



Chapter 2: Static Routing



Routing and Switching Essentials v6.0



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Chapter 2 - Sections & Objectives

2.1 Static Routing Implementation

- Explain the advantages and disadvantages of static routing.
- Explain the purpose of different types of static routes.

2.2 Configure Static and Default Routes

- Configure IPv4 and IPv6 static routes by specifying a next-hop address.
- Configure IPv4 and IPv6 default routes.
- Configure a floating static route to provide a backup connection.
- Configure IPv4 and IPv6 static host routes that direct traffic to a specific host

2.3 Troubleshoot Static and Default Route Issues

- Explain how a router processes packets when a static route is configured.
- Troubleshoot common static and default route configuration issues.



2.1 Static Routing Implementation



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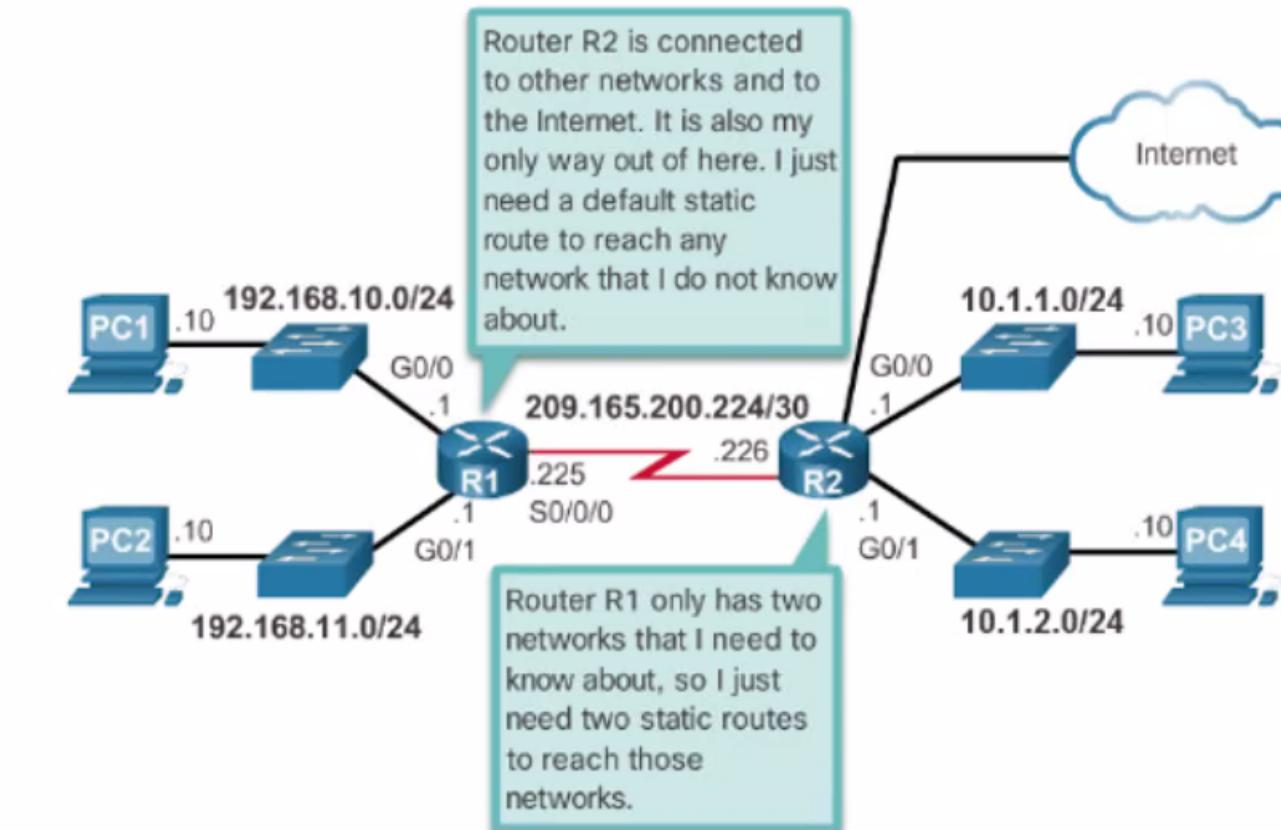


Static Routing Reach Remote Networks

A router can learn about remote networks in one of two ways:

- **Manually** - Remote networks are manually entered into the route table using static routes.
- **Dynamically** - Remote routes are automatically learned using a dynamic routing protocol.

Static and Default Route Scenario





Static Routing

Why Use Static Routing?

