

## CHAPTER 21 : Network Layer: Address Mapping, Error Reporting, and Multiplexing

### Solutions to Selected Review Questions

#### Review Questions

1. This restriction prevents ICMP packets from *flooding* the network. Without this restriction an endless flow of ICMP packets could be created.
2. The size of an ARP packet is *variable*, depending on the length of the logical and physical addresses used.
3. The *IP header* is included because it contains the IP address of the original source. *The first 8 bytes of the data* are included because they contain the first section of the TCP or UDP header which contains information about the port numbers (TCP and UDP) and sequence number (TCP). This information allows the source to direct the ICMP message to the correct application.
4. The value of the *protocol field* of an IP packet carrying an ICMP packet is **1**.
5. ARP Packet Size = 2 + 2 + 1 + 1 + 2 + 6 + 4 + 6 + 4 = **28 bytes**.
6. The minimum size of an IP packet that carries an ICMP packet would be **28 bytes** (a 20 byte IP header + an 8 byte router solicitation packet). The maximum size would be **2068 bytes** (a 20 byte IP header + a 2048 byte router advertisement packet).
7. The minimum size would be **64 bytes** if we do not consider the preamble and SFD fields, which are added at the physical layer. The maximum size would be **1518 bytes**, again not considering the preamble and SFD fields. Although the maximum size of an ICMP packet can be much more than 1500 bytes (for a router advertisement packet), Ethernet can carry only 1500 bytes of it.
8. The minimum size of an ICMP packet is **8 bytes** (router solicitation packet). The largest of the ICMP packets is the router advertisement packet with up to 255 listings. The maximum size is then:

$$255 \text{ listings} \times 8 \text{ bytes/listing} + 8 \text{ bytes for the ICMP header} = \mathbf{2048 \text{ bytes}}$$

9. The size of the ARP packet in Question 2 is 28 bytes. We need to pad the data to have the minimum size of **46**. The size of the packet in the Ethernet frame is then calculated as  $6 + 6 + 2 + 46 + 4 = 64$  bytes (without preamble and SFD).

10. The broadcast for Ethernet is all 1s or **0xFFFFFFFFFFFF**.

11. There is no need for a report message to travel outside of its own network because its only purpose is to *inform the next router in the spanning tree of group membership*. There is no need for a query message to travel outside of the local network because its only purpose is *to poll the local network for membership in any groups*.

12. A host would never receive a redirection message if there is only *one router* that connects the local network to the outside world.