CMPE 472 – Computer Networks

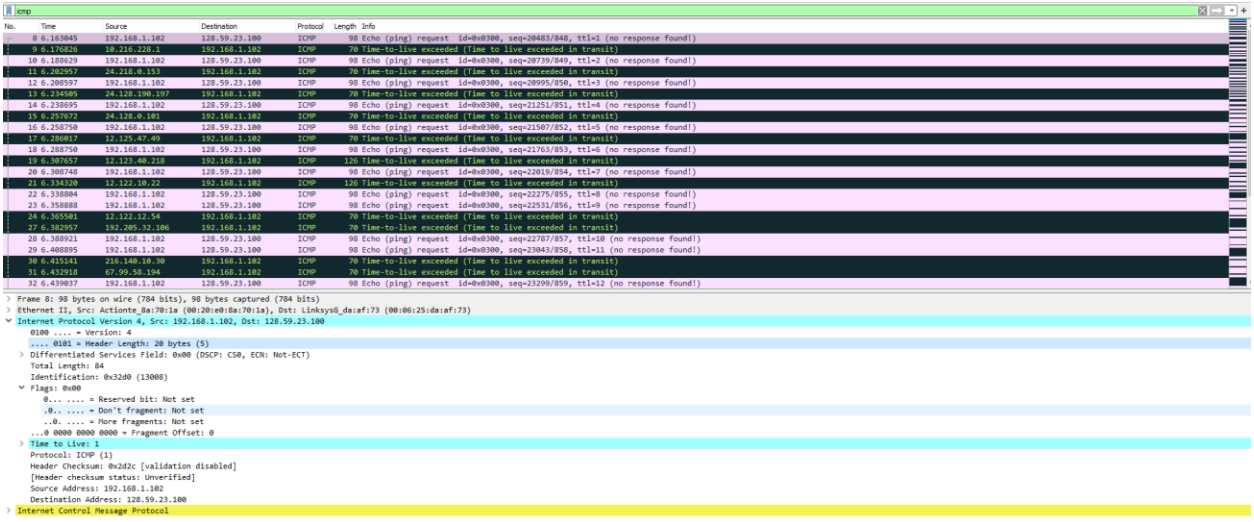
Lab 4: Ip

Bensu Şeker/2251984658

We will use ip-trace answering the questions for this lab.

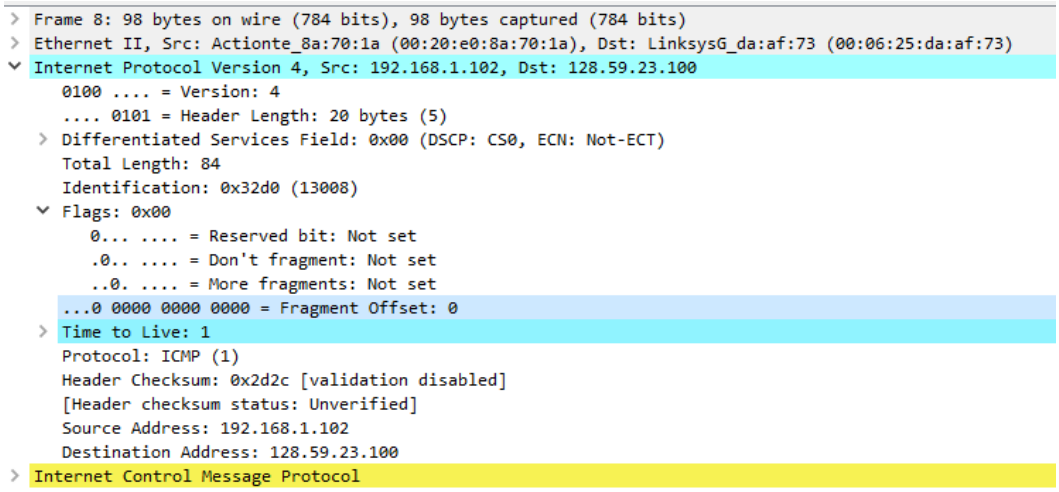
Questions

1. Select the first ICMP Echo Request message sent by your computer:
   - How many bytes are in the IP header? How many bytes are in the payload *of the IP datagram*? Explain how you determined the number of payload bytes.



