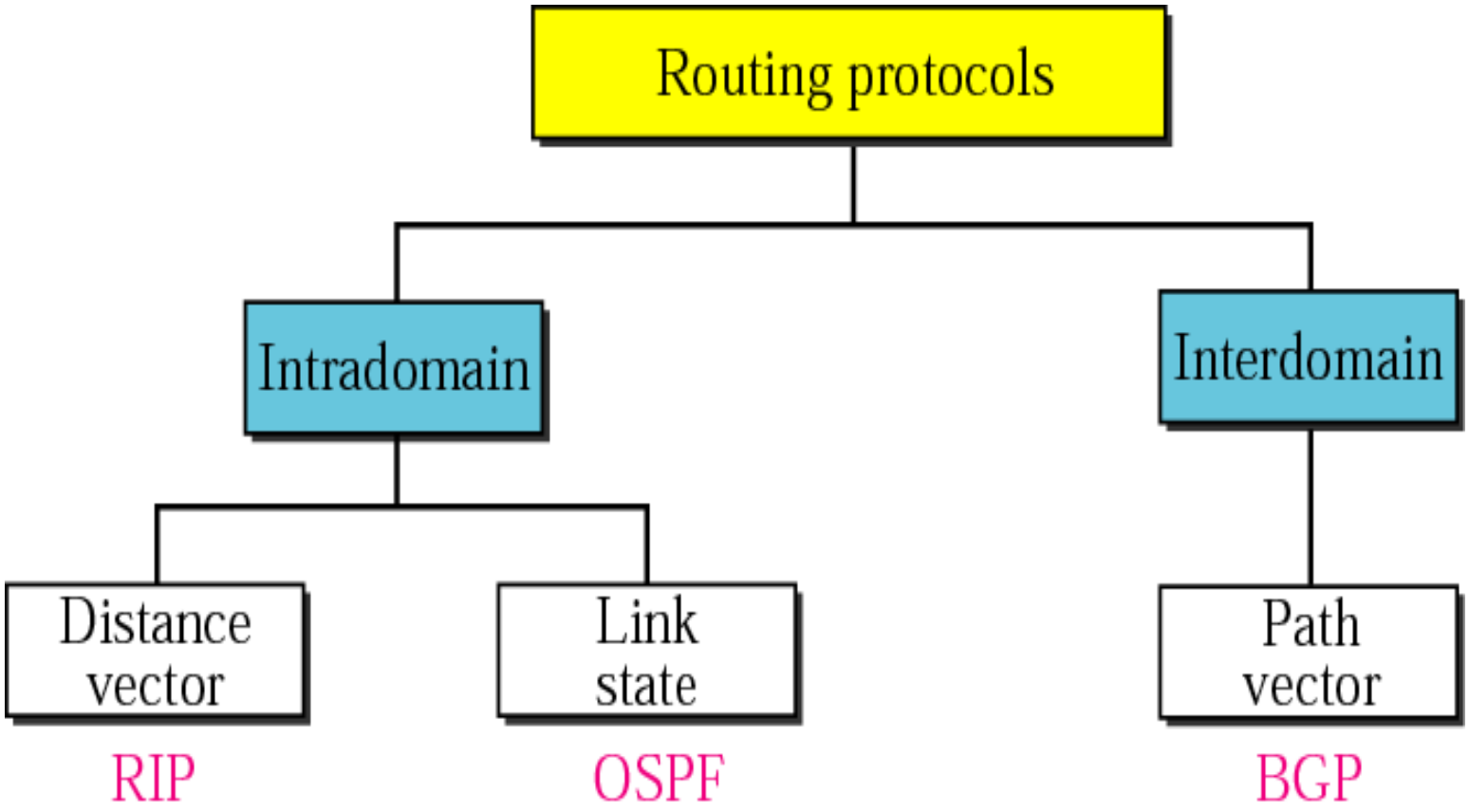
RIP Routing Protocol

Routing

- **Recall:** There are two parts to routing IP packets:
  1. How to pass a packet from an input interface to the output interface of a router (packet forwarding) ?
  2. How to find and setup a route ?

