

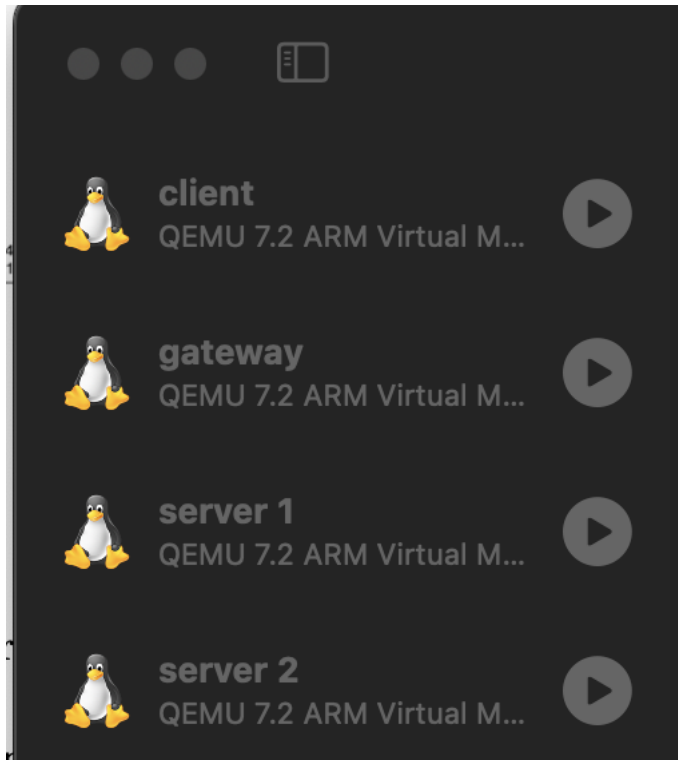
CN ASSIGNMENT 3 (IP TABLES)

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Roll No.: 2022547

Question 1:

- a) Setup 4 Vm's (1 Client; 1 Gateway; 2 Servers), as given in tutorials we configured the network settings.

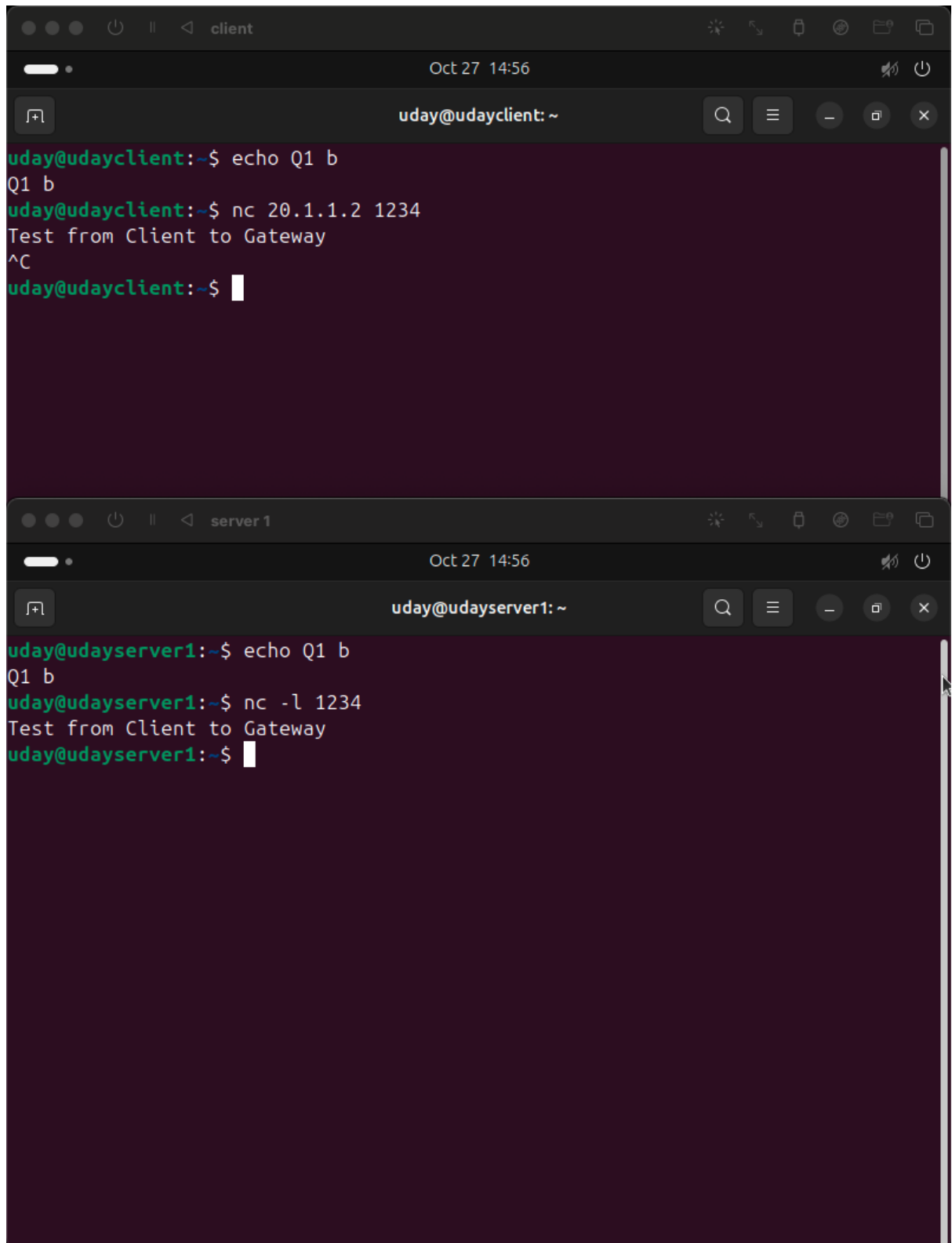


b)

A screenshot of a terminal window titled 'gateway'. The terminal shows the following commands and output:

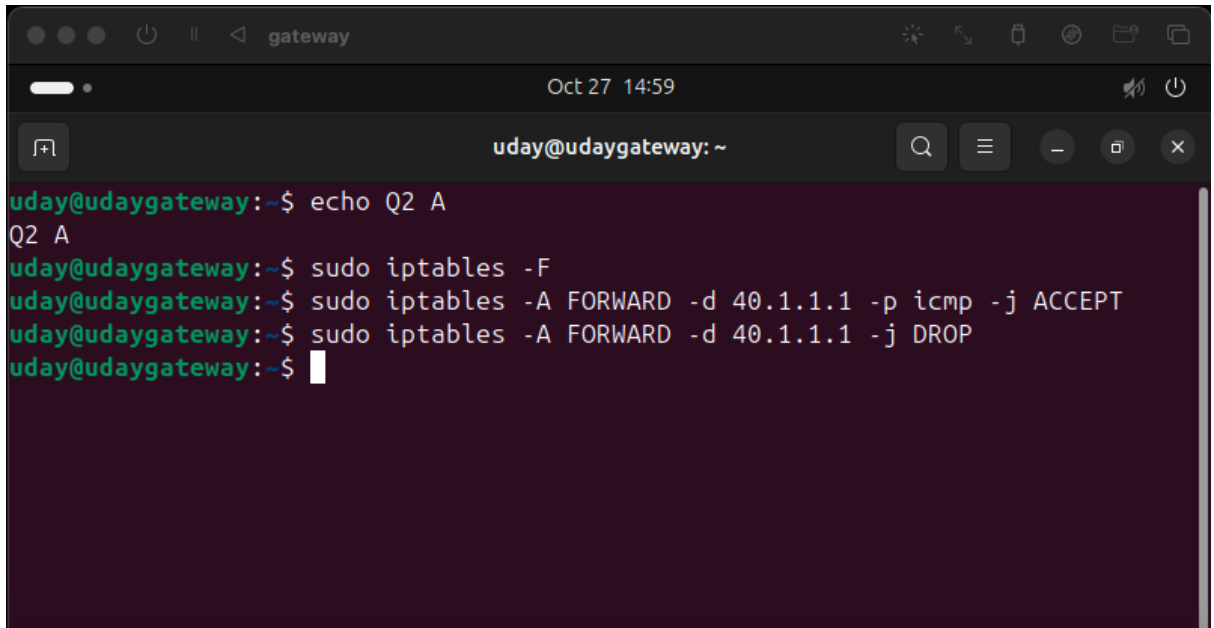
```
uday@udaygateway:~$ echo Q1 b
Q1 b
uday@udaygateway:~$ sudo sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
uday@udaygateway:~$ sudo iptables -F
uday@udaygateway:~$ sudo iptables -t nat -F
uday@udaygateway:~$ sudo iptables -t nat -A PREROUTING -p tcp -d 20.1.1.2 -j DNAT --to-destination 40.1.1.1
uday@udaygateway:~$ sudo iptables -t nat -A PREROUTING -p tcp -d 20.1.1.2 -j DNAT --to-destination 40.1.1.3
uday@udaygateway:~$
```

The terminal window has a dark background and standard window controls at the top.

