



# Configuring the Switch IP Address and Default Gateway

This chapter describes how to configure the IP address, subnet mask, and default gateway on the Catalyst enterprise LAN switches.



## Note

For complete syntax and usage information for the commands used in this chapter, refer to the *Catalyst 5000 Family Command Reference*.

This chapter consists of these sections:

- [Understanding the Switch Management Interfaces, page 3-1](#)
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- [Preparing to Configure the IP Address and Default Gateway, page 3-4](#)
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- [Renewing and Releasing a DHCP-Assigned IP Address, page 3-9](#)

## Understanding the Switch Management Interfaces

The Catalyst 5000 family switches have two configurable IP management interfaces: the in-band (sc0) interface and the Serial Line Interface Protocol (SLIP) (sl0) interface.

The in-band (sc0) management interface is connected to the switching fabric and participates in all of the functions of a normal switch port, such as spanning tree, Cisco Discovery Protocol (CDP), and VLAN membership. The out-of-band management interfaces sl0) is not connected to the switching fabric and does not participate in any of these functions.

When you configure the IP address, subnet mask, and broadcast address of the sc0 interface (and on the sc0 interface VLAN membership), you can access the switch through Telnet or SNMP. When you configure the SLIP (sl0) interface, you can open a point-to-point connection to the switch through the console port from a workstation.

All IP traffic generated by the switch (for example, a Telnet session opened from the switch to a host) is forwarded according to the entries in the switch IP routing table. For intersubnetwork communication to occur, you must configure at least one default gateway for the sc0 interface. The switch IP routing table is used to forward traffic originating on the switch only, not for forwarding traffic sent by devices connected to the switch.

## Understanding Automatic IP Configuration

These sections describe how the switch can automatically obtain its IP configuration:

- [Automatic IP Configuration Overview, page 3-2](#)
- [Understanding How DHCP Works, page 3-2](#)
- [Understanding How RARP Works, page 3-4](#)

### Automatic IP Configuration Overview

The switch can automatically obtain its IP configuration by using one of the following protocols:

- Dynamic Host Configuration Protocol (DHCP)
- Reverse Address Resolution Protocol (RARP)

The switch makes DHCP and RARP requests only if the sc0 interface IP address is set to 0.0.0.0 when the switch boots up. This address is the default for a new switch or a switch whose configuration file has been cleared using the **clear config all** command. DHCP and RARP requests are only broadcast out the sc0 interface.



#### Note

If the CONFIG\_FILE environment variable is set, all configuration files are processed before the switch determines whether to broadcast DHCP and RARP requests. For more information about the CONFIG\_FILE environment variable, see [Chapter 31, “Modifying the Switch Boot Configuration.”](#)

### Understanding How DHCP Works

In software release 5.2 and later, the switch can obtain an IP address and other IP configuration information using DHCP.

There are three methods for obtaining an IP address from the DHCP server:

- Manual allocation—The network administrator maps the switch MAC address to an IP address at the DHCP server.
- Automatic allocation—The switch obtains an IP address when it first contacts the DHCP server. The address is permanently assigned to the switch.
- Dynamic allocation—The switch obtains a “leased” IP address for a specified period of time. The IP address is revoked at the end of this period, and the switch releases the address. The switch must request another IP address.

In addition to the sc0 interface IP address, the switch can obtain the subnet mask, broadcast address, default gateway address, as well as other information. DHCP-learned values are not used if user-configured values are present.

The switch broadcasts a DHCPDISCOVER message one to ten seconds after all of the switch ports are online. The switch always requests an infinite lease time in the DHCPDISCOVER message.

If a DHCP or BOOTP server responds to the request, the switch takes appropriate action. If a DHCPOFFER message is received from a DHCP server, the switch processes all supported options contained in the message. [Table 3-1](#) shows the supported DHCP options. Other options specified in the DHCPOFFER message are ignored.

**Table 3-1 Supported DHCP Options**

Code	Option
1	Subnet mask
2	Time offset
3	Router
6	Domain name server
12	Host name
15	Domain name
28	Broadcast address
33	Static route
42	NTP servers
51	IP address lease time
52	Option overload
61	Client-identifier
66	TFTP server name

If a BOOTP response is received from a BOOTP server, the switch sets the in-band (sc0) interface IP address to the address specified in the BOOTP response.

