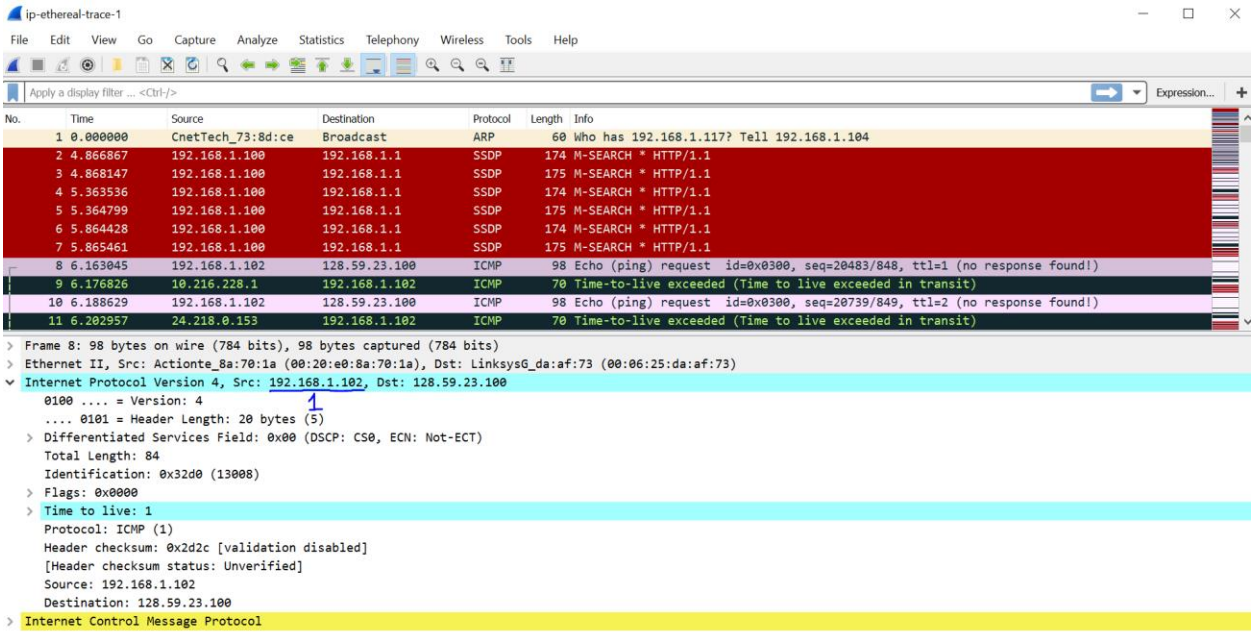
Lachlan Sinclair

11/20/19

Lab 4: CS_372_400

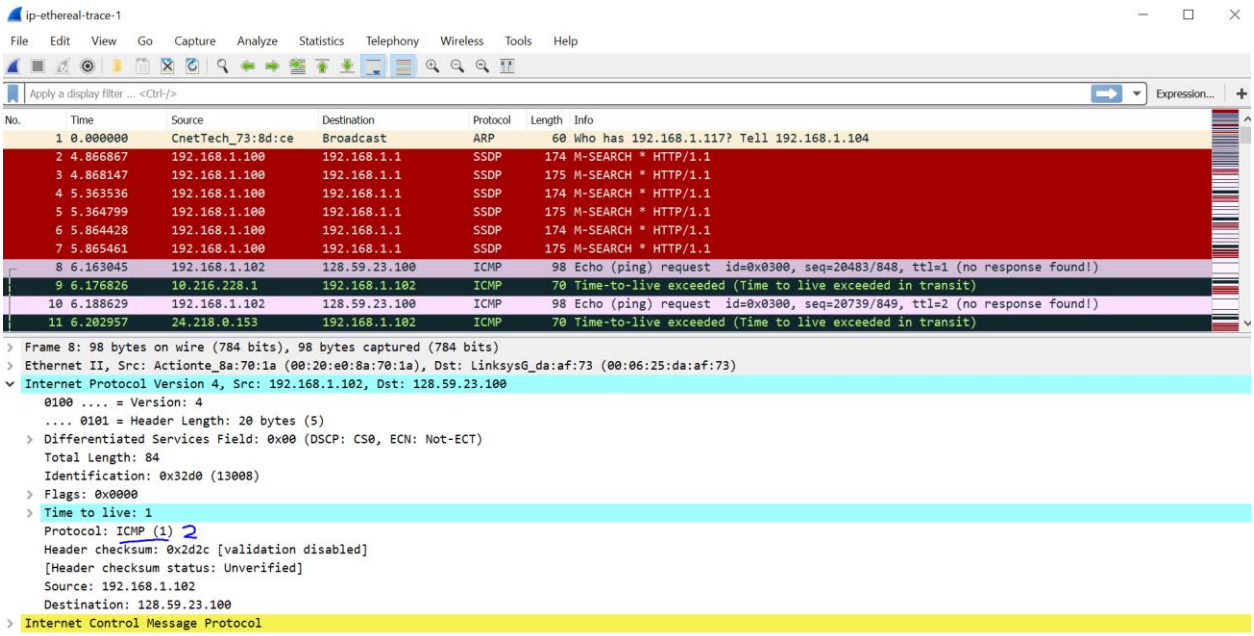
Question 1: Select the first ICMP Echo Request message sent by your computer, and expand the Internet Protocol part of the packet in the packet details window. What is the IP address of your computer?

IP address of my computer: 192.168.1.102



Question 2: Within the IP packet header, what is the value in the upper layer protocol field?

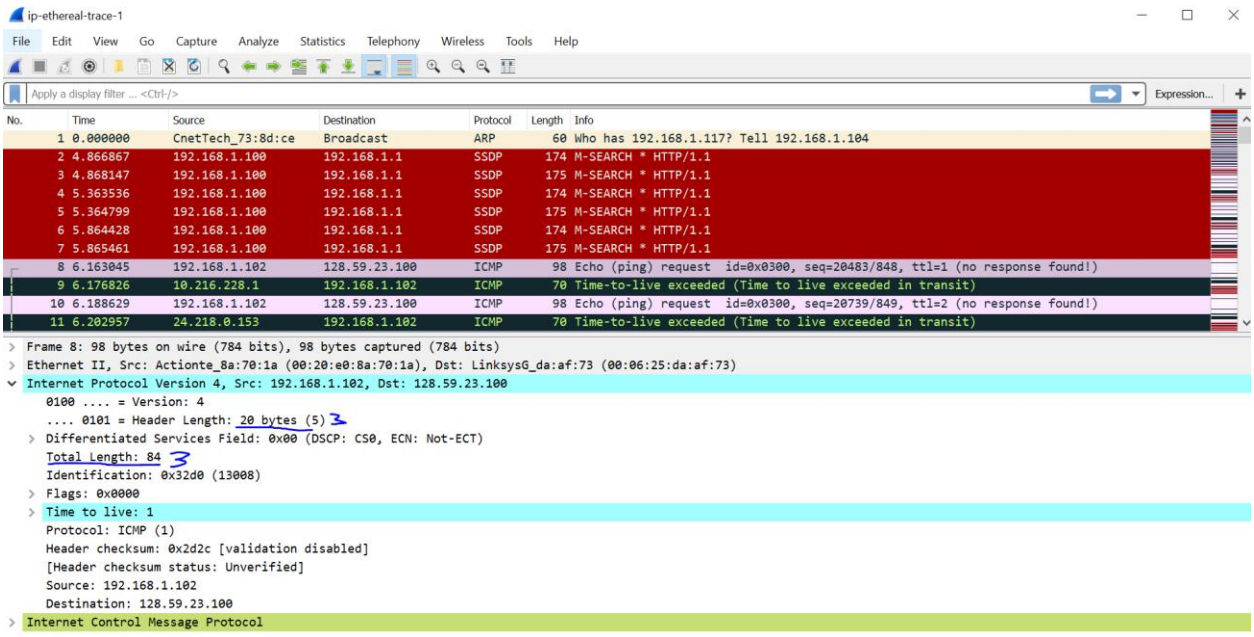
Value in the upper layer protocol field: ICMP(1)



Question 3: 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.

