

SDN - Lab 1

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1. Part 1: Answer Questions

1. When ONOS activate “org.onosproject.openflow,” what APPs does it activate?

It activates:

- org.onosproject.openflow
- org.onosproject.hostprovider
- org.onosproject.lldpprovider
- org.onosproject.openflow-base
- org.onosproject.optical-model

2. After we activate ONOS and run P.17 Mininet command, will H1 ping H2 successfully? Why or why not?

No, S1 and S2 will not forward packets unless org.onosproject.fwd is activated.

3. Which TCP port does the controller listen to the OpenFlow connection request from the switch? (Take screenshot and explain your answer.)

> netstat before activating org.onosproject.openflow-base

```
ytshih@sdn-nfv:~/onos$ netstat -nlpt
(Not all processes could be identified, non-owned process info
will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 0.0.0.0:6655            0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:6654            0.0.0.0:*               LISTEN      -
tcp        0      0 127.0.0.1:5005          0.0.0.0:*               LISTEN      81382/java
tcp        0      0 0.0.0.0:6656            0.0.0.0:*               LISTEN      -
tcp        0      0 127.0.0.1:631          0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN      -
tcp        0      0 127.0.0.53:53           0.0.0.0:*               LISTEN      -
tcp6       0      0 127.0.0.1:45401         :::*                    LISTEN      81382/java
tcp6       0      0 :::8181                  :::*                    LISTEN      81382/java
tcp6       0      0 :::8101                   :::*                    LISTEN      81382/java
tcp6       0      0 :::22                     :::*                    LISTEN      -
tcp6       0      0 :::1:631                  :::*                    LISTEN      -
tcp6       0      0 :::45831                  :::*                    LISTEN      81382/java
tcp6       0      0 :::1099                   :::*                    LISTEN      81382/java
tcp6       0      0 :::9876                   :::*                    LISTEN      81382/java
```

> netstat after activating org.onosproject.openflow-base

```
ytshih@sdn-nfv:~/onos$ netstat -nlpt
(Not all processes could be identified, non-owned process info
will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 0.0.0.0:6655            0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:6654            0.0.0.0:*               LISTEN      -
tcp        0      0 127.0.0.1:5005          0.0.0.0:*               LISTEN      81382/java
tcp        0      0 0.0.0.0:6656            0.0.0.0:*               LISTEN      -
tcp        0      0 127.0.0.1:631          0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN      -
tcp        0      0 127.0.0.53:53           0.0.0.0:*               LISTEN      -
tcp6       0      0 127.0.0.1:45401         :::*                    LISTEN      81382/java
tcp6       0      0 :::6633                   :::*                    LISTEN      81382/java
tcp6       0      0 :::6653                   :::*                    LISTEN      81382/java
tcp6       0      0 :::8181                   :::*                    LISTEN      81382/java
tcp6       0      0 :::8101                   :::*                    LISTEN      81382/java
tcp6       0      0 :::22                     :::*                    LISTEN      -
tcp6       0      0 :::1:631                  :::*                    LISTEN      -
tcp6       0      0 :::45831                  :::*                    LISTEN      81382/java
tcp6       0      0 :::1099                   :::*                    LISTEN      81382/java
tcp6       0      0 :::9876                   :::*                    LISTEN      81382/java
```

The ports that appeared only when openflow-base were enabled are:

- tcpv6 :::6633
- tcpv6 :::6653

4. In question 3, which APP enables the controller to listen on the TCP port?

org.onosproject.openflow-base

2. Part 2: Create a custom Topology

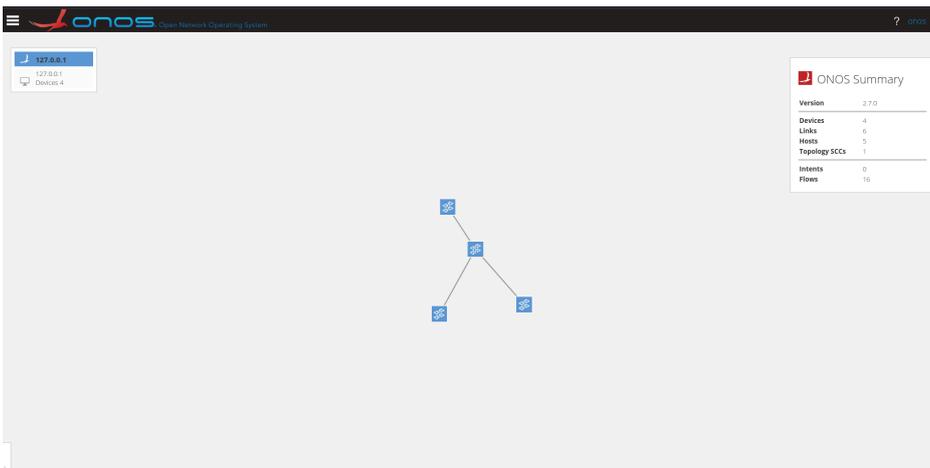
> Run your Python script and use command “pingall”

```

ytshih@sdn-nfv:~/onos$ sudo mn --custom=lab1_part2_111550013.py --topo topo_part2_111550013 --controller=remote,ip=127.0.0.1:6653 --
switch=ovs,protocols=OpenFlow14
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4 h5
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (h4, s4) (h5, s4) (s1, s2) (s2, s3) (s2, s4)
*** Configuring hosts
h1 h2 h3 h4 h5
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
mininet> pingall
*** Png: 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>

