

# CHAPTER 10

## IGMP

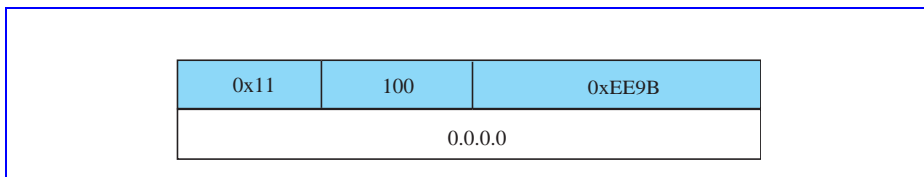
### 10.1 MULTIPLE-CHOICE QUESTIONS

1. d    2. d    3. b    4. d    5. d    6. b    7. b    8. c    9. b    10. b  
11. c    12. a    13. c    14. b    15. a    16. b    17. c    18. d

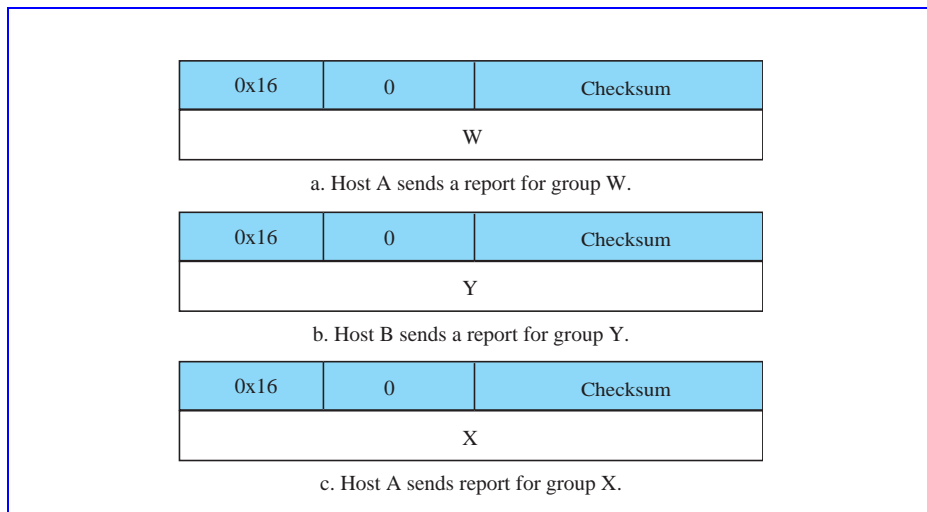
### 10.2 EXERCISES

19. There is no need for a report message to travel outside of its own network because its only purpose is to inform the next higher 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.
20. The following message is sent by the router to monitor membership in any of the groups. See Figure 10.1

**Figure 10.1** *Exercise 20*

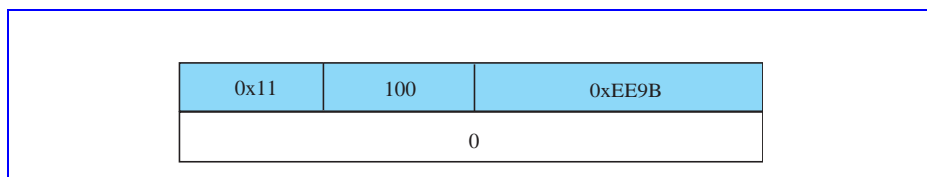


The following messages are sent to preserve membership in the groups. Since reports are sent at random times, there is more than one correct set of messages that can be sent in response to the membership query—this is one possibility. See Figure 10.2.

**Figure 10.2** Exercise 20, part 2

Note that since no reports were sent to the router claiming membership to group Z, this group will be dropped from the group table in the router.

21. 00000001 00000000 01011110 00011000 00111100 00001001
22. A router should send only 1 query message no matter how many entries it has in its group table. The message will be broadcast to all of the local nodes that are below it in the spanning tree.
23. The host must send as many as five different report messages at random times in order to preserve membership in five different groups.
24. See Figure 10.3. Note that the IP address and the physical address of the host are not part of the IGMP messages.