- We already discussed the packet forwarding part in 306NET

- There are two approaches for calculating the routing tables:
  - Static Routing
  - Dynamic Routing: Routes are calculated by a routing protocol


Routing protocols
Intradomain
Interdomain
Distance vector
Link state
Path vector
RIP
OSPF
BGP

RIP -- What is it?

- RIP is a routing protocol for exchanging routing table information between routers.
- RIP is an IGP routing protocol used inside an AS.
- It is a very simple protocol based on distance vector routing

RIP Characteristics

- Distance vector routing protocol.
- Uses hop count as a path selection metric.
- RIP routes have an administrative distance of 120.
- RIP has a maximum hop count of 15 hops , with “16” equal to “□”.
- Three types of timers.

Distance Vector Routing

- In distance vector routing, each router shares its routing table with its immediate neighbors periodically and when there is a change.
- The three features:
  - Each router sends all or part of its routing table in routing updates
  - Sharing only with neighbors
  - Sharing at regular intervals and when there is a change

Routing Table

- Every router keeps a routing table.
- The routing table has one entry for each destination network of which the router is aware.

Table 21.1 ***A distance vector routing table***

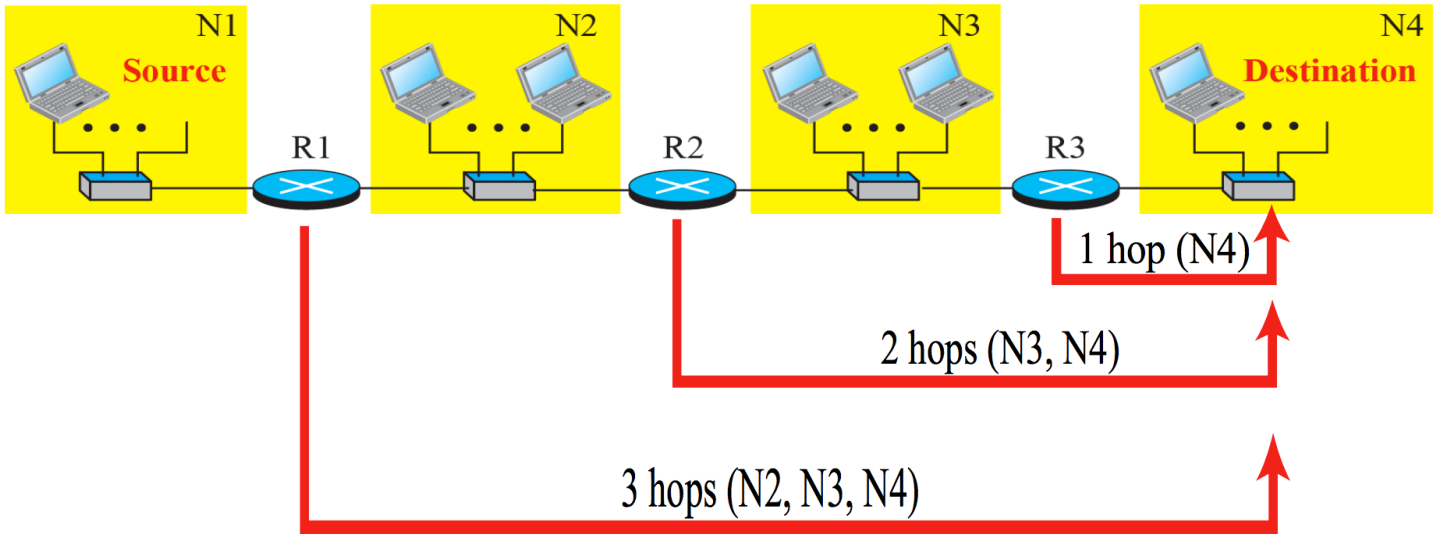
Destination	Hop Count	Next Router	Other information
163.5.0.0	7	172.6.23.4	
197.5.13.0	5	176.3.6.17	
189.45.0.0	4	200.5.1.6	
115.0.0.0	6	131.4.7.19	

Routing Table

- The entry consists of:
  - the destination network address,
  - the shortest distance to reach the destination in hop count,
  - and the next route to which the packet should be delivered.
- The table may contain other information.

