Distance Vector Routing

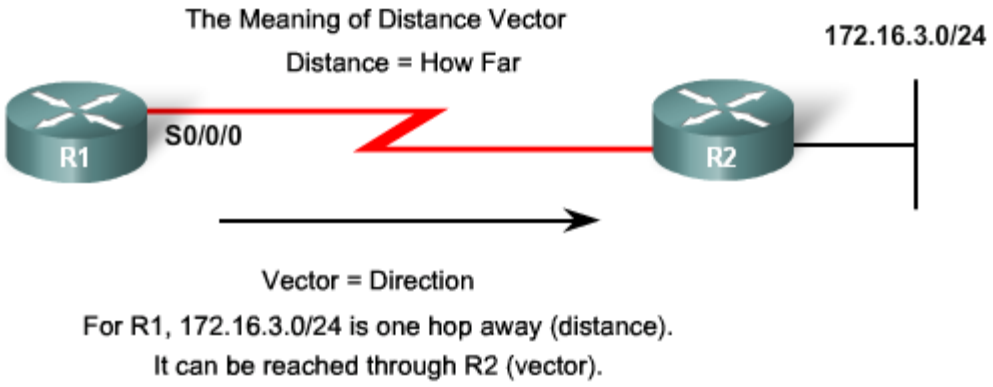
Distance Vector Routing Protocols

- **Dynamic routing protocols help the network administrator overcome the time-consuming and exacting process of configuring and maintaining static routes.**
- **Examples of Distance Vector routing protocols**:
  - Routing Information Protocol (RIP)
    - –RFC 1058.
    - –Hop count is used as the metric for path selection.
    - –If the hop count for a network is greater than 15, RIP cannot supply a route to that network.
    - –Routing updates are broadcast or multicast every 30 seconds, by default.
  - Interior Gateway Routing Protocol (IGRP)
    - –proprietary protocol developed by Cisco.
    - –Bandwidth, delay, load and reliability are used to create a composite metric.
    - –Routing updates are broadcast every 90 seconds, by default.
    - –IGRP is the predecessor of EIGRP and is now obsolete.
  - Enhanced Interior Gateway Routing Protocol (EIGRP)
    - –Cisco proprietary distance vector routing protocol.
    - –It can perform unequal cost load balancing.
    - –It uses Diffusing Update Algorithm (DUAL) to calculate the shortest path.
    - –There are no periodic updates as with RIP and IGRP. Routing updates are sent only when there is a change in the topology.

Distance Vector Routing Protocols

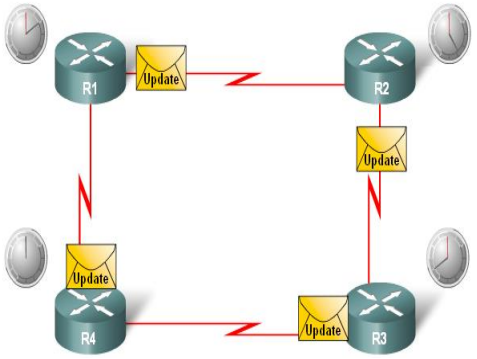
- **The Meaning of Distance Vector**:
  - –A router using distance vector routing protocols knows 2 things:
    - Distance to final destination
      - The distance or how far it is to the destination network
    - Vector, or direction, traffic should be directed
      - The direction or interface in which packets should be forwarded

For example, in the figure, R1 knows that the distance to reach network 172.16.3.0/24 is 1 hop and that the direction is out the interface S0/0/0 toward R2.



Distance Vector Routing Protocols

- **Characteristics of Distance Vector routing protocols**:
  - Periodic updates
    - Periodic Updates sent at regular intervals (30 seconds for RIP). Even if the topology has not changed in several days,
  - Neighbors
    - The router is only aware of the network addresses of its own interfaces and the remote network addresses it can reach through its neighbors.
    - It has no broader knowledge of the network topology
  - Broadcast updates
    - Broadcast Updates are sent to 255.255.255.255.
    - Some distance vector routing protocols use multicast addresses instead of broadcast addresses.
  - Entire routing table is included with routing update
    - Entire Routing Table Updates are sent, with some exceptions to be discussed later, periodically to all neighbors.
    - Neighbors receiving these updates must process the entire update to find pertinent information and discard the rest.
    - Some distance vector routing protocols like EIGRP do not send periodic routing table updates.

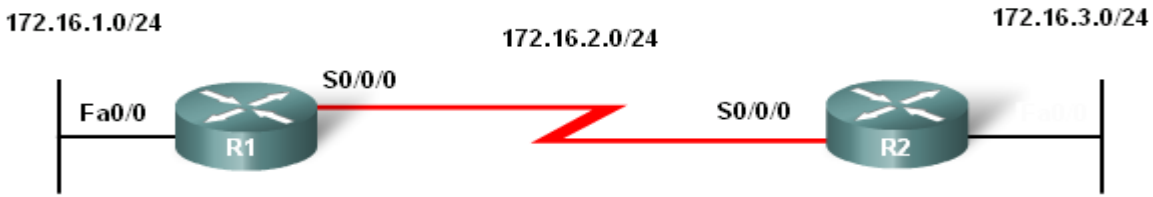


Distance Vector Routing Protocols

- **Routing Protocol Algorithm**:
  - –The algorithm is used to calculate the best paths and then send that information to the neighbors.
  - –Different routing protocols use different algorithms to install routes in the routing table, send updates to neighbors, and make path determination decisions.

