Chapter 2
First-Time Startup and Basic Configuration

2

This chapter describes basic system startup and use. Information in this chapter will help you with these tasks:

■ First-time startup and basic configuration of the Cisco router/bridge using the **setup** command facility

■ Understanding and using the system's command interpreter

■ Entering configuration commands into a configuration file and saving the configuration

■ Using TFTP to load configuration files and system software images over the network

■ Using the Flash Memory Card (CSC-MC+) to boot and store system software images

■ Reloading the operating system

Using the Setup Facility for Basic Configuration

The **setup** command facility enables you to start using your Cisco network server quickly and without extensive background knowledge. It does this by prompting you for the information required to perform basic configuration procedures. The **setup** command facility is available on all Cisco Systems internetworking products with Release 9.0 or later software.

Use the **setup** command facility both at initial system configuration and for basic changes at any time. In addition, use the facility as a teaching tool to become familiar with the expected command sequence as you step through the process. Because of these additional characteristics, Cisco refers to **setup** as a *command facility* rather than simply as a command.

Refer to the *Router Products Getting Started* publication for detailed information and a step-by-step description of the configuration procedure using the **setup** command facility.

Capabilities of the Setup Command Facility

Use the **setup** command facility to:

■ Establish host names

■ Set enable (or privileged mode) passwords

■ Set virtual terminal passwords

■ Enable SNMP network management

- Enable routing of protocols

- Enable transparent Ethernet bridging

Configure the following protocols with the **setup** command facility:

- IP, including IGRP and RIP dynamic routing

- DECnet (Phase IV)

- XNS

- Novell IPX

- Appletalk Phase 1 and Phase 2

- CLNS

- VINES

For more advanced applications, you need to enter a privileged configuration session, as described in the section "Entering Configuration Mode" later in this chapter.

Using the Setup Command Facility

The **setup** command facility operates automatically the first time you power on your network server and when you add new hardware components. To use **setup** on subsequent occasions, you must invoke it as you would any other command, by typing **setup** at the EXEC prompt (described in the section "Entering Configuration Mode" later in this chapter).

Before you start using the **setup** command facility, you need to do the following:

Step 1: Attach an RS-232 ASCII terminal to the system console port located at the rear of the network server.

Refer to the appropriate Cisco hardware and installation publications for details about cabling considerations and establishing electrical connections.

Step 2: Configure the terminal to operate at 9600 baud, 8 data bits, no parity, 1 stop bit.

Step 3: Power on the network server and run the **setup** program.

Note: Network connections are not required in order to effectively use the **setup** command facility.

In addition, you need to know the following before you start:

- Which protocols you plan to route.

  Note that most protocols will prompt you for specific parameters, including host name, network numbers, addresses, and subnet masks (when applicable).

- Types of interfaces installed: Ethernet, Serial, Token Ring, or FDDI.

- Whether or not you plan to use bridging.

The streamlined **setup** command facility enables you to continue to boot your system even though there may be problems with the configuration file when you are attempting to netboot an image.

The router enters the streamlined **setup** command facility under the following circumstances:

- You issued a **write erase** command, thereby deleting the configuration file in nonvolatile memory.

- Your configuration in NVRAM has been corrupted.

- If you set bit 15, the diagnostic bit, and answered "no" in response to the "set test addresses" prompt.

First-Time System Startup

The **setup** command facility determines which interfaces are installed and prompts you for configuration information for each one. Once you complete one interface, the facility automatically starts over for the next, continuing until each interface has been configured.

Note: Once you start the **setup** facility, the system runs through the entire configuration process; you cannot quit out of it. If you want to make a change or correct a mistake, simply press the Return key at each prompt, then restart the command.

