

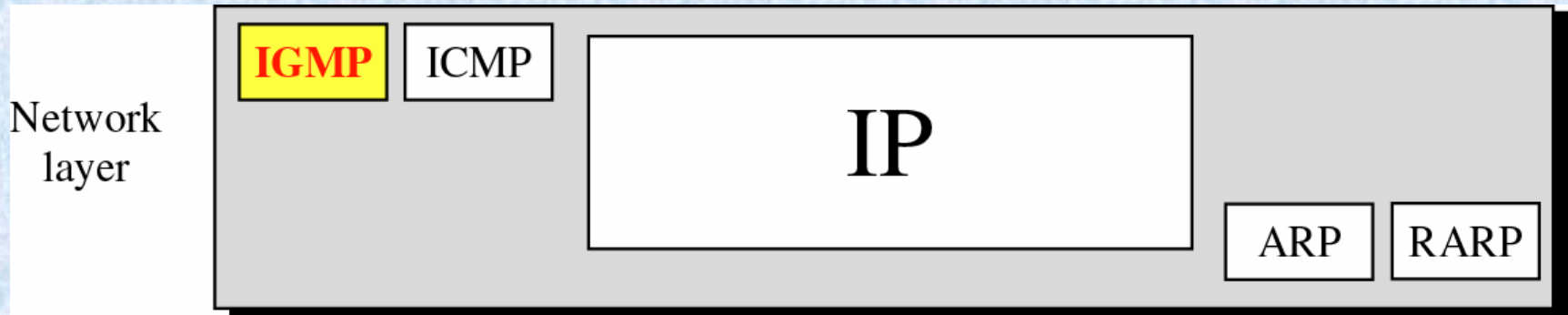
Chapter 10

Internet Group Management Protocol (IGMP)

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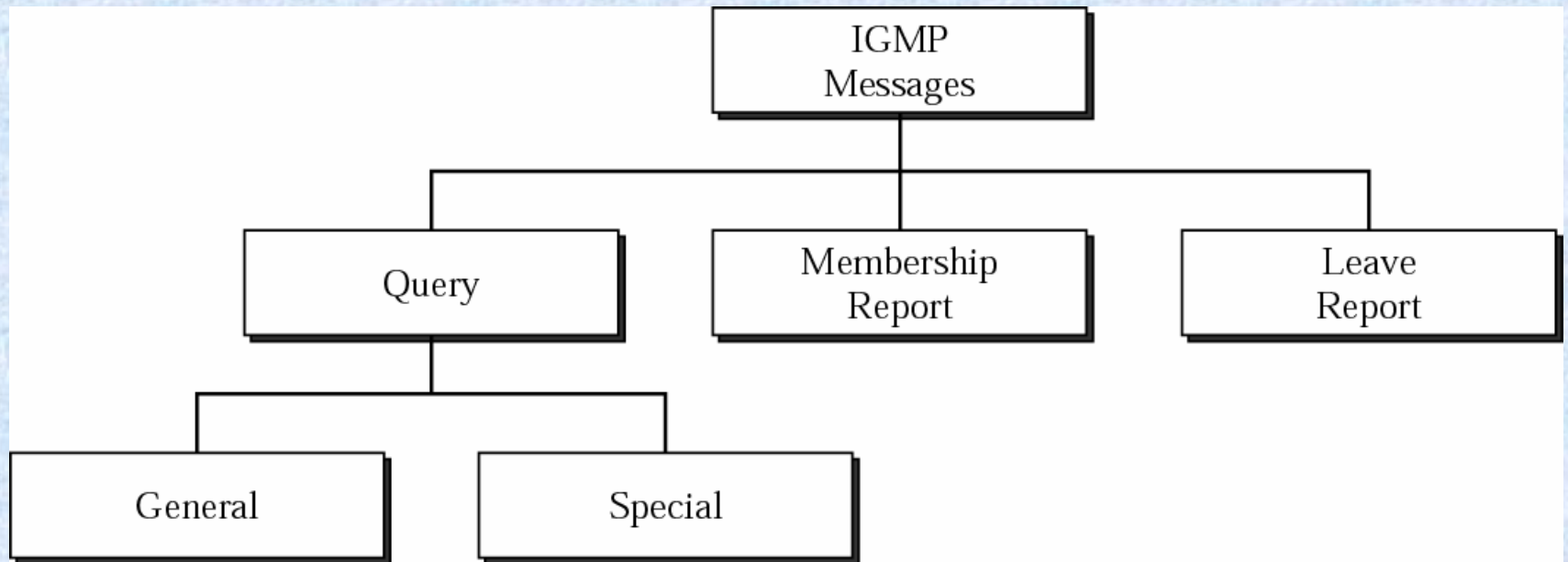
10.1 GROUP MANAGEMENT



