Cisco cBR Converged Broadband Routers High Availability Configuration Guide for Cisco IOS XE Amsterdam 17.3.x

First Published: 2020-09-30

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

© 2020 Cisco Systems, Inc. All rights reserved.

CONTENTS

CHAPTER 1 **Cisco IOS-XE In-Service Software Upgrade Process** 1

- Hardware Compatibility Matrix for the Cisco cBR Series Routers 1
- Information about In-Service Software Upgrade 2
- How to Configure In-Service Software Upgrade 3
  - Configuring Subpackage Upgrade 3
    - Subpackages Upgrade 3
  - Line Card Only In-Service Software Upgrade 4
  - ISSU Upgrade Across Major Releases 5
- Additional References 5
- Feature Information for In-Service Software Upgrade 6

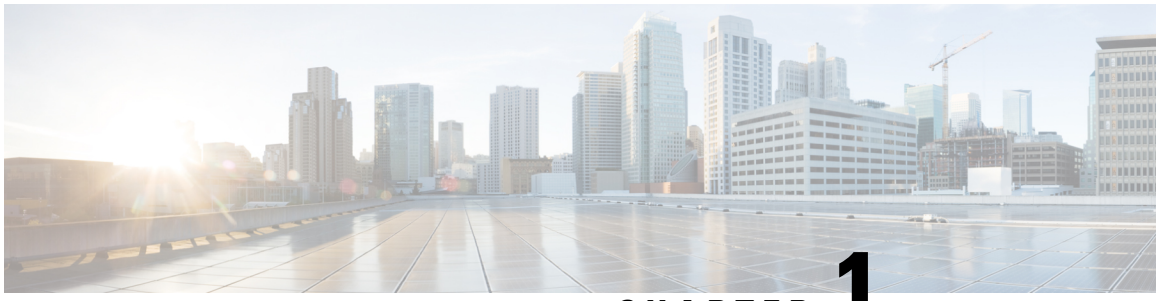
CHAPTER 2 **Supervisor Redundancy** 7

- Hardware Compatibility Matrix for the Cisco cBR Series Routers 7
- Prerequisites for Supervisor Redundancy 8
- Information About Supervisor Redundancy 9
  - Switchover Procedure 9
  - Using Redundant File Systems 10
  - Console Port Usage After Supervisor Switchover 12
  - Benefits 12
- How to Configure Supervisor Redundancy 12
  - Forcing Switchover 12
  - Changing the System Boot Behavior 13
  - Saving a Configuration File to the Bootflash or Hard Disk 16
- Verifying the Supervisor Redundancy Configuration 17
  - Verifying Supervisor Redundancy 17
  - Verifying Supervisor Switchover 20

Configuration Example for Supervisor Redundancy 21
Additional References 21
Feature Information for Supervisor Redundancy 22

CHAPTER 3 **Line Card Redundancy** 23

Hardware Compatibility Matrix for the Cisco cBR Series Routers 23
Prerequisites for Line Card Redundancy 24
Restrictions for Line Card Redundancy 25
Information About Line Card Redundancy 25
How to Configure Line Card Redundancy 26
Configuring Line Card Manual Switchover 26
Configuring N+1 Line Card Redundancy 27
Verifying the Line Card Redundancy Configuration 28
Additional References 32
Feature Information for Line Card Redundancy 32



CHAPTER 1

Cisco IOS-XE In-Service Software Upgrade Process

Cisco cBR-8 Routers support the In-Service Software Upgrades (ISSU) for redundant platforms.

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://tools.cisco.com/ITDIT/CFN/. An account on http://www.cisco.com/ is not required.

Contents

- Hardware Compatibility Matrix for the Cisco cBR Series Routers, on page 1
- Information about In-Service Software Upgrade, on page 2
- How to Configure In-Service Software Upgrade, on page 3
- Additional References, on page 5
- Feature Information for In-Service Software Upgrade, on page 6

Hardware Compatibility Matrix for the Cisco cBR Series Routers

Note The hardware components that are introduced in a given Cisco IOS-XE Release are supported in all subsequent releases unless otherwise specified.

Table 1: Hardware Compatibility Matrix for the Cisco cBR Series Routers

Cisco CMTS Platform	Processor Engine	Interface Cards
Cisco cBR-8 Converged Broadband Router	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 Supervisor: • PID—CBR-SUP-250G • PID—CBR-CCAP-SUP-160G	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 CCAP Line Cards: • PID—CBR-LC-8D30-16U30 • PID—CBR-LC-8D31-16U30 • PID—CBR-RF-PIC • PID—CBR-RF-PROT-PIC • PID—CBR-CCAP-LC-40G • PID—CBR-CCAP-LC-40G-R • PID—CBR-CCAP-LC-G2-R • PID—CBR-SUP-8X10G-PIC • PID—CBR-2X100G-PIC Digital PICs: • PID—CBR-DPIC-8X10G • PID—CBR-DPIC-2X100G Cisco cBR-8 Downstream PHY Module: • PID—CBR-D31-DS-MOD Cisco cBR-8 Upstream PHY Modules: • PID—CBR-D31-US-MOD

Information about In-Service Software Upgrade

Cisco cBR-8 Routers support the In-Service Software Upgrades (ISSU) for redundant platforms. The ISSU process allows software to be updated or otherwise modified while packet forwarding continues with the benefit of LCHA.

For the Cisco cBR Series Routers, ISSU-compatibility depends on the software subpackage being upgraded and the hardware configuration.

The specific procedures in this document represent supported and tested installation sequences. The Cisco IOS-XE system software allows other installation sequences for special purposes under the guidance of Cisco customer support representatives, but the steps in this document should be followed otherwise. These steps should be followed completely, as the Cisco cBR Series Routers are designed to run one version of Cisco

IOS-XE on an SUP, and running subpackages from different versions of Cisco IOS-XE can cause unexpected router behavior.

