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CMPE 148 – Computer Networks I

Lab Assignment #2 – IP

1) What is the IP address of your computer? What is the purpose IP address?

A: My computer's IP address is 10.250.81.167. The purpose of an IP address is to be able to send data to and from a specific host device. With the growing amount of devices on the internet, an IP address is needed to differentiate which host you want to talk to.

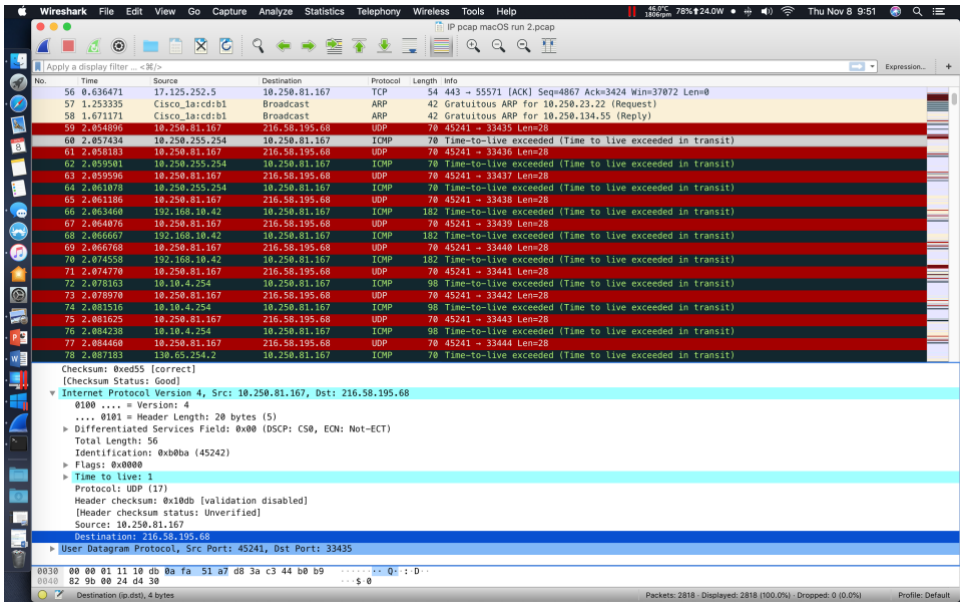

Figure 1: This screenshot shows my IP address listed in multiple places.

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

A: UDP (17)

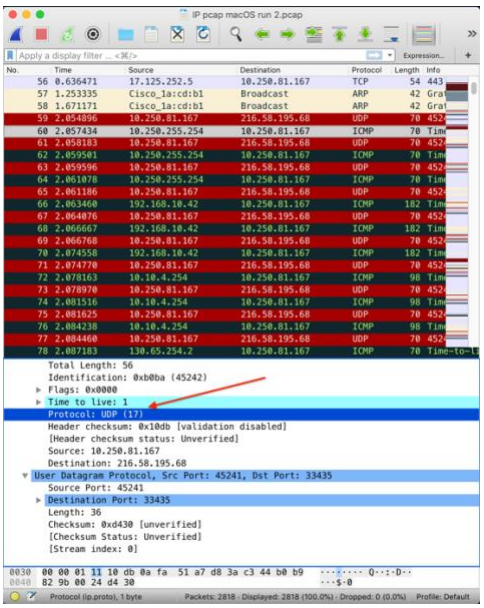

Figure 2: Screenshot shows upper layer protocol field.

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.

A: There are 20 bytes in the IP header. With a total length of 56 bytes in the IP datagram, I can determine that the payload is 56 – 20 = 36 bytes.

