CENG 435 - Data Communications and Networking
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THE - 4

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ICMP

1. For the ICMP request package shown in Figure 1, the source host IP address is `172.26.128.47`, and the destination host IP address is `1.1.1.1`. For the ICMP reply package shown in Figure 2, the source host IP address is `1.1.1.1`, and the destination host IP address is `172.26.128.47`.
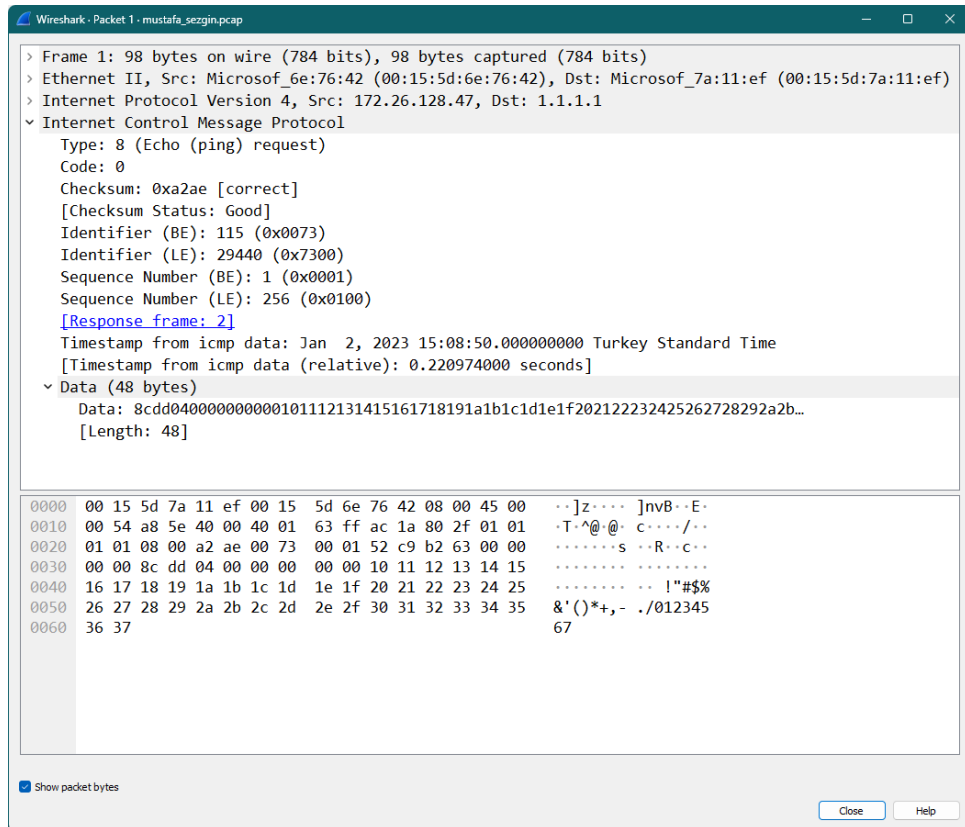