Static routing provides some advantages over dynamic routing, including:

- Static routes are not advertised over the network, resulting in better security.
- Static routes use less bandwidth than dynamic routing protocols, no CPU cycles are used to calculate and communicate routes.
- The path a static route uses to send data is known.

	Dynamic Routing	Static Routing
Configuration Complexity	Generally independent of the network size	Increases with network size
Topology Changes	Automatically adapts to topology changes	Administrator intervention required
Scaling	Suitable for simple and complex topologies	Suitable for simple topologies
Security	Less secure	More secure
Resource Usage	Uses CPU, memory, link bandwidth	No extra resources needed
Predictability	Route depends on the current topology	Route to destination is always the same

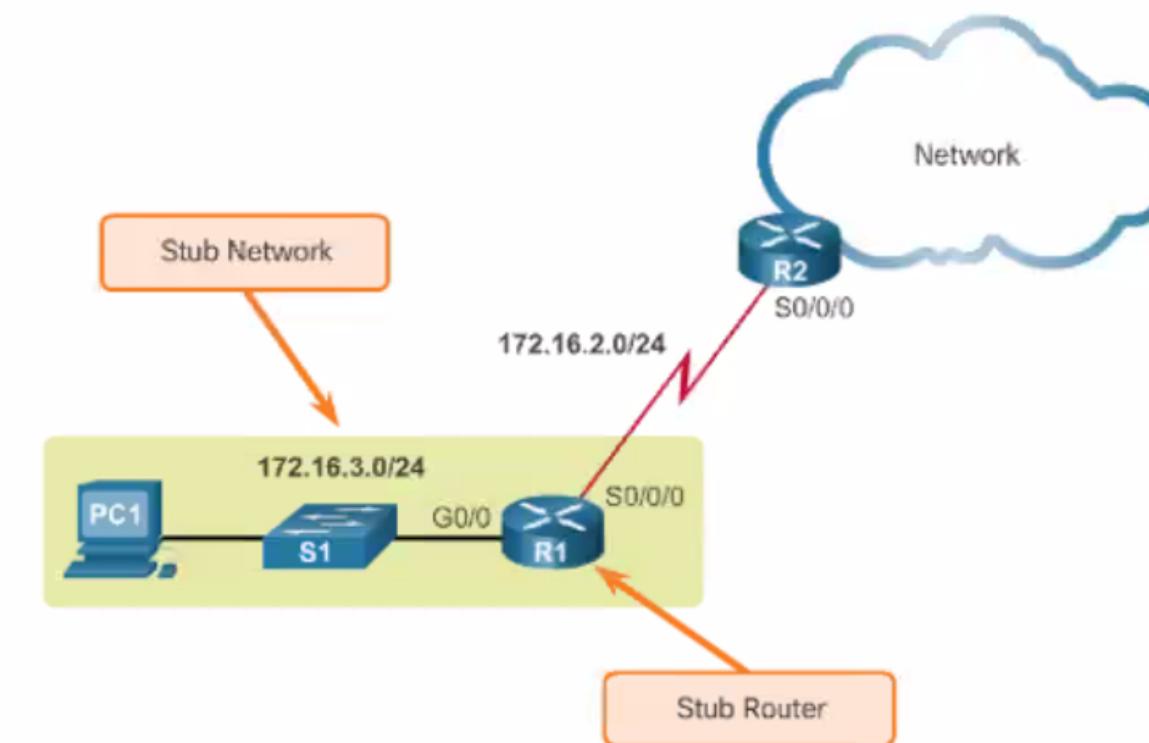


Static Routing

When to Use Static Routes

Static routing has three primary uses:

- Providing ease of routing table maintenance in smaller networks.
- Routing to and from stub networks. A stub network is a network accessed by a single route, and the router has no other neighbors.
- Using a single default route to represent a path to any network that does not have a more specific match with another route in the routing table.





Types of Static Routes

Static Route Applications

Static Routes are often used to:

- Connect to a specific network.
- Provide a Gateway of Last Resort for a stub network.
- Reduce the number of routes advertised by summarizing several contiguous networks as one static route.
- Create a backup route in case a primary route link fails.