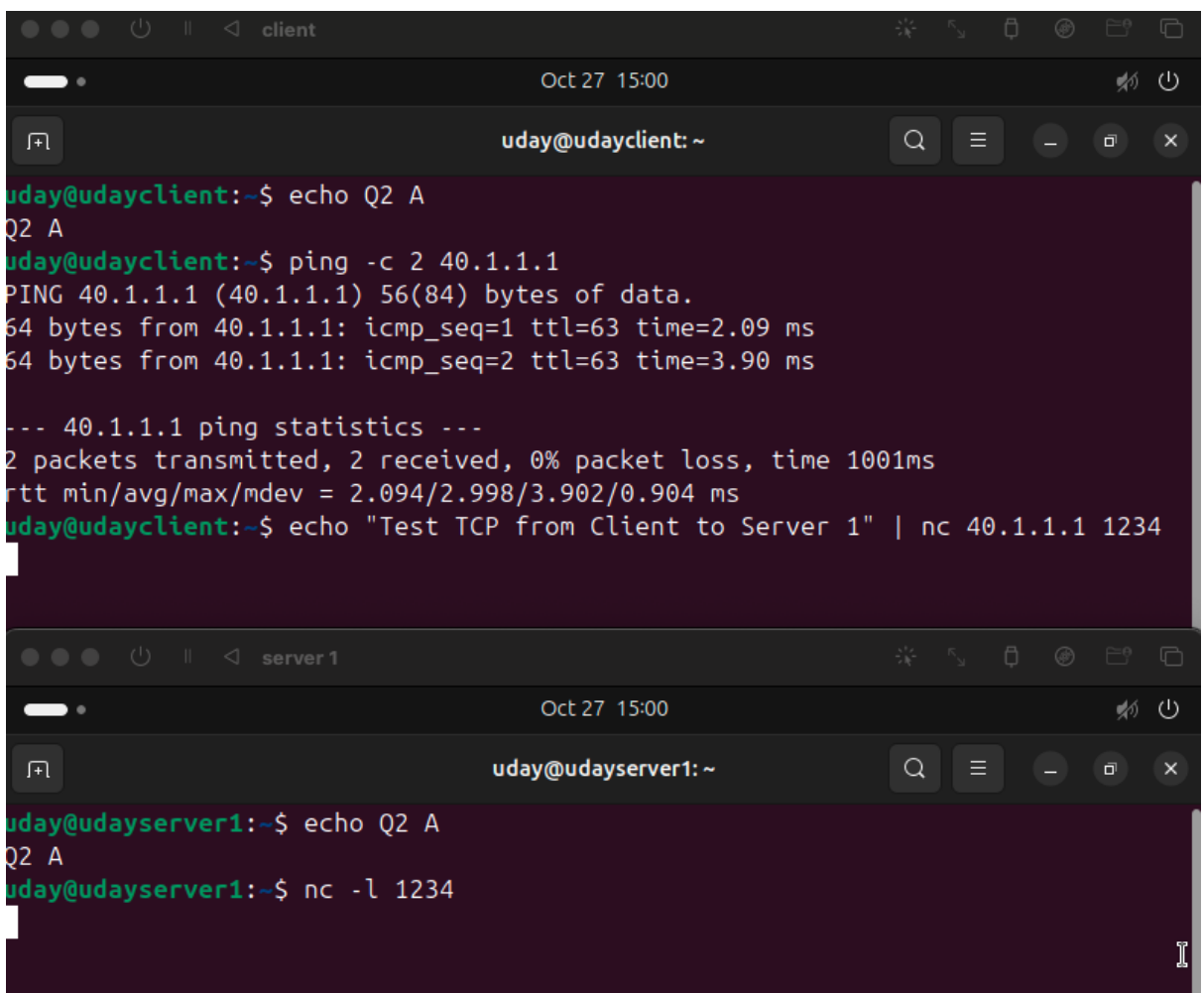


Question 2:

a)



```
gateway
Oct 27 14:59
uday@udaygateway: ~
uday@udaygateway:~$ echo Q2 A
Q2 A
uday@udaygateway:~$ sudo iptables -F
uday@udaygateway:~$ sudo iptables -A FORWARD -d 40.1.1.1 -p icmp -j ACCEPT
uday@udaygateway:~$ sudo iptables -A FORWARD -d 40.1.1.1 -j DROP
uday@udaygateway:~$
```



```
client
Oct 27 15:00
uday@udayclient: ~
uday@udayclient:~$ echo Q2 A
Q2 A
uday@udayclient:~$ ping -c 2 40.1.1.1
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.09 ms
64 bytes from 40.1.1.1: icmp_seq=2 ttl=63 time=3.90 ms

--- 40.1.1.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 2.094/2.998/3.902/0.904 ms
uday@udayclient:~$ echo "Test TCP from Client to Server 1" | nc 40.1.1.1 1234

server 1
Oct 27 15:00
uday@udayserver1: ~
uday@udayserver1:~$ echo Q2 A
Q2 A
uday@udayserver1:~$ nc -l 1234
```

b)

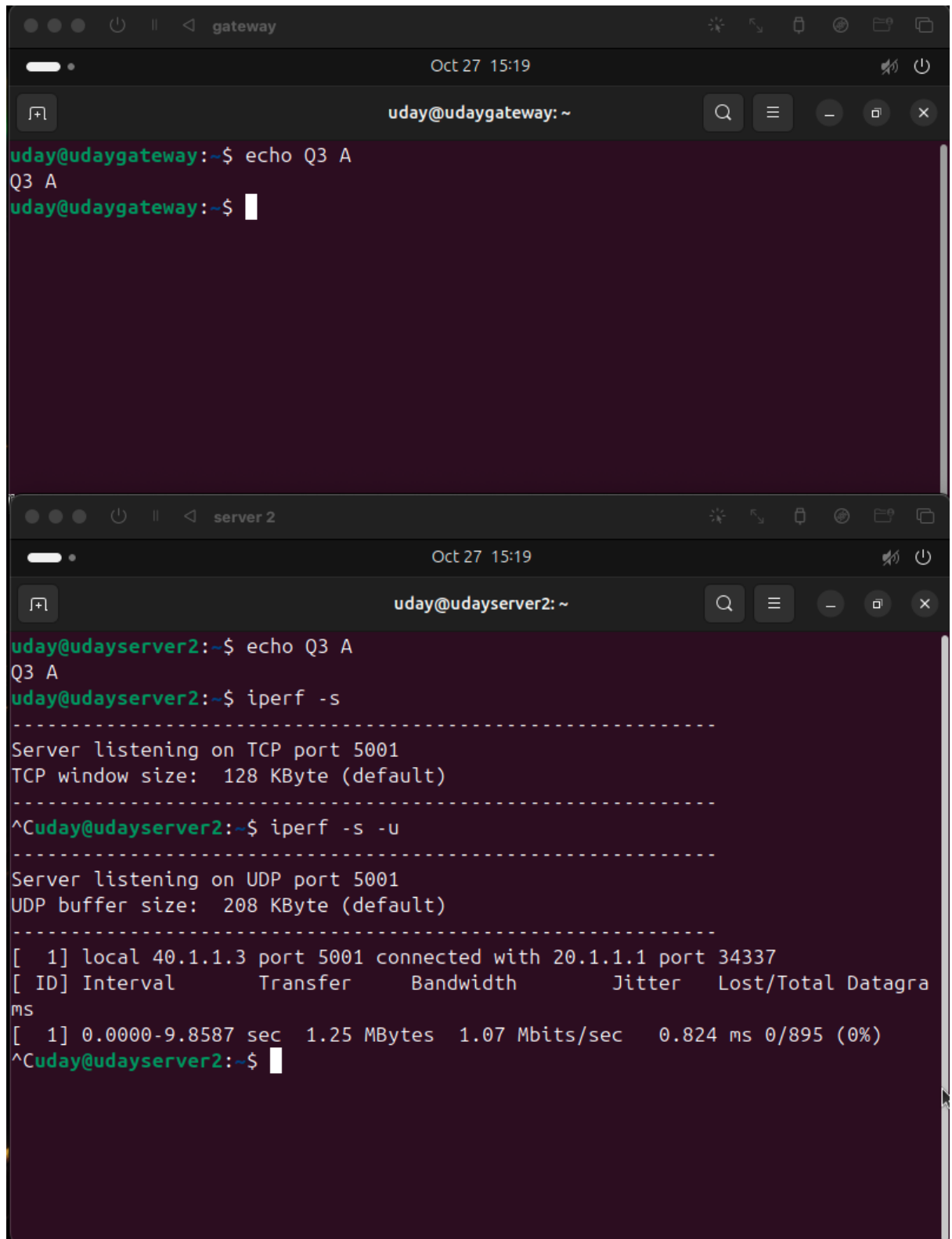
```
gateway
Oct 27 15:02
uday@udaygateway:~
uday@udaygateway:~$ echo Q2 B
Q2 B
uday@udaygateway:~$ sudo iptables -A FORWARD -s 20.1.1.1 -p tcp -j DROP
uday@udaygateway:~$
```

```
client
Oct 27 15:04
uday@udayclient:~
uday@udayclient:~$ echo Q2 B
Q2 B
uday@udayclient:~$ nc -l 1234
Test TCP
```

```
server 1
Oct 27 15:04
uday@udayserver1:~
uday@udayserver1:~$ echo Q2 B
Q2 B
uday@udayserver1:~$ nc 20.1.1.1 1234
```