Figure 1: ICMP request packet details

2. ICMP packets do not contain any port number. This is because ICMP is a host-to-host protocol that does not communicate with processes and, therefore, does not need any port number. It is a part of the network layer.
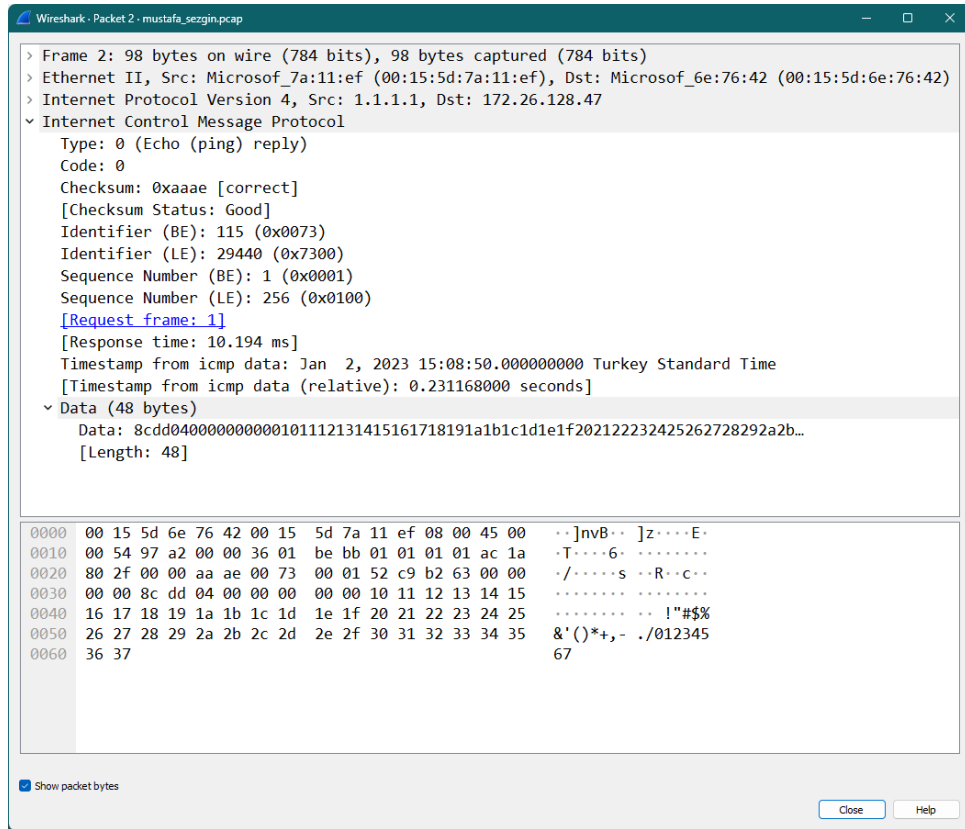
Figure 2: ICMP reply packet details

3. (a) The type field is used to identify the type of the packet, which can be "echo reply", "echo request", "destination unreachable", "TTL expired", "bad IP header", etc.

   (b) The code field is used to provide additional information regarding the type of the packet. It is not always used. For example, if the type is "destination unreachable", the code can mean "network unreachable", "host unreachable", "protocol unreachable", "network unknown", etc.

   (c) The type of the ICMP request packet shown in Figure 1 has the value 8, which means it is an "Echo (ping) request" packet. The type of the ICMP reply packet shown in Figure 2 has the value 0, which means it is an "Echo (ping) reply" packet. The code fields of both packets have the value of 0 and they do not have any meaning when the type is 0 or 8.

4. As seen in Figure 1, ICMP request has a payload data of size 48 bytes, and the total size of the frame is 98 bytes, including all the headers. The size of each field in the header of an ICMP packet is as follows.

   - type: 1 byte
   - code: 1 byte
   - checksum: 2 bytes
   - identifier: 2 bytes
   - sequence number: 2 bytes
   - timestamp: 8 bytes
   - payload: varying size

5. The routing table can be seen in Figure 3. The IP address `1.1.1.1` does not match any of the rules and, therefore, packets are forwarded to the default interface according to the `default` rule. Removing the `default` rule would cause the outgoing packets to drop.

Figure 3: `ping` Packets and Routing Table

6. (a) The 48-bit Ethernet address of my computer is `00:15:5d:6e:77:1b`.

   (b) The 48-bit destination address in the Ethernet frame is also `00:15:5d:6e:77:1b`, which belongs to my computer.

   (c) The type fields in layer 2 of ICMP packets are all `0x0800`, which means IPv4. For other packets:
       - `0x0800` (IPv4) for most of the packets
       - `0x86dd` (IPv6) for some of the packets
       - `0x0806` (ARP) for Address Resolution Protocol packets