Computer Networks 1

Lab 4a

Wireshark Lab: IP v8.0

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I. Objectives

In this lab, we'll explore several aspects of the HTTP protocol:

- Investigate the IP protocol
- Focusing on the IP datagram
- Investigate the various fields in the IP datagram
- Study IP fragmentation in detail

II. Content

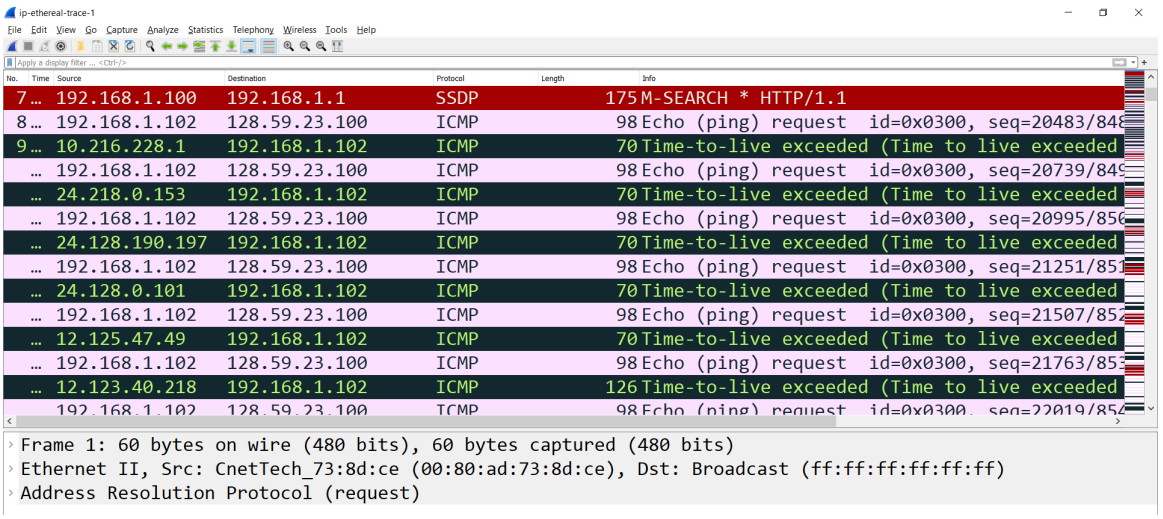
1. Capturing packets from an execution of traceroute

- Following the lab's guide.

2. A look at the captured trace

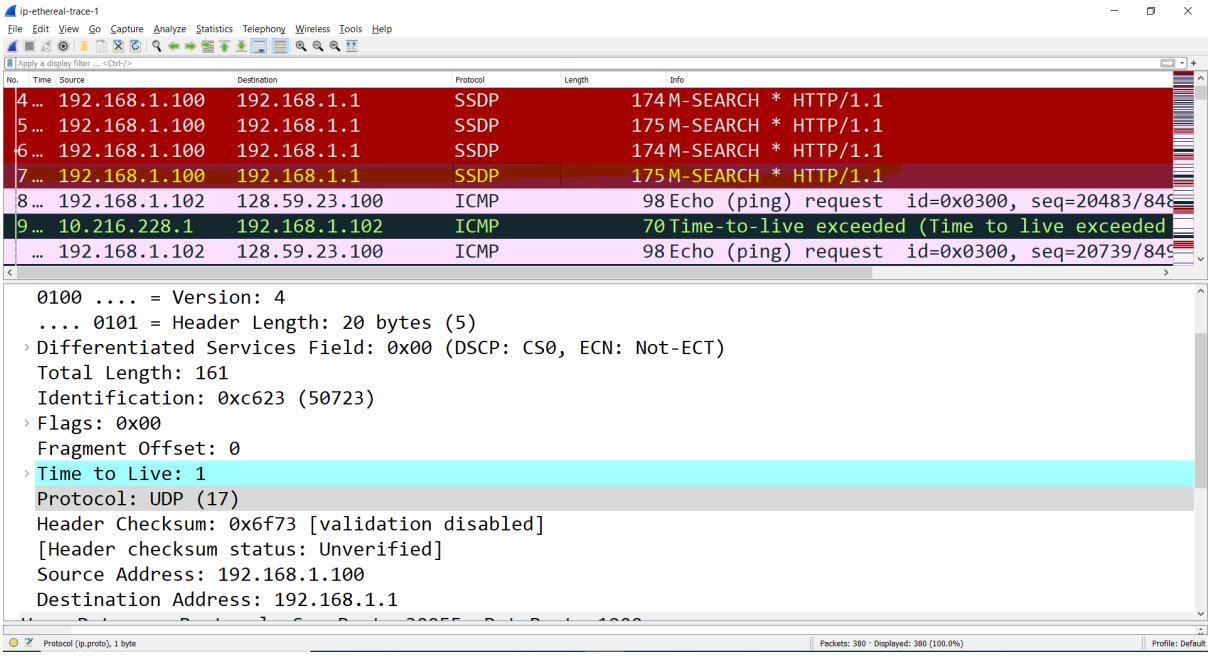
- Q1: Select the first ICMP Echo Request message sent by your computer, and expand the Internet Protocol part of the packet in the packet details window. What is the IP address of your computer?

