# Performing Device Setup Configuration


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# Information About Performing Device Setup Configuration

Review the sections in this module before performing your initial device configuration tasks that include IP address assignments and DHCP autoconfiguration.

## Boot Process

To start your device, you need to follow the procedures in the getting started guide or the hardware installation guide for installing and powering on the device and setting up the initial device configuration (IP address, subnet mask, default gateway, secret and Telnet passwords, and so forth).

The boot loader software performs the normal boot process and includes these activities:

- Locates the bootable (base) package in the bundle or installed package set.
- Performs low-level CPU initialization. It initializes the CPU registers, which control where physical memory is mapped, its quantity, its speed, and so forth.
- Performs power-on self-test (POST) for the CPU subsystem and tests the system DRAM.
- Initializes the file systems on the system board.
- Loads a default operating system software image into memory and boots up the device.

The boot loader provides access to the flash file systems before the operating system is loaded. Normally, the boot loader is used only to load, decompress, and start the operating system. After the boot loader gives the operating system control of the CPU, the boot loader is not active until the next system reset or power-on.

The boot loader also provides trap-door access into the system if the operating system has problems serious enough that it cannot be used. The trap-door operation provides enough access to the system so that if it is necessary, you can format the flash file system, reinstall the operating system software image by using the Xmodem Protocol, recover from a lost or forgotten password, and finally restart the operating system.

Before you can assign device information, make sure that you have connected a PC or terminal to the console port or a PC to the Ethernet management port, and make sure you have configured the PC or terminal-emulation software baud rate and character format to match that of the device console port settings:

- Baud rate default is 9600.
- Data bits default is 8.

**Note** If the data bits option is set to 8, set the parity option to none.

- Stop bits default is 2 (minor).
- Parity settings default is none.

# Devices Information Assignment

You can assign IP information through the device setup program, through a DHCP server, or manually.

Use the device setup program if you want to be prompted for specific IP information. With this program, you can also configure a hostname and an enable secret password.

It gives you the option of assigning a Telnet password (to provide security during remote management) and configuring your switch as a command or member switch of a cluster or as a standalone switch.

Use a DHCP server for centralized control and automatic assignment of IP information after the server is configured.

**Note** If you are using DHCP, do not respond to any of the questions in the setup program until the device receives the dynamically assigned IP address and reads the configuration file.

If you are an experienced user familiar with the device configuration steps, manually configure the device. Otherwise, use the setup program described in the *Boot Process* section.

# Default Switch Information

***Table 1: Default Switch Information***

| Feature | Default Setting |
|---|---|
| IP address and subnet mask | No IP address or subnet mask are defined. |
| Default gateway | No default gateway is defined. |
| Enable secret password | No password is defined. |
| Hostname | The factory-assigned default hostname is Device. |
| Telnet password | No password is defined. |

| Feature | Default Setting |
|---|---|
| Cluster command switch functionality | Disabled. |
| Cluster name | No cluster name is defined. |

# DHCP-Based Autoconfiguration Overview

DHCP provides configuration information to Internet hosts and internetworking devices. This protocol consists of two components: one for delivering configuration parameters from a DHCP server to a device and an operation for allocating network addresses to devices. DHCP is built on a client-server model, in which designated DHCP servers allocate network addresses and deliver configuration parameters to dynamically configured devices. The device can act as both a DHCP client and a DHCP server.

During DHCP-based autoconfiguration, your device (DHCP client) is automatically configured at startup with IP address information and a configuration file.

With DHCP-based autoconfiguration, no DHCP client-side configuration is needed on your device. However, you need to configure the DHCP server for various lease options associated with IP addresses.

If you want to use DHCP to relay the configuration file location on the network, you might also need to configure a Trivial File Transfer Protocol (TFTP) server and a Domain Name System (DNS) server.

The DHCP server for your device can be on the same LAN or on a different LAN than the device. If the DHCP server is running on a different LAN, you should configure a DHCP relay device between your device and the DHCP server. A relay device forwards broadcast traffic between two directly connected LANs. A router does not forward broadcast packets, but it forwards packets based on the destination IP address in the received packet.

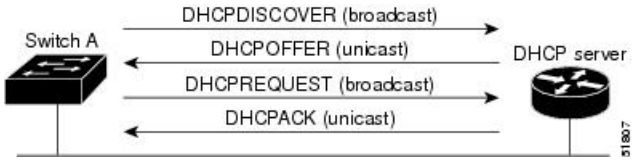
DHCP-based autoconfiguration replaces the BOOTP client functionality on your device.

## DHCP Client Request Process

When you boot up your device, the DHCP client is invoked and requests configuration information from a DHCP server when the configuration file is not present on the device. If the configuration file is present and the configuration includes the **ip address dhcp** interface configuration command on specific routed interfaces, the DHCP client is invoked and requests the IP address information for those interfaces.

