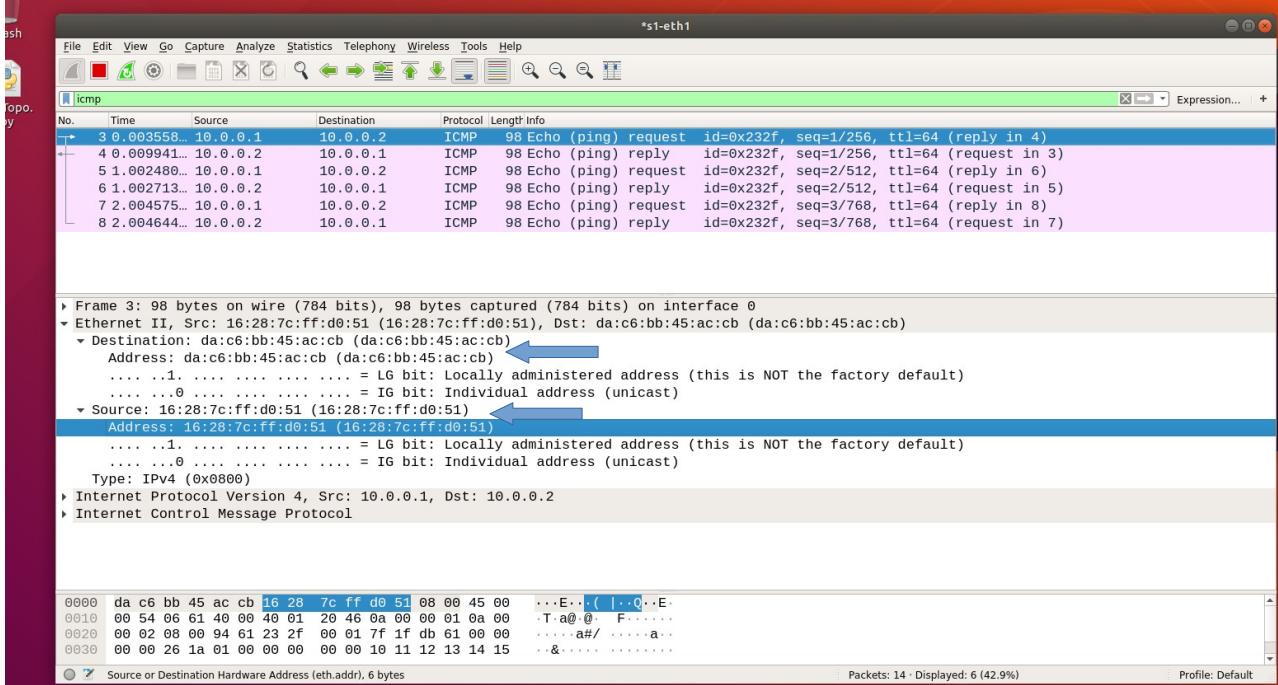


3.1 Answers:

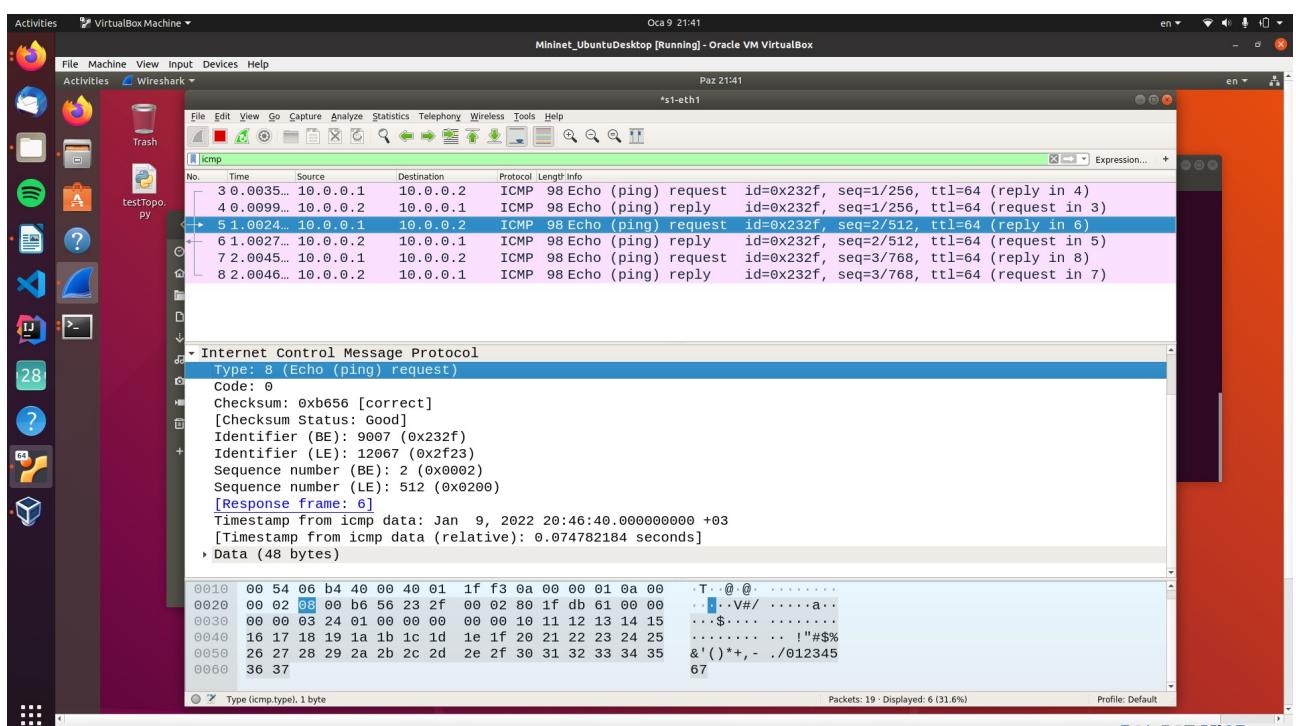
1-) Source IP is 16:28:7c:ff:d0:51 and Destination IP is da:c6:bb:45:ac:cb. Since i looked at the request ping it is the same source and destination. Moreover, looking at the IP addresses we can clearly say IP addresses are IPv6.