Question 3:

a)



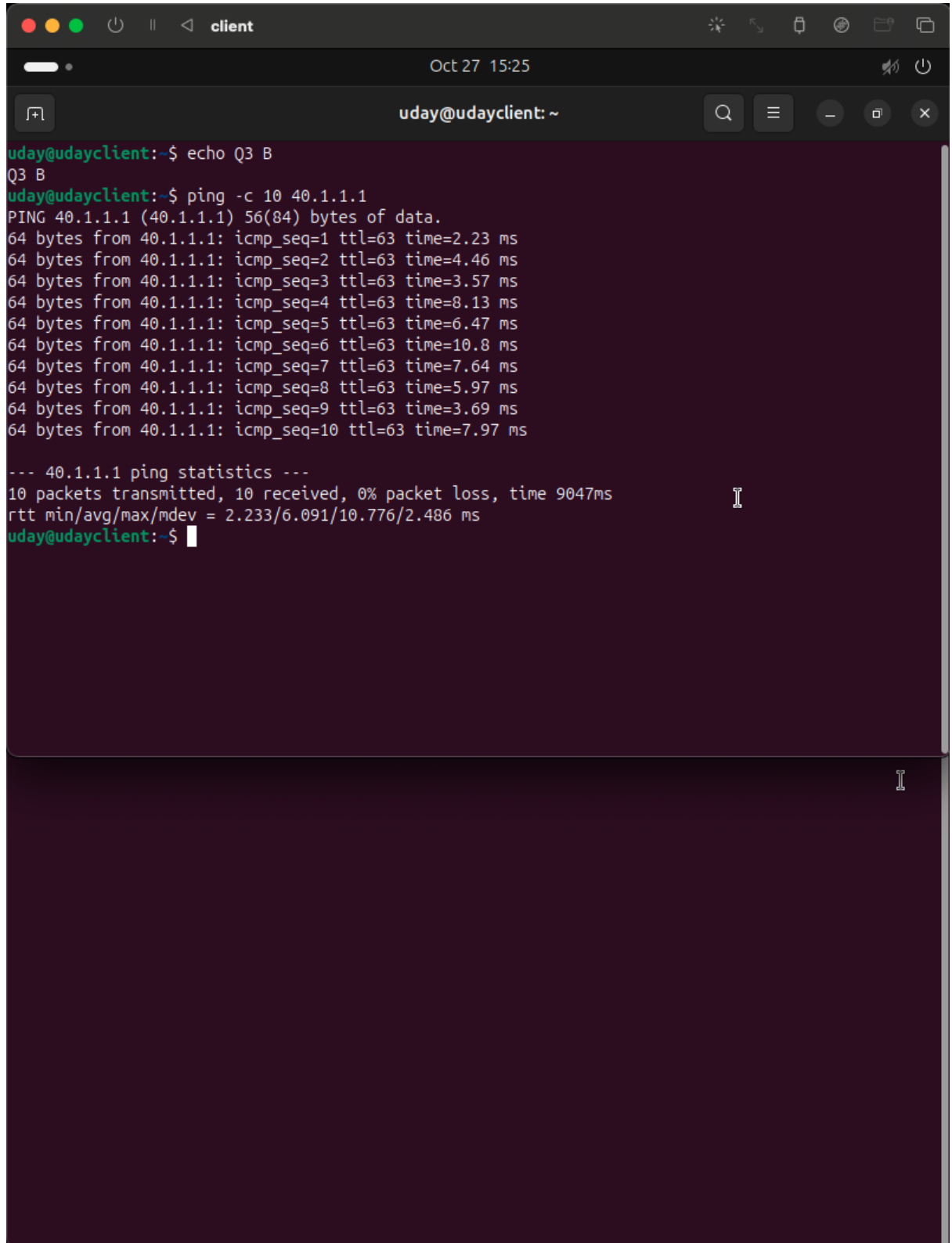
The image shows two terminal windows. The top window, titled 'gateway', shows a user 'uday' at 'udaygateway' running the command 'echo Q3 A', which outputs 'Q3 A'. The bottom window, titled 'server 2', shows a user 'uday' at 'udayserver2' running 'echo Q3 A' (outputting 'Q3 A') and then 'iperf -s'. The 'iperf -s' command starts a server listening on TCP port 5001. After pressing Ctrl+C (indicated by '^C'), the user runs 'iperf -s -u', starting a server listening on UDP port 5001. A client then connects from local 40.1.1.3 port 5001 to 20.1.1.1 port 34337. The output shows a transfer of 1.25 MBytes at 1.07 Mbits/sec with 0.824 ms jitter and 0% loss.

```
gateway
Oct 27 15:19
uday@udaygateway: ~
uday@udaygateway:~$ echo Q3 A
Q3 A
uday@udaygateway:~$

server 2
Oct 27 15:19
uday@udayserver2: ~
uday@udayserver2:~$ echo Q3 A
Q3 A
uday@udayserver2:~$ iperf -s
-----
Server listening on TCP port 5001
TCP window size: 128 KByte (default)
-----
^Cuday@udayserver2:~$ iperf -s -u
-----
Server listening on UDP port 5001
UDP buffer size: 208 KByte (default)
-----
[ 1] local 40.1.1.3 port 5001 connected with 20.1.1.1 port 34337
[ ID] Interval      Transfer    Bandwidth      Jitter    Lost/Total Datagrams
ms
[ 1] 0.0000-9.8587 sec 1.25 MBytes 1.07 Mbits/sec 0.824 ms 0/895 (0%)
^Cuday@udayserver2:~$
```

```
client
Oct 27 15:19
uday@udayclient: ~
uday@udayclient:~$ iperf -c 40.1.1.3
-----
Client connecting to 40.1.1.3, TCP port 5001
TCP window size: 16.0 KByte (default)
-----
^C^Cuday@udayclient:~$ iperf -c 40.1.1.3 -u
-----
Client connecting to 40.1.1.3, UDP port 5001
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size: 208 KByte (default)
-----
[ 1] local 20.1.1.1 port 34337 connected with 40.1.1.3 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 1] 0.0000-10.0167 sec 1.25 MBytes 1.05 Mbits/sec
[ 1] Sent 896 datagrams
[ 1] Server Report:
[ ID] Interval      Transfer    Bandwidth      Jitter    Lost/Total Datagrams
ms
[ 1] 0.0000-9.8587 sec 1.25 MBytes 1.07 Mbits/sec 0.823 ms 0/895 (0%)
uday@udayclient:~$
```

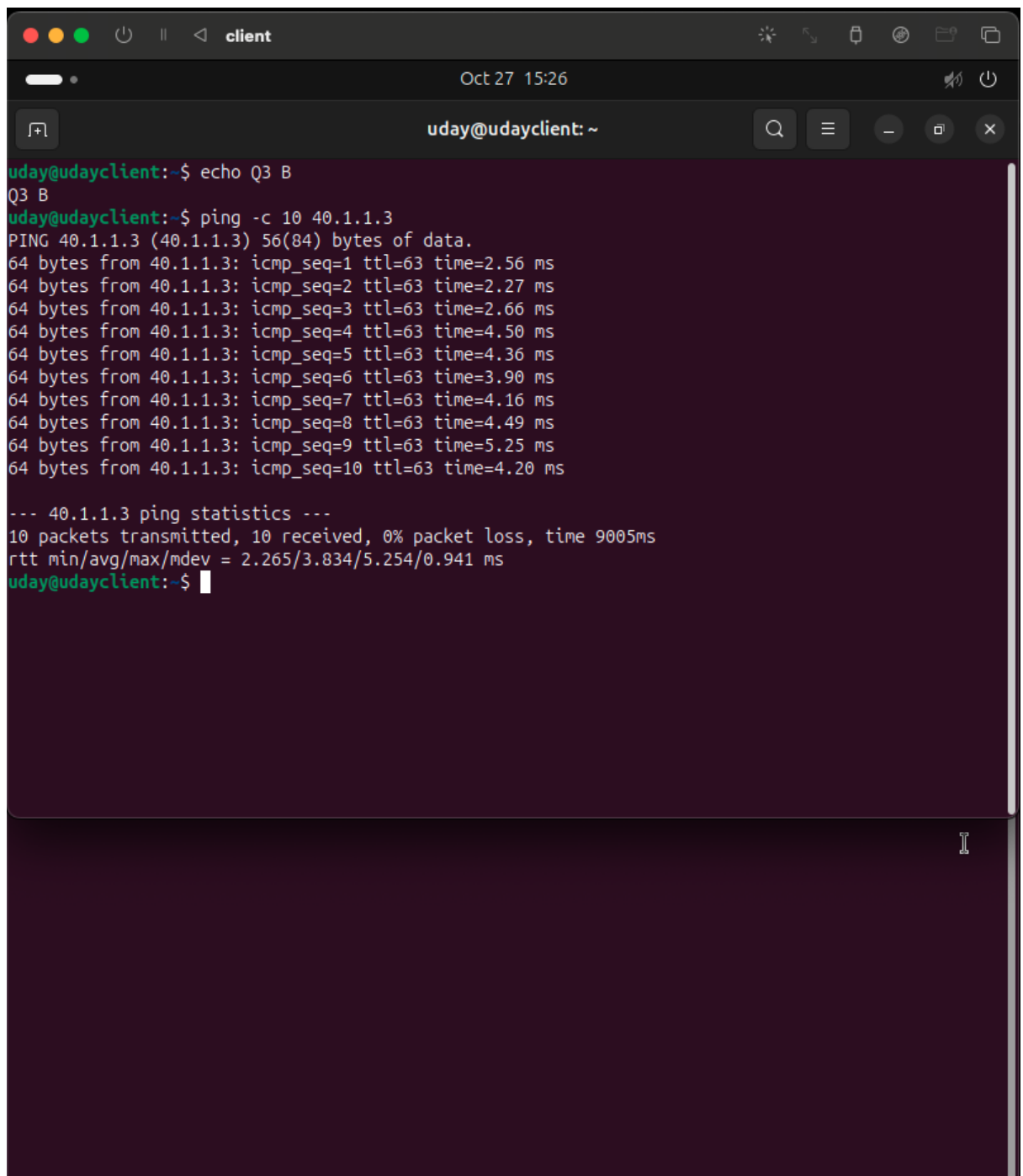
b)



