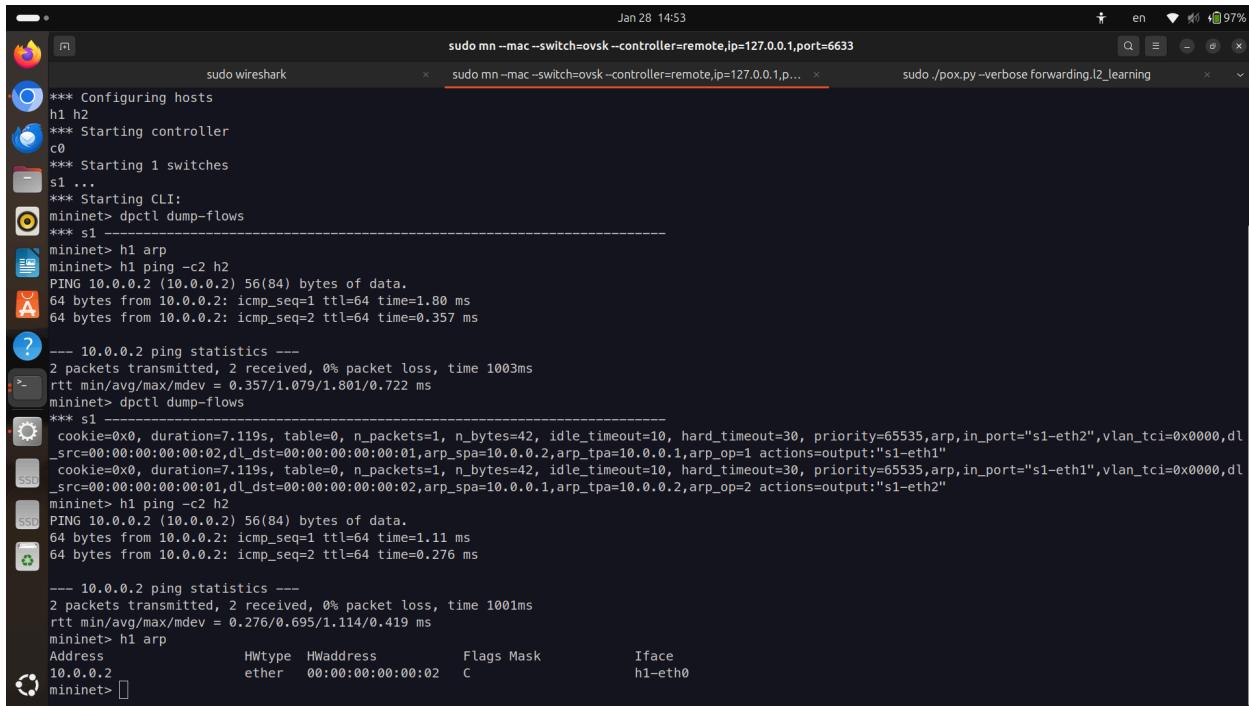


Assignment 5

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LAB POX



The screenshot shows a terminal window with three tabs. The active tab displays the output of a Mininet setup:

```
Jan 28 14:53
sudo mn --mac --switch=ovsk --controller=remote,ip=127.0.0.1,port=6633
sudo mn --mac --switch=ovsk --controller=remote,ip=127.0.0.1,p...
sudo ./pox.py -verbose forwarding.l2_learning

*** Configuring hosts
h1 h2
*** Starting controller
c0
*** Starting 1 switches
s1 ...
*** Starting CLI:
mininet> dptcl dump-flows
*** s1 -----
mininet> h1 arp
mininet> h1 ping -c2 h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=1.80 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.357 ms
?
--- 10.0.0.2 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1003ms
rtt min/avg/max/mdev = 0.357/1.079/1.801/0.722 ms
mininet> dptcl dump-flows
*** s1 -----
(cookie=0x0, duration=7.119s, table=0, n_packets=1, n_bytes=42, idle_timeout=10, hard_timeout=30, priority=65535,arp,in_port="s1-eth2",vlan_tci=0x0000,dl_src=0:0:0:0:0:02,dl_dst=0:0:0:0:0:01,arp_spa=10.0.0.2,arp_tpa=10.0.0.1,arp_op=1 actions=output:"s1-eth1"
(cookie=0x0, duration=7.119s, table=0, n_packets=1, n_bytes=42, idle_timeout=10, hard_timeout=30, priority=65535,arp,in_port="s1-eth1",vlan_tci=0x0000,dl_src=0:0:0:0:0:01,dl_dst=0:0:0:0:0:02,arp_spa=10.0.0.1,arp_tpa=10.0.0.2,arp_op=2 actions=output:"s1-eth2"
mininet> h1 ping -c2 h2
mininet> PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=1.11 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.276 ms
?
--- 10.0.0.2 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.276/0.695/1.114/0.419 ms
mininet> h1 arp
Address          Hwtype   HWAddress           Flags Mask      Iface
10.0.0.2          ether    00:00:00:00:00:02  C          h1-eth0
mininet> 
```

