NSCAP HW7 Report   109550039 楊富翔

1. **When h1 ping h2, what will happen?**

   ARP:

   h1 sent request

   h2 received and replied

   h1 received the reply

   ICMP:

   h1 sent request

   h2 received and replied

   h1 received the reply

```
22:14:40.802960 ARP, Request who-has 10.0.0.2 tell 10.0.0.1, length 28
22:14:40.809012 ARP, Reply 10.0.0.2 is-at f6:74:c5:77:21:5b (oui Unknown), lengt
h 28
22:14:40.809076 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 9707, seq 1, lengt
h 64
22:14:40.811324 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 9707, seq 1, length
64
22:14:45.852154 ARP, Request who-has 10.0.0.1 tell 10.0.0.2, length 28
22:14:45.852208 ARP, Reply 10.0.0.1 is-at ba:2f:41:d1:46:14 (oui Unknown), lengt
h 28
22:14:59.922880 IP6 fe80::b82f:41ff:fed1:4614 > ip6-allrouters: ICMP6, router so
licitation, length 16
22:14:59.923159 IP6 fe80::bcfd:4aff:feec:181f > ip6-allrouters: ICMP6, router so
licitation, length 16
22:15:04.030502 IP6 fe80::cc69:d1ff:fe62:1103 > ip6-allrouters: ICMP6, router so
licitation, length 16
22:15:06.170502 IP6 fe80::f474:c5ff:fe77:215b > ip6-allrouters: ICMP6, router so
```

```
mininet> h1 ping h2 -c 1
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=9.33 ms

--- 10.0.0.2 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 9.326/9.326/9.326/0.000 ms
```

2. **When h1 ping h3, what will happen?**

   ARP:

   h1 sent request

   h3 received and replied

   h1 received the reply

   ICMP:

   h1 sent request

   h3 received and reply

   h1 cannot received since controller dropped it

```
23:47:43.351260 ARP, Request who-has 10.0.0.3 tell 10.0.0.1, length 28
23:47:43.354884 ARP, Reply 10.0.0.3 is-at d6:65:25:3d:c7:50 (oui Unknown), lengt
h 28
23:47:43.354942 IP 10.0.0.1 > 10.0.0.3: ICMP echo request, id 11553, seq 1, leng
th 64
23:47:48.434611 ARP, Request who-has 10.0.0.1 tell 10.0.0.3, length 28
23:47:48.434669 ARP, Reply 10.0.0.1 is-at 76:aa:59:58:52:66 (oui Unknown), lengt
h 28
23:47:52.530586 IP6 fe80::74aa:59ff:fe58:5266 > ip6-allrouters: ICMP6, router so
licitation, length 16
```

```
mininet> h1 ping h3 -c 1
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.
64 bytes from 10.0.0.3: icmp_seq=1 ttl=64 time=5.70 ms

--- 10.0.0.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 5.700/5.700/5.700/0.000 ms
```

3. **When h3 ping h2, what will happen?**

   ARP:

   h3 sent request

   h2 received and replied

   h3 received the reply

   ICMP:

   h3 sent request

   h2 cannot received since controller dropped it

```
23:48:56.291830 ARP, Request who-has 10.0.0.2 tell 10.0.0.3, length 28
23:48:56.295820 ARP, Reply 10.0.0.2 is-at e6:93:d6:29:39:5c (oui Unknown), lengt
h 28
23:48:56.295880 IP 10.0.0.3 > 10.0.0.2: ICMP echo request, id 11569, seq 1, leng
th 64
23:49:02.137513 IP6 fe80::58ee:f8ff:fec4:f18c.mdns > ff02::fb.mdns: 0 [2q] PTR (
QM)? _ipps._tcp.local. PTR (QM)? _ipp._tcp.local. (45)
23:49:02.163060 IP6 fe80::58ee:f8ff:fec4:f18c > ip6-allrouters: ICMP6, router so
```

```
mininet> h3 ping h2 -c 1
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.

--- 10.0.0.2 ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 0ms
```

4. **When h1 ping h5, what will happen?**

ARP:

h1 sent request 3 times and no reply

ICMP:

h1 couldn't send request

```
listening on h1-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
22:38:55.100847 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
22:38:56.118262 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
22:38:57.142086 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
```

```
mininet> h1 ping h5 -c 1
ping: h5: Temporary failure in name resolution
mininet> xterm h1
mininet> h1 ping h5 -c 1
ping: h5: Temporary failure in name resolution
mininet> h1 ping 10.0.0.5 -c 1
PING 10.0.0.5 (10.0.0.5) 56(84) bytes of data.
From 10.0.0.1 icmp_seq=1 Destination Host Unreachable

--- 10.0.0.5 ping statistics ---
1 packets transmitted, 0 received, +1 errors, 100% packet loss, time 0ms
```

