

# lab1 report

## Part 1:

1.Flush all switch tables and take screenshots to show the switch tables of all switches.

```
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s1
  port  VLAN  MAC          Age
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s2
  port  VLAN  MAC          Age
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s3
  port  VLAN  MAC          Age
```

2.How does h4 knows h1's MAC address? Take screenshot on Wireshark to verify your answers.

Ans: 封包傳到了h4後，h4可以獲得h1的 MAC address

No.	Time	Source	Destination	Protocol	Length	Info
27	160.863792699	10.0.0.1	10.0.0.4	ICMP	98	Echo (ping) request id=0x17fc, seq=3/768, ttl=64 (r)
28	160.863850829	10.0.0.4	10.0.0.1	ICMP	98	Echo (ping) reply id=0x17fc, seq=3/768, ttl=64 (r)
29	161.887954603	10.0.0.1	10.0.0.4	ICMP	98	Echo (ping) request id=0x17fc, seq=4/1024, ttl=64 (r)
30	161.888012382	10.0.0.4	10.0.0.1	ICMP	98	Echo (ping) reply id=0x17fc, seq=4/1024, ttl=64 (r)
31	162.912028997	10.0.0.1	10.0.0.4	ICMP	98	Echo (ping) request id=0x17fc, seq=5/1280, ttl=64 (r)
32	162.912073780	10.0.0.4	10.0.0.1	ICMP	98	Echo (ping) reply id=0x17fc, seq=5/1280, ttl=64 (r)
33	163.839870502	36:7b:fa:b1:0d:b6	56:af:72:2b:b3:7d	ARP	42	Who has 10.0.0.1? Tell 10.0.0.4
34	163.839881837	56:af:72:2b:b3:7d	36:7b:fa:b1:0d:b6	ARP	42	10.0.0.1 is at 56:af:72:2b:b3:7d
35	178.175951905	fe80::80fb:2aff:fee..	ff02::2	ICMPv6	70	Router Solicitation from 82:fb:2a:e1:b2:b0
36	182.272115134	fe80::e4b4:36ff:fed..	ff02::2	ICMPv6	70	Router Solicitation from e6:b4:36:d4:98:a1
37	192.512214002	fe80::54af:72ff:fe2..	ff02::2	ICMPv6	70	Router Solicitation from 56:af:72:2b:b3:7d
38	194.559775245	fe80::9a:93ff:fe81..	ff02::2	TCPv6	70	Router Solicitation from 02:9a:93:81:19:df

3.How does h1 knows h4's MAC address? Take screenshot on Wireshark to verify your answers.

Ans: 透過broadcast的方式來獲得 MAC address

No.	Time	Source	Destination	Protocol	Length	Info
16	69.308596994	fe80::9a:93ff:fe81..	ff02::fb	MDNS	107	Standard query 0x0000 PTR _ipps._tcp.local, "QM" que
17	69.605938579	fe80::e4b4:36ff:fed..	ff02::fb	MDNS	107	Standard query 0x0000 PTR _ipps._tcp.local, "QM" que
18	69.833359857	fe80::80fb:2aff:fee..	ff02::fb	MDNS	107	Standard query 0x0000 PTR _ipps._tcp.local, "QM" que
19	73.727933444	fe80::a8a6:17ff:fe2..	ff02::2	ICMPv6	70	Router Solicitation from aa:a6:17:2a:1b:77
20	77.824875201	fe80::a4ae:32ff:fe6..	ff02::2	ICMPv6	70	Router Solicitation from a6:ae:32:61:72:8a
21	158.832554838	56:af:72:2b:b3:7d	Broadcast	ARP	42	Who has 10.0.0.4? Tell 10.0.0.1
22	158.832841484	36:7b:fa:b1:0d:b6	56:af:72:2b:b3:7d	ARP	42	10.0.0.4 is at 36:7b:fa:b1:0d:b6
23	158.832845308	10.0.0.1	10.0.0.4	ICMP	98	Echo (ping) request id=0x17fc, seq=1/256, ttl=64 (r)
24	158.832990680	10.0.0.4	10.0.0.1	ICMP	98	Echo (ping) reply id=0x17fc, seq=1/256, ttl=64 (r)
25	159.839806968	10.0.0.1	10.0.0.4	ICMP	98	Echo (ping) request id=0x17fc, seq=2/512, ttl=64 (r)
26	159.839843350	10.0.0.4	10.0.0.1	ICMP	98	Echo (ping) reply id=0x17fc, seq=2/512, ttl=64 (r)
27	160.863792699	10.0.0.1	10.0.0.4	TCP	98	Echo (ping) request id=0x17fc, seq=3/768, ttl=64 (r)

#### 4.Why does the first ping have a longer delay?

Ans: 第一次ping時，switch tables還沒被建立，因此必須花更多時間來broadcast

#### 5.Show the switch tables and identify the entries that constitute the path of Ping.

```
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s1
port  VLAN  MAC          Age
  1      0  7e:0e:c1:21:79:f8    5
  3      0  6a:3b:6a:f8:38:8f    5
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s2
port  VLAN  MAC          Age
  2      0  6a:3b:6a:f8:38:8f   10
  1      0  7e:0e:c1:21:79:f8   10
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s3
port  VLAN  MAC          Age
  3      0  7e:0e:c1:21:79:f8   15
  2      0  6a:3b:6a:f8:38:8f   14
```

