

Chapter 13

Routing Protocols (RIP, OSPF, BGP)

CONTENTS

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- **RIP**
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- **BGP**

- Static Vs. Dynamic Routing
- Cost or Metric

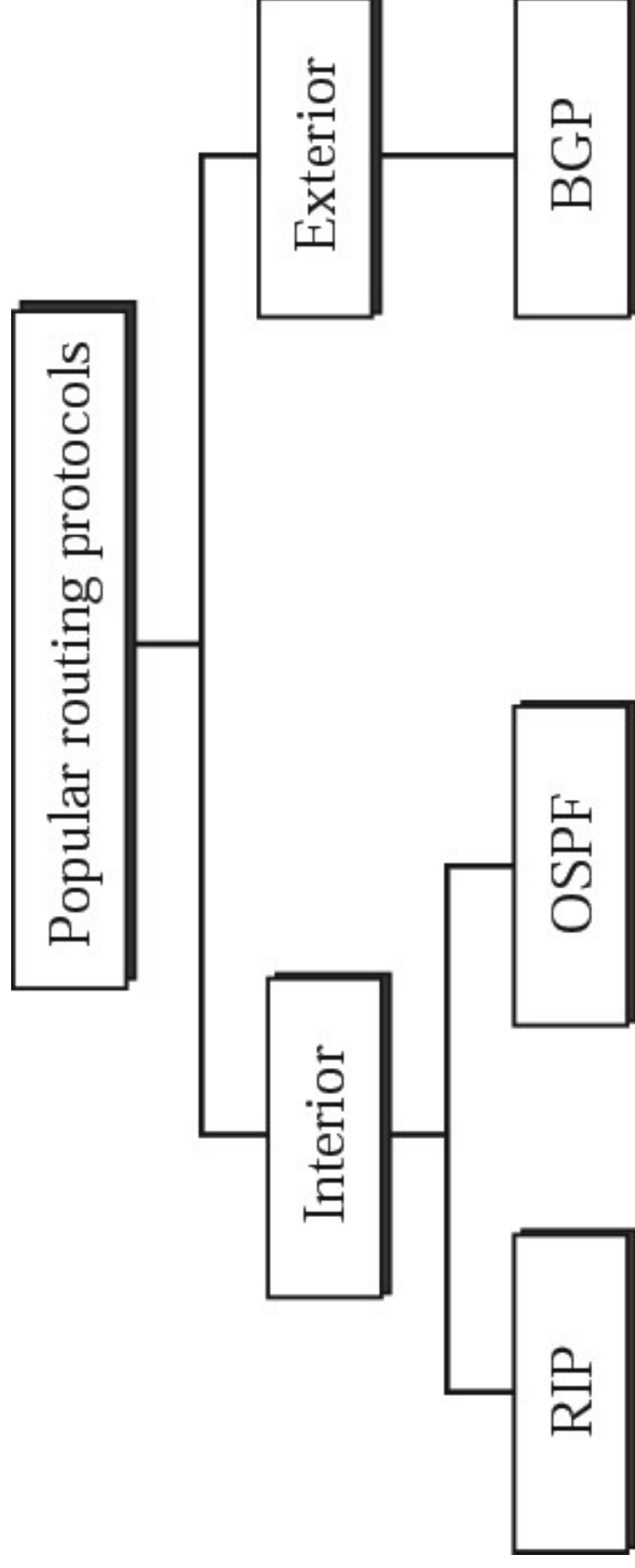
A Routing Protocol is a combination of rules and procedures that lets routers in the internet inform each other of changes.