This is the sequence of messages that are exchanged between the DHCP client and the DHCP server.

***Figure 1: DHCP Client and Server Message Exchange***




The client, Device A, broadcasts a DHCPDISCOVER message to locate a DHCP server. The DHCP server offers configuration parameters (such as an IP address, subnet mask, gateway IP address, DNS IP address, a lease for the IP address, and so forth) to the client in a DHCPOFFER unicast message.

In a DHCPREQUEST broadcast message, the client returns a formal request for the offered configuration information to the DHCP server. The formal request is broadcast so that all other DHCP servers that received

the DHCPDISCOVER broadcast message from the client can reclaim the IP addresses that they offered to the client.

The DHCP server confirms that the IP address has been allocated to the client by returning a DHCPACK unicast message to the client. With this message, the client and server are bound, and the client uses configuration information received from the server. The amount of information the device receives depends on how you configure the DHCP server.

If the configuration parameters sent to the client in the DHCPOFFER unicast message are invalid (a configuration error exists), the client returns a DHCPDECLINE broadcast message to the DHCP server.

The DHCP server sends the client a DHCPNAK denial broadcast message, which means that the offered configuration parameters have not been assigned, that an error has occurred during the negotiation of the parameters, or that the client has been slow in responding to the DHCPOFFER message (the DHCP server assigned the parameters to another client).

A DHCP client might receive offers from multiple DHCP or BOOTP servers and can accept any of the offers; however, the client usually accepts the first offer it receives. The offer from the DHCP server is not a guarantee that the IP address is allocated to the client; however, the server usually reserves the address until the client has had a chance to formally request the address. If the device accepts replies from a BOOTP server and configures itself, the device broadcasts, instead of unicasts, TFTP requests to obtain the device configuration file.

The DHCP hostname option allows a group of devices to obtain hostnames and a standard configuration from the central management DHCP server. A client (device) includes in its DCHPDISCOVER message an option 12 field used to request a hostname and other configuration parameters from the DHCP server. The configuration files on all clients are identical except for their DHCP-obtained hostnames.

If a client has a default hostname (the **hostname** *name* global configuration command is not configured or the **no hostname** global configuration command is entered to remove the hostname), the DHCP hostname option is not included in the packet when you enter the **ip address dhcp** interface configuration command. In this case, if the client receives the DCHP hostname option from the DHCP interaction while acquiring an IP address for an interface, the client accepts the DHCP hostname option and sets the flag to show that the system now has a hostname configured.

# DHCP-based Autoconfiguration and Image Update

You can use the DHCP image upgrade features to configure a DHCP server to download both a new image and a new configuration file to one or more devices in a network. Simultaneous image and configuration upgrade for all switches in the network helps ensure that each new device added to a network receives the same image and configuration.

There are two types of DHCP image upgrades: DHCP autoconfiguration and DHCP auto-image update.

## Restrictions for DHCP-based Autoconfiguration

- The DHCP-based autoconfiguration with a saved configuration process stops if there is not at least one Layer 3 interface in an up state without an assigned IP address in the network.
- Unless you configure a timeout, the DHCP-based autoconfiguration with a saved configuration feature tries indefinitely to download an IP address.
- The auto-install process stops if a configuration file cannot be downloaded or if the configuration file is corrupted.

- The configuration file that is downloaded from TFTP is merged with the existing configuration in the running configuration but is not saved in the NVRAM unless you enter the **write memory** or **copy running-configuration startup-configuration** privileged EXEC command. If the downloaded configuration is saved to the startup configuration, the feature is not triggered during subsequent system restarts.

## DHCP Autoconfiguration

DHCP autoconfiguration downloads a configuration file to one or more devices in your network from a DHCP server. The downloaded configuration file becomes the running configuration of the device. It does not over write the bootup configuration saved in the flash, until you reload the device.

## DHCP Auto-Image Update

You can use DHCP auto-image upgrade with DHCP autoconfiguration to download both a configuration and a new image to one or more devices in your network. The device (or devices) downloading the new configuration and the new image can be blank (or only have a default factory configuration loaded).

If the new configuration is downloaded to a switch that already has a configuration, the downloaded configuration is appended to the configuration file stored on the switch. (Any existing configuration is not overwritten by the downloaded one.)

To enable a DHCP auto-image update on the device, the TFTP server where the image and configuration files are located must be configured with the correct option 67 (the configuration filename), option 66 (the DHCP server hostname) option 150 (the TFTP server address), and option 125 (description of the Cisco IOS image file) settings.

After you install the device in your network, the auto-image update feature starts. The downloaded configuration file is saved in the running configuration of the device, and the new image is downloaded and installed on the device. When you reboot the device, the configuration is stored in the saved configuration on the device.