A terminal window titled "client" with a dark background. The window shows a series of commands and their outputs. The first command is "echo Q3 B", which outputs "Q3 B". The second command is "ping -c 10 40.1.1.1", which outputs a series of ping results for 10 packets. The output shows the IP address, the number of bytes, the sequence number, the TTL, and the time taken for each packet. The final line of the ping output is "10 packets transmitted, 10 received, 0% packet loss, time 9047ms". The terminal window has a title bar with standard macOS window controls (red, yellow, green buttons, a power button, and a close button) and a status bar at the bottom showing the date and time "Oct 27 15:25".

```
client
Oct 27 15:25
uday@udayclient: ~
uday@udayclient:~$ echo Q3 B
Q3 B
uday@udayclient:~$ ping -c 10 40.1.1.1
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.23 ms
64 bytes from 40.1.1.1: icmp_seq=2 ttl=63 time=4.46 ms
64 bytes from 40.1.1.1: icmp_seq=3 ttl=63 time=3.57 ms
64 bytes from 40.1.1.1: icmp_seq=4 ttl=63 time=8.13 ms
64 bytes from 40.1.1.1: icmp_seq=5 ttl=63 time=6.47 ms
64 bytes from 40.1.1.1: icmp_seq=6 ttl=63 time=10.8 ms
64 bytes from 40.1.1.1: icmp_seq=7 ttl=63 time=7.64 ms
64 bytes from 40.1.1.1: icmp_seq=8 ttl=63 time=5.97 ms
64 bytes from 40.1.1.1: icmp_seq=9 ttl=63 time=3.69 ms
64 bytes from 40.1.1.1: icmp_seq=10 ttl=63 time=7.97 ms

--- 40.1.1.1 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9047ms
rtt min/avg/max/mdev = 2.233/6.091/10.776/2.486 ms
uday@udayclient:~$
```

A terminal window titled 'client' with a dark background. The window shows a series of commands and their outputs. The first command is 'echo Q3 B', which outputs 'Q3 B'. The second command is 'ping -c 10 40.1.1.3', which outputs a series of ping results for 10 packets. The results show varying round-trip times (RTT) for each packet, ranging from approximately 2.25 ms to 5.25 ms. The final line of the ping output shows the statistics: '10 packets transmitted, 10 received, 0% packet loss, time 9005ms' and 'rtt min/avg/max/mdev = 2.265/3.834/5.254/0.941 ms'. The prompt 'uday@udayclient:~\$' is visible at the end of the output.

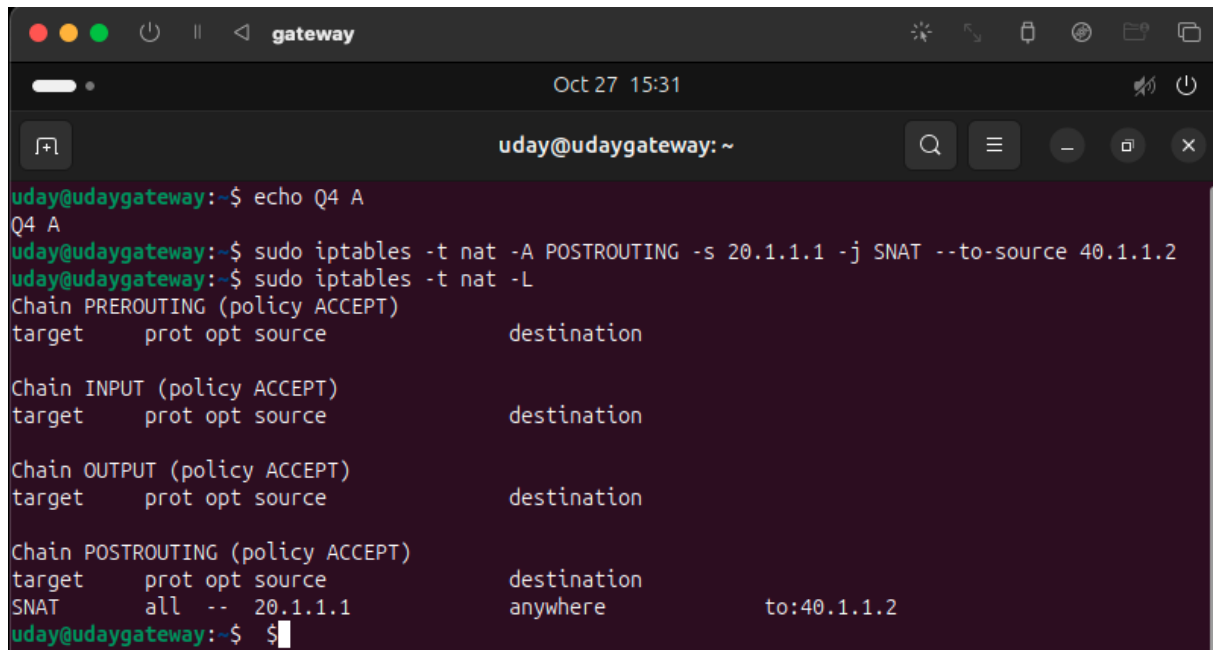
```
uday@udayclient:~$ echo Q3 B
Q3 B
uday@udayclient:~$ ping -c 10 40.1.1.3
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.56 ms
64 bytes from 40.1.1.3: icmp_seq=2 ttl=63 time=2.27 ms
64 bytes from 40.1.1.3: icmp_seq=3 ttl=63 time=2.66 ms
64 bytes from 40.1.1.3: icmp_seq=4 ttl=63 time=4.50 ms
64 bytes from 40.1.1.3: icmp_seq=5 ttl=63 time=4.36 ms
64 bytes from 40.1.1.3: icmp_seq=6 ttl=63 time=3.90 ms
64 bytes from 40.1.1.3: icmp_seq=7 ttl=63 time=4.16 ms
64 bytes from 40.1.1.3: icmp_seq=8 ttl=63 time=4.49 ms
64 bytes from 40.1.1.3: icmp_seq=9 ttl=63 time=5.25 ms
64 bytes from 40.1.1.3: icmp_seq=10 ttl=63 time=4.20 ms

--- 40.1.1.3 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9005ms
rtt min/avg/max/mdev = 2.265/3.834/5.254/0.941 ms
uday@udayclient:~$
```

The second servers RTT is lesser as there are no rules applied in the IP Table for server 2, and server 1 has rules which might be a reason for the more time.