How to Configure In-Service Software Upgrade

This section describes the configuration of the ISSU feature:

Configuring Subpackage Upgrade

Subpackages Upgrade

Subpackage upgrade allows a subset of the running software to be upgraded. It is intended for patching small and targeted fix instead of full image upgrade. Subpackage upgrade supports both single and dual SUP setup.

Single SUP Subpackages Upgrade

Before you begin

Be sure to complete the following prerequisites before running the ISSU process:

- Config register autoboot enabled.
- Target patch copied to active SUP in the same directory of the packages.conf file system is booted up with.
- If needed copy patch info file to SUP.
- Enough bootflash disk space on SUP.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**request platform software package install rp** *rp-slot* **file bootflash:** **Example:** `Router# request platform software package install rp 1 file bootflash:cbrsup-universalk9.03.17.00.S.156-1.S-std.SPA.bin`	Upgrades the cBR-8 router with one SUP using subpackages ISSU procedure.

Dual SUPs Subpackages Upgrade

Before you begin

Be sure to complete the following prerequisites before running the ISSU process:

- Standby SUP must be in hot standby.

- Config register autoboot enabled.
- Both SUP in sub-package mode, running same base image and patches from same path.
- Target patch copied to active SUP in the same directory of the packages.conf file system is booted up with.
- If needed copy patch info file to both SUPs.
- Enough bootflash disk space on both SUPs.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**request platform software package install node file bootflash:** **Example:** `Router# request platform software package install node file bootflash:cbrsup-universalk9.03.17.00.S.156-1.S-std.SPA.bin`	Upgrades the cBR-8 router with dual SUPs using subpackages ISSU procedure.

Line Card Only In-Service Software Upgrade

If the upgrade fails or you cancel manually at line card upgrade stage, you can initiate a line card only upgrade.

Use the **request platform software package install node linecard-only** command to upgrade only the line card to the same version as the one in the current active SUP, the customer can choose to upgrade one line card or all the line cards in the chassis.

Use this command together with the **request platform software package install node file** *file-path* **noreload linecard** command to upgrade SUP first, and then upgrade the line card.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**request platform software package install node linecard-only** **Example:** `Router# request platform software package install node linecard-only all`	Upgrade all line cards to the same version as the one in the current active SUP.

ISSU Upgrade Across Major Releases

Starting from Cisco IOS XE Fuji 16.7.1 release, ISSU can upgrade cbr-8 between major releases.

Step 1 Copy the base image to active and standby SUPs. Copy the ISSU target image to active SUP.

```
copy <location>/<base_image> <location_active_sup>
copy <location>/<base_image> <location_standby_sup>
copy <location>/<target_image> <location_active_sup>
```

Step 2 Expand base image to both SUPs at the same folder.

```
request platform software package expand file <location_active_sup>/<base_image>
request platform software package expand file <location_standby_sup>/<base_image>
```

Step 3 Config register for auto boot (eg) config-reg 0x2102.

```
config-register 0x2102
boot system <location_active_sup>/packages.conf
```

Step 4 Save then reload router via subpackage mode.

```
reload
```

Step 5 After boot up, verify base image loaded using **show version running** and check more.

Step 6 Copy the target image to active SUP in the same location as before.

```
copy <location>/<target_image> <location_active_sup>
```

Step 7 Using Request command to do ISSU.

```
request platform software package install node file <location_active_sup>/<target_image>
```

Additional References

The following sections provide references related to the ISSU feature.

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

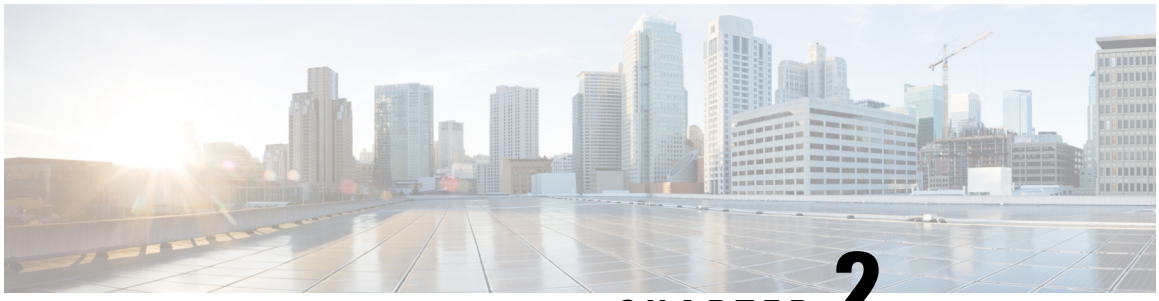
Feature Information for In-Service Software Upgrade

Use Cisco Feature Navigator to find information about the platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to the https://cfnng.cisco.com/ link. An account on the Cisco.com page is not required.

Note The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 2: Feature Information for ISSU

Feature Name	Releases	Feature Information
ISSU	Cisco IOS XE Fuji 16.7.1	This feature was integrated on the cisco cBR Series Converged Broadband Routers.



CHAPTER 2

Supervisor Redundancy

The Supervisor Redundancy feature reduces unplanned downtime. It enables a quicker switchover between active and standby Supervisors when a fatal error occurs on the active Supervisor. When you configure Supervisor Redundancy, the standby Supervisor is synchronized with the active Supervisor. If a fatal error occurs on the active Supervisor, the system immediately switches to the standby Supervisor.

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://tools.cisco.com/ITDIT/CFN/. An account on http://www.cisco.com/ is not required.

Contents

- Hardware Compatibility Matrix for the Cisco cBR Series Routers, on page 7
- Prerequisites for Supervisor Redundancy, on page 8
- Information About Supervisor Redundancy, on page 9
- How to Configure Supervisor Redundancy, on page 12
- Verifying the Supervisor Redundancy Configuration, on page 17
- Configuration Example for Supervisor Redundancy, on page 21
- Additional References, on page 21
- Feature Information for Supervisor Redundancy, on page 22

Hardware Compatibility Matrix for the Cisco cBR Series Routers

Note The hardware components that are introduced in a given Cisco IOS-XE Release are supported in all subsequent releases unless otherwise specified.