**Figure 10.3** Exercise 24

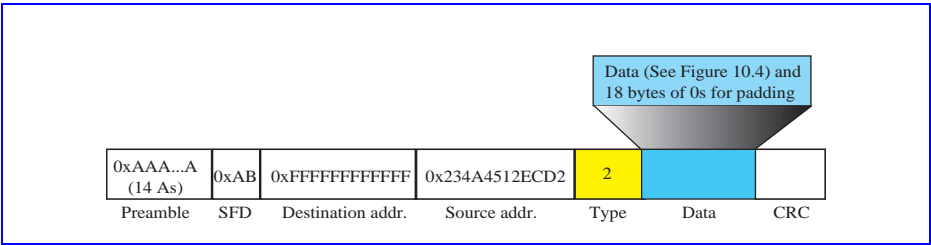
25. See Figure 10.4.

Figure 10.4 Exercise 25

4	5	0	28
1			00
1	2	0xEE9B	
202.45.33.21			
224.0.0.1			
0x11	100	Checksum	
0			

26. See Figure 10.5.

Figure 10.5 Exercise 26



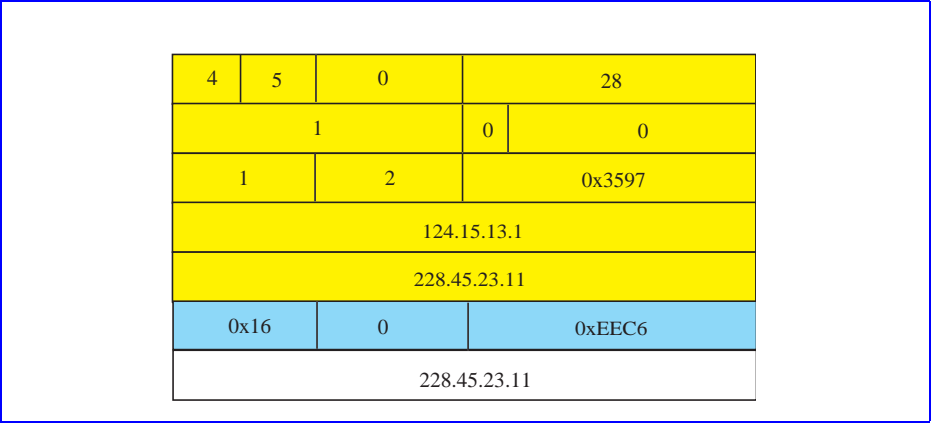
27. See Figure 10.6.

Figure 10.6 Exercise 27

0x16	0	0xEEC6
228.45.23.11		

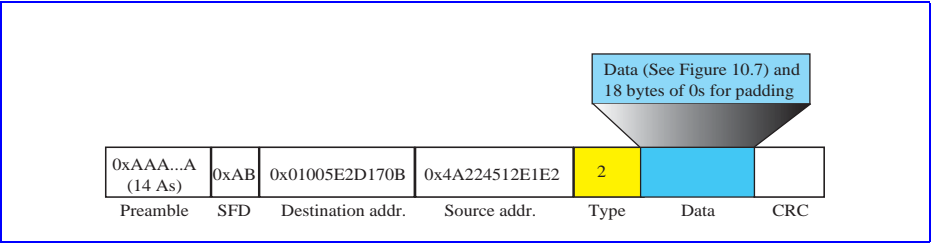
28. See Figure 10.7.