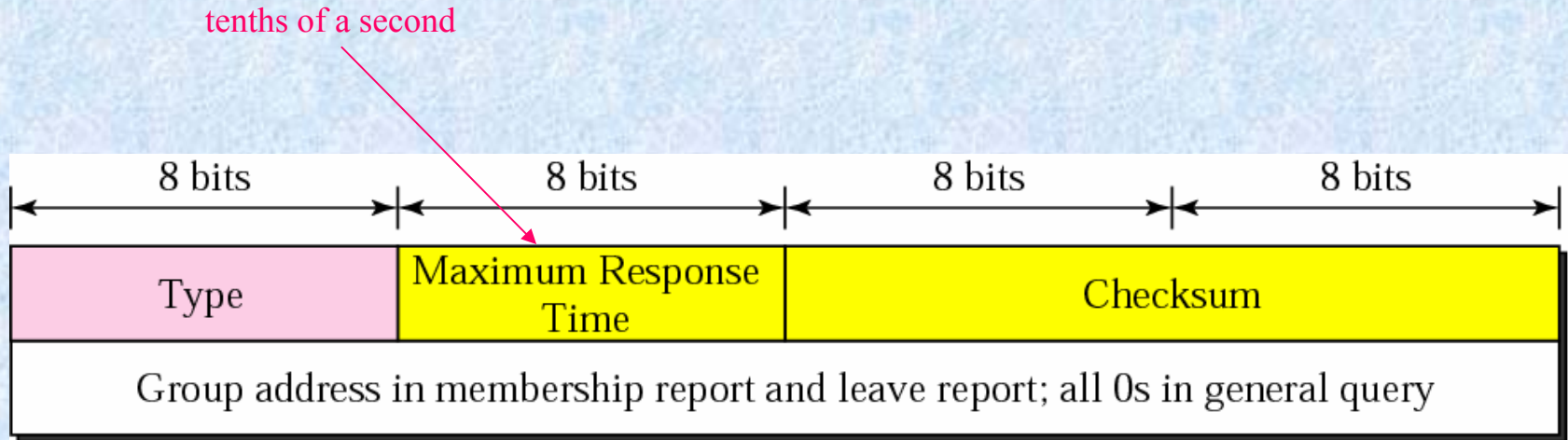
- IGMP helps build up multicasting groups and maintain membership lists.
 - Members may be Hosts or Routers.
- Multicast Routers are needed to route Multicast traffic
 - Their routing tables are updated using special multicasting routing protocols (which do NOT include IGMP)
- Multicast Routers maintain a list of groups for each interface (network) they are connected.
 - Each list contains only the groups for which there is at least one member.