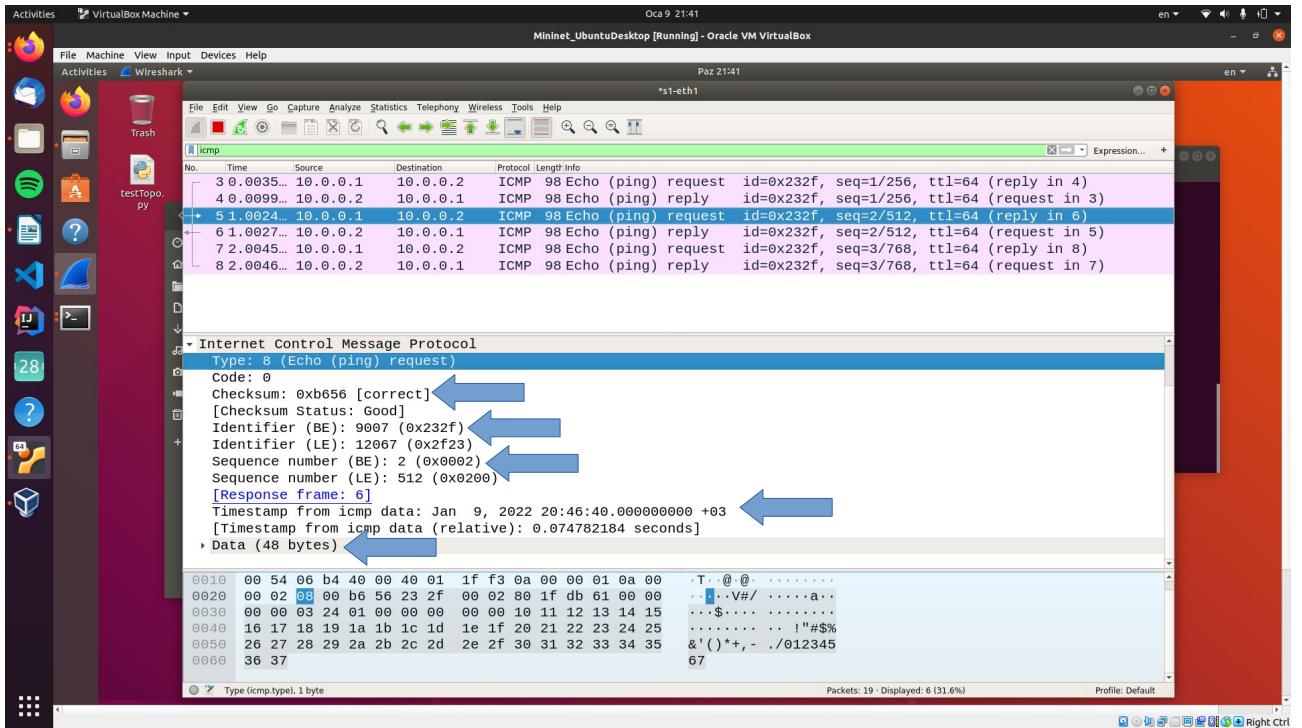
2-) Since we are not in the transport layer, we do not use the port numbers. Port numbers are used for UDP and TCP to reach their messages to the correct socket.

ICMP is in the network layer, thus it does not use the port numbers.

3.1-) Type number is 8 and code number is 0. It means its just the echo message.

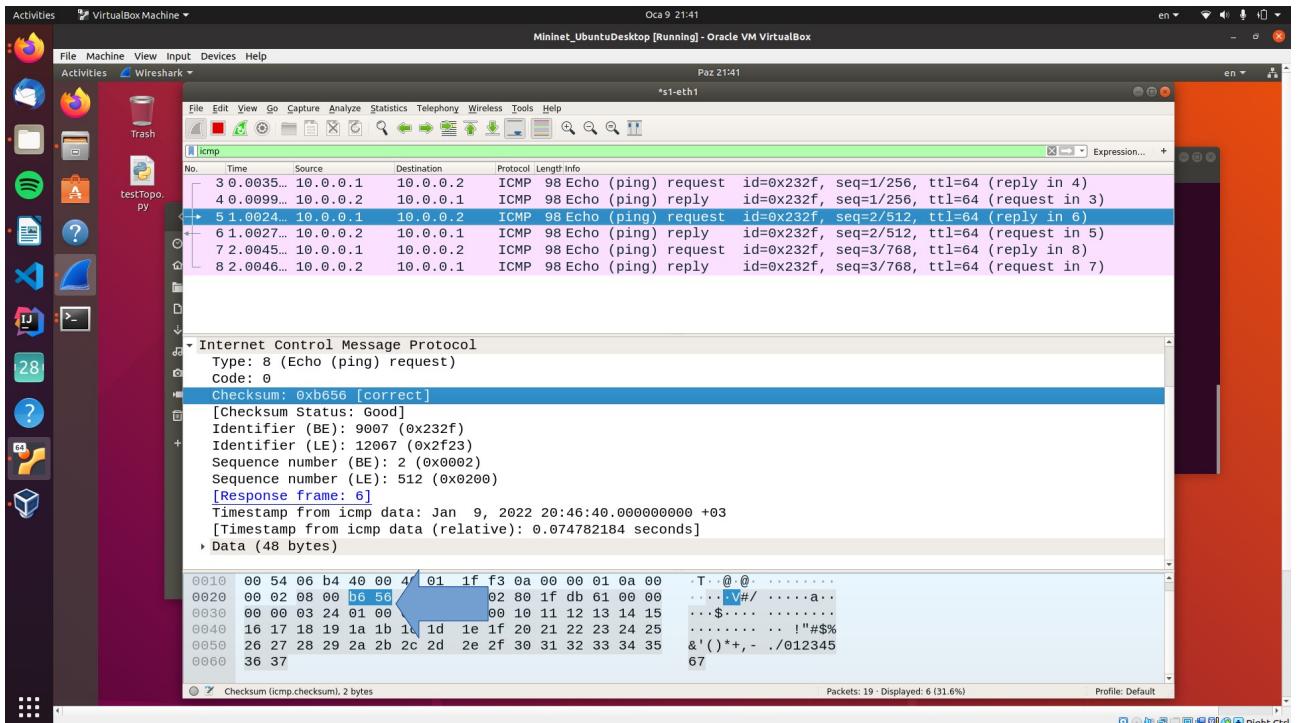


3.2-) There are identifier, checksum, sequence number, timestamp for ICMP data and last is the data itself.