Ans: 因為s1,s2,s3都有同樣的destination，所以由h1 ping h4的過程應該是h1->s1->s2->s3->h4

### Part 2:

#### 1.Can h1 ping h4 successfully before enabling STP?

Ans: 不行

```
mininet> h1 ping h4 -c 5
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
PING 10.0.0.4 (10.0.0.4) 56(84) bytes of data.
From 10.0.0.1 icmp_seq=1 Destination Host Unreachable
From 10.0.0.1 icmp_seq=2 Destination Host Unreachable
From 10.0.0.1 icmp_seq=3 Destination Host Unreachable
From 10.0.0.1 icmp_seq=4 Destination Host Unreachable
From 10.0.0.1 icmp_seq=5 Destination Host Unreachable
--- 10.0.0.4 ping statistics ---
5 packets transmitted, 0 received, +5 errors, 100% packet loss, time 4080ms
pipe 4
```

## 2.Can h1 ping h4 successfully after STP enabled?

Ans: 可以

```
mininet> h1 ping h4 -c 5
PING 10.0.0.4 (10.0.0.4) 56(84) bytes of data.
64 bytes from 10.0.0.4: icmp_seq=1 ttl=64 time=0.631 ms
64 bytes from 10.0.0.4: icmp_seq=2 ttl=64 time=0.203 ms
64 bytes from 10.0.0.4: icmp_seq=3 ttl=64 time=0.072 ms
64 bytes from 10.0.0.4: icmp_seq=4 ttl=64 time=0.091 ms
64 bytes from 10.0.0.4: icmp_seq=5 ttl=64 time=0.092 ms

--- 10.0.0.4 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4066ms
rtt min/avg/max/mdev = 0.072/0.217/0.631/0.212 ms
```

## 3.Show s1 MAC tables before and after enables STP and explain the differences.

before:

```
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s1
port  VLAN  MAC                                Age
      0   42:e3:a8:45:b8:6e    0
      0   36:60:6f:df:ba:88    0
      0   96:67:96:6f:77:a9    0
      0   f2:1b:25:76:99:a1    0
      0   76:dd:0f:97:d4:2a    0
      0   86:a6:db:b7:bc:e3    0
      0   ee:c3:86:4e:e6:87    0
      0   2a:47:9d:27:27:6b    0
      0   ae:20:28:37:ff:59    0
      0   72:12:34:ed:b4:86    0
      0   86:ce:ec:a6:6d:ad    0
      0   2a:06:0b:b6:10:50    0
```

```
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s2
port  VLAN  MAC                                Age
      0   f2:1b:25:76:99:a1    0
      0   2a:47:9d:27:27:6b    0
      0   ae:20:28:37:ff:59    0
      0   96:67:96:6f:77:a9    0
      0   76:dd:0f:97:d4:2a    0
      0   36:60:6f:df:ba:88    0
      0   42:e3:a8:45:b8:6e    0
      0   ee:c3:86:4e:e6:87    0
      0   86:a6:db:b7:bc:e3    0
      0   86:ce:ec:a6:6d:ad    0
      0   72:12:34:ed:b4:86    0
      0   2a:06:0b:b6:10:50    0
```

```
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s3
port VLAN MAC Age
 3   0 ee:c3:86:4e:e6:87 0
 3   0 86:a6:db:b7:bc:e3 0
 3   0 ae:20:28:37:ff:59 0
 3   0 76:dd:0f:97:d4:2a 0
 4   0 f2:1b:25:76:99:a1 0
 4   0 36:60:6f:df:ba:88 0
 3   0 2a:47:9d:27:27:6b 0
 4   0 42:e3:a8:45:b8:6e 0
 4   0 96:67:96:6f:77:a9 0
 3   0 72:12:34:ed:b4:86 0
 4   0 86:ce:ec:a6:6d:ad 0
 4   0 2a:06:0b:b6:10:50 0
```

```
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s4
port VLAN MAC Age
 2   0 2a:47:9d:27:27:6b 0
 1   0 42:e3:a8:45:b8:6e 0
 2   0 76:dd:0f:97:d4:2a 0
 2   0 ae:20:28:37:ff:59 0
 1   0 96:67:96:6f:77:a9 0
 2   0 86:a6:db:b7:bc:e3 0
 2   0 ee:c3:86:4e:e6:87 0
 1   0 36:60:6f:df:ba:88 0
 1   0 f2:1b:25:76:99:a1 0
 2   0 72:12:34:ed:b4:86 0
 2   0 86:ce:ec:a6:6d:ad 0
 2   0 2a:06:0b:b6:10:50 0
```

after:

```
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s1
port VLAN MAC Age
 4   0 86:a6:db:b7:bc:e3 38
 4   0 86:ce:ec:a6:6d:ad 38
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s2
port VLAN MAC Age
 2   0 36:60:6f:df:ba:88 59
 2   0 86:ce:ec:a6:6d:ad 42
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s3
port VLAN MAC Age
 4   0 36:60:6f:df:ba:88 62
 3   0 86:a6:db:b7:bc:e3 45
 2   0 86:ce:ec:a6:6d:ad 45
potatofarm@potatofarm-VirtualBox:~$ sudo ovs-appctl fdb/show s4
port VLAN MAC Age
 1   0 2a:06:0b:b6:10:50 122
 2   0 86:a6:db:b7:bc:e3 48
 2   0 86:ce:ec:a6:6d:ad 48
```

Ans: 還沒開啟STP前，h1的broadcast會先傳到s1，之後傳道s2,s4，同理s2也會傳到s3,s4，以此類推，導致broadcast形成loop，封包傳不出去，開啟STP後，某些port會休息，使loop被解開，才能正常傳封包

#### 4.What have you observed and learned from this lab?

switch table 可以說是整個網路傳輸的基礎，這次的lab讓我理解整個table的建立過程，和STP是如何影響封包傳遞的，同時也順便熟悉mininet和一些網路的command line的使用。