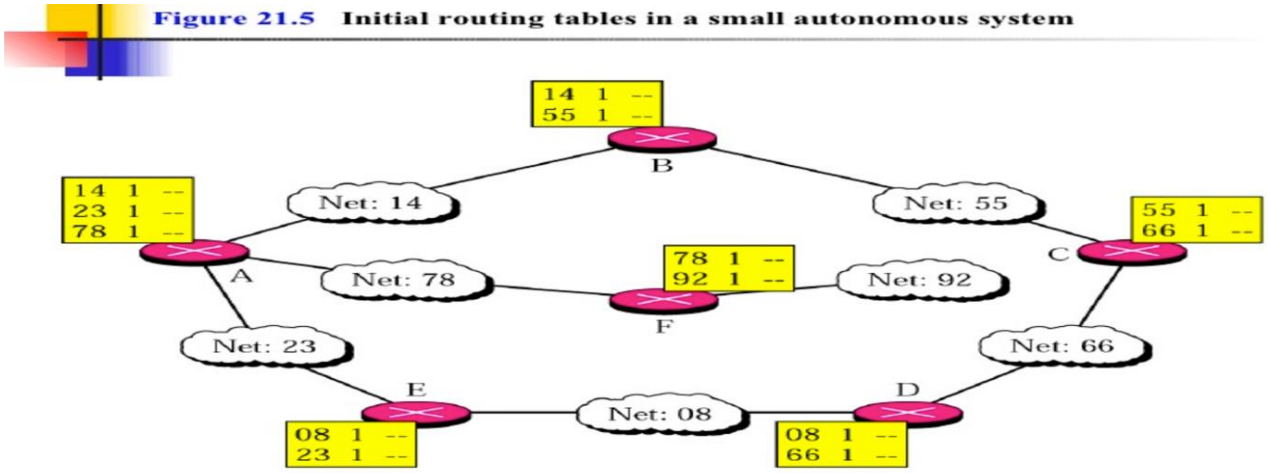
Hop Count

- The hop count is the number of networks that a packet encounters to reach its final destination.
- After 15 hops, the packet is discarded



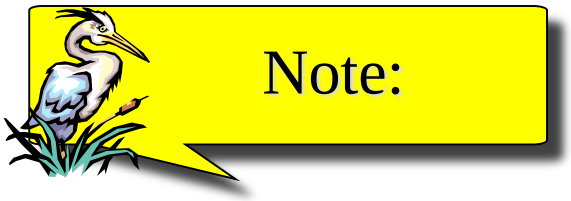
Initialization

- When a router is added to a network, it initializes a routing table for itself, using its configuration file.
- The table contains only the directly attached networks and hop counts, which are initialized to 1.
- The next-hop field is empty.



Sharing

- The whole idea of distance vector routing is the sharing of information between neighbors
- Although router A does not know about router C, router B does. So if router B shares its routing table with A, node A can also know how to reach node C



