



# Exploring the Functions of Routing

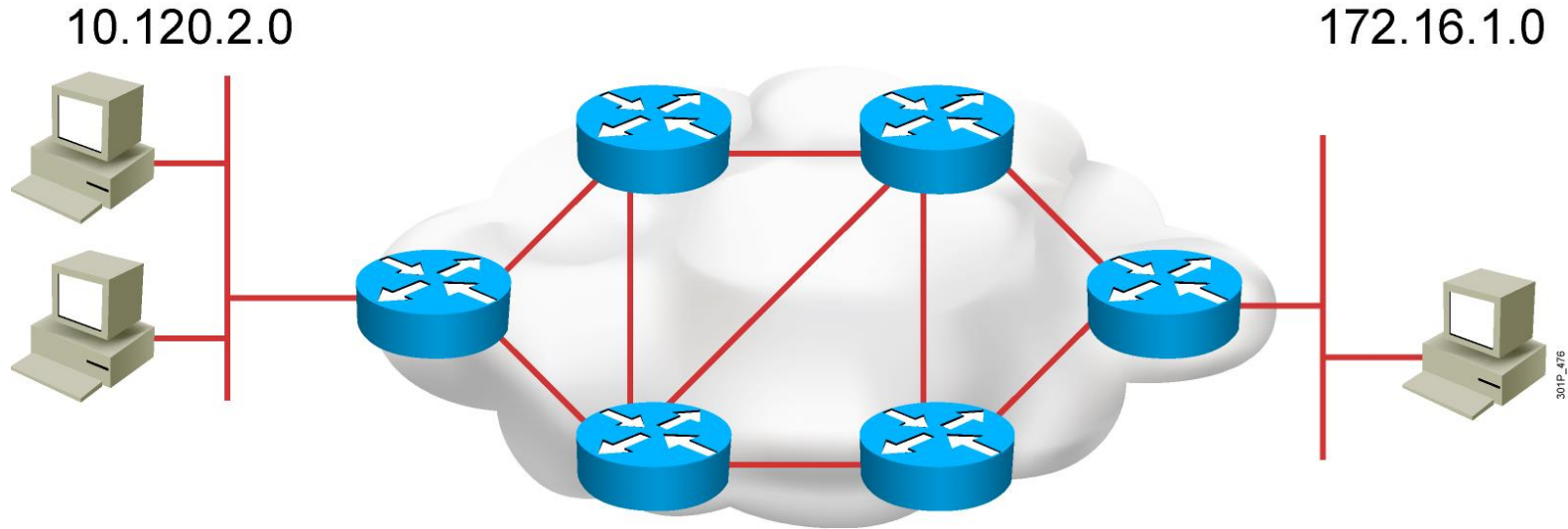
# Routers

## Cisco 2800 Series Router



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

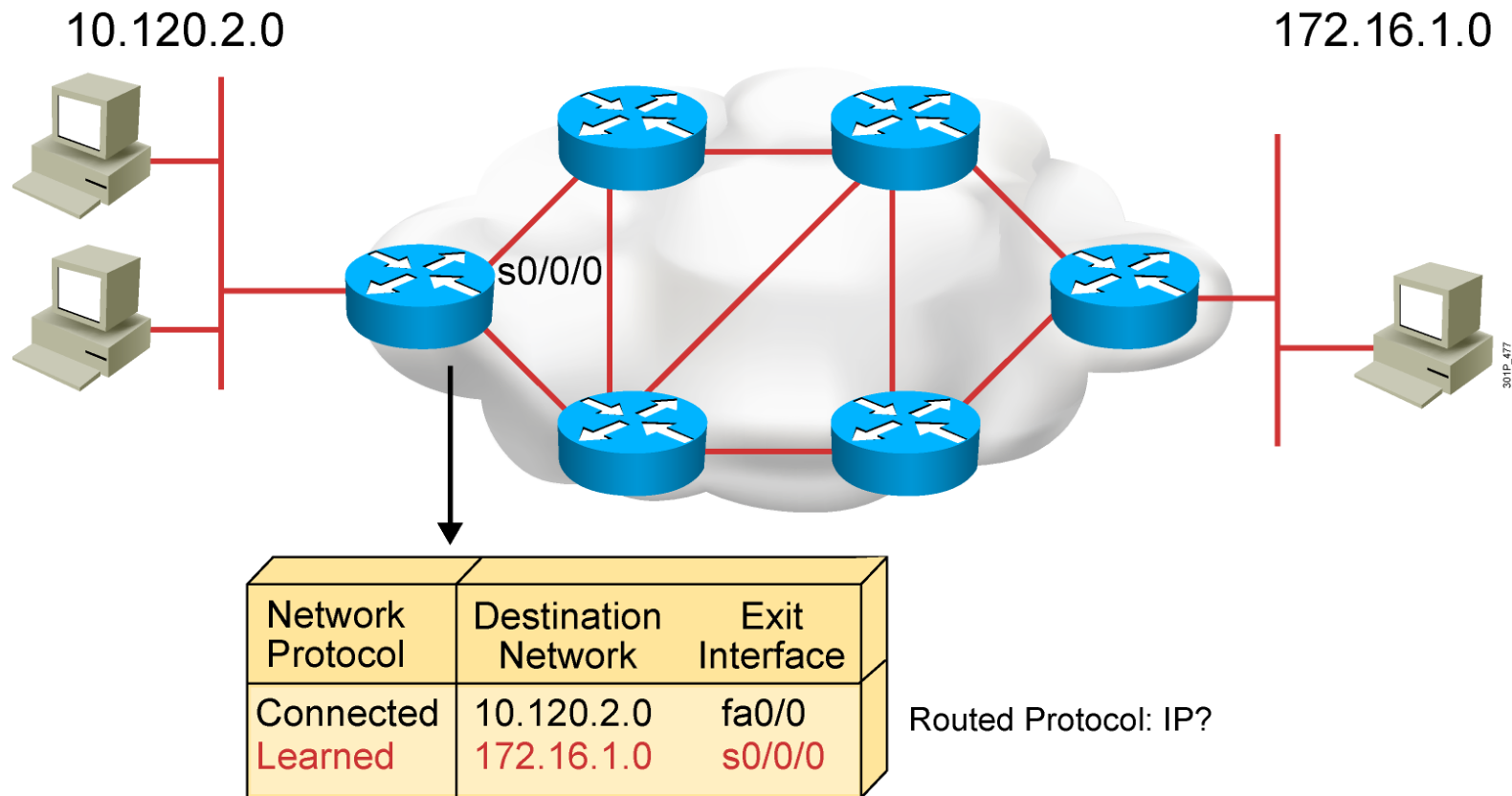
# Router Operations



## A router needs to do the following:

- Know the destination address.
- Identify the sources from which the router can learn.
- Discover possible routes to the intended destination.
- Select the best route.
- Maintain and verify routing information.

# Router Operations (Cont.)



- Routers must learn destinations that are not directly connected.

# Router Functions

RouterX# **show ip route**

1 {  
    **D** 192.168.1.0/24 [90/25789217] **via** 10.1.1.1  
    **R** 192.168.2.0/24 [120/4] **via** 10.1.1.2  
    **O** 192.168.3.0/24 [110/229840] **via** 10.1.1.3  
} 2

1. Lets other routers know about changes
2. Determines where to forward packets

# Identifying Static and Dynamic Routes

## **Static route**

- Uses a route that a network administrator enters into the router manually

## **Dynamic route**

- Uses a route that a network routing protocol adjusts automatically for topology or traffic changes