# DHCP Server Configuration Guidelines

Follow these guidelines if you are configuring a device as a DHCP server:

- You should configure the DHCP server with reserved leases that are bound to each device by the device hardware address.
- If you want the device to receive IP address information, you must configure the DHCP server with these lease options:
  - IP address of the client (required)
  - Subnet mask of the client (required)
  - DNS server IP address (optional)
  - Router IP address (default gateway address to be used by the device) (required)
- If you want the device to receive the configuration file from a TFTP server, you must configure the DHCP server with these lease options:
  - TFTP server name (required)
  - Boot filename (the name of the configuration file that the client needs) (recommended)

- Hostname (optional)

- Depending on the settings of the DHCP server, the device can receive IP address information, the configuration file, or both.
- If you do not configure the DHCP server with the lease options described previously, it replies to client requests with only those parameters that are configured. If the IP address and the subnet mask are not in the reply, the device is not configured. If the router IP address or the TFTP server name are not found, the device might send broadcast, instead of unicast, TFTP requests. Unavailability of other lease options does not affect autoconfiguration.
- The device can act as a DHCP server. By default, the Cisco IOS DHCP server and relay agent features are enabled on your device but are not configured. (These features are not operational.)

## Purpose of the DNS Server

The DHCP server uses the DNS server to resolve the TFTP server name to an IP address. You must configure the TFTP server name-to-IP address map on the DNS server. The TFTP server contains the configuration files for the device.

You can configure the IP addresses of the DNS servers in the lease database of the DHCP server from where the DHCP replies will retrieve them. You can enter up to two DNS server IP addresses in the lease database.

The DNS server can be on the same LAN or on a different LAN from the device. If it is on a different LAN, the device must be able to access it through a router.

# How to Obtain Configuration Files

Depending on the availability of the IP address and the configuration filename in the DHCP reserved lease, the device obtains its configuration information in these ways:

- The IP address and the configuration filename is reserved for the device and provided in the DHCP reply (one-file read method).

  The device receives its IP address, subnet mask, TFTP server address, and the configuration filename from the DHCP server. The device sends a unicast message to the TFTP server to retrieve the named configuration file from the base directory of the server and upon receipt, it completes its boot up process.

- The IP address and the configuration filename is reserved for the device, but the TFTP server address is not provided in the DHCP reply (one-file read method).

  The device receives its IP address, subnet mask, and the configuration filename from the DHCP server. The device sends a broadcast message to a TFTP server to retrieve the named configuration file from the base directory of the server, and upon receipt, it completes its boot-up process.

- Only the IP address is reserved for the device and provided in the DHCP reply. The configuration filename is not provided (two-file read method).

  The device receives its IP address, subnet mask, and the TFTP server address from the DHCP server. The device sends a unicast message to the TFTP server to retrieve the network-confg or cisconet.cfg default configuration file. (If the network-confg file cannot be read, the device reads the cisconet.cfg file.)

  The default configuration file contains the hostnames-to-IP-address mapping for the device. The device fills its host table with the information in the file and obtains its hostname. If the hostname is not found

in the file, the device uses the hostname in the DHCP reply. If the hostname is not specified in the DHCP reply, the device uses the default *Switch* as its hostname.

After obtaining its hostname from the default configuration file or the DHCP reply, the device reads the configuration file that has the same name as its hostname (*hostname*-confg or *hostname*.cfg, depending on whether network-confg or cisconet.cfg was read earlier) from the TFTP server. If the cisconet.cfg file is read, the filename of the host is truncated to eight characters.

If the device cannot read the network-confg, cisconet.cfg, or the hostname file, it reads the router-confg file. If the device cannot read the router-confg file, it reads the ciscortr.cfg file.

**Note** The device broadcasts TFTP server requests if the TFTP server is not obtained from the DHCP replies, if all attempts to read the configuration file through unicast transmissions fail, or if the TFTP server name cannot be resolved to an IP address.

# How to Control Environment Variables

With a normally operating device, you enter the boot loader mode only through the console connection. Unplug the switch power cord, then reconnect the power cord. Hold down the **MODE** button until you see the boot loader switch prompt

The device boot loader software provides support for nonvolatile environment variables, which can be used to control how the boot loader or any other software running on the system, functions. Boot loader environment variables are similar to environment variables that can be set on UNIX or DOS systems.

Environment variables that have values are stored in flash memory outside of the flash file system.

Each line in these files contains an environment variable name and an equal sign followed by the value of the variable. A variable has no value if it is not present; it has a value if it is listed even if the value is a null string. A variable that is set to a null string (for example, " ") is a variable with a value. Many environment variables are predefined and have default values.

Environment variables store two kinds of data:

- Data that controls code, which does not read the Cisco IOS configuration file. For example, the name of a boot loader helper file, which extends or patches the functionality of the boot loader can be stored as an environment variable.
- Data that controls code, which is responsible for reading the Cisco IOS configuration file. For example, the name of the Cisco IOS configuration file can be stored as an environment variable.