13.1

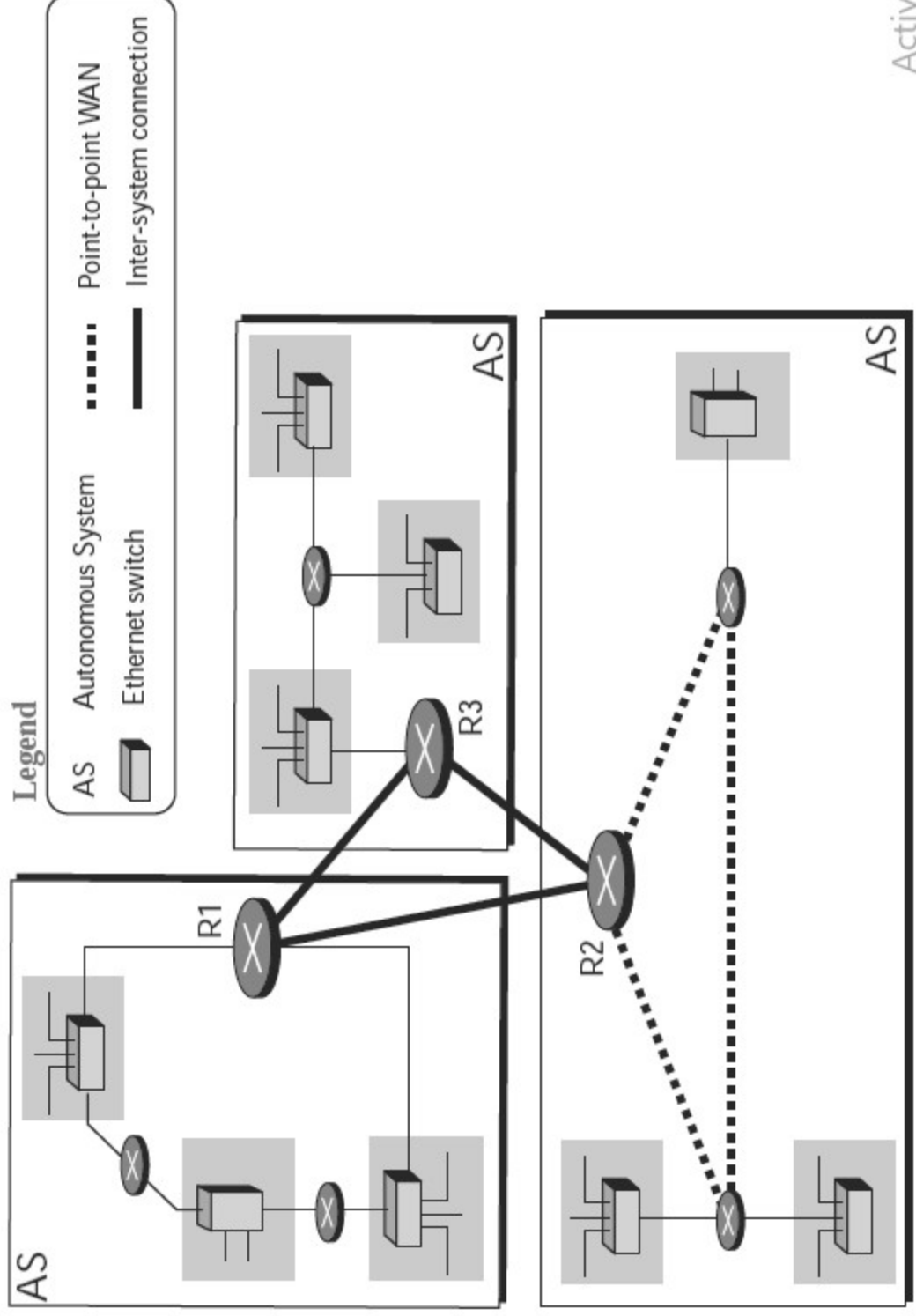
INTERIOR AND EXTERIOR ROUTING

Figure 13-1

Popular routing protocols



Autonomous systems



Activate

13.2

RIP: Routing Information Protocol

Distance Vector Routing

- Bellman-Ford Algorithm
- The three keys:
 - 1- Sharing knowledge about the entire Autonomous System.
 - 2- Sharing only with neighbors.
 - 3- Sharing at regular intervals.

Routing Table

Table 13.1 A distance vector routing table

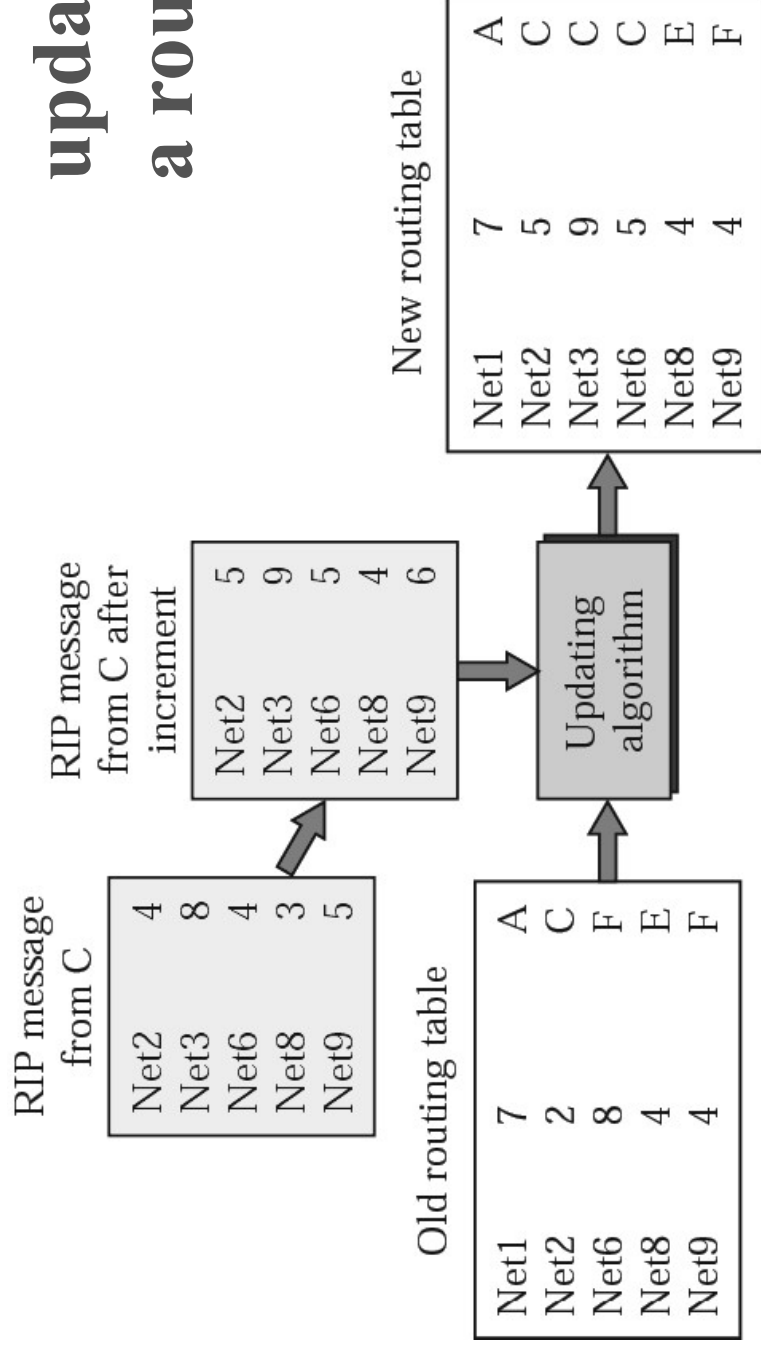
<i>Destination</i>	<i>Hop Count</i>	<i>Next Hop</i>	<i>Other Information</i>
163.5.0.0	7	172.6.23.4	
197.5.13.0	5	176.3.6.17	
189.45.0.0	4	200.5.1.6	
115.0.0.0	6	131.4.7.19	

