Lab 6: Design and implementing a small network

Question 1

What is the IP subnet that is chosen for the hosts?

The subnet for the hosts is 10.0.0.0/24

Question 2

Are the two servers srv1 and srv2 in the same subnet?

srv1 (IP address 10.0.0.10) and srv2 (IP address 10.0.0.11) are on the same subnet.

Question 3

Test if you can observe the switch with tracepath from h1 to srv1? Hint: use the -n option for tracepath to prevent unnecessary DNS lookups. Why are you not able to observe the switch?

Unable to observe switches because switches do not have an IP address associated with them and should be transparent in the network.

Question 4

What is the gateway for the devices srv1, srv2, and the hosts h0 to h4?

The gateway for the srv1 and svr2 is 10.0.0.1.
The gateway for h0 to h4 is 10.0.0.111.

Question 5

Can you ping/reach the server test.net (8.8.8.2) from h1? If not, do you have an idea what goes wrong?

test.net / 8.8.8.2 cannot be reached from h1, but can be reached from srv1. h1 is using the wrong IP to the gateway router while srv1 is using the correct one.

```
mininet> srv1 ping 8.8.8.2
PING 8.8.8.2 (8.8.8.2) 56(84) bytes of data.
64 bytes from 8.8.8.2: icmp_seq=1 ttl=62 time=4.21 ms
64 bytes from 8.8.8.2: icmp_seq=2 ttl=62 time=0.899 ms
^C
--- 8.8.8.2 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1000ms
rtt min/avg/max/mdev = 0.899/2.559/4.219/1.660 ms
mininet> h1 ping 8.8.8.2
PING 8.8.8.2 (8.8.8.2) 56(84) bytes of data.
From 10.0.0.105 icmp_seq=1 Destination Host Unreachable
From 10.0.0.105 icmp_seq=2 Destination Host Unreachable
From 10.0.0.105 icmp_seq=3 Destination Host Unreachable
```

Question 6

Is a DHCP server running in the local network? On which machine? You can use dhclient (where IFNAME correspond to the name of a network interface) to request a new IP address manually:

mininet> xterm h1
 # dhclient h1-eth0

A DHCP server is running on the local network on srv1 (10.0.0.10)

Question 7

Do you find something that might need to be improved?

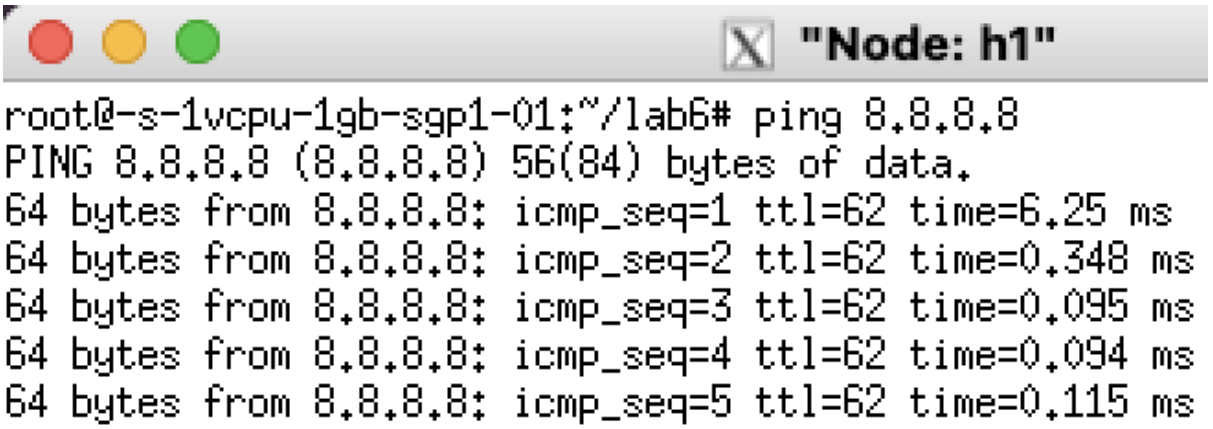
The first-hop router IP supplied to the hosts is not the same as the gateway IP for the server. Looking at the architecture, the hosts need to use the same router as the servers to reach IPs outside the subnet. Since we could reach 8.8.8.2 from srv1, it must have the correct IP for the router.

Changed the line “dhcp-option=3, 10.0.0.111” to “dhcp-option=3, 10.0.0.1”

Question 8

In the open mininet session, open an xterm on h1 again and ping Google (8.8.8.8). Can you reach it now?

We are now able to ping Google from h1.



Question 9

On the h1 host, ping test.net. Can you reach it? Why? Try using dig or nslookup to find out more. What is the IP of test.net?

We can reach test.net. The IP of test.net is 8.8.8.2. This is due to the line “address=/test.net/8.8.8.2” in extH2DNS.conf which was used to set up the DNS server on

8.8.8.8. As a result, when using our DNS server to resolve test.net, we get the IP address 8.8.8.2.

```
"Node: h1"
root@s-1vcpu-1gb-sgp1-01:~/lab6# dig test.net

; <<>> DiG 9.11.3-1ubuntu1.16-Ubuntu <<>> test.net
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 32202
;; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;test.net.                      IN      A

;; ANSWER SECTION:
test.net.               0       IN      A       8.8.8.2

;; Query time: 5 msec
;; SERVER: 8.8.8.8#53(8.8.8.8)
;; WHEN: Sat Dec 11 08:39:30 UTC 2021
;; MSG SIZE  rcvd: 42
```

Question 10

In the provided setup, one node provides NAT for the hosts with a private IP address. Which node is this?

In net.py, we can see that enableNAT is called with intGW as a parameter, meaning intGW provides NAT.

1	0.000000000	10.0.0.10	8.8.8.8	ICMP	100 Echo (ping) request
2	0.000075251	2.2.2.2	8.8.8.8	ICMP	100 Echo (ping) request
3	0.000771792	8.8.8.8	2.2.2.2	ICMP	100 Echo (ping) reply
4	0.000834289	8.8.8.8	10.0.0.10	ICMP	100 Echo (ping) reply

From the above Wireshark capture, we can see that when we ping 8.8.8.8 from srv1, the internal IP (10.0.0.10) gets converted to the external NAT IP of 2.2.2.2.

Question 11

What is the rule you added? Test if it works, i.e. if you can still ping 8.8.8.8 from srv2 after the rule is effective. Ideally, you should not!

The rule added was `iptables -I FORWARD -s 10.0.0.11 -j DROP`. We are not able to reach 8.8.8.8 after the rule was added.

```
mininet> srv2 ping 8.8.8.8
        ^CPING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.

--- 8.8.8.8 ping statistics ---
72 packets transmitted, 0 received, 100% packet loss, time 71261ms
```