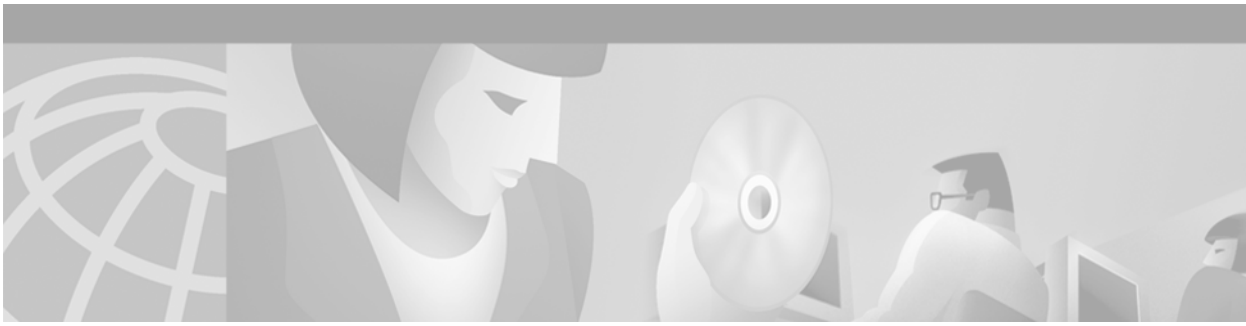


Using Configuration Tools

Cisco IOS software includes a number of configuration tools that simplify the process of setting up the initial configuration of a router or access server. The following sections in this chapter describe different tools available for configuration:

- Using AutoInstall
- Using the Setup Command Facility
- Using the ConfigMaker and FastStep Configuration Applications

For a complete description of the setup command, refer to the "Using the Setup Configuration Tool" chapter in the Release 12.1 *Cisco IOS Configuration Fundamentals Command Reference*. To locate documentation of other commands, use the command reference index or search online.

Using AutoInstall

This section provides information about AutoInstall, a Cisco IOS software feature that allows you to configure a new router automatically and dynamically. The AutoInstall process involves connecting a new router to a network where an existing router is preconfigured, turning on the new router, and enabling it with a configuration file that is automatically downloaded from a TFTP server.

The AutoInstall process begins any time a Cisco IOS software-based device is turned on and a valid configuration file is not found in nonvolatile random-access memory (NVRAM). If you wish to configure the device manually, you should connect directly to the console port and ensure that the router is not connected to the network via any of the interface ports before you turn on the router. Note that it may take several minutes for the device to determine that AutoInstall is not connected to the network.

This chapter describes the the manual configuration of the network to enable AutoInstall. AutoInstall can also be configured with network managment applications such as the AutoInstall Manager in CiscoWorks software. For details on other ways to setup the AutoInstall process, see the documentation for your application, or search for Network Management information on Cisco.com.

The following sections provide the requirements for AutoInstall and an overview of how the procedure works. To start the procedure, see the "Performing the AutoInstall Procedure" section.

AutoInstall Requirements

For the AutoInstall procedure to work, your system must meet the following requirements:

- Routers must be physically attached to the network using one or more of the following interface types: Ethernet, Token Ring, FDDI, serial with High-Level Data Link Control (HDLC) encapsulation, or serial with Frame Relay encapsulation. HDLC is the default serial encapsulation. If the AutoInstall process fails over HDLC, the Cisco IOS software automatically configures Frame Relay encapsulation.

Note Of Token Ring interfaces, only those that set ring speed with physical jumpers support AutoInstall. AutoInstall does not work with Token Ring interfaces for which the ring speed must be set with software configuration commands. If the ring speed is not set, the interface is set to shutdown mode.

- You must complete procedure 1 and either procedure 2 or 3:
  - Procedure 1: A configuration file for the new router must reside on a TFTP server. This file can contain the full configuration or the minimum needed for the administrator to Telnet into the new router for configuration. In addition, make sure to complete one of the following procedures.
  - Procedure 2: A file named *network-confg* also must reside on the server. The file must have an Internet Protocol (IP) host name entry for the new router. The server must be reachable from the existing router.
  - Procedure 3: An IP address-to-host name mapping for the new router must be added to a Domain Name System (DNS) database file.
- If the existing router is to help automatically install the new router via an HDLC-encapsulated serial interface using Serial Line Address Resolution Protocol (SLARP), that interface must be configured with an IP address whose host portion has the value 1 or 2. (AutoInstall over Frame Relay does not have this address constraint.) Subnet masks of any size are supported.
- If the existing router is to help automatically install the new router using a Frame Relay-encapsulated serial interface, that interface must be configured with the following:
  - An IP helper address pointing to the TFTP server. In the following example, 171.69.2.75 is the address of the TFTP server:

    ```
    ip helper 171.69.2.75
    ```
  - A Frame Relay map pointing back to the new router. In the following example, 172.21.177.100 is the IP address of the *new* router's serial interface, and 100 is the PVC identifier:

    ```
    frame-relay map ip 172.21.177.100 100 dlci
    ```
- If the existing router is to help automatically install the new router via an Ethernet, Token Ring, or FDDI interface using BOOTP or Reverse Address Resolution Protocol (RARP), a BOOTP or RARP server also must be set up to map the new router's Media Access Control (MAC) address to its IP address.
- IP helper addresses might need to be configured to forward the TFTP and DNS broadcast requests from the new router to the host that is providing those services.

Using a DOS-Based TFTP Server

AutoInstall over Frame Relay and other WAN encapsulations support downloading configuration files from UNIX-based and DOS-based TFTP servers. Other booting mechanisms such as RARP and SLARP also support UNIX-based and DOS-based TFTP servers.

The DOS format of the UNIX network-confg file that must reside on the server must be 8 characters or fewer, with a 3-letter extension. Therefore, when an attempt to load network-confg fails, AutoInstall automatically attempts to download the file *cisconet.cfg* from the TFTP server.

If cisconet.cfg exists and is downloaded successfully, the server is assumed to be a DOS machine. The AutoInstall program then attempts to resolve the host name for the router through host commands in cisconet.cfg.

