

Part 1: Answer Questions

Activate ONOS APPS

1. OpenFlow Provider Suite 會被啟動因為”org.onosproject.openflow”對應到的 App 名稱是它。
2. 可以，因為 H1 有接到 switch 上，這個 switch 有接到另一個接到 H2 的 switch，所以 Ping H2 從 H1 會經過 H1, Switch-H1, Switch-H2 最後到 H2。
3. 6633 和 6653

X

OpenFlowControllerImpl
openflowPorts

Component org.onosproject.openflow.controller.impl.OpenFlowControllerImpl
Property openflowPorts
Type string
Value 6633,6653
Default 6633,6653
Description Port numbers (comma separated) used by OpenFlow protocol;
default is 6633,6653.

```
*:cpu      0      0  ::1.6010          ...          LISTEN      -  
tcp6      0      0  ::::6653          ::::*        LISTEN      81293/java  
tcp6      0      0  ::::6633          ::::*        LISTEN      81293/java  
tcp6      0      0  ::1.45613         ...          LISTEN      6497/hazelcast
```

4. 在 deactivate ID: org.onosproject.openflow、名稱: OpenFlow Provider Suite 後就會沒有 6633 和 6653 在聽 OpenFlow 的 request。

```
mike@SDN1:~$ 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      0 127.0.0.1:6010          0.0.0.0:*        LISTEN     -
tcp      0      0 127.0.0.53:53           0.0.0.0:*        LISTEN     -
tcp      0      0 0.0.0.0:22             0.0.0.0:*        LISTEN     -
tcp      0      0 127.0.0.1:5005          0.0.0.0:*        LISTEN     81293/java
tcp6     0      0 ::1:6010              ::*:*           LISTEN     -
tcp6     0      0 ::1:45613             ::*:*           LISTEN     6497/bazel(onos)
tcp6     0      0 ::8101               ::*:*           LISTEN     81293/java
tcp6     0      0 ::8181               ::*:*           LISTEN     81293/java
tcp6     0      0 ::22                 ::*:*           LISTEN     -
tcp6     0      0 ::9876               ::*:*           LISTEN     81293/java
tcp6     0      0 127.0.0.1:37587        ::*:*           LISTEN     81293/java
tcp6     0      0 ::38685              ::*:*           LISTEN     81293/java
tcp6     0      0 ::1099               ::*:*           LISTEN     81293/java
mike@SDN1:~$ D■

tcp6     0      0 ::9876              ::*:*           LISTEN     81293/java
tcp6     0      0 127.0.0.1:37587        ::*:*           LISTEN     81293/java
tcp6     0      0 ::38685              ::*:*           LISTEN     81293/java
tcp6     0      0 ::1099               ::*:*           LISTEN     81293/java
mike@SDN1:~$ D^C
mike@SDN1:~$ tools/test/bin/onos localhost
-bash: tools/test/bin/onos: No such file or directory
mike@SDN1:~$ cd onos/
mike@SDN1:~/onos$ tools/test/bin/onos localhost
Welcome to Open Network Operating System (ONOS)!


$$\begin{array}{c} / \bar{\cup} \vee \backslash / \bar{/} \vee \bar{/} \\ \{ \bar{\cup} \bar{\cup} \bar{/} \bar{/} \bar{\cup} \wedge \bar{\cup} \\ \bar{\cup} \bar{/} \bar{|} \bar{\cup} \bar{\cup} \end{array}$$


Documentation: wiki.onosproject.org
Tutorials: tutorials.onosproject.org
Mailing lists: lists.onosproject.org

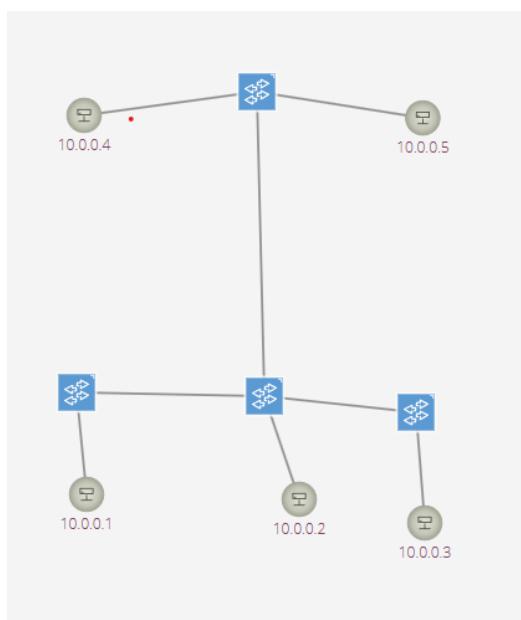
Come help out! Find out how at: contribute.onosproject.org

Hit '<tab>' for a list of available commands
and '[cmd] --help' for help on a specific command.
Hit '<ctrl-d>' or type 'logout' to exit ONOS session.

mike@root > app deactivate org.onosproject.openflow
Deactivated org.onosproject.openflow
mike@root >
```