<u>Answer:</u> There are 20 bytes in the IP header, and 84 bytes total length, this gives 64 bytes in the payload of the IP datagram.

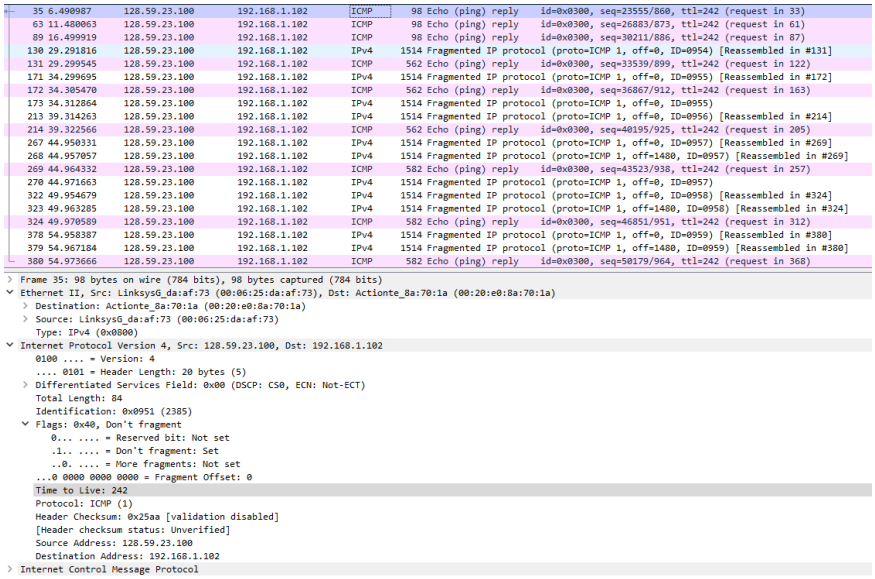
- Has this IP datagram been fragmented? Explain how you determined whether or not the datagram has been fragmented.

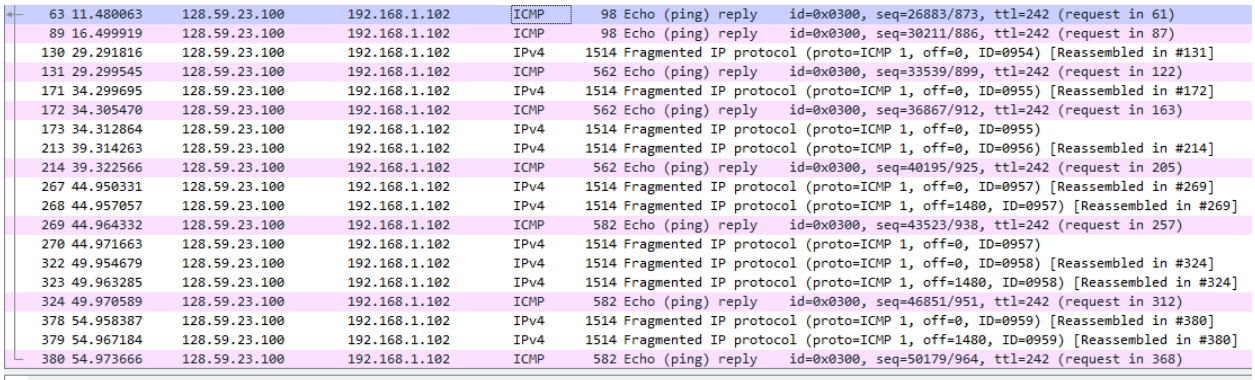


<u>Answer:</u> The fragment offset is set to 0, therefore, the packet has not been fragmented.

