

NSC HW 7

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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

```
mininet> xterm h1 h2 h3 h4
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=38.0 ms

--- 10.0.0.2 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 37.988/37.988/37.988/0.000 ms
mininet> 
```

```
"Node: h2"
root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h2-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:28:57.613064 ARP, Request who-has 10.0.0.2 tell 10.0.0.1, length 28
02:28:57.616704 ARP, Reply 10.0.0.2 is-at 00:00:00:00:00:02 (oui Ethernet), length 28
02:28:57.640834 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 6917, seq 1, length 64
02:28:57.640887 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 6917, seq 1, length 64
02:29:02.767025 ARP, Request who-has 10.0.0.1 tell 10.0.0.2, length 28
02:29:02.767581 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28

```

```
root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h1-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:28:57.604830 ARP, Request who-has 10.0.0.2 tell 10.0.0.1, length 28
02:28:57.630713 ARP, Reply 10.0.0.2 is-at 00:00:00:00:00:02 (oui Ethernet), length 28
02:28:57.630774 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 6917, seq 1, length 64
02:28:57.642798 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 6917, seq 1, length 64
02:29:02.767333 ARP, Request who-has 10.0.0.1 tell 10.0.0.2, length 28
02:29:02.767341 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28
```

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 replied

s1 drop the reply

h1 did not receive the reply

```
mininet> xterm h1 h2 h3 h4
mininet> h1 ping h3 -c 1
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.

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

mininet>
```

```
root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h1-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:34:28.456615 ARP, Request who-has 10.0.0.3 tell 10.0.0.1, length 28
02:34:28.481625 ARP, Reply 10.0.0.3 is-at 00:00:00:00:00:03 (oui Ethernet), length 28
02:34:28.483389 IP 10.0.0.1 > 10.0.0.3: ICMP echo request, id 7147, seq 1, length 64
02:34:33.642159 ARP, Request who-has 10.0.0.1 tell 10.0.0.3, length 28
02:34:33.642213 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28
```

```

root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h3-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:34:28.465567 ARP, Request who-has 10.0.0.3 tell 10.0.0.1, length 28
02:34:28.467335 ARP, Reply 10.0.0.3 is-at 00:00:00:00:00:03 (oui Ethernet), length 28
02:34:28.501627 IP 10.0.0.1 > 10.0.0.3: ICMP echo request, id 7147, seq 1, length 64
02:34:28.501697 IP 10.0.0.3 > 10.0.0.1: ICMP echo reply, id 7147, seq 1, length 64
02:34:33.641744 ARP, Request who-has 10.0.0.1 tell 10.0.0.3, length 28
02:34:33.642317 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28

```

3. When h3 ping h2, what will happen?

ARP:

h3 sent request

h2 received and replied

h3 received the reply

ICMP:

h3 sent request

s1 drop the request

h2 id not receive the request

```

mininet> xterm h1 h2 h3 h4
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

mininet>

```

```

root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h2-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:38:33.162438 ARP, Request who-has 10.0.0.2 tell 10.0.0.3, length 28
02:38:33.165367 ARP, Reply 10.0.0.2 is-at 00:00:00:00:00:02 (oui Ethernet), length 28

```

"Node: h3"

```
root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h3-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:38:33.159331 ARP, Request who-has 10.0.0.2 tell 10.0.0.3, length 28
02:38:33.170942 ARP, Reply 10.0.0.2 is-at 00:00:00:00:00:02 (oui Ethernet), length 28
02:38:33.170946 IP 10.0.0.3 > 10.0.0.2: ICMP echo request, id 7381, seq 1, length 64
```

4. When h1 ping h5, what will happen?

ARP:

h1 sent request

h1 sent request

h1 sent request

h5 did not receive the request

```
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
mininet>
```

"Node: h1"

```
root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h1-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:42:16.553057 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
02:42:17.856892 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
02:42:18.989672 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
```

"Node: h5"

```
root@nscap2:/home/ns# tcpdump -f 'not ip6'
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h5-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
```

------(gre)-----

5. When h1 ping h5, what will happen?

ARP:

h1 sent request

h5 received and replied

h1 received the reply

ICMP:

h1 sent request

h5 received and replied

h1 received the reply

```
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.
64 bytes from 10.0.0.5: icmp_seq=1 ttl=64 time=46.7 ms

--- 10.0.0.5 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 46.720/46.720/46.720/0.000 ms
mininet>
```

```
"Node: h1"
root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h1-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:45:54.183626 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
02:45:54.226802 ARP, Reply 10.0.0.5 is-at 00:00:00:00:00:05 (oui Ethernet), length 28
02:45:54.226841 IP 10.0.0.1 > 10.0.0.5: ICMP echo request, id 7811, seq 1, length 64
02:45:54.230325 IP 10.0.0.5 > 10.0.0.1: ICMP echo reply, id 7811, seq 1, length 64
02:45:59.557949 ARP, Request who-has 10.0.0.1 tell 10.0.0.5, length 28
02:45:59.557984 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28
```

```
"Node: h5"
root@nscap2:/home/ns# tcpdump -f 'not ip6'
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h5-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:45:54.215339 ARP, Request who-has 10.0.0.5 tell 10.0.0.1, length 28
02:45:54.215381 ARP, Reply 10.0.0.5 is-at 00:00:00:00:00:05 (oui Ethernet), length 28
02:45:54.229324 IP 10.0.0.1 > 10.0.0.5: ICMP echo request, id 7811, seq 1, length 64
02:45:54.229370 IP 10.0.0.5 > 10.0.0.1: ICMP echo reply, id 7811, seq 1, length 64
02:45:59.556813 ARP, Request who-has 10.0.0.1 tell 10.0.0.5, length 28
02:45:59.557950 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28
```

6. When h1 ping h7, what will happen?

ARP:

h1 sent request

h7 received and replied

h1 received the reply

ICMP:

h1 sent request

h7 received and replied

s2 drop the reply

h1 did not receive the reply

```
mininet> xterm h1
mininet> h1 ping h7 -c 1
ping: h7: Temporary failure in name resolution
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

mininet>
```

```
"Node: h1"
root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h1-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:49:25.855748 ARP, Request who-has 10.0.0.7 tell 10.0.0.1, length 28
02:49:25.888415 ARP, Reply 10.0.0.7 is-at 00:00:00:00:00:07 (oui Ethernet), length 28
02:49:25.888451 IP 10.0.0.1 > 10.0.0.7: ICMP echo request, id 8042, seq 1, length 64
02:49:31.766284 ARP, Request who-has 10.0.0.1 tell 10.0.0.7, length 28
02:49:31.766294 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28
```

```
"Node: h7"
root@nscap2:/home/ns# tcpdump -f 'not ip6'
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h7-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:49:25.874413 ARP, Request who-has 10.0.0.7 tell 10.0.0.1, length 28
02:49:25.874453 ARP, Reply 10.0.0.7 is-at 00:00:00:00:00:07 (oui Ethernet), length 28
02:49:25.898043 IP 10.0.0.1 > 10.0.0.7: ICMP echo request, id 8042, seq 1, length 64
02:49:25.898160 IP 10.0.0.7 > 10.0.0.1: ICMP echo reply, id 8042, seq 1, length 64
02:49:31.767274 ARP, Request who-has 10.0.0.1 tell 10.0.0.7, length 28
02:49:31.768583 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28
```

7. When h7 ping h1, what will happen?

ARP:

h7 sent request

h1 received and replied

h7 received the reply

ICMP:

h7 sent request

s2 drop the request

h1 did not receive the request

```
mininet> xterm h7
mininet> h7 ping h1 -c 1
ping: h1: Temporary failure in name resolution
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

mininet> █
```

```
"Node: h1"
root@nscap1:/home/ns# tcpdump -f "not ip6"
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h1-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:52:35.823818 ARP, Request who-has 10.0.0.1 tell 10.0.0.7, length 28
02:52:35.823880 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28
█
```

```
"Node: h7"
root@nscap2:/home/ns# tcpdump -f 'not ip6'
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h7-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
02:52:35.821358 ARP, Request who-has 10.0.0.1 tell 10.0.0.7, length 28
02:52:35.838466 ARP, Reply 10.0.0.1 is-at 00:00:00:00:00:01 (oui Ethernet), length 28
02:52:35.838503 IP 10.0.0.7 > 10.0.0.1: ICMP echo request, id 5960, seq 1, length 64
█
```

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? (use screenshot to prove)

不同，因為在 Q4 時兩者不連通，所以連 ARP 都收不到，因此會判斷成 unreachable，而 Q6, Q7 則是連通的且 ARP 收得到，因此他只覺得是 packet loss 不是 unreachable。


```
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

mininet> █
```

```
mininet> xterm h1
mininet> h1 ping h7 -c 1
ping: h7: Temporary failure in name resolution
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

mininet> █
```

```
mininet> xterm h7
mininet> h7 ping h1 -c 1
ping: h1: Temporary failure in name resolution
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

mininet> █
```

9. Change filter_table2 rule

- From: packets coming from port_3 or port_4 will be dropped, while other packets will be allowed to pass.
To: packets coming from port_1 or port_2 will be allowed to pass, while other packets will be dropped.
- Will the outcome of questions 5, 6, and 7 differ? (no need to print screenshot)
explain why or why not

Q5, Q6, Q7 都會 packet loss

因為 gre tunnel 對 switch 來講，在這個 case 中是 port_5，新舊規則差異於這個情境下是 port_5 進來的 ICMP 會不會 drop 掉。因此都會在經過 tunnel，被 switch drop 掉。