Part 2:

```
sudo mn --custom=lab1_part2_314551022.py --topo=topo_part2_314551022 --  
controller=remote,ip=127.0.0.1:6653 --switch=ovs,protocols=OpenFlow14
```



```
mike@SDN1:~$ sudo mn --custom=lab1_part2_314551022.py --topo=topo_part2_314551022 --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) (s2, s1) (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
*** 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> █
```

```
from mininet.topo import Topo

class Lab1_Topo_314551022( Topo ):
    def __init__( self ):
        Topo.__init__( self )

        # Add hosts
        h1 = self.addHost('h1')
        h2 = self.addHost('h2')
        h3 = self.addHost('h3')
        h4 = self.addHost('h4')
        h5 = self.addHost('h5')
        # Add switches
        s1 = self.addSwitch('s1')
        s2 = self.addSwitch('s2')
        s3 = self.addSwitch('s3')
        s4 = self.addSwitch('s4')

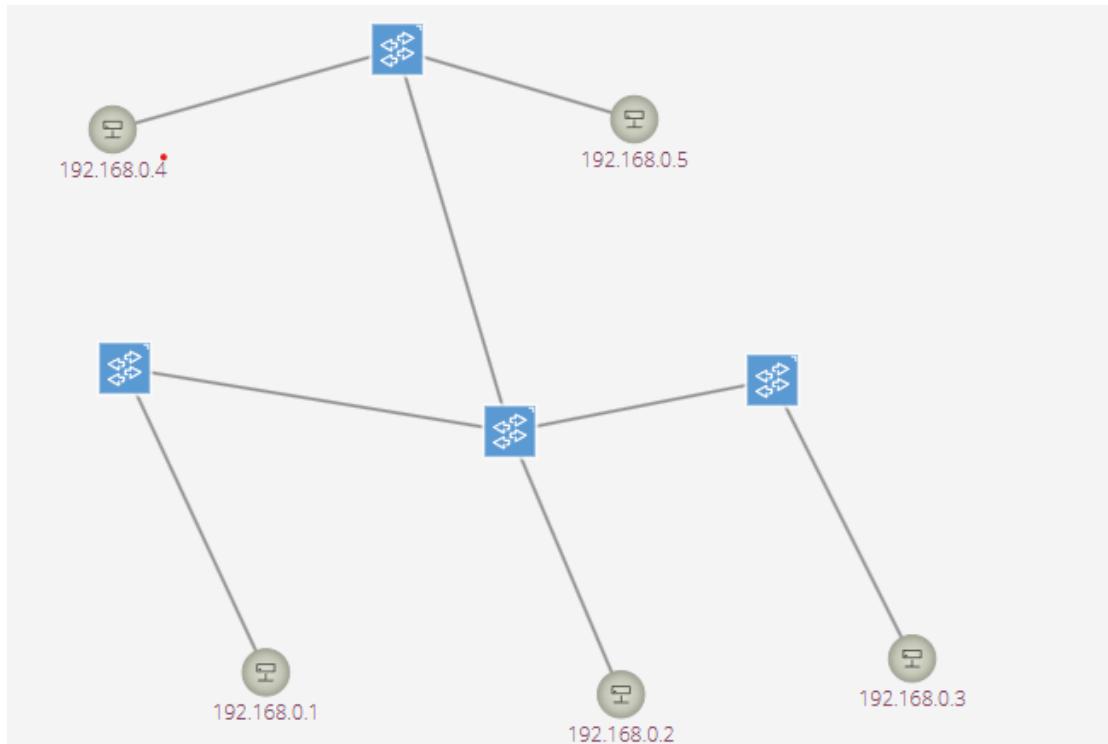
        # Add links
        self.addLink( h1, s1 )
        self.addLink( h2, s2 )
        self.addLink( h3, s3 )
        self.addLink( h4, s4 )
        self.addLink( h5, s4 )
        self.addLink( s2, s4 )
        self.addLink( s2, s1 )
        self.addLink( s2, s3 )

topos = { 'topo_part2_314551022': Lab1_Topo_314551022 }
```