# Dynamic Routing Protocols

Autonomous System 10

Autonomous System 20

IANA

FPT

VNPT

EGP

Exterior Gateway Protocols

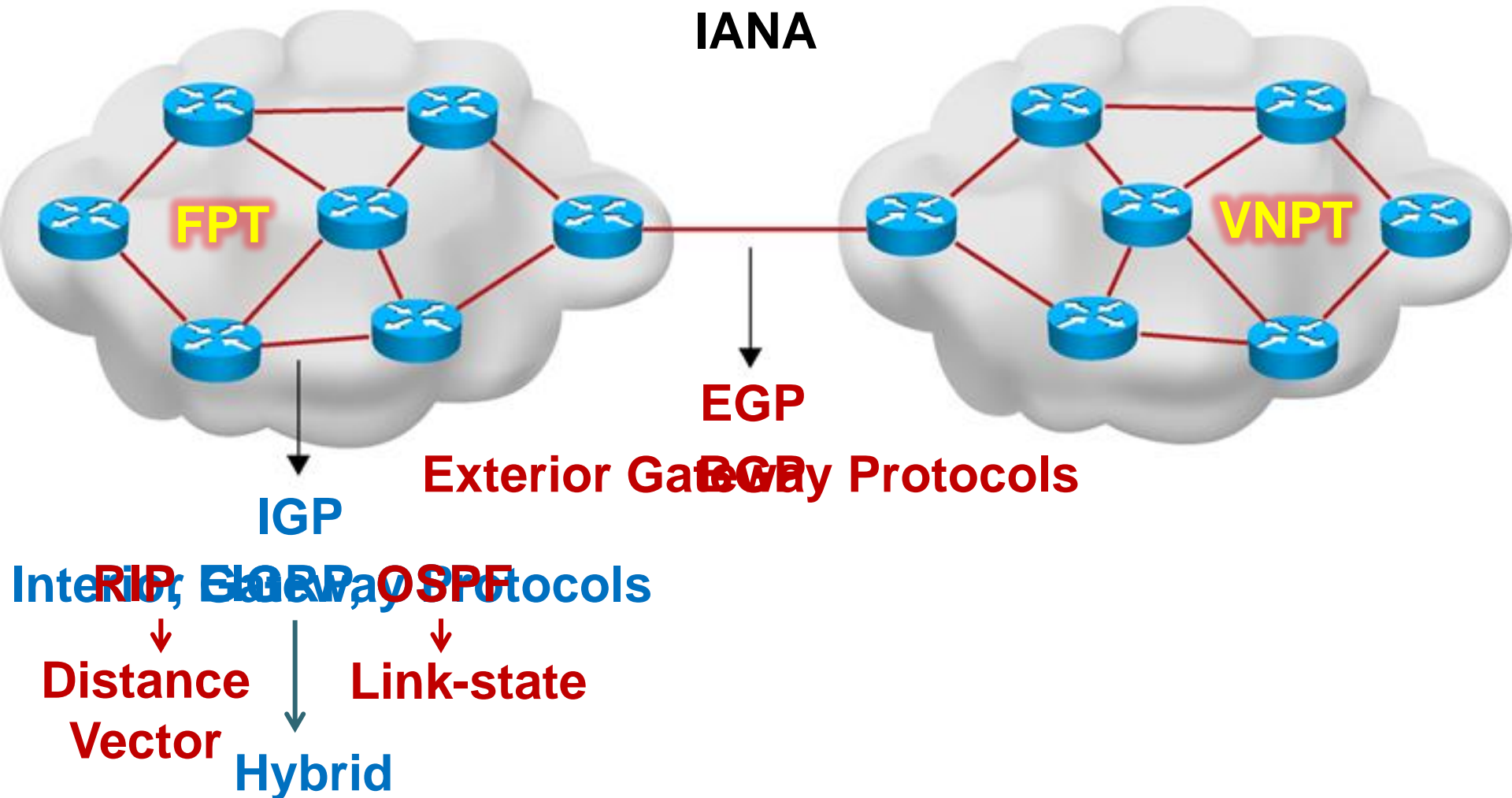
IGP

Interior Gateway Protocols