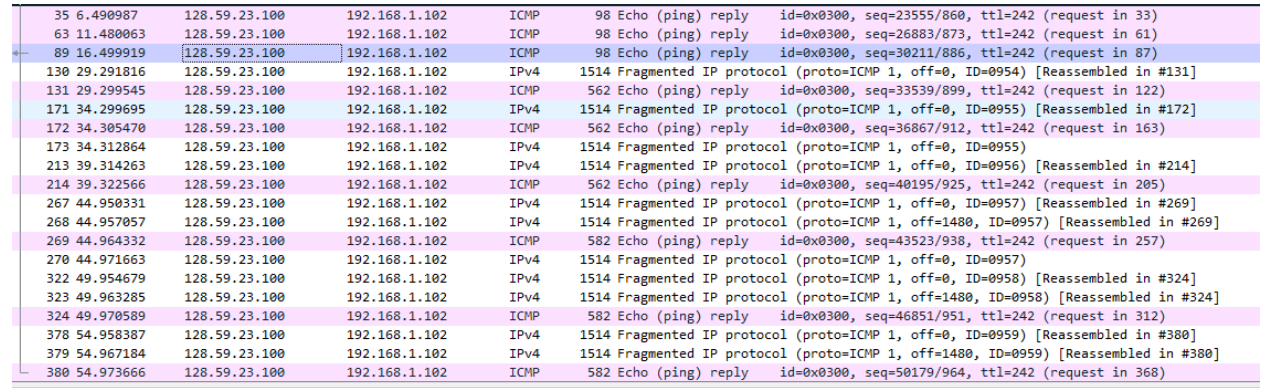
2. Sort the traced packets according to IP source address by clicking on the Source column header. Select the first ICMP Echo Request message sent by your computer:
   - Which fields in the IP datagram *always* change from one datagram to the next within this series of ICMP messages sent by your computer?