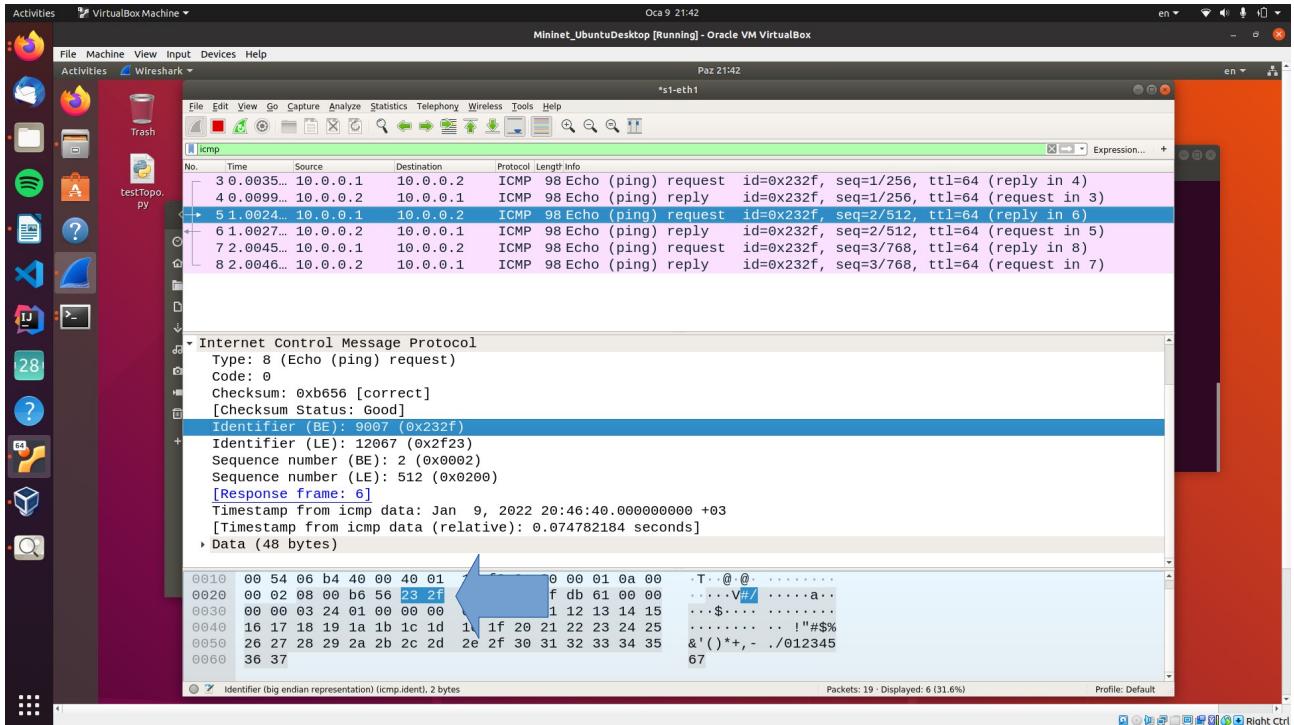


3.3-) 2 bytes for checksum , 2 bytes for identifier, 2 bytes for sequence number.

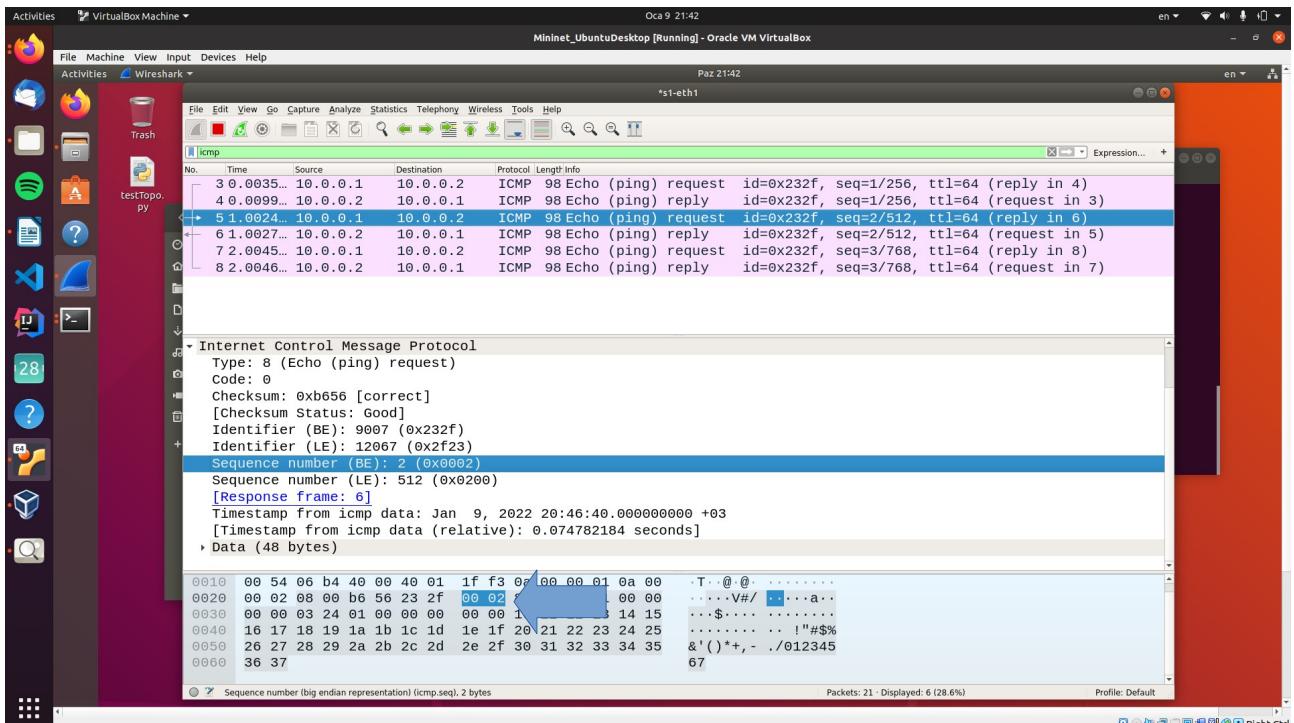
Checksum – 2 bytes :