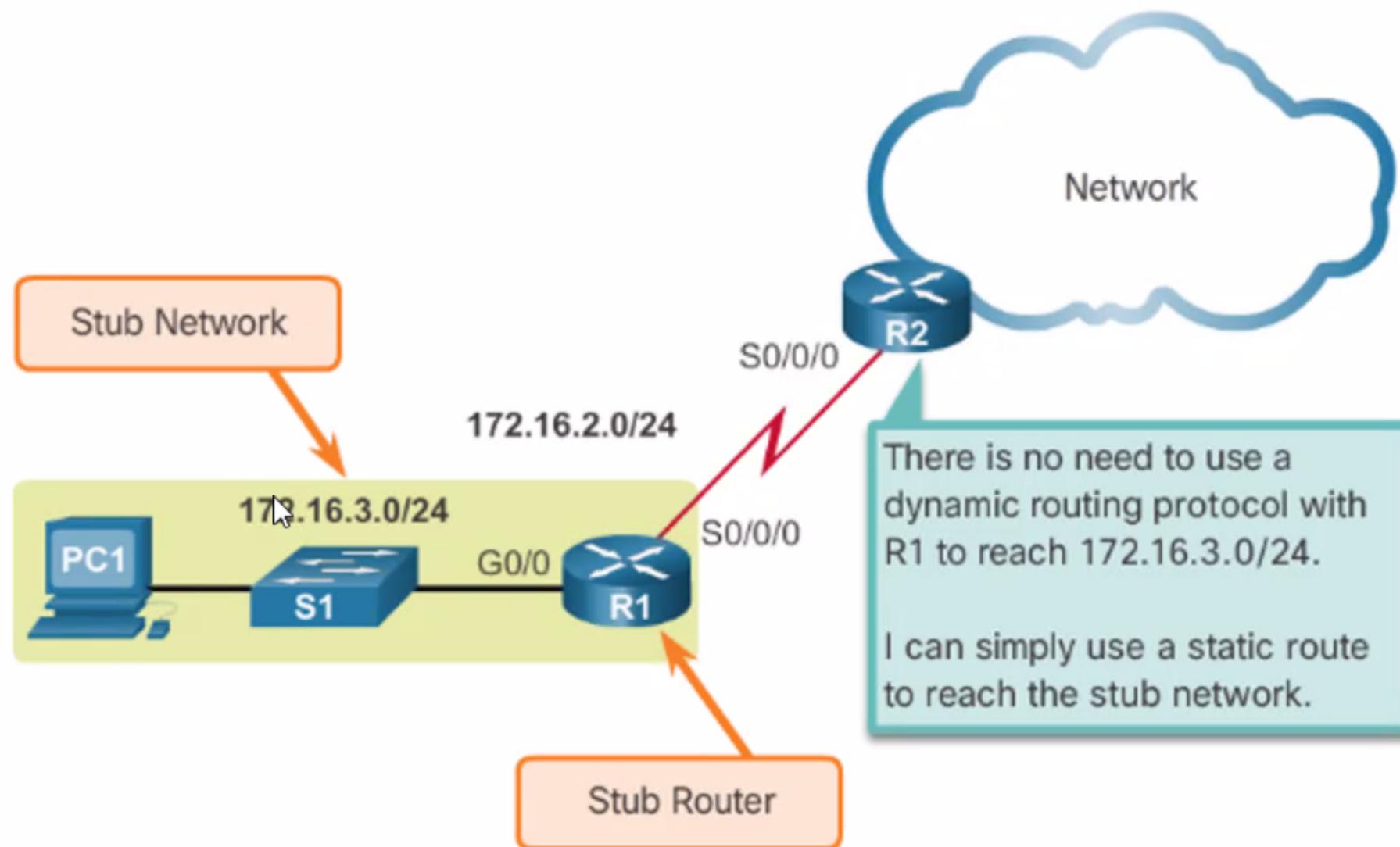




Types of Static Routes

Standard Static Route

Connecting to a Stub Network

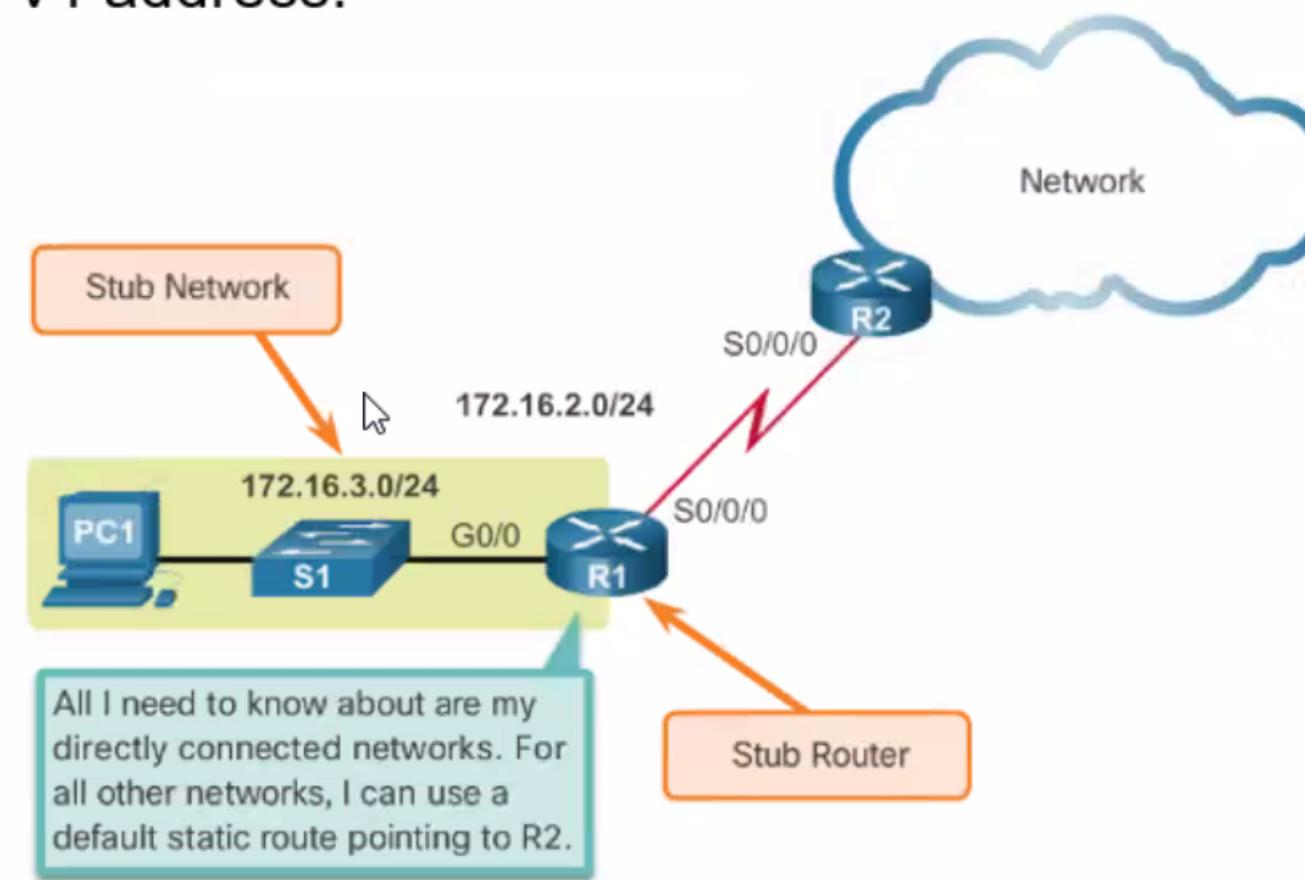




Types of Static Routes

Default Static Route

- A default static route is a route that matches all packets.
- A default route identifies the gateway IP address to which the router sends all IP packets that it does not have a learned or static route.
- A default static route is simply a static route with $0.0.0.0/0$ as the destination IPv4 address.