Table 3: Hardware Compatibility Matrix for the Cisco cBR Series Routers

Cisco CMTS Platform	Processor Engine	Interface Cards
Cisco cBR-8 Converged Broadband Router	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 Supervisor: • PID—CBR-SUP-250G • PID—CBR-CCAP-SUP-160G	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 CCAP Line Cards: • PID—CBR-LC-8D30-16U30 • PID—CBR-LC-8D31-16U30 • PID—CBR-RF-PIC • PID—CBR-RF-PROT-PIC • PID—CBR-CCAP-LC-40G • PID—CBR-CCAP-LC-40G-R • PID—CBR-CCAP-LC-G2-R • PID—CBR-SUP-8X10G-PIC • PID—CBR-2X100G-PIC Digital PICs: • PID—CBR-DPIC-8X10G • PID—CBR-DPIC-2X100G Cisco cBR-8 Downstream PHY Module: • PID—CBR-D31-DS-MOD Cisco cBR-8 Upstream PHY Modules: • PID—CBR-D31-US-MOD

Prerequisites for Supervisor Redundancy

- Two Supervisors (that is, two Supervisor Cards and two Supervisor PICs) must be installed in the Cisco cBR chassis.
- Both Supervisors must be running identical software releases. If there is release mismatch, when inserting the standby Supervisor, either the standby Supervisor or the active Supervisor may be impacted, even reloaded. So before inserting the new standby Supervisor, make sure it will boot with the identical software release as the active Supervisor.

Information About Supervisor Redundancy

The Supervisor redundancy feature enables the Cisco cBR router to use two Supervisors in a redundant configuration, so that if the active Supervisor fails or becomes inactive, the system automatically performs a switchover , where the standby Supervisor takes over and assumes full responsibility for systems operations.

The Supervisor redundancy feature does not require a full reboot of the system to perform a switchover. When the system boots up, the standby Supervisor performs full initialization, which includes self initialization, running configuration synchronization from the active Supervisor, and SSO feature data synchronization from the active Supervisor, then it enters into hot standby state and monitors the active Supervisor. If the standby Supervisor detects a failure in the active Supervisor, it can quickly assume the active responsibility for systems operations.

Each Supervisor contains all the resources required to operate the router, such as bootflash memory, hard disks, Ethernet ports, and console port. In the default operation, the standby Supervisor also synchronizes the major systems files, such as the running configuration file, so that during a switchover, the standby Supervisor can duplicate the active Supervisor's configuration.

You can use Cisco IOS CLI commands to access the standby Supervisor resources, such as the bootflash and hard disk. For example, you can use the **dir** command to list the contents of a device, or use the **copy** command to transfer files between the active and standby Supervisor.

Switchover Procedure

A switchover occurs when the standby Supervisor takes over responsibilities from the active Supervisor. The switchover can occur automatically if the standby Supervisor has determined that the active Supervisor has failed, or an operator can initiate a manual switchover whenever desired.

A switchover triggers the following events:

1. If this is a manual switchover, the active Supervisor verifies that the standby Supervisor is present and has entered into SSO. If so, it instructs the standby Supervisor to begin switchover procedures, and the active Supervisor either attempts to reload its configured Cisco IOS software image or enters ROM monitor mode, depending on the setting of its configuration register.
2. The standby Supervisor assumes responsibility as the active Supervisor and brings the Cisco cBR chassis into active state, and continues the service as active Supervisor.
3. The new active Supervisor begins normal systems operations, including passing traffic.

Note The Supervisor does not begin functioning as a standby Supervisor until it is booted up with a proper Cisco IOS software.

Is Supervisor Switchover Failing?

The usual phenomenon for a Supervisor switchover to be affected is when the active Supervisor has these issues:

- Supervisor hangs
- Login to Supervisor console or Telnet to chassis fails

- Interface cards unable to connect to active Supervisor, hence crashing
- Cable modems drop offline
- Chassis reload required
- Reset of active Supervisor required to restore service

Note In case there is hardware issue with the Supervisor, do not reinsert the faulty Supervisor in the chassis. Inserting a faulty Supervisor (although a standby Supervisor) may cause the interface card to switch to the faulty Supervisor causing the interface card to crash and cable modems to go offline.

Using Redundant File Systems

Both the active and standby Supervisors have active file systems that can be accessed to store and transfer files. The table below lists the available file systems, the filenames that you can use with CLI commands to access the file systems,and a short description of each.

File System	File Name for CLI Commands	Description
• Bootflash • Flash • Hard disk • USB • Standby bootflash • Standby hard disk • Standby USB	• bootflash: • flash: • harddisk: • usb0: • usb1: • stby-bootflash: • stby-harddisk: • stby-usb0: • stby-usb1:	Stores image, crash file, core files, saved configuration files, and various user files.
• System • Temporary system • Null • Tar • Syslog • CNS • RCSF	• system: • tmpsys: • null: • tar: • syslog: • cns: • revrcsf:	Stores the running configuration and other system files.

File System	File Name for CLI Commands	Description
• NVRAM • Standby NVRAM • Standby RCSF	• nvram: • stby-nvram: • stby-rcsf:	Typically stores the system default configuration file and startup configuration file.
• TFTP • RCP • PRAM • FTP • HTTP • SCP • HTTPS	• tftp: • rcp: • pram: • ftp: • http: • scp: • https:	Protocols used to transfer files to and from remote devices.

You can use the privileged EXEC commands **dir**, **del**, and **copy** to manage the contents of the file systems. You can also use the commands **mkdir** and **rmdir** to create and remove directories on bootflash or hard disks.

