



CHAPTER 1

ROM Monitor Overview and Basic Procedures

This chapter provides an overview of ROM Monitor concepts and operations. For instructions on how to perform various tasks in ROM Monitor mode (ROMMON), see the other chapters in this book.

This chapter includes the following main topics:

- [ROM Monitor Overview, page 1-1](#)
- [Entering ROM Monitor Mode, page 1-3](#)
- [ROM Monitor Commands, page 1-8](#)
- [Displaying the Configuration Register Setting, page 1-10](#)
- [Environment Variable Settings, page 1-11](#)
- [Exiting ROM Monitor Mode, page 1-13](#)
- [Additional References, page 1-15](#)

ROM Monitor Overview

The *ROM Monitor* is a bootstrap program that initializes the hardware and boots the Cisco IOS XR software when you power on or reload a router. A version of the ROM Monitor software exists on each card. If the Cisco IOS XR software cannot boot on a card, the card startup ends in ROM Monitor mode. When you connect a terminal to a card that is in ROM Monitor mode, the ROM Monitor CLI prompt is displayed.

Cisco XR 12000 Series Router Prompt

```
rommon1>
```

During normal operation, users do not see the ROM Monitor prompt or use ROM Monitor mode. ROM Monitor mode is used only in special circumstances, such as reinstalling the entire software set, resetting the router password, or specifying a configuration file to use at startup.

The ROM Monitor software is known by many names. It is sometimes called *ROMMON* because of the CLI prompt in ROM Monitor mode. The ROM Monitor software is also called the *boot software*, *boot image*, or *boot helper*. On Cisco XR 12000 Series Routers, the boot helper software is different from the ROM Monitor software, and it is described in the [About Boothelper in Cisco XR 12000 Series Routers, page 2-25](#).

Although it is distributed with routers that use the Cisco IOS XR software, ROM Monitor is a separate program from the Cisco IOS XR software. During normal startup, the ROM Monitor initializes the cards, and then control passes to the Cisco IOS XR software. After the Cisco IOS XR software takes over, ROM Monitor is no longer in use.

A copy of the ROM Monitor software exists on each card. If a card fails to boot the Cisco IOS XR software, the card is forced to run from the ROM Monitor mode. Because a card in ROM Monitor mode is not running the Cisco IOS XR software, that card becomes unavailable for normal router operations.

Understanding the Role of the DSC

The active Route Processor (RP) for the owner Secure Domain Router (SDR) is called the Designated Shelf Controller (DSC). This card performs system-wide functions, including the creation of additional non-owner SDRs. If the active DSC is placed in ROM Monitor mode, it is no longer running the Cisco IOS XR software. If a standby DSC is available, the standby RP resumes router operations. If a standby DSC is not available or is also placed in the ROM Monitor mode, then router operations stop.

Designated Secure Domain Router Shelf Controller (DSDRSC)

In addition to the DSC, each SDR in the system contains at least one DSDRSC. The DSDRSCs provide configuration and administrative functions for a single SDR only. The DSC also serves as the DSDRSC for the owner SDR.

When the Designated Secure Domain Router Shelf Controller (DSDRSC) in an SDR is placed in ROM Monitor mode, the router operations are transferred to the standby DSDRSC (if available). If both the primary and standby DSDRSCs are in ROM Monitor mode, then the router operations cease because the Cisco IOS XR software is no longer running.

Accessing ROM Monitor Mode on the DSC

In most situations, you interact with the ROM Monitor mode only on the DSC (DSDRSC for the owner SDR). The DSC contains the administration configuration for the entire system and distributes the required software to all the other nodes in the router. All the tasks in this document describe ROM Monitor mode accessed through the DSC for the system.



Note

The only time you will interact with a non-DSC node is when reinstalling the Cisco IOS XR software on the standby PRP of a Cisco XR 12000 Series Router. For more information, see [Reinstalling Cisco IOS XR Software on Cisco XR 12000 Series Routers, page 2-23](#).

Remember, the DSC is also the following:

- Active RP of rack 0
- DSDRSC for the owner SDR

Environmental Variables and the Configuration Register

Two primary connections exist between ROM Monitor and the Cisco IOS XR software: the ROM Monitor environment variables and the configuration register.