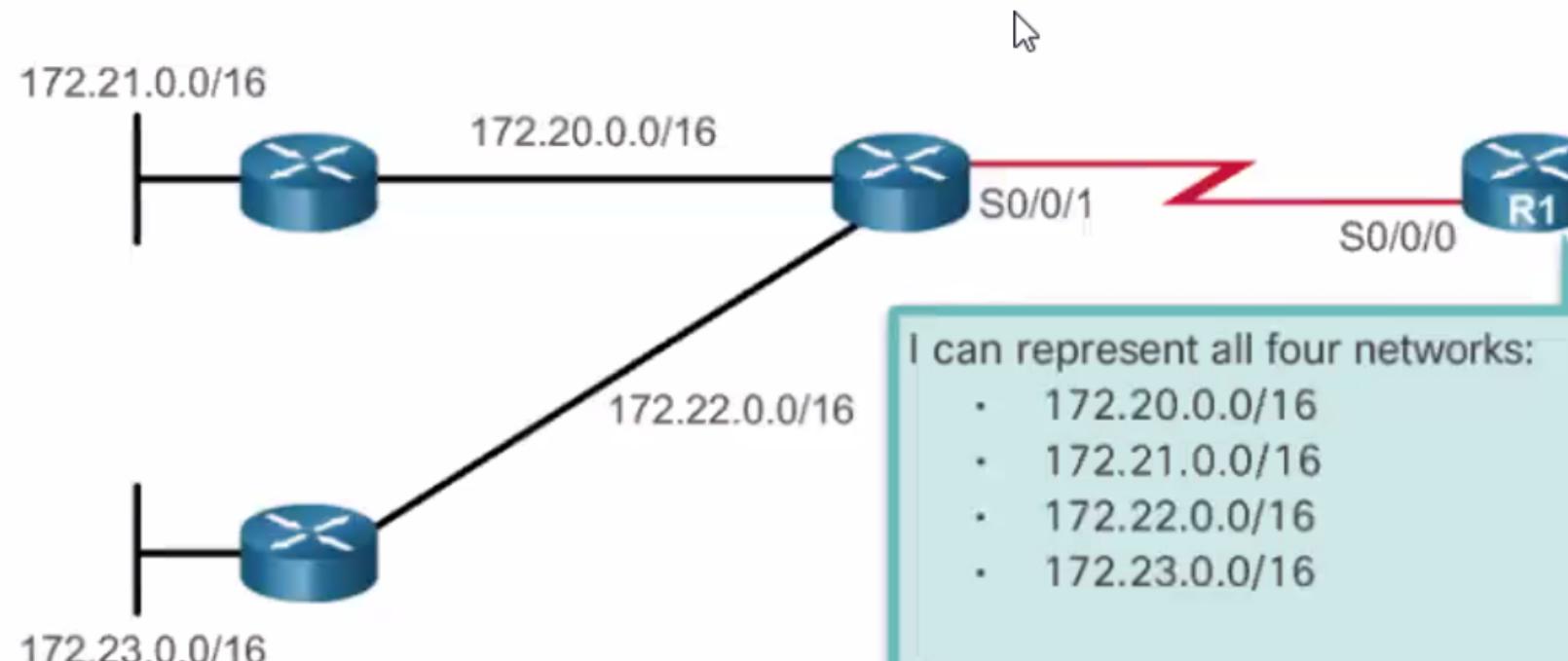




Types of Static Routes

Summary Static Route

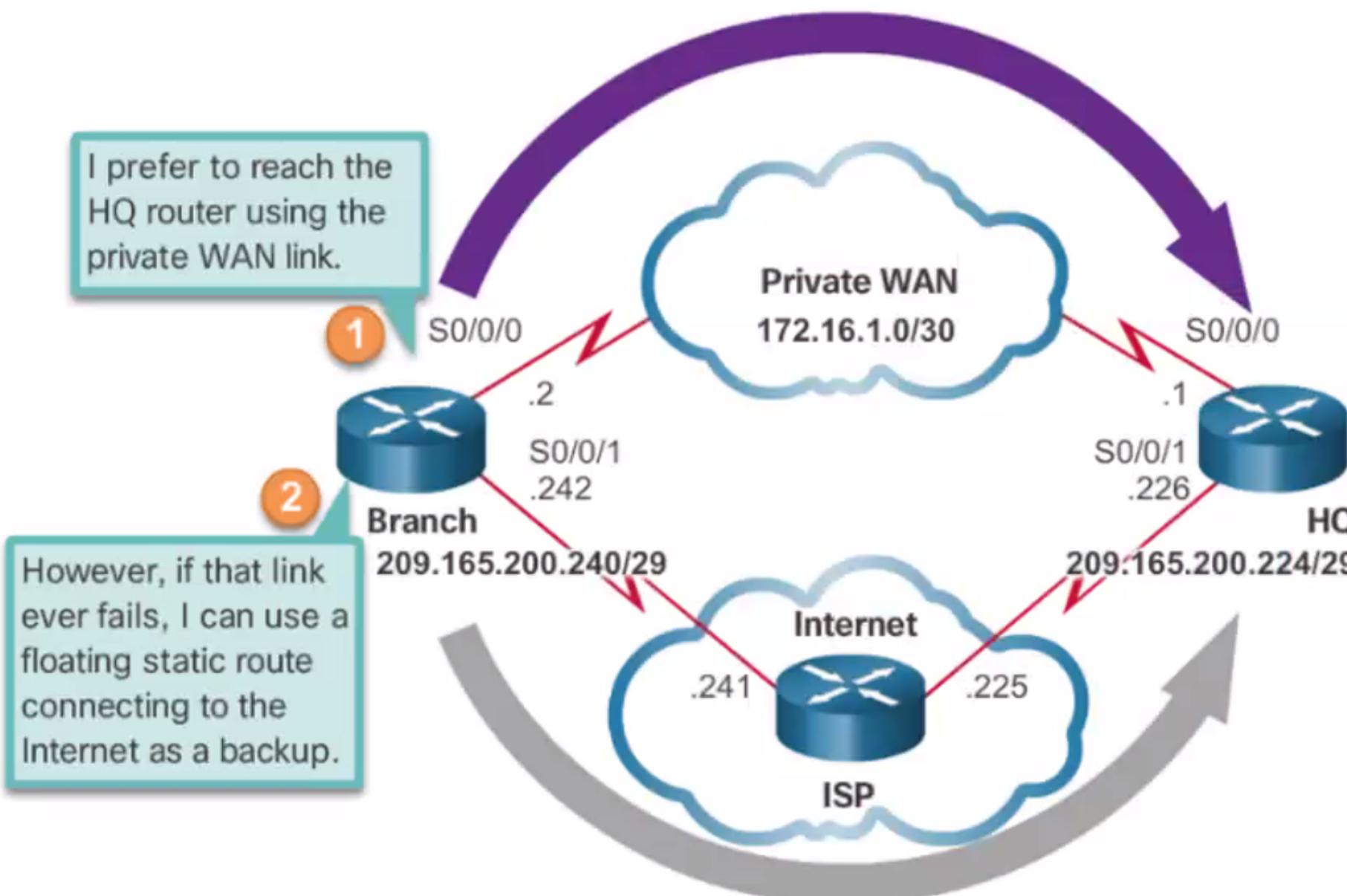
Using One Summary Static Route





Types of Static Routes Floating Static Route

Configuring a Backup Route





Configure IPv4 Static Routes ip route Command

```
Router(config)# ip route network-address subnet-mask  
(ip-address | exit-intf)
```

Parameter	Description
network-address	Destination network address of the remote network to be added to the routing table
subnet-mask	<ul style="list-style-type: none">Subnet mask of the remote network to be added to the routing tableThe subnet mask can be modified to summarize a group of networks
ip-address	<ul style="list-style-type: none">Commonly referred to as the next-hop router's IP addressTypically used when connecting to a broadcast media (i.e., Ethernet)Commonly creates a recursive lookup