The terminal also shows a Wireshark capture window with several network traffic entries.

รูปที่ 1 Mininet Configuration

Jan 28 14:51

```

sudo wireshark           sudo mn --mac --switch=ovsk --controller=remote,ip=127.0.0.1,p...           sudo ./pox.py --verbose forwarding.l2_learning
nithiroj@nithiroj-Nitro-AN515-57 ~ cd pox
nithiroj@nithiroj-Nitro-AN515-57 ~/pox gar-experimental sudo ./pox.py --verbose forwarding.l2_learning
[sudo] password for nithiroj:
POX 0.7.0 (gar) / Copyright 2011-2020 James McCauley, et al.
DEBUG:core:POX 0.7.0 (gar) going up...
DEBUG:core:Running on CPython (3.12.3/Nov 6 2025 13:44:16)
DEBUG:core:Platform is Linux-6.14.0-37-generic-x86_64-with-glibc2.39
WARNING:version:POX requires one of the following versions of Python: 3.6 3.7 3.8 3.9
WARNING:version:You're running Python 3.12.
WARNING:version:If you run into problems, try using a supported version.
INFO:core:POX 0.7.0 (gar) is up.
DEBUG:openflow.of_01:Listening on 0.0.0.0:6633
INFO:openflow.of_01:[00-00-00-00-00-01 2] connected
DEBUG:forwarding.l2_learning:Connection [00-00-00-00-00-01 2]
DEBUG:openflow.of_01:1 connection aborted