Part 3:

```
sudo mn --custom=lab1_part3_314551022.py --topo=topo_part3_314551022 --
controller=remote,ip=127.0.0.1:6653 --switch=ovs,protocols=OpenFlow14
```

```
mike@SDN1:~$ sudo mn --custom=lab1_part3_314551022.py --topo=topo_part3_314551022 --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) (s2, s1) (s2, s3) (s2, s4)
*** Configuring hosts
h1 h2 h3 h4 h5
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
```



```
1 from mininet.topo import Topo
2
3 class Lab1_Topo_314551022( Topo ):
4     def __init__( self ):
5         Topo.__init__( self )
6
7         # Add hosts
8         h1 = self.addHost('h1', ip='192.168.0.1/27')
9         h2 = self.addHost('h2', ip='192.168.0.2/27')
10        h3 = self.addHost('h3', ip='192.168.0.3/27')
11        h4 = self.addHost('h4', ip='192.168.0.4/27')
12        h5 = self.addHost('h5', ip='192.168.0.5/27')
13
14         # Add switches
15         s1 = self.addSwitch('s1')
16         s2 = self.addSwitch('s2')
17         s3 = self.addSwitch('s3')
18         s4 = self.addSwitch('s4')
19
20         # Add links
21         self.addLink( h1, s1 )
22         self.addLink( h2, s2 )
23         self.addLink( h3, s3 )
24         self.addLink( h4, s4 )
25         self.addLink( h5, s4 )
26         self.addLink( s2, s4 )
27         self.addLink( s2, s1 )
28         self.addLink( s2, s3 )
29
30 topos = { 'topo_part3_314551022': Lab1_Topo_314551022 }
```

```

mininet> dump
<Host h1: h1-eth0:192.168.0.1 pid=87047>
<Host h2: h2-eth0:192.168.0.2 pid=87049>
<Host h3: h3-eth0:192.168.0.3 pid=87051>
<Host h4: h4-eth0:192.168.0.4 pid=87053>
<Host h5: h5-eth0:192.168.0.5 pid=87055>
<OVSSwitch{'protocols': 'OpenFlow14'} s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None pid=87060>
<OVSSwitch{'protocols': 'OpenFlow14'} s2: lo:127.0.0.1,s2-eth1:None,s2-eth2:None,s2-eth3:None,s2-eth4:N
one pid=87063>
<OVSSwitch{'protocols': 'OpenFlow14'} s3: lo:127.0.0.1,s3-eth1:None,s3-eth2:None pid=87066>
<OVSSwitch{'protocols': 'OpenFlow14'} s4: lo:127.0.0.1,s4-eth1:None,s4-eth2:None,s4-eth3:None pid=87069
>
<RemoteController{'ip': '127.0.0.1:6653'} c0: 127.0.0.1:6653 pid=87041>
mininet> ifconfig

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::c416:9eff:fe45:2df1 prefixlen 64 scopeid 0x20<link>
            ether c6:16:9e:45:2d:f1 txqueuelen 1000 (Ethernet)
              RX packets 183 bytes 23088 (23.0 KB)
              RX errors 0 dropped 150 overruns 0 frame 0
              TX packets 27 bytes 1986 (1.9 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> 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::b0d4:57ff:fe7a:a53e prefixlen 64 scopeid 0x20<link>
            ether b2:d4:57:7a:a5:3e txqueuelen 1000 (Ethernet)
              RX packets 189 bytes 23922 (23.9 KB)
              RX errors 0 dropped 156 overruns 0 frame 0
              TX packets 27 bytes 1986 (1.9 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> 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::8a:ad:76:bc:c0:f1 prefixlen 64 scopeid 0x20<link>
          ether 8a:ad:76:bc:c0:f1 txqueuelen 1000 (Ethernet)
            RX packets 222 bytes 28440 (28.4 KB)
            RX errors 0 dropped 188 overruns 0 frame 0
            TX packets 27 bytes 1986 (1.9 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> 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::1cf8:a2ff:fe97:f405 prefixlen 64 scopeid 0x20<link>
          ether 1e:f8:a2:97:f4:05 txqueuelen 1000 (Ethernet)
            RX packets 224 bytes 28718 (28.7 KB)
            RX errors 0 dropped 190 overruns 0 frame 0
            TX packets 27 bytes 1986 (1.9 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> 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::c4c4:8aff:fe94:40cc prefixlen 64 scopeid 0x20<link>
          ether c6:c4:8a:94:40:cc txqueuelen 1000 (Ethernet)
            RX packets 236 bytes 30386 (30.3 KB)
            RX errors 0 dropped 202 overruns 0 frame 0
            TX packets 28 bytes 2056 (2.0 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
```