  Answer: My computer is 192.168.1.11. And the author's computer in example is 192.168.1.102.



- Q2. Within the IP packet header, what is the value in the upper layer protocol field?

  Answer: the upper layer protocol field's value is 17

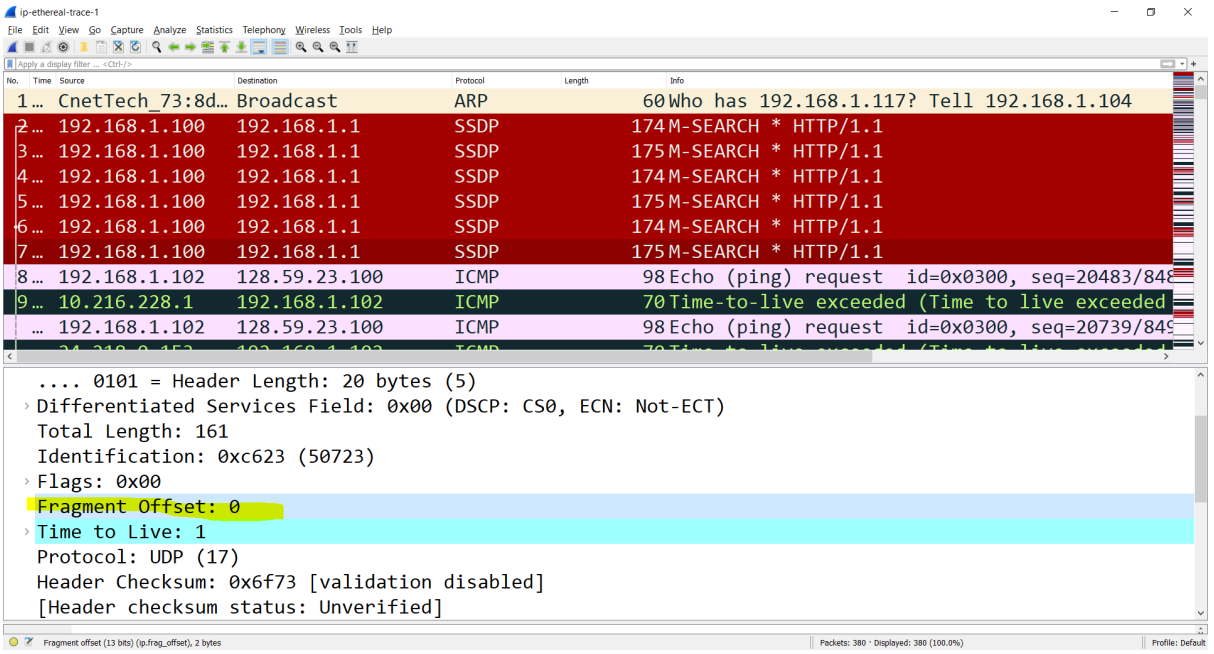


- Q3. How many bytes are in the IP header? How many bytes are in the payload of the IP datagram? Explain how you determined the number of payload bytes.