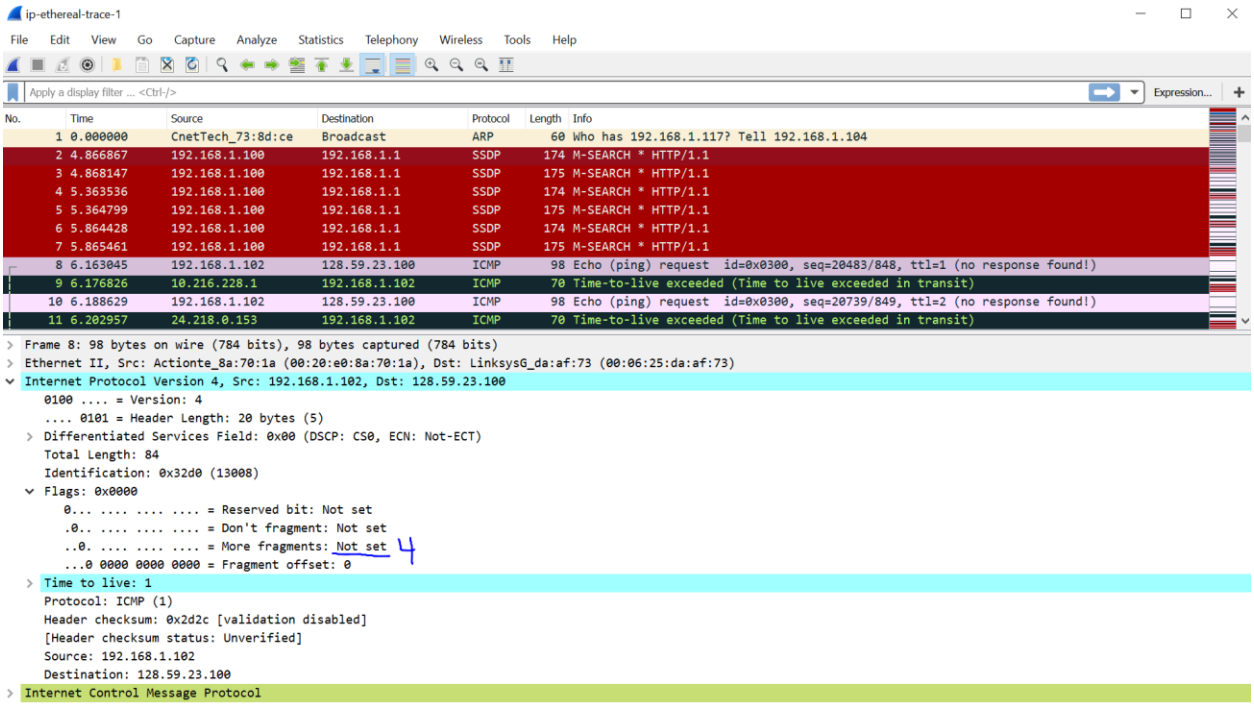
The header has a length of 20 bytes.

Total length-header size = payload size. The total length is 84 bytes, so 84 – 20 = 64 bytes of payload.



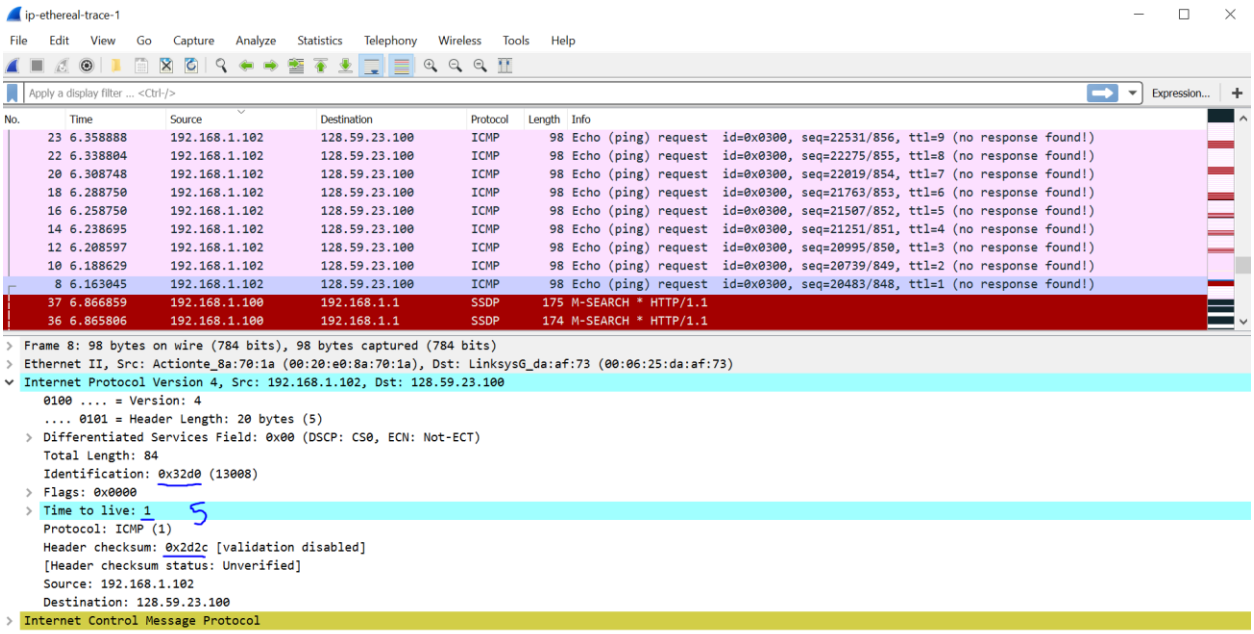
Question 4: Has this IP datagram been fragmented? Explain how you determined whether or not the datagram has been fragmented.

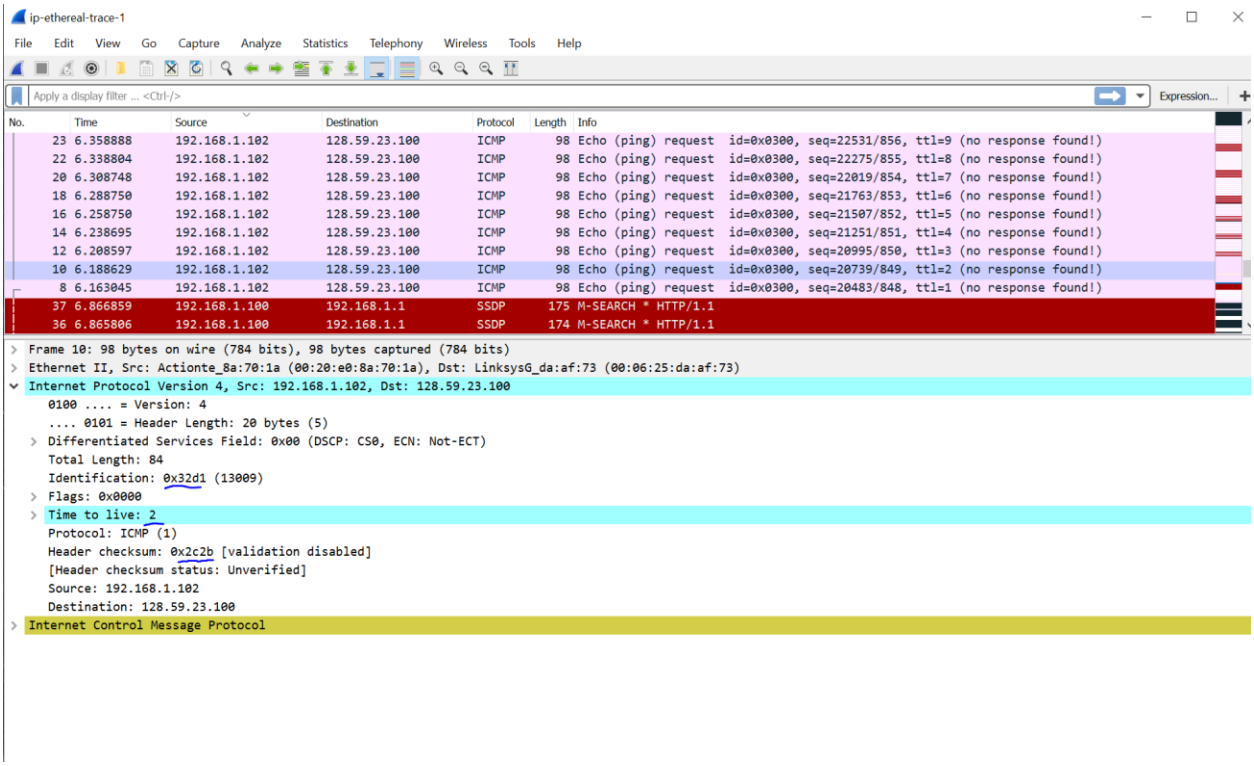
The IP datagram has not been fragmented, this is clear since the “more fragments” flag was not set.



