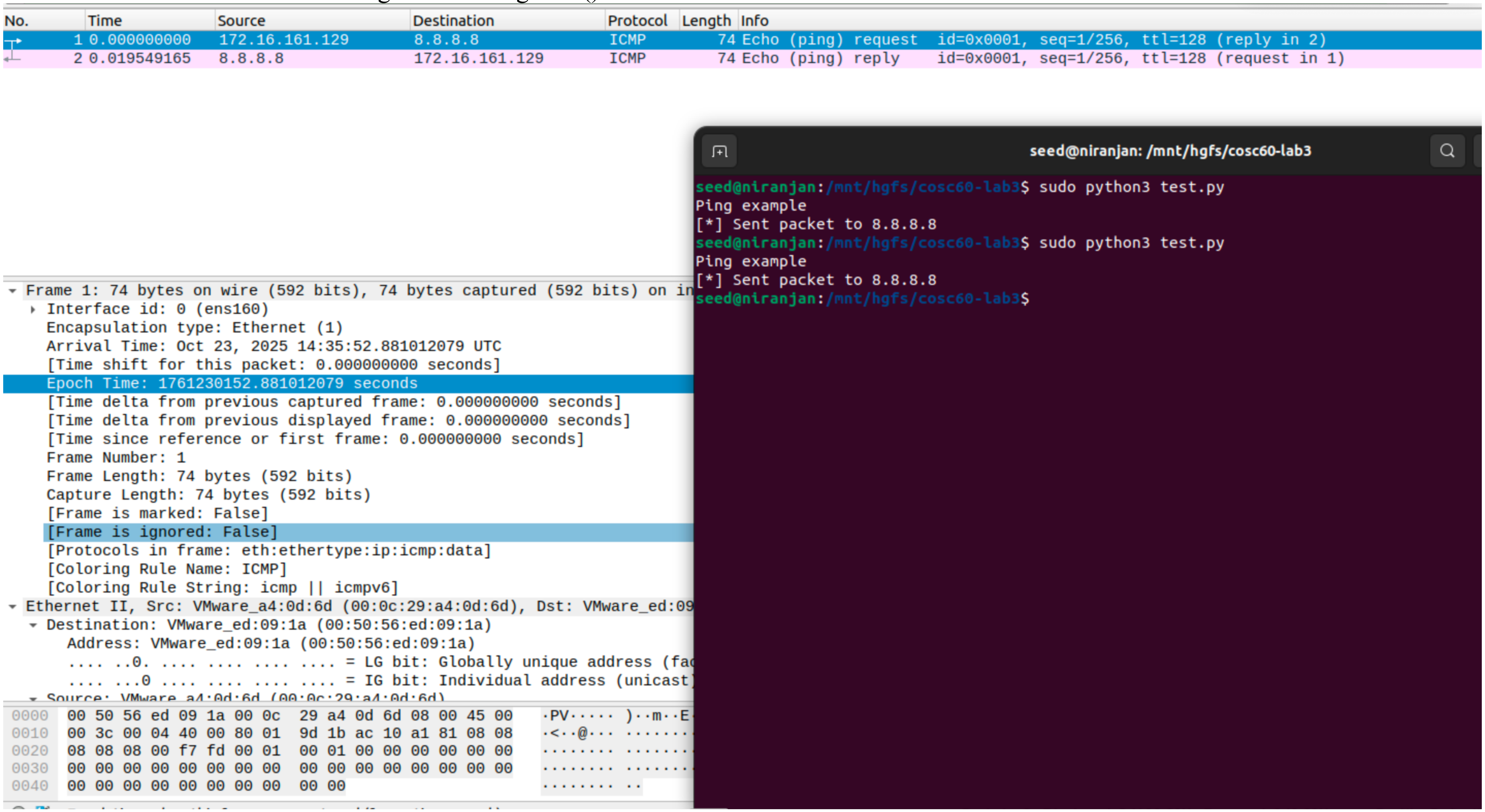
Late Pass (on account of sickness) Used

Wireshark Evidence – ICMP to Google DNS using send()



```
No.   Time          Source            Destination       Protocol  Length  Info
    1 0.000000000   172.16.161.129    8.8.8.8           ICMP         74 Echo (ping) request  id=0x0001, seq=1/256, ttl=128 (reply in 2)
    2 0.019549165   8.8.8.8           172.16.161.129    ICMP         74 Echo (ping) reply    id=0x0001, seq=1/256, ttl=128 (request in 1)
```