10.2

IGMP MESSAGES



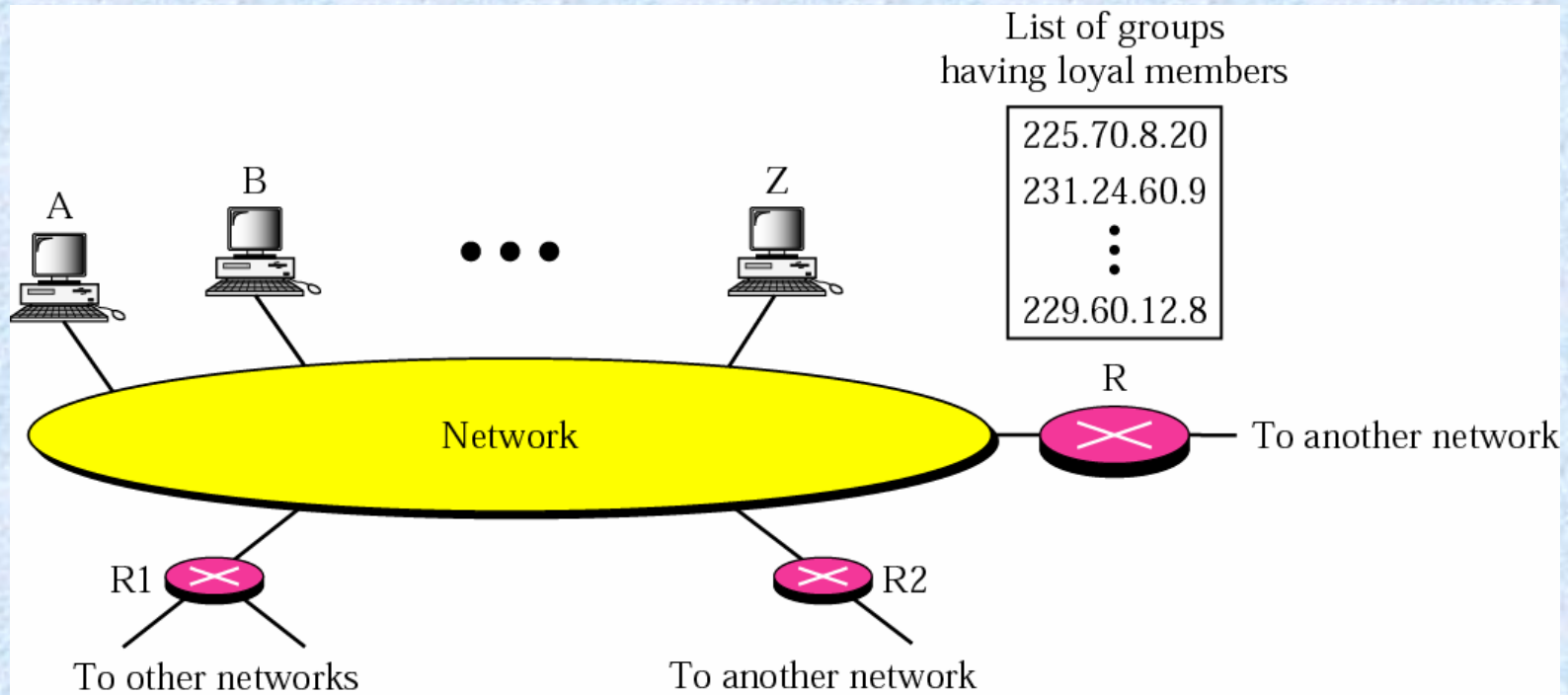
IGMP message format



<i>Type</i>	<i>Value</i>
General or Special Query	0x11 or 0001 0001
Membership Report	0x16 or 0001 0110
Leave Report	0x17 or 0001 0111