Question 5: Which fields in the IP datagram always change from one datagram to the next within this series of ICMP messages sent by your computer?

The identification number always changes. Also, since it is a traceroute the time to live changes. The header checksum also always changes.





Question 6: Which fields stay constant? Which of the fields must stay constant? Which fields must change? Why?

Constants:

The source and destination IP addresses need to stay the same otherwise the data would not follow the same path.

The IP version stays the same, it shouldn't be changed in order to maintain consistency for the traceroute.

Differentiated Services field stays the same, this should stay the same in order to insure the datagrams are treated in the same way at every router during the traceroute.

The upper layer protocol doesn't change since the traceroute always send ICMP packets.

The header length also stays the same, this maintains consistency during the traceroute, adding optional fields to the datagram header could affect the traceroute.

Changes: (note: by definition in the text book, these are the three values that should change)

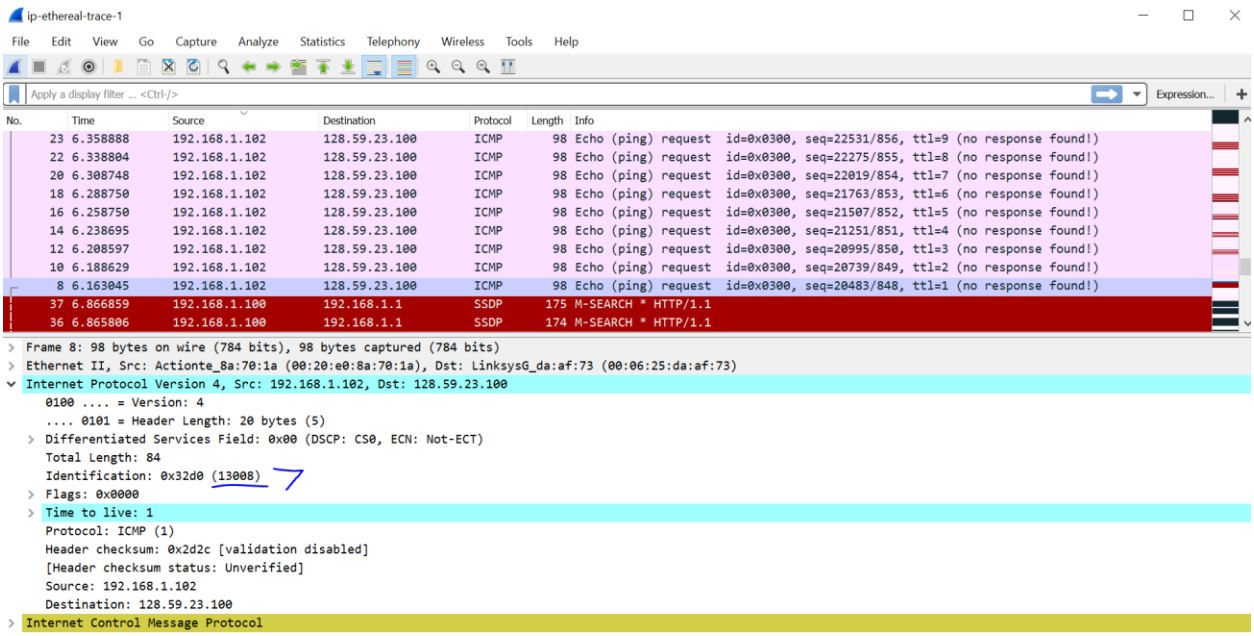
The identification number needs to change for proper datagram tracking.

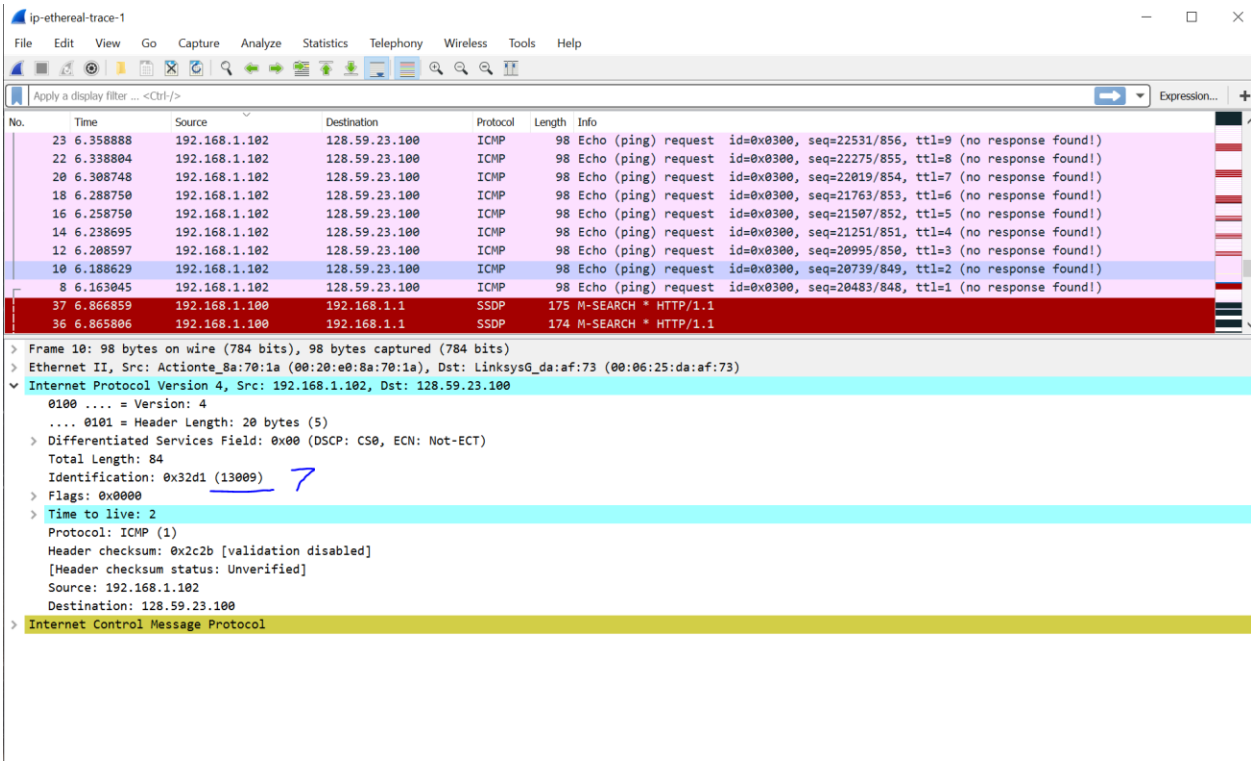
The header checksum changes since the contents of the header change with every packet.