<u>Answer:</u>
-Checksum increase
-Timing constant
-Identifier increase





```
    63 11.480063    128.59.23.100    192.168.1.102    ICMP      98 Echo (ping) reply    id=0x0300, seq=26883/873, ttl=242 (request in 61)
    89 16.499919    128.59.23.100    192.168.1.102    ICMP      98 Echo (ping) reply    id=0x0300, seq=30211/886, ttl=242 (request in 87)
   130 29.291816    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0954) [Reassembled in #131]
   131 29.299545    128.59.23.100    192.168.1.102    ICMP     562 Echo (ping) reply    id=0x0300, seq=33539/899, ttl=242 (request in 122)
   171 34.299695    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0955) [Reassembled in #172]
   172 34.305470    128.59.23.100    192.168.1.102    ICMP     562 Echo (ping) reply    id=0x0300, seq=36867/912, ttl=242 (request in 163)
   173 34.312864    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0955)
   213 39.314263    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0956) [Reassembled in #214]
   214 39.322566    128.59.23.100    192.168.1.102    ICMP     562 Echo (ping) reply    id=0x0300, seq=40195/925, ttl=242 (request in 205)
   267 44.950331    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957) [Reassembled in #269]
   268 44.957057    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0957) [Reassembled in #269]
   269 44.964332    128.59.23.100    192.168.1.102    ICMP     582 Echo (ping) reply    id=0x0300, seq=43523/938, ttl=242 (request in 257)
   270 44.971663    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957)
   322 49.954679    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0958) [Reassembled in #324]
   323 49.963285    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0958) [Reassembled in #324]
   324 49.970589    128.59.23.100    192.168.1.102    ICMP     582 Echo (ping) reply    id=0x0300, seq=46851/951, ttl=242 (request in 312)
   378 54.958387    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0959) [Reassembled in #380]
   379 54.967184    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0959) [Reassembled in #380]
   380 54.973666    128.59.23.100    192.168.1.102    ICMP     582 Echo (ping) reply    id=0x0300, seq=50179/964, ttl=242 (request in 368)

> Frame 63: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
v Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
  > Destination: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
  > Source: LinksysG_da:af:73 (00:06:25:da:af:73)
    Type: IPv4 (0x0800)
v Internet Protocol Version 4, Src: 128.59.23.100, Dst: 192.168.1.102
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 84
    Identification: 0x0952 (2386)
  v Flags: 0x40, Don't fragment
      0... .... = Reserved bit: Not set
      .1.. .... = Don't fragment: Set
      ..0. .... = More fragments: Not set
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 242
    Protocol: ICMP (1)
    Header Checksum: 0x25a9 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 128.59.23.100
    Destination Address: 192.168.1.102
> Internet Control Message Protocol
```



```
    35 6.490987     128.59.23.100    192.168.1.102    ICMP      98 Echo (ping) reply    id=0x0300, seq=23555/860, ttl=242 (request in 33)
    63 11.480063    128.59.23.100    192.168.1.102    ICMP      98 Echo (ping) reply    id=0x0300, seq=26883/873, ttl=242 (request in 61)
    89 16.499919    128.59.23.100    192.168.1.102    ICMP      98 Echo (ping) reply    id=0x0300, seq=30211/886, ttl=242 (request in 87)
   130 29.291816    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0954) [Reassembled in #131]
   131 29.299545    128.59.23.100    192.168.1.102    ICMP     562 Echo (ping) reply    id=0x0300, seq=33539/899, ttl=242 (request in 122)
   171 34.299695    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0955) [Reassembled in #172]
   172 34.305470    128.59.23.100    192.168.1.102    ICMP     562 Echo (ping) reply    id=0x0300, seq=36867/912, ttl=242 (request in 163)
   173 34.312864    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0955)
   213 39.314263    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0956) [Reassembled in #214]
   214 39.322566    128.59.23.100    192.168.1.102    ICMP     562 Echo (ping) reply    id=0x0300, seq=40195/925, ttl=242 (request in 205)
   267 44.950331    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957) [Reassembled in #269]
   268 44.957057    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0957) [Reassembled in #269]
   269 44.964332    128.59.23.100    192.168.1.102    ICMP     582 Echo (ping) reply    id=0x0300, seq=43523/938, ttl=242 (request in 257)
   270 44.971663    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957)
   322 49.954679    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0958) [Reassembled in #324]
   323 49.963285    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0958) [Reassembled in #324]
   324 49.970589    128.59.23.100    192.168.1.102    ICMP     582 Echo (ping) reply    id=0x0300, seq=46851/951, ttl=242 (request in 312)
   378 54.958387    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0959) [Reassembled in #380]
   379 54.967184    128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0959) [Reassembled in #380]
   380 54.973666    128.59.23.100    192.168.1.102    ICMP     582 Echo (ping) reply    id=0x0300, seq=50179/964, ttl=242 (request in 368)

> Frame 89: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
v Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
  > Destination: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
  > Source: LinksysG_da:af:73 (00:06:25:da:af:73)
    Type: IPv4 (0x0800)
v Internet Protocol Version 4, Src: 128.59.23.100, Dst: 192.168.1.102
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 84
    Identification: 0x0953 (2387)
  v Flags: 0x40, Don't fragment
      0... .... = Reserved bit: Not set
      .1.. .... = Don't fragment: Set
      ..0. .... = More fragments: Not set
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 242
    Protocol: ICMP (1)
    Header Checksum: 0x25a8 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 128.59.23.100
    Destination Address: 192.168.1.102
> Internet Control Message Protocol
```

- Which fields stay constant? Which of the fields *must* stay constant? Which fields must change? Why?