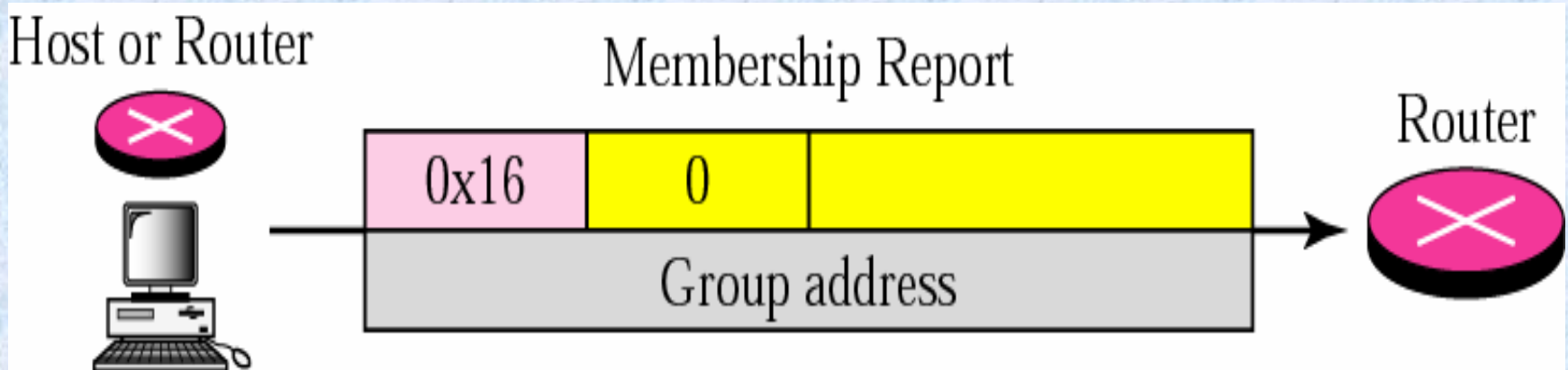
10.3

IGMP OPERATION



- If multiple Multicast Routers exist in one network, then their Group Lists are mutually- exclusive.
- Member routers: one or more other network receives the multicast
- Host Members: one or more local process receives the multicast

Joining a Group: The *Membership Report*



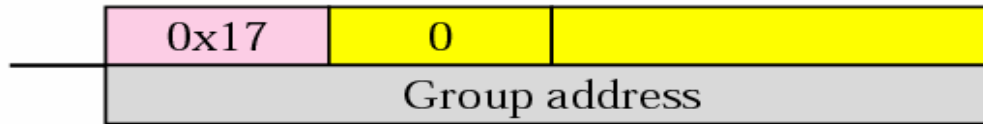
- Each host (or router) may join a group by sending a Membership Report (MR) message.
- A Host maintain list of groupids it subscribes to. If new groupid, send MR.
- Routers maintain one list of groupids per interface. If new (*i.e.* to the router) groupid, send MR out of all interfaces, except the one from which the new interest came from.
- In IGMP, a membership report is sent twice, one after the other.