Purpose of Routing Algorithms

1. **Send and Receive Updates**
2. **Calculate best path; install routes**
3. **Detect and react to topology changes**



Network	Interface	Hop
172.16.1.0/24	Fa0/0	0
172.16.2.0/24	S0/0/0	0
172.16.3.0/24	S0/0/0	1

Network	Interface	Hop
172.16.2.0/24	S0/0/0	0
172.16.3.0/24	Fa0/0	0
172.16.1.0/24	S0/0/0	1

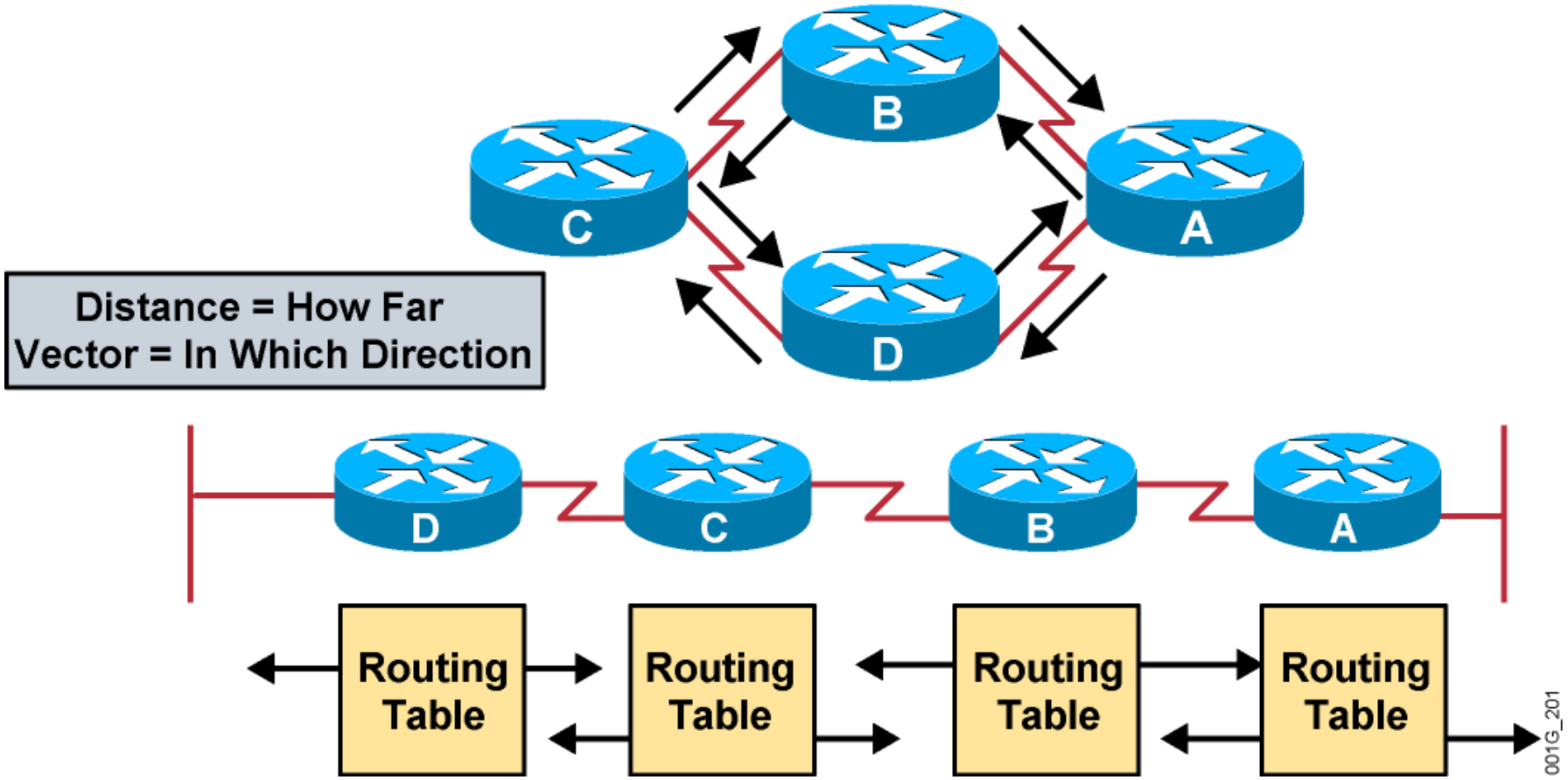
Distance Vector Routing Protocols

Routing Protocol Characteristics

–Criteria used to compare routing protocols includes

- Time to convergence
  - Time to convergence defines how quickly the routers in the network topology share routing information and reach a state of consistent knowledge.
  - The faster the convergence, the more preferable the protocol.
- Scalability
  - Scalability defines how large a network can become based on the routing protocol that is deployed.
  - The larger the network is, the more scalable the routing protocol needs to be.
- Resource usage
  - Resource usage includes the requirements of a routing protocol such as memory space, CPU utilization, and link bandwidth utilization.
  - Higher resource requirements necessitate more powerful hardware to support the routing protocol operation
- Classless (Use of VLSM) or Classful
  - Classless routing protocols include the subnet mask in the updates.
  - This feature supports the use of Variable Length Subnet Masking (VLSM) and better route summarization.
- Implementation & maintenance
  - Implementation and maintenance describes the level of knowledge that is required for a network administrator to implement and maintain the network based on the routing protocol deployed.

Distance Vector Routing Protocols



- Routers pass periodic copies of their routing table to neighboring routers and accumulate distance vectors.