Following is a sample output of the **show file systems** command on the Cisco cBRrouter:

```
Router# show file systems

File Systems:

Size(b)       Free(b)      Type  Flags  Prefixes
             -            -    opaque     rw   system:
             -            -    opaque     rw   tmpsys:
*   7800705024    1574408192      disk     rw   bootflash:
    7800705024    1574408192      disk     rw   flash:
   98394218496   79534682112      disk     rw   harddisk:
    8009056256    8009023488      disk     rw   usb1:
      33554432      33507452     nvram     rw   stby-nvram:
             -            -    opaque     rw   null:
             -            -    opaque     ro   tar:
             -            -   network     rw   tftp:
             -            -    opaque     wo   syslog:
      33554432      33508476     nvram     rw   nvram:
             -            -   network     rw   rcp:
             -            -   network     rw   pram:
             -            -   network     rw   ftp:
             -            -   network     rw   http:
             -            -   network     rw   scp:
             -            -   network     rw   https:
             -            -    opaque     ro   cns:
             -            -     nvram     rw   stby-rcsf:
    7800705024    1635270656      disk     rw   stby-bootflash:
   98394218496   89040576512      disk     rw   stby-harddisk:
             -            -      disk     rw   stby-usb0:
    1000787968     301559808      disk     rw   stby-usb1:
             -            -    opaque     rw   revrcsf:
```

Console Port Usage After Supervisor Switchover

When an active Supervisor fails, and the standby Supervisor becomes the active Supervisor, you must use the console port on the new active Supervisor to give CLI commands and display statistics for the router. The standby Supervisor console is disabled by default and cannot be used to run any CLI commands. Following is an sample output of the standby Supervisor console:

```
Router-stby>
Standby console disabled
Router-stby>
```

To access the console, move the PC or terminal's serial cable to the console port on the other Supervisor, which is now acting as the active Supervisor.

Benefits

- The Supervisor is not a single point of hardware failure. If a permanent hardware failure in the active Supervisor occurs, the standby Supervisor recovers the system, increasing the level of network service and reliability.
- The standby Supervisor can become the active Supervisor without the manual intervention of a system operator. This reduces the recovery time and the need for an instant response from the network administrators.
- The active Supervisor continues to dynamically synchronize the changed configuration and feature data with the standby Supervisor after the system reaches SSO. Therefore, the standby Supervisor always operates as a hot standby and ready to take over.

How to Configure Supervisor Redundancy

The Supervisor redundancy feature is automatically enabled when two Supervisor are installed in the Cisco cBR chassis. The active Supervisor automatically synchronizes the running configuration file with the standby Supervisor during the bootup of standby Supervisor.

Note The Cisco cBR router supports only the SSO mode for Supervisor redundancy. The default redundancy mode is SSO and this mode does not need any new configurations.

This section contains the following:

Forcing Switchover

To manually force a switchover, so that the standby Supervisor becomes active, use the **redundancy force-switchover** command in privileged EXEC mode on the active Supervisor. Manually forcing a switchover is useful in the following situations:

- You need to remove, replace, or upgrade the currently active Supervisor.

- A previous switchover has activated the standby Supervisor and you now want to restore the previously active Supervisor.

Tip Simply removing the active Supervisor also triggers a switchover, but using the **redundancy force-switchover** command does not generate a hardware alarm.

Before you begin

Ensure that the standby Supervisor is in the SSO state using the **show redundancy** command. For more information, see Verifying Supervisor Redundancy , on page 17.

Step 1 Set the configuration register as 0x02 and the load the appropriate image on both the Supervisors

Example:

```
Router# configure terminal
Router(config)# config-register 0x02
Router(config)# boot system bootflash:cbrsup-universalk9.2015-03-08_01.38_xxxxx.SSA.bin
```

Note Do not perform this step if you want to set the previous active Supervisor to stay in ROM monitor mode or manually boot it up after the switchover.

Step 2 Use the **redundancy force-switchover** command to force the switchover.

Example:

```
Router# redundancy force-switchover

Proceed with switchover to standby RP? [confirm]
Manual Swact = enabled

Jan 1 19:23:22.483 R0/0: %PMAN-5-EXITACTION: Process manager is exiting: process exit with reload
fru code

Initializing Hardware ...

System Bootstrap, Version 12.2(20141120:061458) [153], DEVELOPMENT SOFTWARE
Copyright (c) 1994-2014 by cisco Systems, Inc.
Compiled Thu 11/20/2014 18:04:24.91 by xxxxx
```

The standby Supervisor becomes the active Supervisor.

Step 3 (Optional) If you have not performed Step 1, on page 13, the previous active Supervisor is put into the ROM monitor mode after the switchover. To enable the previous active Supervisor to become the new standby Supervisor, manually boot up the new standby Supervisor to enter into SSO mode.

Changing the System Boot Behavior

This section describes how to change the Cisco IOS software configuration register for modifying the system behavior when powering up or rebooting the system. The software configuration register is a 16 bit register in NVRAM that controls the following boot functions:

- Specifies the source of the Cisco IOS software image to be loaded
- Specifies whether the Cisco IOS software must ignore the contents of the saved configuration file in NVRAM memory
- Enables or disables the use of the Break function

Use the following procedure to change the software configuration register settings:

Step 1 Enter global configuration mode and use the **config-register** command to set the contents of the software configuration register to a new value.

Specify the new value as a 16 bit hexadecimal bitmask by using the values provided in the following table.

Table 4: Definition of Bits in the Software Configuration Register

Bit No.	Hex Value	Meaning/Function
00 to 03	0x0000 to 0x000F	Defines the source of the default Cisco IOS software image required to run the router: • 00—When powering up, the system remains at the ROM monitor prompt (rommon), awaiting a user command to boot the system manually by the rommon **boot** command. • 01—When powering up, the system automatically boots the first system image found in the flash memory's single in-line memory module (SIMM) on the Supervisor. • 02 to 0F—When powering up, the system automatically boots from a default Cisco IOS software image stored on a TFTP server in the network. For this setting, configure and enable the Network Management Ethernet port on the Supervisor. The port must be operational. This setting also enables boot system commands which can override the default filename.
06	0x0040	Causes system software to ignore the contents of the NVRAM configuration file.
07	0x0080	Enables the original equipment manufacturer (OEM) bit.
08	0x0100	Disables the Break function after 30 seconds.
09	0x0200	Not used.
10	0x0400	Specifies that broadcast packets are based on the 0.0.0.0 IP address.
11 and 12	0x0800 to 0x1000	Defines the console baud rate (the default value is 9600 baud).
13	0x2000	Boots an image from the boot flash memory.
14	0x4000	Specifies that the broadcast packets must use the subnet broadcast address.
15	0x8000	Enables diagnostic messages and ignores the contents of the NVRAM configuration file.

