shows that the untrusted host can send tcp traffic to the hosts.



IP Addresses are created successfully

The IP addresses are created successfully, since it shows the ip address in the inet.

```
mininet> h102 ifconfig
h102-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 128.114.1.102  netmask 255.255.255.0  broadcast 128.114.1.255
        inet6 fe80::200:ff:fe00:102  prefixlen 64  scopeid 0x20<link>
        ether 00:00:00:00:01:02  txqueuelen 1000  (Ethernet)
        RX packets 180  bytes 13852 (13.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 14  bytes 1136 (1.1 KB)
        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
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        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> h201 ifconfig
h201-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 128.114.2.201  netmask 255.255.255.0  broadcast 128.114.2.255
        inet6 fe80::200:ff:fe00:201  prefixlen 64  scopeid 0x20<link>
        ether 00:00:00:00:02:01  txqueuelen 1000  (Ethernet)
        RX packets 183  bytes 14102 (14.1 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 14  bytes 1136 (1.1 KB)
        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
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        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> h_server ifconfig
h_server-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 128.114.3.178  netmask 255.255.255.0  broadcast 128.114.3.255
        inet6 fe80::200:ff:fe00:378  prefixlen 64  scopeid 0x20<link>
        ether 00:00:00:00:03:78  txqueuelen 1000  (Ethernet)
        RX packets 185  bytes 14202 (14.2 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 14  bytes 1136 (1.1 KB)
        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
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        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> h_trust ifconfig
h_trust-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.47.38.109  netmask 255.255.255.0  broadcast 192.47.38.255
        inet6 fe80::200:ff:fe00:401  prefixlen 64  scopeid 0x20<link>
        ether 00:00:00:00:04:01  txqueuelen 1000  (Ethernet)
        RX packets 187  bytes 14362 (14.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 15  bytes 1206 (1.2 KB)
        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
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        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> h101 ifconfig
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[  1] local 128.114.1.101 port 5001 connected with 108.35.24.113 port 35272 (icwnd/mss/irtt=14/1448/1322)
[ ID] Interval       Transfer     Bandwidth
[  1] 0.0000-9.9991 sec  77.9 GBytes  66.9 Gbits/sec
h101-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 128.114.1.101  netmask 255.255.255.0  broadcast 128.114.1.255
        inet6 fe80::200:ff:fe00:101  prefixlen 64  scopeid 0x20<link>
        ether 00:00:00:00:01:01  txqueuelen 1000  (Ethernet)
        RX packets 1900735  bytes 83716493010 (83.7 GB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 781677  bytes 51591546 (51.5 MB)
        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
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        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
```