Question 4:

a)



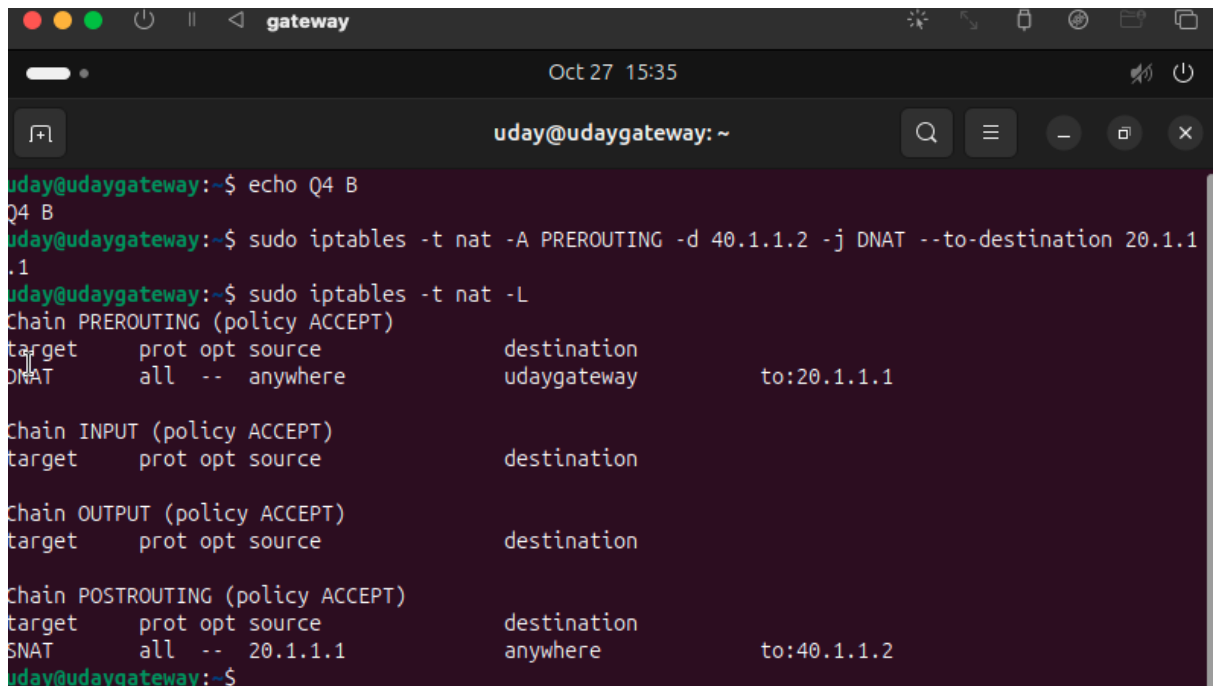
```
gateway
Oct 27 15:31
uday@udaygateway: ~
uday@udaygateway:~$ echo Q4 A
Q4 A
uday@udaygateway:~$ sudo iptables -t nat -A POSTROUTING -s 20.1.1.1 -j SNAT --to-source 40.1.1.2
uday@udaygateway:~$ sudo iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target     prot opt source                destination

Chain INPUT (policy ACCEPT)
target     prot opt source                destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source                destination

Chain POSTROUTING (policy ACCEPT)
target     prot opt source                destination
SNAT       all  --  20.1.1.1              anywhere             to:40.1.1.2
uday@udaygateway:~$
```

b)



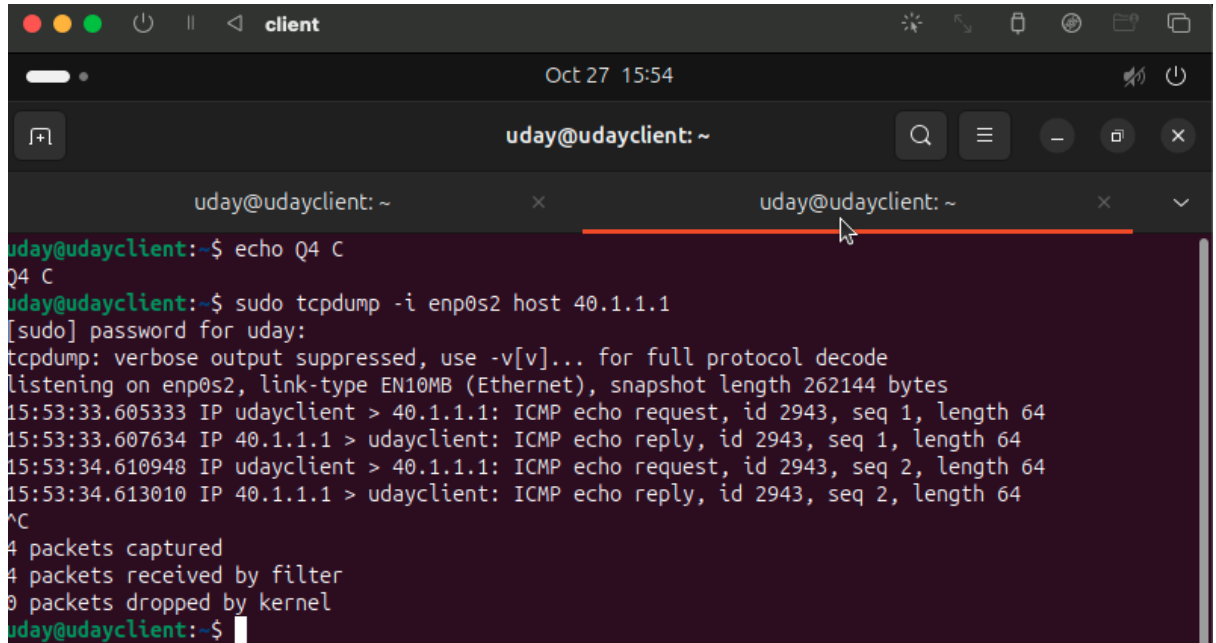
```
gateway
Oct 27 15:35
uday@udaygateway: ~
uday@udaygateway:~$ echo Q4 B
Q4 B
uday@udaygateway:~$ sudo iptables -t nat -A PREROUTING -d 40.1.1.2 -j DNAT --to-destination 20.1.1.1
uday@udaygateway:~$ sudo iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target     prot opt source                destination
DNAT       all  --  anywhere             udaygateway         to:20.1.1.1

Chain INPUT (policy ACCEPT)
target     prot opt source                destination

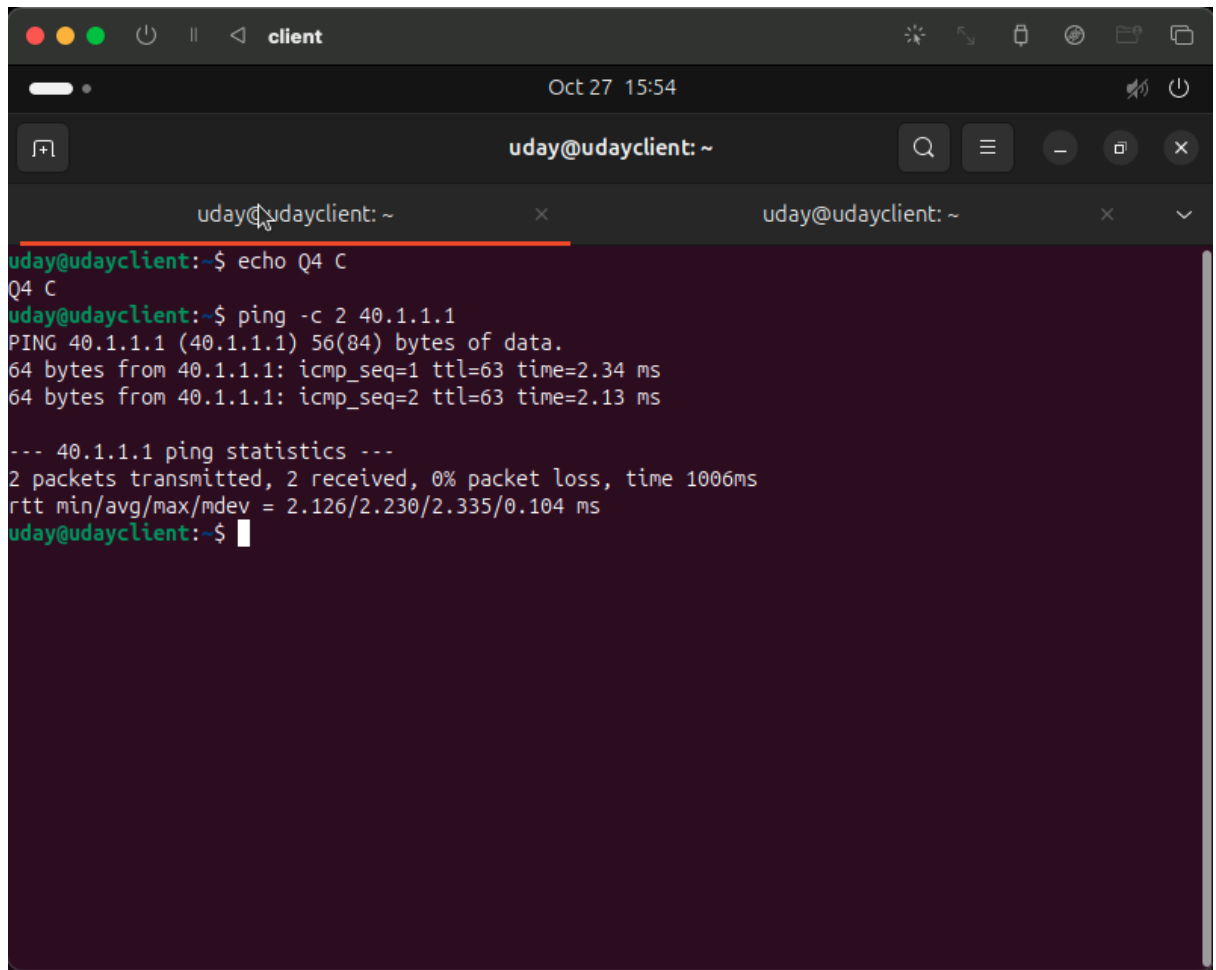
Chain OUTPUT (policy ACCEPT)
target     prot opt source                destination

Chain POSTROUTING (policy ACCEPT)
target     prot opt source                destination
SNAT       all  --  20.1.1.1              anywhere             to:40.1.1.2
uday@udaygateway:~$
```