RIP updating algorithm

<i>RIP Updating Algorithm</i>	
Receive: a response RIP message	
1.	Add one hop to the hop count for each advertised destination.
2.	Repeat the following steps for each advertised destination: 1. If (destination not in the routing table) 1. Add the advertised information to the table. 2. Else 1. If (next-hop field is the same) 1. Replace entry in the table with the advertised one. 2. Else 1. If (advertised hop count smaller than one in the table) 1. Replace entry in the routing table.
3.	Return.

Figure 13-3

Example of updating a routing table



- Net1: No news, do not change
- Net2: Same next hop, replace
- Net3: A new router, add
- Net6: Different next hop, new hop count smaller, replace
- Net8: Different next hop, new hop count the same, do not change
- Net9: Different next hop, new hop count larger, do not change

Figure 13-4

Initial routing tables in a small autonomous system

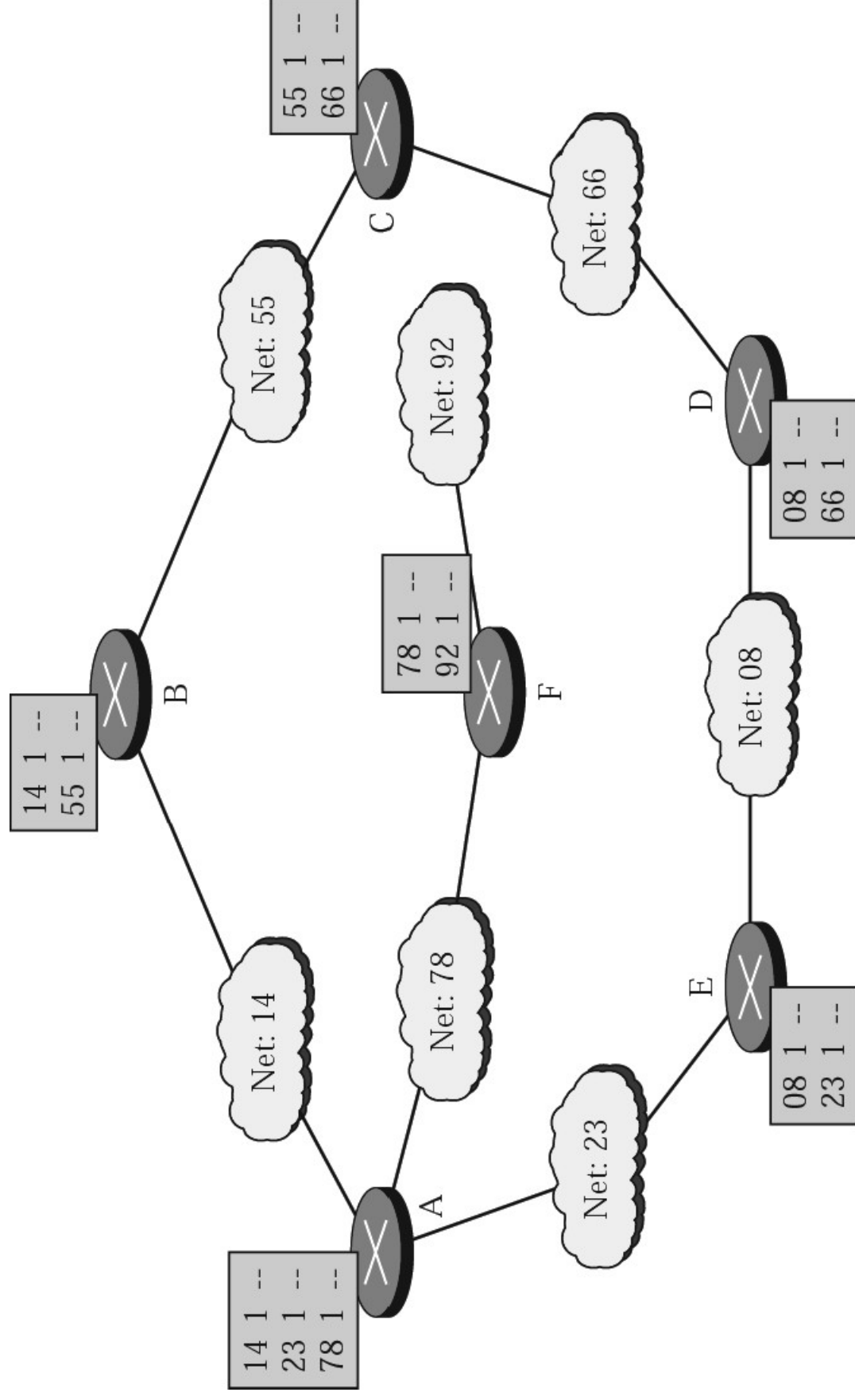


Figure 13-5

Final routing tables for the previous figure

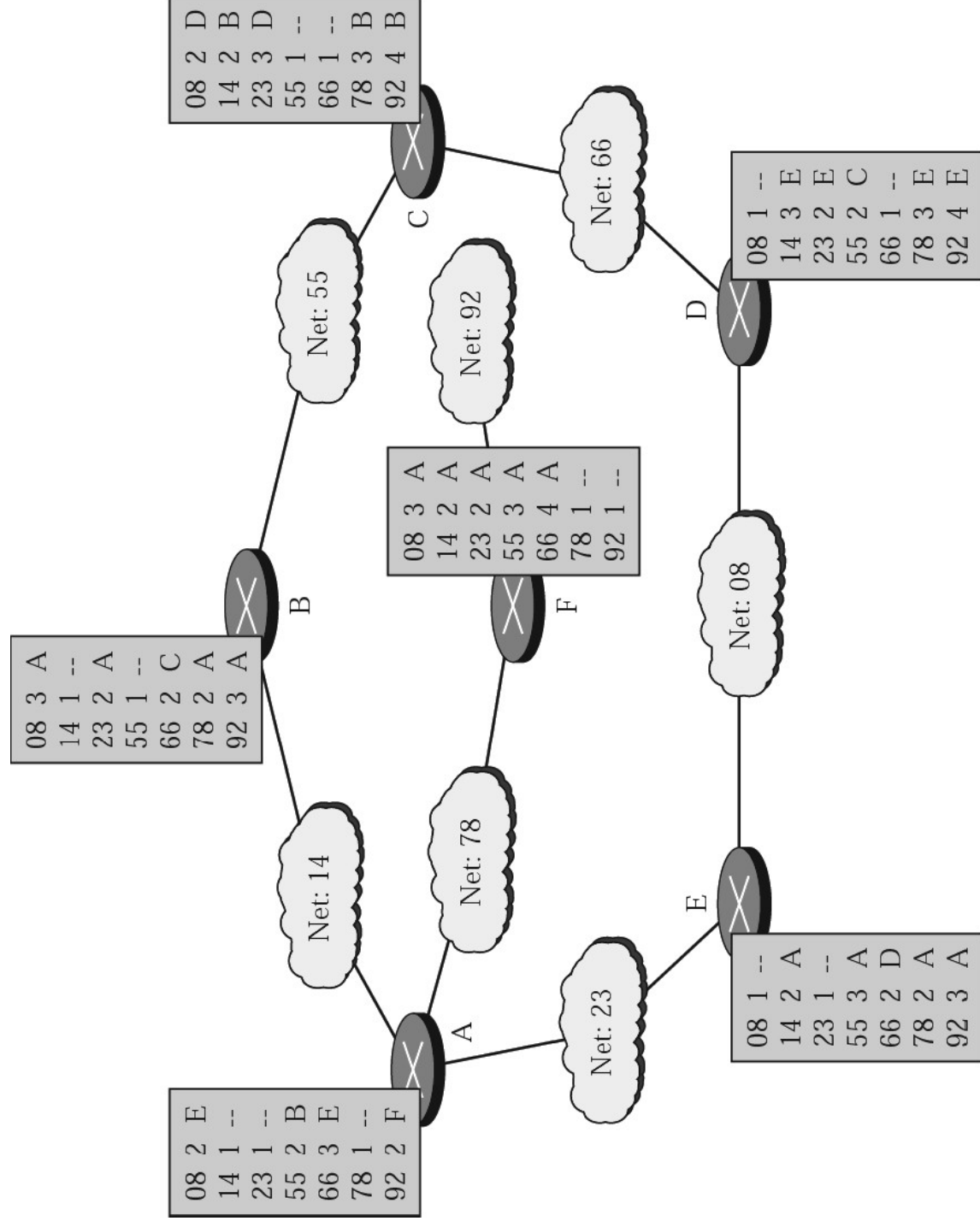


Figure 13-6

RIP message format



Figure 13-7

Request messages

Repeated

Com: 1	Version	Reserved
Family		All 0s
Network address		
All 0s		
All 0s		
All 0s		