**Figure 10.7**    Exercise 28



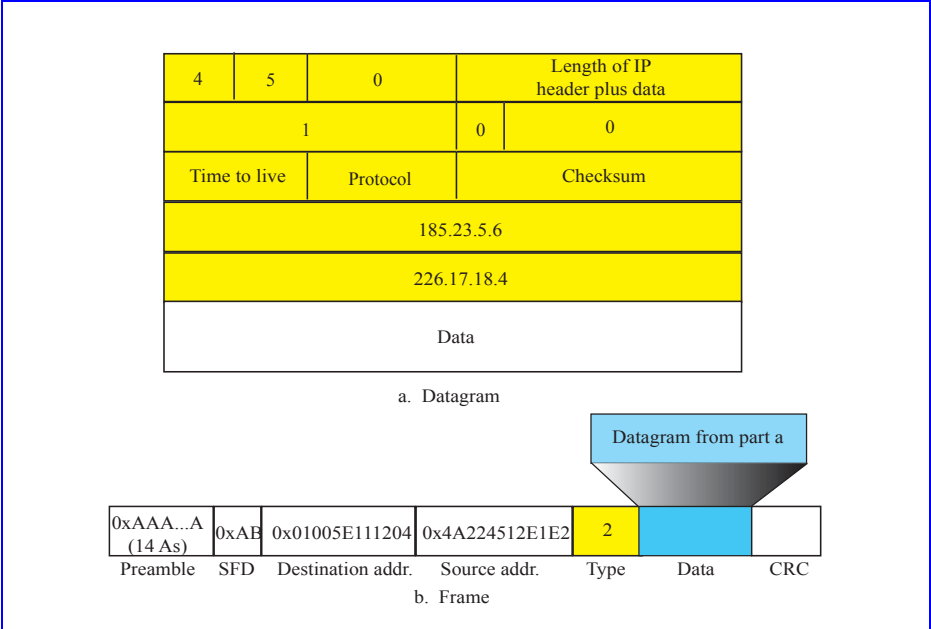
29. See Figure 10.8.

**Figure 10.8**    Exercise 29



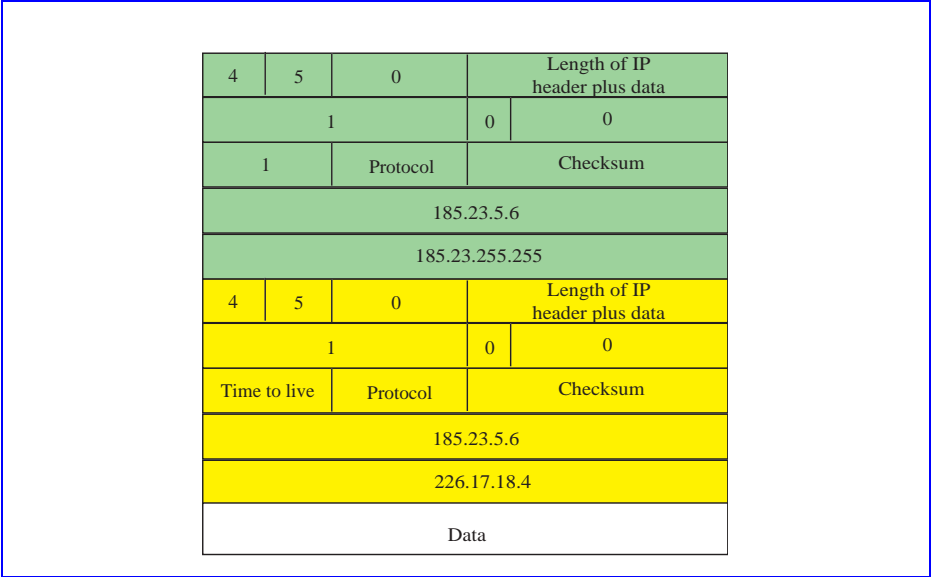
30. The router will not need the services of ARP because the frame is broadcast at the physical address level. See Figure 10.9.

Figure 10.9 Exercise 30



31. If the router cannot find the groupid in its table, it drops the packet.  
32. See Figure 10.10.

Figure 10.10 Exercise 32



33. No action should be taken.

34. It should set the state of the 2 entries to Delaying and start a timer for each with a random time. As each timer expires, a report message should be sent for the corresponding membership to the router that sent the query. See Figure 10.11.