  Answer: It is 141 bytes. Total length is 161 bytes and the header length is 20 bytes. So the payload of IP datagram is 161 - 20 bytes

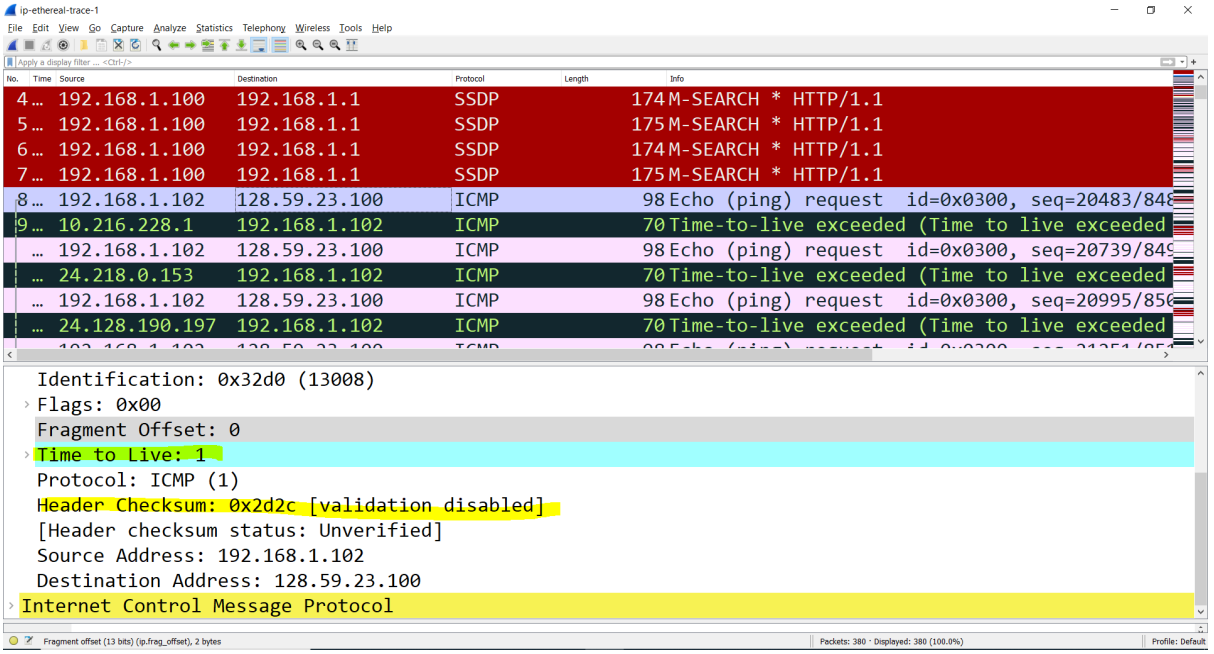
- Q4. Has this IP datagram been fragmented? Explain how you determined whether or not the datagram has been fragmented.

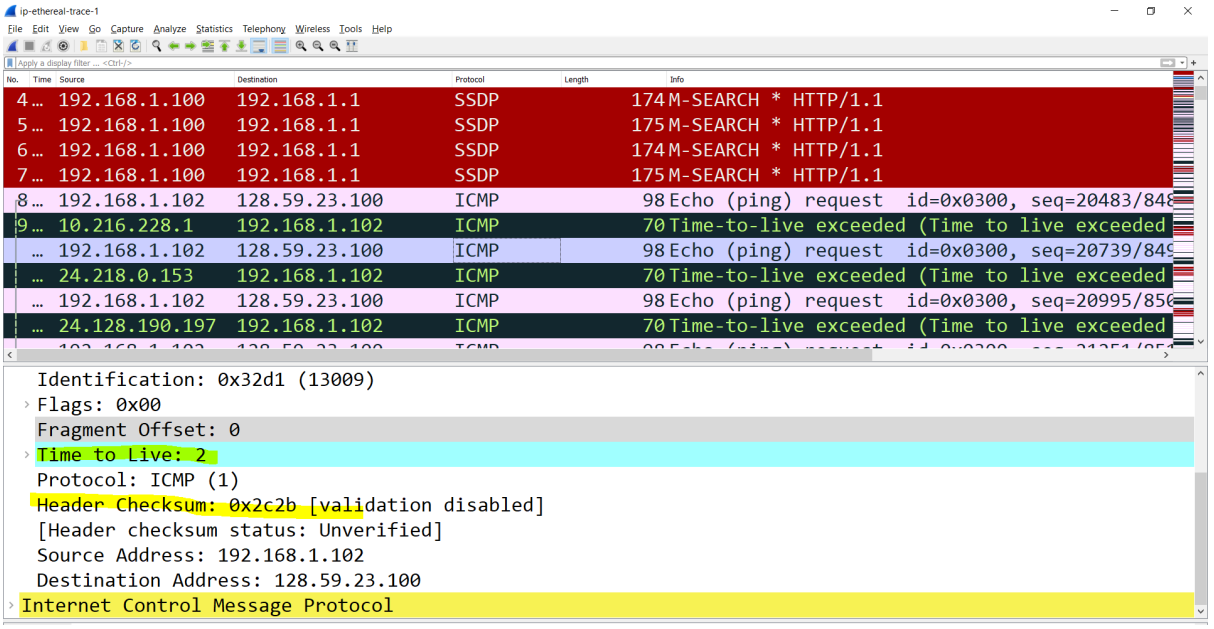
  Answer: No, because fragment offset is 0.