Time to live changes with every packet since this is the fundamental way a traceroute works.

Question 7: Describe the pattern you see in the values in the Identification field of the IP datagram

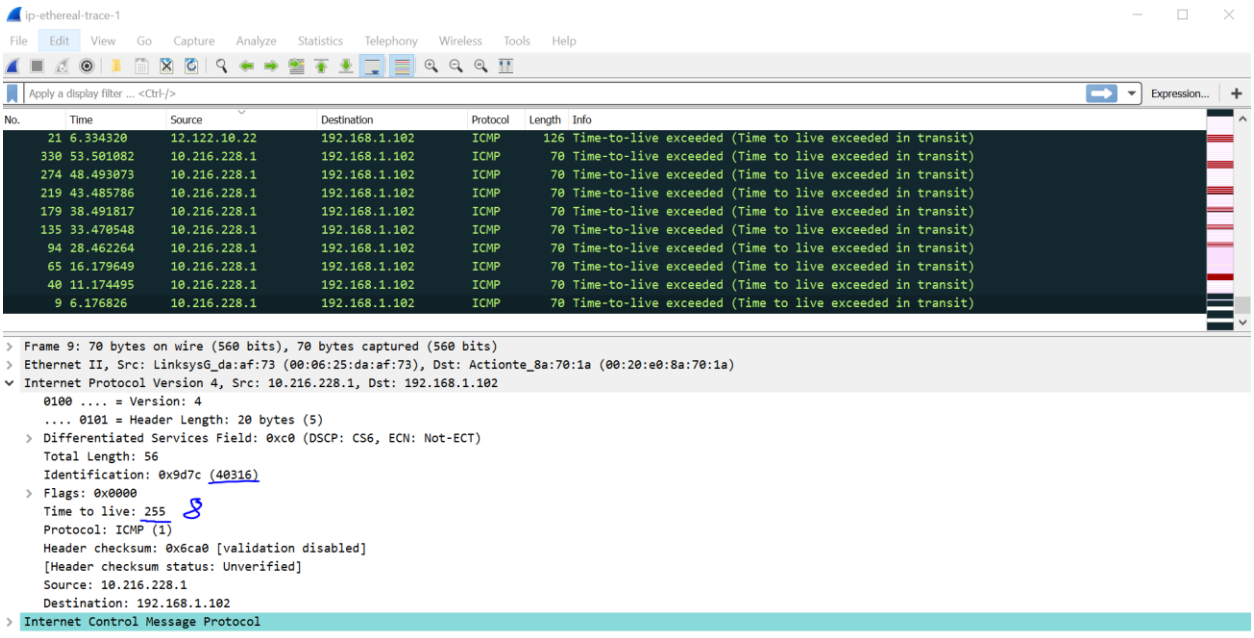
The value of the identification number increases by one with every ICMP message sent.





Question 8: What is the value in the Identification field and the TTL field?

The time to live value is 255, and the identification number is 40316 in the series of ICMP TTL-exceeded sent from the first router.

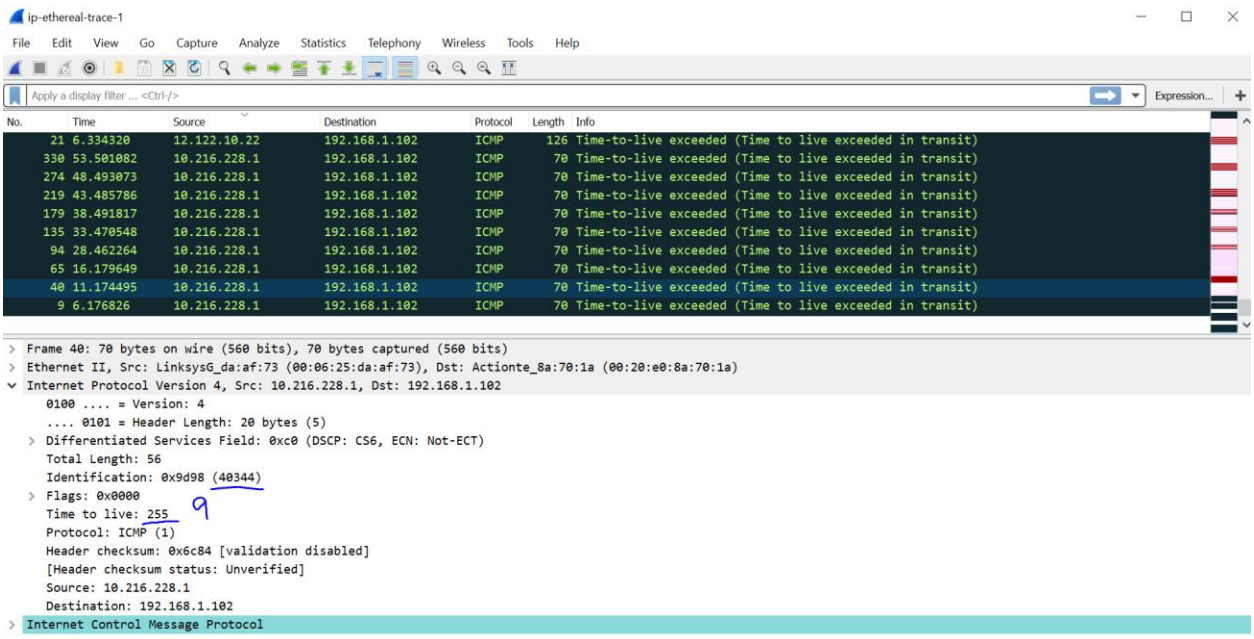


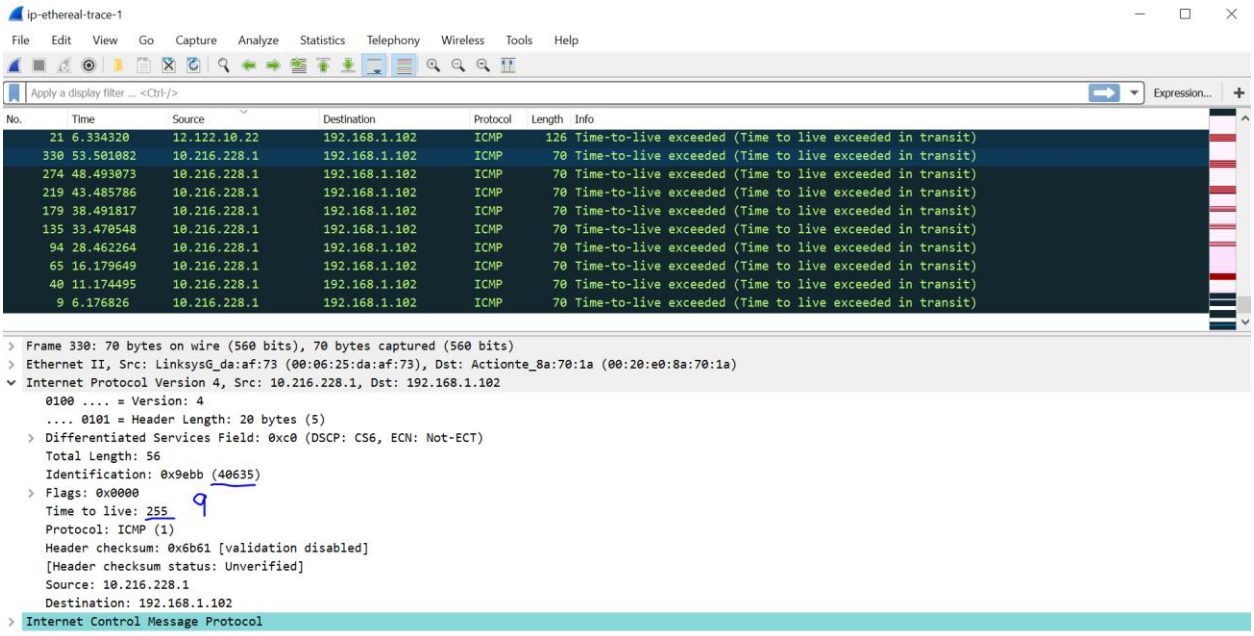
Question 9: Do these values remain unchanged for all of the ICMP TTL-exceeded replies sent to your computer by the nearest (first hop) router? Why?