The ROM Monitor environment variables define the location of the Cisco IOS XR software and describe how to load it. After ROM Monitor has initialized the card, it uses the environment variables to locate and load the Cisco IOS XR software.

The *configuration register* is a software setting that controls how a card starts up. One of the primary uses of the configuration register is to control whether the card starts in ROM Monitor mode or Administration EXEC mode. The configuration register is set in either ROM Monitor mode or

Administration EXEC mode as needed. Typically, you set the configuration register using the Cisco IOS XR software prompt on the active RP when you need to use ROM Monitor mode. When the maintenance in ROM Monitor mode is complete, you change the configuration register so the card reboots with the Cisco IOS XR software.

**Note**

Throughout this guide, the term *PRP* is used to refer to the PRP cards supported on Cisco XR 12000 Series Routers. Cisco XR 12000 Series Router supports both the PRP-2 and the PRP-3 cards. If a feature or an issue applies to only one platform, the accompanying text specifies the platform.

Accessing ROM Monitor Mode with a Terminal Connection

When an RP is in ROM Monitor mode, you can access the ROM Monitor software only from a terminal connected directly to the console port of the card. Because the Cisco IOS XR software (EXEC mode) is not operating, the nonmanagement interfaces (such as POS interfaces) are not accessible. Basically, all Cisco IOS XR software resources are unavailable. The hardware is there, but no configuration exists to make use of the hardware.

Network Management Access and ROM Monitor Mode

Some people get confused when they start to use ROM Monitor mode. It is important to remember that ROM Monitor mode is a router mode, not a mode within the Cisco IOS XR software. It is best to remember that ROM Monitor software and the Cisco IOS XR software are two separate programs that run on the same router. At any given time, the router is running one of these programs, but it never runs both at the same time.

One area that can be confusing when using ROM Monitor and the Cisco IOS XR software is the area that defines the IP configuration for the Management Ethernet interface. Most router users get comfortable with configuring the Management Ethernet interface in the Cisco IOS XR software. When the router is in ROM Monitor mode, however, the router is not running the Cisco IOS XR software, so that Management Ethernet interface configuration is not available.

To access other devices, such as a TFTP server, while in ROM Monitor mode on the **Cisco XR 12000 Series Router**, you must configure the ROM Monitor variables with IP access information.

On Cisco XR 12000 Series Routers, you must configure the Boothelper software, as described in [About Boothelper in Cisco XR 12000 Series Routers, page 2-25](#).

Entering ROM Monitor Mode

The following sections describe two ways to enter ROM Monitor mode:

- [Resetting the Configuration Register and Reloading a DSC to ROM Monitor Mode, page 1-3](#)
- [Manually Halting the Initialization Process During System Reload, page 1-8](#)

Resetting the Configuration Register and Reloading a DSC to ROM Monitor Mode

In normal operating conditions, it should not be necessary to use ROM Monitor mode. If you do find it necessary to place a designated shelf controller (DSC) in ROM Monitor mode, make sure that the system is in a steady state and that you are prepared for the consequences of a system reload. In particular, verify the items described in the [“Prerequisites” section on page 1-4](#).

Prerequisites

Before you place a DSC in ROM Monitor mode, verify that the system is in a steady state:

1. Prepare the RSP card:
 - a. Anticipate substantial downtime, including the loss of packet forwarding on the system.
 - b. Verify the sanity of the configuration file system using the **cfs check** command in EXEC mode.
 - c. Verify that all changes to the active router configuration are saved with the **commit** command in any configuration mode.
 - d. Verify that all changes to the active software set are saved with the **install commit** command in Administration EXEC mode.
 - e. Verify that all install commit processes are complete with the **show install committed** command in Administration EXEC mode. This command displays the committed packages that become active during the next router boot. If any of the processes are not committed, use the **install commit** command in the Administration mode.
2. Verify that the other nodes in the system are in a steady state:
 - a. If a standby RP is installed, verify that it is in the ready state with the **show redundancy** command in EXEC mode.
 - b. Verify that all available nodes in the system are in IOS XR RUN state with the **show platform** command in EXEC mode.