You can change the settings of the environment variables by accessing the boot loader or by using Cisco IOS commands. Under normal circumstances, it is not necessary to alter the setting of the environment variables.

## Common Environment Variables

This table describes the function of the most common environment variables.

***Table 2: Common Environment Variables***

| Variable | Boot Loader Command | Cisco IOS Global Configuration Command |
|---|---|---|
| BOOT | **set BOOT** *filesystem* **:/** *file-url ...*<br><br>A semicolon-separated list of executable files to try to load and execute when automatically booting. If the BOOT environment variable is not set, the system attempts to load and execute the first executable image it can find by using a recursive, depth-first search through the flash file system. If the BOOT variable is set but the specified images cannot be loaded, the system attempts to boot the first bootable file that it can find in the flash file system. | **boot system** {*filesystem* **:** */file-url ...*<br><br>Specifies the Cisco IOS image to load during the next boot cycle and the stack members on which the image is loaded. This command changes the setting of the BOOT environment variable. |
| MANUAL_BOOT | **set MANUAL_BOOT yes**<br><br>Decides whether the switch automatically or manually boots.<br><br>Valid values are 1, yes, 0, and no. If it is set to no or 0, the boot loader attempts to automatically boot up the system. If it is set to anything else, you must manually boot up the switch from the boot loader mode. | **boot manual**<br><br>Enables manually booting the switch during the next boot cycle and changes the setting of the MANUAL_BOOT environment variable.<br><br>The next time you reboot the system, the switch is in boot loader mode. To boot up the system, use the **boot flash:** *filesystem* **:/** *file-url* boot loader command, and specify the name of the bootable image. |

| Variable | Boot Loader Command | Cisco IOS Global Configuration Command |
|---|---|---|
| CONFIG_FILE | **set CONFIG_FILE flash:/** *file-url*<br>Changes the filename that Cisco IOS uses to read and write a nonvolatile copy of the system configuration. | **boot config-file flash:/** *file-url*<br>Specifies the filename that Cisco IOS uses to read and write a nonvolatile copy of the system configuration. This command changes the CONFIG_FILE environment variable. |
| SWITCH_NUMBER | **set SWITCH_NUMBER** *stack-member-number*<br>Changes the member number of a stack member. | **switch** *current-stack-member-number* **renumber** *new-stack-member-number*<br>Changes the member number of a stack member. |
| SWITCH_PRIORITY | **set SWITCH_PRIORITY** *stack-member-number*<br>Changes the priority value of a stack member. | **switch** *stack-member-number* **priority** *priority-number*<br>Changes the priority value of a stack member. |
| BAUD | **set BAUD** *baud-rate* | **line console 0**<br>**speed***speed-value*<br>Configures the baud rate. |
| ENABLE_BREAK | **set ENABLE_BREAK yes/no** | **boot enable-break switch yes/no**<br>This command can be issued when the flash filesystem is initialized when **ENABLE_BREAK** is set to **yes**. |

## Environment Variables for TFTP

When the switch is connected to a PC through the Ethernet management port, you can download or upload a configuration file to the boot loader by using TFTP. Make sure the environment variables in this table are configured.

***Table 3: Environment Variables for TFTP***

| Variable | Description |
|---|---|
| MAC_ADDR | Specifies the MAC address of the switch.<br>**Note** We recommend that you do not modify this variable.<br>However, if you modify this variable after the boot loader is up or the value is different from the saved value, enter this command before using TFTP. |

| Variable | Description |
|---|---|
| IP_ADDR | Specifies the IP address and the subnet mask for the associated IP subnet of the switch. |
| DEFAULT_ROUTER | Specifies the IP address and subnet mask of the default gateway. |

## Scheduled Reload of the Software Image

You can schedule a reload of the software image to occur on the device at a later time (for example, late at night or during the weekend when the device is used less), or you can synchronize a reload network-wide (for example, to perform a software upgrade on all devices in the network).

**Note** A scheduled reload must take place within approximately 24 days.

You have these reload options:

- Reload of the software to take affect in the specified minutes or hours and minutes. The reload must take place within approximately 24 hours. You can specify the reason for the reload in a string up to 255 characters in length.
- Reload of the software to take place at the specified time (using a 24-hour clock). If you specify the month and day, the reload is scheduled to take place at the specified time and date. If you do not specify the month and day, the reload takes place at the specified time on the current day (if the specified time is later than the current time) or on the next day (if the specified time is earlier than the current time). Specifying 00:00 schedules the reload for midnight.

The **reload** command halts the system. If the system is not set to manually boot up, it reboots itself.

If your device is configured for manual booting, do not reload it from a virtual terminal. This restriction prevents the device from entering the boot loader mode and then taking it from the remote user's control.