For example, to configure the router to boot to the ROM monitor prompt, set the configuration register to **0x2100** with the following commands:

Example:

```
Router# config t
Router(config)# config-register 0x2100
Router(config)#
```

Tip The typical bitmask for normal use is 0x2102. It specifies that the router must load the Cisco IOS software from the flash memory and boot to the Cisco IOS CLI prompt. The Break key is enabled only for 30 seconds. Hence, if required, you can break to the ROM monitor prompt.

Step 2 Exit the global configuration mode.

Example:

```
Router(config)# exit
Router#
```

Step 3 View the new software configuration register setting using the **show version** command.

The last line shows the settings of the configuration register:

Example:

```
Router# show version
Cisco IOS XE Software, Version 2015-03-04_00.38_xxxxx
Cisco IOS Software, IOS-XE Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental  \
Version 15.5(20150302:044048) [v155_2_s_xe315_throttle-xxxxx-XE315_0301 121]
This software is an Engineering Special
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Wed 04-Mar-15 00:21 by xxxxx


Cisco IOS-XE software, Copyright (c) 2005-2015 by cisco Systems, Inc.
All rights reserved.  Certain components of Cisco IOS-XE software are
licensed under the GNU General Public License ("GPL") Version 2.0.  The
software code licensed under GPL Version 2.0 is free software that comes
with ABSOLUTELY NO WARRANTY.  You can redistribute and/or modify such
GPL code under the terms of GPL Version 2.0.  For more details, see the
documentation or "License Notice" file accompanying the IOS-XE software,
or the applicable URL provided on the flyer accompanying the IOS-XE
software.


ROM: IOS-XE ROMMON

Router uptime is 14 minutes
Uptime for this control processor is 17 minutes
System returned to ROM by SSO Switchover
System image file is "bootflash:cbrsup-universalk9.2015-03-04_00.38_xxxxx.SSA.bin"
Last reload reason: Reload Command



This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html
```

```
If you require further assistance please contact us by sending email to
export@cisco.com.

cisco cBR1013 (CBR) processor (revision CBR) with 3647635K/6147K bytes of memory.
Processor board ID CSJ13152101
16 Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
50331648K bytes of physical memory.
7739391K bytes of eUSB flash at bootflash:.
97620247K bytes of SATA hard disk at harddisk:.
979258K bytes of USB flash at usb1:.

Configuration register is 0x2
```

When you modify the configuration register, the **show version** command shows both the current value of the register and the value that will be used during the next reboot or reload.

Step 4 Perform one of the following to save the new software configuration register settings in the configuration file:

- Use the **copy running-config startup-config** command.
- Use the **write** command.

Example:

```
Router# copy running-config startup-config


Router# write
Building configuration...
[OK]
```

Step 5 The changes to the software configuration register will take effect the next time the router is rebooted or restarted. To manually reboot the router, use the **reload** command:

Example:

```
Router# reload
System configuration has been modified. Save? [yes/no]: yes
Proceed with reload? [confirm]
```

Saving a Configuration File to the Bootflash or Hard Disk

This section describes how to copy a configuration file to a bootflash or hard disk and configure the Cisco cBR router.

Step 1 Copy the configuration file to the bootflash or hard disks in both Supervisors.

Example:

```
Router# copy running-config bootflash:cbr8-config
Router# copy running-config stby-bootflash:cbr8-config
Router# copy running-config harddisk:cbr8-config
Router# copy running-config stby-harddisk:cbr8-config
```

Step 2 (Optional) If the configuration file is currently on a TFTP server, copy the file from the TFTP server to the bootflash or hard disk in each Supervisor.

Example:

```
Router# copy tftp://192.168.100.10/router-config bootflash:cbr8-config
Router# copy tftp://192.168.100.10/router-config stby-bootflash:cbr8-config
Router# copy tftp://192.168.100.10/router-config harddisk:cbr8-config
Router# copy tftp://192.168.100.10/router-config stby-harddisk:cbr8-config
```

Verifying the Supervisor Redundancy Configuration

This section contains the following topics:

Verifying Supervisor Redundancy

Step 1 View the startup configuration and verify whether the lines for configuring redundancy appear:

Example:

```
Router# show startup-config

...
redundancy
mode sso
...
```

Step 2 View the current Supervisor redundancy state by running the **show redundancy** command.

The active Supervisor is typically shown in slot 4 (SUP0).

```
Router# show redundancy

Redundant System Information :
------------------------------
Available system uptime = 28 minutes
Switchovers system experienced = 0
Standby failures = 0
Last switchover reason = none

Hardware Mode = Duplex
Configured Redundancy Mode = sso
Operating Redundancy Mode = sso
Maintenance Mode = Disabled
Communications = Up

Current Processor Information :
-------------------------------
Active Location = slot 4
Current Software state = ACTIVE
Uptime in current state = 28 minutes
Image Version = Cisco IOS Software, IOS-XE Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental
 Version 15.5(20150302:044048) [v155_2_s_xe315_throttle-xxxxx-XE315_0301 121]
This software is an Engineering Special
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Wed 04-Mar-15 00:21 by xxxxx
```

```
BOOT = bootflash:cbrsup-universalk9.2015-03-04_00.38_xxxxx.SSA.bin,12;
CONFIG_FILE = bootflash:startup_config1419513118
Configuration register = 0x2

Peer Processor Information :
----------------------------
Standby Location = slot 5
Current Software state = STANDBY HOT
Uptime in current state = 24 minutes
Image Version = Cisco IOS Software, IOS-XE Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental
 Version 15.5(20150302:044048) [v155_2_s_xe315_throttle-xxxxx-XE315_0301 121]
This software is an Engineering Special
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Wed 04-Mar-15 00:21 by xxxxx
BOOT = bootflash:cbrsup-universalk9.2015-03-04_00.38_xxxxx.SSA.bin,12;
CONFIG_FILE = bootflash:startup_config1419513118
Configuration register = 0x2
```