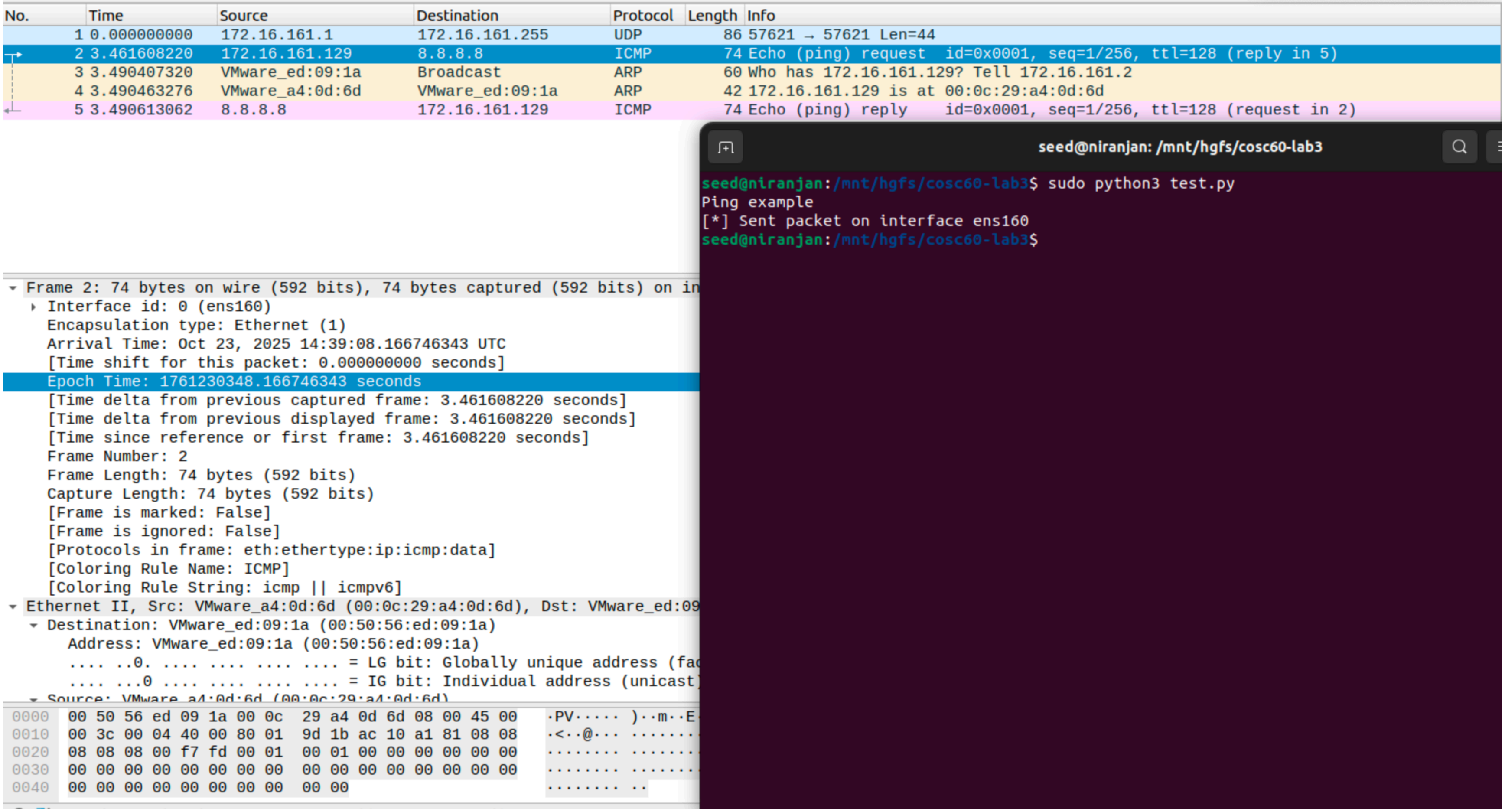
```
▾ Frame 1: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on in
  ▸ Interface id: 0 (ens160)
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 23, 2025 14:35:52.881012079 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1761230152.881012079 seconds
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 74 bytes (592 bits)
    Capture Length: 74 bytes (592 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:icmp:data]
    [Coloring Rule Name: ICMP]
    [Coloring Rule String: icmp || icmpv6]
▾ Ethernet II, Src: VMware_a4:0d:6d (00:0c:29:a4:0d:6d), Dst: VMware_ed:09
  ▾ Destination: VMware_ed:09:1a (00:50:56:ed:09:1a)
      Address: VMware_ed:09:1a (00:50:56:ed:09:1a)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (fac
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  ▾ Source: VMware_a4:0d:6d (00:0c:29:a4:0d:6d)
```

```
0000  00 50 56 ed 09 1a 00 0c  29 a4 0d 6d 08 00 45 00   ·PV····· )··m··E
0010  00 3c 00 04 40 00 80 01  9d 1b ac 10 a1 81 08 08   ·<··@··· ·······
0020  08 08 08 00 f7 fd 00 01  00 01 00 00 00 00 00 00   ········ ·······
0030  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ·······
0040  00 00 00 00 00 00 00 00  00 00                     ········ ··
```

seed@niranjan: /mnt/hgfs/cosc60-lab3

```
seed@niranjan:/mnt/hgfs/cosc60-lab3$ sudo python3 test.py
Ping example
[*] Sent packet to 8.8.8.8
seed@niranjan:/mnt/hgfs/cosc60-lab3$ sudo python3 test.py
Ping example
[*] Sent packet to 8.8.8.8
seed@niranjan:/mnt/hgfs/cosc60-lab3$
```

Wireshark Evidence – ICMP to Google DNS using sendp()