When you first power on your console and network server, a script similar to the following will appear on the screen. The first section of the script displays the banner information, including the software version:

```
                Restricted Rights Legend

  Use, duplication, or disclosure by the Government is
  subject to restrictions as set forth in subparagraph
  (c) of the Commercial Computer Software - Restricted
  Rights clause at FAR sec. 52.227-19 and subparagraph
  (c) (1) (ii) of the Rights in Technical Data and Computer
  Software clause at DFARS sec. 252.227-7013.

            Cisco Systems, Inc.
            1525 O'Brien Drive
            Menlo Park, California 94025

  GS Software (GS3-BFX), Version 9.0(1)
  Copyright (c) 1986-1992 by Cisco Systems, Inc.
  Compiled Fri 31-Jan-92 13:31
```

The next portion of the display is a list of the installed hardware. By reading the installed hardware, the system automatically presents the appropriate interfaces during the configuration process.

```
CSC3 (68020) processor with 4096K bytes of memory.
X.25 software.
Bridging software.
1 MCI controller.
1 Ethernet/IEEE 802.3 interface.
1 Token Ring interface.
1 Serial network interface.
1 FDDI interface.
Environmental Controller.
64 Kbytes of multibus memory.
64 Kbytes of non-volatile memory.
```

The first two sections of the configuration script (the banner and the installed hardware) appear each time the system is started up.

At the first-time system startup, the System Configuration Dialog automatically appears, offering the prompts for which you'll provide the answers to configure your system.

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

At any point you may enter a question mark '?' for help.
Refer to the 'Getting Started' Guide for additional help.
Default settings are in square brackets '[]'. Continue with
configuration dialog? [yes]:
```

At this point, you may choose not to continue with the System Configuration Dialog and exit by answering "no" to this prompt.

Answer "yes" to continue with the **setup** configuration dialog. The remainder of the script is the actual configuration process, with each prompt appearing automatically. Press the Return key to accept the default settings.

There is no default for the final prompt which asks you if you want to use this configuration; you must answer either "yes" or "no". Also note that the **setup** command only asks you to configure the protocols for each interface that you specified on a global basis. For instance, if you said "no" for XNS under the global parameters, the command does not prompt you to configure that protocol under the interface parameters.

Sample Configuration Session:

```
Configuring global parameters:

   Enter host name [Router]:    sandbox
   Enter enable password:    shovel
   Enter virtual terminal password:    pail
   Configure SNMP Network Management? [no]:    yes
   Configure XRemote font servers? [no]:    yes
     Enter a font server IP address or press RETURN to exit: 121.78.1.1
      Enter a font server IP address or press RETURN to exit:
   Configure IP? [yes]:
      Configure IGRP routing? [yes]:
         Your IGRP autonomous system number [1]:
   Configure DECnet? [no]:    yes
```

```
        Your area number [1]:
        Your node number [1]:
        Area (level 2) routing? [no]:   yes
    Configure XNS? [no]:   yes
    Configure Novell? [no]:   yes
    Configure AppleTalk? [no]:   yes
        Multizone networks? [no]:   yes
    Configure CLNS? [yes]:
        CLNS router tag [area_1]:
        CLNS domain [49]:
        CLNS area [0001]:
        CLNS station id [0000.0C01.0D1D]:
    Configure Vines? [no]:   yes
    Configure bridging? [no]:   yes

Configuring interface parameters:

Configuring interface TokenRing0:
    Is this interface in use? [yes]:
    Tokenring ring speed (4 or 16) ? [16]:
    Configure IP on this interface? [no]:   yes
        IP address for this interface:   131.108.92.67
        Number of bits in subnet field [0]:
       Class B network is 131.108.0.0, 0 subnet bits; mask is 255.255.0.0
    Configure DECnet on this interface? [yes]:
        DECnet cost [10]:
    Configure XNS on this interface? [no]:   yes
        XNS network number [1]:
    Configure Novell on this interface? [no]:   yes
        Novell network number [1]:
    Configure AppleTalk on this interface? [no]:   yes
        AppleTalk starting cable range [0]:   4172
        AppleTalk ending cable range [4172]:
        AppleTalk zone name [myzone]:   twilight
        AppleTalk zone name:   ozone
        AppleTalk zone name:
    Configure CLNS on this interface? [yes]:
    Configure Vines on this interface? [yes]:
    Configure bridging on this interface? [yes]:

Configuring interface Ethernet0:
    Is this interface in use? [yes]:
   Configure IP on this interface? [yes]:
        IP address for this interface:   131.108.6.67
        Number of bits in subnet field [0]:
       Class B network is 131.108.0.0, 0 subnet bits; mask is 255.255.0.0
    Configure DECnet on this interface? [yes]:
        DECnet cost [10]:
    Configure XNS on this interface? [yes]:
        XNS network number [2]:
    Configure Novell on this interface? [yes]:
        Novell network number [2]:
    Configure AppleTalk on this interface? [yes]:
        Extended AppleTalk network? [no]:   yes
        AppleTalk starting cable range [4172]:
        AppleTalk ending cable range [4172]:
        AppleTalk zone name [twilight]:
        AppleTalk zone name [ozone]:
```