Com: 1	Version	Reserved
Family		All 0s
All 0s		
All 0s		
All 0s		

a. Request for some

b. Request for all

Response

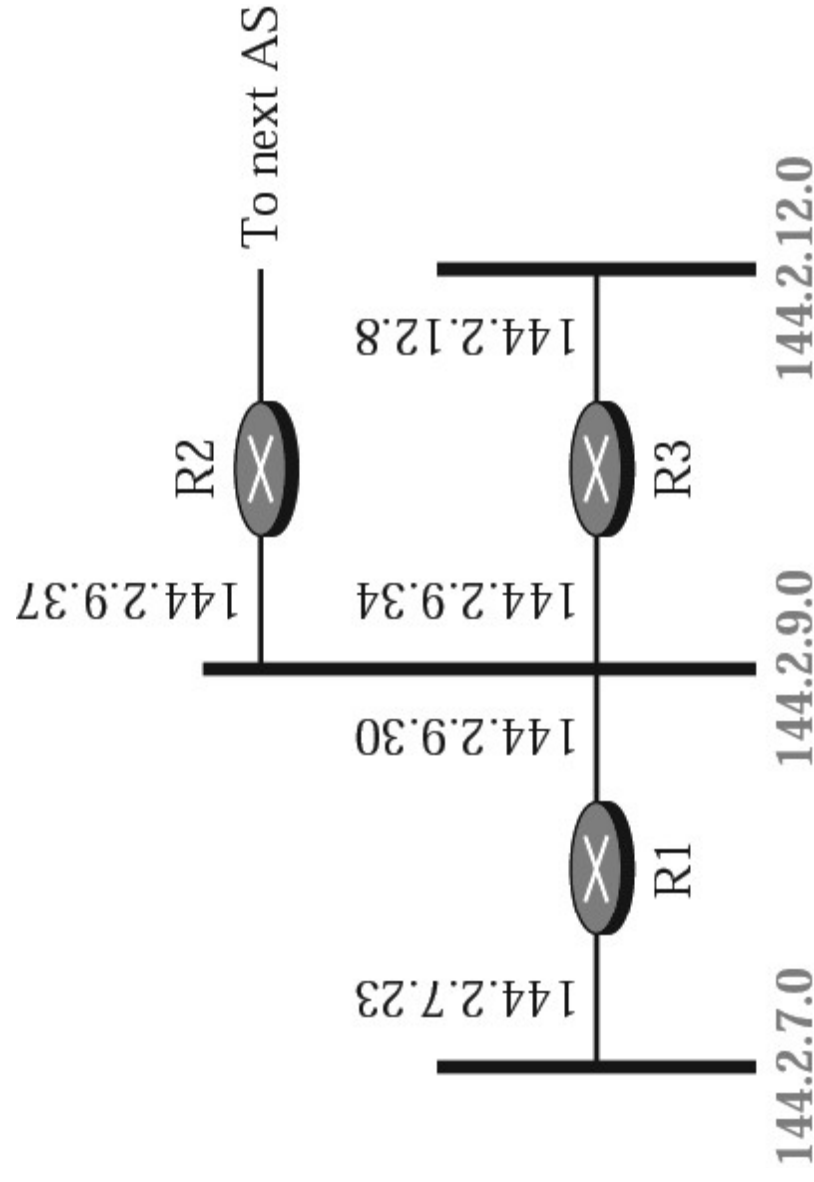
- Solicited
- Unsolicited

Example 1

What is the periodic response sent by router R1 in Figure 13.8 (next slide)? Assume R1 knows about the whole autonomous system.