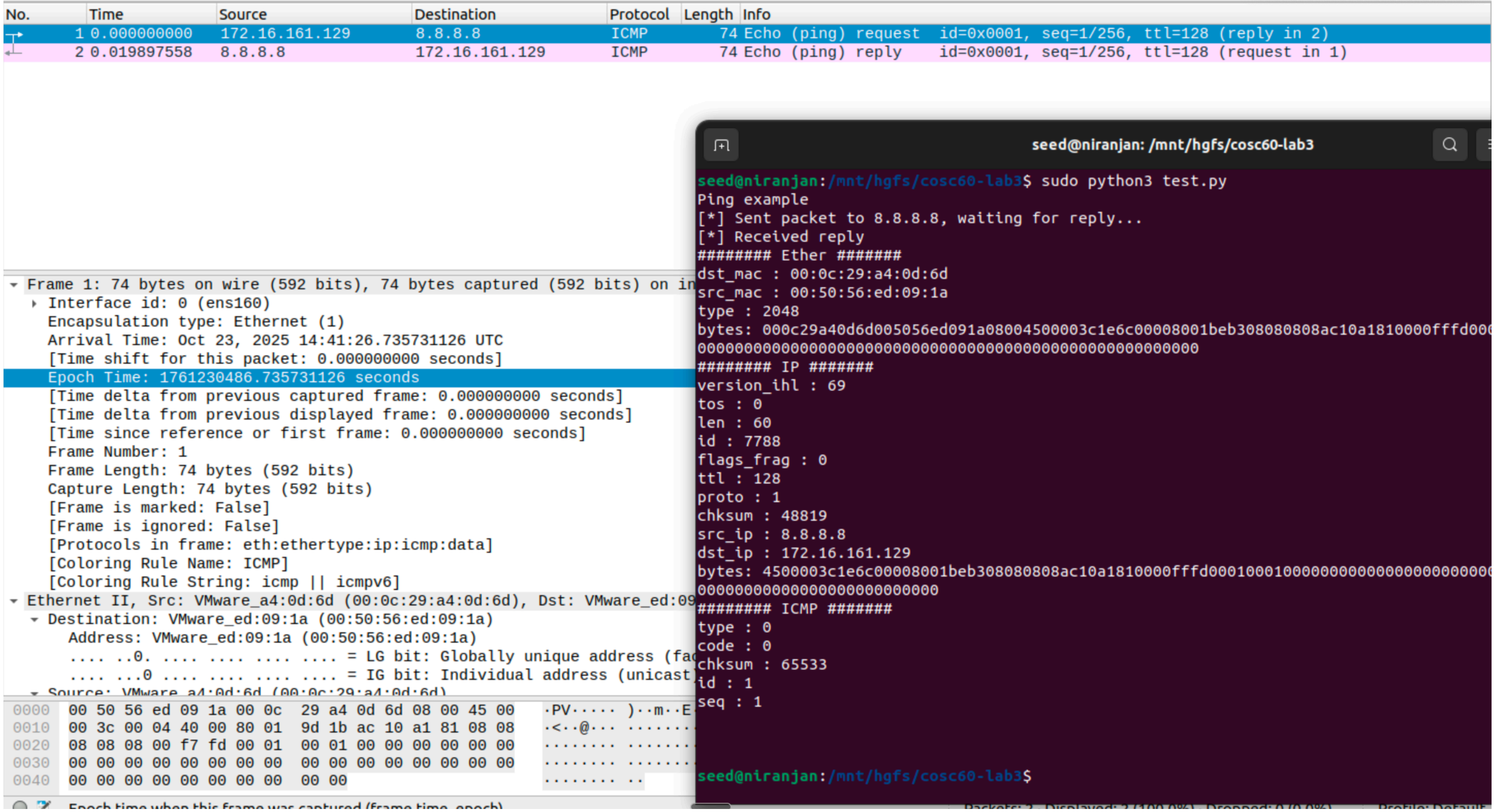
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	172.16.161.1	172.16.161.255	UDP	86	57621 → 57621 Len=44
2	3.461608220	172.16.161.129	8.8.8.8	ICMP	74	Echo (ping) request id=0x0001, seq=1/256, ttl=128 (reply in 5)
3	3.490407320	VMware_ed:09:1a	Broadcast	ARP	60	Who has 172.16.161.129? Tell 172.16.161.2
4	3.490463276	VMware_a4:0d:6d	VMware_ed:09:1a	ARP	42	172.16.161.129 is at 00:0c:29:a4:0d:6d
5	3.490613062	8.8.8.8	172.16.161.129	ICMP	74	Echo (ping) reply id=0x0001, seq=1/256, ttl=128 (request in 2)

```
▾ Frame 2: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on in
  ▸ Interface id: 0 (ens160)
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 23, 2025 14:39:08.166746343 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1761230348.166746343 seconds
    [Time delta from previous captured frame: 3.461608220 seconds]
    [Time delta from previous displayed frame: 3.461608220 seconds]
    [Time since reference or first frame: 3.461608220 seconds]
    Frame Number: 2
    Frame Length: 74 bytes (592 bits)
    Capture Length: 74 bytes (592 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:icmp:data]
    [Coloring Rule Name: ICMP]
    [Coloring Rule String: icmp || icmpv6]
▾ Ethernet II, Src: VMware_a4:0d:6d (00:0c:29:a4:0d:6d), Dst: VMware_ed:09
  ▾ Destination: VMware_ed:09:1a (00:50:56:ed:09:1a)
      Address: VMware_ed:09:1a (00:50:56:ed:09:1a)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (fa
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  ▾ Source: VMware_a4:0d:6d (00:0c:29:a4:0d:6d)
```

```
0000  00 50 56 ed 09 1a 00 0c  29 a4 0d 6d 08 00 45 00   ·PV····· )··m··E
0010  00 3c 00 04 40 00 80 01  9d 1b ac 10 a1 81 08 08   ·<··@··· ·······
0020  08 08 08 00 f7 fd 00 01  00 01 00 00 00 00 00 00   ········ ·······
0030  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ·······
0040  00 00 00 00 00 00 00 00  00 00                     ········ ··
```

```
seed@niranjan:/mnt/hgfs/cosc60-lab3$ sudo python3 test.py
Ping example
[*] Sent packet on interface ens160
seed@niranjan:/mnt/hgfs/cosc60-lab3$
```

