



# CS425

## Assignment II- IPv4 Datagram

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## Question 1

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

### Solution:

Ans: ICMP (0x01)

The Protocol field specifies the value of the upper layer protocol. It indicates the next higher level protocol that is to receive the data field at the destination; thus, this field identifies the type of the next header in the packet after the IP header.

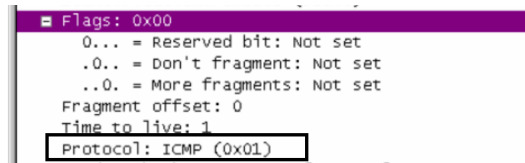


Figure 1:

## 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

### Solution:

Ans: Header length: 20 bytes, Number of bytes in the payload: 36 bytes

The Internet Header Length (IHL) (4 bits) field gives the length of the header. It is given in the figure to be 20 bytes. The Total Length (16bits) field gives the total datagram length, including header plus data, in octets. It is given in the figure to be 56 bytes. Thus we obtain the length of the payload by subtracting the total length and the header length (i.e.  $56 - 20 = 36$  bytes).

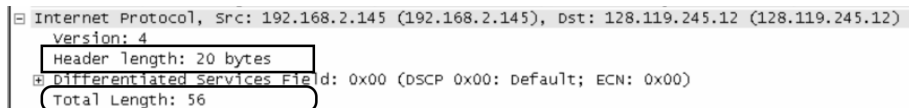


Figure 2:

## Question 3

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

**Solution:**

Ans: No, the IP datagram given has not yet been fragmented.

The value of fragment offset is equal to zero, this means that this is the first datagram even if it has been fragmented. Now, if fragmentation was done and this were the first datagram, the more fragment bit would have been 1. But it is given that the more fragment bit is 0. This indicates that there are no more fragment. Thus, the value of offset and MF bit both being 0, help us to conclude that no fragmentation has been done.

```

0... = Reserved bit: Not set
1... = Don't fragment: Not set
..0. = More fragments: Not set
Fragment offset: 0

```

Figure 3:

### Question 4

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

**Solution:**

Ans: The value of the identification field is 0x80b2 (32946), while that of TTL field is 1.

```

Identification: 0x80b2 (32946)
Flags: 0x00
0... = Reserved bit: Not set
1... = Don't fragment: Not set
..0. = More fragments: Not set
Fragment offset: 0
Time to live: 1

```

Figure 4:

### Question 5

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

**Solution:**

Ans: Yes, the message corresponding to the above packet has been fragmented.

### Question 6

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

**Solution:**

Ans: The more fragment(MF) bit is set to 1. This indicates that fragmentation of the datagram has been done.

## Question 7

What information in the IP header indicates whether this is the first fragment versus a latter fragment?

### Solution:

Ans: The given datagram is the first fragment to be sent in one of the many datagrams which can be send.

This is indicated by the offset bit being equal to 0. This field indicates where in the original datagram this fragment belongs, measured in 64-bit units. This bit being zero indicates that the given datagram is the first one.

```
Flags: 0x02 (More Fragments)
 0... = Reserved bit: Not set
 .0.. = Don't fragment: Not set
 ..1. = More fragments: Set
Fragment offset: 0
Time to live: 1
```

Figure 5:

## Question 8

What information in the IP header indicates that this is not the first datagram fragment?

### Solution:

Ans: The fragment offset (1480) field indicates that the given datagram is not the first fragment.

```
Flags: 0x00
 0... = Reserved bit: Not set
 .0.. = Don't fragment: Not set
 ..0. = More fragments: Not set
Fragment offset: 1480
```

Figure 6:

## Question 9

Are there more fragments? How can you tell?

### Solution:

Ans: There are no more fragments as the more fragment (MF field) is set to 0.

```
Flags: 0x00
 0... = Reserved bit: Not set
 .0.. = Don't fragment: Not set
 ..0. = More fragments: Not set
Fragment offset: 1480
```

Figure 7:

## 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?

### Solution:

Ans: The following are the fields that change in the IP header between the first and the second fragment:

1. The total length field is different, indicating that the two shown fragments carry different amount of data.
2. The frames have different values of offset, which is because of different position of the frames in the original datagram, measured in 64-bit units.
3. The MF bit (more fragment bit) is changed, indicating that the message had only two fragments, of which the first fragment is shown in the figure 2, while the second is shown in figure 3.
4. The header checksum is also different in the two frames.

*Thank You*