Leave report

Host or Router



Leave Report



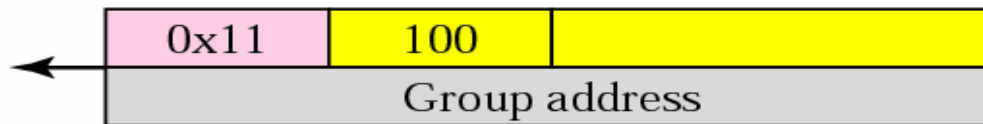
Router



Host or Router



Special Query



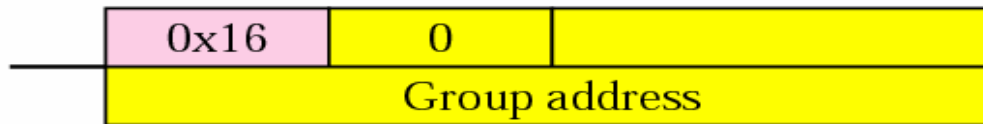
Router



Host or Router



Membership Report



Router



Or

Host or Router

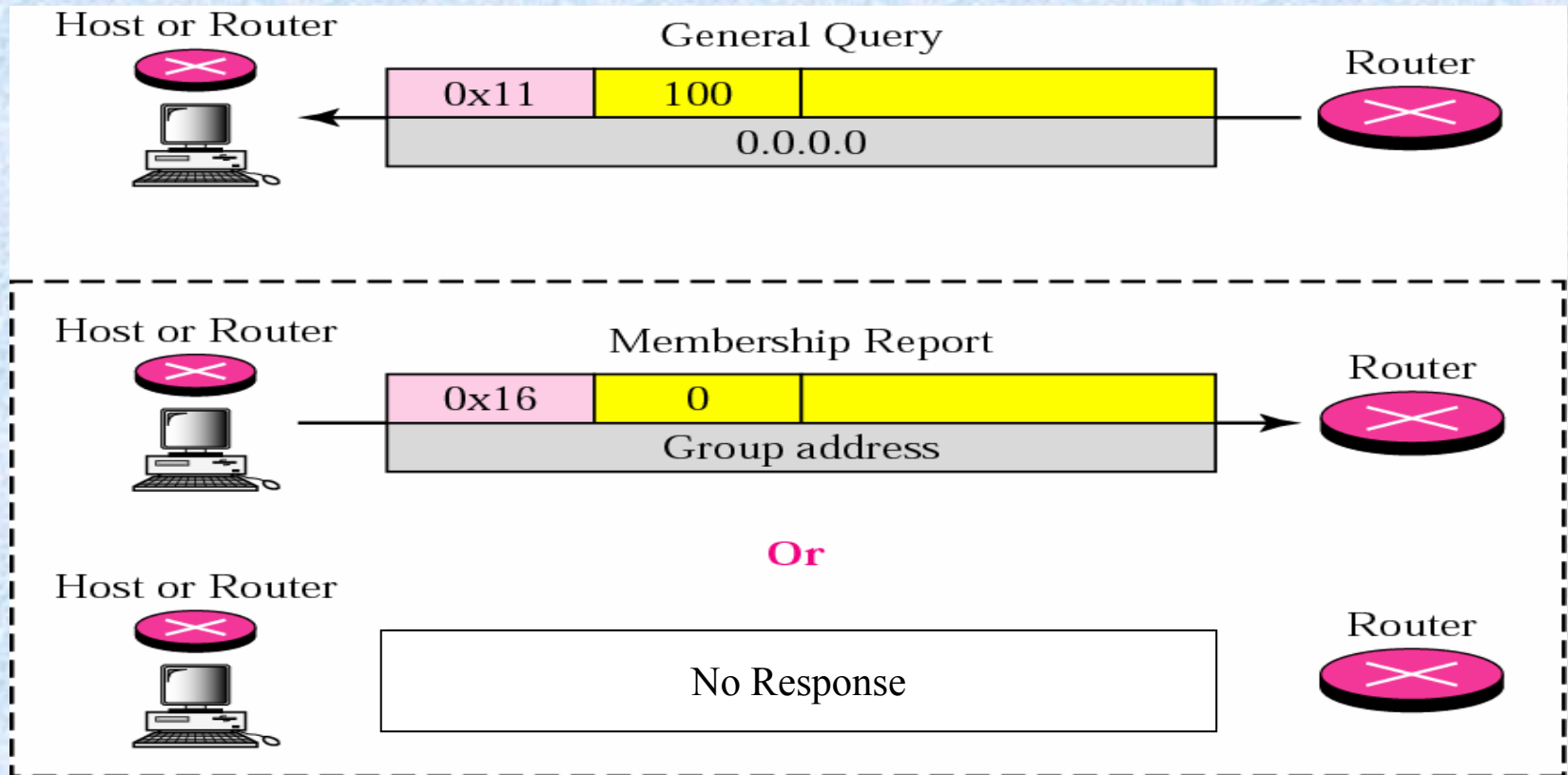


No Response

Router



Monitoring Membership: The *General Query* message



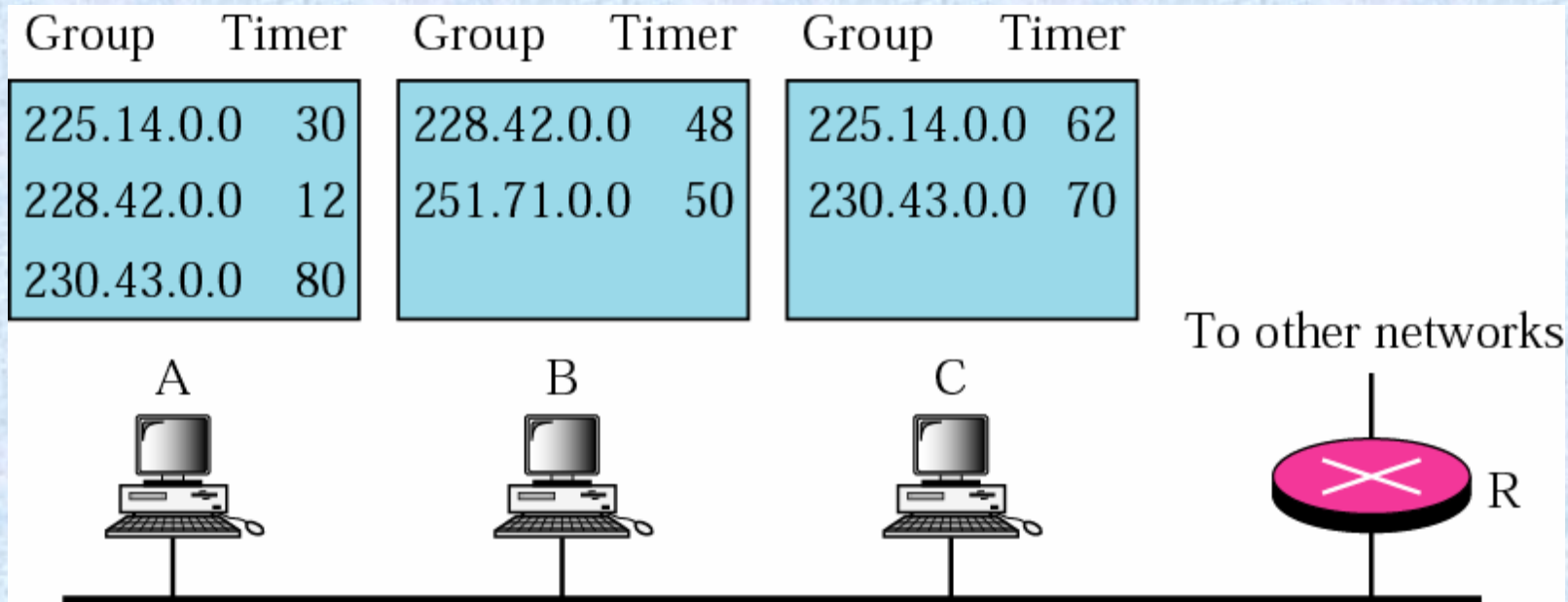
- Distributing routers periodically query each node on an interface for *ALL* the groups they are interested in.
- Nodes must respond in 10 seconds by sending a membership report for each such groupid.