- Q5: Which fields in the IP datagram always change from one datagram to the next within this series of ICMP messages sent by your computer?

Answer: It is header checksum and time to live





- Q6. Which fields stay constant? Which of the fields must stay constant? Which fields must change? Why?

  Answer:

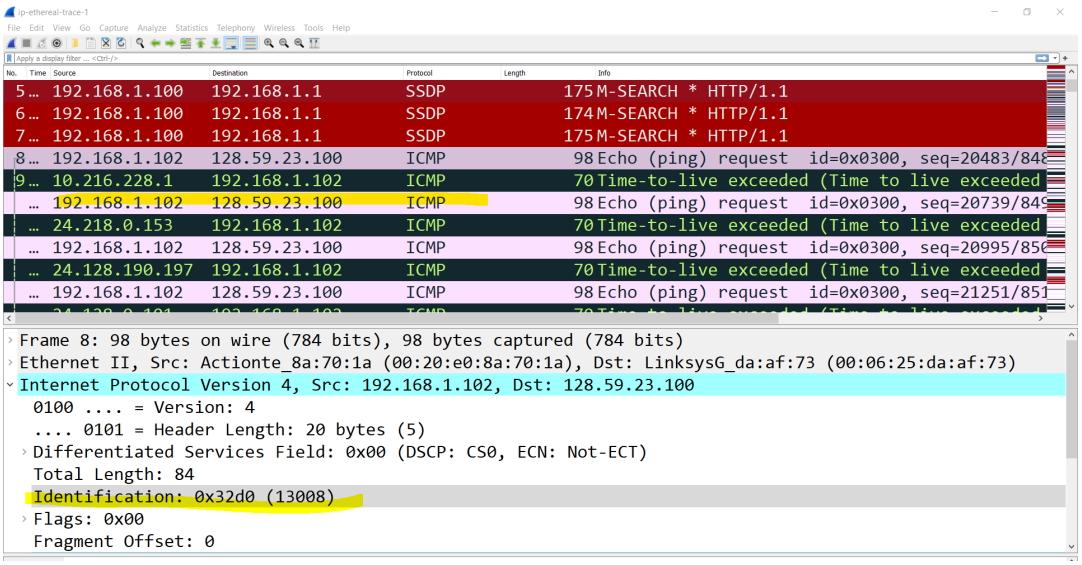
  +Fields stay constant: IP version, Length of header, Source IP address, Destination IP address, Upper Layer Protocol