If cisconet.cfg does not exist or cannot be downloaded, or the program is unable to resolve a host name, DNS attempts to resolve the host name. If DNS cannot resolve the host name, the router attempts to download ciscortr.cfg. If the host name is longer than eight characters, it is truncated to eight characters. For example, a router with a host name "australia" will be treated as "australi" and AutoInstall will attempt to download australi.cfg.

If neither network-confg nor cisconet.cfg exists and DNS is unable to resolve the host name, AutoInstall attempts to load router-confg, and then ciscortr.cfg if router-confg does not exist or cannot be downloaded. The cycle is repeated three times.

How AutoInstall Works

Once the requirements for using AutoInstall are met, the dynamic configuration of the new router occurs as follows:

1. The new router acquires its IP address. Depending on the interface connection between the two routers and/or access servers, the new router's IP address is dynamically resolved by either SLARP requests or BOOTP or RARP requests.
2. The new router resolves its name through network-confg, cisconet.cfg, or DNS.
3. The new router automatically requests and downloads its configuration file from a TFTP server.
4. If a host name is not resolved, the new router attempts to load router-confg or ciscortr.cfg.

Acquiring the New Router's IP Address

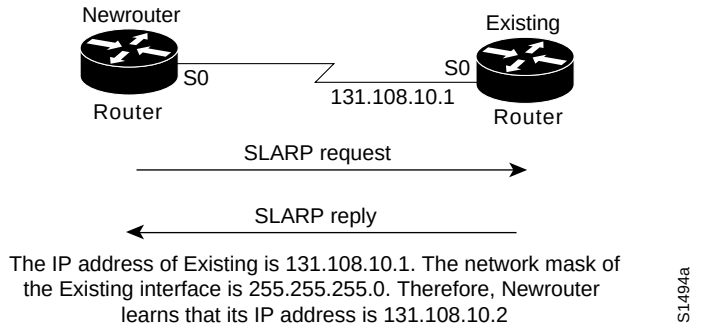
The new router (*newrouter*) resolves its interface's IP addresses by one of the following means:

- If *newrouter* is connected by an HDLC-encapsulated serial line to the existing router (*existing*), *newrouter* sends a SLARP request to *existing.*
- If *newrouter* is connected by an Ethernet, Token Ring, or FDDI interface, it broadcasts BOOTP and RARP requests.
- If *newrouter* is connected by a Frame Relay-encapsulated serial interface, it first attempts the HDLC automatic installation process and then attempts the BOOTP or RARP process over Ethernet, Token Ring, or FDDI. If both attempts fail, the new router attempts to automatically install over Frame Relay. In this case, a BOOTP request is sent over the lowest numbered serial or HSSI interface.

The existing router (*existing*) responds in one of the following ways depending on the request type:

- In response to a SLARP request, *existing* sends a SLARP reply packet to *newrouter.* The reply packet contains the IP address and netmask of *existing*. If the host portion of the IP address in the SLARP response is 1, *newrouter* configures its interface using the value 2 as the host portion of its IP address and vice versa. (See Figure 2.)

Figure 2 Using SLARP to Acquire the New Router's IP Address

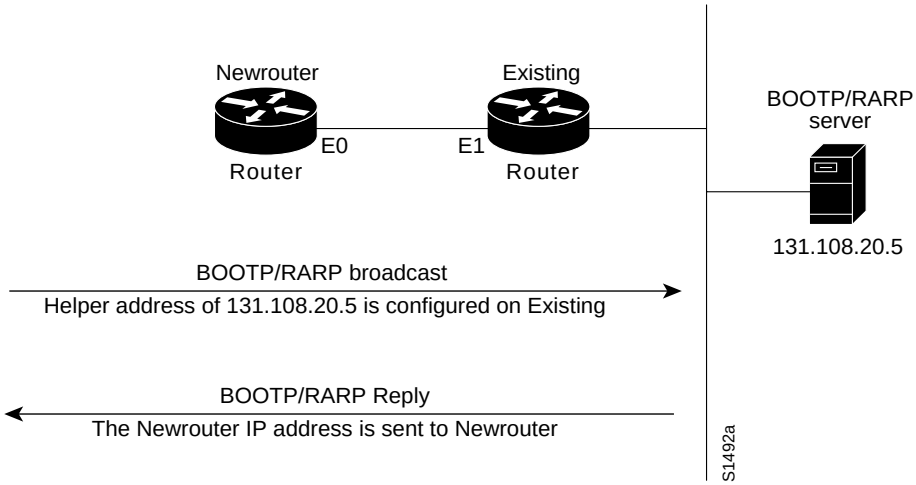


- In response to BOOTP or RARP requests, an IP address is sent from the BOOTP or RARP server to *newrouter.*

  A BOOTP or RARP server must have already been set up to map *newrouter*'s MAC address to its IP address. Cisco routers running Cisco IOS 9.21 or later can be configured to act as RARP servers. If the BOOTP server does not reside on the directly attached network segment, routers between *newrouter* and the BOOTP server can be configured with the **ip helper-address** command to allow the request and response to be forwarded between segments, as shown in Figure 3.

  AutoInstall over Frame Relay is a special case in that the existing router acts as a BOOTP server and responds to the incoming BOOTP request. Only a helper address and a Frame Relay map need to be set up. No MAC-to-IP address map is needed on the existing router.

Figure 3 Using BOOTP or RARP to Acquire the New Router's IP Address



Because the router attempts to resolve its host name as soon as one interface resolves its IP address, only one IP address needs to be set up with SLARP, BOOTP, or RARP.

Resolving the IP Address to the Host Name

The new router resolves its IP address-to-host name mapping by sending a TFTP broadcast requesting the file network-confg, as shown in Figure 4.

The network-confg file is a configuration file generally shared by several routers. In this case, it is used to map the IP address of the new router (just obtained dynamically) to the name of the new router. The file network-confg must reside on a reachable TFTP server and must be globally readable.

