Using the ROM Monitor

This appendix describes using the ROM monitor (also called the bootstrap program), which is the firmware that runs when you power on or restart a Cisco 2600 series router. During normal operation, the ROM monitor helps to initialize the processor hardware and boot the operating system software. You can also use the ROM monitor to:

- Help you isolate or rule out hardware problems encountered when installing your router.

- Recover your router's Cisco IOS image if the image becomes corrupted.

This appendix contains the following sections:

Entering ROM Monitor Mode

To use the ROM monitor, you must have access to the console port. Refer to the *Cisco 2600 Series Cabling and Setup* quick start guide for information on connecting the console cable.

To enter ROM monitor mode follow these steps:

Step 1   Restart the router with the **reload** command.

```
Router # reload
```

Step 2   Press the **Break** key during the first 60 seconds of the system booting. This forces the router into ROM monitor mode.

Verifying ROM Monitor Mode

To verify that you are in the ROM monitor mode, check that the prompt displayed on your screen is the ROM monitor mode prompt:

```
rommon # >
```

The # is the line number and increases incrementally at each prompt.

From the Cisco IOS software, you can configure the router to automatically enter ROM monitor mode the next time the router boots by setting virtual configuration register bits 3, 2, 1, and 0 to zero. From the console, enter the following configuration command:

configuration-register 0x0

The new configuration register value, 0x0, is effective after the router is rebooted with the **reload** command. The router remains in the ROM monitor and does not boot the operating system.

As long as the configuration register value remains 0x0, you must manually boot the operating system from the console. Refer to the **boot** command in the "Command Descriptions" section on page C-3.

ROM Monitor Commands

Enter **?** or **help** at the ROM monitor mode prompt to see a list of available commands. For example:

```
rommon 1 >  ?
alias      set and display aliases command
boot       boot up an external process
break      set/show/clear the breakpoint
confreg    configuration register utility
cont       continue executing a downloaded image
context    display the context of a loaded image
cookie     display contents of cookie PROM in hex
dev        list the device table
dir        list files in the file system
dis        display instruction stream
dnld       serial download a program module
frame      print out a selected stack frame
help       monitor builtin command help
history    monitor command history
meminfo    main memory information
repeat     repeat a monitor command
reset      system reset
set        display the monitor variables
stack      produce a stack trace
sync       write monitor environment to NVRAM
sysret     print out info from last system return
tftpdnld   tftp image download
unalias    unset an alias
unset      unset a monitor variable
xmodem     x/ymodem image download
rommon 2 >
```

The Cisco 2691 has these additional ROM monitor commands:

```
iomemdef      set IO mem to a default 25%
rommon-pref   select ROMMON
```

Note You can end any command by pressing the **Break** key at the console.

ROM Monitor Syntax Conventions

The ROM monitor syntax in this appendix uses the following conventions:

- Square brackets [ ] denote an optional element. In the following example, the element **abc** is not required, but you can specify it if you choose:

  command [**abc**]

- If a minus option is followed by a colon (for example, [**-s:**]) you must provide an argument for the option.

- A term in italics means that you must fill in the appropriate information. In the following example, you replace the term in italics with the interface type you are using:

  command *type interface*

Command Descriptions

This section lists some useful ROM monitor commands. Refer to the Cisco IOS configuration guides and command references for more information on ROM monitor commands.

- **boot** or **b**—Boot an image.
  - **b** boots the first image in Flash memory.
  - **b** *flash*:[*name*] boots the Cisco IOS software from the Flash memory.
  - **b** *filename tftpserver* boots from the specified file over the network from the specified Trivial File Transfer Protocol (TFTP) server. For example:

    boot c2600-i-mz 172.15.19.11

  - **b** *filename* boots from the boothelper image because it does not recognize the device ID. This form of the command is used to netboot the image named *filename*.

    Cisco 2600 series routers do not have a dedicated boothelper image ([rx]boot) as used by some other Cisco routers. With Cisco 2600 series routers, the first image in Flash memory is invoked as the default boothelper image anytime the ROM monitor does not recognize the device ID in the **boot** command.

    You can override the default boothelper image setting by setting the BOOTLDR monitor environment variable to point to another image. Any system image can be used for this purpose.

  Options to the boot command are **-x**, load image but do not execute, and **-v**, verbose.

  Use the Cisco IOS commands **show version** and **show hardware** to see the source of the currently running image.

- **dir** *device:*[*partition:*]—List the files on the named device. For example:

```
rommon 8 > dir flash:
      File size              Checksum    File name
   2229799 bytes (0x220627)  0x469e      C2600-j-m2.113-4T
```

- **help**—View a summary of ROM monitor commands (equivalent to **?**).