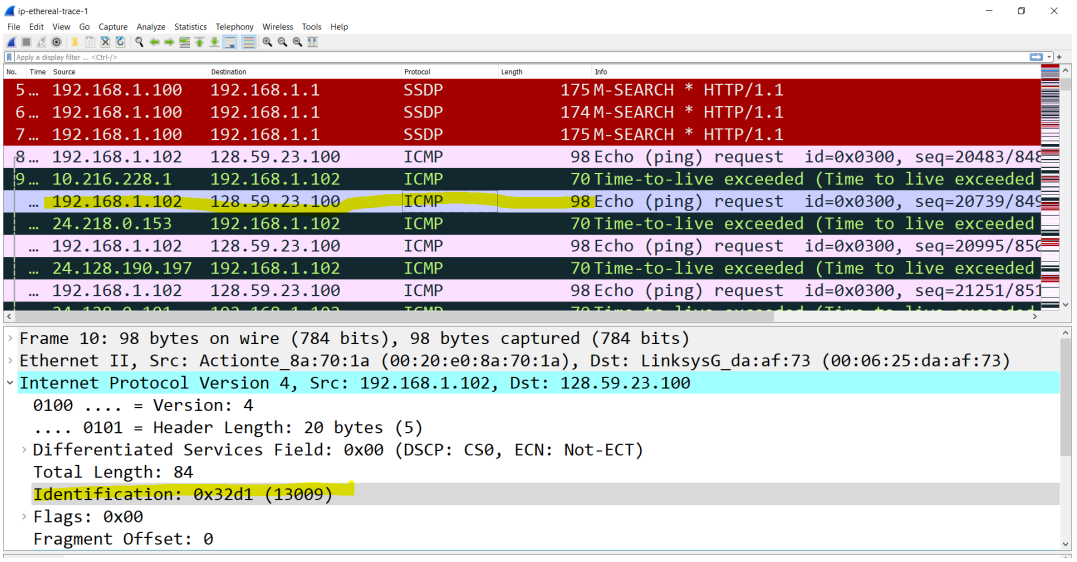
  +Fields must stay constant: Same as Fields stay constant

  +Fields must change: Header Checksum, Time to live, Identification

- Q7. Describe the pattern you see in the values in the Identification field of the IP datagram

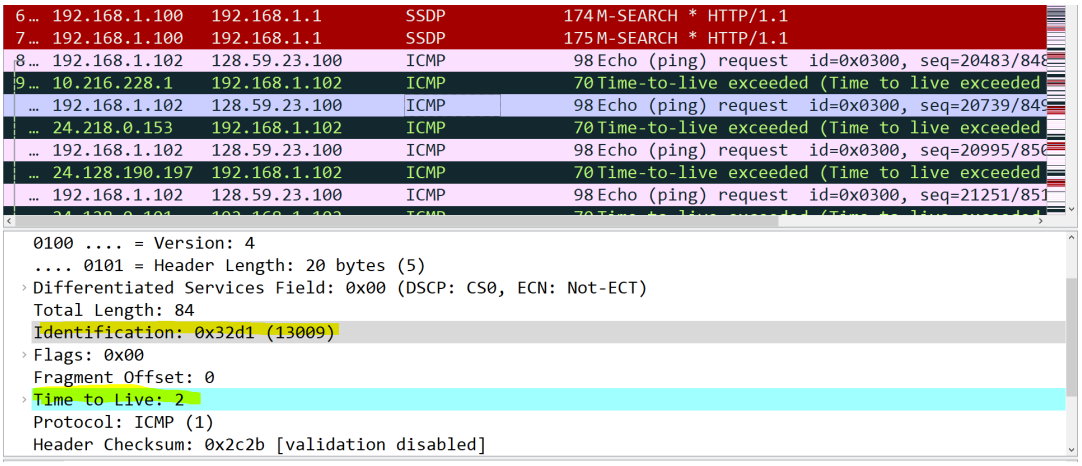
Answer: Pattern: Identification field increases by one each echo request





- Q8. What is the value in the Identification field and the TTL field?

Answer: Identification: 0x32d1 (13009). Time to live: 2



- Q9. Do these values remain unchanged for all of the ICMP TTL-exceeded replies sent to your computer by the nearest (first hop) router? Why?