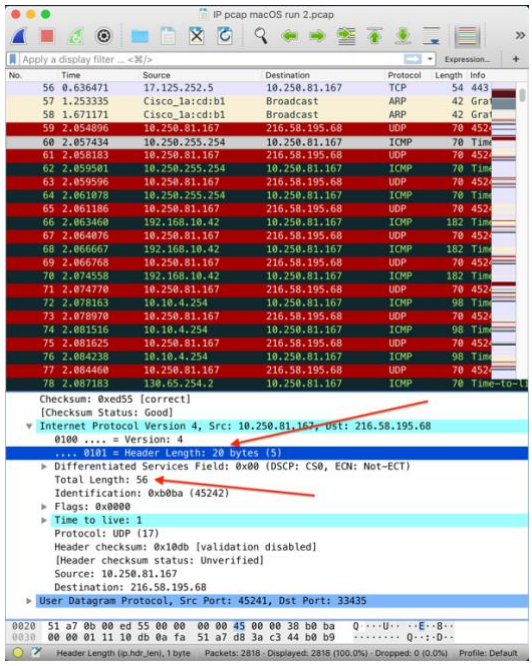

Figure 3: Screenshot showing header length and total length of IP datagram.

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

A: A field exists under the Internet Protocol Version 4 block called Flags. Under it, the fragments flag has not been triggered indicating that the datagram has not been fragmented.

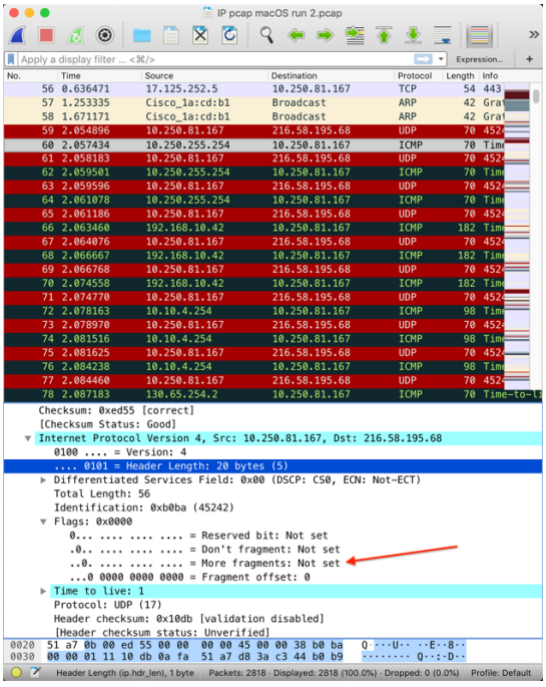

Figure 4: Screenshot showing fragment flag.

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?

A: Time to live increases by 1 in each subsequent datagram sent by my computer. Additionally, the ID field increases as each datagram has a different ID.