- **meminfo**—Display size in bytes, starting address, available range of main memory, the starting point and size of packet memory, and size of nonvolatile memory (NVRAM). The following example shows the **meminfo** command:

```
rommon 9 > meminfo

Main memory size: 32 MB.
Available main memory starts at 0xa000e000, size 32704KB
IO (packet) memory size: 25 percent of main memory.
NVRAM size: 32KB
```

- **meminfo** [**-l**]—The **meminfo** command with the **-l** option shows supported DRAM configurations. The following example shows an example of the **meminfo -l** command:

```
rommon 10 > meminfo -l

Supported memory configurations:

DIMM 0        DIMM 1
-------------------
              4M
              8M-DUAL
              16M
               32M-DUAL
4M
4M            4M
4M            8M-DUAL
4M            16M
4M            32M-DUAL
8M-DUAL
8M-DUAL       4M
8M-DUAL       8M-DUAL
8M-DUAL       16M
8M-DUAL       32M-DUAL
16M
16M           4M
16M           8M-DUAL
16M           16M
16M           32M-DUAL
32M-DUAL
32M-DUAL      4M
32M-DUAL      8M-DUAL
32M-DUAL      16M
32M-DUAL      32M-DUAL
```

- **reset** or **i**—Reset and initialize the router, similar to power on.
- **tftpdnld**—Download an image using TFTP from a remote server.

Debugging Commands

Most debugging commands are functional only when Cisco IOS software has crashed or is ended. If you enter a debugging command and Cisco IOS crash information is not available, the following error message appears:

```
"xxx: kernel context state is invalid, cannot proceed."
```

- **stack** or **k**—Produce a stack trace.
- **context**—View processor context.
- **frame**—View an individual stack frame.

- **sysret**—View return information from the last booted system image. This information includes the reason for terminating the image, a stack dump of up to eight frames, and, if an exception is involved, the address where the exception occurred. For example:

```
rommon 8 > sysret
System Return Info:
count: 19,  reason: a SegV exception
pc:0x802b1040,  error address: 0x802b1040
Stack Trace:
FP: 0x80908398, PC: 0x802b102c
FP: 0x809083b0, PC: 0x802b0b88
FP: 0x809083d8, PC: 0x8017039c
FP: 0x809083e8, PC: 0x8016f764
```

Configuration Register Commands

The virtual configuration register resides in NVRAM. You can view or modify the virtual configuration register from either the ROM monitor or the operating system software.

To change the virtual configuration register from the ROM monitor, enter **confreg** by itself for menu mode, or enter the new value of the register in hexadecimal.

- **confreg** [*hexnum*]—Change the virtual configuration register to the value specified. The value is always interpreted as hexadecimal. Entering **confreg** without an argument displays the contents of the virtual configuration register and prompts you to alter the contents by describing the meaning of each bit.

    In either case, the new virtual configuration register value is written into NVRAM, but is not effective until you reset or power cycle the router.

    The following display shows an example of the **confreg** command:

```
rommon 7 > confreg


    Configuration Summary
enabled are:
break/abort has effect
console baud: 9600
boot: the ROM Monitor

do you wish to change the configuration? y/n  [n]:  y
enable  "diagnostic mode"? y/n  [n]:  y
enable  "use net in IP bcast address"? y/n  [n]:
enable  "load rom after netboot fails"? y/n  [n]:
enable  "use all zero broadcast"? y/n  [n]:
disable "break/abort has effect"? y/n  [n]:
enable  "ignore system config info"? y/n  [n]:
change console baud rate? y/n  [n]:  y
enter rate: 0 = 9600,  1 = 4800,  2 = 1200,  3 = 2400
            4 = 19200, 5 = 38400, 6 = 57600, 7 = 115200 [0]:  0
change the boot characteristics? y/n  [n]:  y
enter to boot:
 0 = ROM Monitor
 1 = the boot helper image
 2-15 = boot system
    [0]:  0


    Configuration Summary
enabled are:
diagnostic mode
```

```
break/abort has effect
console baud: 9600
boot: the ROM Monitor

do you wish to change the configuration? y/n  [n]:


You must reset or power cycle for new config to take effect
```

Procedures for Recovering Boot and System Images

If your Cisco 2600 series router experiences difficulties and no longer contains a valid Cisco IOS software image in Flash memory, you can recover the Cisco IOS image using one of the following ROM monitor commands:

- **xmodem**—Use this command if the computer attached to your console has a terminal emulator that has Xmodem capability.
- **tftpdnld**—Use this command if you have a TFTP server directly connected to the Ethernet 0 port or Token Ring 0 port.

> **Note** The **tftpdnld** command is not available on the Cisco 2691 router. In addition to the **xmodem** command, the router can be booted with a good image loaded in the external compact Flash slot.

Using the xmodem Command

The **xmodem** command establishes a connection between a console and the router console port for disaster recovery if both the boot and system images are erased from Flash memory.

xmodem [*filename*]—Establishes an Xmodem connection between the console and the router. The optional parameter *filename* specifies the source file containing the Cisco IOS image.