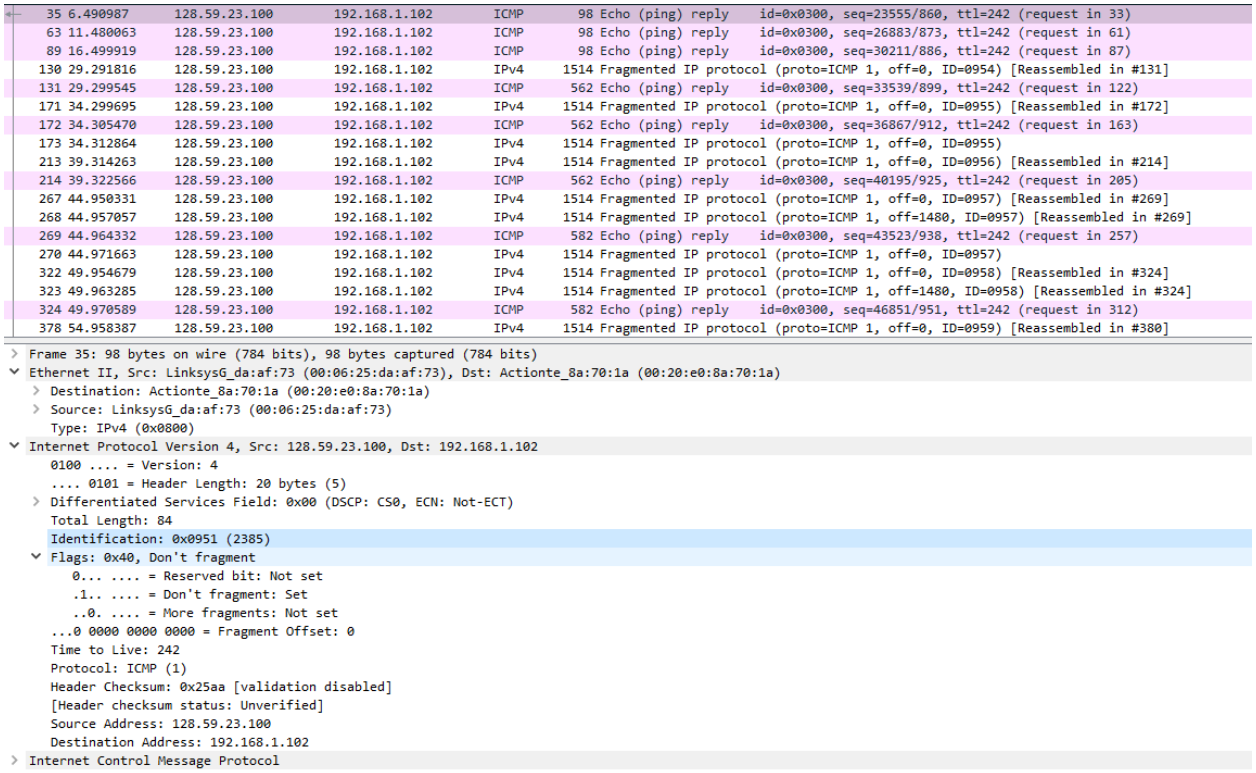
  Answer:

  -source IP stay constant because my computer IP address is constant
  -destination IP stay constant because website IP address is constant
  -differentiated services using same protocol
  -upper layer protocol using same protocol

  The header checksum, identification fields that are change.

  (I observe same steps as previous question)

- What is the value in the Identification field and the TTL field?