If no DHCPOFFER message or BOOTP response is received in reply, the switch rebroadcasts the request using an exponential backoff algorithm (the amount of time between requests increases exponentially). If no response is received after ten minutes, the sc0 interface IP address remains set to 0.0.0.0 (if the RARP requests fail as well).

If you reset or power cycle a switch with a DHCP- or BOOTP-obtained IP address, the information learned from DHCP or BOOTP is retained. At boot up, the switch attempts to renew the lease on the IP address. If no reply is received, the switch retains the current IP address.

## Understanding How RARP Works

With RARP, you map the switch MAC address to an IP address on the RARP server. The switch automatically retrieves its IP address from the server when it boots up.

The switch broadcasts 10 RARP requests after all of the switch ports are online. If a response is received, the switch sets the in-band (sc0) interface IP address to the address specified in the RARP response.

If no response is received, the sc0 interface IP address remains set to 0.0.0.0 (if the DHCP requests fail as well).

If you reset or power cycle a switch with a RARP-obtained IP address, the information learned from RARP is retained.

## Preparing to Configure the IP Address and Default Gateway

Before you can configure the switch IP address and default gateway, you need to obtain the following information, as appropriate:

- IP address for the switch (sc0 interfaces only)
- Subnet mask/number of subnet bits (sc0 interfaces only)
- (Optional) Broadcast address (sc0 interfaces only)
- VLAN membership (sc0 interface only)
- SLIP and SLIP destination addresses (sl0 interface only)
- Interface connection type
  - In-band (sc0) interface: Configure this interface when assigning an IP address, subnet mask, and VLAN to the in-band management interface on the switch.
  - SLIP (sl0) interface: Configure this interface when setting up a point-to-point SLIP connection between a terminal and the switch.

## Default IP Address and Default Gateway Configuration

Table 3-2 shows the default IP address and default gateway configuration.

**Table 3-2** Default Switch IP Address and Gateway Configuration

Feature	Default Value
In-band (sc0) interface	IP address, subnet mask, and broadcast address set to 0.0.0.0 Assigned to VLAN 1
Default gateway address	Set to 0.0.0.0 with a metric of 0
SLIP <sup>1</sup> (sl0) interface	IP address and SLIP destination address set to 0.0.0.0 SLIP for the console port is not active (set to <b>detach</b> )

1. SLIP=Serial Line Internet Protocol

## Setting the In-Band (sc0) Interface IP Address

Before you can use Telnet to connect to the switch or use Simple Network Management Protocol (SNMP) to manage the switch, you must assign an IP address to either the in-band (sc0) logical interface.

You can specify the subnet mask (*netmask*) using the number of subnet bits or using the subnet mask in dotted decimal format.

To set the IP address and VLAN membership of the in-band (sc0) management interface, perform this task in privileged mode:

	Task	Command
Step 1	Assign an IP address, subnet mask (or number of subnet bits), and (optional) broadcast address to the in-band (sc0) interface.	<b>set interface sc0</b> [ <i>ip_addr</i> ][ <i>netmask</i> ] [ <i>broadcast</i> ]
Step 2	Assign the in-band interface to the proper VLAN (make sure the VLAN is associated with the network to which the IP address belongs).	<b>set interface sc0</b> [ <i>vlan</i> ]
Step 3	If necessary, bring the interface up.	<b>set interface sc0 up</b>
Step 4	Verify the interface configuration.	<b>show interface</b>

This example shows how to assign an IP address, specify the number of subnet bits, and specify the VLAN assignment for the in-band (sc0) interface:

```
Console> (enable) set interface sc0 172.20.52.124/29
Interface sc0 IP address and netmask set.
Console> (enable) set interface sc0 5
Interface sc0 vlan set.
Console> (enable)
```

This example shows how to specify the VLAN assignment, assign an IP address, specify the subnet mask in dotted decimal format, and verify the configuration:

```
Console> (enable) set interface sc0 5 172.20.52.124/255.255.255.248
Interface sc0 vlan set, IP address and netmask set.
Console> (enable) show interface
sl0: flags=51<UP, POINTOPOINT, RUNNING>
      slip 0.0.0.0 dest 0.0.0.0
sc0: flags=63<UP, BROADCAST, RUNNING>
      vlan 5 inet 172.20.52.124 netmask 255.255.255.248 broadcast 172.20.52.17
Console> (enable)
```

## Configuring Default Gateways

The supervisor engine sends IP packets destined for other IP subnets to the default gateway (typically a router interface in the same network or subnet as the switch IP address). The switch does not use the IP routing table to forward traffic from connected devices; the switch only forwards IP traffic generated by the switch itself (for example, Telnet, TFTP, and ping).