Figure 13-8

Example 1



Solution

R1 can advertise three networks 144.2.7.0, 144.2.9.0, and 144.2.12.0. The periodic response (update packet) is shown in Figure 13.9 (next slide).

Figure 13-9

Solution to Example 1

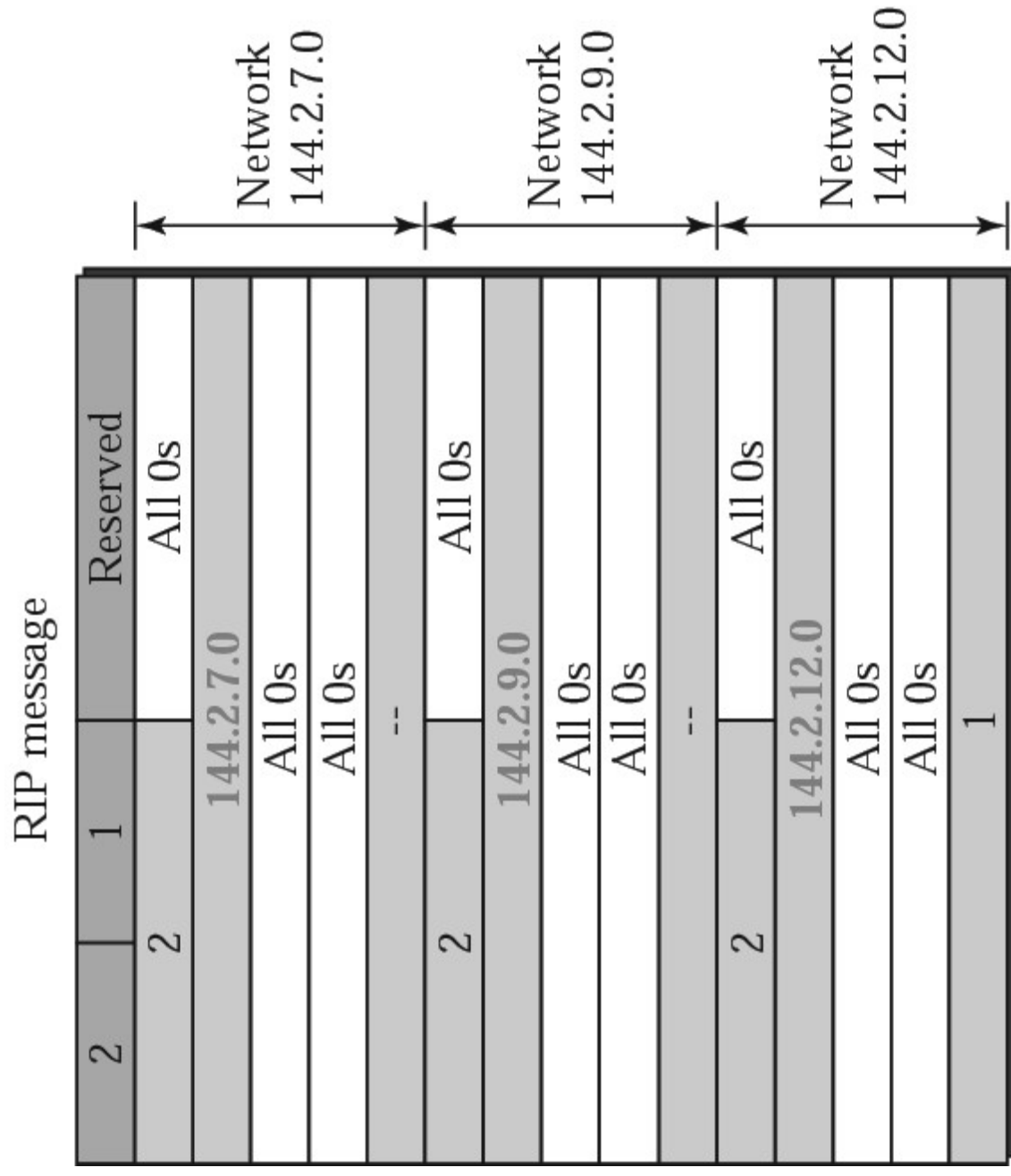
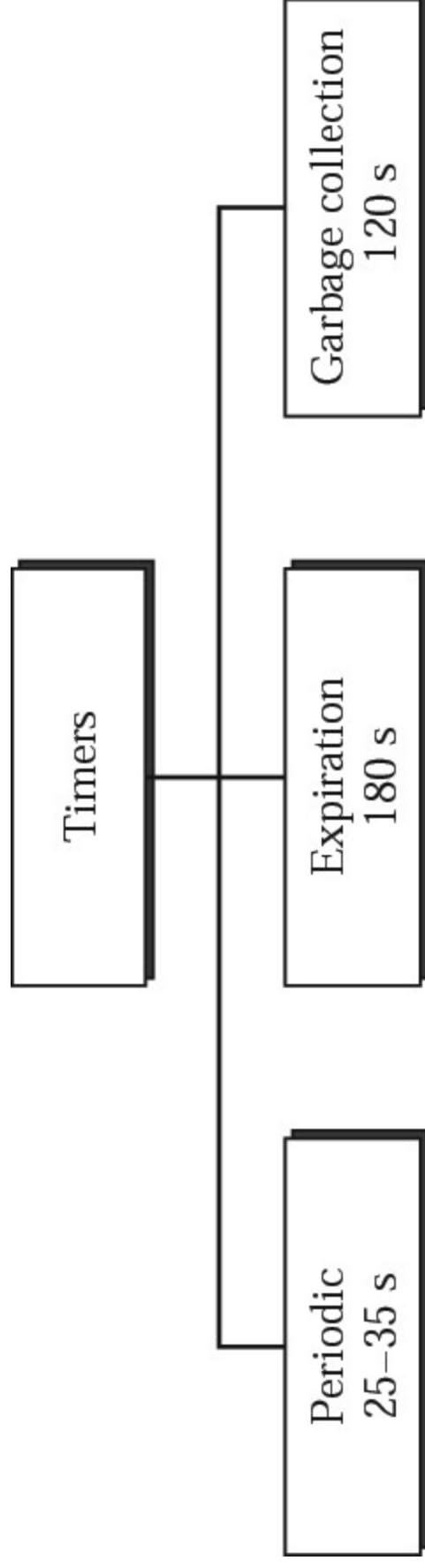