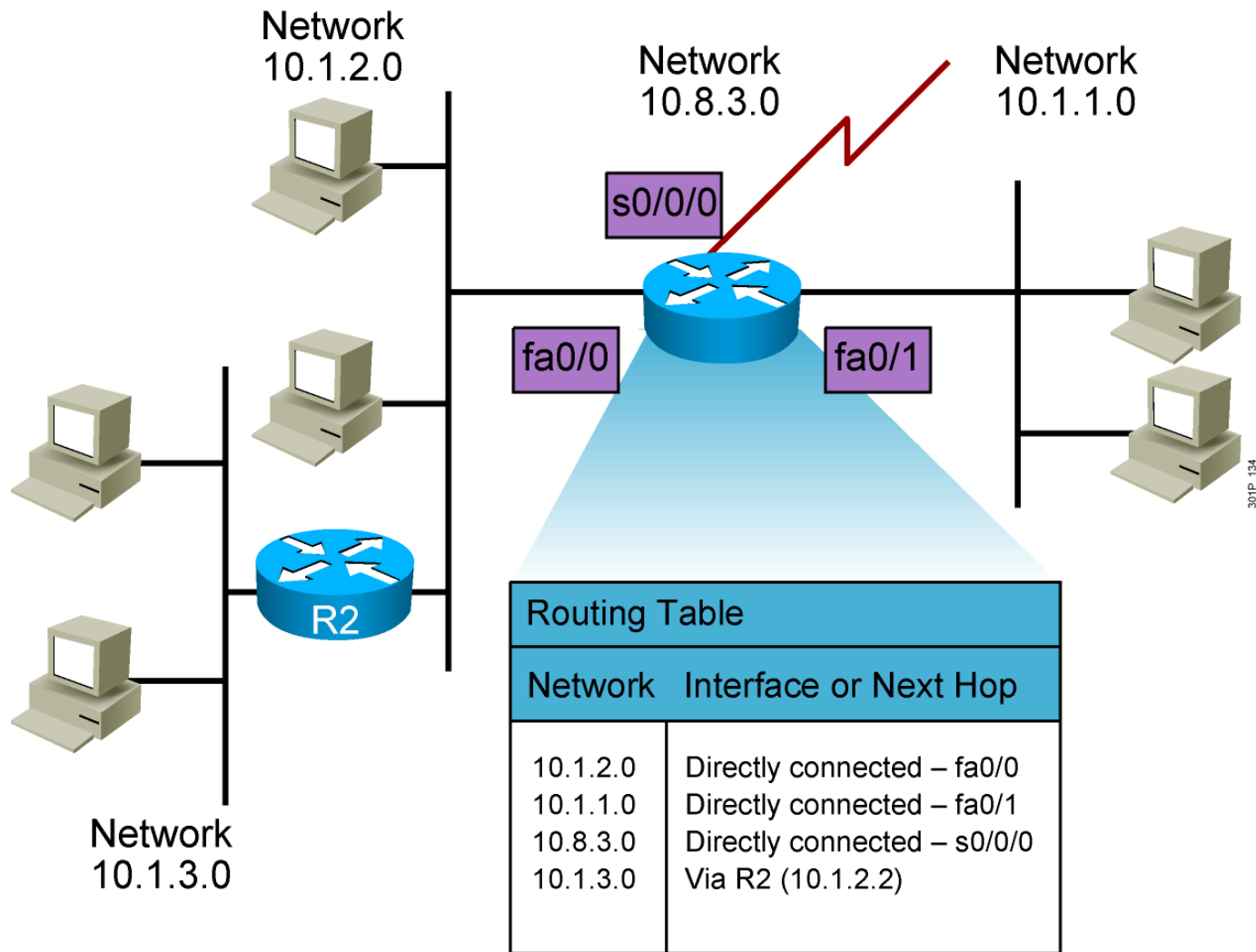
Distance  
Vector

Link-state

Hybrid



# Routing Tables

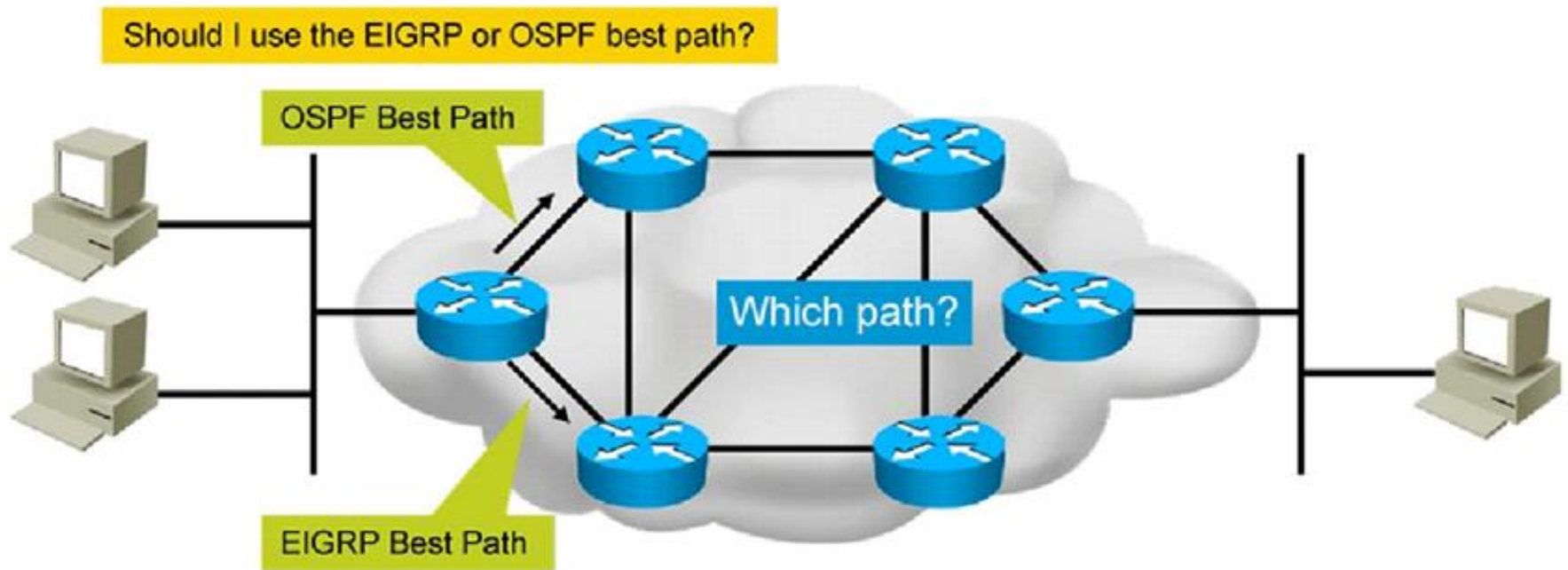




# Routing Table Entries

- **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

