LAN Connections

Exploring the Functions of Routing

Routers

- Routers have the following components:
  - CPU
  - Motherboard
  - Memory
- Routers have network adapters to which IP addresses are assigned.
- Routers may have two kinds of ports:
  - Console/AUX: For the connection of a terminal used for management.
  - Network: Different LAN or WAN media ports.
- Routers forward packets based on a routing table.

Cisco 2800 Series Router

Router Functions

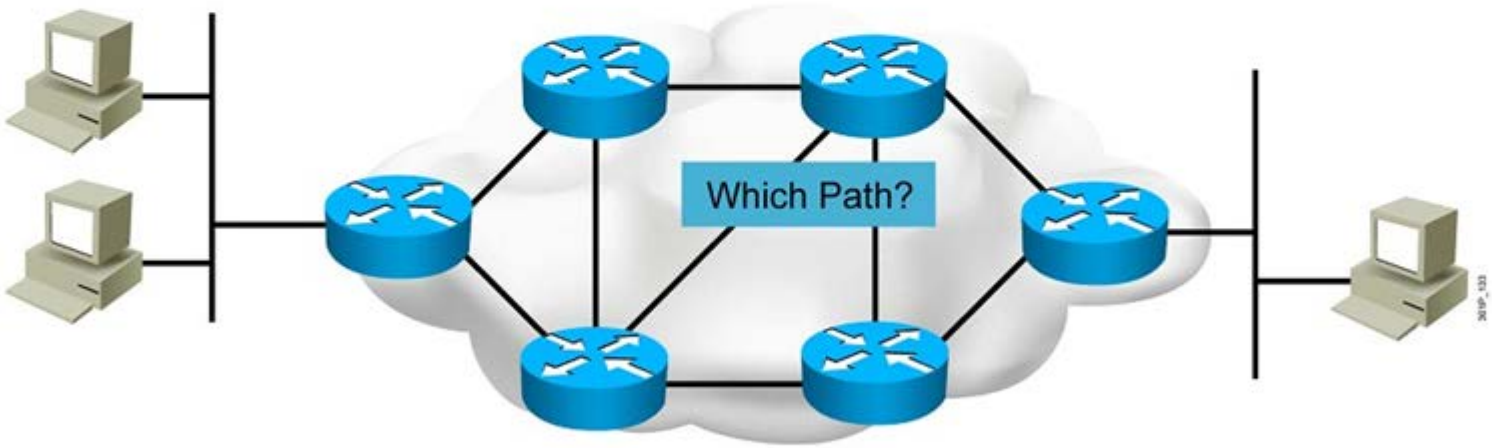
1. Gathers routing information and inform other routers about changes
2. Determines where to forward packets

```
RouterX#show ip route

1 { R 1.2.2.0 [120/1] via 10.1.1.1, 00:00:15, FastEthernet0/0
    C 10.2.2.0 is directly connected, FastEthernet1/0
    C 10.1.1.0 is directly connected, FastEthernet0/0
    O 30.30.30.30 [110/2] via 10.2.2.3, 00:01:08, FastEthernet1/0
    D 40.40.40.40 [90/156160] via 10.1.1.1, 00:01:23, FastEthernet0/0 } 2
```