If you modify your configuration file, the device prompts you to save the configuration before reloading. During the save operation, the system requests whether you want to proceed with the save if the CONFIG_FILE environment variable points to a startup configuration file that no longer exists. If you proceed in this situation, the system enters setup mode upon reload.

To cancel a previously scheduled reload, use the **reload cancel** privileged EXEC command.

# How to Perform Device Setup Configuration

Using DHCP to download a new image and a new configuration to a device requires that you configure at least two devices. One device acts as a DHCP and TFTP server and the second device (client) is configured to download either a new configuration file or a new configuration file and a new image file.

## Configuring DHCP Autoconfiguration (Only Configuration File)

This task describes how to configure DHCP autoconfiguration of the TFTP and DHCP settings on an existing device in the network so that it can support the autoconfiguration of a new device.

### SUMMARY STEPS

1. **configure terminal**
2. **ip dhcp pool** *poolname*
3. **boot** *filename*
4. **network** *network-number mask prefix-length*
5. **default-router** *address*
6. **option 150** *address*
7. **exit**
8. **tftp-server flash**:*filename.text*
9. **interface** *interface-id*
10. **no switchport**
11. **ip address** *address mask*
12. **end**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **ip dhcp pool** *poolname*<br>**Example:**<br>`Device(config)# ip dhcp pool pool` | Creates a name for the DHCP server address pool, and enters DHCP pool configuration mode. |
| **Step 3** | **boot** *filename*<br>**Example:**<br>`Device(dhcp-config)# boot config-boot.text` | Specifies the name of the configuration file that is used as a boot image. |
| **Step 4** | **network** *network-number mask prefix-length*<br>**Example:**<br>`Device(dhcp-config)# network 10.10.10.0 255.255.255.0` | Specifies the subnet network number and mask of the DHCP address pool.<br>**Note** The prefix length specifies the number of bits that comprise the address prefix. The prefix is an alternative way of specifying the network mask of the client. The prefix length must be preceded by a forward slash (/). |
| **Step 5** | **default-router** *address*<br>**Example:** | Specifies the IP address of the default router for a DHCP client. |

| | Command or Action | Purpose |
|---|---|---|
| | `Device(dhcp-config)# default-router 10.10.10.1` | |
| **Step 6** | **option 150** *address*<br>**Example:**<br>`Device(dhcp-config)# option 150 10.10.10.1` | Specifies the IP address of the TFTP server. |
| **Step 7** | **exit**<br>**Example:**<br>`Device(dhcp-config)# exit` | Returns to global configuration mode. |
| **Step 8** | **tftp-server flash**:*filename.text*<br>**Example:**<br>`Device(config)# tftp-server flash:config-boot.text` | Specifies the configuration file on the TFTP server. |
| **Step 9** | **interface** *interface-id*<br>**Example:** | Specifies the address of the client that will receive the configuration file. |
| **Step 10** | **no switchport**<br>**Example:**<br>`Device(config-if)# no switchport` | Puts the interface into Layer 3 mode. |
| **Step 11** | **ip address** *address mask*<br>**Example:**<br>`Device(config-if)# ip address 10.10.10.1 255.255.255.0` | Specifies the IP address and mask for the interface. |
| **Step 12** | **end**<br>**Example:**<br>`Device(config-if)# end` | Returns to privileged EXEC mode. |

# Configuring DHCP Auto-Image Update (Configuration File and Image)

This task describes DHCP autoconfiguration to configure TFTP and DHCP settings on an existing device to support the installation of a new switch.

### Before you begin

You must first create a text file (for example, autoinstall_dhcp) that will be uploaded to the device. In the text file, put the name of the image that you want to download (forexample, c3750e-ipservices-mz.122-44.3.SE.tarc3750x-ipservices-mz.122-53.3.SE2.tar). This image must be a tar and not a bin file.

## SUMMARY STEPS

1. **configure terminal**
2. **ip dhcp pool** *poolname*
3. **boot** *filename*
4. **network** *network-number mask prefix-length*
5. **default-router** *address*
6. **option 150** *address*
7. **option 125** *hex*
8. **copy tftp flash** *filename.txt*
9. **copy tftp flash** *imagename.bin*
10. **exit**
11. **tftp-server flash:** *config.text*
12. **tftp-server flash:** *imagename.bin*
13. **tftp-server flash:** *filename.txt*
14. **interface** *interface-id*
15. **no switchport**
16. **ip address** *address mask*
17. **end**
18. **copy running-config startup-config**