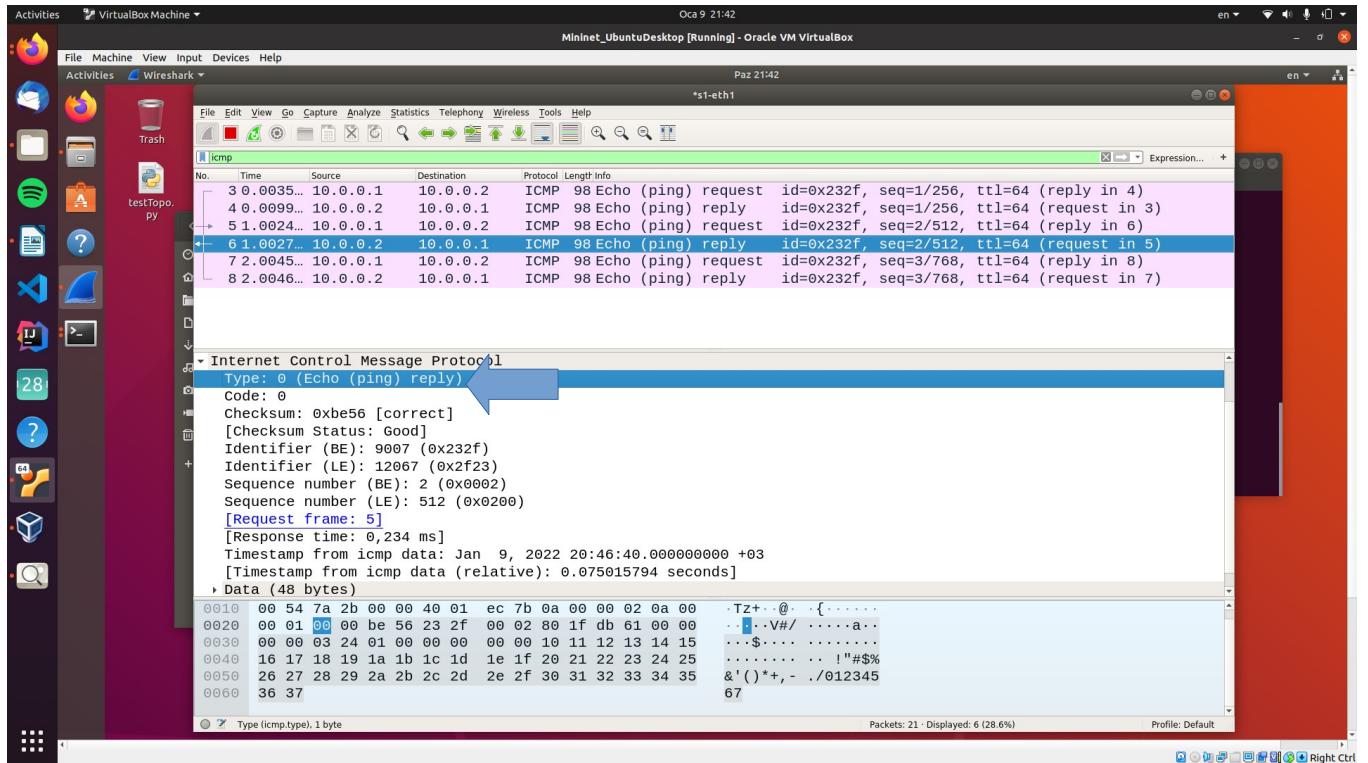
Identifier – 2 bytes :



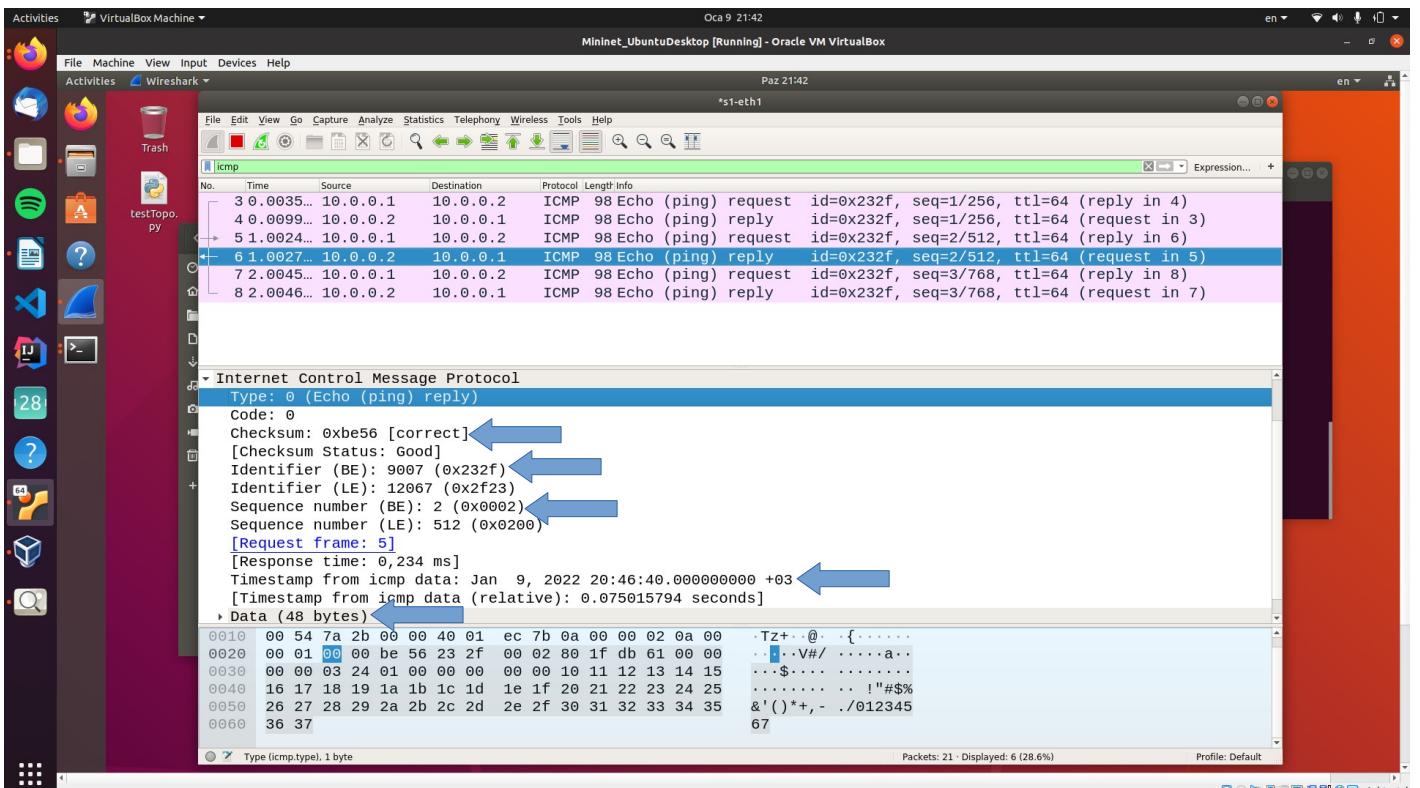
Sequence Number – 2 bytes :