The TTL values stay the same the for all replies from the first router, however the identification number changes with every reply.

The identification number always needs to change, only datagrams that are fragmented can have the same identification number.

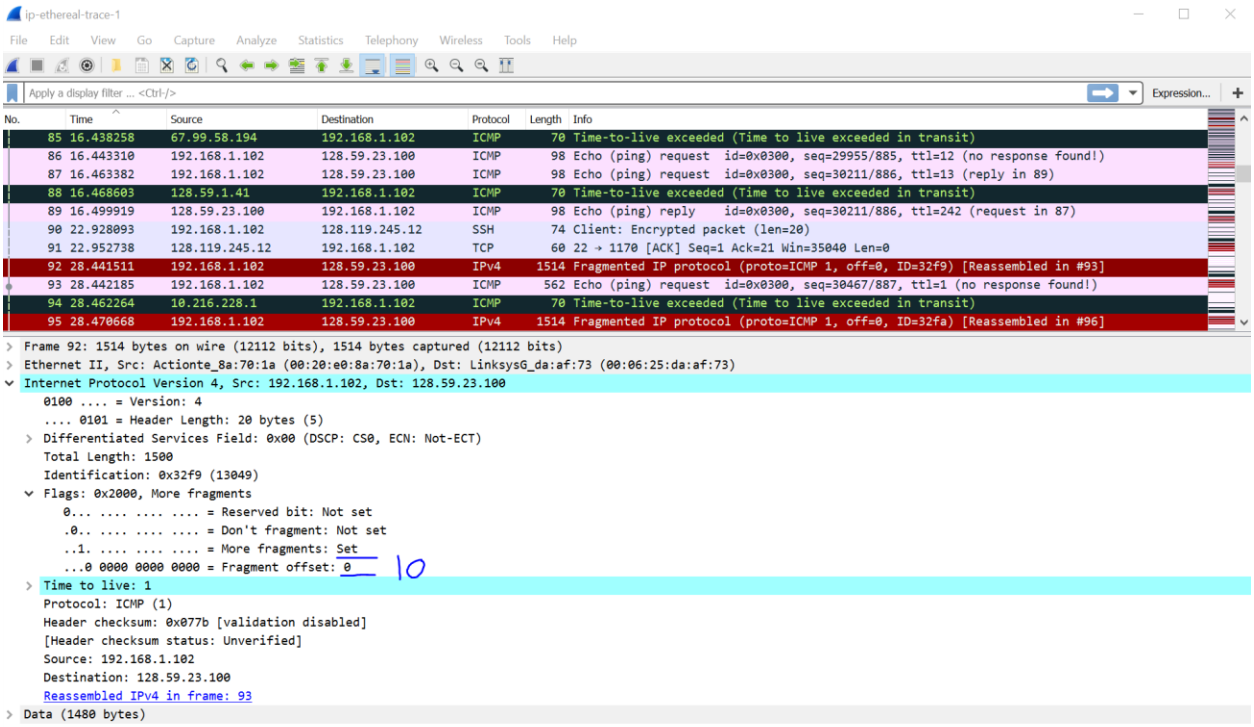
The TTL doesn't change since the replies are all originating from the same router, the router is assigning them the same TTL value and they all follow the same path to my computer.





Question 10: Find the first ICMP Echo Request message that was sent by your computer after you changed the Packet Size in pingplotter to be 2000. Has that message been fragmented across more than one IP datagram?

Yes, it has been fragmented across multiple datagrams.

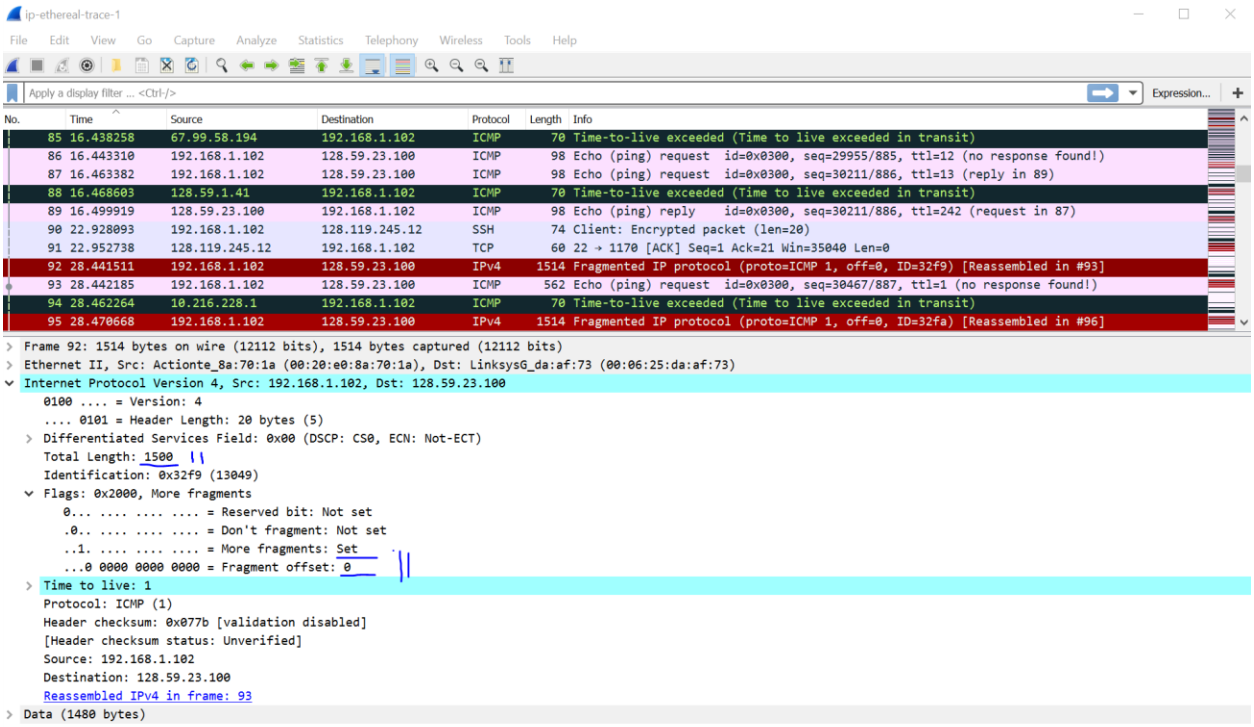


Question 11: Screenshot the first fragment of the fragmented IP datagram (with sufficient details to answer these questions). What information in the IP header indicates that the datagram been fragmented? What information in the IP header indicates whether this is the first fragment versus a latter fragment? How long is this IP datagram?

The more fragments flag has been set, this means that the datagram has been fragmented.