The following is an example of a minimal network-confg file that maps the IP address of the new router (131.108.10.2) to the name *newrouter*. The address of the new router was learned via SLARP and is based on *existing*'s IP address of 131.108.10.1.

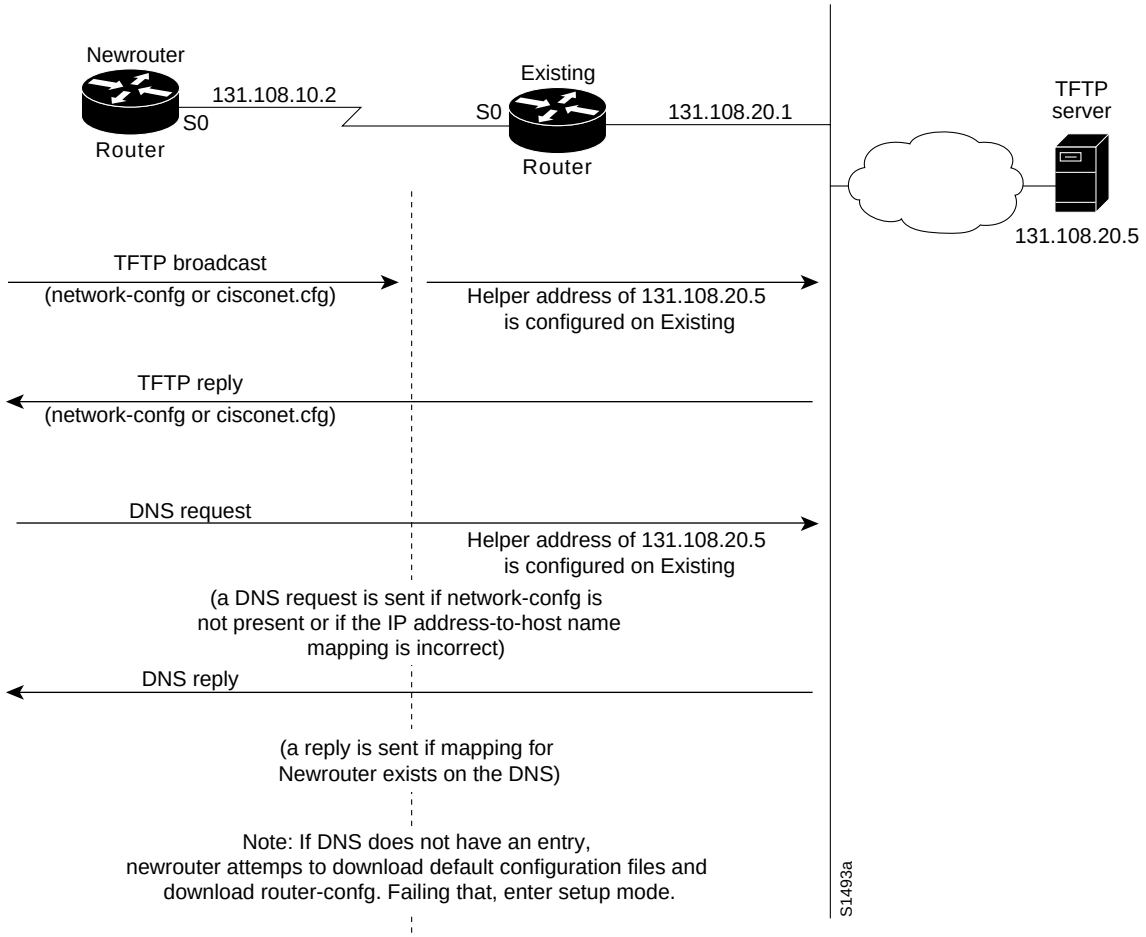
```
ip host newrouter 131.108.10.2
```

If you are not using AutoInstall over Frame Relay, the host portion of the address must be 1 or 2. AutoInstall over Frame Relay does not have this addressing constraint.

If *newrouter* does not receive a network-confg or a cisconet.cfg file, or if the IP address-to-host-name mapping does not match the newly acquired IP address, *newrouter* sends a DNS broadcast. If DNS is configured and has an entry that maps *newrouter*'s SLARP, BOOTP, or RARP-acquired IP address to its name, *newrouter* successfully resolves its name.

If DNS does not have an entry that maps the new router's SLARP, BOOTP, or RARP-acquired address to its name, the new router cannot resolve its host name. The new router attempts to download a default configuration file as described in the next section, and failing that, enters setup mode—or enters user EXEC mode with AutoInstall over Frame Relay.

Figure 4 Dynamically Resolving the New Router's IP Address-to-Host Name Mapping



Downloading the New Router's Host Configuration File

After the router successfully resolves its host name, *newrouter* sends a TFTP broadcast requesting the file newrouter-confg or newrouter.cfg. The name *newrouter-confg* must be in all lowercase letters, even if the true host name is not. If *newrouter* cannot resolve its host name, it sends a TFTP broadcast requesting the default host configuration file router-confg. The file is downloaded to *newrouter*, where the configuration commands take effect immediately.

When using AutoInstall over Frame Relay, you are put into setup mode while the AutoInstall process is running. If the configuration file is successfully installed, the setup process is terminated. If you expect the AutoInstall process to be successful, either do *not* respond to the setup prompts or respond to the prompts as follows:

```
Would you like to enter the initial configuration dialog? [yes]: no
Would you like to terminate autoinstall? [yes]: no
```

If you do not expect the AutoInstall process to be successful, create a configuration file by responding to the setup prompts. The AutoInstall process is terminated transparently.

You will see the following display as the AutoInstall operation is in progress:

```
Please Wait. AutoInstall being attempted!!!!!!!!!!!!!!!!!!
```

If the host configuration file contains only the minimal information, you must connect using Telnet into *existing*, from there connect via Telnet to *newrouter*, and then run the **setup** command to configure *newrouter*. Refer to the "Using the Setup Command Facility" section later in this chapter for details on the **setup** command.