4.1-) Type is 0 and Code is 0. It means echo reply to echo ICMP message type of the request ICMP message.

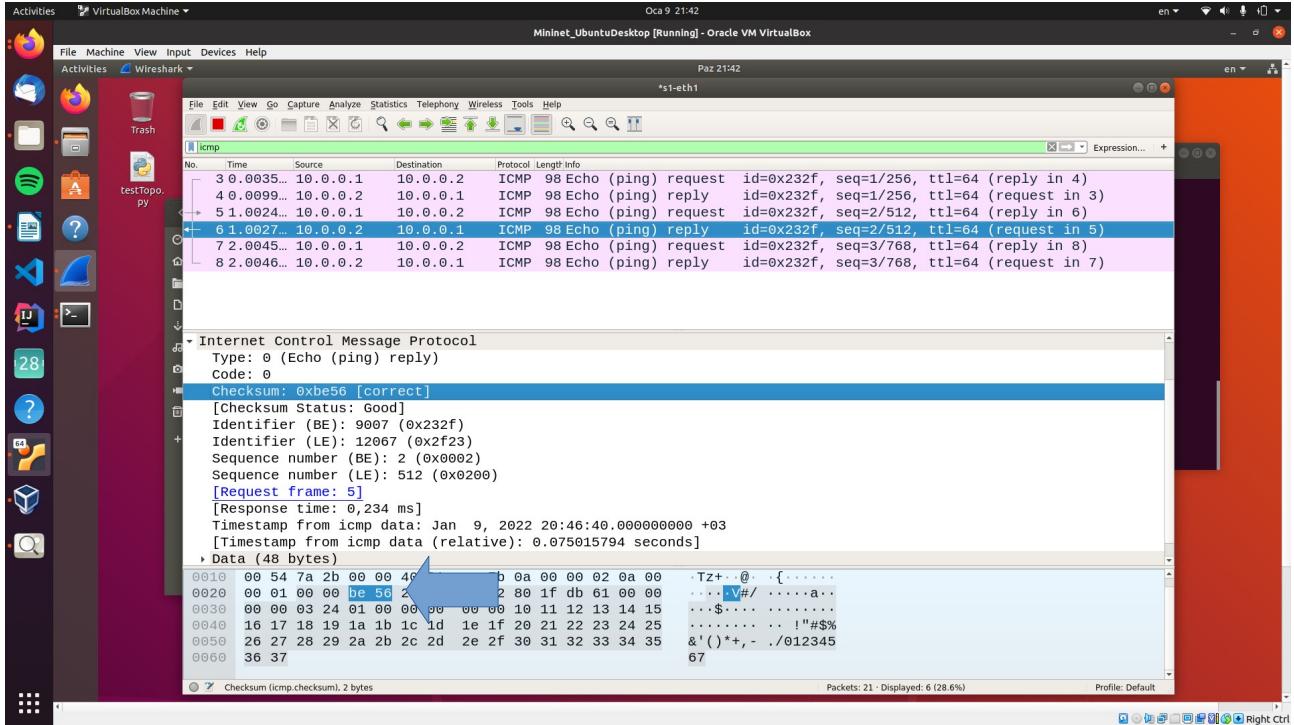


4.2-) It has the same fields as request ICMP message which are identifier, checksum, sequence number, timestamp for ICMP data and last is the data itself. Moreover, ID and the Sequence Number are the same as request ICMP message.