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **ip dhcp pool** *poolname*<br>**Example:**<br>`Device(config)# ip dhcp pool pool1` | Creates a name for the DHCP server address pool and enter DHCP pool configuration mode. |
| **Step 3** | **boot** *filename*<br>**Example:**<br>`Device(dhcp-config)# boot config-boot.text` | Specifies the name of the file that is used as a boot image. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 4** | **network** *network-number mask prefix-length*<br>**Example:**<br>`Device(dhcp-config)# network 10.10.10.0 255.255.255.0` | Specifies the subnet network number and mask of the DHCP address pool.<br>**Note** The prefix length specifies the number of bits that comprise the address prefix. The prefix is an alternative way of specifying the network mask of the client. The prefix length must be preceded by a forward slash (/). |
| **Step 5** | **default-router** *address*<br>**Example:**<br>`Device(dhcp-config)# default-router 10.10.10.1` | Specifies the IP address of the default router for a DHCP client. |
| **Step 6** | **option 150** *address*<br>**Example:**<br>`Device(dhcp-config)# option 150 10.10.10.1` | Specifies the IP address of the TFTP server. |
| **Step 7** | **option 125** *hex*<br>**Example:**<br>`Device(dhcp-config)# option 125 hex 0000.0009.0a05.08661.7574.6f69.6e73.7461.6c6c.5f64.686370` | Specifies the path to the text file that describes the path to the image file. |
| **Step 8** | **copy tftp flash** *filename.txt*<br>**Example:**<br>`Device(config)# copy tftp flash image.bin` | Uploads the text file to the device. |
| **Step 9** | **copy tftp flash** *imagename.bin*<br>**Example:**<br>`Device(config)# copy tftp flash image.bin` | Uploads the tar file for the new image to the device. |
| **Step 10** | **exit**<br>**Example:**<br>`Device(dhcp-config)# exit` | Returns to global configuration mode. |
| **Step 11** | **tftp-server flash:** *config.text*<br>**Example:** | Specifies the Cisco IOS configuration file on the TFTP server. |

| | Command or Action | Purpose |
|---|---|---|
| | `Device(config)# tftp-server flash:config-boot.text` | |
| **Step 12** | **tftp-server flash:** *imagename.bin*<br>**Example:**<br>`Device(config)# tftp-server flash:image.bin` | Specifies the image name on the TFTP server. |
| **Step 13** | **tftp-server flash:** *filename.txt*<br>**Example:**<br>`Device(config)# tftp-server flash:boot-config.text` | Specifies the text file that contains the name of the image file to download |
| **Step 14** | **interface** *interface-id*<br>**Example:**<br>`Device(config)# interface gigabitethernet 1/0/4` | Specifies the address of the client that will receive the configuration file. |
| **Step 15** | **no switchport**<br>**Example:**<br>`Device(config-if)# no switchport` | Puts the interface into Layer 3 mode. |
| **Step 16** | **ip address** *address mask*<br>**Example:**<br>`Device(config-if)# ip address 10.10.10.1 255.255.255.0` | Specifies the IP address and mask for the interface. |
| **Step 17** | **end**<br>**Example:**<br>`Device(config-if)# end` | Returns to privileged EXEC mode. |
| **Step 18** | **copy running-config startup-config**<br>**Example:**<br>`Device(config-if)# end` | (Optional) Saves your entries in the configuration file. |

# Configuring the Client to Download Files from DHCP Server

**Note** You should only configure and enable the Layer 3 interface. Do not assign an IP address or DHCP-based autoconfiguration with a saved configuration.

### SUMMARY STEPS

1. **configure terminal**
2. **boot host dhcp**
3. **boot host retry timeout** *timeout-value*
4. **banner config-save ^C** *warning-message* **^C**
5. **end**
6. **show boot**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **boot host dhcp**<br>**Example:**<br>`Device(conf)# boot host dhcp` | Enables autoconfiguration with a saved configuration. |
| **Step 3** | **boot host retry timeout** *timeout-value*<br>**Example:**<br>`Device(conf)# boot host retry timeout 300` | (Optional) Sets the amount of time the system tries to download a configuration file.<br>**Note** If you do not set a timeout, the system will try indefinitely to obtain an IP address from the DHCP server. |
| **Step 4** | **banner config-save ^C** *warning-message* **^C**<br>**Example:**<br>`Device(conf)# banner config-save ^C Caution - Saving Configuration File to NVRAM May Cause You to No longer Automatically Download Configuration Files at Reboot^C` | (Optional) Creates warning messages to be displayed when you try to save the configuration file to NVRAM. |
| **Step 5** | **end**<br>**Example:** | Returns to privileged EXEC mode. |

| | Command or Action | Purpose |
|---|---|---|
| | `Device(config-if)# end` | |
| **Step 6** | **show boot**<br>**Example:**<br>`Device# show boot` | Verifies the configuration. |

# Manually Assigning IP Information to Multiple SVIs

This task describes how to manually assign IP information to multiple switched virtual interfaces (SVIs):