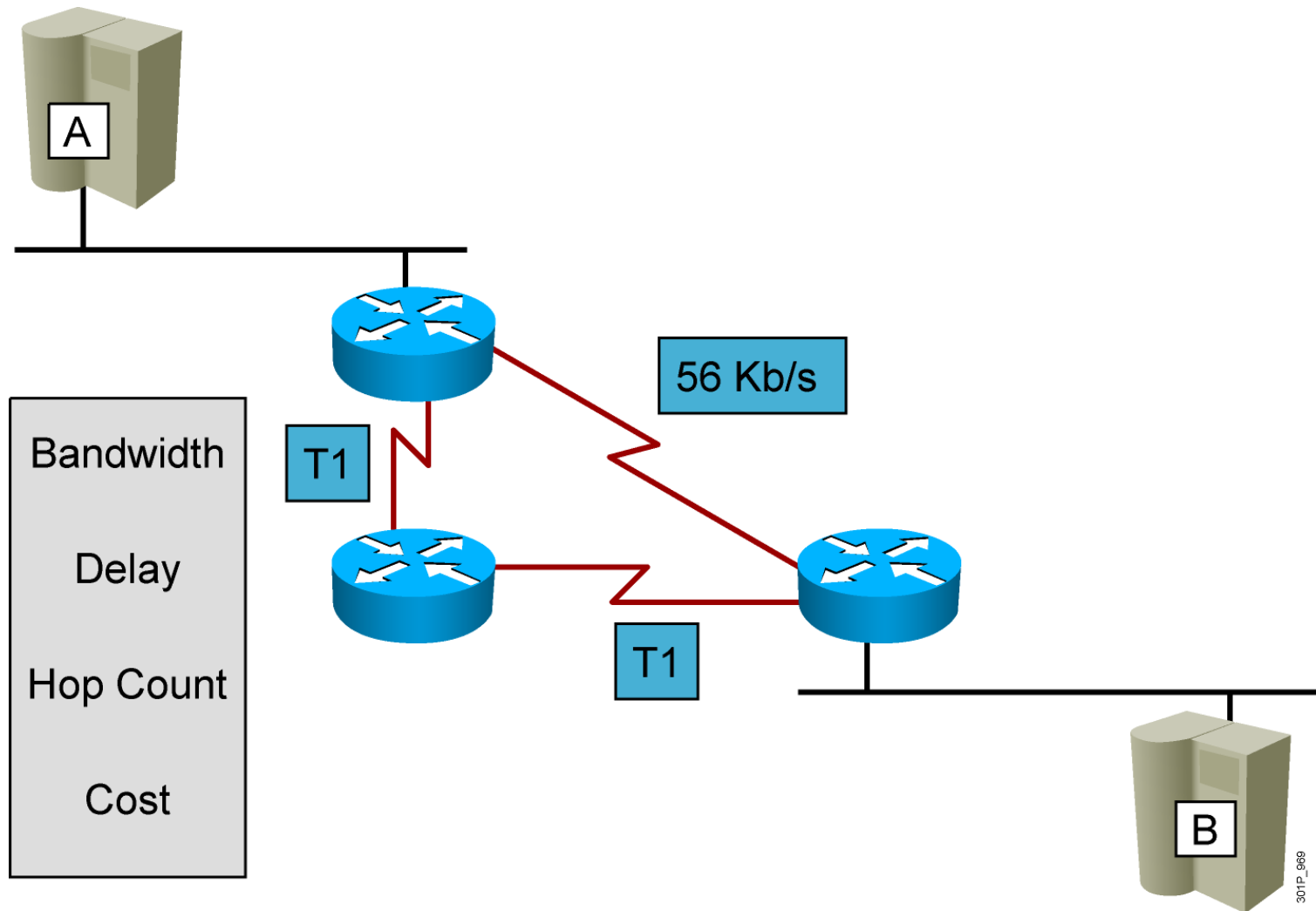
# AD - Administrative Distance



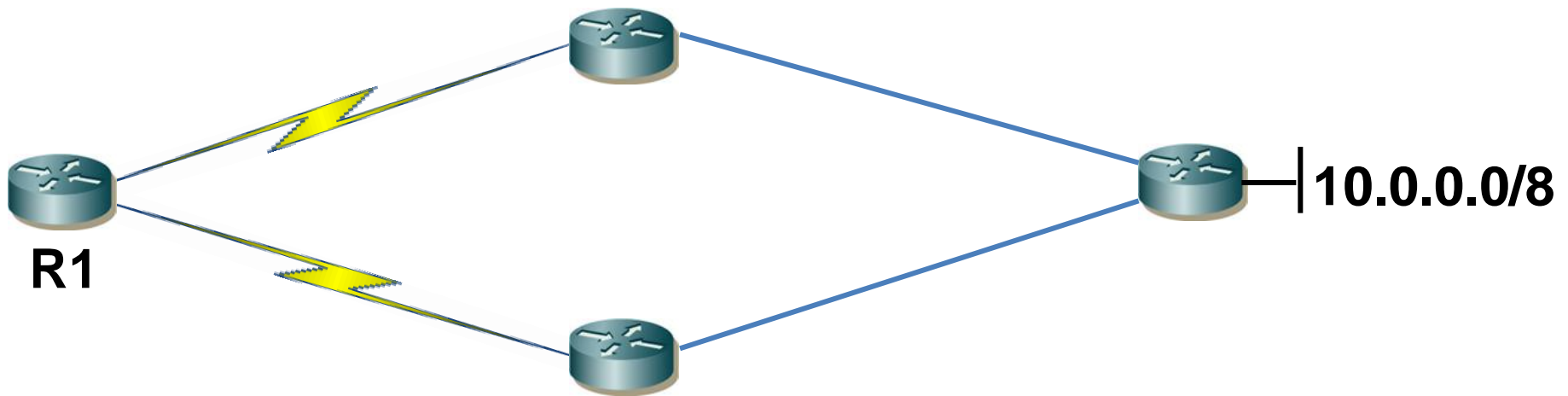
# AD - Administrative Distance

Protocol	AD Value (0-255)
Connected	0
Static	1
EIGRP	90