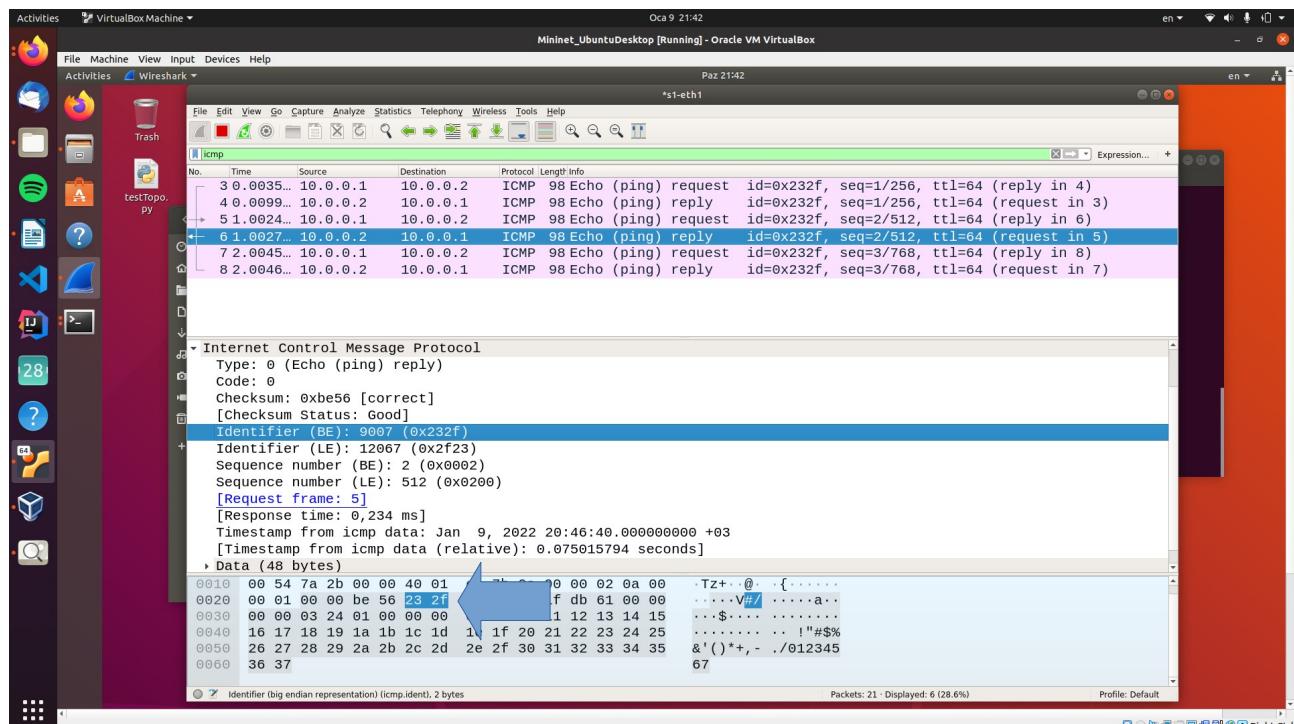


4.3-) It is the same as request ICMP message. 2 bytes for checksum , 2 bytes for identifier, 2 bytes for sequence number.

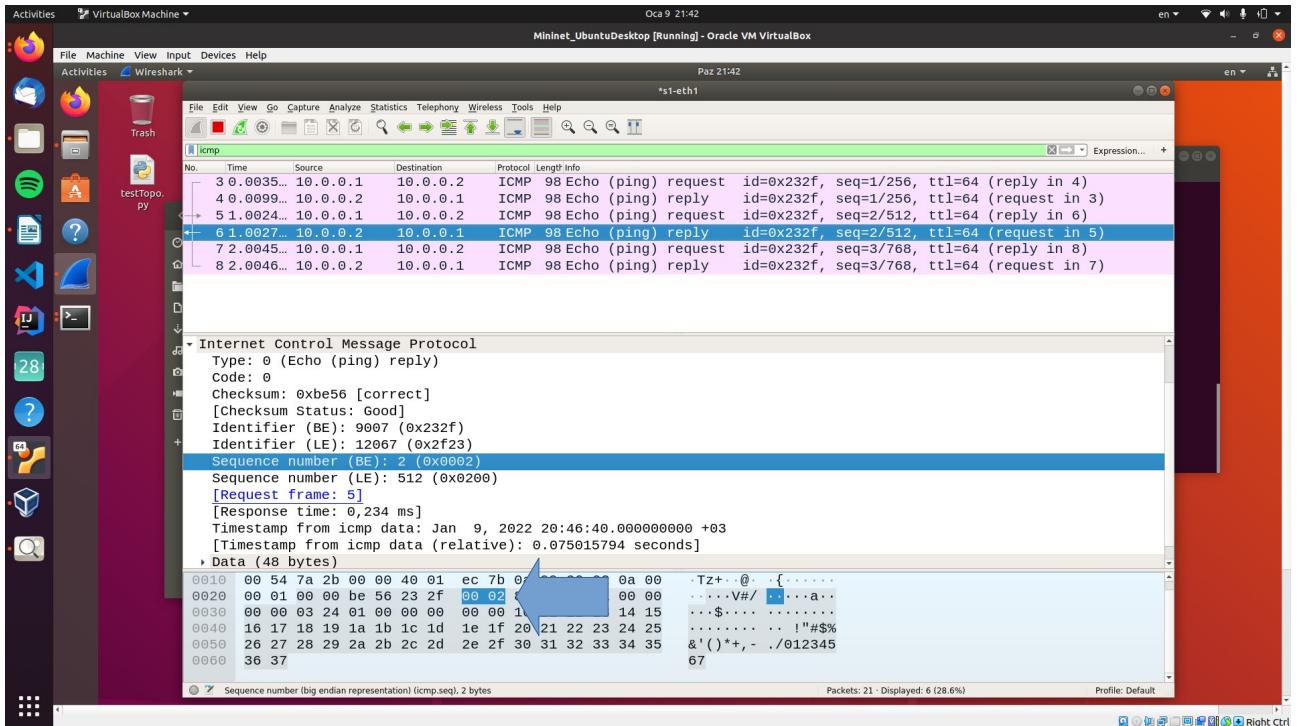
Checksum – 2 bytes :



Identifier – 2 bytes :



Sequence Number – 2 bytes :



4.1 Answers :

1-)

The screenshot shows a terminal window titled "Mininet_UbuntuDesktop 1 [Running] - Oracle VM VirtualBox". The terminal output is as follows:

```
Oca 10 00:30
Mininet_UbuntuDesktop 1 [Running] - Oracle VM VirtualBox

Pzt 00:30

mininet@the3: ~/Desktop
File Edit View Search Terminal Help
12, mininet@the3:~/Desktop$ sudo python3 topology.py
12, *** Creating network
12, *** Adding controller
12, *** Adding hosts:
13, alice bob evilCorp ezekiel frank hannah router1 router2 router3
12, *** Adding switches:
11, switch1 switch2 switch3
12, *** Adding links:
13, (alice, switch2) (bob, switch1) (evilCorp, switch3) (ezekiel, switch1) (frank, switch1) (hannah, switch2) (router1, router2)
11, (router1, router3) (router2, router3) (switch1, router1) (switch2, router2) (switch3, router3)
12, *** Configuring hosts
13, alice bob evilCorp ezekiel frank hannah router1 router2 router3
12, *** Starting controller
13, c0
12, *** Starting 3 switches
11, switch1 switch2 switch3 ...
12, *** Starting CLI:
mininet> pingall
13, *** Ping: testing ping reachability
12, alice -> bob evilCorp ezekiel frank hannah router1 router2 router3
12, bob -> alice evilCorp ezekiel frank hannah router1 router2 router3
12, evilCorp -> alice bob ezekiel frank hannah router1 router2 router3
12, ezekiel -> alice bob evilCorp frank hannah router1 router2 router3
12, frank -> alice bob evilCorp ezekiel hannah router1 router2 router3
12, hannah -> alice bob evilCorp ezekiel frank hannah router1 router2 router3
12, router1 -> alice bob evilCorp ezekiel frank hannah router2 router3
12, router2 -> alice bob evilCorp ezekiel frank hannah router1 router3
12, router3 -> alice bob evilCorp ezekiel frank hannah router1 router2
12, *** Results: 0% dropped (72/72 received)
12, mininet> clear
12, *** Unknown command: clear
mininet> 
```