If the host configuration file is complete, *newrouter* should be fully operational. You can enter the **enable** command (with the system administrator password) at the system prompt on *newrouter*, and then issue the **copy running-config startup-config** command to save the information in the recently obtained configuration file into nonvolatile random-access memory (NVRAM) or to the location specified by the CONFIG_FILE environment variable. If it must reload, *newrouter* simply loads its configuration file from NVRAM.

If the TFTP request fails, or if *newrouter* still has not obtained the IP addresses of all its interfaces, and those addresses are not contained in the host configuration file, then *newrouter* enters **setup** mode automatically. **Setup** mode prompts you for manual configuration of the Cisco IOS software at the console. The new router continues to issue broadcasts to attempt to learn its host name and obtain any unresolved interface addresses. The broadcast frequency will dwindle to every 10 minutes after several attempts. Refer to the "Using the Setup Command Facility" section later in this chapter for details on the **setup** command.

Performing the AutoInstall Procedure

To dynamically configure a new router using AutoInstall, complete the following steps. Steps 1, 2, and 3 are completed by the central administrator. Step 4 is completed by the person at the remote site.

Step 1 Modify the existing router's configuration to support the AutoInstall procedure.

Step 2 Set up the TFTP server to support the AutoInstall procedure.

Step 3 Set up the BOOTP or RARP server if needed. A BOOTP or RARP server is required for AutoInstall using an Ethernet, Token Ring, FDDI, or Frame Relay-encapsulated serial interface. With a Frame Relay-encapsulated serial interface, the existing router acts as the BOOTP server. A BOOTP or RARP server is not required for AutoInstall using an HDLC-encapsulated serial interface.

Step 4 Connect the new router to the network.

Configuring an Interface to Allow Use of AutoInstall

You can use AutoInstall through any of the following types of interfaces:

- An HDLC-encapsulated serial line (the default configuration for a serial line)
- An Ethernet, Token Ring, FDDI interface
- A Frame Relay-encapsulated serial line

Using an HDLC-Encapsulated Serial Interface Connection

To set up AutoInstall via a serial line with HDLC encapsulation (the default), you must configure the existing router. Use the following commands, beginning in global configuration mode:

	Command	Purpose
Step 1	**interface serial** *interface-number*	Configures the serial interface that connects to the new router with HDLC encapsulation (the default), and enters interface configuration mode for the specified interface.
Step 2	**ip address** *address mask*	Enters an IP address for the interface. The host portion of the address must have a value of 1 or 2. (AutoInstall over Frame Relay does not have this address constraint.)
Step 3	**ip helper-address** *address*	Configures a helper address for the serial interface to forward broadcasts associated with the TFTP, BOOTP, and DNS requests.
Step 4	**clock rate** *bps*	(Optional) Configures a DCE clock rate for the serial line, unless an external clock is being used. This step is needed only for DCE appliques.
Step 5	**Ctrl-Z**	Exits configuration mode.
Step 6	**copy running-config startup-config**	Saves the configuration file to your startup configuration. On most platforms, this step saves the configuration to NVRAM. On the Cisco 7000 family, this step saves the configuration to the location specified by the CONFIG_FILE environment variable.

In the following example, the existing router's configuration file contains the commands needed to configure the router for AutoInstall on a serial line using HDLC encapsulation:

```
Router# more system:startup-config
. . .
interface serial 0
 ip address 172.31.10.1 255.255.255.0
 ip helper-address 172.31.20.5
. . .
```

Using an Ethernet, Token Ring, or FDDI Interface Connection

To set up AutoInstall using an Ethernet, Token Ring, or FDDI interface, you must modify the configuration of the existing router. Use the following commands, beginning in global configuration mode:

	Command	Purpose
Step 1	**interface** {**ethernet** | **tokenring** | **fddi**} *interface-number*	Enters interface configuration mode for the specified LAN interface.
Step 2	**ip address** *address mask*	Specifies an IP address for the interface.
Step 3	**ip helper-address** *address*	(Optional) Configures a helper address to forward broadcasts associated with the TFTP, BOOTP, and DNS requests.
Step 4	**Ctrl-Z**	Exits configuration mode.
Step 5	**copy running-config startup-config**	Saves the configuration file to your startup configuration. On most platforms, this step saves the configuration to NVRAM. On the Cisco 7000 family, this step saves the configuration to the location specified by the CONFIG_FILE environment variable.

Typically, the LAN interface and IP address are already configured on the existing router. You might need to configure an IP helper address if the TFTP server is not on the same network as the new router.

In the following example, the existing router's configuration file contains the commands needed to configure the router for AutoInstall on an Ethernet interface:

```
Router# more system:startup-config
. . .
interface Ethernet 0
 ip address 172.31.10.1 255.255.255.0
 ip helper-address 172.31.20.5
. . .
```

Using a Frame Relay-Encapsulated Serial Interface Connection

To set up AutoInstall via a serial line with Frame Relay encapsulation, you must configure the existing router. Use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	**interface serial 0**	Configures the serial interface that connects to the new router, and enters interface configuration mode.
Step 2	**encapsulation frame-relay**	Configures Frame Relay encapsulation on the interface that connects to the new router.
Step 3	**frame-relay map ip** *ip-address dlci* or **frame-relay interface-dlci** *dlci option* [**protocol ip** *ip-address*]	Creates a Frame Relay map pointing back to the new router. or For point-to-point subinterfaces, assigns a data link connection identifier (DLCI) to the interface that connects to the new router, and provides the IP address of the serial port on the new router.
Step 4	**ip address** *address mask*	Specifies an IP address for the interface. This step sets the IP address of the existing router.
Step 5	**ip helper-address** *address*	Configures a helper address for the TFTP server.
Step 6	**clock rate** *bps*	(Optional) Configures a DCE clock rate for the serial line, unless an external clock is being used. This step is needed only for DCE appliques.

	Command	Purpose
Step 7	`Ctrl-Z`	Exits configuration mode.
Step 8	`copy running-config startup-config`	Saves the configuration file to your startup configuration. On most platforms, this step saves the configuration to NVRAM. On the Cisco 7000 family, this step saves the configuration to the location specified by the CONFIG_FILE environment variable.