If a switchover occurs, the **show redundancy** command shows that the active Supervisor has changed slots, moving from slot 4 (SUP0) to slot 5 (SUP1). The output is similar to the one in the following example.

```
Router# show redundancy

Redundant System Information :
------------------------------
Available system uptime = 39 minutes
Switchovers system experienced = 1
Standby failures = 0
Last switchover reason = user forced

Hardware Mode = Duplex
Configured Redundancy Mode = sso
Operating Redundancy Mode = sso
Maintenance Mode = Disabled
Communications = Up

Current Processor Information :
-------------------------------
Active Location = slot 5
Current Software state = ACTIVE
Uptime in current state = 10 minutes
Image Version = Cisco IOS Software, IOS-XE Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental
 Version 15.5(20150302:044048) [v155_2_s_xe315_throttle-xxxxx-XE315_0301 121]
This software is an Engineering Special
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Wed 04-Mar-15 00:21 by xxxxx
BOOT = bootflash:cbrsup-universalk9.2015-03-04_00.38_xxxxx.SSA.bin,12;
CONFIG_FILE = bootflash:startup_config1419513118
Configuration register = 0x2

Peer Processor Information :
----------------------------
Standby Location = slot 4
Current Software state = STANDBY HOT
Uptime in current state = 4 minutes
Image Version = Cisco IOS Software, IOS-XE Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental
 Version 15.5(20150302:044048) [v155_2_s_xe315_throttle-xxxxx-XE315_0301 121]
This software is an Engineering Special
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Wed 04-Mar-15 00:21 by xxxxx
BOOT = bootflash:cbrsup-universalk9.2015-03-04_00.38_xxxxx.SSA.bin,12;
CONFIG_FILE = bootflash:startup_config1419513118
```

```
Configuration register = 0x2
```

If the standby Supervisor is not installed or is not operational, the **show redundancy** command gives an output similar to the following example:

```
Router# show redundancy

Redundant System Information :
------------------------------
Available system uptime = 31 minutes
Switchovers system experienced = 1
Standby failures = 0
Last switchover reason = user forced

Hardware Mode = Simplex
Configured Redundancy Mode = sso
Operating Redundancy Mode = Non-redundant
Maintenance Mode = Disabled
Communications = Down Reason: Failure

Current Processor Information :
-------------------------------
Active Location = slot 5
Current Software state = ACTIVE
Uptime in current state = 2 minutes
Image Version = Cisco IOS Software, IOS-XE Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental
 Version 15.5(20150302:044048) [v155_2_s_xe315_throttle-xxxxx-XE315_0301 121]
This software is an Engineering Special
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Wed 04-Mar-15 00:21 by xxxxx
BOOT = bootflash:cbrsup-universalk9.2015-03-04_00.38_xxxxx.SSA.bin,12;
CONFIG_FILE = bootflash:startup_config1419513118
Configuration register = 0x2

Peer (slot: 4) information is not available because it is in 'DISABLED' state
```

The **show redundancy** command shows details of the redundancy state, software state, system uptime, image version, boot, configuration file, and configuration register information.

After supervisor redundancy, the following messages are displayed, for example:

```
CLC 3/0: May 20 07:26:01.992: %CBR-4-RECONCL_CM_FINISH_CLC: Reconciliation (cdm->ios) for slot 3
finished: total 7, success 5, failed 2, ios-only 2, cdm-only 0, mismatch 0, offline 0,
in-transaction-reconl 0, in-transaction-recover 0.
```

Where:

total indicates the overall number of cable modems on each linecard before failover.

success indicates the number of modems, which are remained online during failover.

failed indicates the number of cable modems which have failed reconciliation check, and deleted from database.

ios-only indicates the number of cable modems which has data entry in linecard iosd only, and have been deleted from database.

cdm-only indicates the number of cable modems which has data entry in linecard cdman (us-schedular) only, and have been deleted from database.

mismatch indicates the number of cable modems which with data mismatch in the modem instance or service-flows after failover. These modems have been deleted from database.

offline indicates the number of cable modems which are dropped offline during failover.

in-transaction-reconl indicates the number of cable modems that are deleted due to in dsx operations during failover.

in-transaction-recover indicates the number of cable modems during in dsx operations during failover.

Verifying Supervisor Switchover

Step 1 Verify the LEDs on the Supervisor Card.

When a Supervisor becomes active, the RP ACT and FP ACT LEDs on the Supervisor Card illuminate green to indicate that they have initialized and acting as the active Supervisor. The RP ACT and FP ACT on standby Supervisor Card are off. For more information, see Monitoring the Supervisor in the Cisco cBR Chassis.

Step 2 Verify the Supervisor switchover by running the **show redundancy switchover history** command.

If the original Supervisor is in slot 4 (SUP0) and the standby Supervisor is in slot 5 (SUP1), the output is similar to the following sample:

Example:

```
Router# show redundancy switchover history

Index Previous Current Switchover Switchover
      active   active  reason     time
----- -------- ------- ---------- ----------
1     48       49      user forced 19:23:11 CST Sun Jan 1 2012
```

The value 48 indicates SUP0 and 49 indicates SUP1.