A small window titled "Starting 3 switches" is visible in the bottom right corner of the terminal window.

2-)

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "Mininet_UbuntuDesktop 1 [Running] - Oracle VM VirtualBox". The terminal session is as follows:

```
Oca 10 00:33 en ▾
Mininet_UbuntuDesktop 1 [Running] - Oracle VM VirtualBox

Pzt 00:33

mininet@the3: ~/Desktop
File Edit View Search Terminal Help
c0
*** Starting 3 switches
switch1 switch2 switch3 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
alice -> bob evilCorp ezeikel frank hannah router1 router2 router3
bob -> alice evilCorp ezeikel frank hannah router1 router2 router3
evilCorp -> alice bob ezeikel frank hannah router1 router2 router3
ezeikel -> alice bob evilCorp frank hannah router1 router2 router3
frank -> alice bob evilCorp ezeikel hannah router1 router2 router3
hannah -> alice bob evilCorp ezeikel frank router1 router2 router3
router1 -> alice bob evilCorp ezeikel frank hannah router2 router3
router2 -> alice bob evilCorp ezeikel frank hannah router1 router3
router3 -> alice bob evilCorp ezeikel frank hannah router1 router2
*** Results: 0% dropped (72/72 received)
mininet> clear
*** Unknown command: clear
mininet> ezeikel traceroute hannah
*** Unknown command: ezeikel traceroute hannah
mininet> ezeikel traceroute hannah
bash: traceroute: command not found
mininet> ezeikel traceroute hannah
bash: traceroute: command not found
mininet> ezeikel traceroute hannah
bash: traceroute: command not found
mininet> ezeikel traceroute hannah
traceroute to 10.1.0.201 (10.1.0.201), 64 hops max
 1  10.0.0.1  4,417ms  5,954ms  4,671ms
 2  10.100.0.2  3,583ms  2,379ms  2,779ms
 3  10.1.0.201  3,632ms  1,770ms  1,776ms
mininet>
```

3-)

Oca 10 00:34 en ▾

Mininet_UbuntuDesktop 1 [Running] - Oracle VM VirtualBox

Pzt 00:34

```
mininet@the3: ~/Desktop
File Edit View Search Terminal Help
ezekiel -> alice bob evilCorp frank hannah router1 router2 router3
frank -> alice bob evilCorp ezekiel hannah router1 router2 router3
hannah -> alice bob evilCorp ezekiel frank router1 router2 router3
router1 -> alice bob evilCorp ezekiel frank hannah router2 router3
router2 -> alice bob evilCorp ezekiel frank hannah router1 router3
router3 -> alice bob evilCorp ezekiel frank hannah router1 router2
*** Results: 0% dropped (72/72 received)
mininet> clear
*** Unknown command: clear
mininet> ezeikel traceroute hannah
*** Unknown command: ezeikel traceroute hannah
mininet> ezekiel traceroute hannah
bash: traceroute: command not found
mininet> ezekiel traceroute hannah
bash: traceroute: command not found
mininet> ezekiel traceroute hannah
bash: traceroute: command not found
mininet> ezekiel traceroute hannah
traceroute to 10.1.0.201 (10.1.0.201), 64 hops max
 1  10.0.0.1  4,417ms  5,954ms  4,671ms
 2  10.100.0.2  3,583ms  2,379ms  2,779ms
 3  10.1.0.201  3,632ms  1,770ms  1,776ms
mininet> alice traceroute bob
traceroute to 10.0.0.251 (10.0.0.251), 64 hops max
 1  10.1.0.1  3,548ms  1,791ms  1,076ms
 2  10.100.0.1  2,833ms  1,380ms  1,906ms
 3  10.0.0.251  3,126ms  2,611ms  1,169ms
mininet>
```

4-)

Oca 10 00:34
Mininet_UbuntuDesktop 1 [Running] - Oracle VM VirtualBox
Pzt 00:34

```
mininet@the3: ~/Desktop
File Edit View Search Terminal Help
router3 -> alice bob evilCorp ezeikel frank hannah router1 router2
*** Results: 0% dropped (72/72 received)
mininet> clear
*** Unknown command: clear
mininet> ezeikel traceroute hannah
*** Unknown command: ezeikel traceroute hannah
mininet> ezekiel traceroute hannah
bash: traceroute: command not found
mininet> ezekiel traceroute hannah
bash: traceroute: command not found
mininet> ezekiel traceroute hannah
bash: traceroute: command not found
mininet> ezekiel traceroute hannah
traceroute to 10.1.0.201 (10.1.0.201), 64 hops max
 1  10.0.0.1  4,417ms  5,954ms  4,671ms
 2  10.100.0.2  3,583ms  2,379ms  2,779ms
 3  10.1.0.201  3,632ms  1,770ms  1,776ms
mininet> alice traceroute bob
traceroute to 10.0.0.251 (10.0.0.251), 64 hops max
 1  10.1.0.1  3,548ms  1,791ms  1,076ms
 2  10.100.0.1  2,833ms  1,380ms  1,906ms
 3  10.0.0.251  3,126ms  2,611ms  1,169ms
mininet> frank traceroute evilCorp
traceroute to 10.0.1.101 (10.0.1.101), 64 hops max
 1  10.0.0.1  1,765ms  0,511ms  0,405ms
 2  10.200.0.2  0,929ms  0,815ms  0,905ms
 3  10.0.1.101  2,506ms  1,031ms  0,785ms
mininet>
```