After you have verified that the system is in a stable state, you can enter ROM Monitor mode by setting the configuration register setting and entering the **reload** command, as described in the following steps:


SUMMARY STEPS

1. Verify that the router is in a steady state.
2. Connect a terminal to the DSC console port and log in to the router.
3. **admin**
4. Place the DSC, or all RPs in ROM Monitor mode:
 - Place only the DSC in the ROM Monitor mode:
 - a. **config-register 0x0**
 - b. **exit**
 - c. **reload**

or
 - Place all RPs in the ROM Monitor mode:
 - a. **config-register 0x0 location all**
 - b. **reload location all**

DETAILED STEPS

	Command or Action	Purpose
Step 1	Verify that the router is in a steady state.	Ensures that all configurations are saved and that no installation processes are running. <ul style="list-style-type: none">For more information, see the “Prerequisites” section on page 1-4.
Step 2	Connect a terminal to the DSC console port and log in to the router.	Connects a terminal or PC to the DSC console port and establishes a router management session. <ul style="list-style-type: none">For more information on connecting a terminal, see <i>“Connecting and Communicating with the Router”</i> in <i>Cisco IOS XR Getting Started Guide for the Cisco XR 12000 Series Router</i>.

	Command or Action	Purpose
Step 3	admin Example: RP/0/0/CPU0:router# admin	Enters administration EXEC mode.
Step 4	config-register 0x0 exit reload or config-register 0x0 location all reload location all Examples: RP/0/0/CPU0:router(admin)# config-register 0x0 RP/0/0/CPU0:router(admin)# exit RP/0/0/CPU0:router# reload Or, RP/0/0/CPU0:router(admin)# config-register 0x0 location all RP/0/0/CPU0:router(admin)# reload location all	Enter the following commands to place only the DSC in ROM Monitor mode: <ol style="list-style-type: none"> Enter the config-register 0x0 command to set the configuration register for ROM Monitor mode during the next card reload. Enter the exit command to exit administration EXEC mode. Enter the reload command to reload the DSC and enter ROM Monitor mode. <p>Note If there is a standby DSC, the configuration register on the standby DSC is also set to 0x0. When you place the active RP in ROM Monitor mode, the system fails over to the standby RP, which then becomes the active RP. If both RPs need to be in ROM Monitor mode, connect to the new active RP and enter the reload command.</p> Enter the following commands to place all RPs and SCs in ROM Monitor mode: <ol style="list-style-type: none"> Enter the config-register 0x0 location all command to reset the configuration register for all RPs in the system. Enter the reload location all command in administration EXEC mode to reload all RPs in the system. <p>Note Make sure you have access to the console ports of both RSP0 and RSP1 cards on the system. To enter the system to the ROM Monitor mode, press Ctrl-C a few times on both RSP0 and RSP1 consoles until you get to the ROM Monitor mode.</p> <p> Caution Resetting the configuration register may change the baud rate for the console.</p>

**Tip**

To verify the configuration register setting, enter the **show variables boot** command in the administration EXEC mode.

Examples

The following examples show how to place the DSC in ROM Monitor mode:

- [Verifying the Router State: Example, page 1-7](#)
- [Placing the DSC in ROM Monitor Mode: Example, page 1-7](#)

Verifying the Router State: Example

The following example shows the redundancy roles of both RPs and shows that both are operating in IOS XR RUN state:

```
RP/0/0/CPU0:router# show redundancy

Sun Jun  6 13:12:19.880 DST
Redundancy information for node 0/0/CPU0:
=====
Node 0/0/CPU0 is in ACTIVE role
Node 0/0/CPU0 has no valid partner

Reload and boot info
-----
PRP reloaded Sat Jun  5 00:09:00 2010: 1 day, 13 hours, 3 minutes ago
Active node booted Sat Jun  5 00:09:00 2010: 1 day, 13 hours, 3 minutes ago

read_last_reboot_record: reboot history looks corrupted (index = 4096)
Unable to read last reboot record, err 89(Function not implemented)
Active node reload : Unable to retrieve reboot reason

RP/0/0/CPU0:router# show platform

Sun Jun  6 13:15:59.580 DST
Node          Type          PLIM          State          Config State
-----
0/0/CPU0     PRP(Active)   N/A           IOS XR RUN     PWR,NSHUT,MON
0/1/CPU0     L3 Service Eng N/A           Admin Down     PWR,SHUT,MON
0/2/CPU0     L3LC Eng 3    OC3-ATM-4     IOS XR RUN     PWR,NSHUT,MON
0/3/CPU0     L3LC Eng 5+   Jacket Card   IOS XR RUN     PWR,NSHUT,MON
0/3/1        SPA           SPA-IPSEC-2G-2  READY          PWR,NSHUT
0/3/2        SPA           SPA-1XCHSTM1/OC  READY          PWR,NSHUT
0/4/CPU0     L3LC Eng 5    Jacket Card   IOS XR RUN     PWR,NSHUT,MON
0/4/0        SPA           SPA-5X1GE      READY          PWR,NSHUT
```