OSPF	110
RIP	120

# Routing Metrics



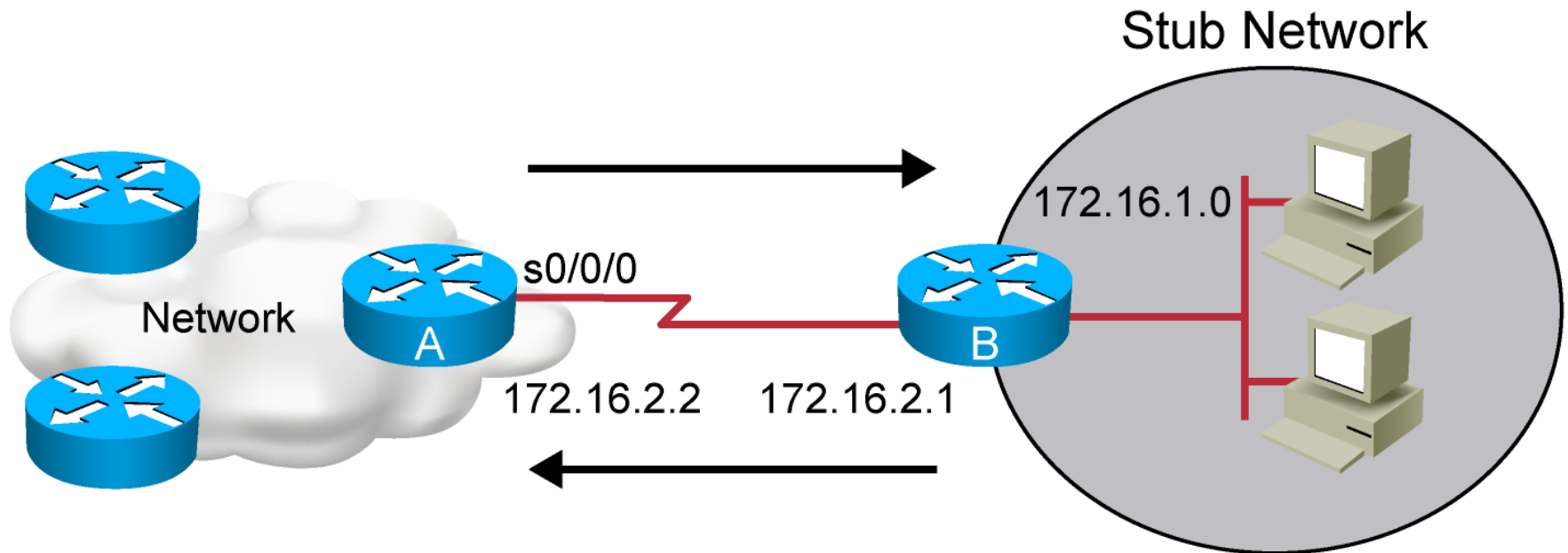
# Load Balancing





# Enabling Static Routing

# Static Routes



- Configure unidirectional static routes to and from a stub