You must use a DTE interface on the new router because the network always provides the clock signal.

In the following example, the existing router's configuration file contains the commands needed to configure the router for Frame Relay AutoInstall on a serial line:

```
Router# more system:startup-config
. . .
interface serial 0
 ip address 172.31.20.20 255.255.255.0
 encapsulation frame-relay
 frame-relay map ip 172.31.10.1 255.255.255.0 48
 ip helper-address 172.31.20.5
. . .
```

Setting Up the TFTP Server

For AutoInstall to work correctly, the new router must be able to resolve its host name and then download a *name*-confg or a *name*.cfg file from a TFTP server. The new router can resolve its host name by using a network-confg or a cisconet.cfg file downloaded from a TFTP server or by using the DNS.

To set up a TFTP server to support AutoInstall, perform the following steps:

Step 1 Enable TFTP on a server. For information on this process, consult your host vendor's TFTP server documentation and RFCs 906 and 783.

Step 2 If you want to use a network-confg or cisconet.cfg file to resolve the new router's name, create the network-confg or cisconet.cfg file containing an IP address-to-host name mapping for the new router. Enter the ip host command into the TFTP config file, not into the router. The IP address must match the IP address that is to be dynamically obtained by the new router.

If you want to use DNS to resolve the new router's name, create an address-to-name mapping entry for the new router in the DNS database. The IP address must match the IP address that is to be dynamically obtained by the new router. For more information on this step, contact your DNS administrator or refer to RFCs 1101 and 1183.

Step 3 Create the *name*-confg or *name*.cfg file, which should reside in the tftpboot directory on the TFTP server. The *name* part of *name*-confg or *name*.cfg filename must match the host name you assigned for the new router in the previous step. Enter configuration commands for the new router into this file.

The *name*-confg or the *name*.cfg file can contain either the new router's full configuration or a minimal configuration.

The minimal configuration file is a virtual terminal password and an enable password. It allows an administrator to Telnet into the new router to configure it. If you are using BOOTP or RARP to resolve the address of the new router, the minimal configuration file must also include the IP address to be obtained dynamically using BOOTP or RARP.

You can use the **copy running-config tftp** command to help you generate the configuration file that you will download during the AutoInstall process.

Note The existing router might need to forward TFTP requests and response packets if the TFTP server is not on the same network segment as the new router. When you modified the existing router's configuration, you specified an IP helper address for this purpose.

You can save a minimal configuration under a generic newrouter-confg file. Use the **ip host** command in the network-confg or cisconet.cfg file to specify *newrouter* as the host name with the address you will be dynamically resolving. The new router should then resolve its IP address, host name, and minimal configuration automatically. Use Telnet to connect to the new router from the existing router and use the **setup** command facility to configure the rest of the interfaces. For example, the line in the network-confg or cisconet.cfg file could be similar to the following:

```
ip host newrouter 131.108.170.1
```

The following host configuration file contains the minimal set of commands needed for AutoInstall using SLARP or BOOTP:

```
enable-password letmein
!
line vty 0
password letmein
!
end
```

The preceding example shows a minimal configuration for connecting from a router one hop away. From this configuration, use the **setup** facility to configure the rest of the interfaces. If the router is more than one hop away, you also must include routing information in the minimal configuration.

The following minimal network configuration file maps the new router's IP address, 131.108.10.2, to the host name *newrouter*. The new router's address was learned via SLARP and is based on the existing router's IP address of 131.108.10.1.

```
ip host newrouter 131.108.10.2
```

Setting Up the BOOTP or RARP Server

If the new router is connected to the existing router using an Ethernet, Token Ring, or FDDI interface, you must configure a BOOTP or RARP server to map the new router's MAC address to its IP address. If the new router is connected to the existing router using a serial line with HDLC encapsulation, or if you are configuring AutoInstall over Frame Relay, the tasks in this section are not required.

To configure a BOOTP or RARP server, use one of the following commands:

Command	Purpose
Refer to your host vendor's manual pages and to RFCs 951 and 1395	If BOOTP is to be used to resolve the new router's IP address, configure your BOOTP server.
Refer to your host vendor's manual pages and to RFC 903	If RARP is to be used to resolve the new router's IP address, configure your RARP server.

Note If the RARP server is not on the same subnet as the new router, use the **ip rarp-server** command to configure the existing router to act as a RARP server. For more information, see the "Configuring a Router as a RARP Server" section on page FC- 246.

The following host configuration file contains the minimum set of commands needed for AutoInstall using RARP. It includes the IP address that will be obtained dynamically via BOOTP or RARP during the AutoInstall process. When RARP is used, this extra information is needed to specify the proper netmask for the interface.

```
interface ethernet 0
 ip address 131.108.10.2 255.255.255.0
enable-password letmein
!
line vty 0
 password letmein
!
end
```

Connecting the New Router to the Network

Connect the new router to the network using either an HDLC-encapsulated or Frame Relay-encapsulated serial interface or an Ethernet, Token Ring, or FDDI interface. After the router successfully resolves its host name, *newrouter* sends a TFTP broadcast requesting the file *name*-confg or *name*.cfg. The router name must be in all lowercase, even if the true host name is not. The file is downloaded to the new router, where the configuration commands take effect immediately. If the configuration file is complete, the new router should be fully operational.

To save the complete configuration to NVRAM, use the following commands in privileged EXEC mode:

	Command	Purpose
Step 1	**enable** *password*	Enters privileged mode on the new router.
Step 2	**copy running-config startup-config**	Saves the information from the *name*-config file into your startup configuration. On most platforms, this step saves the configuration to NVRAM. On the Cisco 7000 family, this step saves the configuration to the location specified by the CONFIG_FILE environment variable.

Caution Verify that the existing and new routers (or access servers) are connected before entering the **copy running-config startup-config** EXEC command to save configuration changes. Use the **ping** EXEC command to verify connectivity. If an incorrect configuration file is downloaded, the new router will load NVRAM configuration information before it can enter AutoInstall mode.