5. **When h1 ping h5, what will happen?**

It is similar to Q1

ARP:

h1 sent request

h5 received and replied

h1 received the reply

ICMP:

h1 sent request

h5 received and replied

h1 received the reply

```
22:43:44.000240 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
22:43:44.023178 ARP, Reply 10.0.0.5 is-at ca:99:9a:9c:d9:75 (oui Unknown), lengt
h 28
22:43:44.023258 IP 10.0.0.1 > 10.0.0.5: ICMP echo request, id 10248, seq 1, leng
th 64
22:43:44.031870 IP 10.0.0.5 > 10.0.0.1: ICMP echo reply, id 10248, seq 1, length
 64
22:43:49.472200 ARP, Request who-has 10.0.0.1 tell 10.0.0.5, length 28
22:43:49.472274 ARP, Reply 10.0.0.1 is-at 6a:54:5b:62:90:0e (oui Unknown), lengt
h 28
```

```
mininet> h1 ping 10.0.0.5 -c 1
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=31.7 ms

--- 10.0.0.5 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 31.694/31.694/31.694/0.000 ms
```

6. **When h1 ping h7, what will happen?**

It is similar to Q2

ARP:

h1 sent request

h7 received and replied

h1 received the reply

ICMP:

h1 sent request

h7 received and reply

h1 cannot received since controller dropped it

```
00:06:22.931978 ARP, Request who-has 10.0.0.7 tell 10.0.0.1, length 28
00:06:22.946517 ARP, Reply 10.0.0.7 is-at 1a:50:c2:47:6e:85 (oui Unknown), lengt
h 28
00:06:22.946724 IP 10.0.0.1 > 10.0.0.7: ICMP echo request, id 12037, seq 1, leng
th 64
00:06:28.343336 ARP, Request who-has 10.0.0.1 tell 10.0.0.7, length 28
00:06:28.343408 ARP, Reply 10.0.0.1 is-at c6:0a:e8:bd:09:60 (oui Unknown), lengt
h 28
```

```
mininet> h1 ping 10.0.0.7 -c 1
PING 10.0.0.7 (10.0.0.7) 56(84) bytes of data.

--- 10.0.0.7 ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 0ms
```

7. **When h7 ping h1, what will happen?**

It is similar to Q3

ARP:

h7 sent request

h1 received and replied

h7 received the reply

ICMP:

h7 sent request

h1 cannot received since controller dropped it

```
listening on H-eth0, link type EN10MB (Ethernet), capture size 262144 bytes
00:08:47.885138 IP 10.0.0.7 > 10.0.0.1: ICMP echo request, id 12528, seq 1, leng
th 64
00:08:53.031221 ARP, Request who-has 10.0.0.1 tell 10.0.0.7, length 28
00:08:53.032898 ARP, Reply 10.0.0.1 is-at c6:0a:e8:bd:09:60 (oui Unknown), lengt
h 28
```

```
mininet> h7 ping 10.0.0.1 -c 1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.

--- 10.0.0.1 ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 0ms
```

8. **If the packet in question 6 or 7 is dropped in some part of the network, are the outcome and explanation the same as that of question 4?**

    No, Q4 is because controller can't handle this packet since these 2 switches aren't connected, but in Q6 and Q7, controller filter it by flow table.

    We know it by observing tcpdump in Q5 since even ARP can't be replyed.

    However, in Q6 and Q7, ARP can be replyed.

    ```
    listening on h1-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
    22:38:55.100847 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
    22:38:56.118262 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
    22:38:57.142086 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
    ```

    ```
    00:06:22.931978 ARP, Request who-has 10.0.0.7 tell 10.0.0.1, length 28
    00:06:22.946517 ARP, Reply 10.0.0.7 is-at 1a:50:c2:47:6e:85 (oui Unknown), lengt
    h 28
    00:06:22.946724 IP 10.0.0.1 > 10.0.0.7: ICMP echo request, id 12037, seq 1, leng
    th 64
    00:06:28.343336 ARP, Request who-has 10.0.0.1 tell 10.0.0.7, length 28
    00:06:28.343408 ARP, Reply 10.0.0.1 is-at c6:0a:e8:bd:09:60 (oui Unknown), lengt
    h 28
    ```

    ```
    listening on h7-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
    00:08:47.885138 IP 10.0.0.7 > 10.0.0.1: ICMP echo request, id 12528, seq 1, leng
    th 64
    00:08:53.031221 ARP, Request who-has 10.0.0.1 tell 10.0.0.7, length 28
    00:08:53.032898 ARP, Reply 10.0.0.1 is-at c6:0a:e8:bd:09:60 (oui Unknown), lengt
    h 28
    ```

9. **Change filter_table2 rule**

    Will the outcome of questions 5, 6, and 7 differ? (no need to print screenshot) explain why or why not.

    No, they are the same. Since "from port_3 or port_4 will be dropped" equals to "from port_1 or port_2 will be allowed to pass" logically, controller dropped port3 and port4 mean let port1 and port2 pass.