network to allow communications to occur.

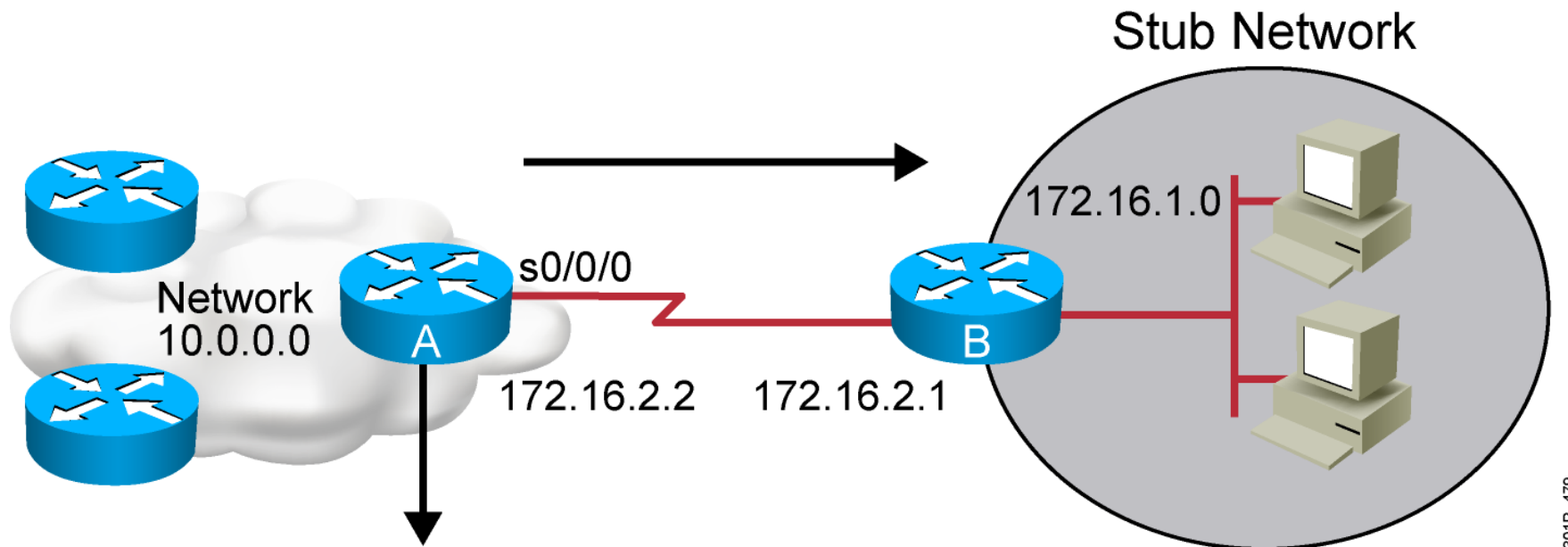
# Static Route Configuration

```
RouterX(config)# ip route network [mask]  
{address | interface}[distance] [permanent]
```