Delayed Response

- To prevent of burst of, and sometimes unnecessary, membership reports in response to a Query, the responding node (hosts or other routers) delay the response for each group by a random time.
- During the waiting period, if some other node responds to the same groupid, the waiting node simply cancels its own timer for that groupid.

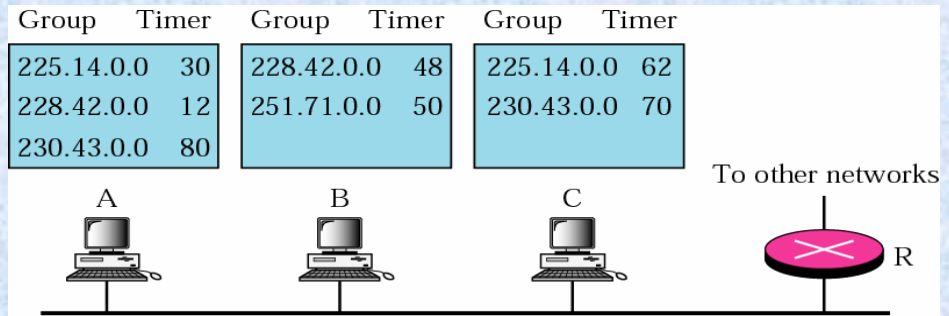
Example 1

Imagine there are three hosts in a network as shown



A query message was received at time 0; the random delay time (in tenths of seconds) for each group is shown next to the group address. Show the sequence of report messages.

Solution



The events occur in this sequence:

Time 12: The timer for 228.42.0.0 in host A expires and a membership report is sent, which is received by the router and every host including host B which cancels its timer for 228.42.0.0.

Time 30: The timer for 225.14.0.0 in host A expires and a membership report is sent, which is received by the router and every host including host C which cancels its timer for 225.14.0.0.