c)



```
client
Oct 27 15:54
uday@udayclient: ~
uday@udayclient:~$ echo Q4 C
Q4 C
uday@udayclient:~$ sudo tcpdump -i enp0s2 host 40.1.1.1
[sudo] password for uday:
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s2, link-type EN10MB (Ethernet), snapshot length 262144 bytes
15:53:33.605333 IP udayclient > 40.1.1.1: ICMP echo request, id 2943, seq 1, length 64
15:53:34.610948 IP udayclient > 40.1.1.1: ICMP echo request, id 2943, seq 2, length 64
15:53:34.613010 IP 40.1.1.1 > udayclient: ICMP echo reply, id 2943, seq 2, length 64
^C
4 packets captured
4 packets received by filter
0 packets dropped by kernel
uday@udayclient:~$
```



```
client
Oct 27 15:54
uday@udayclient: ~
uday@udayclient:~$ echo Q4 C
Q4 C
uday@udayclient:~$ ping -c 2 40.1.1.1
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data:
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.34 ms
64 bytes from 40.1.1.1: icmp_seq=2 ttl=63 time=2.13 ms

--- 40.1.1.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1006ms
rtt min/avg/max/mdev = 2.126/2.230/2.335/0.104 ms
uday@udayclient:~$
```

```
gateway
Oct 27 16:50
uday@udaygateway: ~
uday@udaygateway:~$ echo Q4 C
Q4 C
uday@udaygateway:~$ sudo tcpdump -i enp0s3 host 40.1.1.2
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), snapshot length 262144 bytes
16:50:21.133860 IP udaygateway > 40.1.1.3: ICMP echo request, id 3290, seq 1, length 64
16:50:21.134991 IP 40.1.1.3 > udaygateway: ICMP echo reply, id 3290, seq 1, length 64
16:50:26.363638 ARP, Request who-has 40.1.1.3 tell udaygateway, length 28
16:50:26.366431 ARP, Reply 40.1.1.3 is-at 5a:6a:d6:bf:b9:9b (oui Unknown), length 28
16:50:26.490245 ARP, Request who-has udaygateway tell 40.1.1.3, length 28
16:50:26.490291 ARP, Reply udaygateway is-at 52:3f:a4:e4:fe:bc (oui Unknown), length 28
^C
6 packets captured
6 packets received by filter
0 packets dropped by kernel
uday@udaygateway:~$

client
Oct 27 16:50
uday@udayclient: ~
uday@udayclient: ~
uday@udayclient:~$ ping -c 1 40.1.1.3
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.27 ms

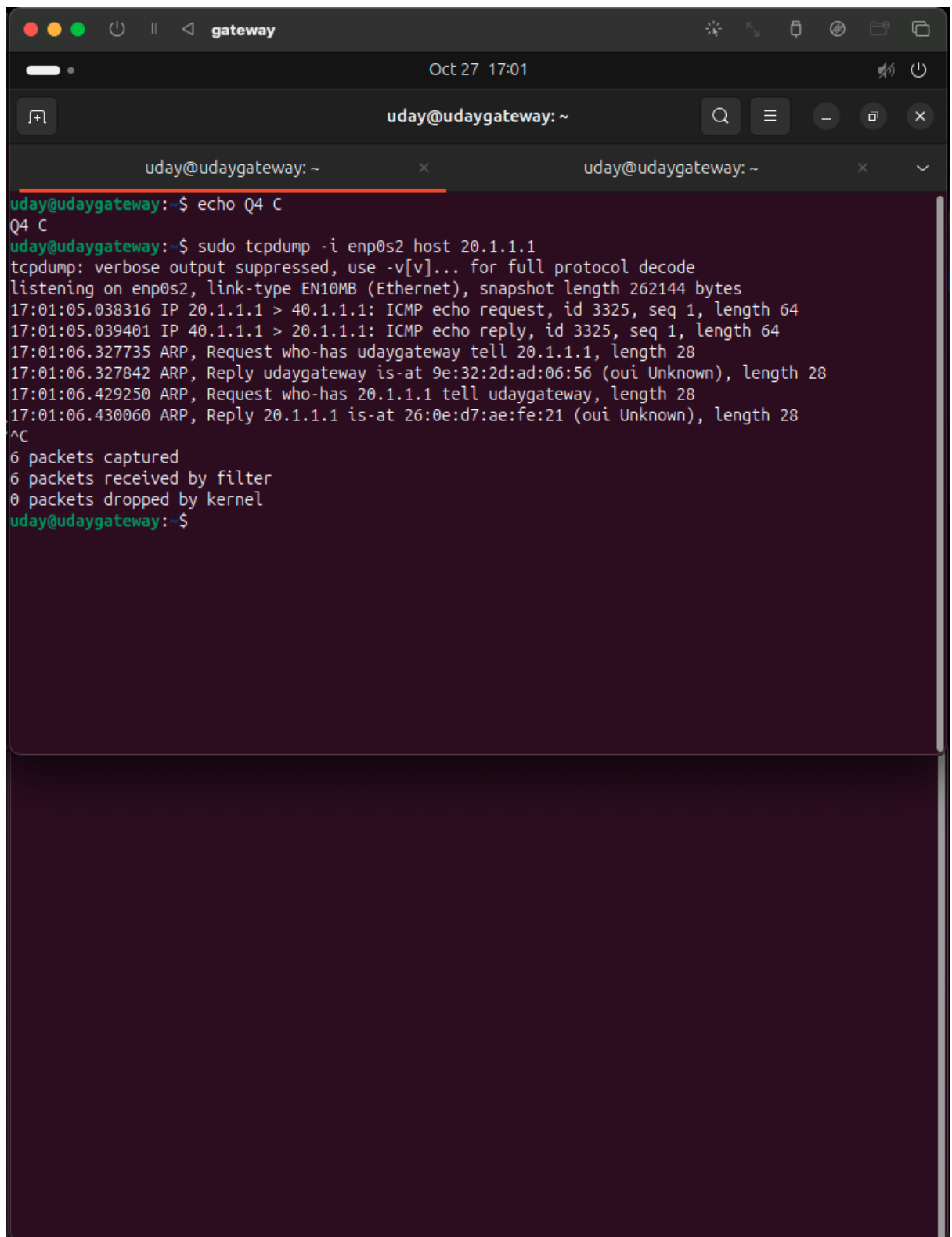
--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.271/2.271/2.271/0.000 ms
uday@udayclient:~$
```

```
client
Oct 27 16:56
uday@udayclient: ~
uday@udayclient:~$ echo Q4 C
Q4 C
uday@udayclient:~$ ping -c 1 40.1.1.1
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=3.35 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 3.346/3.346/3.346/0.000 ms
uday@udayclient:~$

server 1
Oct 27 16:56
uday@udayserver1: ~
uday@udayserver1:~$ echo Q4 C
Q4 C
uday@udayserver1:~$ sudo tcpdump -i enp0s2 host 40.1.1.2
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s2, link-type EN10MB (Ethernet), snapshot length 262144 bytes
16:55:40.924846 IP _gateway > udayserver1: ICMP echo request, id 3316, seq 1, length 64
16:55:40.924914 IP udayserver1 > _gateway: ICMP echo reply, id 3316, seq 1, length 64
16:55:46.092658 ARP, Request who-has _gateway tell udayserver1, length 28
16:55:46.095319 ARP, Reply _gateway is-at 52:3f:a4:e4:fe:bc (oui Unknown), length 28
16:55:46.291182 ARP, Request who-has udayserver1 tell _gateway, length 28
16:55:46.291226 ARP, Reply udayserver1 is-at ea:2c:46:fa:90:c0 (oui Unknown), length 28
^C
6 packets captured
6 packets received by filter
0 packets dropped by kernel
uday@udayserver1:~$
```

```
gateway
Oct 27 16:59
uday@udaygateway: ~
uday@udaygateway:~$ echo Q4 C
Q4 C
uday@udaygateway:~$ sudo tcpdump -i enp0s3 host 40.1.1.2
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), snapshot length 262144 bytes
16:58:40.786496 IP udaygateway > 40.1.1.3: ICMP echo request, id 3881, seq 1, length 64
16:58:40.787462 IP 40.1.1.3 > udaygateway: ICMP echo reply, id 3881, seq 1, length 64
16:58:45.786409 ARP, Request who-has udaygateway tell 40.1.1.3, length 28
16:58:45.786504 ARP, Reply udaygateway is-at 52:3f:a4:e4:fe:bc (oui Unknown), length 28
16:58:46.137632 ARP, Request who-has 40.1.1.3 tell udaygateway, length 28
16:58:46.140333 ARP, Reply 40.1.1.3 is-at 5a:6a:d6:bf:b9:9b (oui Unknown), length 28
^C
6 packets captured
6 packets received by filter
0 packets dropped by kernel
uday@udaygateway:~$
```