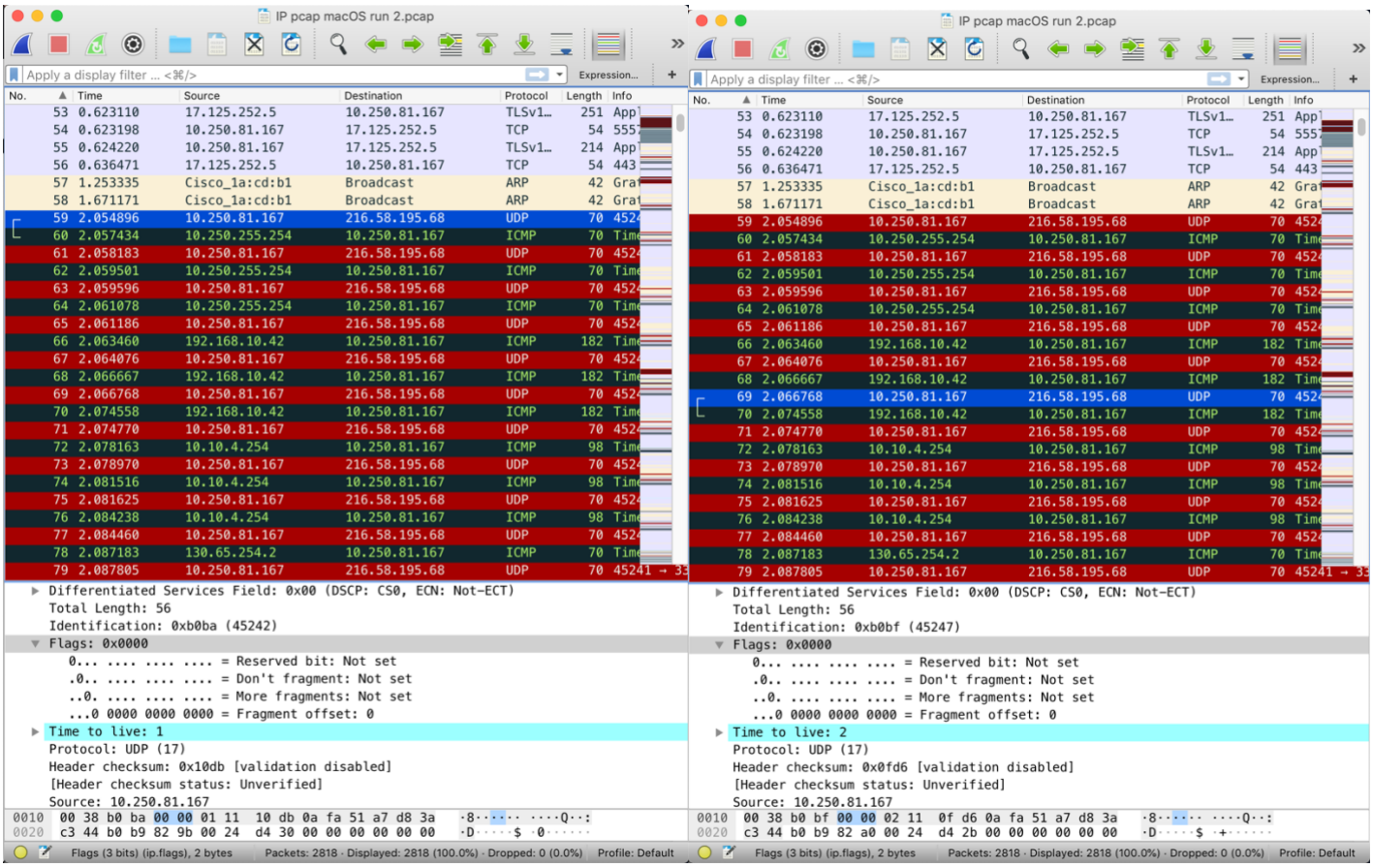

Figure 5: Screenshot shows the changes between a sequence of traceroute requests. Notice the time to live and ID files change.

6) Which fields stay constant? Which of the fields must stay constant? Which fields must change? Why?

A: Version, header length, source IP, destination IP differentiated services, upper layer protocol, and header checksum do not change. These fields must stay constant for traceroute to work properly to map out the routers to a destination. Additionally, since the packets are all UDP, these fields must use the UDP protocol. Identification field and time to live do change constantly.

7) Describe the pattern you see in the values in the Identification field of the IP datagram.

A: The ID field increments by 1 with each request. See screenshots below:

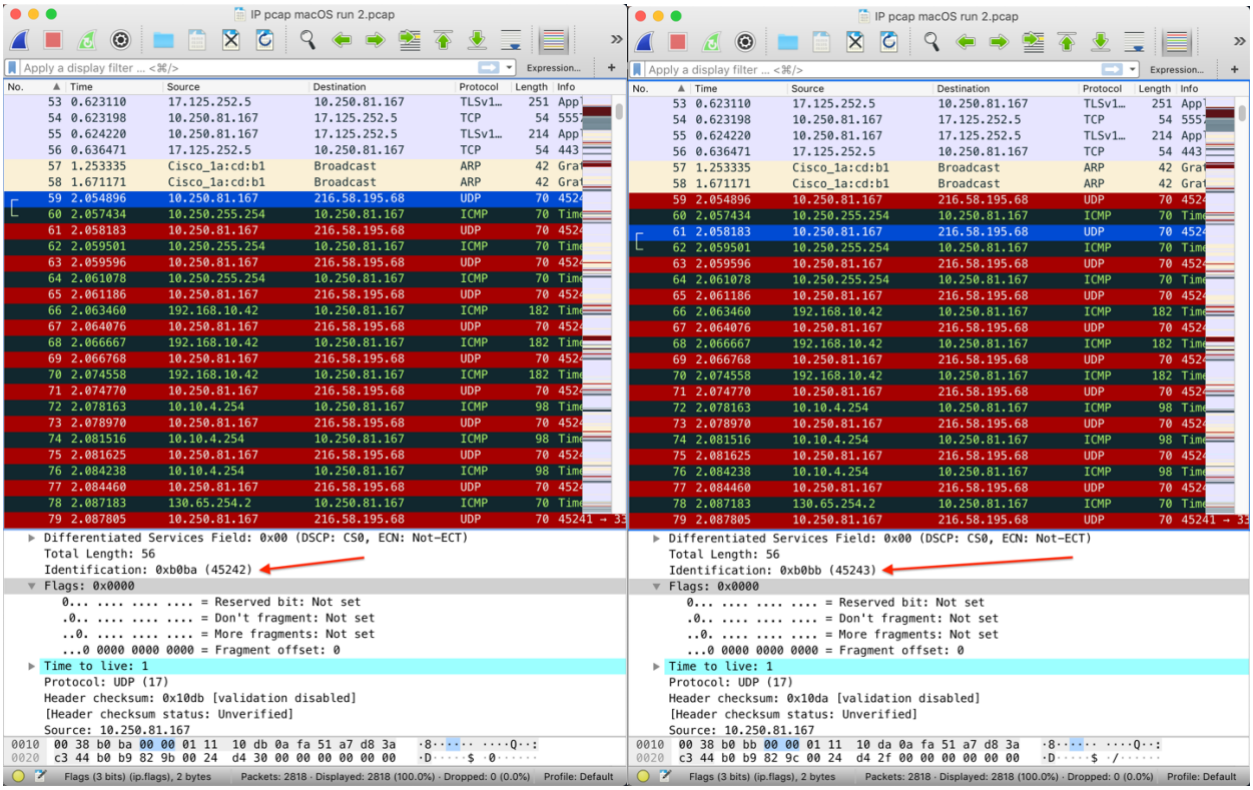

Figure 6: Screenshots showing incremental pattern between datagrams.

8) What is the value in the Identification field and the TTL field?

A: Identification: 0x62de (25310). Time to live: 255

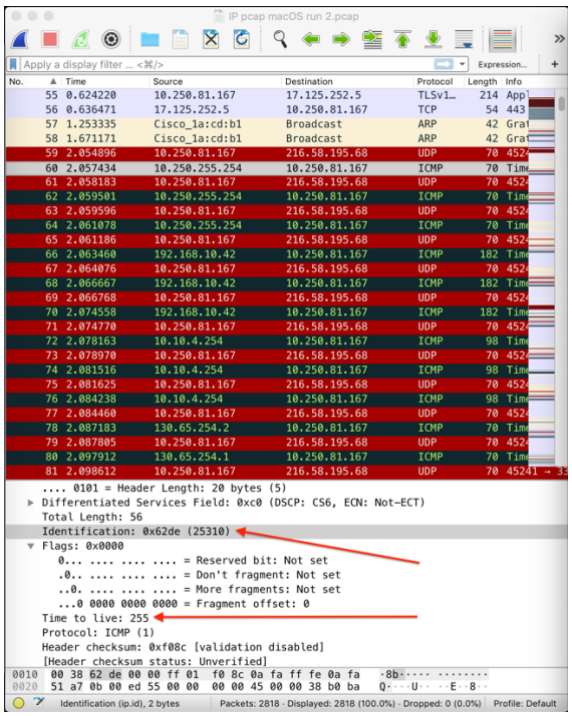

Figure 7: Screenshot showing ID and TTL field.

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?

A: The values change as expected. The TTL replies change as the more hops the sender requests increases, the more hops the reply has to travel to reach the original sender. Additionally, the ID increments by one as the ID must be a unique value.

10) Find the first ICMP Echo Request message that was sent by your computer after you changed the Packet Size in pingplotter to be 2400. Has that message been fragmented across more than one IP datagram?