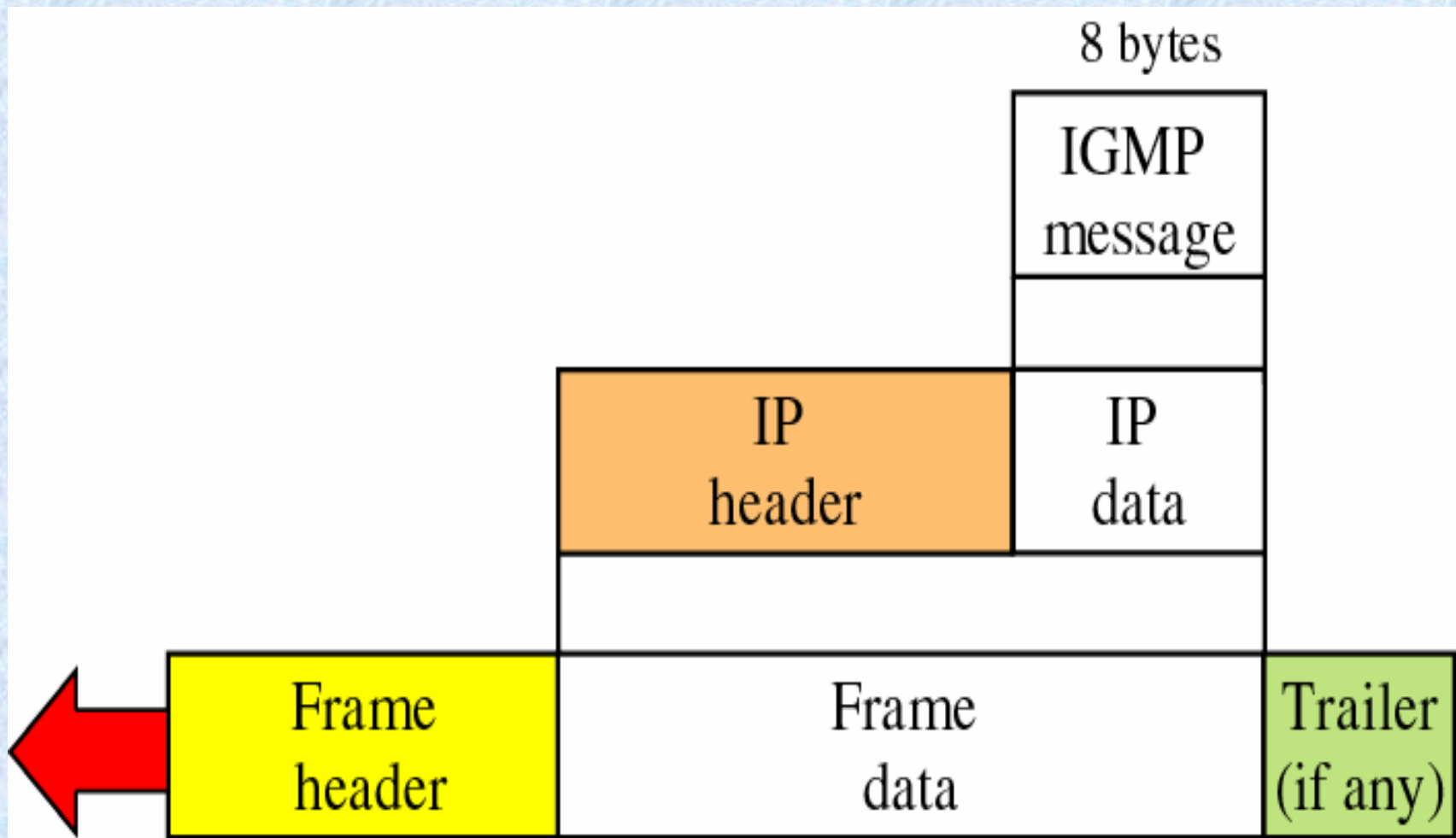
Time 50: The timer for 251.70.0.0 in host B expires and a membership report is sent, which is received by the router and every host.

Time 70: The timer for 230.43.0.0 in host C expires and a membership report is sent, which is received by the router and every host including host A which cancels its timer for 230.43.0.0.

Note that if each host had sent a report for every group in its list, there would have been seven reports; with this strategy only four reports are sent.