```
      AppleTalk zone name:
   Configure CLNS on this interface? [yes]:
   Configure Vines on this interface? [yes]:
   Configure bridging on this interface? [yes]:

Configuring interface Serial0:
   Is this interface in use? [yes]:
   Configure IP on this interface? [yes]:
      IP address for this interface:   131.108.97.67
      Number of bits in subnet field [0]:
     Class B network is 131.108.0.0, 0 subnet bits; mask is 255.255.0.0
   Configure DECnet on this interface? [yes]:    no
   Configure XNS on this interface? [yes]:    no
   Configure Novell on this interface? [yes]:    no
   Configure AppleTalk on this interface? [yes]:
      Extended AppleTalk network? [no]:
      AppleTalk network number [1]:
      AppleTalk zone name [twilight]:
   Configure CLNS on this interface? [yes]:
   Configure Vines on this interface? [yes]:
   Configure bridging on this interface? [yes]:

Configuring interface Fddi0:
   Is this interface in use? [yes]:
   Configure IP on this interface? [yes]:    no
   Configure DECnet on this interface? [yes]:    no
   Configure XNS on this interface? [yes]:    no
   Configure Novell on this interface? [yes]:    no
   Configure AppleTalk on this interface? [yes]:
      AppleTalk starting cable range [0]:
   Configure CLNS on this interface? [yes]:    no
   Configure Vines on this interface? [yes]:    no
   Configure bridging on this interface? [yes]:    no

The following configuration command script was created:

hostname sandbox
enable-password shovel
line vty 0 4
password pail
snmp-server community
xremote tftp host 121.78.1.1
!
ip routing
decnet routing 1.1
decnet node-type area
xns routing
novell routing
appletalk routing
clns routing
router iso-igrp area_1
net  49.0001.0000.0C01.0D1D.00
vines routing
bridge 1 protocol dec
!
interface TokenRing0
ip address 131.108.92.67 255.255.255.0
xns network 1
```

```
novell network 1
appletalk cable-range 4172-4172
appletalk zone twilight
clns router iso-igrp area_1
vines metric
bridge-group 1
!
interface Ethernet0
ip address 131.108.6.67 255.255.255.0
xns network 2
novell network 2
appletalk cable-range 4172-4172
appletalk discovery
clns router iso-igrp area_1
vines metric
bridge-group 1
!
interface Serial0
no shutdown
no ip address
appletalk address 50000.72
appletalk zone twilight
clns router iso-igrp area_1
vines metric
bridge-group 1
!
interface Fddi0
no ip address
appletalk cable-range 0-0 0.0
appletalk discovery
!
router igrp 109
network 131.108.0.0
!
end

Use this configuration? [yes/no]: yes
[OK]
Use the enabled mode 'configure' command to modify this configuration.

Press RETURN to get started!
```

The server displays the system name (sandbox), followed by an angle bracket (>), which is the prompt of the system's command interpreter.

Using the EXEC Command Interpreter

The command interpreter is called the EXEC. The EXEC interprets the commands you type and carries out the corresponding operations.

You can type commands when you see the system prompt, which is the system's host name ending with an angle bracket (>). Although the default system host name is *Router>*, this may have been changed during the initial configuration using the **setup** command, or with the **hostname** configuration command. The following sections describe how to use the EXEC.

Command Syntax

The EXEC accepts commands typed in uppercase letters, lowercase letters, or both. You may also abbreviate commands and other keywords to the number of characters that cause the command to be a unique abbreviation. For example, you can abbreviate the **show** command to **sh**.

If you make a typing mistake, you can erase characters one at a time with the Delete or the Backspace key. Press either key to erase the last character typed. To erase the entire line, type Ctrl-U. (This notation means "Hold down the Ctrl key and press the U key.") The server acts on most commands after you press the Return key.

You can list available EXEC commands by typing a question mark (?). You can also enter a question mark to obtain more information about commands. For example, type **terminal ?** to obtain a list of **terminal** commands or **show ?** to obtain a list of **show** commands.

Certain EXEC commands produce multiple screens of output. At the end of each screen, the EXEC pauses and displays:

```
–More–
```

Type a space to continue the output; type anything else to return to the system command prompt.

EXEC Command Levels

For security purposes, the EXEC has two levels of access: user and privileged. The commands available at the user level are a subset of the commands available at the privileged level. Because many of the privileged commands set operating parameters, the privileged level should be password-protected to prevent its unauthorized use. The system prompt for the privileged level ends with a pound sign (#) instead of an angle bracket (>).

The EXEC **enable** command allows access to the privileged level, prompting for a password if one has been set with the **enable**-**password** configuration command. (For more information, see the section "Establishing Passwords and System Security" in the "Configuring the System" chapter.)

Type the **?** (question mark) command at the user level to see a list of the user-level EXEC commands similar to the following:

```
Router>?

connect <host>  Connect to host - same as typing just a host name
disconnect <cn> Break the connection specified by name or number
exit, quit      Exit from the EXEC
name-connection Give a connection a logical name
resume          Make the named connection be current
show <cmd>      Information commands, type "show ?" for list
systat          Show terminal lines and users
telnet <host>   Connect to host using telnet protocol
terminal        Change terminal's parameters, type "terminal ?"
where           Show open connections
<cr>            To resume connection
```

Type **enable** and enter the password to access the privileged command level. Type the **?** (question mark) command to see a list of privileged-level EXEC commands similar to this example:

```
Router#?

clear           Reinitialization functions, type "clear ?" for list
configure       Configure from terminal or over network
connect <host>  Connect to host - same as typing just a host name
debug           Enable debugging functions, type "debug ?" for list
disable         Turn off privileged commands
disconnect <cn> Break the connection specified by name or number
enable          Turn on privileged commands
exit, quit      Exit from the EXEC
name-connection Give a connection a logical name
ping            Send echo messages
reload          Halt and reload system
resume          Make the named connection be current
send <line>|*   Send message to a terminal line or lines
setup           Initialize system configuration
show <cmd>      Information commands, type "show ?" for list
systat          Show terminal lines and users
telnet <host>   Connect to host using telnet protocol
terminal        Change terminal's parameters, type "terminal ?"
test            Run hardware tests, type "test ?"
trace <address> Trace route to <address>
undebug         Disable debugging functions, type "undebug ?" for list
where           Show open connections
write           Write configuration memory, type "write ?" for list
<cr>            To resume connection
```

To return to the user-level prompt, type **disable** at the EXEC prompt.

The EXEC command **configure** begins the configuration mode, where you enter the commands to configure your network server for its particular routing or bridging function. The following section describes the use of this command.

Entering Configuration Mode

Use the privileged EXEC command **configure** to begin configuration of the network server.

Begin by entering the privileged level of the EXEC. This is done by entering the **enable** command at the EXEC prompt:

```
Router>enable
```

The EXEC then prompts you for a privileged-level password:

```
Password:
```

Type in the password. For security purposes, the password will not be displayed. (Also note that the password is case-sensitive.) When you enter the correct password, the system displays the privileged-mode system prompt:

```
Router#
```

To begin configuration mode, enter the **configure** command at the privileged-mode prompt:

```
Router#configure
```

When you enter this command, the EXEC prompts you for the source of the configuration subcommands.

```
Configuring from terminal, memory, or network [terminal]?
```

The default is to type in commands from the terminal console. Pressing the Return key begins this configuration method. Each configuration technique (terminal, memory, and network) is described in more detail later in this chapter.

The EXEC provides you with a simple editor for entering the configuration commands, and explains the editing functions:

```
Enter configuration commands, one per line.
Edit with DELETE, CTRL/W, and CTRL/U;end with CTRL/Z
```

Table 1-1 lists the edit key functions and their meanings.

Table 1-1   Configuration Edit Keys

Key	Meaning
Delete or Backspace	Erases one character.
Ctrl-W	Erases a word.
Ctrl-U	Erases a line.
Ctrl-R	Redisplays a line.
Return	Executes single-line commands.
Ctrl-Z	Ends configuration mode and returns to the EXEC.

Entering the Configuration Commands

The configuration subcommands are categorized by these functions:

- Global configuration commands—Define system-wide parameters.

- Interface subcommands—Define the characteristics of an interface (a serial or Ethernet interface, for example) and must be preceded by an **interface** command.

- Line subcommands—Define the characteristics of a serial terminal line and must be preceded by a **line** command.

- Router subcommands—Configure an IP routing protocol and must be preceded by a **router** command.

The descriptions of the commands include the command type and give examples of their use.

As with EXEC commands, you can type configuration subcommands in uppercase letters, lowercase letters, or both. You may also shorten all commands and other keywords to unique abbreviations. You may add comments by preceding the line with an exclamation point (!). Comments do not affect command processing.

The network server does not display confirmation messages as it executes the commands. If the network server encounters a problem, it displays an error message on the console terminal.

In most cases, you can negate a configuration subcommand or restore a default by typing **no** before the subcommand keyword. You can usually omit the arguments of the subcommand when you negate it with **no.** The command descriptions note any exceptions to these rules.

Examples of Configuration Files

The following examples of configuration files illustrate how to enter the configuration commands.

The EXEC accepts commands in uppercase and lowercase letters. Exclamation points are not parsed and serve as comment lines and delimiters between configuration commands.

Global Configuration Commands

Use global configuration commands to enable functions that affect the system rather than a particular line or interface, and can appear any place within the configuration file. An example of this is the global configuration command to define the host name, or the name of the router:

```
hostname router-1
```

Commands to enable a particular routing or bridging function are also global configuration commands. The following example illustrates how to enable the Xerox Network System (XNS) routing protocol:

```
xns routing 0123.4567.abcd
```

Once enabled, interface characteristics for XNS routing are specified using the **interface** command and XNS-specific interface subcommands. Command descriptions in the sections describing configuration will define the command type.

Interface Subcommands

Interface subcommands modify the operation of an interface such as an Ethernet, FDDI, or serial port. Interface subcommands always follow an **interface** command, which defines the interface type.

The following example illustrates how to enable XNS network 1 on interface Ethernet 0:

```
interface ethernet 0
xns network 1
```

The following example illustrates how to configure the token rotation timer on interface FDDI 0:

```
interface FDDI 0
fddi token-rotation-timer 24000
```

If you forget to enter the **interface** command, the system displays the message "must specify a network interface."

Line Subcommands

Line subcommands modify the operation of a serial terminal line. Line subcommands always follow a **line** command, which defines the line number. If you forget to enter the **line** command, the system displays the message "must specify a line or range of lines."

The following example illustrates how to set the password on line 5:

```
line 5
password secretword
```

Router Subcommands

Router subcommands are used to configure IP routing protocol characteristics and always follow a **router** command. The following example illustrates how to set the maximum hop metric for the Cisco IGRP routing protocol:

```
router igrp
metric maximum-hops 150
```

If you forget to enter the **router** command, the system displays the message "must specify a routing protocol."

Remember to type Ctrl-Z to end your configuration sessions, and to use the **disable** command to leave the privileged mode.

Creating the Configuration File

If you used the **setup** facility's interactive dialog prompts to start your configuration file, it was saved in nonvolatile memory when you finished the prompts. If you chose not to create your configuration file this way, there are several options you may now choose from to create the configuration file.

The network server holds configuration information in two places—in *running memory*, and in *nonvolatile memory*. Configuration information in running memory is temporary and will not be stored if power is shut off. Configuration information in nonvolatile memory is always available.

You use the EXEC command **write memory** to copy current (running) configuration information to nonvolatile memory. This command stores all nondefault configuration information as configuration commands in text format. The command also records a checksum for the information to protect against data corruption.

The EXEC command **show configuration** displays information stored in nonvolatile memory. You can use this command and the **write terminal** command to find differences between the current configuration (that in running memory) and that stored in nonvolatile memory. You use the EXEC command **write erase** to clear the contents of nonvolatile memory.

The **write** commands create their output by examining the state of the system currently running. The output produced by the **write** commands is generated by the software, and will not necessarily match the text the user entered to create the current configuration.

The network server also allows you to store the configuration file on a network host. (This allows you to use an editor on the host to edit and create the configuration file.) Use the EXEC command **write network** to copy the current configuration information to a server host on the network. Use of this command is described later in this section.

Configuring from the Console

To issue configuration commands from the console terminal, enter the EXEC command **configure** at the privileged-level EXEC prompt and enter configuration mode.

The network server responds with this prompt asking you to specify the terminal, a file, or nonvolatile memory as the source of configuration commands.