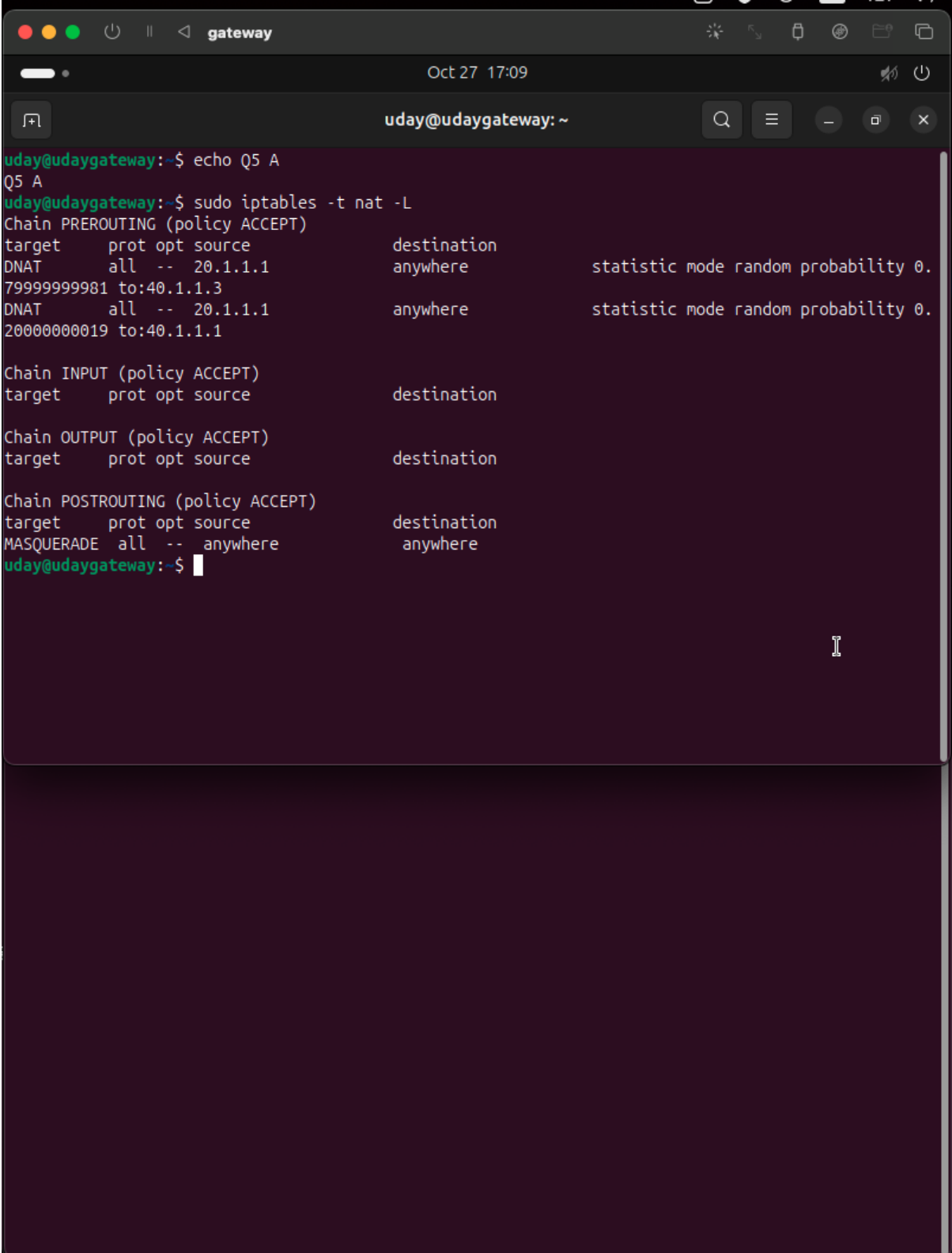


A terminal window titled "gateway" showing a network traffic capture. The user runs "echo Q4 C" and then "sudo tcpdump -i enp0s2 host 20.1.1.1". The output shows six packets: an ICMP echo request from 20.1.1.1 to 40.1.1.1, an ICMP echo reply from 40.1.1.1 to 20.1.1.1, and three ARP requests and replies between 20.1.1.1 and the gateway. The terminal also shows summary statistics: 6 packets captured, 6 received by filter, and 0 dropped by kernel.

```
gateway
Oct 27 17:01
uday@udaygateway: ~
uday@udaygateway:~$ echo Q4 C
Q4 C
uday@udaygateway:~$ sudo tcpdump -i enp0s2 host 20.1.1.1
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s2, link-type EN10MB (Ethernet), snapshot length 262144 bytes
17:01:05.038316 IP 20.1.1.1 > 40.1.1.1: ICMP echo request, id 3325, seq 1, length 64
17:01:05.039401 IP 40.1.1.1 > 20.1.1.1: ICMP echo reply, id 3325, seq 1, length 64
17:01:06.327735 ARP, Request who-has udaygateway tell 20.1.1.1, length 28
17:01:06.327842 ARP, Reply udaygateway is-at 9e:32:2d:ad:06:56 (oui Unknown), length 28
17:01:06.429250 ARP, Request who-has 20.1.1.1 tell udaygateway, length 28
17:01:06.430060 ARP, Reply 20.1.1.1 is-at 26:0e:d7:ae:fe:21 (oui Unknown), length 28
^C
6 packets captured
6 packets received by filter
0 packets dropped by kernel
uday@udaygateway:~$
```

Question 5:

a)

A terminal window titled 'gateway' with a dark background and light text. The window shows the output of the command 'sudo iptables -t nat -L'. The output lists four chains: PREROUTING, INPUT, OUTPUT, and POSTROUTING, each with its policy (ACCEPT) and a table of rules. The PREROUTING chain has two DNAT rules. The INPUT and OUTPUT chains are empty. The POSTROUTING chain has one MASQUERADE rule. The terminal window has a title bar with standard macOS window controls and a status bar at the bottom showing the date and time as 'Oct 27 17:09'.

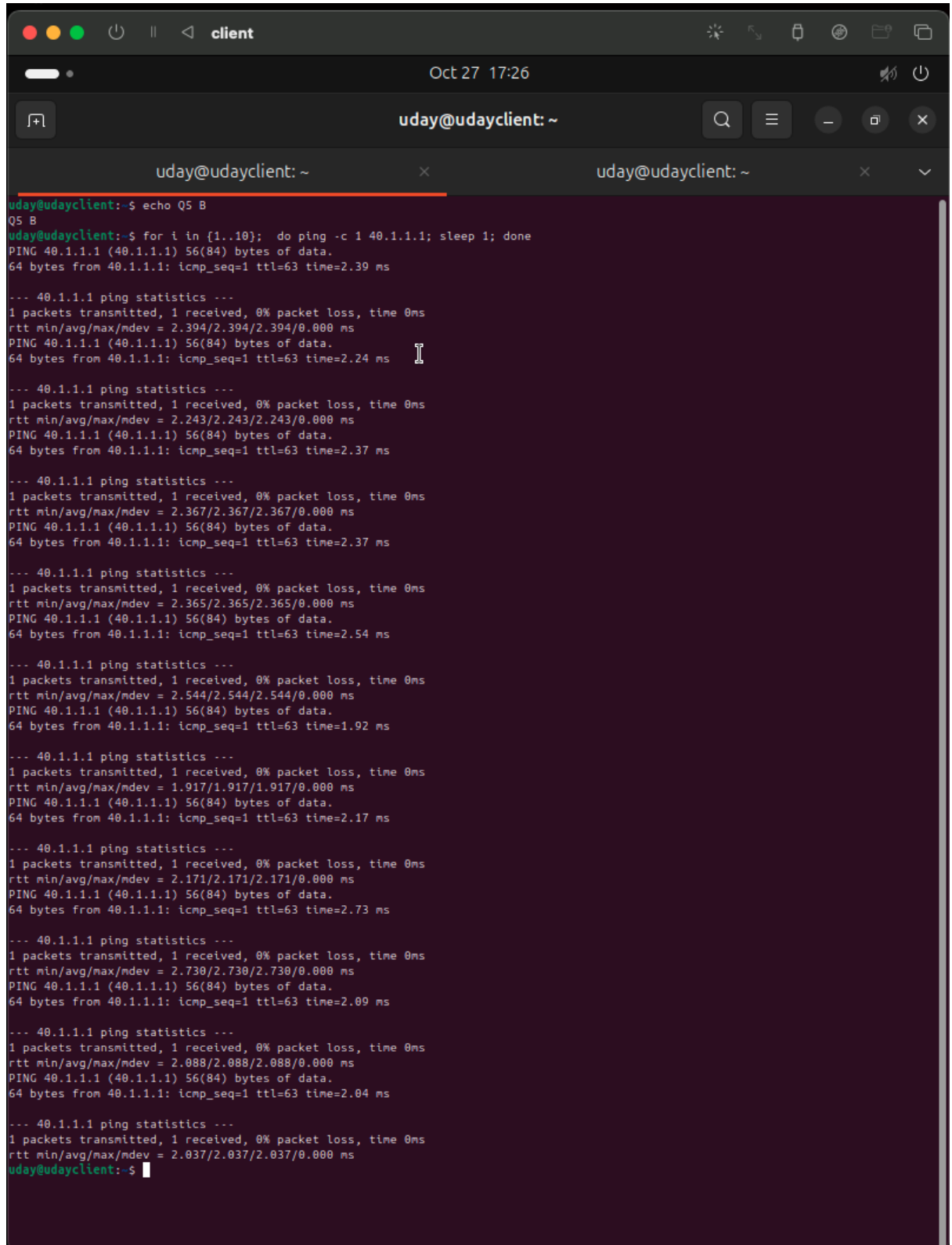
```
gateway
Oct 27 17:09
uday@udaygateway: ~
uday@udaygateway:~$ echo Q5 A
Q5 A
uday@udaygateway:~$ sudo iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target     prot opt source                destination
DNAT       all  --  20.1.1.1               anywhere        statistic mode random probability 0.
79999999981 to:40.1.1.3
DNAT       all  --  20.1.1.1               anywhere        statistic mode random probability 0.
20000000019 to:40.1.1.1

Chain INPUT (policy ACCEPT)
target     prot opt source                destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source                destination

Chain POSTROUTING (policy ACCEPT)
target     prot opt source                destination
MASQUERADE all  --  anywhere              anywhere
uday@udaygateway:~$
```