Figure 13-10

RIP timers



Example 2

A routing table has 20 entries. It does not receive information about five routes for 200 seconds. How many timers are running at this time?

Solution

The timers are listed below:

Periodic timer: 1

Expiration timer: $20 - 5 = 15$

Garbage collection timer: 5

Figure 13-11

Slow convergence

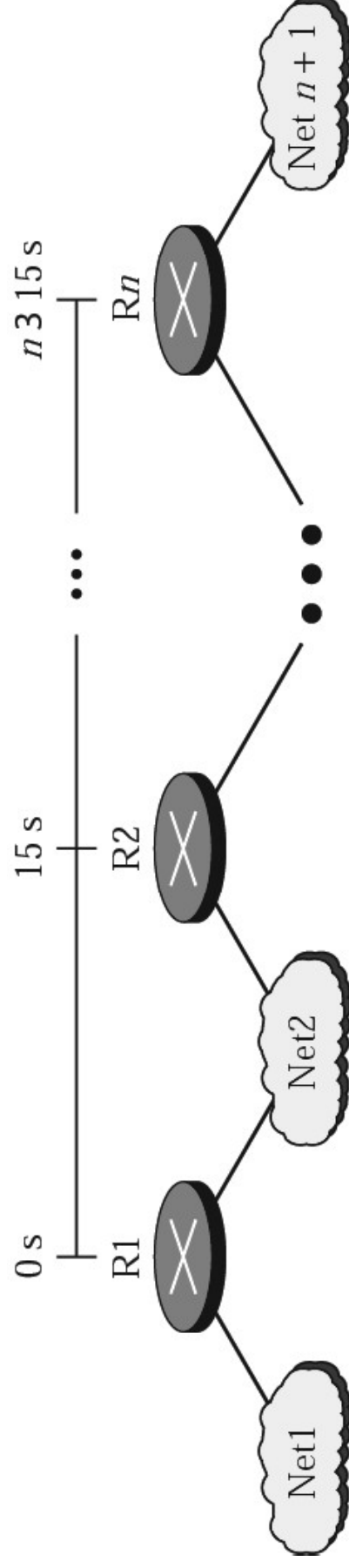


Figure 13-12

Hop count

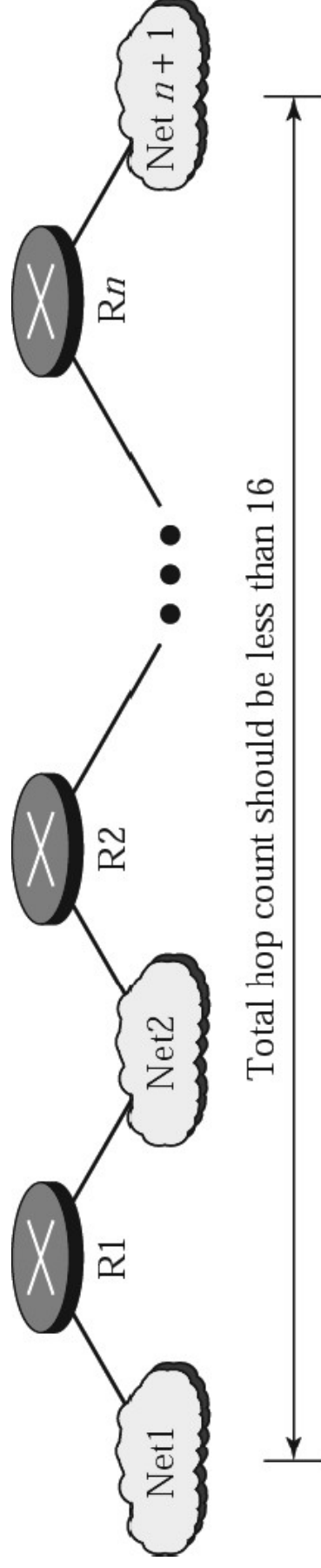
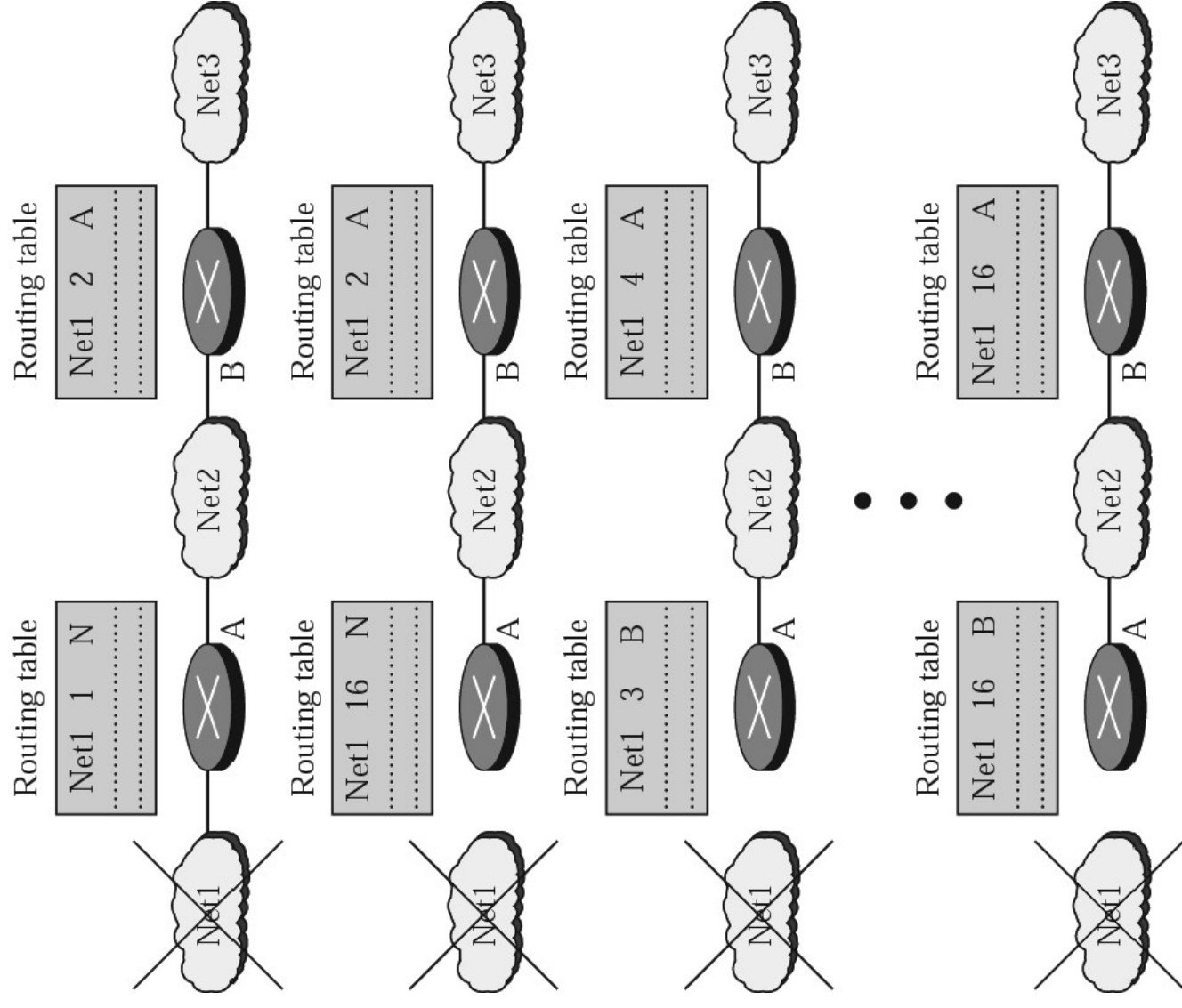