5-)

Oca 10 00:34
Mininet_UbuntuDesktop 1 [Running] - Oracle VM VirtualBox

Pzt 00:34

mininet@the3: ~/Desktop

```
File Edit View Search Terminal Help
*** Unknown command: ezeikel traceroute hannah
mininet> ezeikel traceroute hannah
bash: traceroute: command not found
mininet> ezeikel traceroute hannah
bash: traceroute: command not found
mininet> ezeikel traceroute hannah
bash: traceroute: command not found
mininet> ezeikel traceroute hannah
traceroute to 10.1.0.201 (10.1.0.201), 64 hops max
 1  10.0.0.1  4,417ms  5,954ms  4,671ms
 2  10.100.0.2  3,583ms  2,379ms  2,779ms
 3  10.1.0.201  3,632ms  1,770ms  1,776ms
mininet> alice traceroute bob
traceroute to 10.0.0.251 (10.0.0.251), 64 hops max
 1  10.1.0.1  3,548ms  1,791ms  1,076ms
 2  10.100.0.1  2,833ms  1,380ms  1,906ms
 3  10.0.0.251  3,126ms  2,611ms  1,169ms
mininet> frank traceroute evilCorp
traceroute to 10.0.1.101 (10.0.1.101), 64 hops max
 1  10.0.0.1  1,765ms  0,511ms  0,405ms
 2  10.200.0.2  0,929ms  0,815ms  0,905ms
 3  10.0.1.101  2,506ms  1,031ms  0,785ms
mininet> evilCorp traceroute frank
traceroute to 10.0.0.250 (10.0.0.250), 64 hops max
 1  10.0.1.1  4,882ms  1,197ms  1,034ms
 2  10.200.0.1  3,314ms  2,140ms  4,002ms
 3  10.0.0.250  3,470ms  1,711ms  0,872ms
mininet> |
```

6-)

Oca 10 00:34 en

Mininet_UbuntuDesktop 1 [Running] - Oracle VM VirtualBox

Pzt 00:34

```
mininet@the3: ~/Desktop
File Edit View Search Terminal Help
mininet> ezekiel traceroute hannah
bash: traceroute: command not found
mininet> ezekiel traceroute hannah
traceroute to 10.1.0.201 (10.1.0.201), 64 hops max
 1  10.0.0.1  4,417ms  5,954ms  4,671ms
 2  10.100.0.2  3,583ms  2,379ms  2,779ms
 3  10.1.0.201  3,632ms  1,770ms  1,776ms
mininet> alice traceroute bob
traceroute to 10.0.0.251 (10.0.0.251), 64 hops max
 1  10.1.0.1  3,548ms  1,791ms  1,076ms
 2  10.100.0.1  2,833ms  1,380ms  1,906ms
 3  10.0.0.251  3,126ms  2,611ms  1,169ms
mininet> frank traceroute evilCorp
traceroute to 10.0.1.101 (10.0.1.101), 64 hops max
 1  10.0.0.1  1,765ms  0,511ms  0,405ms
 2  10.200.0.2  0,929ms  0,815ms  0,905ms
 3  10.0.1.101  2,506ms  1,031ms  0,785ms
mininet> evilCorp traceroute frank
traceroute to 10.0.0.250 (10.0.0.250), 64 hops max
 1  10.0.1.1  4,882ms  1,197ms  1,034ms
 2  10.200.0.1  3,314ms  2,140ms  4,002ms
 3  10.0.0.250  3,470ms  1,711ms  0,872ms
mininet> evilCorp traceroute alice
traceroute to 10.1.0.144 (10.1.0.144), 64 hops max
 1  10.0.1.1  1,683ms  2,371ms  0,694ms
 2  10.150.0.1  1,527ms  1,224ms  0,626ms
 3  10.1.0.144  2,147ms  2,074ms  0,900ms
mininet>
```

7-)

Oca 10 00:35 en ▾

Mininet_UbuntuDesktop 1 [Running] - Oracle VM VirtualBox

Pzt 00:35

```
mininet@the3: ~/Desktop
File Edit View Search Terminal Help
 2 10.100.0.2 3,583ms 2,379ms 2,779ms
 3 10.1.0.201 3,632ms 1,770ms 1,776ms
mininet> alice traceroute bob
traceroute to 10.0.0.251 (10.0.0.251), 64 hops max
 1 10.1.0.1 3,548ms 1,791ms 1,076ms
 2 10.100.0.1 2,833ms 1,380ms 1,906ms
 3 10.0.0.251 3,126ms 2,611ms 1,169ms
mininet> frank traceroute evilCorp
traceroute to 10.0.1.101 (10.0.1.101), 64 hops max
 1 10.0.0.1 1,765ms 0,511ms 0,405ms
 2 10.200.0.2 0,929ms 0,815ms 0,905ms
 3 10.0.1.101 2,506ms 1,031ms 0,785ms
mininet> evilCorp traceroute frank
traceroute to 10.0.0.250 (10.0.0.250), 64 hops max
 1 10.0.1.1 4,882ms 1,197ms 1,034ms
 2 10.200.0.1 3,314ms 2,140ms 4,002ms
 3 10.0.0.250 3,470ms 1,711ms 0,872ms
mininet> evilCorp traceroute alice
traceroute to 10.1.0.144 (10.1.0.144), 64 hops max
 1 10.0.1.1 1,683ms 2,371ms 0,694ms
 2 10.150.0.1 1,527ms 1,224ms 0,626ms
 3 10.1.0.144 2,147ms 2,074ms 0,900ms
mininet> hannah traceroute evilCorp
traceroute to 10.0.1.101 (10.0.1.101), 64 hops max
 1 10.1.0.1 4,653ms 1,273ms 1,021ms
 2 10.150.0.2 3,722ms 2,267ms 1,400ms
 3 10.0.1.101 3,838ms 1,748ms 2,808ms
mininet>
```