Placing the DSC in ROM Monitor Mode: Example

The following example shows how to place the RP0 in the ROM Monitor mode:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# config-register 0x0

Successfully set config-register to 0x0 on node 0/0/CPU0
Successfully set config-register to 0x0 on node 0/1/CPU0
RP/0/0/CPU0:router(admin)# reload

Proceed with reload? [confirm]
System Bootstrap, Version 12.0(20040624:164256) [assafb-misc1 1.14dev(0.91)] DEV
ELOPMENT SOFTWARE
Copyright (c) 1994-2004 by cisco Systems, Inc.

DRAM DIMM Slot 1: 512M found, Slot 2: Empty
MPC7450 platform with 524288 Kbytes of main memory

rommon 1 >
```

Manually Halting the Initialization Process During System Reload

To force the DSC to stop loading and enter ROM Monitor mode, press **Ctrl-J** when you see the following message:

```
MBI validation sending request.
HIT Ctrl-J
TYPE 'Send Break'to abort
```

This message usually appears during the first 20 seconds of system startup. Press the **Ctrl-J** key combination immediately. This ends your Telnet session to the console or auxiliary port. Enter **send break** and press the **Return** key repeatedly to ensure that the initialization process stops and the system enters the ROM Monitor mode.

This operation can be performed only from a terminal directly connected to the DSC console port. For more information, see the “Connecting and Communicating with the Router” section in *Cisco IOS XR Getting Started Guide for the Cisco XR 12000 Series Router*.



Note

When the DSC is placed in ROMMON, it switches over to the standby DSC, which can then also be placed in ROMMON. Repeat this process for both RP cards.

ROM Monitor Commands

The commands in the ROM Monitor mode are different from those available in the Cisco IOS XR software. You can run ROM Monitor commands only while in ROM Monitor mode, and you cannot run Cisco IOS XR software commands. This section includes the following topics:

- [Commonly Used ROM Monitor Commands, page 1-8](#)
- [Displaying the Available ROM Monitor Commands, page 1-9](#)
- [Changing the ROM Monitor Prompt, page 1-10](#)


Commonly Used ROM Monitor Commands

[Table 1-1](#) summarizes the commands commonly used in ROM Monitor. For specific instructions on using these commands, refer to the relevant procedure in this document.

Table 1-1 Commonly Used ROM Monitor Commands

ROMMON Command	Description
<code>boot image</code>	Manually boots a vm Cisco IOS XR software image.
<code>boot image -o config-file-path</code>	Manually boots the Cisco IOS XR software with a temporary alternative administration configuration file.
<code>boot image -a config-file-path</code>	Manually boots the Cisco IOS XR software with an alternative SDR configuration file.
<code>cookie</code>	Displays the system cookie.

Table 1-1 Commonly Used ROM Monitor Commands (continued)

ROMMON Command	Description
confreg	Changes the config-register setting.  Note When the value of confreg is 0, it means autoboot is disabled and you need to manually boot the Cisco IOS XR software image from the ROM Monitor mode. However, if the value of confreg is non-zero value of 0x2, it means autoboot is enabled and the ROM Monitor mode automatically boots the Cisco IOS XR software image given in the BOOT= environment variable.
dev	Displays the available local storage devices (for example, disk0: and disk1:).
dir	Displays the files on a storage device.
reset	Resets the node.
set	Displays the currently set ROM Monitor environmental settings.
sync	Saves the new ROM Monitor environmental settings.
unset	Removes an environmental variable setting.
version	Displays the ROM Monitor version.

Displaying the Available ROM Monitor Commands

Table 1-2 describes the available **help** commands for ROM Monitor mode.

Table 1-2 Help Commands in ROMMON

Command	Description
help or ?	Displays a summary of all available ROM Monitor commands.
-?	Displays information about command syntax.

**Note**

Commands are case sensitive. You can halt any command by pressing **Ctrl-C**.

Examples

The following example shows what appears when you enter the **?** command on a Cisco XR 12000 Series Router:

```
rommon 2 > ?