After supervisor redundancy, a messages is displayed, below is an example:

```
CLC 3/0: May 20 07:26:01.992: %CBR-4-RECONCL_CM_FINISH_CLC: Reconciliation (cdm->ios) for
slot 3 finished: total 7, success 5, failed 2, ios-only 2, cdm-only 0, mismatch 0, offline
 0, in-transaction-reconl 0, in-transaction-recover 0.
```

Table 5: Message Description

Name	Description
total	Overall amount of cable modems on each linecard before failover.
success	Indicates the number of cable modems remain online during failover.
failed	Indicates the number of cable modems failed reconciliation check, and have been deleted from database.
ios-only	Indicates the number of cable modems which has data entry in linecard iosd only, and have been deleted from database.

Name	Description
cdm-only	Indicates the number of cable modems which has data entry in linecard cdman (us-schedular) only, and have been deleted from database.
mismatch	Indicates the number of cable modems with data mismatch in the modem instance or service-flows after failover. These modems have been deleted from database.
offline	Indicates the number of cable modems dropped offline during failover.
in-transaction-reconl	Indicates the number of cable modems deleted due to in dsx operations during failover.
in-transaction-recove	Indicates the number of cable modems during in dsx operations during failover.

Configuration Example for Supervisor Redundancy

The following example shows the relevant portion of the Cisco IOS configuration file for the default configuration of the Supervisor Redundancy feature. Use this configuration for most of the applications:

```
Router# show running-config | sec redundancy

redundancy
 mode sso

Router#
```

Additional References

Related Documents

Related Topic	Document Title
CMTS commands	Cisco IOS CMTS Cable Command Reference
Stateful Switchover	Stateful Switchover

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. 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. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support

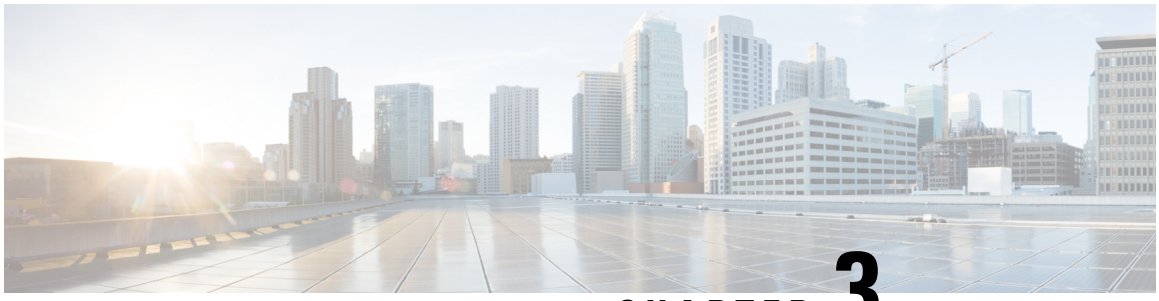
Feature Information for Supervisor Redundancy

Use Cisco Feature Navigator to find information about the platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to the https://cfnng.cisco.com/ link. An account on the Cisco.com page is not required.

Note The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 6: Feature Information for Supervisor Redundancy

Feature Name	Releases	Feature Information
Supervisor Redundancy	Cisco IOS XE Fuji 16.7.1	This feature was integrated on Cisco cBR Series Converged Broadband Routers.



CHAPTER 3

Line Card Redundancy

The line cards support high availability with redundancy schemes. Line card redundancy can help limit customer premises equipment (CPE) downtime by enabling robust automatic switchover and recovery in the event that there is a localized system failure.

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://tools.cisco.com/ITDIT/CFN/. An account on http://www.cisco.com/ is not required.

Contents

- Hardware Compatibility Matrix for the Cisco cBR Series Routers, on page 23
- Prerequisites for Line Card Redundancy, on page 24
- Restrictions for Line Card Redundancy, on page 25
- Information About Line Card Redundancy, on page 25
- How to Configure Line Card Redundancy, on page 26
- Verifying the Line Card Redundancy Configuration, on page 28
- Additional References, on page 32
- Feature Information for Line Card Redundancy, on page 32

Hardware Compatibility Matrix for the Cisco cBR Series Routers

Note The hardware components that are introduced in a given Cisco IOS-XE Release are supported in all subsequent releases unless otherwise specified.

Table 7: Hardware Compatibility Matrix for the Cisco cBR Series Routers

Cisco CMTS Platform	Processor Engine	Interface Cards
Cisco cBR-8 Converged Broadband Router	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 Supervisor: • PID—CBR-SUP-250G • PID—CBR-CCAP-SUP-160G	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 CCAP Line Cards: • PID—CBR-LC-8D30-16U30 • PID—CBR-LC-8D31-16U30 • PID—CBR-RF-PIC • PID—CBR-RF-PROT-PIC • PID—CBR-CCAP-LC-40G • PID—CBR-CCAP-LC-40G-R • PID—CBR-CCAP-LC-G2-R • PID—CBR-SUP-8X10G-PIC • PID—CBR-2X100G-PIC Digital PICs: • PID—CBR-DPIC-8X10G • PID—CBR-DPIC-2X100G Cisco cBR-8 Downstream PHY Module: • PID—CBR-D31-DS-MOD Cisco cBR-8 Upstream PHY Modules: • PID—CBR-D31-US-MOD

Prerequisites for Line Card Redundancy

- At least one RF Through PIC and its corresponding interface line card must be installed in the chassis to be configured as the primary card.
- An RF Protect PIC and its corresponding interface line card must be installed in the chassis to be configured as the secondary card.

Restrictions for Line Card Redundancy

- For Supervisor 160G, the line cards installed in slot 3 and 6 of the Cisco cBR-8 router cannot be configured as the secondary card. The limitation does not apply for Supervisor 250G.
- The RF Protect PIC can send RF signals only to the lower slots (with larger slot number). So, the slot number of the secondary card must be the smallest in the redundancy group.

Note We recommend that you install the RF Protect PIC in the uppermost slot (slot 0) of the chassis and configure it as the secondary card.