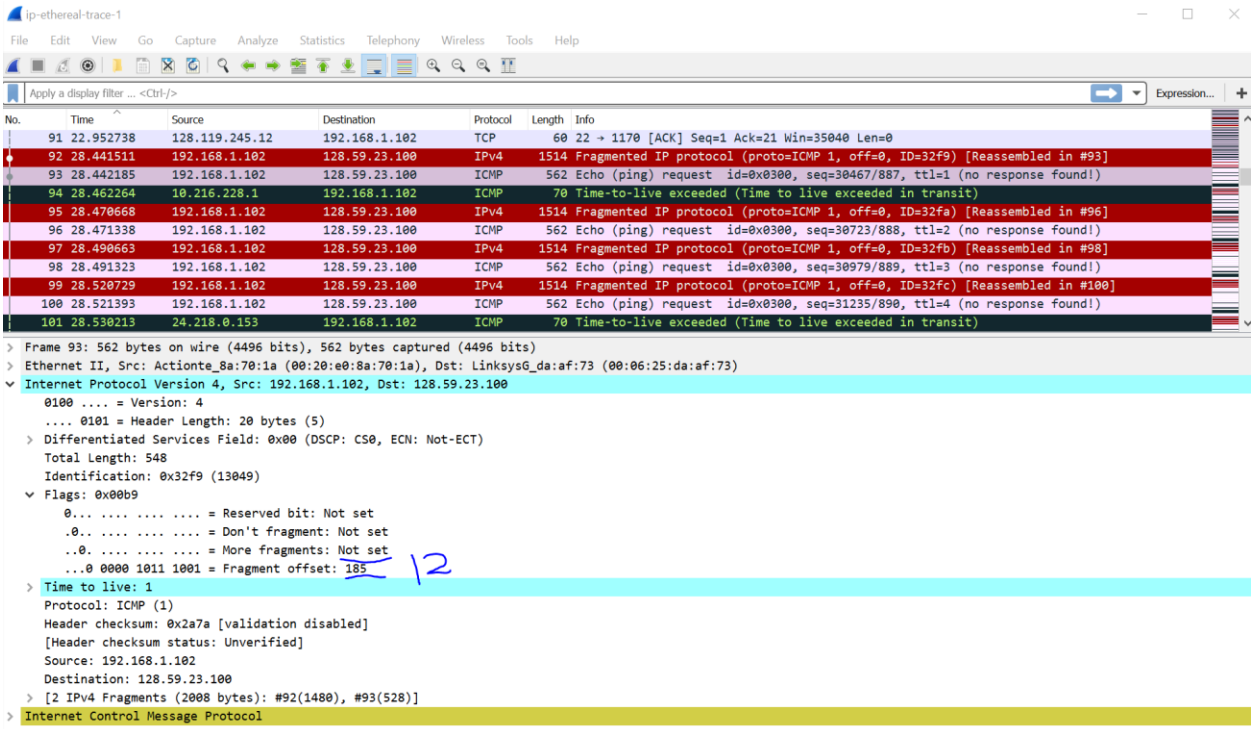
The fragment offset is 0 which means it is the first fragment of the datagram.

The length of this datagram is 1500 bytes including the 20 byte header. The length of all of the datagrams fragments combined including the second fragments 20 byte header is 1948 bytes.



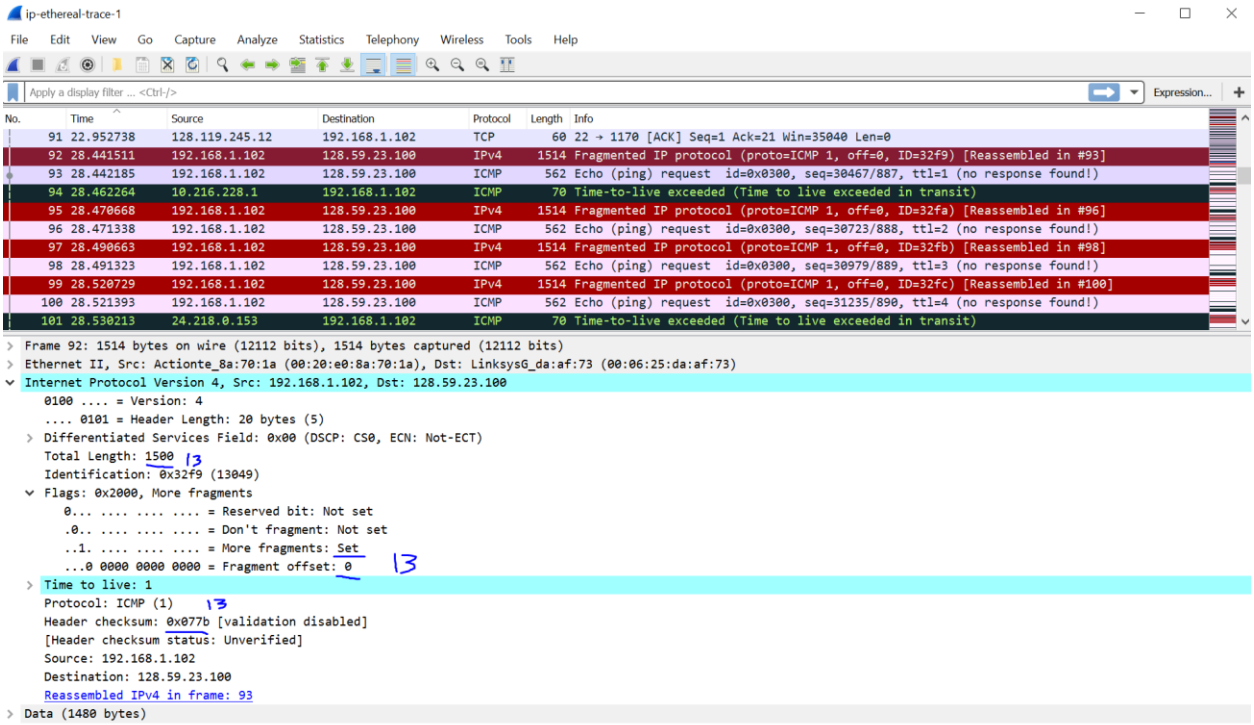
Question 12: Screenshot the second fragment of the fragmented IP datagram (with sufficient details to answer these questions). What information in the IP header indicates that this is not the first datagram fragment? Are the more fragments? How can you tell?

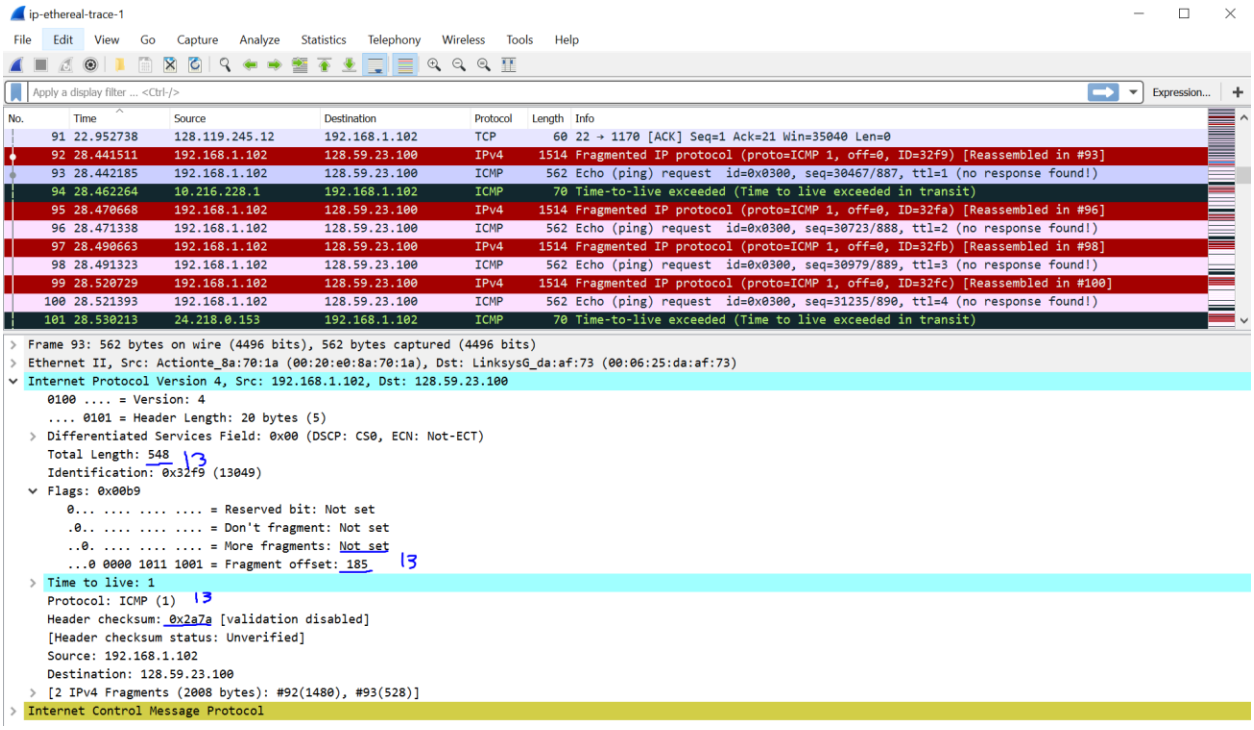
The fragments offset is set to 185 which means it is not the data fragment. The more fragments flag is not set which means there is not more fragments.