If the configuration file is a minimal configuration file, the new router comes up, but with only one interface operational. Use the following commands to connect to the new router and configure it:

	Command	Purpose
Step 1	**telnet** *existing*	Establishes a Telnet connection to the existing router.
Step 2	**telnet** *newrouter*	From the existing router, establishes a Telnet connection to the new router.
Step 3	**enable** *password*	Enters privileged EXEC mode.
Step 4	**setup**	Enters setup mode to configure the new router.

Using the Setup Command Facility

The **setup** command facility is an interactive facility that allows you to perform first-time configuration and other basic configuration procedures on all routers. The facility prompts you to enter basic information needed to start a router functioning quickly and uneventfully.

Although the **setup** command facility is a quick way to "set up" a router, you can also use it after first-time startup to perform basic configuration changes. This section describes:

- Using Setup After First-Time Startup
- Using the Streamlined Setup Command Facility

Refer to your hardware platform's user guide for more information on how to use the **setup** command for first-time startup.

Whenever you use the **setup** command facility, be sure that you have the following information:

- What interfaces the router has
- What protocols the router is routing
- Whether the router is to perform bridging
- Network addresses for the protocols being configured
- Password strategy for your environment

Using Setup After First-Time Startup

The command parser accessable thought the CLI allows you to make very detailed changes to your configurations. However, some major configuration changes do not require the granularity provided by the command parser. In these cases, you can use the **setup** command facility to make major enhancements to your configurations. For example, you might want to use setup to add a protocol suite, to make major addressing scheme changes, or to configure a newly installed interface. Although you can use the configuration modes available though the CLI to make these major changes, the **setup** command facility provides you with a high-level view of the configuration and guides you through the configuration change process.

Additionally, if you are not familiar with Cisco products and the command parser, the **setup** command facility is a particularly valuable tool because it asks you the questions required to make configuration changes.

Note If you use setup to modify a configuration because you have added to or modified the hardware, be sure to verify the physical connections using the **show version** command. Also, verify the logical port assignments using the **show running-config** command to ensure that you configure the proper port. Refer to your platform's hardware publications for details on physical and logical port assignments.

To enter the **setup** command facility, use the following command in privileged EXEC mode:

Command	Purpose
`setup`	Enters the **setup** command facility.

When you enter the **setup** command facility after first-time startup, an interactive dialog called the *System Configuration Dialog* appears on the system console screen. The System Configuration Dialog guides you through the configuration process. It prompts you first for global parameters and then for interface parameters. The values shown in brackets next to each prompt are the default values last set using either the **setup** command facility or the **configure** command.

Note The prompts and the order in which they appear on the screen vary depending on the platform and the interfaces installed in the device.

You must run through the entire System Configuration Dialog until you come to the item that you intend to change. To accept default settings for items that you do not want to change, press the Return (Enter) key. The default choice is indicated by square brackets (for example, [yes]) before the prompt colon (:).

To exit back to privileged EXEC mode without making changes and without running through the entire System Configuration Dialog, press **Ctrl-C**.

The facility also provides help text for each prompt. To access help text, press the question mark (?) key at a prompt.

When you complete your changes, the **setup** command facility shows you the configuration command script that was created during the setup session. It also asks you if you want to use this configuration. If you answer Yes, the configuration is saved to NVRAM. If you answer No, the configuration is not saved and the process begins again. There is no default for this prompt; you must answer either Yes or No.

Note If any problems exist with the configuration file pointed to in NVRAM, or if the ignore NVRAM bit is set in the configuration register, the router enters the streamlined **setup** command facility. See the "Using the Streamlined Setup Command Facility" section for more information.