- Omitted **show ip route** command output of RouterX

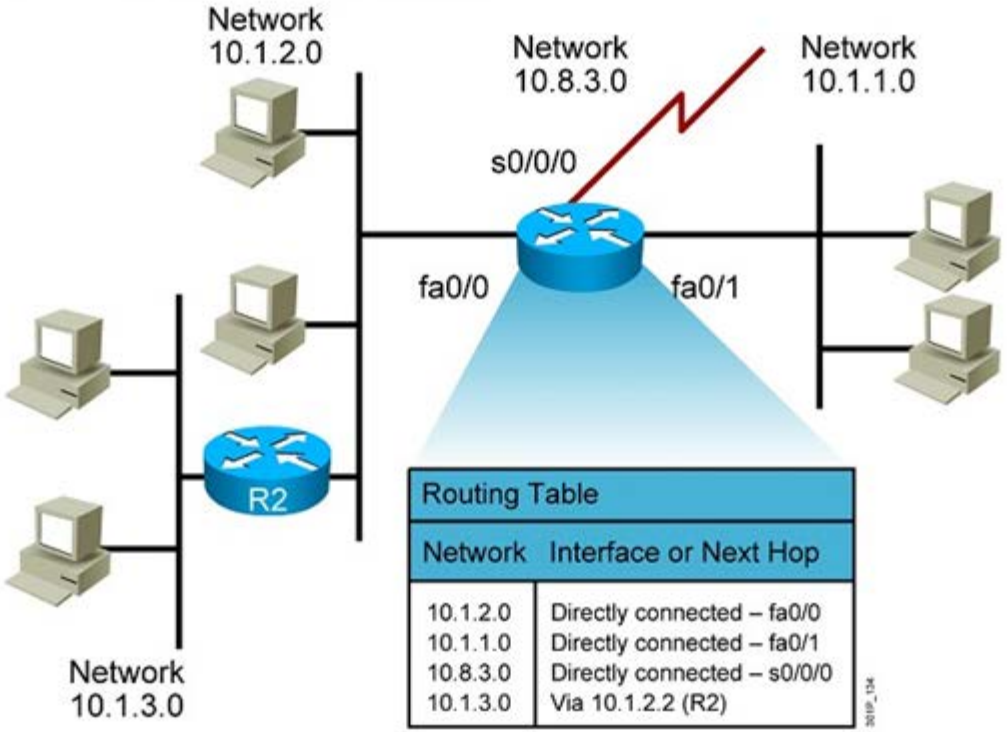
Path Determination

- Routers are used to select the best path to the destination.



Routing Tables

- Routing tables list all known destinations and information regarding how to teach them.



Routing Table Entries

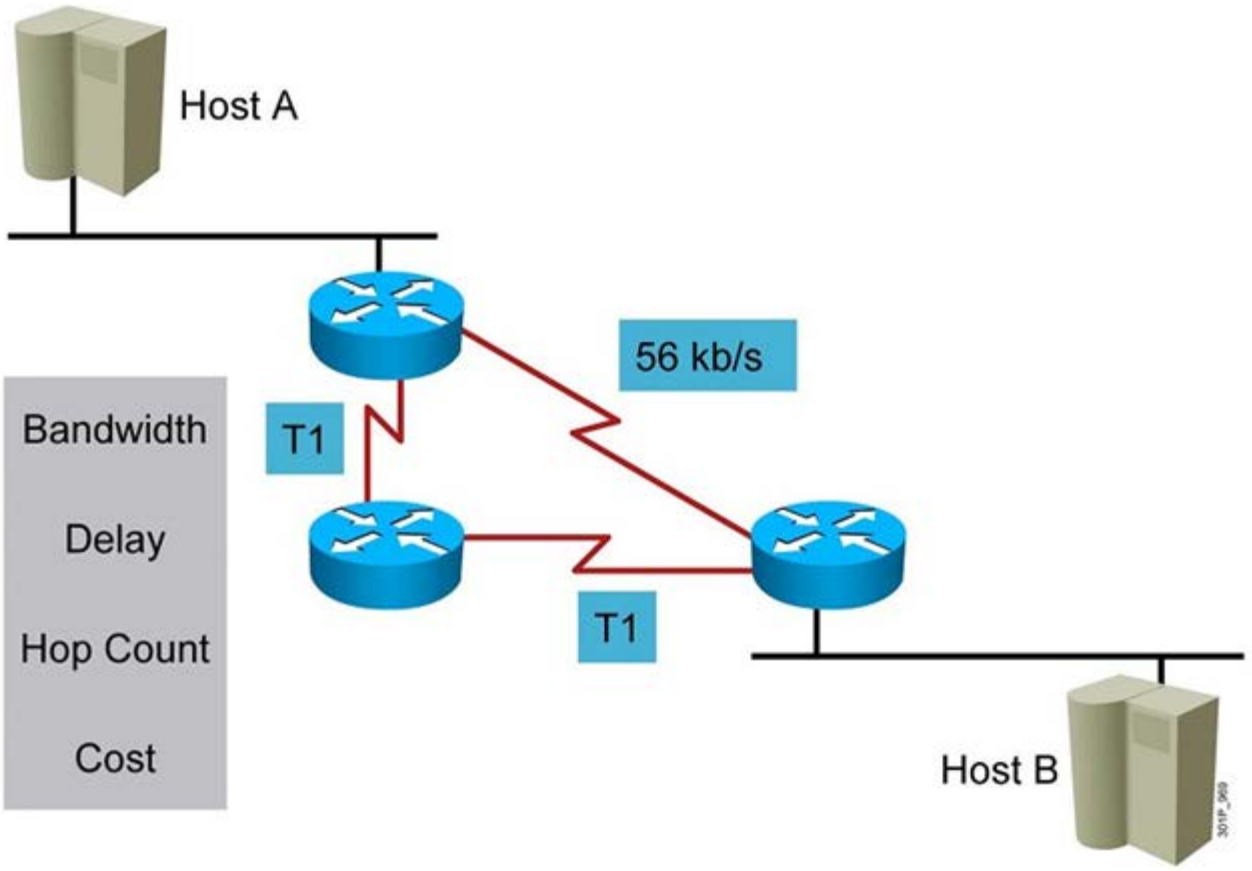
- **Directly connected:** Router attaches to this network.
- **Static routing:** Entered manually by a system administrator.
- **Dynamic routing:** Learned by exchange of routing information.
- **Default route:** Statically or dynamically learned; used when no explicit route to network is known.