```
Configuring from terminal, memory, or network [terminal]?
```

To begin configuration, type **terminal** at the prompt or press Return (since terminal is the default) to start command collection. (See the section "Entering Configuration Mode" in this chapter for more information.)

During command collection, the network server accepts one configuration command per line. You can enter as many configuration subcommands as you want.

Type Ctrl-Z when you finish entering configuration commands. This returns you to the EXEC, where you can test your configuration or write the configuration commands to memory.

At periodic intervals, you will want to write the configuration information into nonvolatile memory or to a configuration file stored on a remote host. This will make checking, adding information to, and booting the configuration file an easier task. The procedures for writing information to nonvolatile memory are described next.

Writing the Configuration File to Nonvolatile Memory

After you enter the desired configuration information at the console terminal, use the privileged EXEC command **write memory** to make a copy of the configuration information in the nonvolatile memory. Nonvolatile memory stores the current configuration information in text format as configuration commands, recording only nondefault settings. The memory is checksummed to guard against corrupted data.

As part of its start-up sequence, the network server startup software always checks for configuration information in the nonvolatile memory. If the nonvolatile memory holds valid configuration commands, the network server executes the commands automatically at startup. If the network server detects a problem with the nonvolatile memory or the configuration information it contains, the network server may enter the setup mode, prompting for configuration information. Problems can include a bad checksum for the information in the nonvolatile memory and the absence of critical information.

To display the configuration information stored in the nonvolatile memory, enter the **show configuration** EXEC command at the privileged-mode EXEC prompt.

To clear the contents of the nonvolatile memory, enter the **write erase** EXEC command at the privileged level EXEC prompt.

To re-execute the configuration commands stored in nonvolatile memory, enter **memory** at the configure mode prompt:

```
Configuring from terminal, memory, or network [terminal]?memory
```

Writing the Configuration File to a Remote Host

To store configuration information on a remote host, enter the privileged EXEC command **write network**. This command sends a copy of the current configuration information to a remote host. The command will prompt you for the destination host's address and a file name, as the following example illustrates.

Example:

```
Tokyo#write network
Remote host [131.108.2.155]?
Name of configuration file to write [tokyo-confg]?
Write file tokyo-confg on host 131.108.2.155? [confirm]y
Writing tokyo-confg...
 [OK]
```

To retrieve and/or add to the configuration information stored on a host file on a device on your network, enter **network** at the configure mode prompt (see the section "Entering Configuration Mode" in this chapter for more information):

```
Configuring from terminal, memory, or network [terminal]?network
```

The system will ask you to select a host or network configuration file, for the address of the host, and for a file name. The following example illustrates this process.

Example:

```
Host or network configuration file [host]?
IP address of remote host [255.255.255.255]? 131.108.2.155
Name of configuration file [tokyo-confg]?
Configure using tokyo-confg from 131.108.2.155? [confirm]y
Booting tokyo-confg from 131.108.2.155: !! [OK - 874/16000 bytes]
```

Setting Up Auto Load of the Configuration File

The network server may be configured to automatically load additional configuration information from a network host. You may want to keep an up-to-date version of configuration information on another host, where you can change it as necessary, and use the nonvolatile memory as a bootstrap or backup mechanism. You can instruct the network server to load configuration information over the network by entering the **service config** subcommand and then writing the information to nonvolatile memory using the **write memory** command. Loading configuration information over the network is the default if nonvolatile memory is not installed. (The **service** configuration subcommand is described in the section "Tailoring Use of Network Services" in the "Configuring the System" chapter.)

After loading configuration information from the nonvolatile memory, the network server will attempt to load two configuration files from remote hosts. The first is the network configuration file, which contains commands that apply to all network servers and terminal servers on a network. The second is the host configuration file, which contains commands that apply to one network server in particular.

Using TFTP to Load Configuration Files or System Images

The network server uses the Trivial File Transfer Protocol (TFTP) to load and save system images and configuration files.

Note: TFTP is defined in RFC 783. The details of setting up a TFTP server process and installing system images or configuration files on the server host vary from one operating system to another; see the documentation for your host computer if you need more information about TFTP support.

Loading Configuration Files

The default name of the network configuration file is *network-confg*. The default name for the host configuration file is taken from the host name. The host name can be specified by the **hostname** configuration subcommand or can be derived from the Domain Name System (DNS); see the section "Setting the Host Name" in the "Configuring the System" chapter for more information. To form the host configuration file name, the network server converts the host name to lowercase, stripped of any DNS information, and appends "-confg." If no host name information is available, the default host configuration file name is *router-confg*. Other names for these configuration files can be set using the **boot** command, which is described in the section "Setting Configuration File Specifications" in the "Configuring the System" chapter.

Note: The default host configuration file name has changed in release 9.0 to *router-confg*, from the earlier releases' use of *gateway-confg*.

> **service config**
> **no service config**

To enable the loading of network configuration files at router reboot time, use the **service config** command. The **no** version of this command (the default) disables the loading of these files.

If the network server fails to load a configuration file during startup, it tries again every ten minutes (default setting) until a host provides the requested files. With each failed attempt, the network server displays a message on the console terminal.

If the network server is unable to load the file named `network-confg`, it displays the following message.