```

รูปที่ 2 Controller pox information ก่อน ping

Jan 28 14:51

```

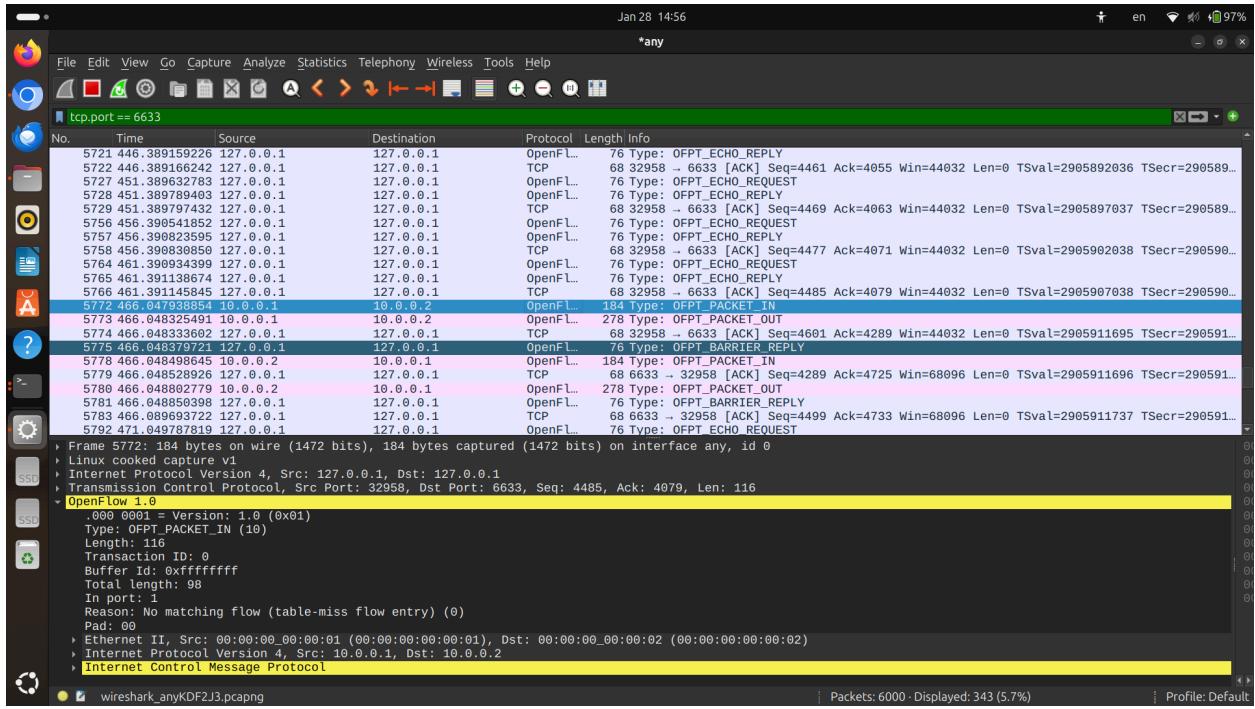
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
tcp.port == 6633
No. Time Source Destination Protocol Length Info
3553 145.589581020 127.0.0.1 TCP 76 32948 - 6633 [SYN] Seq=0 Win=43600 Len=0 MSS=65495 SACK_PERM TStamp=2905591228 TSecr=2905591228
3554 145.589582040 127.0.0.1 TCP 76 6633 - 32048 [SYN, ACK] Seq=0 Ack=1 Win=65483 Len=0 MSS=65495 SACK_PERM TStamp=2905591228
3555 145.589681155 127.0.0.1 TCP 68 32948 - 6633 [ACK] Seq=1 Ack=1 Win=44032 Len=0 TStamp=2905591228 TSecr=2905591228
3556 145.589697295 127.0.0.1 TCP 68 32948 - 6633 [FIN, ACK] Seq=1 Ack=1 Win=44032 Len=0 TStamp=2905591228 TSecr=2905591228
3557 145.589772831 127.0.0.1 TCP 76 6633 - 32948 [PSH, ACK] Seq=1 Ack=2 Win=65536 Len=0 TStamp=2905591228 TSecr=2905591228
3558 145.589784892 127.0.0.1 TCP 56 32948 - 6633 [RST] Seq=2 Win=0 Len=0
3541 145.648851069 127.0.0.1 TCP 76 32958 - 6633 [SYN] Seq=0 Win=43600 Len=0 MSS=65495 SACK_PERM TStamp=2905591296 TSecr=2905591296
3542 145.648864382 127.0.0.1 TCP 76 6633 - 32958 [SYN, ACK] Seq=0 Ack=1 Win=65483 Len=0 MSS=65495 SACK_PERM TStamp=2905591296
3543 145.648873713 127.0.0.1 TCP 68 32958 - 6633 [ACK] Seq=1 Ack=1 Win=44032 Len=0 TStamp=2905591296 TSecr=2905591296
3544 145.649078937 127.0.0.1 OpenFl... 76 Type: OFPT_HELLO
3545 145.649984139 127.0.0.1 OpenFl... 76 Type: OFPT_HELLO
3546 145.649989113 127.0.0.1 TCP 68 6633 - 32958 [ACK] Seq=9 Ack=9 Win=65536 Len=0 TStamp=2905591296 TSecr=2905591296
3547 145.649996251 127.0.0.1 TCP 68 32958 - 6633 [ACK] Seq=9 Ack=9 Win=44032 Len=0 TStamp=2905591296 TSecr=2905591296
3548 145.649316399 127.0.0.1 OpenFl... 88 Type: OFPT_STATS_REQUEST
3549 145.649317832 127.0.0.1 TCP 68 32958 - 6633 [ACK] Seq=9 Ack=29 Win=44032 Len=0 TStamp=2905591296 TSecr=2905591296
3550 145.650272567 127.0.0.1 OpenFl... 244 Type: OFPT_FEATURES_REPLY
3551 145.650290911 127.0.0.1 OpenFl... 1136 Type: OFPT_STATS_REPLY
3552 145.650293694 127.0.0.1 TCP 68 6633 - 32958 [ACK] Seq=29 Ack=1253 Win=67872 Len=0 TStamp=2905591297 TSecr=2905591297
3553 145.650473480 127.0.0.1 OpenFl... 80 Type: OFPT_SET_CONFIG
3557 145.691564666 127.0.0.1 TCP 68 32958 - 6633 [ACK] Seq=1253 Ack=41 Win=44032 Len=0 TStamp=2905591339 TSecr=2905591297
3558 145.691573184 127.0.0.1 OpenFl... 148 Type: OFPT_BARRIER_REQUEST

