

CS2007-ASSIGNMENT-8

PART-A:

AFTER STARTING THE POX CONTROLLER ON A SEPARATE WINDOW,
USING COMMAND :

pox/pox.py - - verbose forwarding.hub

OUTPUT:

```
csg@Ubuntu1: ~  
csg@Ubuntu1:~$ sudo mn --custom ~/mininet/custom/topo-lab8.py --topo mytopo --controller=remote,0.0.0.0  
*** Creating network  
*** Adding controller  
Unable to contact the remote controller at 0.0.0.0:6653  
Connecting to remote controller at 0.0.0.0:6633  
*** Adding hosts:  
h1 h2 h3 h4 h5  
*** Adding switches:  
s1 s2 s3  
*** Adding links:  
(h1, s1) (h2, s1) (h3, s3) (h4, s3) (h5, s3) (s1, s2) (s2, s3)  
*** Configuring hosts  
h1 h2 h3 h4 h5  
*** Starting controller  
c0  
*** Starting 3 switches  
s1 s2 s3 ...  
*** Starting CLI:  
mininet> sh ovs-ofctl dump-flows s1  
cookie=0x0, duration=24.085s, table=0, n_packets=73, n_bytes=8704, actions=FLOOD  
mininet> sh ovs-ofctl dump-flows s2  
cookie=0x0, duration=27.531s, table=0, n_packets=73, n_bytes=8700, actions=FLOOD  
mininet> sh ovs-ofctl dump-flows s3  
cookie=0x0, duration=31.704s, table=0, n_packets=78, n_bytes=9050, actions=FLOOD  
mininet> h1 ping 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=0.946 ms  
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.051 ms  
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.049 ms  
^C  
--- 10.0.0.2 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2031ms  
rtt min/avg/max/mdev = 0.049/0.348/0.946/0.422 ms  
mininet> h1 ping h5  
PING 10.0.0.5 (10.0.0.5) 56(84) bytes of data.  
64 bytes from 10.0.0.5: icmp_seq=1 ttl=64 time=3.05 ms  
64 bytes from 10.0.0.5: icmp_seq=2 ttl=64 time=0.104 ms  
64 bytes from 10.0.0.5: icmp_seq=3 ttl=64 time=0.118 ms  
^C  
--- 10.0.0.5 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2007ms  
rtt min/avg/max/mdev = 0.104/1.092/3.054/1.387 ms  
mininet> pingall  
*** Ping: testing ping reachability  
h1 -> h2 h3 h4 h5  
h2 -> h1 h3 h4 h5  
h3 -> h1 h2 h4 h5  
h4 -> h1 h2 h3 h5  
h5 -> h1 h2 h3 h4  
*** Results: 0% dropped (20/20 received)  
mininet> xterm h1 h2  
mininet> xterm h1 h2 h5  
mininet>   
root@Ubuntu1:/home/csg# iperf  
Client connecting to 10.0.0.1,  
TCP window size: 340 KByte (d  
[ 5] local 10.0.0.2 port 3892  
[ ID] Interval Transfer  
[ 5] 0.0-10.0 sec 38.8 GByt  
root@Ubuntu1:/home/csg#
```

X-term Window h1

```
"Node: h1"
root@Ubuntu1:/home/csg# iperf -s
-----
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
-----
[ 6] local 10.0.0.1 port 5001 connected with 10.0.0.2 port 38920
[ ID] Interval      Transfer    Bandwidth
[ 6] 0.0-10.2 sec  38.8 GBytes 32.7 Gbits/sec
[ 6] local 10.0.0.1 port 5001 connected with 10.0.0.5 port 34728
[ 6] 0.0-10.0 sec  42.1 GBytes 36.2 Gbits/sec
[ 6]
```

X-term Window h2

```
"Node: h2"
root@Ubuntu1:/home/csg# iperf -c 10.0.0.1
-----
Client connecting to 10.0.0.1, TCP port 5001
TCP window size: 340 KByte (default)
-----
[ 5] local 10.0.0.2 port 38920 connected with 10.0.0.1 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 5] 0.0-10.0 sec  38.8 GBytes 33.3 Gbits/sec
root@Ubuntu1:/home/csg#
```

X-term Window h5

```
"Node: h5"
root@Ubuntu1:/home/csg# iperf -c 10.0.0.1
-----
Client connecting to 10.0.0.1, TCP port 5001
TCP window size: 442 KByte (default)
-----
[ 5] local 10.0.0.5 port 34728 connected with 10.0.0.1 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 5] 0.0-10.0 sec  42.1 GBytes 36.2 Gbits/sec
root@Ubuntu1:/home/csg#
```

PART-B:

THIS TIME, AFTER STARTING THE POX CONTROLLER ON A SEPARATE WINDOW, USING COMMAND :

pox/pox.py - - verbose forwarding.I2_learning

OUTPUT:

```
csf@Ubuntu1: ~  
csf@Ubuntu1:~$ sudo mn -c custom -/mininet/custom/topo-lab8.py --topo mytopo --controller=remote,0.0.0.0  
[sudo] password for csf:  
*** Creating network  
*** Adding controller  
Unable to contact the remote controller at 0.0.0.0:6633  
Connecting to remote controller at 0.0.0.0:6633  
*** Adding hosts:  
h1 h2 h3 h4 h5  
*** Adding switches:  
s1 s2 s3  
*** Adding links:  
(h1, s1) (h2, s1) (h3, s3) (h4, s3) (h5, s3) (s1, s2) (s2, s3)  
*** Configuring hosts  
h1 h2 h3 h4 h5  
*** Starting controller  
c0  
*** Starting 3 switches  
s1 s2 s3 ...  
*** Starting CLI:  
mininet> sh ovs-ofctl dump-flows s1  
mininet> sh ovs-ofctl dump-flows s1  
mininet> sh ovs-ofctl dump-flows s1  
mininet> h1 ping 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=7.20 ms  
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.349 ms  
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.084 ms  
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.057 ms  
^C  
-- 10.0.0.2 ping statistics --  
4 packets transmitted, 4 received, 0% packet loss, time 3055ms  
rtt min/avg/max/mdev = 0.057/1.923/7.203/3.050 ms  
mininet> h1 ping h5  
PING 10.0.0.5 (10.0.0.5) 56(84) bytes of data.  
64 bytes from 10.0.0.5: icmp_seq=1 ttl=64 time=15.0 ms  
64 bytes from 10.0.0.5: icmp_seq=2 ttl=64 time=0.181 ms  
64 bytes from 10.0.0.5: icmp_seq=3 ttl=64 time=0.119 ms  
64 bytes from 10.0.0.5: icmp_seq=4 ttl=64 time=0.157 ms  
^C  
-- 10.0.0.5 ping statistics --  
4 packets transmitted, 4 received, 0% packet loss, time 3014ms  
rtt min/avg/max/mdev = 0.119/4.072/15.000/6.319 ms  
mininet> sh ovs-ofctl dump-flows s1  
cookie=0x0, duration=0.159s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth2",vlan_tci=0x0000,dl_src=ee:b4:b4:80:a9:79,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.2,arp_tpa=10.0.0.1,arp_op=2 actions:output:"s1-eth1"  
cookie=0x0, duration=0.159s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth2",vlan_tci=0x0000,dl_src=ee:b4:b4:80:a9:79,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.2,arp_tpa=10.0.0.1,arp_op=1 actions:output:"s1-eth1"  
cookie=0x0, duration=0.158s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth1",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=ee:b4:b4:80:a9:79,arp_spa=10.0.0.1,arp_tpa=10.0.0.2,arp_op=2 actions:output:"s1-eth2"  
cookie=0x0, duration=0.177s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth3",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.5,arp_tpa=10.0.0.1,arp_op=2 actions:output:"s1-eth1"  
cookie=0x0, duration=0.077s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth3",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.5,arp_tpa=10.0.0.1,arp_op=1 actions:output:"s1-eth1"  
cookie=0x0, duration=0.076s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth1",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=f2:10:66:36:9a:ee,nw_src=10.0.0.1,nw_dst=10.0.0.5,arp_op=2 actions:output:"s1-eth3"  
mininet> sh ovs-ofctl dump-flows s2  
cookie=0x0, duration=0.159s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s2-eth2",vlan_tci=0x0000,dl_src=ee:b4:b4:80:a9:79,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.2,arp_tpa=10.0.0.1,arp_op=2 actions:output:"s1-eth1"  
cookie=0x0, duration=0.157s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth2",vlan_tci=0x0000,dl_src=ee:b4:b4:80:a9:79,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.2,arp_tpa=10.0.0.1,arp_op=1 actions:output:"s1-eth1"  
cookie=0x0, duration=0.158s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth1",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=ee:b4:b4:80:a9:79,arp_spa=10.0.0.1,arp_tpa=10.0.0.2,arp_op=2 actions:output:"s1-eth2"  
cookie=0x0, duration=0.177s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth3",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.5,arp_tpa=10.0.0.1,arp_op=2 actions:output:"s1-eth1"  
cookie=0x0, duration=0.077s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth3",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.5,arp_tpa=10.0.0.1,arp_op=1 actions:output:"s1-eth1"  
cookie=0x0, duration=0.076s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s1-eth1",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=f2:10:66:36:9a:ee,nw_src=10.0.0.1,nw_dst=10.0.0.5,arp_op=2 actions:output:"s1-eth3"  
mininet> sh ovs-ofctl dump-flows s3  
cookie=0x0, duration=0.159s, table=0, n_packets=4, n_bytes=392, priority=65535,icmp,in_port="s1-eth1",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=ee:b4:b4:80:a9:79,nw_src=10.0.0.1,nw_dst=10.0.0.2,nw_tos=0,icmp_type=8,icmp_code=0 actions:output:"s1-eth2"  
cookie=0x0, duration=0.157s, table=0, n_packets=4, n_bytes=392, priority=65535,icmp,in_port="s1-eth2",vlan_tci=0x0000,dl_src=ee:b4:b4:80:a9:79,dl_dst=3e:2e:b9:04:ab:9f,nw_src=10.0.0.2,nw_dst=10.0.0.1,nw_tos=0,icmp_type=8,icmp_code=0 actions:output:"s1-eth1"  
cookie=0x0, duration=0.172s, table=0, n_packets=4, n_bytes=392, priority=65535,icmp,in_port="s1-eth1",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=f2:10:66:36:9a:ee,nw_src=10.0.0.1,nw_dst=10.0.0.5,nw_tos=0,icmp_type=8,icmp_code=0 actions:output:"s1-eth3"  
cookie=0x0, duration=0.166s, table=0, n_packets=4, n_bytes=392, priority=65535,icmp,in_port="s1-eth3",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,nw_src=10.0.0.5,nw_dst=10.0.0.1,nw_tos=0,icmp_type=8,icmp_code=0 actions:output:"s1-eth1"  
mininet> sh ovs-ofctl dump-flows s2  
cookie=0x0, duration=0.143s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s2-eth2",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.5,arp_tpa=10.0.0.1,arp_op=2 actions:output:"s2-eth1"  
cookie=0x0, duration=0.134s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s2-eth2",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.5,arp_tpa=10.0.0.1,arp_op=1 actions:output:"s2-eth1"  
cookie=0x0, duration=0.133s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s2-eth1",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=f2:10:66:36:9a:ee,arp_spa=10.0.0.1,arp_tpa=10.0.0.5,arp_op=2 actions:output:"s2-eth2"  
cookie=0x0, duration=0.143s, table=0, n_packets=4, n_bytes=392, priority=65535,icmp,in_port="s2-eth1",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=f2:10:66:36:9a:ee,nw_src=10.0.0.1,nw_dst=10.0.0.5,nw_tos=0,icmp_type=8,icmp_code=0 actions:output:"s2-eth2"  
cookie=0x0, duration=0.142s, table=0, n_packets=4, n_bytes=392, priority=65535,icmp,in_port="s2-eth2",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,nw_src=10.0.0.5,nw_dst=10.0.0.1,nw_tos=0,icmp_type=8,icmp_code=0 actions:output:"s2-eth1"  
mininet> sh ovs-ofctl dump-flows s3  
cookie=0x0, duration=0.195s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s3-eth3",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,arp_spa=10.0.0.5,arp_tpa=10.0.0.1,arp_op=2 actions:output:"s3-eth4"  
cookie=0x0, duration=0.184s, table=0, n_packets=1, n_bytes=42, priority=65535,arp,in_port="s3-eth4",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=f2:10:66:36:9a:ee,arp_spa=10.0.0.1,arp_tpa=10.0.0.5,arp_op=2 actions:output:"s3-eth4"  
cookie=0x0, duration=0.194s, table=0, n_packets=4, n_bytes=392, priority=65535,icmp,in_port="s3-eth4",vlan_tci=0x0000,dl_src=3e:2e:b9:04:ab:9f,dl_dst=f2:10:66:36:9a:ee,nw_src=10.0.0.1,nw_dst=10.0.0.5,nw_tos=0,icmp_type=8,icmp_code=0 actions:output:"s3-eth3"  
cookie=0x0, duration=0.194s, table=0, n_packets=4, n_bytes=392, priority=65535,icmp,in_port="s3-eth3",vlan_tci=0x0000,dl_src=f2:10:66:36:9a:ee,dl_dst=3e:2e:b9:04:ab:9f,nw_src=10.0.0.5,nw_dst=10.0.0.1,nw_tos=0,icmp_type=8,icmp_code=0 actions:output:"s3-eth4"  
mininet> xterm h1 h2 h5  
mininet> []
```