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
dev           list the device table
dir           list files in file system
dis           disassemble 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
unalias      unset an alias
unset        unset a monitor variable

```

The following example shows the parameters for the **dir** (directory) command:

```

rommon 2 > dir -?
bad device name
usage: dir <device>

```

Changing the ROM Monitor Prompt

You can change the prompt in ROM Monitor mode by using the **PS1=** command as shown in the following example:

```
rommon 2 > PS1= "GSR_ROMMON_2! >"
```

Changing the prompt is useful if you are working with multiple routers in ROM Monitor at the same time. This example specifies that the prompt is **GSR_ROMMON_2** followed by the line number.

Displaying the Configuration Register Setting

To display the current configuration register setting, enter the **confreg** command without parameters as follows:

```

rommon 2 > confreg

          Configuration Summary
(Virtual Configuration Register: 0x0)
enabled are:
console baud: 9600
boot: the ROM Monitor

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

```

The configuration register setting is labeled Virtual Configuration Register. Enter the **no** command to avoid changing the configuration register setting. For more information about exiting the ROM Monitor mode or changing the configuration setting, see the [“Exiting ROM Monitor Mode”](#) section on page 1-13.

Environment Variable Settings

The ROM Monitor environment variables define the attributes of the ROM Monitor, such as the IP address for an RP control Ethernet port or the location of the Cisco IOS XR software and describe how to load it. Environmental variables are entered like commands and are always followed by the equal sign (=). Environment variable settings are entered in capital letters, followed by a definition. For example:

```
TURBOBOOT=on,disk0,format
```

Under normal operating conditions, you do not need to modify these variables. They are cleared or set only when you need to make changes to the way ROM Monitor operates.

This section includes the following topics:

- [Frequently Used Environmental Variables, page 1-11](#)
- [Displaying Environment Variable Settings, page 1-12](#)
- [Entering Environment Variable Settings, page 1-12](#)
- [Saving Environment Variable Settings, page 1-12](#)

Frequently Used Environmental Variables

Table 1-3 shows the main ROM Monitor environmental variables. For instructions on how to use these variables, see the relevant instructions in this document.

Table 1-3 Frequently Used ROM Monitor Environmental Variables

Environmental variable	Description
TFTP_SERVER = <i>ip_address</i>	Sets the IP address of the TFTP server where a bootable software image is located.
TFTP_FILE = <i>drive : path / file</i>	Sets the directory and filename of a bootable software image.
TURBOBOOT = <i>on, boot-device, options</i>	Completely replaces the existing software when the router is reloaded.
BOOT = <i>drive : path / file</i>	Identifies the boot software for a node. This variable is usually set automatically when the router boots.
AUX_AUTHEN_LEVEL = <i>number</i>	Bypasses ksh authentication. A reboot is required only on the card that has to bypass authentication.
IOX_ADMIN_CONFIG_FILE = <i>drive : path / file</i>	Permanently changes the location of the default administration configuration file.
IOX_CONFIG_FILE = <i>drive : path / file</i>	Permanently changes the location of the SDR configuration file.
IOX_CONFIG_MEDIUM = <i>drive : path</i>	Permanently changes the default location where configuration files are saved.

Displaying Environment Variable Settings

To display the current environment variable settings, enter the **set** command:

```
rommon 2> set

PS1=rommon ! >
RET_2_RUTC=1142837696
CONFIG_FILE=
NT_K=0:0:0:0
CONFGEN=74
CHASSIS_SN=TBM10080357
IOX_ADMIN_CONFIG_FILE=
IP_SUBNET_MASK=255.255.255.0
DEFAULT_GATEWAY=172.29.52.1
IP_ADDRESS=172.29.52.226
RET_2_RTS=08:45:17 UTC Tue Jul 3 2007
RET_2_RCALTS=1183452318
BOOTLDR=bootflash:c12kprp-boot-mz.120-32.S7.bin
MIRROR_ENABLE=Y
BOOT_DEV_SEQ_CONF=disk0;;disk1:
?=0
TURBOBOOT=
BSI=0
BOOT=disk0:c12k-os-mbi-3.9.0.08I/mbiprp-rp.vm,1;
BOOT_DEV_SEQ_OPER=disk0;;disk1:
ReloadReason=1
```

Entering Environment Variable Settings

Environment variable settings are entered in capital letters, followed by a definition. The following example shows the environmental variables used to configure the control Ethernet port on a Cisco XR 12000 Series Router:

```
rommon 1> IP_ADDRESS=1.1.1.1
rommon 2> IP_SUBNET_MASK=255.255.254.0
rommon 3> DEFAULT_GATEWAY=1.1.0.1
```

Saving Environment Variable Settings

To save the current environment variable settings, enter the **sync** command:

```
rommon 1> sync
```



Note

Environmental values that are not saved with the **sync** command are discarded whenever the system is reset or booted.

Exiting ROM Monitor Mode

To exit ROM Monitor mode, you must change the configuration register to 0x102 and reset the RP. This process can be done by either entering CLI commands or responding to prompts.



Tip

The first RP to enter EXEC mode becomes the DSC. You can determine which RP is the DSC by resetting that card to EXEC mode first and then waiting 1 to 2 minutes to allow it to boot fully. You can also switchover to the standby DSDRSC at any time with the **redundancy switchover** command in EXEC mode.

The following sections describe ways to exit the ROM Monitor mode:

- [Resetting to EXEC Mode with CLI Commands, page 1-13](#)
- [Resetting the Configuration Register Using Prompts, page 1-14](#)

Resetting to EXEC Mode with CLI Commands

Perform this task to reset the configuration register in ROM Monitor mode and start the RP in EXEC mode.

SUMMARY STEPS

1. `confreg 0x102`
2. `reset`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>confreg 0x102</code> Example: <code>rommon B1> confreg 0x102</code>	Resets the configuration register to enter EXEC mode after the system is reset.
Step 2	<code>reset</code> Example: <code>rommon B1> reset</code>	Resets and initializes the router.

Resetting the Configuration Register Using Prompts

In ROM Monitor mode, you can change the configuration register value using the configuration register prompts, as shown in this procedure.

SUMMARY STEPS

1. **confreg**
2. Respond to each prompt as instructed.
3. **reset**

DETAILED STEPS

	Command or Action	Purpose
Step 1	confreg Example: rommon B1> confreg	Starts the configuration register configuration prompts.
Step 2	Respond to each prompt as instructed.	See the example that follows this procedure for more information.
Step 3	reset Example: rommon B2> reset	Resets and initializes the router.

Examples

The following example shows the commands required and the prompts that appear when you reset the RP to EXEC mode using the configuration register prompts:

```
rommon 1>
confreg

          Configuration Summary
(Virtual Configuration Register: 0x0)
enabled are:
console baud: 9600
boot: the ROM Monitor

do you wish to change the configuration? y/n [n]: y
enable "diagnostic mode"? y/n [n]: n
change console baud rate? y/n [n]: n
change the boot characteristics? y/n [n]: y
enter to boot:
  0 = ROM Monitor
  1 = MBI Validation Boot Mode
  [0]: 1

          Configuration Summary
(Virtual Configuration Register: 0x102)
enabled are:
console baud: 9600
boot: image specified by the boot system commands
```

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

```
You must reset or power cycle for new config to take effect
rommon B2> reset
```

**Note**

MBI validation mode causes the RP to boot the startup Cisco IOS XR software and configuration.

Additional References

The following sections provide references related to the ROM Monitor.

Related Documents

Related Topic	Document Title
Connecting a terminal to a router	“Connecting and Communicating with the Router” in <i>Cisco IOS XR Getting Started Guide for the Cisco XR 12000 Series Router</i>
Configuring a router with Cisco IOS XR software	Cisco IOS XR Software Documentation: http://www.cisco.com/en/US/products/ps5845/tsd_products_support_series_home.html

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/support