### SUMMARY STEPS

1. **configure terminal**
2. **interface vlan** *vlan-id*
3. **ip address** *ip-address subnet-mask*
4. **exit**
5. **ip default-gateway** *ip-address*
6. **end**
7. **show interfaces vlan** *vlan-id*
8. **show ip redirects**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **interface vlan** *vlan-id*<br>**Example:**<br>`Device(config)# interface vlan 99` | Enters interface configuration mode, and enter the VLAN to which the IP information is assigned. The range is 1 to 4094. |
| **Step 3** | **ip address** *ip-address subnet-mask*<br>**Example:**<br>`Device(config-vlan)# ip address 10.10.10.2 255.255.255.0` | Enters the IP address and subnet mask. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 4** | **exit**<br>**Example:**<br>`Device(config-vlan)# exit` | Returns to global configuration mode. |
| **Step 5** | **ip default-gateway** *ip-address*<br>**Example:**<br>`Device(config)# ip default-gateway 10.10.10.1` | Enters the IP address of the next-hop router interface that is directly connected to the device where a default gateway is being configured. The default gateway receives IP packets with unresolved destination IP addresses from the device.<br>Once the default gateway is configured, the device has connectivity to the remote networks with which a host needs to communicate.<br>**Note** When your device is configured to route with IP, it does not need to have a default gateway set. |
| **Step 6** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |
| **Step 7** | **show interfaces vlan** *vlan-id*<br>**Example:**<br>`Device# show interfaces vlan 99` | Verifies the configured IP address. |
| **Step 8** | **show ip redirects**<br>**Example:**<br>`Device# show ip redirects` | Verifies the configured default gateway. |

# Configuring the NVRAM Buffer Size

The default NVRAM buffer size is 512 KB. In some cases, the configuration file might be too large to save to NVRAM. Typically, this occurs when you have many switches in a switch stack. You can configure the size of the NVRAM buffer to support larger configuration files. The new NVRAM buffer size is synced to all current and new member switches.

**Note** After you configure the NVRAM buffer size, reload the switch or switch stack.

When you add a switch to a stack and the NVRAM size differs, the new switch syncs with the stack and reloads automatically.

**SUMMARY STEPS**

1. **configure terminal**
2. **boot buffersize** *size*
3. **end**
4. **show boot**

**DETAILED STEPS**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **boot buffersize** *size*<br>**Example:**<br>`Device(config)# boot buffersize 524288` | Configures the NVRAM buffersize in KB. The valid range for *size* is from 4096 to 1048576. |
| **Step 3** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |
| **Step 4** | **show boot**<br>**Example:**<br>`Device# show boot` | Verifies the configuration. |

# Modifying the Device Startup Configuration

## Specifying the Filename to Read and Write the System Configuration

By default, the Cisco IOS software uses the config.text file to read and write a nonvolatile copy of the system configuration. However, you can specify a different filename, which will be loaded during the next boot cycle.

### Before you begin

Use a standalone device for this task.

### SUMMARY STEPS

1. **configure terminal**
2. **boot config-file** file name
3. **end**
4. **show boot**
5. **copy running-config startup-config**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **boot config-file** file name<br>**Example:**<br>`Device(config)# boot config-file config.text` | Specifies the configuration file to load during the next boot cycle.<br>*file-url*—The path (directory) and the configuration filename.<br>Filenames and directory names are case-sensitive. |
| **Step 3** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |
| **Step 4** | **show boot**<br>**Example:**<br>`Device# show boot` | Verifies your entries.<br>The **boot** global configuration command changes the setting of the CONFIG_FILE environment variable. |
| **Step 5** | **copy running-config startup-config**<br>**Example:**<br>`Device# copy running-config startup-config` | (Optional) Saves your entries in the configuration file. |

## Manually Booting the Switch

By default, the switch automatically boots up; however, you can configure it to manually boot up.

### Before you begin

Use a standalone switch for this task.

## SUMMARY STEPS

1. **configure terminal**
2. **boot manual**
3. **end**
4. **show boot**
5. **copy running-config startup-config**

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **boot manual**<br>**Example:**<br>`Device(config)# boot manual` | Enables the switch to manually boot up during the next boot cycle. |
| **Step 3** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |
| **Step 4** | **show boot**<br>**Example:**<br>`Device# show boot` | Verifies your entries.<br>The **boot manual** global command changes the setting of the MANUAL_BOOT environment variable.<br>The next time you reboot the system, the switch is in boot loader mode, shown by the *switch:* prompt. To boot up the system, use the **boot** *filesystem:/file-url* boot loader command.<br>• *filesystem*:—Uses flash: for the system board flash device.<br>`device: boot flash:`<br>• For *file-url*—Specifies the path (directory) and the name of the bootable image.<br>Filenames and directory names are case-sensitive. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 5** | **copy running-config startup-config**<br>**Example:**<br>`Device# copy running-config startup-config` | (Optional) Saves your entries in the configuration file. |

## Configuring a Scheduled Software Image Reload

This task describes how to configure your device to reload the software image at a later time.