1

E



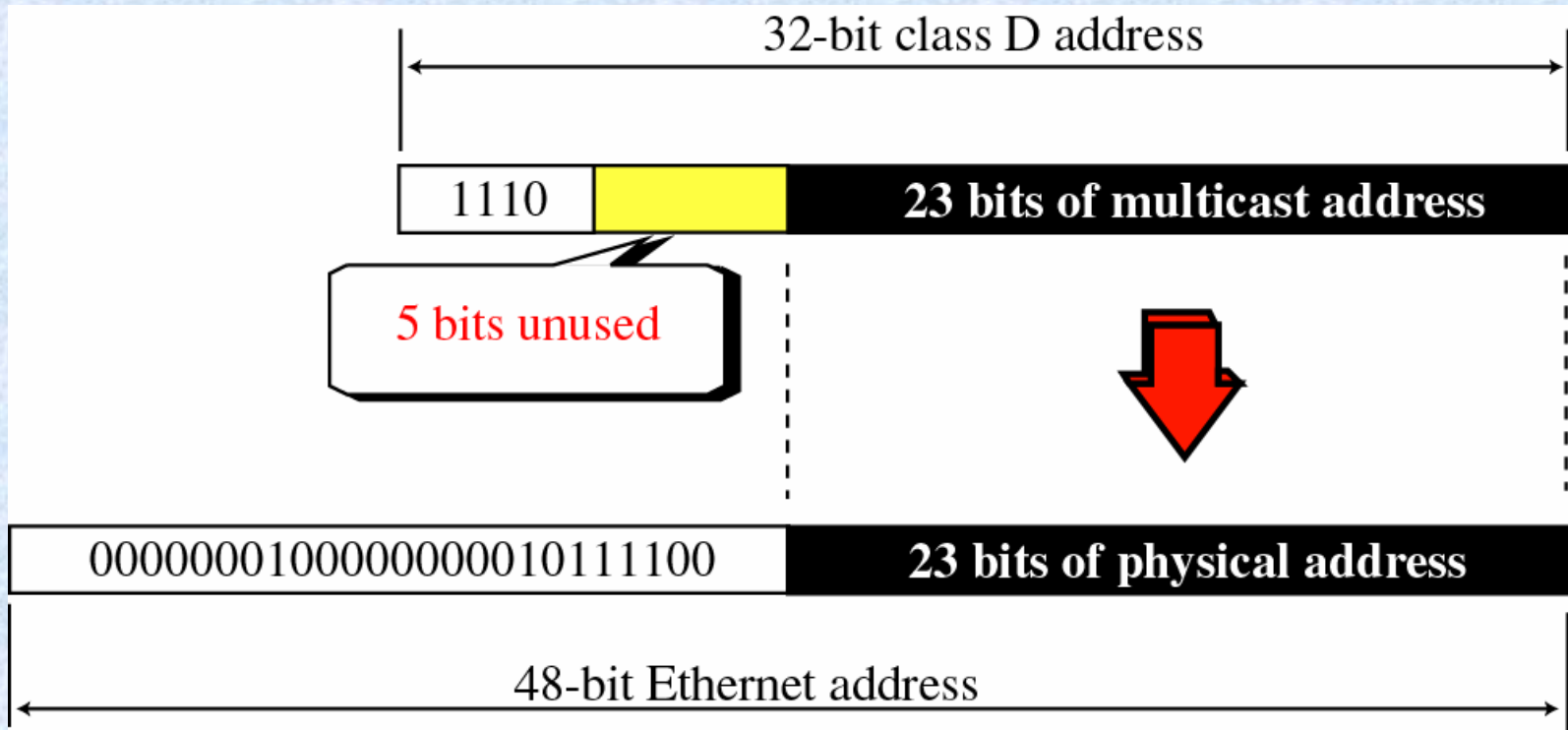
The IP Datagram

<i>Type</i>	<i>Destination IP address</i>	
General or Special Query	224.0.0.1	All systems on this subnet
Membership Report	The multicast address of the group	
Leave Report	224.0.0.2	All routers on this subnet

*The IP packet that carries an IGMP packet has a value of **2** in its protocol field.*

*The IP packet that carries an IGMP packet has a value of **1** in its TTL field.*

Mapping class D to Ethernet physical address



10.5

Host IGMP Package

Application layer

A request to join a group

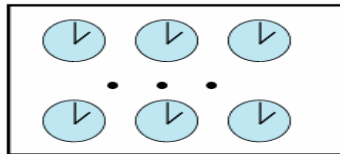
A request to leave a group

I
G
M
P

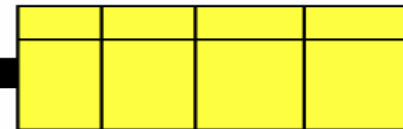
Group-joining module

Group-leaving module

Timers



Group table



Input module

Output module

IGMP packet
(query or report)

IP layer

IGMP packet
(report)

Group table

State	Interface No.	Group Address	Reference Count
.....
.....
.....

State: Free, Delaying, Idle

Reference Count: Number of processes interested