A: Yes. The datagram was split into two separate datagrams. You can see this in the screenshot below:

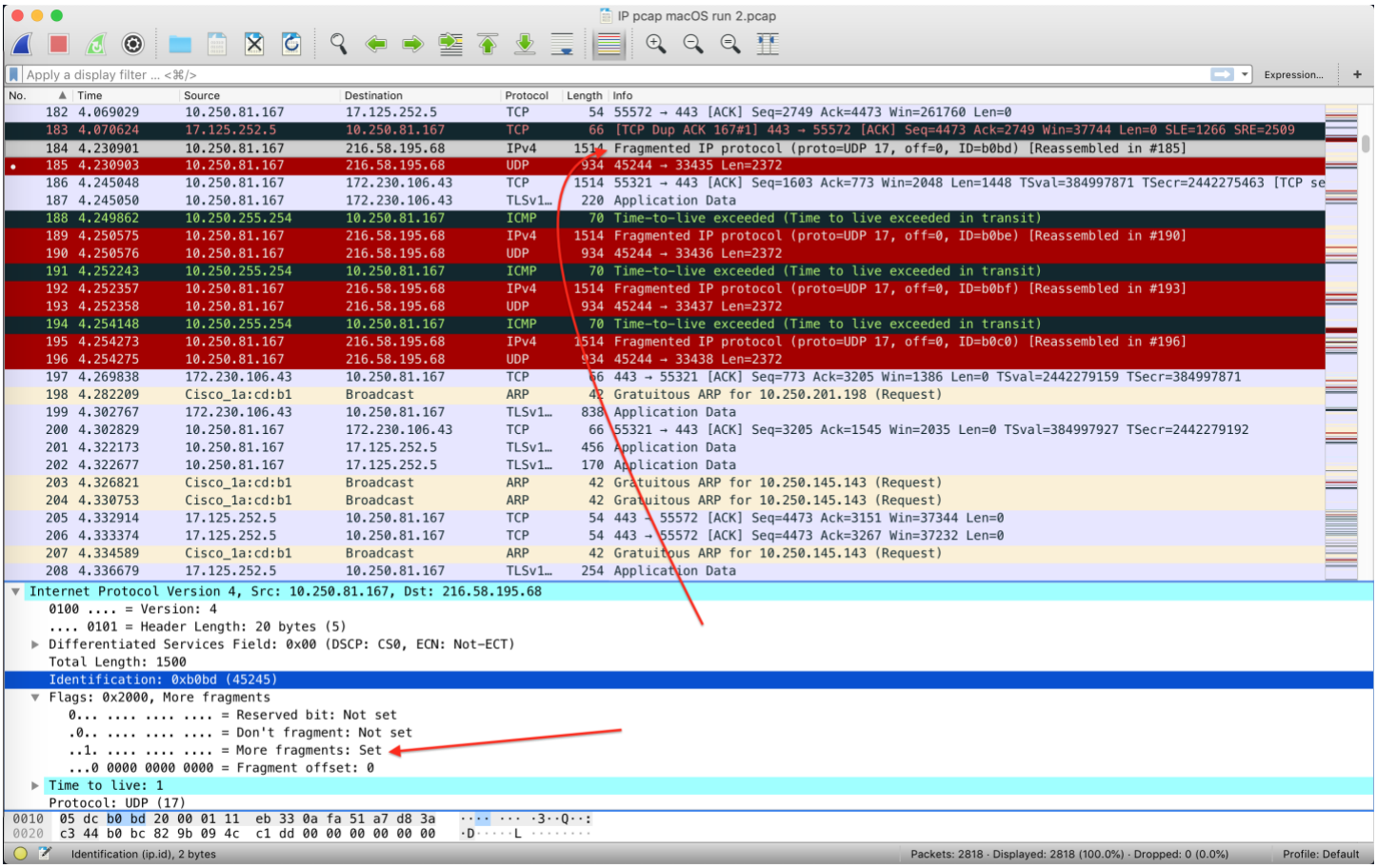

Figure 8: The arrows show indications that the datagram was fragmented.

11) Print out the first fragment of the fragmented IP datagram. What information in the UP header indicates that the datagram has 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?

A: The first fragment is printed below. One of the flags in the IPV4 block called “More Fragments” is set indicating that there are more fragments that should be part of this datagram. The “Fragment Offset” flag indicates that this is the first fragment as the offset is 0. In the other fragment, the offset will be 185. The length of this fragment is 1500.