exit-intf	<ul style="list-style-type: none">Use the outgoing interface to forward packets to the destination networkAlso referred to as a directly attached static routeTypically used when connecting in a point-to-point configuration
distance	<ul style="list-style-type: none">(Optional) Configures an administrative distanceTypically used to configure a floating static route



Configure IPv4 Static Routes Next-Hop Options

The next hop can be identified by an IP address, exit interface, or both. How the destination is specified creates one of the three following route types:

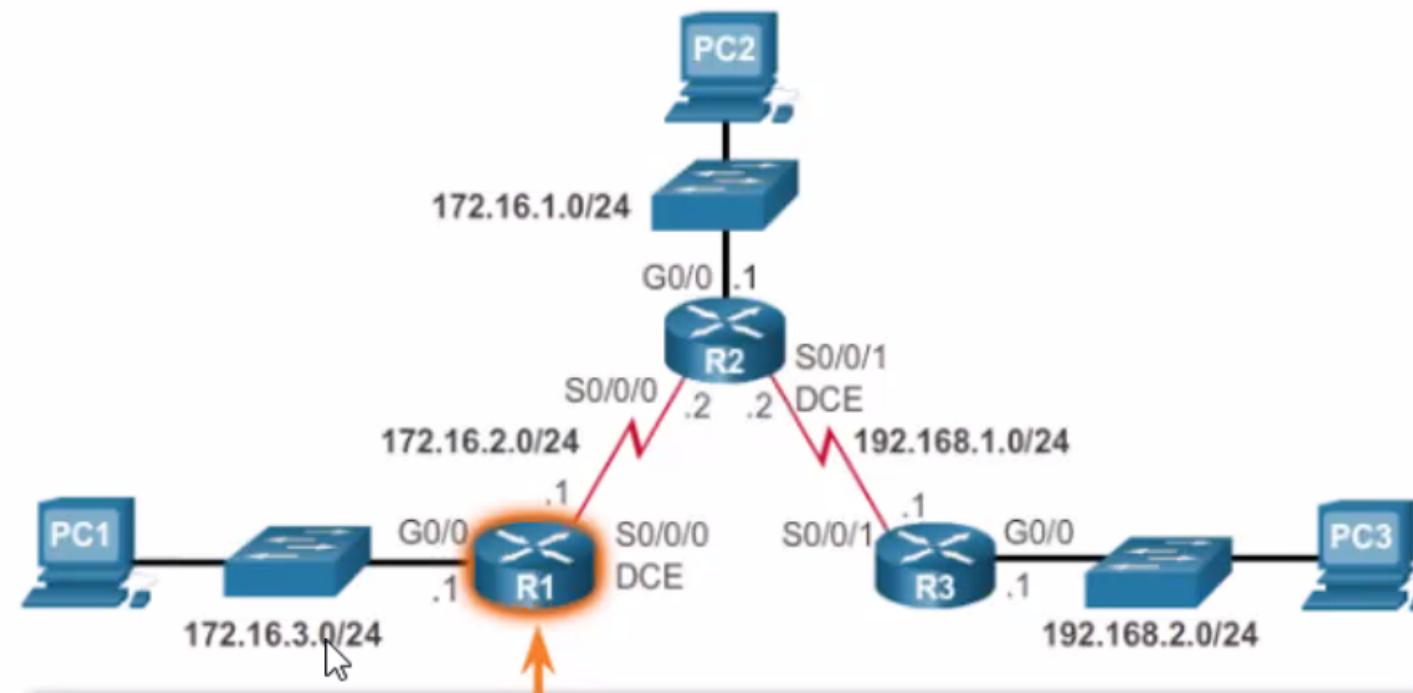
- **Next-hop route** - Only the next-hop IP address is specified.
- **Directly connected static route** - Only the router exit interface is specified.
- **Fully specified static route** - The next-hop IP address and exit interface are specified.