b)



A terminal window titled 'client' showing a script execution. The script pings 40.1.1.1 10 times. The output shows consistent 0% packet loss and stable RTT values around 2.3 ms.

```
uday@udayclient:~$ echo Q5 B
Q5 B
uday@udayclient:~$ for i in {1..10}; do ping -c 1 40.1.1.1; sleep 1; done
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.39 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.394/2.394/2.394/0.000 ms
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.24 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.243/2.243/2.243/0.000 ms
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.37 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.367/2.367/2.367/0.000 ms
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.37 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.365/2.365/2.365/0.000 ms
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.54 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.544/2.544/2.544/0.000 ms
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=1.92 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.917/1.917/1.917/0.000 ms
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.17 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.171/2.171/2.171/0.000 ms
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.73 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.730/2.730/2.730/0.000 ms
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.09 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.088/2.088/2.088/0.000 ms
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp_seq=1 ttl=63 time=2.04 ms

--- 40.1.1.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.037/2.037/2.037/0.000 ms
uday@udayclient:~$
```



```
gateway
Oct 27 17:27
uday@udaygateway: ~
uday@udaygateway: ~$ echo Q5 B
Q5 B
uday@udaygateway: ~$ sudo tcpdump -i enp0s3 host 40.1.1.1
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), snapshot length 262144 bytes
17:20:51.534864 IP 20.1.1.1 > 40.1.1.1: ICMP echo request, id 3470, seq 1, length 64
17:20:51.536212 IP 40.1.1.1 > 20.1.1.1: ICMP echo reply, id 3470, seq 1, length 64
17:20:53.903255 IP 20.1.1.1 > 40.1.1.1: ICMP echo request, id 3480, seq 1, length 64
17:20:53.904147 IP 40.1.1.1 > 20.1.1.1: ICMP echo reply, id 3480, seq 1, length 64
17:20:54.595774 IP 20.1.1.1 > 40.1.1.1: ICMP echo request, id 3482, seq 1, length 64
17:20:54.596901 IP 40.1.1.1 > 20.1.1.1: ICMP echo reply, id 3482, seq 1, length 64
17:20:56.650011 ARP, Request who-has udaygateway tell 40.1.1.1, length 28
17:20:56.650071 ARP, Reply udaygateway is-at 52:3f:a4:e4:fe:bc (oui Unknown), length 28
17:20:56.834211 ARP, Request who-has 40.1.1.1 tell udaygateway, length 28
17:20:56.834878 ARP, Reply 40.1.1.1 is-at ea:2c:46:fa:90:c0 (oui Unknown), length 28
17:20:57.940012 IP 20.1.1.1 > 40.1.1.1: ICMP echo request, id 3496, seq 1, length 64
17:20:57.940844 IP 40.1.1.1 > 20.1.1.1: ICMP echo reply, id 3496, seq 1, length 64
^C
12 packets captured
12 packets received by filter
0 packets dropped by kernel
uday@udaygateway: ~$
```

```
client
Oct 27 17:27
uday@udayclient: ~
uday@udayclient: ~
uday@udayclient:~$ echo Q5 B
Q5 B
uday@udayclient:~$ for i in {1..10}; do ping -c 1 40.1.1.3; sleep 1; done
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.04 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.037/2.037/2.037/0.000 ms
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.06 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.058/2.058/2.058/0.000 ms
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.66 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.656/2.656/2.656/0.000 ms
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.82 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.816/2.816/2.816/0.000 ms
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=8.52 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 8.520/8.520/8.520/0.000 ms
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.18 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.179/2.179/2.179/0.000 ms
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.39 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.393/2.393/2.393/0.000 ms
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.43 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.426/2.426/2.426/0.000 ms
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=3.20 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 3.199/3.199/3.199/0.000 ms
PING 40.1.1.3 (40.1.1.3) 56(84) bytes of data.
64 bytes from 40.1.1.3: icmp_seq=1 ttl=63 time=2.79 ms

--- 40.1.1.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.791/2.791/2.791/0.000 ms
uday@udayclient:~$
```

```
gateway
Oct 27 17:27
uday@udaygateway: ~
uday@udaygateway:~$ echo Q5 B
Q5 B
uday@udaygateway:~$ sudo tcpdump -i enp0s3 host 40.1.1.3
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), snapshot length 262144 bytes
17:20:48.851914 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3460, seq 1, length 64
17:20:48.853040 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3460, seq 1, length 64
17:20:49.512414 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3462, seq 1, length 64
17:20:49.513314 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3462, seq 1, length 64
17:20:49.862575 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3464, seq 1, length 64
17:20:49.863668 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3464, seq 1, length 64
17:20:50.517414 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3466, seq 1, length 64
17:20:50.518329 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3466, seq 1, length 64
17:20:50.872862 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3468, seq 1, length 64
17:20:50.874094 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3468, seq 1, length 64
17:20:51.881362 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3472, seq 1, length 64
17:20:51.882721 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3472, seq 1, length 64
17:20:52.553985 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3474, seq 1, length 64
17:20:52.554909 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3474, seq 1, length 64
17:20:52.891059 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3476, seq 1, length 64
17:20:52.892338 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3476, seq 1, length 64
17:20:53.574298 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3478, seq 1, length 64
17:20:53.576416 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3478, seq 1, length 64
17:20:54.167898 ARP, Request who-has udaygateway tell 40.1.1.3, length 28
17:20:54.167933 ARP, Reply udaygateway is-at 52:3f:a4:e4:fe:bc (oui Unknown), length 28
17:20:54.277402 ARP, Request who-has 40.1.1.3 tell udaygateway, length 28
17:20:54.282696 ARP, Reply 40.1.1.3 is-at 5a:6a:d6:bf:b9:9b (oui Unknown), length 28
17:20:54.913480 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3484, seq 1, length 64
17:20:54.914424 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3484, seq 1, length 64
17:20:55.609788 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3486, seq 1, length 64
17:20:55.610798 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3486, seq 1, length 64
17:20:55.920201 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3488, seq 1, length 64
17:20:55.921467 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3488, seq 1, length 64
17:20:56.626529 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3490, seq 1, length 64
17:20:56.627729 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3490, seq 1, length 64
17:20:56.934914 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3492, seq 1, length 64
17:20:56.935921 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3492, seq 1, length 64
17:20:57.649446 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3494, seq 1, length 64
17:20:57.651178 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3494, seq 1, length 64
17:20:58.665470 IP 20.1.1.1 > 40.1.1.3: ICMP echo request, id 3498, seq 1, length 64
17:20:58.666958 IP 40.1.1.3 > 20.1.1.1: ICMP echo reply, id 3498, seq 1, length 64
^C
36 packets captured
36 packets received by filter
0 packets dropped by kernel
uday@udaygateway:~$
```

As we can see there are 16 requests from server 2 (0.8 probability) whereas 4 from server 1 which is the one with the higher RTT.