Other options include the following:

- **c**—Use cyclic redundancy check (CRC-16)
- **y**—Use Ymodem transfer protocol
- **r**—Copy the image to dynamic random-access memory (DRAM) for launch
- **x**—Do not launch image on completion of download

Using the tftpdnld Command

The **tftpdnld** command downloads a Cisco IOS software image from a remote server accessible from an Ethernet or Token Ring network interface on a Cisco 2600 series router. The **tftpdnld** command downloads the Cisco IOS software image into Flash memory using TFTP.

The following software restrictions apply when using the **tftpdnld** command:

- Ethernet platform—Only accepts and sends Ethernet V2.0 data packets.

- Token Ring platform—Only accepts and sends Token Ring frames with IEEE802.3 SNAP frames. Does not support any frames with routing information fields (RIFs), limiting all use of the **tftpdnld** command to a TFTP server on the local ring. If the TFTP server resides off the local ring, you must establish a path to the server through a router or transparent bridge from the local ring.

tftpdnld [**-h**] [**-r**]—Begins the TFTP copy procedure.

Options include the following:

- **h**—Displays the **tftpdnld** command help screen.
- **r**—Loads the Cisco IOS software image only to DRAM and launches the image without writing the image into Flash memory.

The **tftpdnld** command requires that you specify certain variables when you issue the command. The syntax for specifying the variables is:

```
VARIABLE_NAME=value
```

The variables that you must specify include the following:

- IP_ADDRESS—IP address for the router you are using.
- IP_SUBNET_MASK—Subnet mask for the router you are using.
- DEFAULT_GATEWAY—Default gateway for the router you are using.
- TFTP_SERVER—IP address of the server from which you want to download the image file.
- TFTP_FILE—Name of the file that you want to download.

The following **tftpdnld** command variables are optional:

- TFTP_VERBOSE—Print setting. The default is 1.
    - 0=quiet—After you enter the **tftpdnld** command, the prompt

      ```
      Do you wish to continue? y/n:
      ```

      is the only information that displays until the command completes successfully or fails.
    - 1=progress—Displays the state of the required **tftpdnld** command variables. Also displays progress characters to indicate successful and lost packet transmissions.
    - 2=verbose—Displays all progress print setting messages, along with error information. The information provided by this print setting may be useful when debugging interface link and configuration problems that may prevent connecting to the TFTP server.
- TFTP_RETRY_COUNT—Number of times from 1 to 65535 that the ROM monitor will retry ARP and ACK. The default is 7 retries.
- TFTP_TIMEOUT—Overall timeout of the download operation in seconds. The range is from 1 to 65535 seconds. The default is 7200 seconds.
- TFTP_CHECKSUM—Performs a checksum test on the image. 0=checksum off, 1=checksum on. The default is 1.
- FE_SPEED_MODE—Sets the Fast Ethernet speed and duplex mode. 0=10 Mbps half-duplex mode, 1=10 Mbps full-duplex mode, 2=100 Mbps half-duplex mode, 3=100 Mbps full-duplex mode, 4=auto-negotiation. The default is 4.

> **Note** Specify the FE_SPEED_MODE variable only for routers with a Fast Ethernet network interface.

- TR_SPEED_MODE—Sets the Token Ring speed and duplex mode. 0=4 Mbps half-duplex mode, 1=4 Mbps full-duplex mode, 2=16 Mbps half-duplex mode, 3=16 Mbps full-duplex mode. The default is 2.

> **Note** Specify the TR_SPEED_MODE variable only for routers with a Token Ring network interface; or for routers with both an Ethernet and a Token Ring port, those routers that are set to use the Token Ring port with the **tftpdnld** command.

- TR_1E1R_PORT—Sets the port to be used with the **tftpdnld** command. 0=Use Ethernet port, 1=Use Token Ring port. The default is 0.

> **Note** Specify the TR_1E1R_PORT variable only for those routers with both an Ethernet and a Token Ring port.

After you specify the variables, you must reenter the **tftpdnld** command. For example:

```
rommon 1 > IP_ADDRESS=172.15.19.11
rommon 2 > IP_SUBNET_MASK=255.255.255.0
rommon 3 > DEFAULT_GATEWAY=172.16.19.1
rommon 4 > TFTP_SERVER=172.15.20.10
rommon 5 > TFTP_FILE=/tftpboot/c2600-i-mz
rommon 6 > tftpdnld

    IP_ADDRESS=172.15.19.11
    IP_SUBNET_MASK=255.255.255.0
    DEFAULT_GATEWAY=172.16.19.1
    TFTP_SERVER=172.15.20.10
    TFTP_FILE=/tftpboot/2600-i-mz

Invoke this command for disaster recovery only.
WARNING: all existing data in all partitions on flash will be lost!
Do you wish to continue? y/n: [n]:
```

Enter **y** to begin downloading the Cisco IOS software image. When the process is complete, the ROM monitor mode prompt appears on your screen.