**Figure 10.11** Exercise 34

0x16	0	0x03F4
227.4.3.7		

0x16	0	0xFEBA
229.45.6.23		

35. When the host receives the request from the process, it should create a new entry in its group table setting the state for the group to Delaying and its reference count to 1. It should also set a timer. When the timer expires, it should send a report message to the router. See Figure 10.12

**Figure 10.12** Exercise 35

0x16	0	0x9EB0
230.44.101.34		

36. When the host receives the request from the process, it should increment the reference count for that group in its group table by one.
37. When the router receives the report from the host, it should create a new entry in its group table setting the state for the group to Delaying. It should also set a timer. When the timer expires, it should send a report message to the next higher router in the spanning tree. See Figure 10.13.

**Figure 10.13** Exercise 37

0x16	0	0xF7A6
232.54.10.34		

38. No action needs to be taken by the router.

39. When the router receives the report about groupid 225.32.56.8 (a new membership), it should create a new entry in its group table setting the state for the group to Delaying. It should also set a timer. When the timer expires, it should send a report message to the next higher router in the spanning tree to indicate the new member of that group. Since the groups 225.4.6.7 and 226.34.12.9 are both listed in the group table, no action needs to be taken for these groups. Since there was no response for groups 225.11.6.8, 226.23.22.67, and 229.12.4.89, they should all be removed from the group table (have their state marked Free).
- 40.
- This is a query message.
  - The checksum is 0xEEFF (11101110 11111111)
  - The groupid is all 0s (this is a query, after all)
- 41.
- This is a membership report.
  - The checksum is 0xF9C0 (11111001 11000000).
  - The groupid is 225.42.19.20
42. Yes, there is an error. The checksum does not reflect the contents of the packet.
43. Yes there is an error. The message is a leave report but its groupid field is all 0s – it should indicate a groupid. Also, the checksum does not reflect the contents of the packet.
44.  $2^{23} = 8,388,608$
45.  $2^{28} = 268,435,456$
46.  $2^{28} - 2^{23} = 260,046,848$
- 47.
- 00000001 00000000 01011110 00010010 01001000 00001000  
(0x01005E124808)
  - 00000001 00000000 01011110 00010010 01001000 00001000  
(0x01005E124808)
  - 00000001 00000000 01011110 00010010 00000110 01011000  
(0x01005E120658)
  - 00000001 00000000 01011110 01011000 00001100 00001000  
(0x01005E580C08)
- a and b represent the same Ethernet address.
48. Since multicast routing in an internet is accomplished using a spanning tree algorithm and since the multicast routers represent intermediate nodes in the tree instead of leaves of the tree (like the hosts), there are some basic differences between the IGMP design used by the routers from that used by the hosts.

#### Multicast Address List

The multicast address list maintained by a router will be similar to the group table that is maintained by the hosts except that a reference count does not need to be

maintained (and, in fact, cannot be maintained). When a router sends a query packet to the nodes below it in the tree, it should receive only 1 report for each group with continuing membership. A router doesn't care how many hosts are interested in a group; simply that there is interest.

### Timers

A router must still keep a timer for each entry in its address list that is in the Delaying state after receiving a query from above. These timers operate just as they do in the host. A router, however, must also start a timer when it sends a query message to the lower levels in the tree. The router then changes the state of each address in the list to a fourth state, Waiting. If a report for a group is received before the timer expires, the state for that group is changed to Idle. When the timer expires, any entries in the Waiting state are purged from the address list and their entries are marked Free.

#### 49. Type field = 4 bits

No version field in IGMPv2.

Version 1 is compatible with version 2. There is a state variable for each interface that describes which version of IGMP is running.

For more information see <http://www.faqs.org/rfcs/rfc2236.html>.