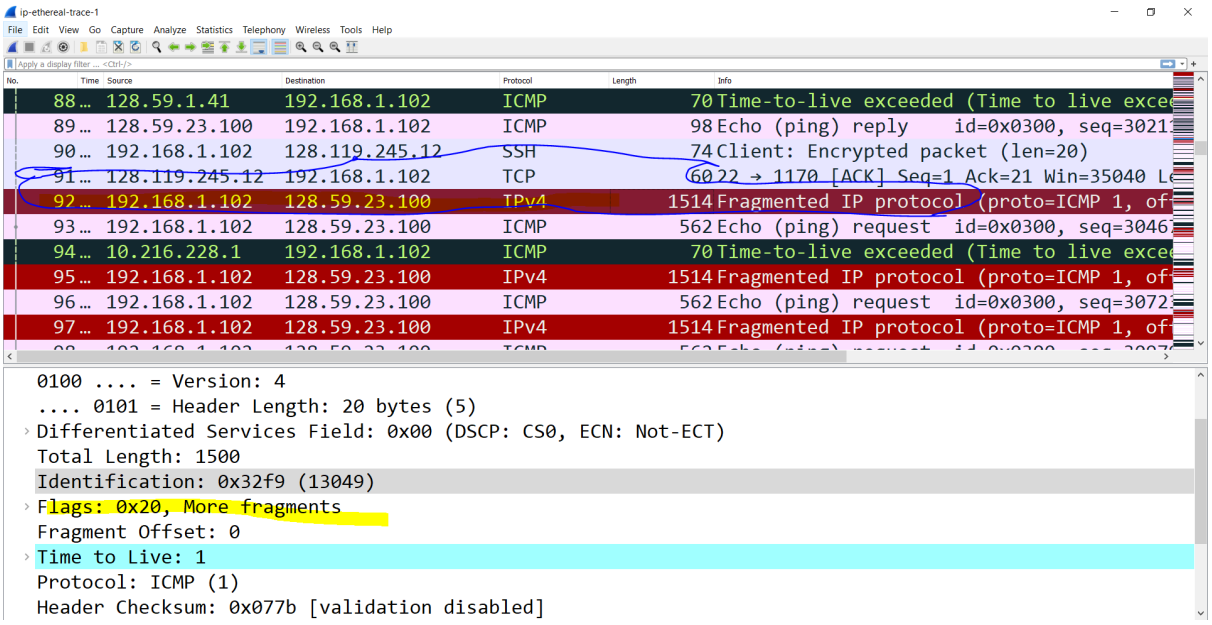
  Answer:

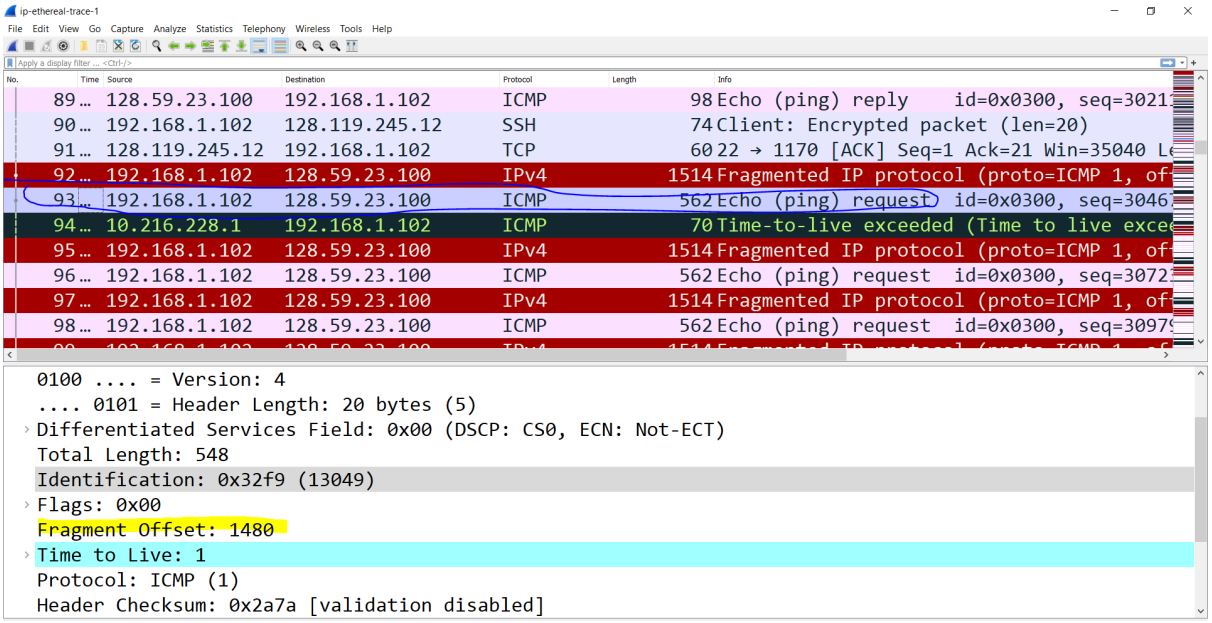
  - The values of identification field changes for all the ICMP TTL-exceeded replies since the identification field is a unique value. If two or more IP datagrams have the same identification value, then it means that these IP datagrams are fragments of a single large IP datagram.
  - The TTL field was unchanged since the TTL for the nearest router is always the same