```

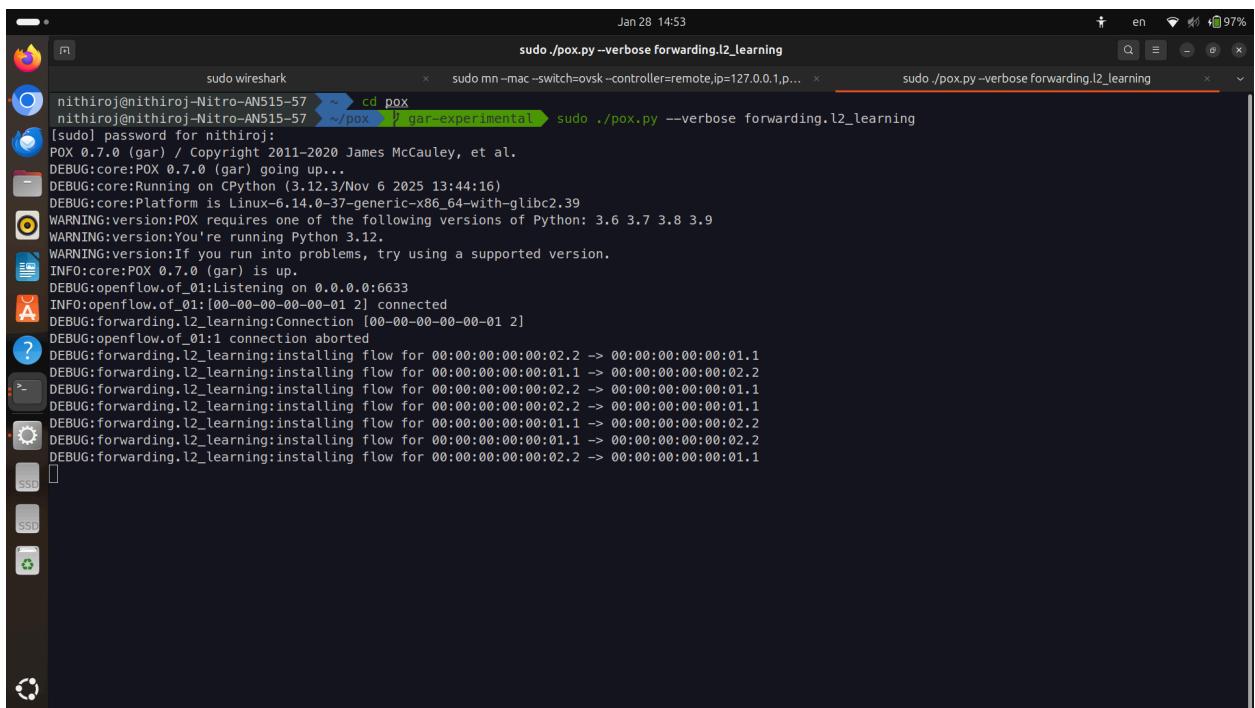
Frame 3544: 76 bytes on wire (608 bits), 76 bytes captured (608 bits) on interface any, id 0
Linux cooked capture v1
Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1
Transmission Control Protocol, Src Port: 6633, Dst Port: 32958, Seq: 1, Ack: 1, Len: 8
OpenFlow 1.0
.000 0001 = Version: 1.0 (0x01)
Type: OFPT_HELLO (0)
Length: 8
Transaction ID: 2