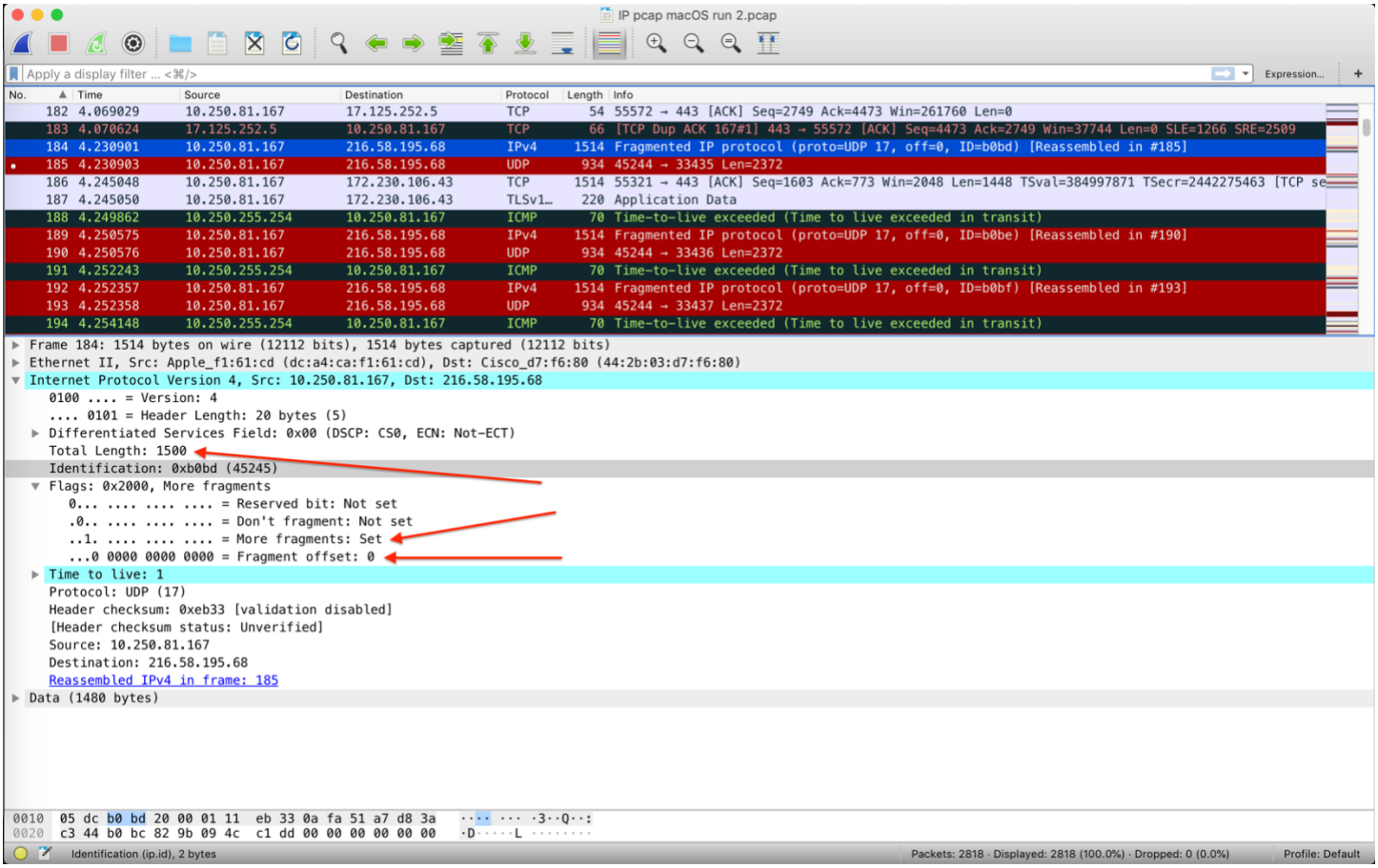

Figure 9: Shows the various indicators of this being a fragment.

12) Print out the second fragment of the fragmented IP datagram. What information in the IP header indicates that this is not the first datagram fragment? Are there more fragments? How can you tell?

A: The second data fragment can be found below. Similarly to number 11, the flags give me all the information I need. The fragment offset flag tells me that this is not the first fragment as there is an offset of 185. No more fragments exist as the more fragments flag is not set.