```
Booting network-confg... [timed out]
```

Note: Be aware that the system treats network and host configuration files differently when loading new parameters. When a host configuration file is loaded, all terminal line parameters are cleared before setting any new parameters. When a network configuration file is loaded, no old parameters are cleared. This means that terminal line parameters set by the network configuration file, which are generally loaded first, will be reset by the host configuration file, which is generally loaded second.

Loading System Images Over the Network

As configured at the factory, the operating system software executes instructions in the onboard EPROM. You need not change the system EPROMs with each software update. Instead, you can download the latest software over the network. This process is called *netbooting*.

Netbooting works as follows: when you power on your Cisco network server product for the first time, it checks the processor configuration register or the nonvolatile memory for special netbooting instructions. If the system finds no special instructions, it executes the default EPROM software.

If the system finds netbooting instructions, it determines its interface address and then runs a special process to TFTP-load the new software into memory.

You can specify boot loading in two ways. The first way involves setting the low four bits of the processor configuration register; see the appropriate Cisco hardware publication for details. If no bits are set, you must manually boot the system using the System Bootstrap program. If only the low bit is set, the system runs the default software. The system interprets any other binary bit combination as an octal number for use in forming the boot file name. The system forms the boot file name by starting with the word "cisco" and then appending the octal number, a hyphen, and the processor type name. The System Bootstrap program displays the processor type name at system startup.

For example, if bit one in the four-bit field is set and the processor type is CSC/3, the boot file name formed is *cisco2-csc3*. Assuming no other information is available, the system would try to TFTP-load the file *cisco2-csc3* by first sending a broadcast TFTP read request to determine which server host had the file.

The second way to specify netbooting uses the nonvolatile memory option, which enables you to provide more detailed instructions for software downloading. You can use the **boot** configuration command to specify both the boot filename and the IP address of the server host. You must still set the bottom four bits of the configuration register to a netbooting value.

By default, the router uses an Internet address of all ones (255.255.255.255) to broadcast TFTP Read Request message. However, many hosts use an old style of broadcast address consisting of all zeros. You can change the operation of the router to accommodate hosts using the old style of broadcast address by using the **ip broadcast-address** command described in the "Routing IP" chapter.

Note: Netbooting over X.25 and Frame Relay have special configuration considerations; refer to the "Configuring Packet-Switched Software" chapter for these special netbooting considerations.

Monitoring the TFTP Transaction

The TFTP session can sometimes fail. To help determine why a TFTP session failed, TFTP generates a "E" character if it receives an erroneous packet, and an "O" if it receives an out-of-sequence packet. A period (.) indicates a timeout. The transfer session may still succeed even if TFTP generates these characters, but the output is useful for diagnosing the transfer failure.

Using the Flash Memory Card for Storing and Booting System Software

With a CSC-MC+ Flash Memory Card and either a CSC-MCI or CSC-ENVM controller and appropriate cables, system software images may be written to Flash memory for booting. The Flash Memory Card is available for the AGS+, AGS, MGS, and CGS chassis. Refer to the section "Storing and Booting System Software Using the Flash Memory Card" in the "Configuring the System" chapter for a description of the Flash commands. Refer to the *Modular Products Hardware Installation and Reference* publication for hardware installation instructions.

Reloading the Operating System

Use the following EXEC command to halt and restart the network server:

reload

If the system is set to restart on error, it reboots itself.