



## Configuring Static IP Unicast Routing

This chapter describes how to configure IP Version 4 (IPv4) static IP unicast routing on the Catalyst switch. Static routing is supported only on switched virtual interfaces (SVIs) and not on physical interfaces. The switch does not support routing protocols.

Unless otherwise noted, the term *switch* refers to a standalone switch and a switch stack. A switch stack operates and appears as a single switch to the routers in the network.

For complete syntax and usage information for the commands used in this chapter, see the *Cisco IOS IP Command Reference, Volume 1 of 3: Addressing and Services, Release 12.2*

- [Understanding IP Routing, page 35-1](#)
- [Steps for Configuring Routing, page 35-3](#)
- [Enabling IP Unicast Routing, page 35-3](#)
- [Configuring Static Unicast Routes, page 35-5](#)
- [Monitoring and Maintaining the IP Network, page 35-5](#)

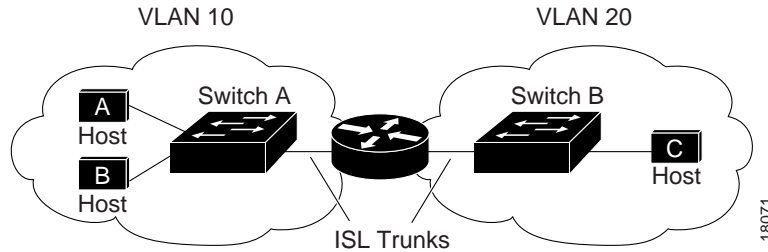
**Note**

When configuring routing parameters on the switch and to allocate system resources to maximize the number of unicast routes allowed, use the **sdm prefer lanbase-routing** global configuration command to set the Switch Database Management (SDM) feature to the routing template. For more information on the SDM templates, see [Chapter 10, “Configuring SDM Templates”](#) or see the **sdm prefer** command in the command reference for this release.

## Understanding IP Routing

In some network environments, VLANs are associated with individual networks or subnetworks. In an IP network, each subnetwork is mapped to an individual VLAN. Configuring VLANs helps control the size of the broadcast domain and keeps local traffic local. However, network devices in different VLANs cannot communicate with one another without a Layer 3 device to route traffic between the VLANs, referred to as inter-VLAN routing. You configure one or more routers to route traffic to the appropriate destination VLAN.

[Figure 35-1](#) shows a basic routing topology. Switch A is in VLAN 10, and Switch B is in VLAN 20. The router has an interface in each VLAN.

**Figure 35-1 Routing Topology Example**

When Host A in VLAN 10 needs to communicate with Host B in VLAN 10, it sends a packet addressed to that host. Switch A forwards the packet directly to Host B, without sending it to the router.

When Host A sends a packet to Host C in VLAN 20, Switch A forwards the packet to the router, which receives the traffic on the VLAN 10 interface. The router uses the routing table to find the correct outgoing interface, and forwards the packet on the VLAN 20 interface to Switch B. Switch B receives the packet and forwards it to Host C.

When static routing is enabled on Switch A and B, the router device is no longer needed to route packets.

## Types of Routing

Routers and Layer 3 switches can route packets in these ways:

- Using default routing to send traffic with a destination unknown to the router to a default outlet or destination
- Using static routes to forward packets from predetermined ports through a single path into and out of a network
- Dynamically calculating routes by using a routing protocol

The switch supports static routes and default routes, It does not support routing protocols.

## IP Routing and Switch Stacks

A switch stack appears to the network as a single switch, regardless of which switch in the stack is connected to a peer. For additional information about switch stack operation, see [Chapter 9, “Managing Switch Stacks.”](#)

Stack master functions:

- The MAC address of the stack master is used as the router MAC address for the whole stack, and all outside devices use this address to send IP packets to the stack.
- All IP packets that require software forwarding or processing go through the CPU of the stack master.

Stack members functions:

- Act as routing standby switches, taking over if elected as the new stack master when the stack master fails.
- Program the routes into hardware.

If a stack master fails, the stack detects that the stack master is down and elects a stack member to be the new stack master. Except for a momentary interruption, the hardware continues to forward packets.

New stack master functions after election:

- Builds routing table and distributes it to stack members.
- Uses its MAC address as the router MAC address. To notify its network peers of the new MAC address, it periodically (every few seconds for 5 minutes) sends a gratuitous ARP reply with the new router MAC address.



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**Note** If you configure the persistent MAC address feature on the stack and the stack master changes, the stack MAC address does not change during the configured time period. If the previous stack master rejoins the stack as a member switch during that time period, the stack MAC address remains the MAC address of the previous stack master. See the [“Enabling Persistent MAC Address”](#) section on page 9-18.