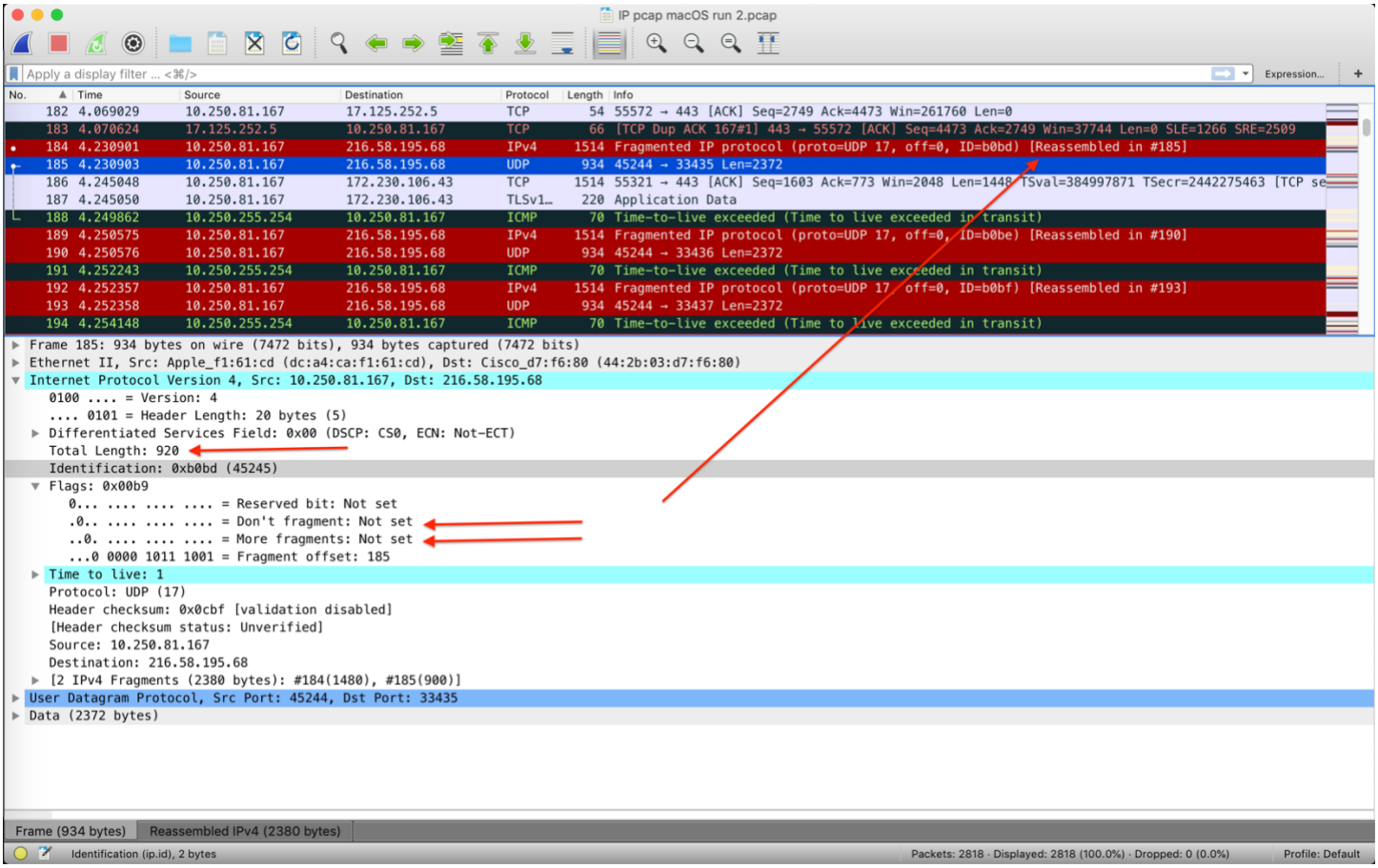

Figure 10: Screenshot shows the various flag indicators of this fragment.

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

A: Flag data changes between the two fragments. These include the “More Fragment” and “Fragment Offset” flag. Additionally, the total length field changes. The ID field and time to live fields do not change, however.

14) How many fragments were created from the original datagram?

