Routing Information Protocol (RIP)

Intra domain routing protocols based on the distance-vector routing algorithm

Hop Count

A router in this protocol basically implements the modified distance-vector routing algorithm to support autonomous system.

Modifications:

- RIP routers advertise the cost of reaching different networks instead of reaching other nodes. In other words, the cost is defined between a router and the network in which the destination host is located.
- the cost is defined as the number of hops, which means the number of networks (sub-nets) a packet needs to travel through from the source router to the final destination host.[*the maximum cost of a path can be 15, which means 16 is considered as infinity*]

Forwarding Tables

- The routers in an autonomous system need to keep forwarding tables to forward packets to their destination networks.

- A forwarding table in RIP is a three-column table

✓first column is the address of the destination network

✓second column is the address of the next router to which the packet should be forwarded,

✓third column is the cost(the number of hops) to reach the destination network.

Figure 4.70 *Hop counts in RIP*

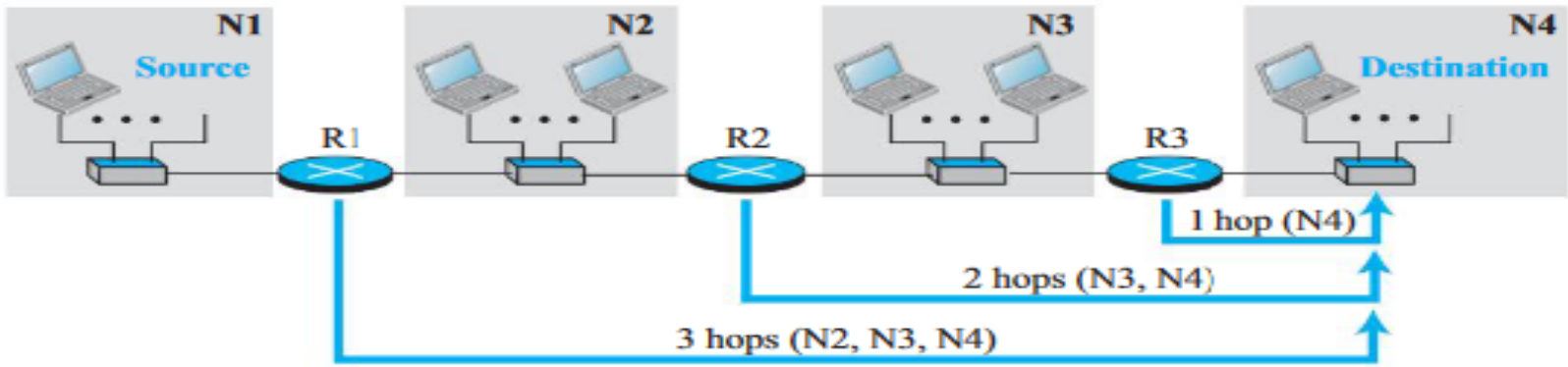


Figure 4.71 *Forwarding tables*

Forwarding table for R1

Destination network	Next router	Cost in hops
N1	——	1
N2	——	1
N3	R2	2
N4	R2	3

Forwarding table for R2

Destination network	Next router	Cost in hops
N1	R1	2
N2	——	1
N3	——	1
N4	R3	2

Forwarding table for R3

Destination network	Next router	Cost in hops
N1	R2	3
N2	R2	2
N3	——	1
N4	——	1

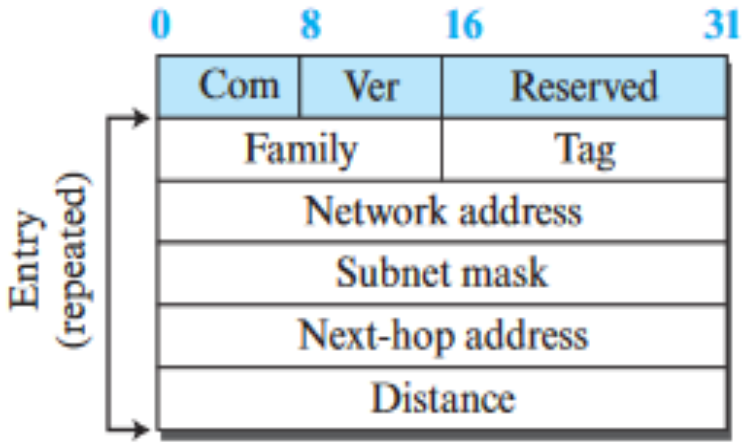
RIP Implementation

- implemented as a process that uses the service of UDP on the well-known port number 520
- IP has gone through two versions: RIP-1 and RIP-2.

RIP 2: RIP Messages

- Two RIP processes, a client and a server, like any other processes,need to exchange messages.
- RIP-2 defines the format of the message.

Figure 4.72 *RIP message format*



Fields

Com: Command, request (1), response (2)
Ver: Version, current version is 2
Family: Family of protocol, for TCP/IP value is 2
Tag: Information about autonomous system
Network address: Destination address
Subnet mask: Prefix length
Next-hop address: Address length
Distance: Number of hops to the destination

