CHAPTER 9

Internet Control Message Protocol Version 4 (ICMPv4)

Exercises

1.

a. The original message is lost in transit. The sender can re-send the message.

b. The reply is lost in transit. The sender can re-send the message.

c. The original message was corrupted and discarded. The sender can re-send the message.

3. It could happen that host B is unreachable, for some reason. The error message generated by an intermediate router could then be lost on its way back to host A. Or perhaps the datagram was dropped due to congestion and the error message generated by an intermediate router was lost.

5. The maximum value is 59 because the pointer points to a byte somewhere in the original IP header (a maximum of 60 bytes). An offset of 0 would point to the first byte, so an offset of 59 would point to the 60th byte.

7. See Table 9.E7.

Table 9.E7 *Solution to Exercise 7*

Category	*Type*	*Code*	*Non-Dest. host*	*Router*	*Destin. host*
Error	Destination unreachable	0		√	
		1		√	
		2			√
		3			√
		4		√	
		5		√	
		6		√	
		7		√	
		8		√	
		9		√	
		10		√	
		11		√	
		12		√	
		13		√	
		14		√	
		15		√	
	Source quench	0		√	√
	Time exceeded	0		√	
		1			√
	Parameter problem	0		√	√
	Redirection	0		√	
Query	Echo request	0	√	√	√
	Echo reply	0	√	√	√
	Timestamp request	0	√		
	Timestamp reply	0			√

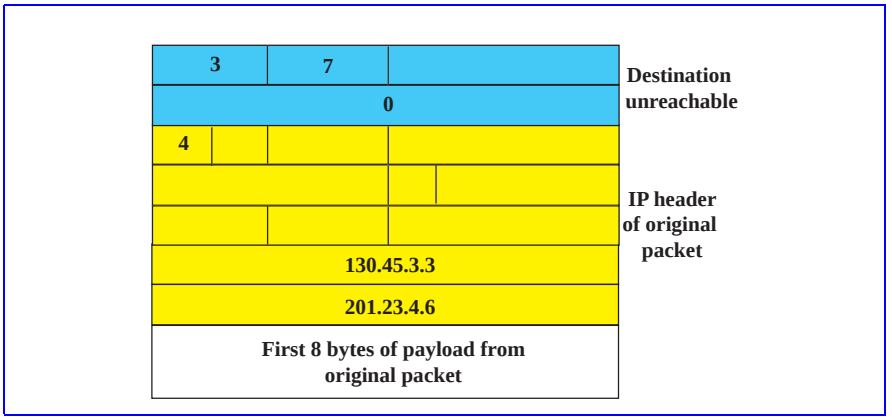
9. The one way time is not the round trip divided by 2 because the request packet may have traveled by a different route than the response packet. In this case, the transmission time in one direction may be different than the transmission time in the other direction.

11. 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).

13. The value of the protocol field of an IP packet carrying an ICMP packet is 1.

15. See Figure 9.E15.

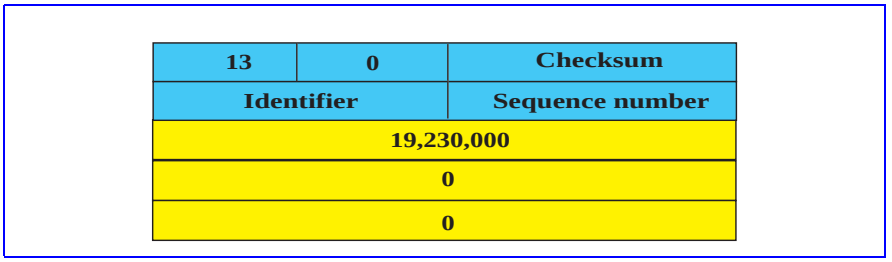
Figure 9.E15 *Solution to Exercise 15*



17. The type in this message is 3, which means it is a destination unreachable message. The code in this message is 3, which means that the target port is unreachable. The purpose of this message is to inform the sender that the destination port is not available on the destination host at this time.

19. See Figure 9.E19.

Figure 9.E19 *Solution to Exercise 19*



21.

2:34:20 PM = 52,460,000 ms

52,460,000 ms − 52,453,000 ms = 7000 ms

7000 ms + 5 ms = 7005 milliseconds

23. Assume that the message travels at 2×10^8 meters/second and that 6.2 miles equals 10 kilometers.

(5000) (10)/6.2 = 8064.5 km = 8.06×10^6 meters

(8.06×10^6 meters)/ 2×10^8 meters/second = 4.03 $\times 10^{-2}$ s = 40.3 ms