```

> Then take a screenshot of topology on GUI



3. Part 3: Statically assign Hosts IP Address in Mininet

> command “dump”

```

ytshih@sdn-nfv:~/onos$ sudo mn --custom=lab1_part3_111550013.py --topo=topo_part3_111550013 --controller=remote,ip=127.0.0.1:6653 --
switch=ovs,protocols=OpenFlow14
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4 h5
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (h4, s4) (h5, s4) (s1, s2) (s2, s3) (s2, s4)
*** Configuring hosts
h1 h2 h3 h4 h5
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
mininet> h1 dump
bash: dump: command not found
mininet> dump
<Host h1: h1-eth0:192.168.0.1 pid=151357>
<Host h2: h2-eth0:192.168.0.2 pid=151359>
<Host h3: h3-eth0:192.168.0.3 pid=151361>
<Host h4: h4-eth0:192.168.0.4 pid=151363>
<Host h5: h5-eth0:192.168.0.5 pid=151365>
<OVSSwitch('protocols': 'OpenFlow14') s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None pid=151370>
<OVSSwitch('protocols': 'OpenFlow14') s2: lo:127.0.0.1,s2-eth1:None,s2-eth2:None,s2-eth3:None,s2-eth4:None pid=151373>
<OVSSwitch('protocols': 'OpenFlow14') s3: lo:127.0.0.1,s3-eth1:None,s3-eth2:None pid=151376>
<OVSSwitch('protocols': 'OpenFlow14') s4: lo:127.0.0.1,s4-eth1:None,s4-eth2:None,s4-eth3:None,s4-eth4:None pid=151379>
<RemoteController('ip': '127.0.0.1:6653') c0: 127.0.0.1:6653 pid=151351>

```

> “ifconfig” on host h1

```

mininet> h1 ifconfig
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.0.1 netmask 255.255.255.224 broadcast 192.168.0.31
inet6 fe80::14c4:11ff:fe74:890e prefixlen 64 scopeid 0x20<link>
ether 16:c4:11:74:89:0e txqueuelen 1000 (Ethernet)
RX packets 49 bytes 6424 (6.4 KB)
RX errors 0 dropped 26 overruns 0 frame 0
TX packets 9 bytes 726 (726.0 B)
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

```

> “ifconfig” on host h2

```

mininet> h2 ifconfig
h2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.0.2 netmask 255.255.255.224 broadcast 192.168.0.31
inet6 fe80::343a:b7ff:fe36:bd9d prefixlen 64 scopeid 0x20<link>
ether 36:3a:b7:36:bd:9d txqueuelen 1000 (Ethernet)
RX packets 75 bytes 9937 (9.9 KB)
RX errors 0 dropped 50 overruns 0 frame 0
TX packets 10 bytes 796 (796.0 B)
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

```

> “ifconfig” on host h3

```

mininet> h3 ifconfig
h3-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.0.3 netmask 255.255.255.224 broadcast 192.168.0.31
inet6 fe80::441c:cbff:fe14:2543 prefixlen 64 scopeid 0x20<link>
ether 46:1c:cb:14:25:43 txqueuelen 1000 (Ethernet)
RX packets 77 bytes 10215 (10.2 KB)
RX errors 0 dropped 52 overruns 0 frame 0
TX packets 10 bytes 796 (796.0 B)
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

```

> “ifconfig” on host h4

```

mininet> h4 ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.0.4 netmask 255.255.255.224 broadcast 192.168.0.31
inet6 fe80::88ac:b0ff:fe85:afce prefixlen 64 scopeid 0x20<link>
ether 8a:ac:b0:85:af:ce txqueuelen 1000 (Ethernet)
RX packets 79 bytes 10493 (10.4 KB)
RX errors 0 dropped 54 overruns 0 frame 0
TX packets 10 bytes 796 (796.0 B)
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

```

> “ifconfig” on host h5

```
mininet> h5 ifconfig
h5-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.0.5 netmask 255.255.255.224 broadcast 192.168.0.31
inet6 fe80::c16:4eff:fe5e:46e6 prefixlen 64 scopeid 0x20<link>
ether 0e:16:4e:5e:46:e6 txqueuelen 1000 (Ethernet)
RX packets 81 bytes 10771 (10.7 KB)
RX errors 0 dropped 56 overruns 0 frame 0
TX packets 10 bytes 796 (796.0 B)
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
```