

Lab 7 (Multiple Tables Test)

- In this lab, the Type of Service field of packet will be marked to 0x10 for the first operation in the switch. Then this packet will be sent to the second table for flooding.

Put this file, mytest.py, under /pox/ext

```
from pox.core import core
from pox.lib.addresses import EthAddr
import pox.openflow.libopenflow_01 as of
import pox.openflow.nicira as nx
from pox.lib.revent import EventRemove

# Even a simple usage of the logger is much nicer than print!
log = core.getLogger()

def _handle_ConnectionUp (event):
    print "_handle_ConnectionUP"

    # Turn on ability to specify table in flow_mods
    msg = nx.nx_flow_mod_table_id()
    event.connection.send(msg)

    # Clear second table
    msg = nx.nx_flow_mod(command=of.OFPFC_DELETE, table_id = 1)
    event.connection.send(msg)
```

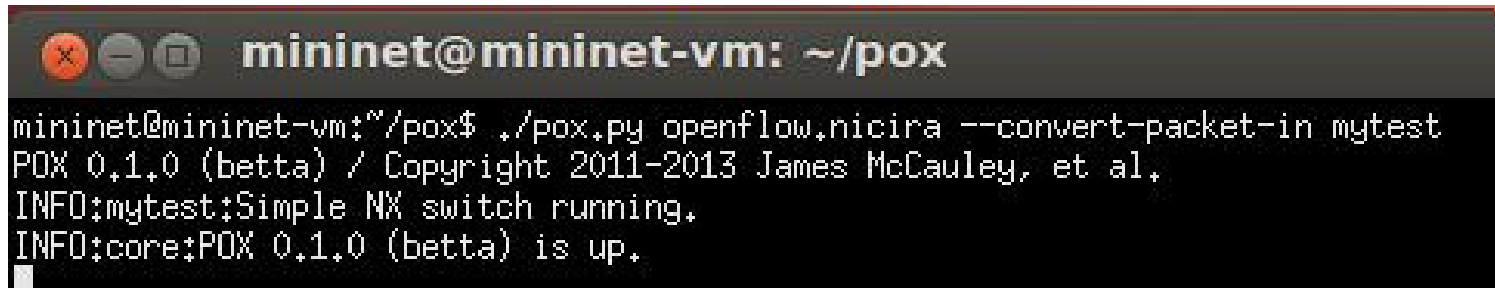
```
# Fallthrough rule for table 0: set nw_tos and resubmit to table 1
msg = nx.nx_flow_mod()
msg.priority = 1
msg.actions.append(of.ofp_action_nw_tos(nw_tos=0x10))
msg.actions.append(nx.nx_action_resubmit.resubmit_table(table = 1))
event.connection.send(msg)
```

```
# Fallthrough rule for table 1: flood
msg = nx.nx_flow_mod()
msg.table_id = 1
msg.priority = 1
msg.actions.append(of.ofp_action_output(port = of.OFPP_FLOOD))
event.connection.send(msg)
```

```
def launch ():
    assert core.NX, "Nicira extensions required"
    assert core.NX.convert_packet_in, "PacketIn conversion required"
    core.openflow.addListenerByName("ConnectionUp", _handle_ConnectionUp)

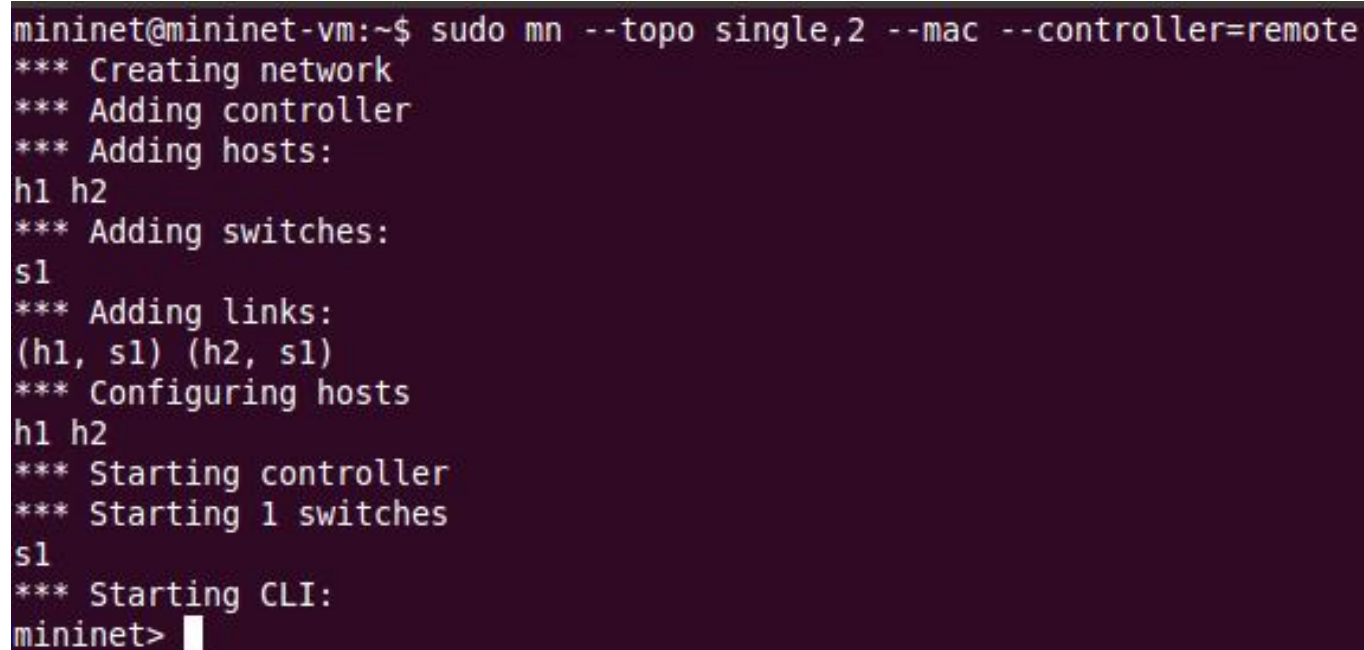
    log.info("Simple NX switch running.")
```