Routing Table Entries (Cont.)

```
RouterX#show ip route

Codes: I - IGRP derived, R - RIP derived, O - OSPF derived,
       C - connected, S - static, E - EGP derived, B - BGP derived,
       * - candidate default route, IA - OSPF inter area route,
       i - IS-IS derived, ia - IS-IS, U - per-user static route,
       o - ondemand routing, M - mobile, P - periodic downloaded static route,
       D - EIGRP, EX - EIGRP external, E1 - OSPF external type 1 route,
       E2 - OSPF external type 2 route, N1 - OSPF NSSA external type 1 route,
       N2 - OSPF NSSA external type 2 route

Gateway of last resort is 10.1.1.1 to network 0.0.0.0

R 1.2.2.0 [120/1] via 10.1.1.1, 00:00:15, FastEthernet0/0
C 10.2.2.0 is directly connected, FastEthernet1/0
C 10.1.1.0 is directly connected, FastEthernet0/0
O 172.16.1.0 [110/2] via 10.2.2.3, 00:01:08, FastEthernet1/0
D 192.168.20.0 [90/156160] via 10.1.1.1, 00:01:23, FastEthernet0/0
S 192.168.1.0 is directly connected, Ethernet0/0
S* 0.0.0.0/0 [1/0] via 10.1.1.1
```

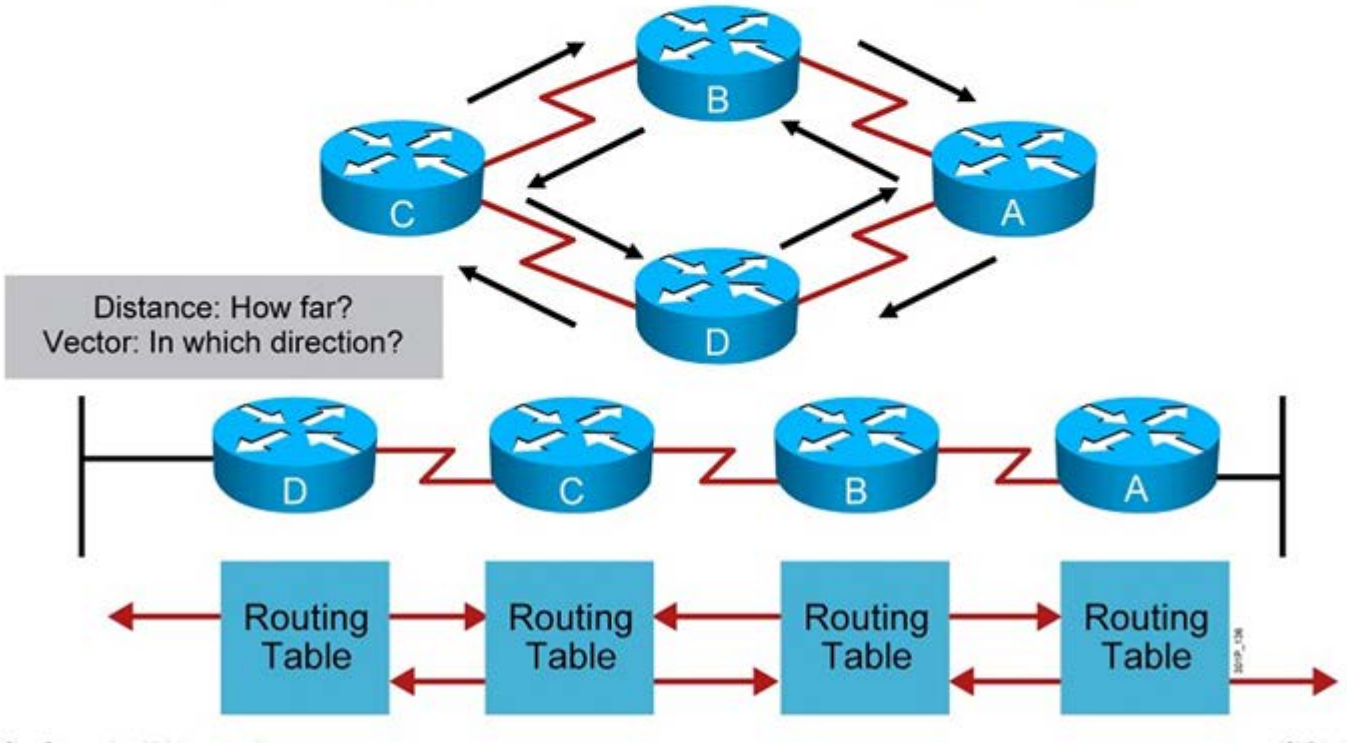
- Output of **show ip route** command output of RouterX