The following example shows how to use the **setup** command facility to configure interface serial 0 and to add ARAP and IP/IPX PPP support on the asynchronous interfaces:

```
Router# setup

         --- System Configuration Dialog ---

At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.
```

```
Continue with configuration dialog? [yes]:

First, would you like to see the current interface summary? [yes]:

Interface          IP-Address      OK?  Method    Status                  Protocol
Ethernet0          172.16.72.2     YES  manual    up                      up
Serial0            unassigned      YES  not set   administratively down  down
Serial1            172.16.72.2     YES  not set   up                      up

Configuring global parameters:

  Enter host name [Router]:

The enable secret is a one-way cryptographic secret used
instead of the enable password when it exists.
```

```
  Enter enable secret [<Use current secret>]:

The enable password is used when there is no enable secret
and when using older software and some boot images.

  Enter enable password [ww]:
  Enter virtual terminal password [ww]:
  Configure SNMP Network Management? [yes]:
    Community string [public]:
  Configure DECnet? [no]:
  Configure AppleTalk? [yes]:
    Multizone networks? [no]: yes
  Configure IPX? [yes]:
  Configure IP? [yes]:
    Configure IGRP routing? [yes]:
      Your IGRP autonomous system number [15]:
  Configure Async lines? [yes]:
    Async line speed [9600]: 57600
    Configure for HW flow control? [yes]:
    Configure for modems? [yes/no]: yes
      Configure for default chat script? [yes]: no
    Configure for Dial-in IP SLIP/PPP access? [no]: yes
      Configure for Dynamic IP addresses? [yes]: no
      Configure Default IP addresses? [no]: yes
      Configure for TCP Header Compression? [yes]: no
      Configure for routing updates on async links? [no]:
    Configure for Async IPX? [yes]:
    Configure for Appletalk Remote Access? [yes]:
      AppleTalk Network for ARAP clients [1]: 20
      Zone name for ARAP clients [ARA Dialins]:

Configuring interface parameters:

Configuring interface Ethernet0:
  Is this interface in use? [yes]:
  Configure IP on this interface? [yes]:
    IP address for this interface [172.16.72.2]:
    Number of bits in subnet field [8]:
    Class B network is 172.16.0.0, 8 subnet bits; mask is /24
  Configure AppleTalk on this interface? [yes]:
    Extended AppleTalk network? [yes]:
    AppleTalk starting cable range [1]:
    AppleTalk ending cable range [1]:
    AppleTalk zone name [Sales]:
    AppleTalk additional zone name:
  Configure IPX on this interface? [yes]:
    IPX network number [1]:

Configuring interface Serial0:
  Is this interface in use? [no]: yes
  Configure IP on this interface? [no]: yes
  Configure IP unnumbered on this interface? [no]: yes
    Assign to which interface [Ethernet0]:
  Configure AppleTalk on this interface? [no]: yes
    Extended AppleTalk network? [yes]:
    AppleTalk starting cable range [2]: 3
    AppleTalk ending cable range [3]: 3
    AppleTalk zone name [myzone]: ZZ Serial
    AppleTalk additional zone name:
  Configure IPX on this interface? [no]: yes
    IPX network number [2]: 3

Configuring interface Serial1:
  Is this interface in use? [yes]:
```

```
  Configure IP on this interface? [yes]:
  Configure IP unnumbered on this interface? [yes]:
    Assign to which interface [Ethernet0]:
  Configure AppleTalk on this interface? [yes]:
    Extended AppleTalk network? [yes]:
    AppleTalk starting cable range [2]:
    AppleTalk ending cable range [2]:
    AppleTalk zone name [ZZ Serial]:
    AppleTalk additional zone name:
  Configure IPX on this interface? [yes]:
    IPX network number [2]:
Configuring interface Async1:
    IPX network number [4]:
    Default client IP address for this interface [none]: 172.16.72.4
Configuring interface Async2:
    IPX network number [5]:
    Default client IP address for this interface [172.16.72.5]:
Configuring interface Async3:
    IPX network number [6]:
    Default client IP address for this interface [172.16.72.6]:
Configuring interface Async4:
    IPX network number [7]:
    Default client IP address for this interface [172.16.72.7]:
Configuring interface Async5:
    IPX network number [8]:
    Default client IP address for this interface [172.16.72.8]:
Configuring interface Async6:
    IPX network number [9]:
    Default client IP address for this interface [172.16.72.9]:
Configuring interface Async7:
    IPX network number [A]:
    Default client IP address for this interface [172.16.72.10]:
Configuring interface Async8:
    IPX network number [B]:
    Default client IP address for this interface [172.16.72.11]:
Configuring interface Async9:
    IPX network number [C]:
    Default client IP address for this interface [172.16.72.12]:
Configuring interface Async10:
    IPX network number [D]:
    Default client IP address for this interface [172.16.72.13]:
Configuring interface Async11:
    IPX network number [E]:
    Default client IP address for this interface [172.16.72.14]:
Configuring interface Async12:
    IPX network number [F]:
    Default client IP address for this interface [172.16.72.15]:
Configuring interface Async13:
    IPX network number [10]:
    Default client IP address for this interface [172.16.72.16]:
Configuring interface Async14:
    IPX network number [11]:
    Default client IP address for this interface [172.16.72.17]:
Configuring interface Async15:
    IPX network number [12]:
    Default client IP address for this interface [172.16.72.18]:
Configuring interface Async16:
    IPX network number [13]:
    Default client IP address for this interface [172.16.72.19]:

The following configuration command script was created:

hostname Router
enable secret 5 $1$krIg$emfYm/1OwHVspDuS8Gy0K1
```

```
enable password ww
line vty 0 4
password ww
snmp-server community public
!
no decnet routing
appletalk routing
ipx routing
ip routing
!
line 1 16
speed 57600
flowcontrol hardware
modem inout
!
arap network 20 ARA Dialins
line 1 16
arap enable
autoselect
!
! Turn off IPX to prevent network conflicts.
interface Ethernet0
no ipx network
interface Serial0
no ipx network
interface Serial1
no ipx network
!
interface Ethernet0
ip address 172.16.72.2 255.255.255.0
appletalk cable-range 1-1 1.204
appletalk zone Sales
ipx network 1
no mop enabled
!
interface Serial0
no shutdown
no ip address
ip unnumbered Ethernet0
appletalk cable-range 3-3
appletalk zone ZZ Serial
ipx network 3
no mop enabled
!
interface Serial1
no ip address
ip unnumbered Ethernet0
appletalk cable-range 2-2 2.2
appletalk zone ZZ Serial
ipx network 2
no mop enabled
!
Interface Async1
ipx network 4
ip unnumbered Ethernet0
peer default ip address 172.16.72.4
async mode interactive
!
Interface Async2
ipx network 5
ip unnumbered Ethernet0
peer default ip address 172.16.72.5
async mode interactive
!
```

```
Interface Async3
ipx network 6
ip unnumbered Ethernet0
peer default ip address 172.16.72.6
async mode interactive
!
Interface Async4
ipx network 7
ip unnumbered Ethernet0
peer default ip address 172.16.72.7
async mode interactive
async dynamic address
!
Interface Async5
ipx network 8
ip unnumbered Ethernet0
peer default ip address 172.16.72.8
async mode interactive
!
Interface Async6
ipx network 9
ip unnumbered Ethernet0
peer default ip address 172.16.72.9
async mode interactive
!
Interface Async7
ipx network A
ip unnumbered Ethernet0
peer default ip address 172.16.72.10
async mode interactive
!
Interface Async8
ipx network B
ip unnumbered Ethernet0
peer default ip address 172.16.72.11
async mode interactive
!
Interface Async9
ipx network C
ip unnumbered Ethernet0
peer default ip address 172.16.72.12
async mode interactive
!
Interface Async10
ipx network D
ip unnumbered Ethernet0
peer default ip address 172.16.72.13
async mode interactive
!
Interface Async11
ipx network E
ip unnumbered Ethernet0
peer default ip address 172.16.72.14
async mode interactive
!
Interface Async12
ipx network F
ip unnumbered Ethernet0
peer default ip address 172.16.72.15
async mode interactive
!
Interface Async13
ipx network 10
ip unnumbered Ethernet0
```

```
peer default ip address 172.16.72.16
async mode interactive
!
Interface Async14
ipx network 11
ip unnumbered Ethernet0
peer default ip address 172.16.72.17
async mode interactive
!
Interface Async15
ipx network 12
ip unnumbered Ethernet0
peer default ip address 172.16.72.18
async mode interactive
!
Interface Async16
ipx network 13
ip unnumbered Ethernet0
peer default ip address 172.16.72.19
async mode interactive
!
router igrp 15
network 172.16.0.0
!
end

Use this configuration? [yes/no]: yes

Building configuration...

Use the enabled mode 'configure' command to modify this configuration.

Router#
```