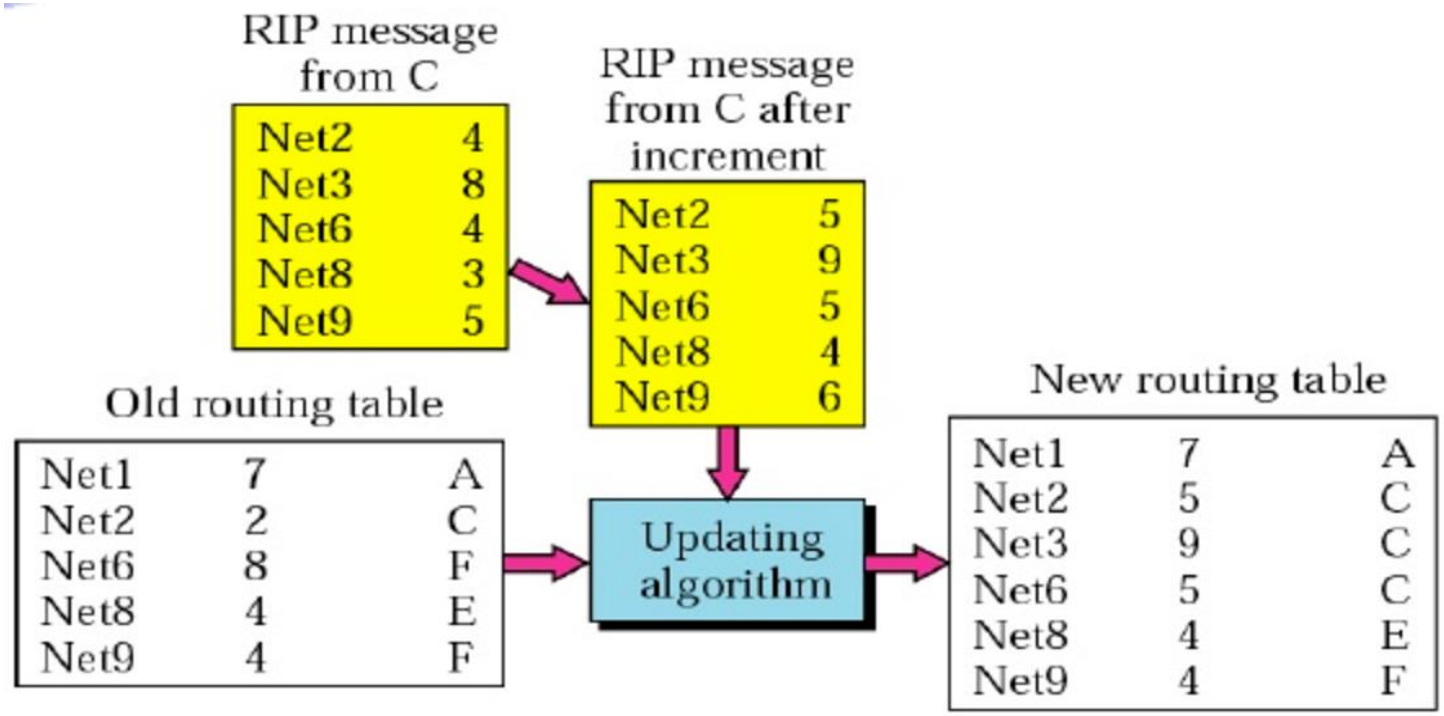
In distance vector routing, each node shares its routing table with its immediate neighbors periodically and when there is a change.

Updating

- When a router receives a 2-column table from a neighbor, it needs to update its routing table. Updating takes 3 steps:
  1. The receiving router needs to add one hop count to each value in the hop count column
  2. The receiving router needs to add the name of the sending router to each row as the 3rd column if the receiving router uses information from any row. The sending router is the next node in the route