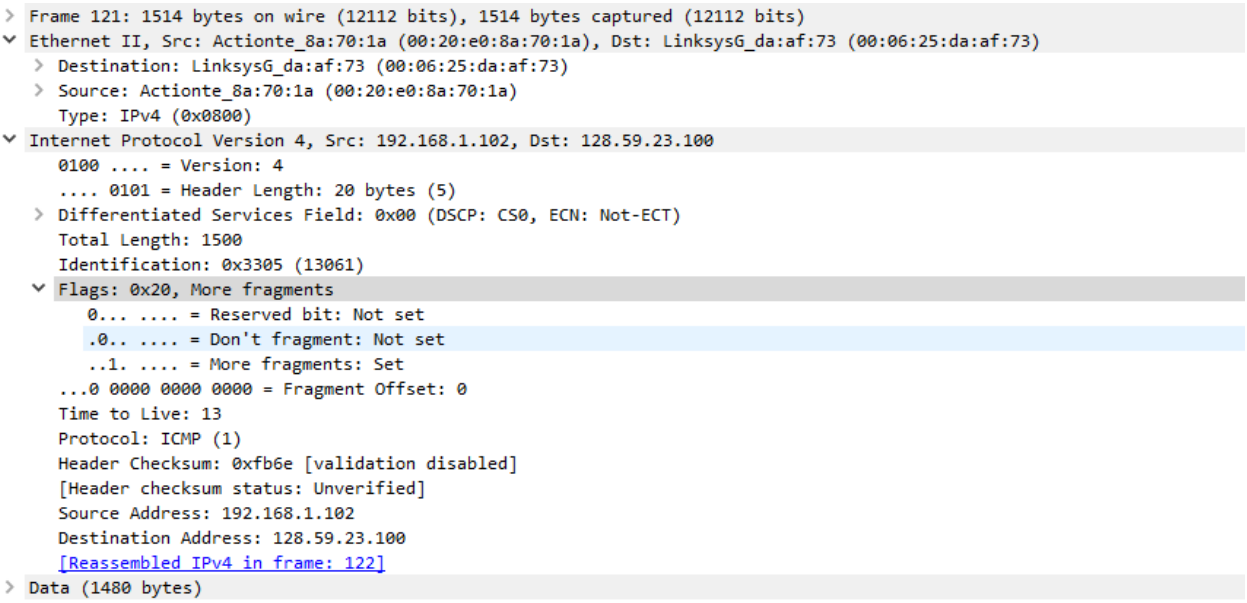
```
   35 6.490987    128.59.23.100    192.168.1.102    ICMP      98 Echo (ping) reply    id=0x0300, seq=23555/860, ttl=242 (request in 33)
   63 11.480063   128.59.23.100    192.168.1.102    ICMP      98 Echo (ping) reply    id=0x0300, seq=26883/873, ttl=242 (request in 61)
   89 16.499919   128.59.23.100    192.168.1.102    ICMP      98 Echo (ping) reply    id=0x0300, seq=30211/886, ttl=242 (request in 87)
  130 29.291816   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0954) [Reassembled in #131]
  131 29.299545   128.59.23.100    192.168.1.102    ICMP     562 Echo (ping) reply    id=0x0300, seq=33539/899, ttl=242 (request in 122)
  171 34.299695   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0955) [Reassembled in #172]
  172 34.305470   128.59.23.100    192.168.1.102    ICMP     562 Echo (ping) reply    id=0x0300, seq=36867/912, ttl=242 (request in 163)
  173 34.312864   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0955)
  213 39.314263   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0956) [Reassembled in #214]
  214 39.322566   128.59.23.100    192.168.1.102    ICMP     562 Echo (ping) reply    id=0x0300, seq=40195/925, ttl=242 (request in 205)
  267 44.950331   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957) [Reassembled in #269]
  268 44.957057   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0957) [Reassembled in #269]
  269 44.964332   128.59.23.100    192.168.1.102    ICMP     582 Echo (ping) reply    id=0x0300, seq=43523/938, ttl=242 (request in 257)
  270 44.971663   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957)
  322 49.954679   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0958) [Reassembled in #324]
  323 49.963285   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0958) [Reassembled in #324]
  324 49.970589   128.59.23.100    192.168.1.102    ICMP     582 Echo (ping) reply    id=0x0300, seq=46851/951, ttl=242 (request in 312)
  378 54.958387   128.59.23.100    192.168.1.102    IPv4    1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0959) [Reassembled in #380]

> Frame 35: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
v Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
  > Destination: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
  > Source: LinksysG_da:af:73 (00:06:25:da:af:73)
    Type: IPv4 (0x0800)
v Internet Protocol Version 4, Src: 128.59.23.100, Dst: 192.168.1.102
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 84
    Identification: 0x0951 (2385)
  v Flags: 0x40, Don't fragment
      0... .... = Reserved bit: Not set
      .1.. .... = Don't fragment: Set
      ..0. .... = More fragments: Not set
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 242
    Protocol: ICMP (1)
    Header Checksum: 0x25aa [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 128.59.23.100
    Destination Address: 192.168.1.102
> Internet Control Message Protocol
```