3. Fragmentation

- Q10: 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? [Note: if you find your packet has not been fragmented, you should download the zip file http://gaia.cs.umass.edu/wireshark-labs/wireshark-traces.zip and extract the ipethereal-trace-1packet trace. If your computer has an Ethernet interface, a packet size of 2000 should cause fragmentation.3]

  Answer: No.92 message has been fragmented across more than one IP datagram (in No.93).





- Q11. Print out the first fragment of the fragmented IP datagram. What information in the IP 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?

  Answer: First fragment:

  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: 0x20, More fragments

  Fragment Offset: 0

  Time to Live: 1

  Protocol: ICMP (1)

  Header Checksum: 0x077b [validation disabled]

  [Header checksum status: Unverified]

  Source Address: 192.168.1.102

  Destination Address: 128.59.23.100

  [Reassembled IPv4 in frame: 93]

- Q12. 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 the more fragments? How can you tell?

  Answer: Second fragment:

  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: 0x00

  Fragment Offset: 1480

  Time to Live: 1

  Protocol: ICMP (1)

  Header Checksum: 0x2a7a [validation disabled]

  [Header checksum status: Unverified]

  Source Address: 192.168.1.102

  Destination Address: 128.59.23.100

  [2 IPv4 Fragments (2008 bytes): #92(1480), #93(528)]

  => No more fragments because flags are now 0. This is not the first fragments but is the last one

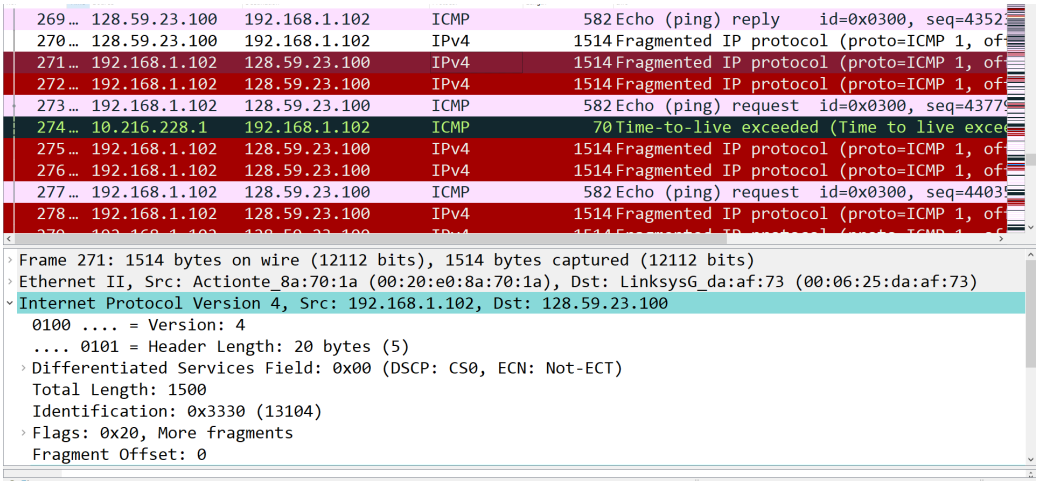
- Q13. What fields change in the IP header between the first and second fragment?

  Answer:

  - Total length: 1500 -> 548
  - flags: 0x20 -> 0x00
  - fragment offset: 0 -> 1480
  - checksum: 0x077b -> 0x2a7a

- Q14. How many fragments were created from the original datagram?

  Answer: 3 fragments were created from the original datagram



- Q15. What fields change in the IP header among the fragments?

  <u>Answer</u>: Fragment offset (0->1480->2960), checksum(0x0744->0x068b0->0x2976)