Question 13: What fields change in the IP header between the first and second fragment?

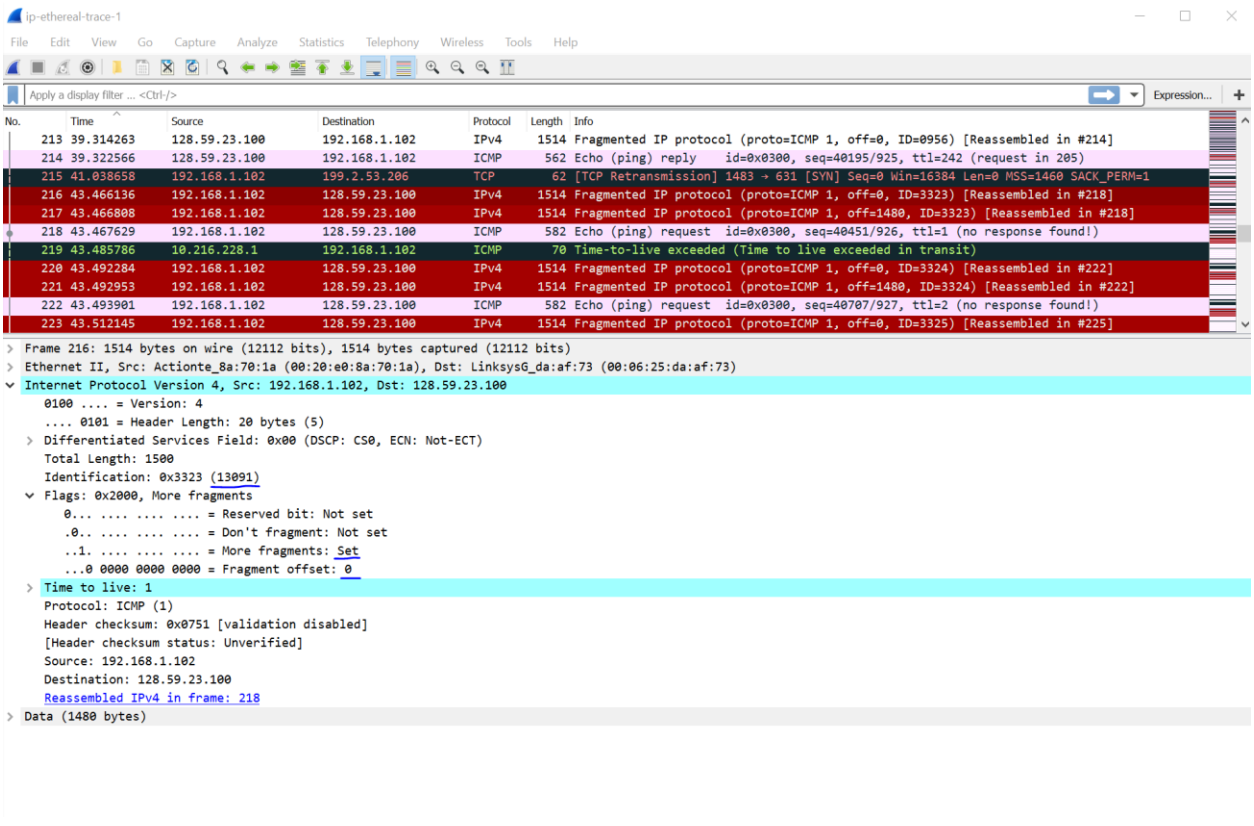
The header check sum, fragments offset, more fragments flag, and the total length fields change between the two fragments IP headers.