Wireshark Evidence – ICMP to Google DNS using sr()



```
No.   Time          Source           Destination      Protocol Length Info
    1 0.000000000   172.16.161.129   8.8.8.8          ICMP         74 Echo (ping) request  id=0x0001, seq=1/256, ttl=128 (reply in 2)
    2 0.019897558   8.8.8.8          172.16.161.129   ICMP         74 Echo (ping) reply    id=0x0001, seq=1/256, ttl=128 (request in 1)
```

```
▾ Frame 1: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on in
  ▸ Interface id: 0 (ens160)
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 23, 2025 14:41:26.735731126 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1761230486.735731126 seconds
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 74 bytes (592 bits)
    Capture Length: 74 bytes (592 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:icmp:data]
    [Coloring Rule Name: ICMP]
    [Coloring Rule String: icmp || icmpv6]
▾ Ethernet II, Src: VMware_a4:0d:6d (00:0c:29:a4:0d:6d), Dst: VMware_ed:09
  ▾ Destination: VMware_ed:09:1a (00:50:56:ed:09:1a)
      Address: VMware_ed:09:1a (00:50:56:ed:09:1a)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (fac
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast
  ▾ Source: VMware_a4:0d:6d (00:0c:29:a4:0d:6d)
```

```
0000  00 50 56 ed 09 1a 00 0c  29 a4 0d 6d 08 00 45 00   ·PV····· )··m··E
0010  00 3c 00 04 40 00 80 01  9d 1b ac 10 a1 81 08 08   ·<··@··· ·······
0020  08 08 08 00 f7 fd 00 01  00 01 00 00 00 00 00 00   ········ ·······
0030  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ·······
0040  00 00 00 00 00 00 00 00  00 00                     ········ ··
```

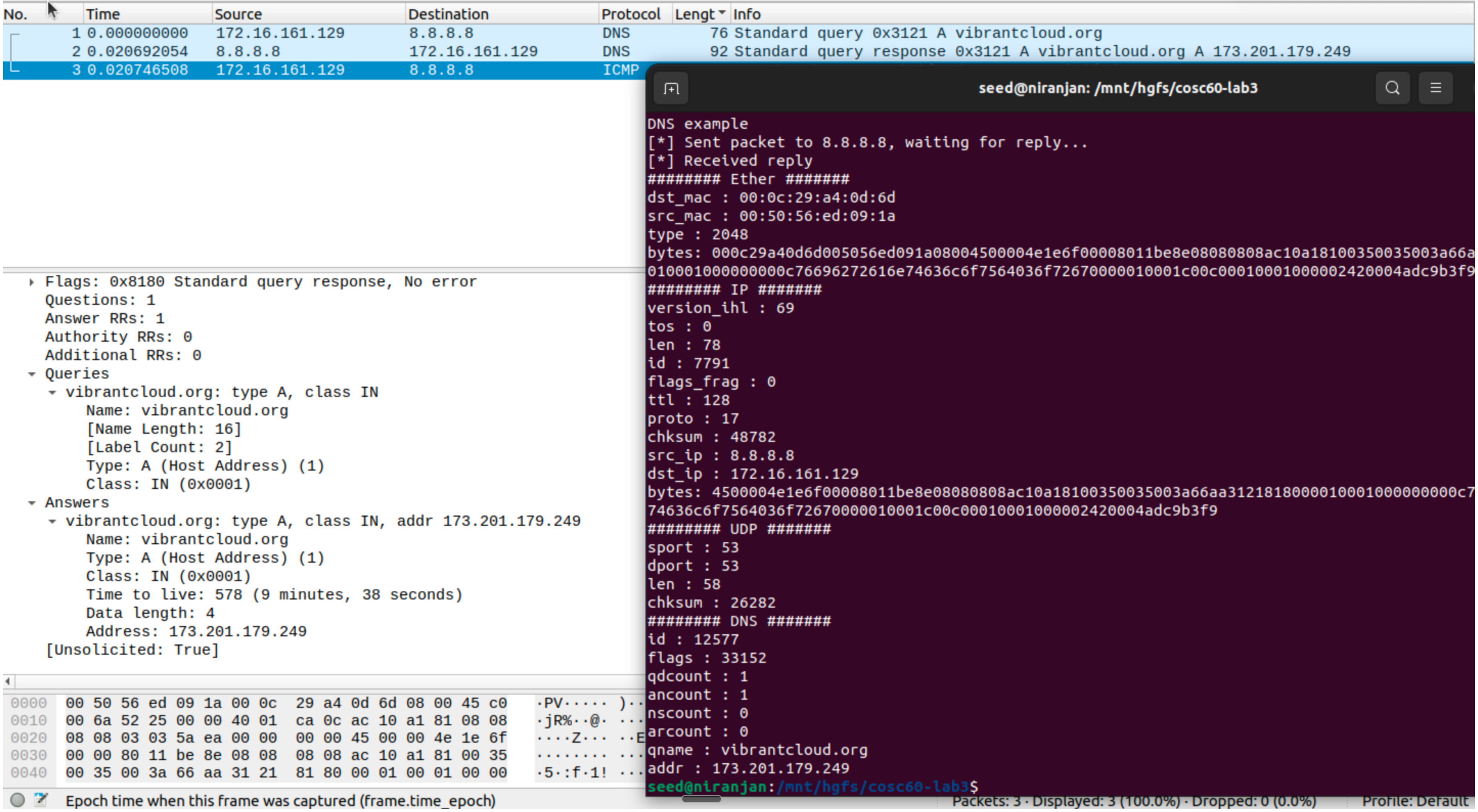
Epoch time when this frame was captured (frame.time_epoch)