A: Three fragments were created from the original datagram.

15) What fields change in the UP header among the fragments?

A: The fragment offset flag changes between each fragment. Additionally, the total length changes from fragment 2 to 3.

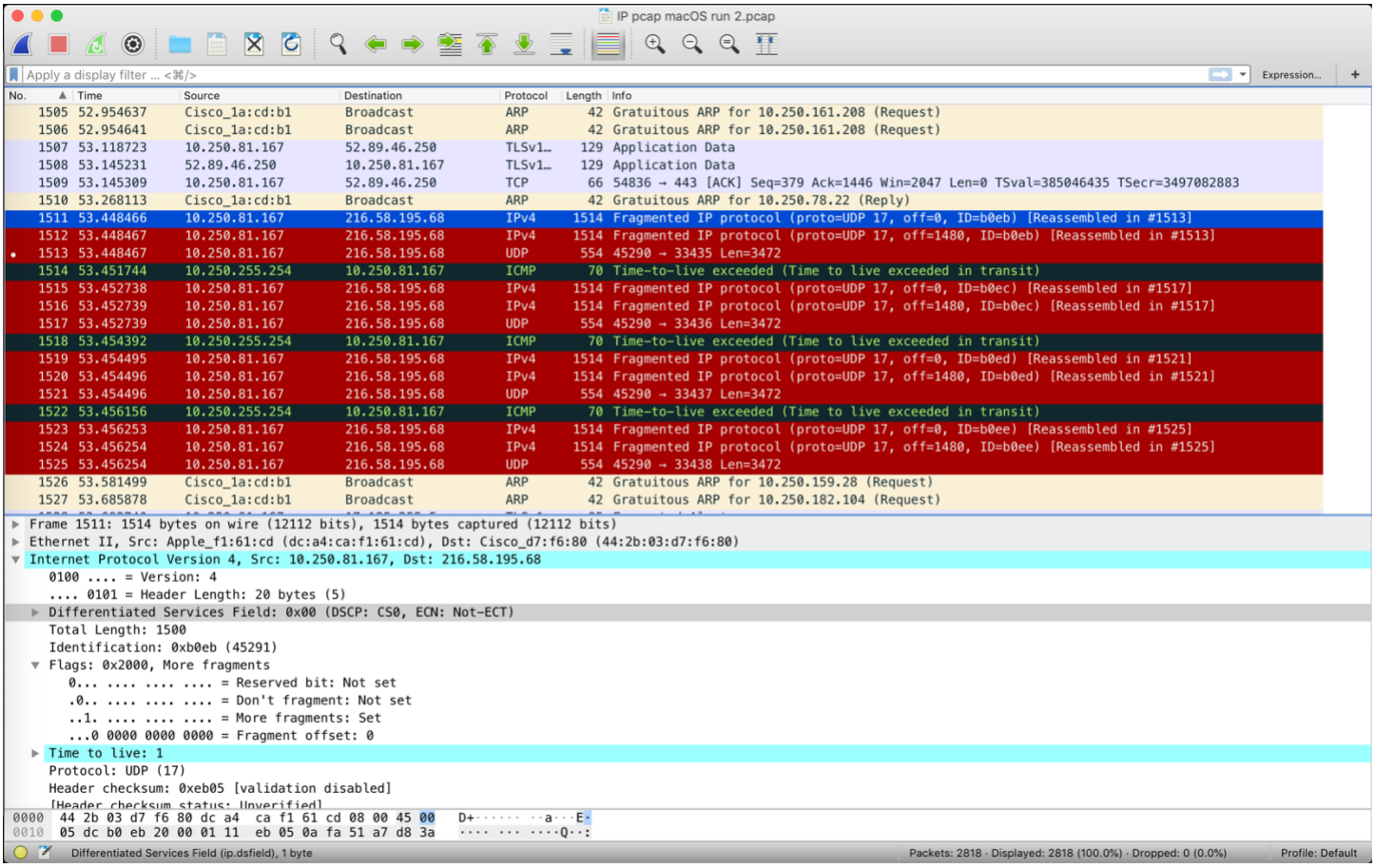

Figure 11: Screenshot showing fragmented 3500 size datagram.