Routing Metrics



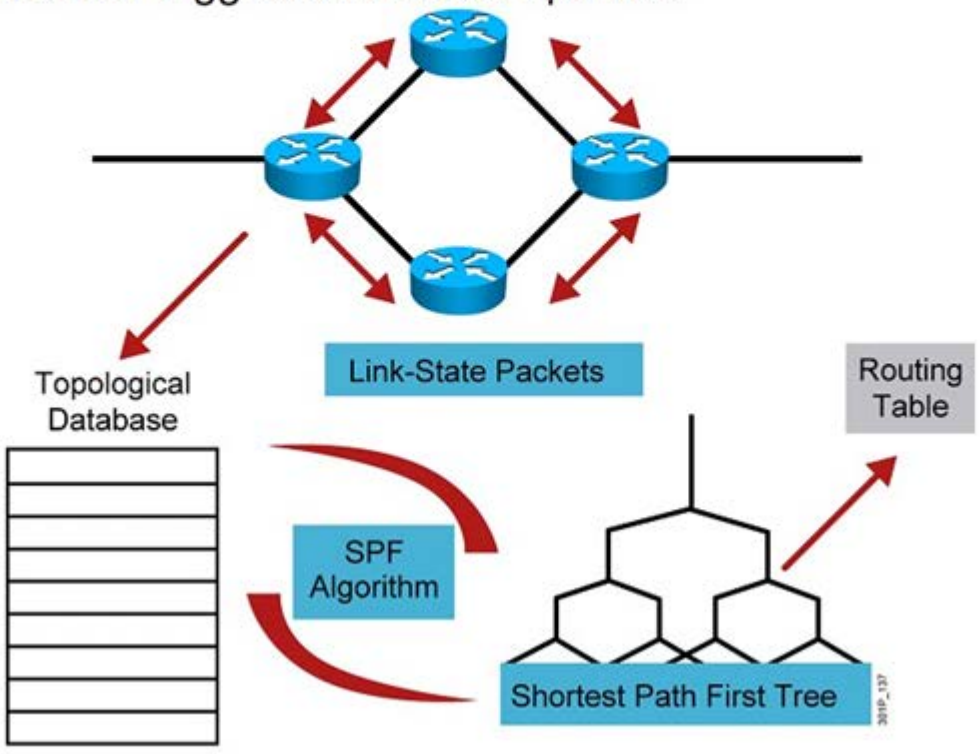
Distance Vector Routing Protocols

- Collect distance and vector to neighboring routers
- Send periodic updates of routing table to neighboring routers



Link-State Routing Protocols

- Create the network topology map
- Send event-triggered link-state updates



Summary

- Routers have certain components that are also found in computers and switches, such as the CPU, motherboard, RAM, and ROM. Routers have two primary functions in the IP packet delivery process:
  - Maintaining routing tables
  - Determining the best path to be used to forward packets
- Routers determine the optimal path for forwarding IP packets between networks.
- Routing tables provide an ordered list of best paths to known networks, and include information such as destination, next-hop associations, and routing metrics.
- Routers can use different types of routes to reach the destination networks. Routing tables include static, dynamic, and default routes.

Summary (Cont.)

- Commonly used routing metrics include bandwidth, delay, hop count, and cost. Two main groups of the routing protocols are as follows:
  - Distance vector routing protocols build and update routing tables automatically by sending all or some portion of their routing table to neighbors. The distance vector routing approach determines the direction (vector) and distance to any network in the internetwork.
  - Link-state routing protocols build and update routing tables automatically, running algorithms against the link-state database to determine the best paths, and flood routing information about their own links to all the routers in the network.