Packets: 2 · Displayed: 2 (100.0%) · Dropped: 0 (0.0%) · Profile: Default

```
seed@niranjan:/mnt/hgfs/cosc60-lab3$ sudo python3 test.py
Ping example
[*] Sent packet to 8.8.8.8, waiting for reply...
[*] Received reply
######## Ether #######
dst_mac : 00:0c:29:a4:0d:6d
src_mac : 00:50:56:ed:09:1a
type : 2048
bytes: 000c29a40d6d005056ed091a08004500003c1e6c00008001beb308080808ac10a1810000fffd000
0000000000000000000000000000000000000000000000000000
######## IP #######
version_ihl : 69
tos : 0
len : 60
id : 7788
flags_frag : 0
ttl : 128
proto : 1
chksum : 48819
src_ip : 8.8.8.8
dst_ip : 172.16.161.129
bytes: 4500003c1e6c00008001beb308080808ac10a1810000fffd00010001000000000000000000000000
00000000000000000000000000
######## ICMP #######
type : 0
code : 0
chksum : 65533
id : 1
seq : 1


seed@niranjan:/mnt/hgfs/cosc60-lab3$
```

DNS Request to resolve vibrantcloud.org:



```
No.   Time          Source           Destination      Protocol  Lengt  Info
    1 0.000000000   172.16.161.129   8.8.8.8          DNS          76 Standard query 0x3121 A vibrantcloud.org
    2 0.020692054   8.8.8.8          172.16.161.129   DNS          92 Standard query response 0x3121 A vibrantcloud.org A 173.201.179.249
    3 0.020746508   172.16.161.129   8.8.8.8          ICMP
```

```
 ▸ Flags: 0x8180 Standard query response, No error
   Questions: 1
   Answer RRs: 1
   Authority RRs: 0
   Additional RRs: 0
 ▾ Queries
   ▾ vibrantcloud.org: type A, class IN
       Name: vibrantcloud.org
       [Name Length: 16]
       [Label Count: 2]
       Type: A (Host Address) (1)
       Class: IN (0x0001)
 ▾ Answers
   ▾ vibrantcloud.org: type A, class IN, addr 173.201.179.249
       Name: vibrantcloud.org
       Type: A (Host Address) (1)
       Class: IN (0x0001)
       Time to live: 578 (9 minutes, 38 seconds)
       Data length: 4
       Address: 173.201.179.249
   [Unsolicited: True]
```

```
0000  00 50 56 ed 09 1a 00 0c  29 a4 0d 6d 08 00 45 c0   ·PV····· )··
0010  00 6a 52 25 00 00 40 01  ca 0c ac 10 a1 81 08 08   ·jR%··@· ···
0020  08 08 03 03 5a ea 00 00  00 00 45 00 00 4e 1e 6f   ····Z··· ··E
0030  00 00 80 11 be 8e 08 08  08 08 ac 10 a1 81 00 35   ········ ···
0040  00 35 00 3a 66 aa 31 21  81 80 00 01 00 01 00 00   ·5·:f·1! ···
```

Epoch time when this frame was captured (frame.time_epoch)

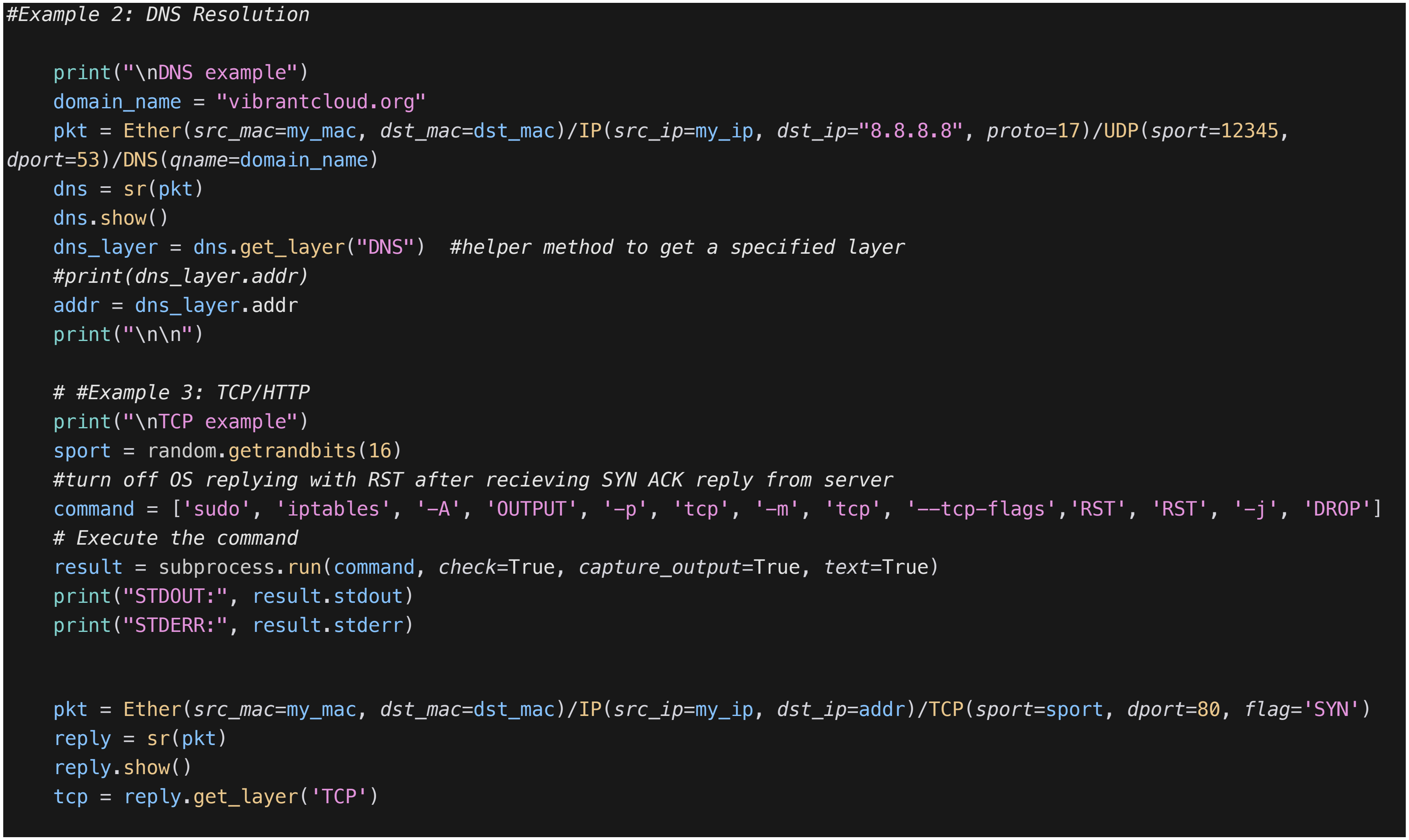
Packets: 3 · Displayed: 3 (100.0%) · Dropped: 0 (0.0%)   Profile: Default