- Defines a path to an IP destination network or subnet or host
- Address = IP address of the next hop router
- Interface = outbound interface of the local router



# Static Route Example



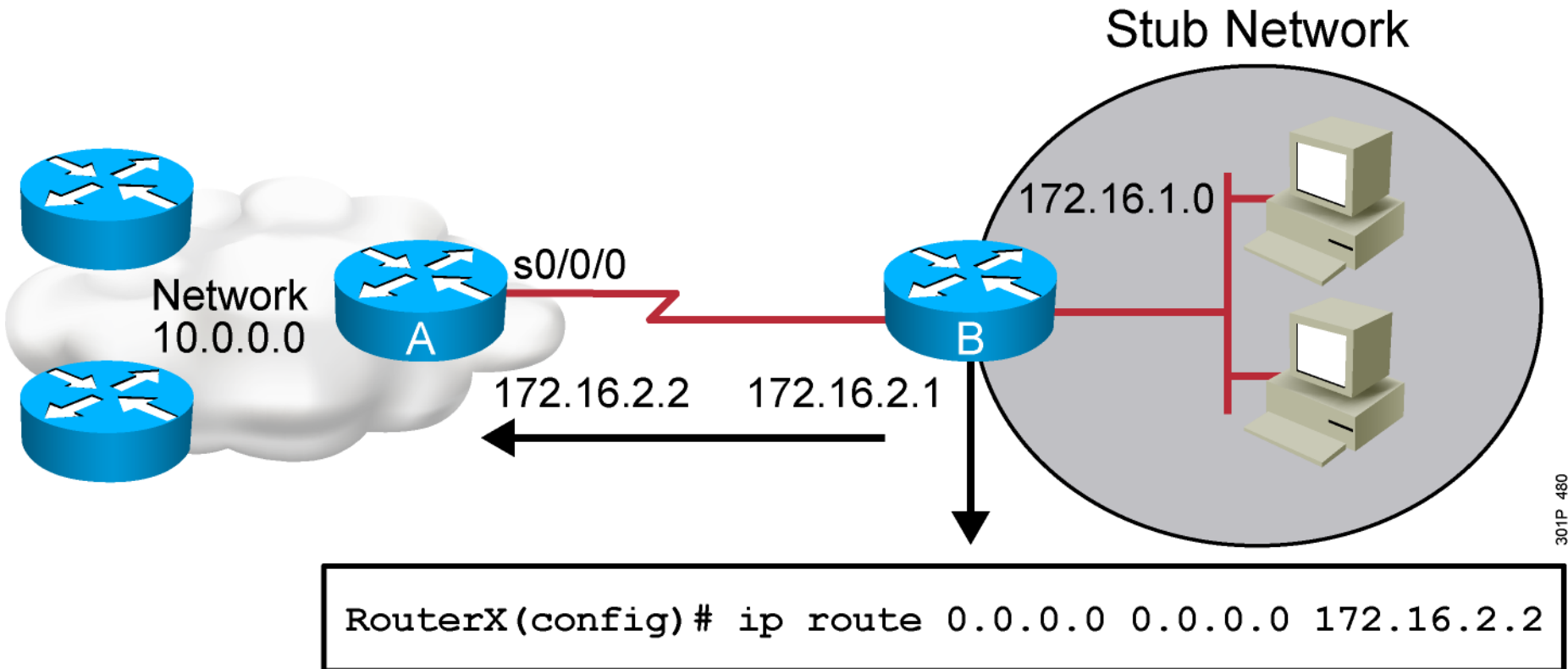
```
RouterX(config)#ip route 172.16.1.0 255.255.255.0 172.16.2.1
```

or

```
RouterX(config)#ip route 172.16.1.0 255.255.255.0 s0/0/0
```

- This is a unidirectional route. You must have a route configured in the opposite direction.

# Default Routes



- This route allows the stub network to reach all known networks beyond Router A.

# Verifying the Static Route Configuration

```
RouterX# show ip route
```

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP  
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area  
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP  
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default  
       U - per-user static route
```

```
Gateway of last resort is 0.0.0.0 to network 0.0.0.0
```

```
    10.0.0.0/8 is subnetted, 1 subnets
```

```
C        10.1.1.0 is directly connected, Serial0/0/0
```

```
S*    0.0.0.0/0 is directly connected, Serial0
```