_packets: 3975 · Displayed: 75 (1.9%) | Profile: Default

รูปที่ 3 แพ็กเก็ต ofpt hello



รูปที่ 4 แพ็คเก็ต OFPT_PACKET_IN และ OFPT_PACKET_OUT



รูปที่ 5 แพ็คเก็ต OFPT_PACKET_IN และ OFPT_PACKET_OUT

LAB Step by step OVN Testbed using alpine containers

```
nithiroj@nithiroj-Nitro-AN515-57 ➤ ~ for i in {1..4}; do
    sudo docker exec host1 ping -c 3 10.0.0.$i
done
PING 10.0.0.1 (10.0.0.1): 56 data bytes
64 bytes from 10.0.0.1: seq=0 ttl=64 time=0.038 ms
64 bytes from 10.0.0.1: seq=1 ttl=64 time=0.038 ms
64 bytes from 10.0.0.1: seq=2 ttl=64 time=0.040 ms

--- 10.0.0.1 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.038/0.038/0.040 ms
PING 10.0.0.2 (10.0.0.2): 56 data bytes
64 bytes from 10.0.0.2: seq=0 ttl=64 time=0.228 ms
64 bytes from 10.0.0.2: seq=1 ttl=64 time=0.052 ms
64 bytes from 10.0.0.2: seq=2 ttl=64 time=0.082 ms

--- 10.0.0.2 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.052/0.120/0.228 ms
PING 10.0.0.3 (10.0.0.3): 56 data bytes
64 bytes from 10.0.0.3: seq=0 ttl=64 time=0.238 ms
64 bytes from 10.0.0.3: seq=1 ttl=64 time=0.052 ms
64 bytes from 10.0.0.3: seq=2 ttl=64 time=0.053 ms

--- 10.0.0.3 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.052/0.114/0.238 ms
PING 10.0.0.4 (10.0.0.4): 56 data bytes
64 bytes from 10.0.0.4: seq=0 ttl=64 time=0.343 ms
64 bytes from 10.0.0.4: seq=1 ttl=64 time=0.052 ms
64 bytes from 10.0.0.4: seq=2 ttl=64 time=0.055 ms

--- 10.0.0.4 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.052/0.150/0.343 ms
nithiroj@nithiroj-Nitro-AN515-57 ➤ ~
```

รูปที่ 6 ผลการ Ping ของ host 1 ไปหา host2, host3, host4

```
nithiroj@nithiroj-Nitro-AN515-57 ~ sudo ovn-nbctl show
switch 6450090c-5e56-4949-b00f-02510087dbb9 (ls-test)
    port lp-host1
        addresses: ["02:00:00:00:00:01 10.0.0.1/24"]
    port ln-port
        type: localnet
        addresses: ["unknown"]
    port lp-host4
        addresses: ["02:00:00:00:00:04 10.0.0.4/24"]
    port lp-host2
        addresses: ["02:00:00:00:00:02 10.0.0.2/24"]
    port lp-host3
        addresses: ["02:00:00:00:00:03 10.0.0.3/24"]
nithiroj@nithiroj-Nitro-AN515-57 ~
```

รูปที่ 7 sudo ovn-nbctl show

```
nithiroj@nithiroj-Nitro-AN515-57 ~ sudo ovn-sbctl show
Chassis ovs-host
    hostname: nithiroj-Nitro-AN515-57
    Encap geneve
        ip: "127.0.0.1"
        options: {csum="true"}
nithiroj@nithiroj-Nitro-AN515-57 ~
```

รูปที่ 8 sudo ovn-sbctl show

```
nithiroj@nithiroj-Nitro-AN515-57 ~ sudo ovs-vsctl show  
8af89a25-d1e5-40d5-8d8b-c22babcb5957  
    Bridge br-int  
        fail_mode: secure  
        datapath_type: system  
    Port br-int  
        Interface br-int  
            type: internal  
Bridge br-ovs2  
    Port patch-ovs2-to-ovs1  
        Interface patch-ovs2-to-ovs1  
            type: patch  
            options: {peer=patch-ovs1-to-ovs2}  
    Port br-ovs2  
        Interface br-ovs2  
            type: internal  
    Port veth4  
        Interface veth4  
    Port veth3  
        Interface veth3  
Bridge br-ovs1  
    Port patch-ovs1-to-ovs2  
        Interface patch-ovs1-to-ovs2  
            type: patch  
            options: {peer=patch-ovs2-to-ovs1}  
    Port veth1  
        Interface veth1  
    Port br-ovs1  
        Interface br-ovs1  
            type: internal  
    Port veth2  
        Interface veth2  
    ovs_version: "3.3.4"  
nithiroj@nithiroj-Nitro-AN515-57 ~
```

รูปที่ 9 sudo ovn-sbctl show

```
nithiroj@nithiroj-Nitro-AN515-57 ~ sudo ovs-ofctl dump-flows br-ovs1  
cookie=0x0, duration=514.965s, table=0, n_packets=141, n_bytes=11094, priority=0 actions=NORMAL  
nithiroj@nithiroj-Nitro-AN515-57 ~
```

รูปที่ 10 sudo ovs-ofctl dump-flows br-ovs1