X-term Window h1

```
"Node: h1"
root@Ubuntu1:/home/csg# iperf -s
-----
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
-----
[ 6] local 10.0.0.1 port 5001 connected with 10.0.0.2 port 52902
[ ID] Interval      Transfer    Bandwidth
[ 6] 0.0-10.2 sec  47.0 GBytes 39.5 Gbits/sec
[ 6] local 10.0.0.1 port 5001 connected with 10.0.0.5 port 53682
[ 6] 0.0-10.0 sec  46.5 GBytes 39.9 Gbits/sec
[]
```

X-term Window h2

```
"Node: h5"
root@Ubuntu1:/home/csg# iperf -c 10.0.0.1
-----
Client connecting to 10.0.0.1, TCP port 5001
TCP window size: 4.67 MByte (default)
-----
[ 5] local 10.0.0.5 port 53682 connected with 10.0.0.1 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 5] 0.0-10.0 sec  46.5 GBytes 40.0 Gbits/sec
root@Ubuntu1:/home/csg#
```

X-term Window h5

```
"Node: h2"
root@Ubuntu1:/home/csg# iperf -c 10.0.0.1
-----
Client connecting to 10.0.0.1, TCP port 5001
TCP window size: 4.25 MByte (default)
-----
[ 5] local 10.0.0.2 port 52902 connected with 10.0.0.1 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 5] 0.0-10.0 sec  47.0 GBytes 40.4 Gbits/sec
root@Ubuntu1:/home/csg#
```