Configure IPv4 Static Routes

Configure a Next-Hop Static Route

Configuring Next-Hop Static Routes on R1



```
R1(config)# ip route 172.16.1.0 255.255.255.0 172.16.2.2
R1(config)# ip route 192.168.1.0 255.255.255.0 172.16.2.2
R1(config)# ip route 192.168.2.0 255.255.255.0 172.16.2.2
R1(config)#

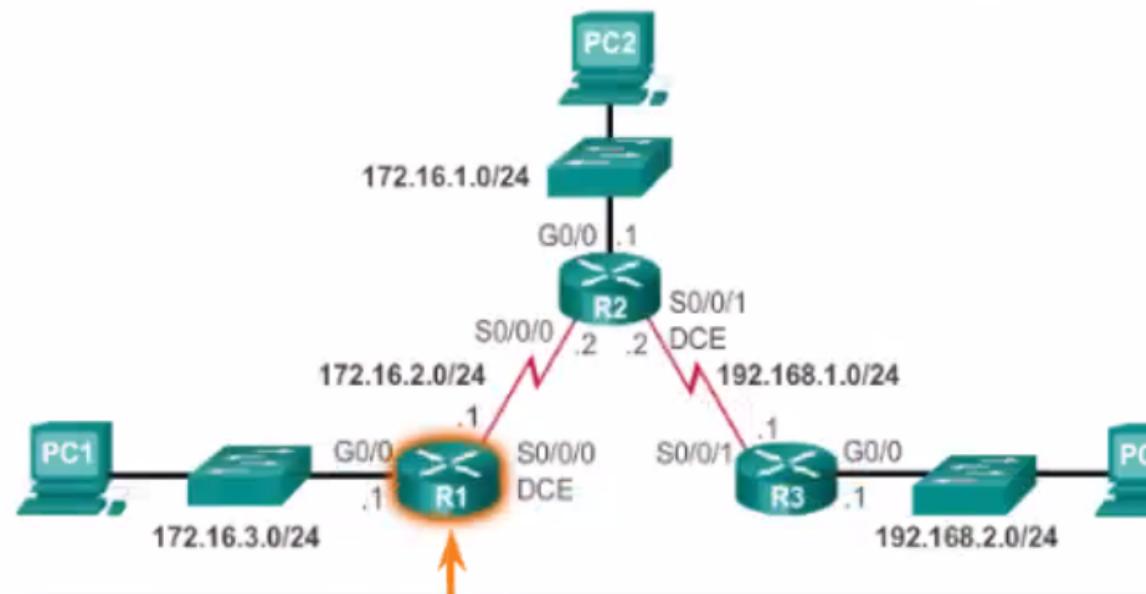
```



Configure IPv4 Static Routes

Configure Directly Connected Static Route

Configure Directly Attached Static Routes on R1



```
R1(config)#ip route 172.16.1.0 255.255.255.0 s0/0/0
R1(config)#ip route 192.168.1.0 255.255.255.0 s0/0/0
R1(config)#ip route 192.168.2.0 255.255.255.0 s0/0/0
R1(config)#End
```

```
S 172.16.1.0/24 is directly connected, Serial0/0/0
C 172.16.2.0/24 is directly connected, Serial0/0/0
L 172.16.2.1/32 is directly connected, Serial0/0/0
C 172.16.3.0/24 is directly connected, GigabitEthernet0/0
L 172.16.3.1/32 is directly connected, GigabitEthernet0/0
S 192.168.1.0/24 is directly connected, Serial0/0/0
S 192.168.2.0/24 is directly connected, Serial0/0/0
R1#End
```