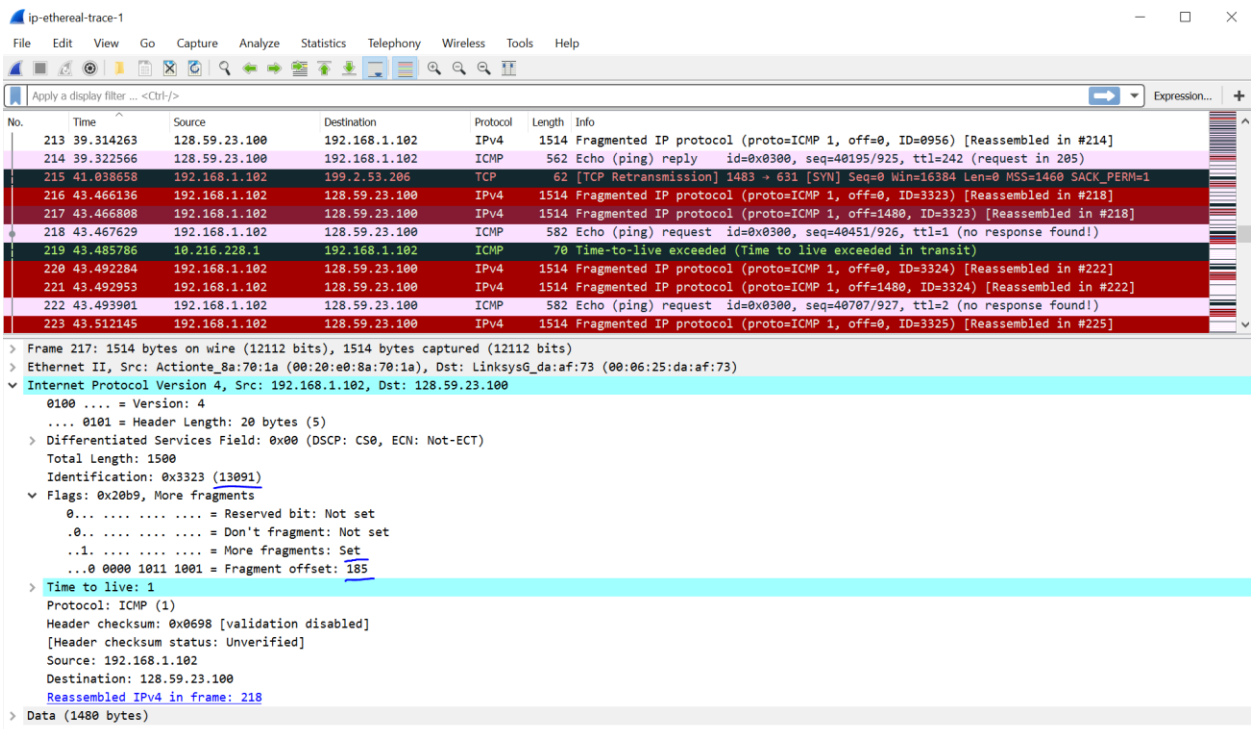

ip-ethereal-trace-1
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Expression...
No. Time Source Destination Protocol Length Info
91 22.952738 128.119.245.12 192.168.1.102 TCP 60 22 → 1170 [ACK] Seq=1 Ack=21 Win=35040 Len=0
92 28.441511 192.168.1.102 128.59.23.100 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=32f9) [Reassembled in #93]
93 28.442185 192.168.1.102 128.59.23.100 ICMP 562 Echo (ping) request id=0x0300, seq=30467/887, ttl=1 (no response found!)
94 28.462264 10.216.228.1 192.168.1.102 ICMP 70 Time-to-live exceeded (Time to live exceeded in transit)
95 28.470668 192.168.1.102 128.59.23.100 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=32fa) [Reassembled in #96]
96 28.471338 192.168.1.102 128.59.23.100 ICMP 562 Echo (ping) request id=0x0300, seq=30723/888, ttl=2 (no response found!)
97 28.490663 192.168.1.102 128.59.23.100 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=32fb) [Reassembled in #98]
98 28.491323 192.168.1.102 128.59.23.100 ICMP 562 Echo (ping) request id=0x0300, seq=30979/889, ttl=3 (no response found!)
99 28.520729 192.168.1.102 128.59.23.100 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=32fc) [Reassembled in #100]
100 28.521393 192.168.1.102 128.59.23.100 ICMP 562 Echo (ping) request id=0x0300, seq=31235/890, ttl=4 (no response found!)
101 28.530213 24.218.0.153 192.168.1.102 ICMP 70 Time-to-live exceeded (Time to live exceeded in transit)
Frame 92: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 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)
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: 1500
Identification: 0x32f9 (13049)
Flags: 0x2000, More fragments
0... .... = Reserved bit: Not set
.0.. .... = Don't fragment: Not set
..1. .... = More fragments: Set
...0 0000 0000 0000 = Fragment offset: 0
Time to live: 1
Protocol: ICMP (1)
Header checksum: 0x077b [validation disabled]
[Header checksum status: Unverified]
Source: 192.168.1.102
Destination: 128.59.23.100
Reassembled IPv4 in frame: 93
Data (1480 bytes)

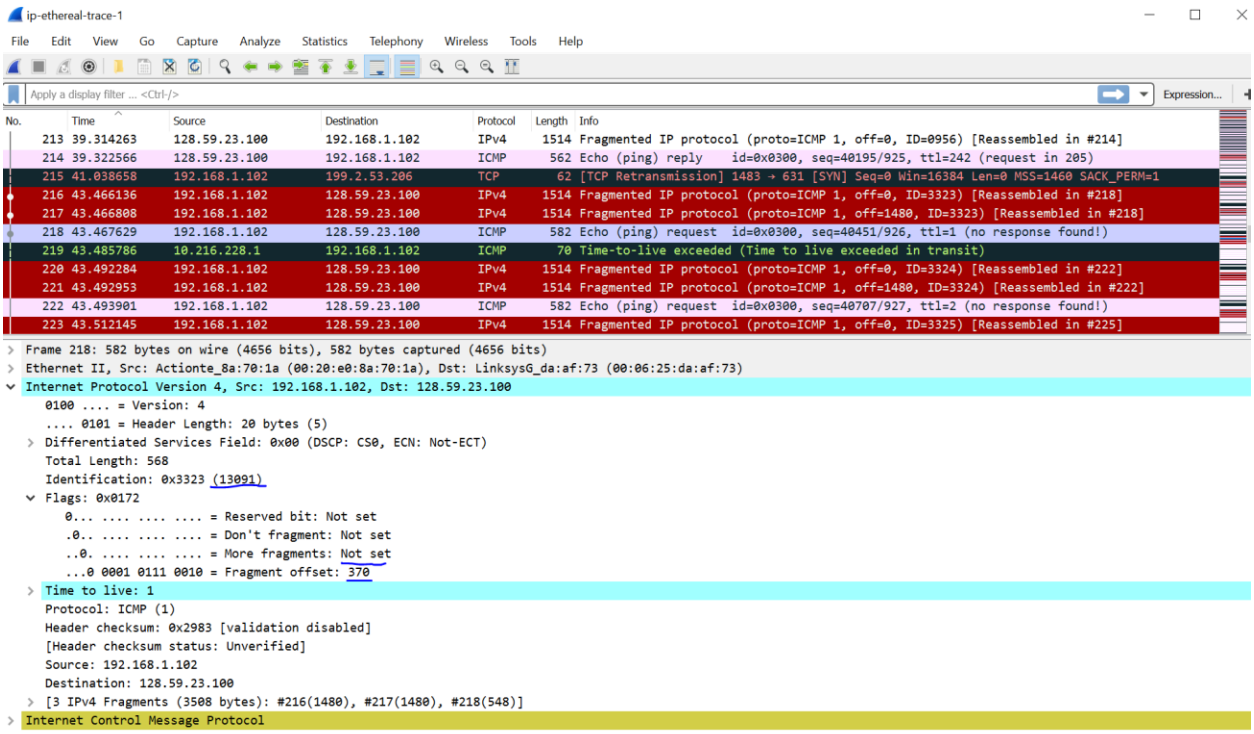

ip-ethereal-trace-1
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Expression...
No. Time Source Destination Protocol Length Info
91 22.952738 128.119.245.12 192.168.1.102 TCP 60 22 → 1170 [ACK] Seq=1 Ack=21 Win=35040 Len=0
92 28.441511 192.168.1.102 128.59.23.100 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=32f9) [Reassembled in #93]
93 28.442185 192.168.1.102 128.59.23.100 ICMP 562 Echo (ping) request id=0x0300, seq=30467/887, ttl=1 (no response found!)
94 28.462264 10.216.228.1 192.168.1.102 ICMP 70 Time-to-live exceeded (Time to live exceeded in transit)
95 28.470668 192.168.1.102 128.59.23.100 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=32fa) [Reassembled in #96]
96 28.471338 192.168.1.102 128.59.23.100 ICMP 562 Echo (ping) request id=0x0300, seq=30723/888, ttl=2 (no response found!)
97 28.490663 192.168.1.102 128.59.23.100 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=32fb) [Reassembled in #98]
98 28.491323 192.168.1.102 128.59.23.100 ICMP 562 Echo (ping) request id=0x0300, seq=30979/889, ttl=3 (no response found!)
99 28.520729 192.168.1.102 128.59.23.100 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=32fc) [Reassembled in #100]
100 28.521393 192.168.1.102 128.59.23.100 ICMP 562 Echo (ping) request id=0x0300, seq=31235/890, ttl=4 (no response found!)
101 28.530213 24.218.0.153 192.168.1.102 ICMP 70 Time-to-live exceeded (Time to live exceeded in transit)
Frame 93: 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)
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: 0x32f9 (13049)
Flags: 0x00b9
0... .... = Reserved bit: Not set
.0.. .... = Don't fragment: Not set
..0. .... = More fragments: Not set
...0 0000 1011 1001 = Fragment offset: 185
Time to live: 1
Protocol: ICMP (1)
Header checksum: 0x2a7a [validation disabled]
[Header checksum status: Unverified]
Source: 192.168.1.102
Destination: 128.59.23.100
[2 IPv4 Fragments (2008 bytes): #92(1480), #93(528)]
Internet Control Message Protocol

Question 14: How many fragments were created from the original datagram?

3 fragments were created from the original datagram.







Question 15: What fields change in the IP header among the fragments?

The fragments offset and checksum change for all three as expected. The first two both have the “more fragments” flag set, whereas the third fragment’s “more fragments flag” is not set. The first two also have the same total length at 1500 bytes, and the third only has a total length of 568 bytes. See the screen shots above for reference.