seed@niranjan: /mnt/hgfs/cosc60-lab3

```
DNS example
[*] Sent packet to 8.8.8.8, waiting for reply...
[*] Received reply
######## Ether #######
dst_mac : 00:0c:29:a4:0d:6d
src_mac : 00:50:56:ed:09:1a
type : 2048
bytes: 000c29a40d6d005056ed091a08004500004e1e6f00008011be8e08080808ac10a18100350035003a66a
010001000000000c76696272616e74636c6f7564036f72670000010001c00c000100010000002420004adc9b3f9
######## IP #######
version_ihl : 69
tos : 0
len : 78
id : 7791
flags_frag : 0
ttl : 128
proto : 17
chksum : 48782
src_ip : 8.8.8.8
dst_ip : 172.16.161.129
bytes: 4500004e1e6f00008011be8e08080808ac10a18100350035003a66aa31218180000100010000000000c7
74636c6f7564036f72670000010001c00c000100010000002420004adc9b3f9
######## UDP #######
sport : 53
dport : 53
len : 58
chksum : 26282
######## DNS #######
id : 12577
flags : 33152
qdcount : 1
ancount : 1
nscount : 0
arcount : 0
qname : vibrantcloud.org
addr : 173.201.179.249
seed@niranjan:/mnt/hgfs/cosc60-lab3$
```

Evidence for Making TCP/HTTP request to vibrantcloud.org

CODE:

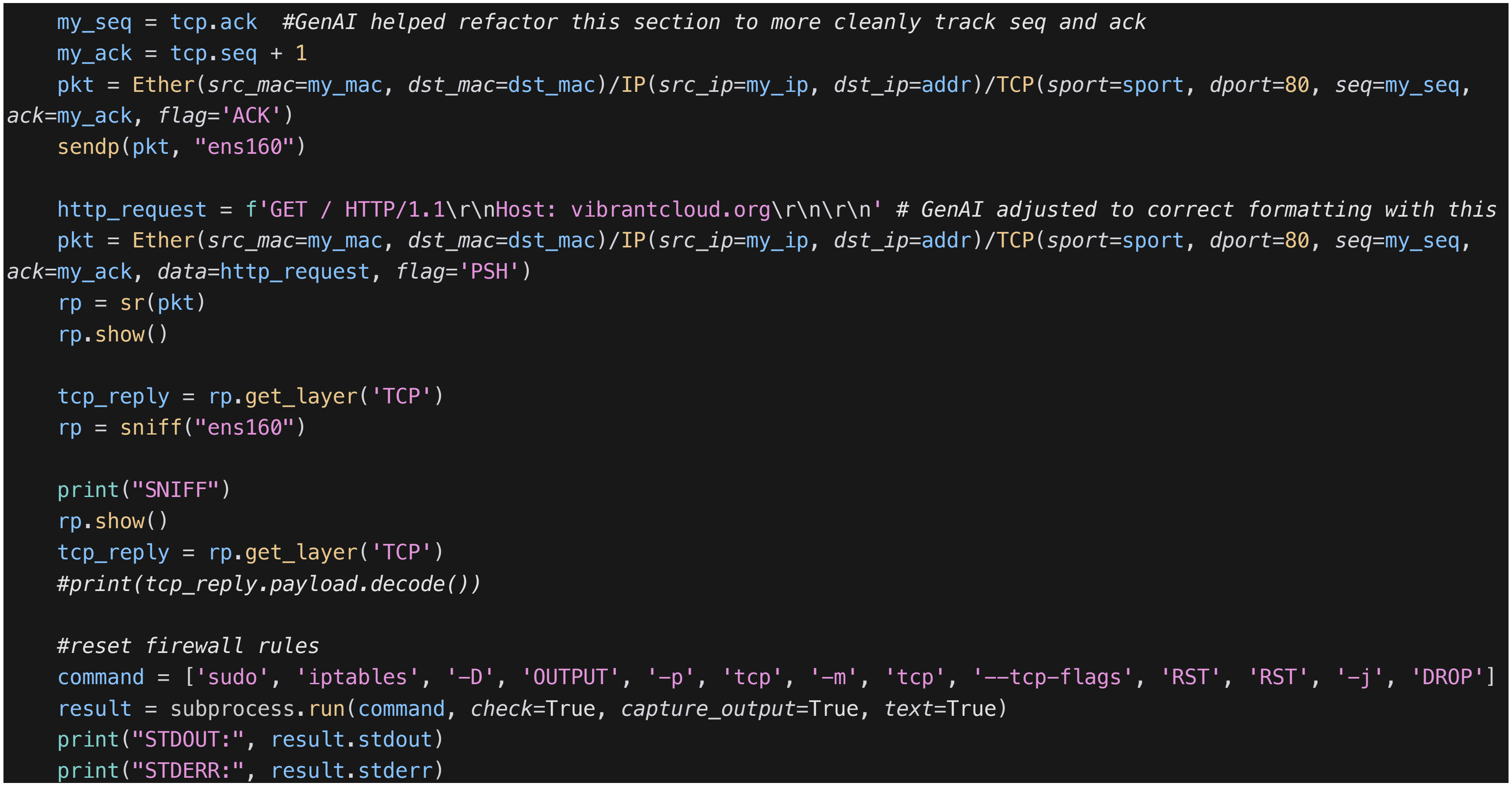


```
#Example 2: DNS Resolution

    print("\nDNS example")
    domain_name = "vibrantcloud.org"
    pkt = Ether(src_mac=my_mac, dst_mac=dst_mac)/IP(src_ip=my_ip, dst_ip="8.8.8.8", proto=17)/UDP(sport=12345, 
dport=53)/DNS(qname=domain_name)
    dns = sr(pkt)
    dns.show()
    dns_layer = dns.get_layer("DNS")  #helper method to get a specified layer
    #print(dns_layer.addr)
    addr = dns_layer.addr
    print("\n\n")

    # #Example 3: TCP/HTTP
    print("\nTCP example")
    sport = random.getrandbits(16)
    #turn off OS replying with RST after recieving SYN ACK reply from server
    command = ['sudo', 'iptables', '-A', 'OUTPUT', '-p', 'tcp', '-m', 'tcp', '--tcp-flags','RST', 'RST', '-j', 'DROP']
    # Execute the command
    result = subprocess.run(command, check=True, capture_output=True, text=True)
    print("STDOUT:", result.stdout)
    print("STDERR:", result.stderr)


    pkt = Ether(src_mac=my_mac, dst_mac=dst_mac)/IP(src_ip=my_ip, dst_ip=addr)/TCP(sport=sport, dport=80, flag='SYN')
    reply = sr(pkt)
    reply.show()
    tcp = reply.get_layer('TCP')
```



```
    my_seq = tcp.ack  #GenAI helped refactor this section to more cleanly track seq and ack
    my_ack = tcp.seq + 1
    pkt = Ether(src_mac=my_mac, dst_mac=dst_mac)/IP(src_ip=my_ip, dst_ip=addr)/TCP(sport=sport, dport=80, seq=my_seq,
ack=my_ack, flag='ACK')
    sendp(pkt, "ens160")

    http_request = f'GET / HTTP/1.1\r\nHost: vibrantcloud.org\r\n\r\n' # GenAI adjusted to correct formatting with this
    pkt = Ether(src_mac=my_mac, dst_mac=dst_mac)/IP(src_ip=my_ip, dst_ip=addr)/TCP(sport=sport, dport=80, seq=my_seq,
ack=my_ack, data=http_request, flag='PSH')
    rp = sr(pkt)
    rp.show()

    tcp_reply = rp.get_layer('TCP')
    rp = sniff("ens160")

    print("SNIFF")
    rp.show()
    tcp_reply = rp.get_layer('TCP')
    #print(tcp_reply.payload.decode())

    #reset firewall rules
    command = ['sudo', 'iptables', '-D', 'OUTPUT', '-p', 'tcp', '-m', 'tcp', '--tcp-flags', 'RST', 'RST', '-j', 'DROP']
    result = subprocess.run(command, check=True, capture_output=True, text=True)
    print("STDOUT:", result.stdout)
    print("STDERR:", result.stderr)
```

RESPONSE:
[*] Sent packet to 8.8.8.8, waiting for reply...
[*] Received reply
… DNS resolution responds, and we get the IP.