Start the controller



```
mininet@mininet-vm: ~/pox
mininet@mininet-vm:~/pox$ ./pox.py openflow,nicira --convert-packet-in mytest
POX 0.1.0 (beta) / Copyright 2011-2013 James McCauley, et al.
INFO:mytest:Simple NX switch running.
INFO:core:POX 0.1.0 (beta) is up.
```

Create a simple topology: one switch and two hosts.



```
mininet@mininet-vm:~$ sudo mn --topo single,2 --mac --controller=remote
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1)
*** Configuring hosts
h1 h2
*** Starting controller
*** Starting 1 switches
s1
*** Starting CLI:
mininet>
```

Open xterm for h1 and h2. Use tcpdump in h2 to capture received packets sent by h1

```
mininet@mininet-vm:~$ mininet
mininet> *** Creating network
mininet> *** Adding controllers
mininet> *** Adding hosts:
mininet> h1 h2
mininet> *** Adding switches
mininet> s1
mininet> *** Adding links:
mininet> (h1, s1) (h2, s1)
mininet> *** Configuring hosts
mininet> h1 h2
mininet> *** Starting controller
mininet> *** Starting switches
mininet> s1
mininet> *** Starting CLI:
mininet> xterm h1 h2
mininet> 
```

```
Node: h2
root@mininet-vm:~# ifconfig
h2-eth0  Link encap:Ethernet  HWaddr 00:00:00:00:00:02
         inet addr:10.0.0.2  Bcast:10.255.255.255  Mask:255.0.0.0
         inet6 addr: fe80::200:ff:fe00:2/64  Scope:Link
         UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
         RX packets:27 errors:0 dropped:0 overruns:0 frame:0
         TX packets:7 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:1000
         RX bytes:4747 (4.7 KB)  TX bytes:558 (558.0 B)

lo       Link encap:Local Loopback
         inet addr:127.0.0.1  Mask:255.0.0.0
         inet6 addr: ::1/128  Scope:Host
         UP LOOPBACK RUNNING  MTU:16436  Metric:1
         RX packets:0 errors:0 dropped:0 overruns:0 frame:0
         TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:0
         RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

root@mininet-vm:~# tcpdump -i h2-eth0 -U -w h2-eth0
tcpdump: listening on h2-eth0, link-type EN10MB (Ethernet), capture size 65535 bytes

```

```
Node: h1
root@mininet-vm:~# ping -c 5 10.0.0.2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data:
64 bytes from 10.0.0.2: icmp_req=1 ttl=64 time=7.32 ms
64 bytes from 10.0.0.2: icmp_req=2 ttl=64 time=0.383 ms
64 bytes from 10.0.0.2: icmp_req=3 ttl=64 time=0.143 ms
64 bytes from 10.0.0.2: icmp_req=4 ttl=64 time=0.286 ms
64 bytes from 10.0.0.2: icmp_req=5 ttl=64 time=0.261 ms

--- 10.0.0.2 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4002ms
rtt min/avg/max/mdev = 0.143/1.679/7.326/2.824 ms
root@mininet-vm:~# 
```


h2-eth0 [Wireshark 1.6.7]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	00:00:00_00:00:01	Broadcast	ARP	42	Who has 10.0.0.2? Tell
2	0.000047	00:00:00_00:00:02	00:00:00_00:00:01	ARP	42	10.0.0.2 is at 00:00:00
3	0.000214	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id
4	0.000265	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id
5	1.001188	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id
6	1.001277	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id
7	2.003377	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id

▶ Frame 3: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)

- ▶ Ethernet II, Src: 00:00:00_00:00:01 (00:00:00:00:00:01), Dst: 00:00:00_00:00:02 (00:00:00:00:00:02)
- ▼ Internet Protocol Version 4, Src: 10.0.0.1 (10.0.0.1), Dst: 10.0.0.2 (10.0.0.2)
 - Version: 4
 - Header length: 20 bytes
 - ▶ Differentiated Services Field: **0x10** (DSCP 0x04: Unknown DSCP; ECN: 0x00: Not-ECT (Not ECN-Capable Transport
 - Total Length: 84
 - Identification: 0x0000 (0)
 - ▶ Flags: 0x02 (Don't Fragment)

0000 00 00 00 00 00 02 00 00 00 00 01 08 00 45 10E.
0010 00 54 00 00 40 00 40 01 26 97 0a 00 00 01 0a 00 .T..@.@. &.....
0020 00 02 08 00 a8 0e 16 b9 00 01 f4 ba e3 52 76 26Rv&
0030 00 00 08 09 0a 0b 0c 0d 0e 0f 10 11 12 13 14 15
0040 00 17 10 10 11 12 13 14 15 16 17 18 19 1a 1b 1c

File: "h2-eth0" 1513 Bytes 00:... Packets: 15 Displayed: 15 Marked: 0 Load time: 0:... Profile: Default

```

*** Done
completed in 26.278 seconds
mininet@mininet-vm:~$ wireshark h2-eth0
Gtk-Message: Failed to load module "canberra-gtk-module"
Gtk-Message: Failed to load module "canberra-gtk-module"

```

References

- POX Wiki, Nicira/Open vSwitch Extensions
<https://openflow.stanford.edu/display/ONL/POX+Wiki>
- The source code under
`/pox/pox/forwarding.l2_nx.py`