### SUMMARY STEPS

1. **configure terminal**
2. **copy running-config startup-config**
3. **reload in** [*hh*:]*mm* [*text*]
4. **reload at** *hh*: *mm* [*month day* | *day month*] [*text*]
5. **reload cancel**
6. **show reload**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **copy running-config startup-config**<br>**Example:**<br>`copy running-config startup-config` | Saves your device configuration information to the startup configuration before you use the **reload** command. |
| **Step 3** | **reload in** [*hh*:]*mm* [*text*]<br>**Example:**<br>`Device(config)# reload in 12`<br>`System configuration has been modified. Save? [yes/no]: y` | Schedules a reload of the software to take affect in the specified minutes or hours and minutes. The reload must take place within approximately 24 days. You can specify the reason for the reload in a string up to 255 characters in length. |
| **Step 4** | **reload at** *hh*: *mm* [*month day* | *day month*] [*text*]<br>**Example:** | Specifies the time in hours and minutes for the reload to occur. |

| | Command or Action | Purpose |
|---|---|---|
| | `Device(config)# reload at 14:00` | **Note** Use the **at** keyword only if the device system clock has been set (through Network Time Protocol (NTP), the hardware calendar, or manually). The time is relative to the configured time zone on the device. To schedule reloads across several devices to occur simultaneously, the time on each device must be synchronized with NTP. |
| **Step 5** | **reload cancel**<br>**Example:**<br>`Device(config)# reload cancel` | Cancels a previously scheduled reload. |
| **Step 6** | **show reload**<br>**Example:**<br>`show reload` | Displays information about a previously scheduled reload or identifies if a reload has been scheduled on the device. |

# Monitoring Device Setup Configuration

## Example: Verifying the Device Running Configuration

```
Device# show running-config
Building configuration...

Current configuration: 1363 bytes
!
version 12.4
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Stack1
!
enable secret 5 $1$ej9.$DMUvAUnZOAmvmgqBEzIxE0
!
.
<output truncated>
.
interface gigabitethernet6/0/2
mvr type source

<output truncated>

...!
interface VLAN1
 ip address 172.20.137.50 255.255.255.0
 no ip directed-broadcast
!
```

```
ip default-gateway 172.20.137.1 !
!
snmp-server community private RW
snmp-server community public RO
snmp-server community private@es0 RW
snmp-server community public@es0 RO
snmp-server chassis-id 0x12
!
end
```

## Examples: Displaying Software Install

This example displays software bootup in install mode:

```
switch# boot flash:/c3560cx-universalk9-mz.152-3.E/c3560cx-universalk9-tar.152-3.E.bin
```

# Configuration Examples for Performing Device Setup

## Example: Configuring a Device as a DHCP Server

```
Device# configure terminal
Device(config)# ip dhcp pool pool1
Device(dhcp-config)# network 10.10.10.0 255.255.255.0
Device(dhcp-config)# boot config-boot.text
Device(dhcp-config)# default-router 10.10.10.1
Device(dhcp-config)# option 150 10.10.10.1
Device(dhcp-config)# exit
Device(config)# tftp-server flash:config-boot.text
Device(config)# interface gigabitethernet 1/0/4
Device(config-if)# no switchport
Device(config-if)# ip address 10.10.10.1 255.255.255.0
Device(config-if)# end
```

## Example: Configuring DHCP Auto-Image Update

## Example: Configuring a Device to Download Configurations from a DHCP Server

This example uses a Layer 3 SVI interface on VLAN 99 to enable DHCP-based autoconfiguration with a saved configuration:

```
Device# configure terminal
Device(config)# boot host dhcp
Device(config)# boot host retry timeout 300
Device(config)# banner config-save ^C Caution - Saving Configuration File to NVRAM May Cause
 You to No longer Automatically Download Configuration Files at Reboot^C
Device(config)# vlan 99
```

```
Device(config-vlan)# interface vlan 99
Device(config-if)# no shutdown
Device(config-if)# end
Device# show boot
BOOT path-list:
Config file:          flash:/config.text
Private Config file:  flash:/private-config.text
Enable Break:         no
Manual Boot:          no
HELPER path-list:
NVRAM/Config file
      buffer size:    32768
Timeout for Config
          Download:    300 seconds
Config Download
       via DHCP:       enabled (next boot: enabled)
Device#
```

# Example: Configuring NVRAM Buffer Size

```
Device# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Device(config)# boot buffersize 600000
Device(config)# end
Device# show boot
BOOT path-list      :
Config file         : flash:/config.text
Private Config file : flash:/private-config.text
Enable Break        : no
Manual Boot         : no
HELPER path-list    :
Auto upgrade        : yes
Auto upgrade path   :
NVRAM/Config file
      buffer size:   600000
Timeout for Config
          Download:    300 seconds
Config Download
       via DHCP:       enabled (next boot: enabled)
Device#
```