Updating

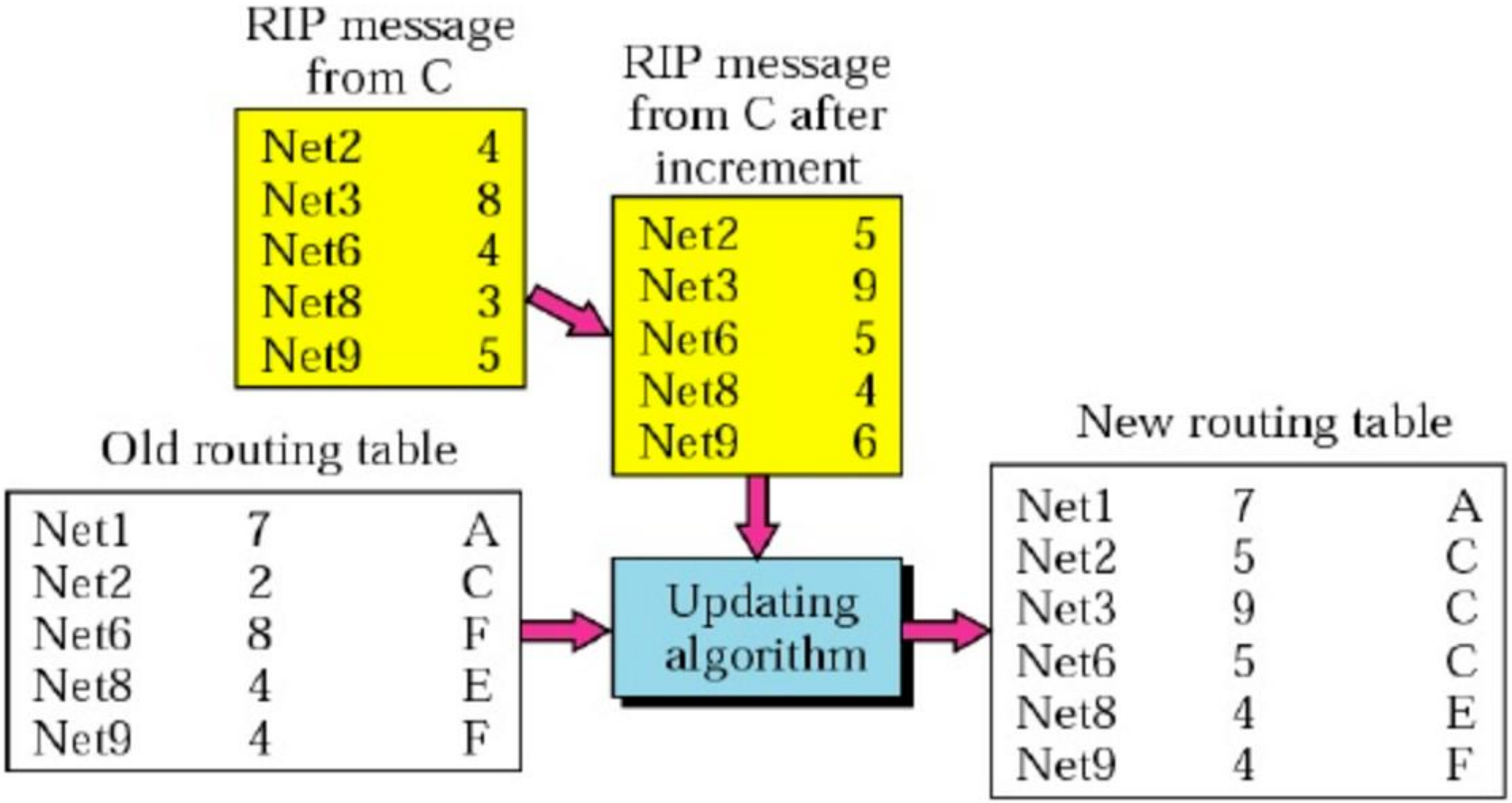
3- The receiving router needs to compare each row of its old table with the corresponding row of the modified version of the received table.



Updating Algorithm

Receive: a response RIP message

1. Add one to the hop count for each advertised destination
2. Repeat for each advertised destination
   - If (destination is not in my routing table)
     - Add the destination to my table
   - Else If (next-hop field is the same)
     - Replace existing entry with the new advertised one
     - Else if (advertised hop-count –after incrementing- is smaller)
       - Replace existing entry with the new advertised one



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

RIP v1 Drawbacks

- RIP version 1 does not recognize subnets.
- This feature was added in RIP version 2.
- Because RIP only uses hop count as a metric, packets may be forced to take a slower route with less hops over a faster route with more hops.
  - Other routing protocols use a combination of different metrics to calculate a route.

RIPv2

- RIPv2 is an extends RIPv1:
  - Subnet masks are carried in the route information
  - Authentication of routing messages
  - Exploits IP multicasting

- Extensions of RIPv2 are carried in unused fields of RIPv1 messages