Configure IPv4 Static Routes

Default Static Route

Default Static Route Syntax



```
Router(config)#ip route 0.0.0.0 0.0.0.0 {ip-address | exit-intf}
```

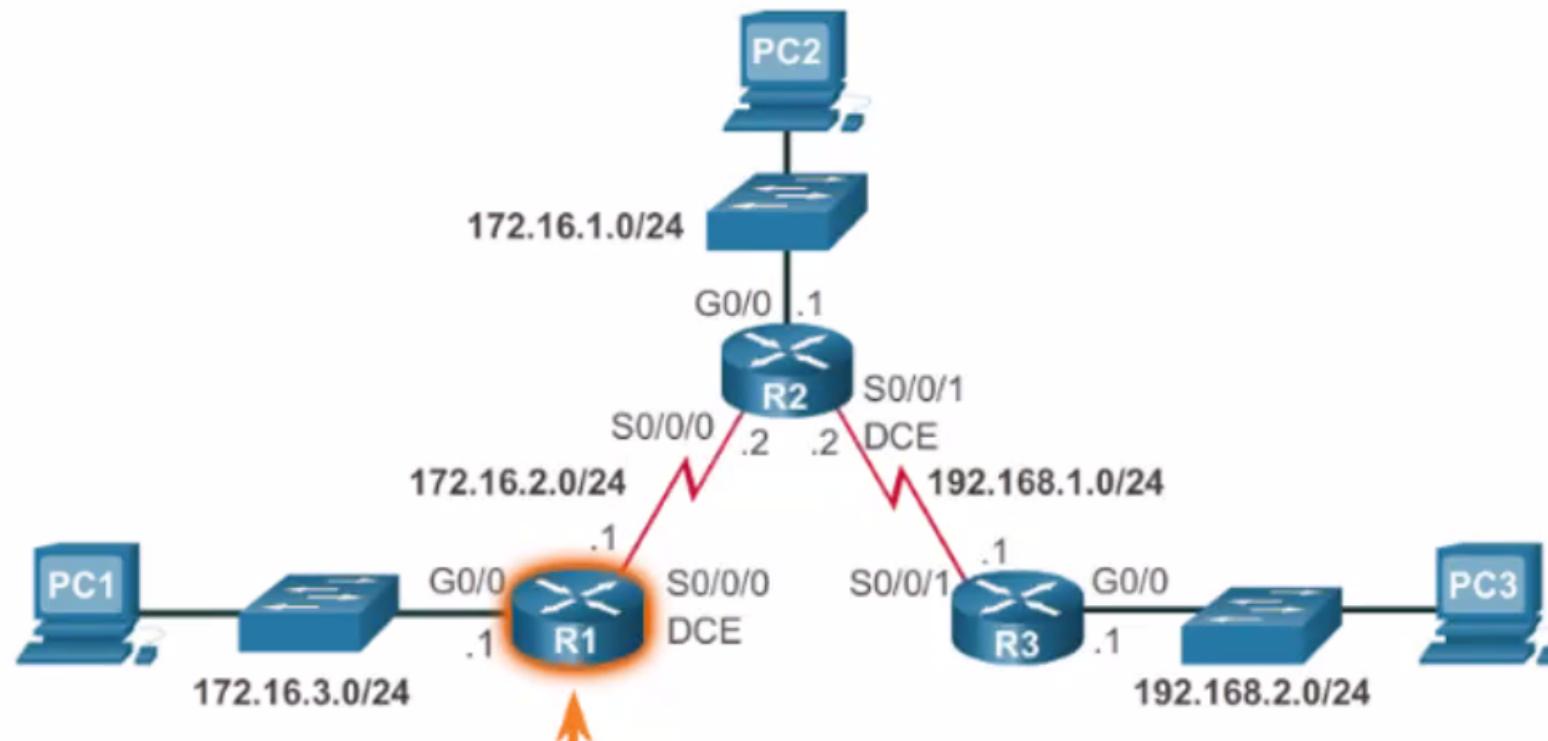
Parameter	Description
0.0.0.0 0.0.0.0	Matches any network address.
ip-address	<ul style="list-style-type: none">Commonly referred to as the next-hop router's IP address.Typically used when connecting to a broadcast media (i.e., Ethernet).Commonly creates a recursive lookup.
exit-intf	<ul style="list-style-type: none">Use the outgoing interface to forward packets to the destination network.Also referred to as a directly attached static route.Typically used when connecting in a point-to-point configuration.



Configure IPv4 Static Routes

Configure a Default Static Route

Configuring a Default Static Route



```
R1(config)# ip route 0.0.0.0 0.0.0.0 172.16.2.2
R1(config)#
```