Computer Networks
Homework-3

Due date: Friday 05/04/2024
Total marks: 20
Name: Surendra Kumar Ahiiwar
Roll no.: 211083

Let's consider the above IPv4 packet (given the above information) and its various fields. Please answer the following questions.

Question 1. Within the IP packet header, what is the value in the upper layer protocol field?

Answer 1. Upper Layer Protocol Field: The value in the upper layer protocol field of the IP packet header is indicated by the "Protocol" field. For this packet, the Protocol is ICMP (Internet Control Message Protocol), with a hexadecimal value of 0x01.

Question 2. 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 2. Bytes in the IP Header and Payload:

IP Header Bytes: The header length is specified in the "Header length" field. It is 20 bytes long for this packet.

Payload Bytes: The Total Length field specifies the entire packet size, including the header and payload. For this packet, the total length is 56 bytes. To find the payload size, we subtract the header length from the total length: 56 bytes (total) -20 bytes (header) $= 36$ bytes (payload).

Question 3. Has this IP datagram been fragmented? Explain how you determined whether or not the datagram has been fragmented.

Answer 3. The datagram has not been fragmented. This can be determined from the "Flags" field:

- The "Don't fragment" bit is not set (.0..), allowing fragmentation if necessary.
- The "More fragments" bit is also not set (..0.), indicating this packet is either the only fragment or the last one.
- The "Fragment offset" field is 0, which further indicates this packet has not been fragmented or is the first fragment.

Question 4. What is the value in the Identification field and the TTL field?

Answer 4. Identification Field Value: The value in the Identification field is 0x80b2, which translates to 32946 in decimal.

TTL Field Value: The TTL (Time to Live) field value is 1.

Let's concentrate on the above packet fields (given above).

Question 5. Can you say whether the message corresponding to the above packet has been fragmented?

Answer 5. Yes, the message corresponding to the above packet has been fragmented. This is indicated by the presence of the "Fragmented IP protocol" information in the packet descriptions.

Question 6. What information in the IP header indicates that the datagram been fragmented?

Answer 6. Fragmentation Information in IP Header: The following fields in the IP header provide information about fragmentation:

- Flags: The Flags field contains information about fragmentation. In this case, the "More Fragments" flag is set, indicating that there are more fragments to follow.
- Fragment Offset: The Fragment Offset field specifies the offset of the current fragment relative to the beginning of the original unfragmented datagram. In this case, the Fragment Offset is 0 for the first fragment.

Question 7. What information in the IP header indicates whether this is the first fragment versus a latter fragment?
Answer 7. The presence of the "More Fragments" flag being set in the Flags field indicates that this is not the last fragment of the original datagram. Additionally, the Fragment Offset being 0 indicates that this is the first fragment. Subsequent fragments would have non-zero values in the Fragment Offset field to indicate their position relative to the original datagram.

Let's concentrate on the above packet fields (given above).
Question 8. What information in the IP header indicates that this is not the first datagram fragment?
Answer 8. The "More Fragments" flag in the Flags field of the IP header is not set (0), indicating that this is the last fragment of the original datagram. In Frame 122, the Fragment offset is 1480 bytes, indicating that this fragment is not the first one. The Fragment offset value specifies the offset of the data in the current fragment relative to the start of the original unfragmented datagram.

Question 9. Are the more fragments? How can you tell?
Answer 9. No, there are no more fragments. This can be determined by checking the "More Fragments" flag in the Flags field of the IP header, which is not set (0). When this flag is set, it indicates that there are more fragments to follow. Since it's not set in this case, there are no more fragments.

Question 10. If Fig. 2 and Fig. 3 are the 1st and 2nd fragments of a message, then what fields change in the IP header between the first and second fragment?
Answer 10. Fields Change Between First and Second Fragment:

- Fragment Offset: This is the primary field that changes between the first and second fragment. In Fig. 2 (Frame 121), the offset is 0, indicating the beginning of the data. In Fig. 3 (Frame 122), the offset is 1480, indicating this fragment's data begins at byte 1480 of the original datagram.

- Flags: Specifically, the "More fragments" flag could change if the second fragment is the last one, indicating there are no further fragments. However, according to the given information for Frame 122, the flags field description doesn't align with the standard notation, making it hard to compare directly. Typically, if the first fragment has the "More fragments" flag set and the second one does not, it would indicate the second fragment is the last one.

- Total Length: This field changes to reflect the size of the individual fragment. Frame 121 has a total length of 1500 bytes (typical for a maximally sized fragment due to MTU limits), while Frame 122 shows a total length of 520 bytes, indicating the size of the second fragment.