Types of RIP MESSAGES

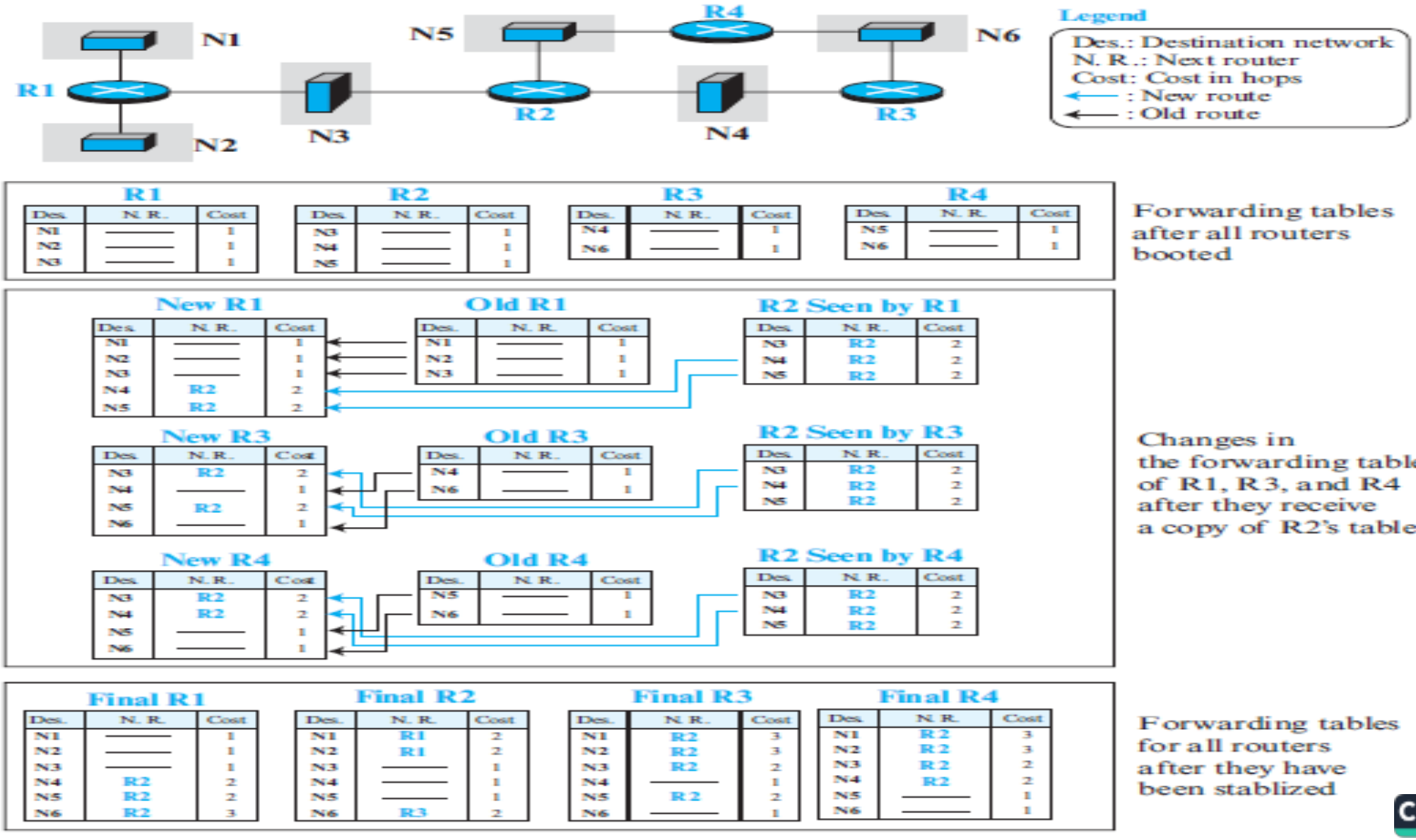
- RIP has two types of messages: request and response.

- A request message is sent by a router that has just come up or by a router that has some time-out entries.
- A request message can *ask about specific entries or all entries.*
- A response (or update)message can be either solicited or unsolicited.
- *A solicited response message is sent only in answer to a request message*. It contains information about the destinations pecified in the corresponding request message.
- *An unsolicited response message*, on the other hand, is sent periodically, every 30 seconds or when there is a change in the forwarding table

RIP Algorithm RIP implements the same algorithm as the distance-vector routing algorithm we discussed in the previous section. However, some changes need to be made to the algorithm to enable a router to update its forwarding table:

- Instead of sending only distance vectors, a router needs to send the whole contents of its forwarding table in a response message.
- The receiver adds one hop to each cost and changes the next router field to the address of the sending router. We call each route in the modified forwarding table the *received route* and each route in the old forwarding table the *old route*. The received router select the old routes as the new ones except in the following three cases:
  1. If the received route does not exist in the old forwarding table, it should be added to the route.
  2. If the cost of the received route is lower than the cost of the old one, the received route should be selected as the new one.
  3. If the cost of the received route is higher than the cost of the old one, but the value of the next router is the same in both routes, the receive route should be selected as the new one. This is the case where the route was actually advertised by the same router in the past, but now the situation has been changed. For example, suppose a neighbor has previously advertised a route to a destination with cost 3, but now there is no path between this neighbor and that destination. The neighbor advertises this destination with cost value infinity (16 in RIP). The receiving router must not ignore this value even though its old route has a lower cost to the same destination.
- The new forwarding table needs to be sorted according to the destination route (mostly using the longest prefix first).

RIP Algorithm-Example



Timers in RIP

- The periodic timer controls the advertising of regular update messages. Each router has one periodic timer that is randomly set to a number between 25 and 35 seconds (to prevent all routers sending their messages at the same time and creating excess traffic). The timer counts down; when zero is reached, the update message is sent, and the timer is randomly set again
- The expiration timer governs the validity of a route. When a router receives update information for a route, the expiration timer is set to 180 seconds for that particularroute. Every time a new update for the route is received, the timer is reset. If there is a problem on an internet and no update is received within the allotted 180 seconds the route is considered expired and the hop count of the route is set to 16, which means the destination is unreachable. Every route has its own expiration timer.

- The garbage collection timer is used to purge a route from the forwarding table. When the information about a route becomes invalid, the router does not immediately purge that route from its table.