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## Steps for Configuring Routing

By default, IP routing is disabled on the switch. For detailed IP routing configuration information, see the *Cisco IOS IP Configuration Guide, Release 12.2* from the Cisco.com page under **Documentation > Cisco IOS Software Releases > 12.2 Mainline > Configuration Guides**.

In these procedures, the specified interface must be a switch virtual interface (SVI)—a VLAN interface created by using the **interface vlan** *vlan\_id* global configuration command and by default a Layer 3 interface. All Layer 3 interfaces on which routing will occur must have IP addresses assigned to them. See the [“Assigning IP Addresses to SVIs”](#) section on page 35-4.



**Note**

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The switch supports 16 static routes (including user-configured routes and the default route) and any directly connected routes and default routes for the management interface. The switch can have an IP address assigned to each SVI. Before enabling routing, enter the **sdm prefer lanbase-routing** global configuration command and reload the switch.

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Procedures for configuring routing:

- To support VLAN interfaces, create and configure VLANs on the switch or switch stack, and assign VLAN membership to Layer 2 interfaces. For more information, see [Chapter 14, “Configuring VLANs.”](#)
- Configure Layer 3 interfaces (SVIs).
- Enable IP routing on the switch.
- Assign IP addresses to the Layer 3 interfaces.
- Configure static routes

## Enabling IP Unicast Routing

By default, the switch is in Layer 2 switching mode, and IP routing is disabled. To use the Layer 3 capabilities of the switch, enable IP routing.

Beginning in privileged EXEC mode, follow these steps to enable IP routing:

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>ip routing</b>	Enable IP routing.
Step 3	<b>end</b>	Return to privileged EXEC mode.
Step 4	<b>show running-config</b>	Verify your entries.
Step 5	<b>copy running-config startup-config</b>	(Optional) Save your entries in the configuration file.

Use the **no ip routing** global configuration command to disable routing.

This example shows how to enable IP routing on a switch:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# ip routing
Switch(config)# end
```

## Assigning IP Addresses to SVIs

To configure IP routing, you need to assign IP addresses to Layer 3 network interfaces. This enables communication with the hosts on those interfaces that use IP. IP routing is disabled by default, and no IP addresses are assigned to SVIs.

An IP address identifies a destination for IP packets. Some IP addresses are reserved for special uses and cannot be used for host, subnet, or network addresses. RFC 1166, "Internet Numbers," contains the official description of these IP addresses.

An interface can have one primary IP address. A subnet mask identifies the bits that denote the network number in an IP address.

Beginning in privileged EXEC mode, follow these steps to assign an IP address and a network mask to an SVI

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>interface vlan <i>vlan_id</i></b>	Enter interface configuration mode, and specify the Layer 3 VLAN to configure.
Step 3	<b>ip address <i>ip-address subnet-mask</i></b>	Configure the IP address and IP subnet mask.
Step 4	<b>end</b>	Return to privileged EXEC mode.
Step 5	<b>show interfaces</b> [ <i>interface-id</i> ] <b>show ip interface</b> [ <i>interface-id</i> ] <b>show running-config interface</b> [ <i>interface-id</i> ]	Verify your entries.
Step 6	<b>copy running-config startup-config</b>	(Optional) Save your entries in the configuration file.

## Configuring Static Unicast Routes

Static unicast routes are user-defined routes that cause packets moving between a source and a destination to take a specified path. Static routes can be important if the router cannot build a route to a particular destination and are useful for specifying a gateway of last resort to which all unroutable packets are sent.

Beginning in privileged EXEC mode, follow these steps to configure a static route:

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>ip route</b> <i>prefix mask {address   interface} [distance]</i>	Establish a static route.
Step 3	<b>end</b>	Return to privileged EXEC mode.
Step 4	<b>show ip route</b>	Display the current state of the routing table to verify the configuration.
Step 5	<b>copy running-config startup-config</b>	(Optional) Save your entries in the configuration file.

Use the **no ip route** *prefix mask {address | interface}* global configuration command to remove a static route. The switch retains static routes until you remove them.

When an interface goes down, all static routes through that interface are removed from the IP routing table. When the software can no longer find a valid next hop for the address specified as the forwarding router's address in a static route, the static route is also removed from the IP routing table.

## Monitoring and Maintaining the IP Network

You can specific statistics for the routing table or database. Use the privileged EXEC commands in [Table 35-1](#) to display status:

**Table 35-1** Commands to Clear IP Routes or Display Route Status

Command	Purpose
<b>show ip route</b> [ <i>address [mask] [longer-prefixes]</i> ]	Display the state of the routing table.
<b>show ip route summary</b>	Display the state of the routing table in summary form.
<b>show platform ip unicast</b>	Display platform-dependent IP unicast information.