Answer: Identification: 2385

Time to live: 242

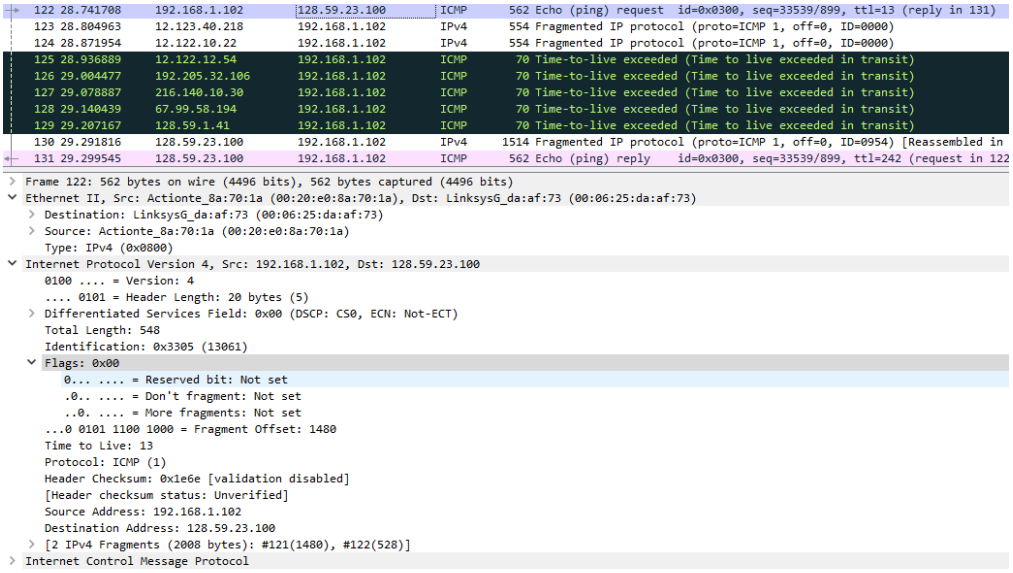
3. Now, look at the first fragmented IP protocol and its reassembled package with a response.
   - Has that message been fragmented across more than one IP datagram? Explain how you find the answer.

     <u>Answer:</u> The flag being set for multiple segments indicates that the datagram has been broken apart.



   - What fields change in the IP header among the fragments?

     <u>Answer:</u> Length, flags, header checksum, fragment offset.


122 28.741708 192.168.1.102 128.59.23.100 ICMP 562 Echo (ping) request id=0x0300, seq=33539/899, ttl=13 (reply in 131)
123 28.804963 12.123.40.218 192.168.1.102 IPv4 554 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
124 28.871954 12.122.10.22 192.168.1.102 IPv4 554 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
125 28.936889 12.122.12.54 192.168.1.102 ICMP 70 Time-to-live exceeded (Time to live exceeded in transit)
126 29.004477 192.205.32.106 192.168.1.102 ICMP 70 Time-to-live exceeded (Time to live exceeded in transit)
127 29.078887 216.140.10.30 192.168.1.102 ICMP 70 Time-to-live exceeded (Time to live exceeded in transit)
128 29.140439 67.99.58.194 192.168.1.102 ICMP 70 Time-to-live exceeded (Time to live exceeded in transit)
129 29.207167 128.59.1.41 192.168.1.102 ICMP 70 Time-to-live exceeded (Time to live exceeded in transit)
130 29.291816 128.59.23.100 192.168.1.102 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0954) [Reassembled in
131 29.299545 128.59.23.100 192.168.1.102 ICMP 562 Echo (ping) reply id=0x0300, seq=33539/899, ttl=242 (request in 122
Frame 122: 562 bytes on wire (4496 bits), 562 bytes captured (4496 bits)
Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
Destination: LinksysG_da:af:73 (00:06:25:da:af:73)
Source: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
Type: IPv4 (0x0800)
Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.59.23.100
0100 .... = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 548
Identification: 0x3305 (13061)
Flags: 0x00
0... .... = Reserved bit: Not set
.0.. .... = Don't fragment: Not set
..0. .... = More fragments: Not set
...0 0101 1100 1000 = Fragment Offset: 1480
Time to Live: 13
Protocol: ICMP (1)
Header Checksum: 0x1e6e [validation disabled]
[Header checksum status: Unverified]
Source Address: 192.168.1.102
Destination Address: 128.59.23.100
[2 IPv4 Fragments (2008 bytes): #121(1480), #122(528)]
Internet Control Message Protocol