### Note

In some cases, you might want to configure static IP routes in addition to default gateways. For information on configuring static routes, see the [“Configuring Static Routes”](#) section on page 29-8.

You can define up to three default IP gateways. Use the **primary** keyword to make a gateway the primary gateway. If you do not specify a primary default gateway, the first gateway configured is the primary gateway. If more than one gateway is designated as primary, the last primary gateway configured is the primary default gateway.

The switch sends all off-network IP traffic to the primary default gateway. If connectivity to the primary gateway is lost, the switch attempts to use the backup gateways in the order they were configured. The switch sends periodic ping messages to determine whether each default gateway is up or down. If connectivity to the primary gateway is restored, the switch resumes sending traffic to the primary.

To specify one or more default gateways, perform this task in privileged mode:

	<b>Task</b>	<b>Command</b>
<b>Step 1</b>	Configure a default IP gateway address for the switch.	<b>set ip route default</b> <i>gateway</i> [ <i>metric</i> ] [ <b>primary</b> ]
<b>Step 2</b>	(Optional) Configure additional default gateways for the switch.	<b>set ip route default</b> <i>gateway</i> [ <i>metric</i> ] [ <b>primary</b> ]
<b>Step 3</b>	Verify that the default gateways appear correctly in the IP routing table.	<b>show ip route</b>

To remove default gateway entries, perform one of these tasks in privileged mode:

	<b>Task</b>	<b>Command</b>
	Clear an individual default gateway entry.	<b>clear ip route default</b> <i>gateway</i>
	Clear all default gateways and static routes.	<b>clear ip route all</b>

This example shows how to configure three default gateways on the switch and how to verify the default gateway configuration:

```

Console> (enable) set ip route default 10.1.1.10
Route added.
Console> (enable) set ip route default 10.1.1.20
Route added.
Console> (enable) set ip route default 10.1.1.1 primary
Route added.
Console> (enable)
Console> (enable) show ip route
Fragmentation   Redirect   Unreachable
-----
enabled         enabled   enabled

```

```

The primary gateway: 10.1.1.1
Destination      Gateway          RouteMask      Flags   Use      Interface
-----
default          10.1.1.1        0x0            UG      6        sc0
default          10.1.1.20       0x0            G       0        sc0
default          10.1.1.10       0x0            G       0        sc0
10.0.0.0         10.1.1.100     0xff000000    U       75       sc0
default          default         0xff000000    UH      0        s10
Console> (enable)

```

## Configuring the SLIP (s10) Interface on the Console Port

Use the SLIP (s10) interface for point-to-point SLIP connections between the switch and an IP host.



### Caution

You *must* use the console port for the SLIP connection. When the SLIP connection is enabled and SLIP is attached on the console port, an EIA/TIA-232 terminal cannot connect through the console port. If you are connected to the switch CLI through the console port and you enter the **slip attach** command, you will lose the console port connection. To reconnect the port, use Telnet to access the switch, enter privileged mode, and then enter the **slip detach** command to restore the console port connection.

To enable and attach SLIP on the console port, perform this task:

	Task	Command
Step 1	Access the switch from a remote host with Telnet.	<b>telnet</b> {host_name   ip_addr}
Step 2	Enter privileged mode on the switch.	<b>enable</b>
Step 3	Set the console port SLIP address and the destination address of the attached host.	<b>set interface s10</b> slip_addr dest_addr
Step 4	Verify the SLIP interface configuration.	<b>show interface</b>
Step 5	Enable SLIP for the console port.	<b>slip attach</b>

To disable SLIP on the console port, perform this task:

	Task	Command
Step 1	Access the switch from a remote host with Telnet.	<b>telnet</b> {host_name   ip_addr}
Step 2	Enter privileged mode on the switch.	<b>enable</b>
Step 3	Disable SLIP for the console port.	<b>slip detach</b>

This example shows how to configure SLIP on the console port and verify the configuration:

```

sparc20% telnet 172.20.52.38
Trying 172.20.52.38 ...
Connected to 172.20.52.38.
Escape character is '^]'.

Cisco Systems, Inc. Console

Enter password:

```

```

Console> enable

Enter password:
Console> (enable) set interface s10 10.1.1.1 10.1.1.2
Interface s10 slip and destination address set.
Console> (enable) show interface
s10: flags=51<UP,POINTOPOINT,RUNNING>
      slip 10.1.1.1 dest 10.1.1.2
sc0: flags=63<UP,BROADCAST,RUNNING>
      vlan 522 inet 172.20.52.38 netmask 255.255.255.240 broadcast 172.20.52.7
Console> (enable) slip attach
Console Port now running SLIP.

Console> (enable) slip detach
SLIP detached on Console port.
Console> (enable)

```

## Using DHCP or RARP to Obtain an IP Address Configuration



### Note

For complete information on how the switch uses DHCP or RARP to obtain its IP configuration, see the [“Understanding Automatic IP Configuration”](#) section on page 3-2.

To use DHCP or RARP to obtain an IP address for the switch, perform this task:

	Task	Command
Step 1	Make sure there is a DHCP, BOOTP, or RARP server on the network.	—
Step 2	Obtain the last address in the MAC address range for module 1 (the supervisor engine). This address is displayed under the MAC-Address(es) heading. (With DHCP, this step is necessary only if using the manual allocation method.)	<b>show module</b>
Step 3	Add an entry for each switch in the DHCP, BOOTP, or RARP server configuration, mapping the MAC address of the switch to the IP configuration information for the switch. (With DHCP, this step is necessary only if using the manual or automatic allocation methods.)	—
Step 4	Set the sc0 interface IP address to 0.0.0.0.	<b>set interface sc0 0.0.0.0</b>
Step 5	Reset the switch. The switch broadcasts DHCP and RARP requests only when the switch boots up.	<b>reset system</b>
Step 6	When the switch reboots, confirm that the sc0 interface IP address, subnet mask, and broadcast address are set correctly.	<b>show interface</b>
Step 7	For DHCP, confirm that other options (such as default gateway address) are set correctly.	<b>show ip route</b>

This example shows the switch broadcasting a DHCP request, receiving a DHCP offer, and configuring the IP address and other IP parameters according to the contents of the DHCP offer:

```

Console> (enable) Sending RARP request with address 00:90:0c:5a:8f:ff
Sending DHCP packet with address: 00:90:0c:5a:8f:ff
dhcpoffer
Sending DHCP packet with address: 00:90:0c:5a:8f:ff
Timezone set to '', offset from UTC is 7 hours 58 minutes
Timezone set to '', offset from UTC is 7 hours 58 minutes
172.16.30.32 added to DNS server table as primary server.
172.16.31.32 added to DNS server table as backup server.
172.16.32.32 added to DNS server table as backup server.
NTP server 172.16.25.253 added
NTP server 172.16.25.252 added
%MGMT-5-DHCP_S:Assigned IP address 172.20.25.244 from DHCP Server 172.20.25.254
Console> (enable) show interface
s10: flags=51<UP,POINTOPOINT,RUNNING>
    slip 0.0.0.0 dest 0.0.0.0
sc0: flags=63<UP,BROADCAST,RUNNING>
    vlan 1 inet 172.20.25.244 netmask 255.255.255.0 broadcast 172.20.25.255
dhcp server: 172.20.25.254
Console>

```

## Renewing and Releasing a DHCP-Assigned IP Address

If you are using DHCP for IP address assignment, you can perform either of these tasks:

- Renew—Renew the lease on a DHCP-assigned IP address
- Release—Release the lease on a DHCP-assigned IP address

To renew or release a DHCP-assigned IP address on the in-band (sc0) management interface, perform one of these tasks in privileged mode:

Task	Command
Renew the lease on a DHCP-assigned IP address.	<b>set interface sc0 dhcp renew</b>
Release the lease on a DHCP-assigned IP address.	<b>set interface sc0 dhcp release</b>

This example shows how to renew the lease on a DHCP-assigned IP address:

```

Console> (enable) set interface sc0 dhcp renew
Renewing IP address...
Console> (enable) Sending DHCP packet with address: 00:90:0c:5a:8f:ff
<...output truncated...>

```

This example shows how to release the lease on a DHCP-assigned IP address:

```

Console> (enable) set interface sc0 dhcp release
Releasing IP address...
Console> (enable) Sending DHCP packet with address: 00:90:0c:5a:8f:ff
Done
Console> (enable)

```

■ Renewing and Releasing a DHCP-Assigned IP Address