Figure 13-13

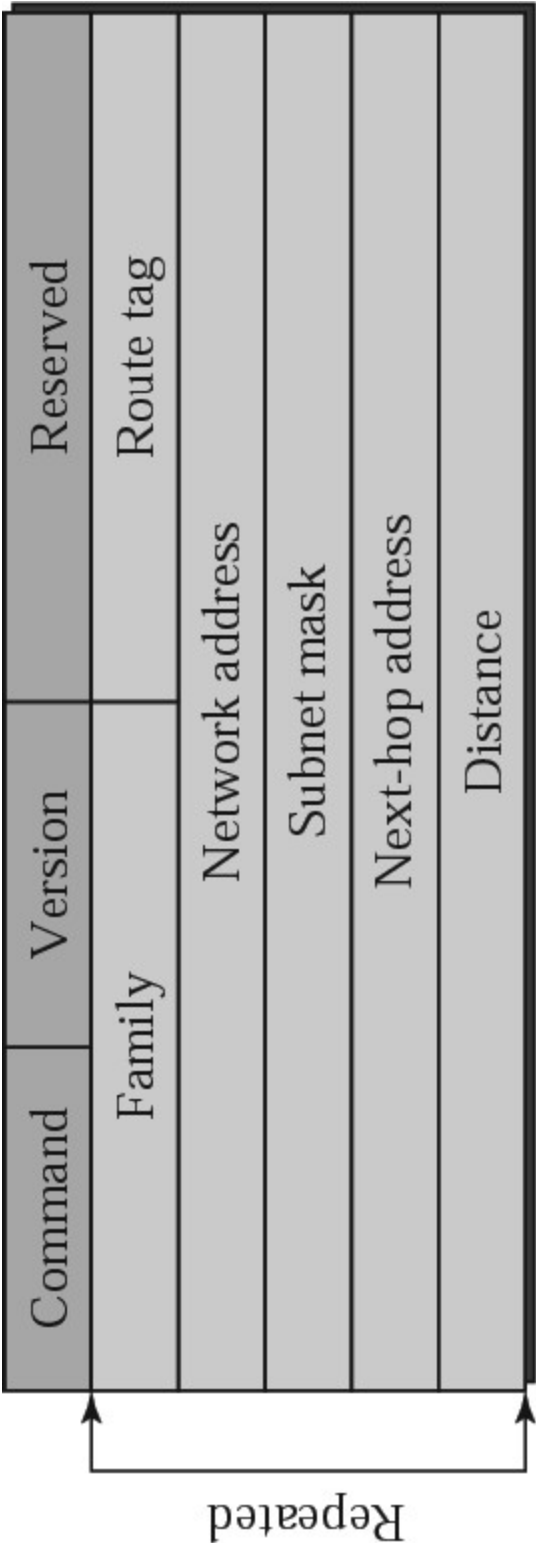


Instability

Triggered Update

Figure 13-16

RIP-v2 Format

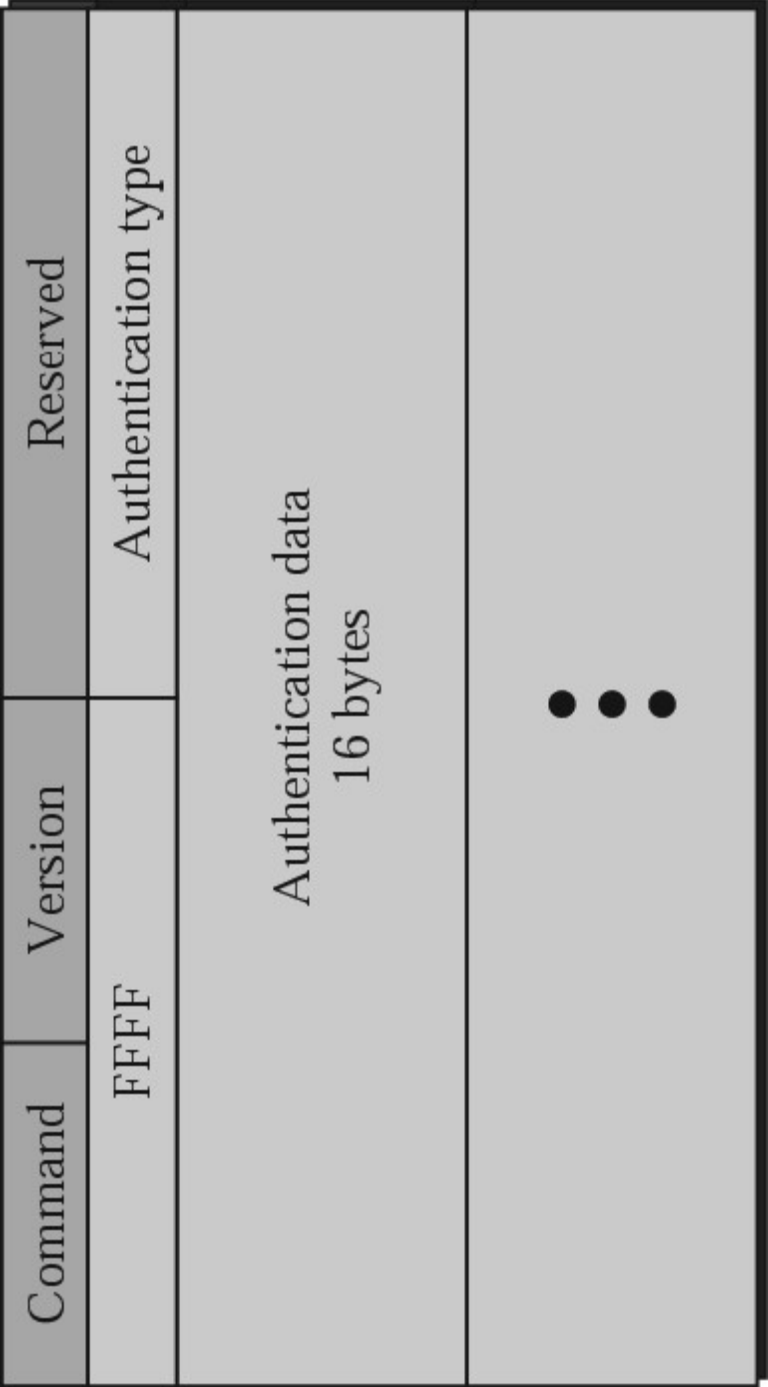


Note

*RIP version 2 supports
CIDR.*

Figure 13-17

Authentication



Multicast

- 224.0.0.9

Note

*RIP uses the services of UDP
on well-known port 520.*