TCP example

```
STDOUT:
STDERR:
[*] Sent packet to 173.201.179.249, waiting for reply...
[*] Received reply
######## Ether #######
dst_mac : 00:0c:29:a4:0d:6d
src_mac : 00:50:56:ed:09:1a
type : 2048
bytes:
000c29a40d6d005056ed091a08004500002c20e9000080066a8eadc9b3f9ac10a1810050527627b163c5000000026012faf00f920000020
405b40000
######## IP #######
version_ihl : 69
tos : 0
len : 44
id : 8425
flags_frag : 0
ttl : 128
proto : 6
chksum : 27278
src_ip : 173.201.179.249
dst_ip : 172.16.161.129
bytes: 4500002c20e9000080066a8eadc9b3f9ac10a1810050527627b163c5000000026012faf00f920000020405b40000
######## TCP #######
sport : 80
dport : 21110
seq : 665936837
ack : 2
offset_reserv_flags : 24594
window : 64240
chksum : 3986
urgptr : 0
offset : 6
```

```
message :
[*] Sent packet on interface ens160
[*] Sent packet to 173.201.179.249, waiting for reply...
[*] Received reply
######## Ether #######
dst_mac : 00:0c:29:a4:0d:6d
src_mac : 00:50:56:ed:09:1a
type : 2048
bytes:
000c29a40d6d005056ed091a08004500002820ea000080066a91adc9b3f9ac10a1810050527627b163c60000002c5010faf02725000000
0000000000
######## IP #######
version_ihl : 69
tos : 0
len : 40
id : 8426
flags_frag : 0
ttl : 128
proto : 6
chksum : 27281
src_ip : 173.201.179.249
dst_ip : 172.16.161.129
bytes: 4500002820ea000080066a91adc9b3f9ac10a1810050527627b163c60000002c5010faf027250000000000000000
######## TCP #######
sport : 80
dport : 21110
seq : 665936838
ack : 44
offset_reserv_flags : 20496
window : 64240
chksum : 10021
urgptr : 0
offset : 5
```

```
message :
[*] Captured packet
SNIFF
######## Ether #######
dst_mac : 00:0c:29:a4:0d:6d
src_mac : 00:50:56:ed:09:1a
type : 2048
bytes:
000c29a40d6d005056ed091a08004500027920eb00008006683fadc9b3f9ac10a1810050527627b163c60000002c5018faf0d7a3000048
5454502f312e3120323030204f4b0d0a446174653a205468752c203233204f6374203230323520031343a35333a323020474d540d0a536
5727665723a204170616368650d0a557067726164653a2068322c6832630d0a436f6e6e656374696f6e3a2055706772616465 0d0a4c61
73742d4d6f6469666965643a204672692c203136204170722032303231 2031353a31373a333020474d540d0a455461673a20223162323
13061352d3133372d3563303138376137383336383022 0d0a4163636570742d52616e6765733a2062797465730d0a436f6e74656e742d
4c656e6774683a203331310d0a566172793a204163636570742d456e636f64696e670d0a436f6e74656e742d547970653a20746578742f
68746d6c0d0a0d0a3c21646f63747970652068746d6c3e0a0a3c68746d6c206c616e673d22656e223e0a3c686561643e0a20203c6d6574
6120636861727365743d227574662d38223e0a0a20203c7469746c653e56696272616e74436c6f75643c2f7469746c653e0a20203c6d65
7461206e616d653d226465736372697074696f6e2220636f6e74656e743d2256696272616e74436c6f7564223e0a20203c6d657461206e
616d653d22617574686f722220636f6e74656e743d22416e6f6e223e0a0a3c2f686561643e0a0a3c626f64793e0a20203c68313e5669627
2616e74436c6f75643c2f68313e0a20203c703e5468697320697320746865206616d6f7573205669627 2616e74436c6f756420796f752
7766520686561726420736f206d7563682061626f75742e3c2f703e0a3c2f626f64793e0a3c2f68746d6c3e
######## IP #######
version_ihl : 69
tos : 0
len : 633
id : 8427
flags_frag : 0
ttl : 128
proto : 6
chksum : 26687
src_ip : 173.201.179.249
dst_ip : 172.16.161.129
bytes:
4500027920eb00008006683fadc9b3f9ac10a1810050527627b163c60000002c5018faf0d7a30000485454502f312e3120323030204f4b0
```

```
d0a446174653a205468752c203233204f637420323032352031343a35333a323020474d540d0a5365727665723a204170616368650d0a
557067726164653a2068322c6832630d0a436f6e6e656374696f6e3a20557067726164650d0a4c6173742d4d6f6469666965643a204672
692c203136204170722032303231203135a31373a333020474d540d0a455461673a202231623231306135 2d3133372d356330313837
61373833363830220d0a4163636570742d52616e6765733a2062797465730d0a436f6e74656e742d4c656e6774683a203331310d0a566
172793a204163636570742d456e636f64696e670d0a436f6e74656e742d547970653a20746578742f68746d6c0d0a0d0a3c21646f63747
970652068746d6c3e0a0a3c68746d6c206c616e673d22656e223e0a3c686561643e0a20203c6d65746120636861727365743d22757466
2d38223e0a0a20203c7469746c653e56696272616e74436c6f75643c2f7469746c653e0a20203c6d657461206e616d653d226465736372
697074696f6e2220636f6e74656e743d2256696272616e74436c6f7564223e0a20203c6d657461206e616d653d22617574686f72222063
6f6e74656e743d22416e6f6e223e0a0a3c2f686561643e0a0a3c626f64793e0a20203c68313e56696272616e74436c6f75643c2f68313e0a
20203c703e5468697320697320746865206661 6d6f75732056696272616e74436c6f756420796f7527766520686561726420736f206d7
563682061626f75742e3c2f703e0a3c2f626f64793e0a3c2f68746d6c3e
######## TCP #######
sport : 80
dport : 21110
seq : 665936838
ack : 44
offset_reserv_flags : 20504
window : 64240
chksum : 55203
urgptr : 0
offset : 5
message : HTTP/1.1 200 OK
Date: Thu, 23 Oct 2025 14:53:20 GMT
Server: Apache
Upgrade: h2,h2c
Connection: Upgrade
Last-Modified: Fri, 16 Apr 2021 15:17:30 GMT
ETag: "1b210a5-137-5c0187a783680"
Accept-Ranges: bytes
Content-Length: 311
Vary: Accept-Encoding
Content-Type: text/html
```

```
<!doctype html>

<html lang="en">
<head>
  <meta charset="utf-8">

  <title>VibrantCloud</title>
  <meta name="description" content="VibrantCloud">
  <meta name="author" content="Anon">

</head>

<body>
  <h1>VibrantCloud</h1>
  <p>This is the famous VibrantCloud you've heard so much about.</p>
</body>
</html>
STDOUT:
STDERR:
```