Using the Streamlined Setup Command Facility

The streamlined setup command facility is available only if your router has RXBOOT ROMs installed. The following routers can have this type of ROM installed:

- Cisco 2500 running the IGS-RXBOOT image
- Cisco 3000 running the IGS-RXBOOT image
- Cisco 4000 running the XX-RXBOOT image
- Other routers running the RXBOOT image

The streamlined **setup** command facility permits your router to load a system image from a network server when there are problems with the startup configuration. If RXBOOT is on your system, the Cisco IOS software automatically puts you in the streamlined setup command mode when your router is accidentally or intentionally rebooted (or you are attempting to load a system image from a network server) after any of the following circumstances:

- You issued an **erase startup-config** command, thereby deleting the startup configuration file.
- You have bit 6 (ignore NVRAM configuration) set in the configuration register.
- Your startup configuration has been corrupted.
- You configured the router to boot from a network server (the last four bits of the configuration register are not equal to 0 or 1) and there is no Flash or no valid image in Flash.
- You configured the router to boot the RXBOOT image.

Note that the above conditions are the same as for entering standard ROM monitor mode.If the RXBOOT image is not available, you will enter ROM monitor mode instead.

The streamlined **setup** command facility differs from the standard **setup** command facility because the streamlined facility does not ask you to configure global router parameters. You are prompted only to configure interface parameters, which permit your router to boot.

As with ROM monitor mode, the configuration information you provide in RXBOOT setup mode is *temporary* and exists only so that you can proceed with booting your system. When you reload the system, your original configuration is left intact. If your startup configuration is corrupted, enter the **setup** command facility, and configure the basic parameters. Then issue the **copy running-config startup-config** command to write this configuration to NVRAM.

The following example shows a router entering the streamlined **setup** command facility:

```
         --- System Configuration Dialog ---

Default settings are in square brackets '[]'.

Configuring interface IP parameters for netbooting:
```

Note The message "Configuring interface IP parameters for netbooting" only appears if you are booting over a network server and your configuration has insufficient IP information.

The streamlined **setup** command facility continues by prompting you for interface parameters for each installed interface. The facility asks if an interface is in use. If so, the facility then prompts you to provide an IP address and subnet mask bits for the interface. Enter the subnet mask bits as a decimal value, such as 5.

The following example shows the portion of the streamlined **setup** command facility that prompts for interface parameters. In the example, the facility is prompting for Ethernet0 interface parameters and Serial0 interface parameters:

```
Configuring interface Ethernet0:
  Is this interface in use? [yes]:
  Configure IP on this interface? [yes]:
    IP address for this interface: 192.195.78.50
    Number of bits in subnet field [0]: 5
    Class C network is 192.195.78.0, 5 subnet bits; mask is 255.255.255.248

Configuring interface Serial0:
  Is this interface in use? [yes]:
  Configure IP on this interface? [yes]:
    IP address for this interface: 192.195.78.34
    Number of bits in subnet field [5]:
    Class C network is 192.195.78.0, 5 subnet bits; mask is 255.255.255.248
```

Using the ConfigMaker and FastStep Configuration Applications

You can also configure Cisco IOS using the following tools:

- Cisco ConfigMaker
- Cisco FastStep

For full details regarding these configuration tools use the web addresses below.

Cisco ConfigMaker

Cisco ConfigMaker is an easy-to-use Microsoft Windows (95/98/NT) application used to configure a small network of Cisco routers (800, 1000, 1600, 1700, 2500, 2600, 3600, and 4000 series), switches, hubs, and other network devices from a single PC without requiring knowledge of Cisco IOS software. Cisco ConfigMaker is designed for resellers and network administrators of small to medium-sized businesses who are proficient in LAN and WAN fundamentals and basic network design.

ConfigMaker makes configuring a High-Level Data Link Control (HDLC), Frame Relay or ISDN wide-area network connection between routers or the Internet as easy as drawing a network diagram. The tool guides users step-by-step through network design and addressing tasks and automatically delivers configuration files to individual routers on the network. ConfigMaker provides a graphical view of the entire network and lets the user build network diagrams using standard copy/paste, drag/drop and online editing functions. ConfigMaker enables the user to monitor router and network configuration status at a glance with simple color codes.

The Cisco ConfigMaker software download is made available to customers free of charge. You will be asked to complete a brief customer survey before you may download the software. This survey provides Cisco with information on how our customers use ConfigMaker.

For your free copy, and for documentation, go to http://www.cisco.com/go/configmaker.

Cisco FastStep

Cisco Fast Step software, a free software configuration utility, is an easy-to-use Microsoft Windows 95, 98, and NT 4.0-based tool that simplifies the setup, monitoring, and troubleshooting of Cisco routers for home and small offices.

The Cisco Fast Step Setup application leads users through a step-by-step, wizards-based procedure that simplifies the configuration of Cisco routers connected to Internet service providers or remote corporate networks. Cisco Fast Step software includes the Cisco Fast Step Monitor application, which provides router LAN and WAN performance statistics, fault alarms, and troubleshooting assistance.

Cisco Fast Step is included on CD-ROM with Cisco 700, 800, and 1600 series routers, and Cisco 2610, 2509, and 2511 dialup routers.

The Cisco Fast Step software download is made available to customers free of charge. You will be asked to complete a brief customer survey before you may download Fast Step. This survey provides Cisco with information on how our customers use Fast Step.

For your free copy, and for documentation, go to http://www.cisco.com/go/faststep.