- The RF Through PIC can send RF signal only from upper slot to lower slot. So, do not install any RF blank PICs between the secondary card and primary cards.
- You cannot change any configuration on the primary or secondary card when the secondary card is active.
- You cannot remove the last primary card if there is a secondary card in the redundancy group. You must remove the secondary card and then remove the primary card.
- If the primary card is in the standby role, you must revert to the primary card before removing it from the redundancy group.
- For CBR-CCAP-LC-40G high availability domain, ensure that all CBR-CCAP-LC-40G Line Cards are in continuous slots and using the lowest slot number as secondary Line Card. The limitation does not apply for CBR-CCAP-LC-40G-R or CBR-CCAP-LC-G2-R Line Cards.
- CBR-CCAP-LC-G2-R provides protection only to CBR-CCAP-LC-G2-R.

Note

- From Cisco IOS XE Bengaluru 17.6.1, CBR-CCAP-LC-G2-R and CBR-CCAP-LC-40G-R line cards must not be part of the same redundancy group.
- In Cisco IOS XE Amsterdam 17.3.1 and earlier releases, CBR-CCAP-LC-G2-R provides protection to CBR-CCAP-LC-G2-R or CBR-CCAP-LC-40G-R.
- Protection for CBR-CCAP-LC-G2-R by CBR-CCAP-LC-40G-R is not supported.

Information About Line Card Redundancy

Line card redundancy reduces the unplanned downtime. When you configure line card redundancy, a protect zone (redundancy group) is created on the router and the configurations on the primary cards are synchronized with the secondary card.

The following events can trigger a switchover from an active card to a standby card:

- Manual switchover using the **redundancy linecard-group switchover from slot** *slot*command.
- Line card reload using the **hw-module slot reload** command.
- Line card crash.
- Line card Online Insertion and Removal (OIR).

The secondary card reloads after the switchover. The router can be configured to automatically revert to the primary card when it becomes hot standby after an unplanned switchover triggered by the line card OIR or crash.

Following are the line card redundancy states:

- **Unavail**—The line card state is not available.
- **Init**—The line card did not boot up.
- **Active Cold**—The active card is downloading the configuration.
- **Active**—The active card is fully configured and working.
- **Stdby Cold**—The standby card configuration is synchronizing with the active card.
- **Stdby Warm**—(Only for the secondary card) The standby card is fully synchronized and ready for switchover. It is the stable state of a secondary standby card.
- **Stdby Hot**—The primary standby card is fully synchronized. It is the stable state of a primary standby card. The secondary standby card is chosen to switchover for a primary card, and will be active soon. It is a transient state when secondary card is becoming active.

N+1 Line Card Redundancy

The Cisco cBR-8 router supports N+1 redundancy scheme for line cards. A single RF Protect PIC can be configured as a secondary card for multiple RF Through PICs (primary cards). In this redundancy scheme, when the secondary card becomes the active card for a primary card, the redundancy scheme is changed to 1+1 redundancy.

The Cisco cBR-8 router supports a single protect zone or redundancy group (group 0).

How to Configure Line Card Redundancy

This section contains the following:

Configuring Line Card Manual Switchover

Before you begin

The line card must be in active role, and warm standby or hot standby state. Use the **show redundancy linecard all** command to verify the role and state of the card.

Restrictions

- You cannot perform a manual switchover when the standby Supervisor is booting up and not yet entered into SSO.

- You cannot auto revert the switchover triggered manually.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**redundancy linecard-group switchover from slot** *slot* **Example:** `Router# redundancy linecard-group switchover from slot 9`	Manually switches over from the active line card.

Configuring N+1 Line Card Redundancy

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**redundancy** **Example:** `Router(config)# redundancy`	Enables redundancy and enters redundancy configuration mode.
Step 4	**linecard-group** *group-id* **internal-switch** **Example:** `Router(config-red)# linecard-group 0 internal-switch`	Configures the redundancy group and enters the line card redundancy configuration mode.
Step 5	**description** *group-description* **Example:** `Router(config-red-lc)# description RedundancyGroup0`	(Optional) Configures the redundancy group description.
Step 6	**class 1:N** **Example:** `Router(config-red-lc)# class 1:N`	Configures the N+1 redundancy class for the redundancy group.

	Command or Action	Purpose
Step 7	**revertive** *seconds* **Example:** `Router(config-red-lc)# revertive 60`	(Optional) Configures the auto revert time for the primary card, in seconds.
Step 8	**member slot** *slot* **primary** **Example:** `Router(config-red-lc)# member slot 1 primary`	Adds the line card as a primary card in the redundancy group. **Note** Repeat this step for each primary card to be added in the redundancy group.
Step 9	**member slot** *slot* **secondary** **Example:** `Router(config-red-lc)# member slot 0 secondary`	Adds the line card as a primary card in the redundancy group.
Step 10	**end** **Example:** `Router(config-red-lc)# end`	Returns to privileged EXEC mode.

Verifying the Line Card Redundancy Configuration

- **show redundancy linecard group all**—Displays the redundancy group information.

  The following is a sample output of this command:

```
Router# show redundancy linecard group all

Group Identifier: 0
Revertive, Revert Timer: OFF (60000 sec)
Reserved Cardtype: 0xFFFFFFFF  4294967295
Group Redundancy Type: INTERNAL SWITCH
Group Redundancy Class: 1:N
Group Redundancy Configuration Type: LINECARD GROUP
Primary: Slot 6
Primary: Slot 7
Secondary: Slot 0
```

- **show redundancy linecard all**—Displays the role and state information for all line cards.

  Following is a sample output of this command:

```
Router# show redundancy linecard all

              LC     My         Peer       Peer     Peer
Slot Subslot  Group  State      State      Slot     Subslot  Role     Mode
-------------------------------------------------------------------------------
 9   -        0      Active     Stdby Cold 0        -        Active   Primary
 8   -        0      Active     Stdby Warm 0        -        Active   Primary
 7   -        0      Active     Stdby Warm 0        -        Active   Primary
 6   -        0      Active     Stdby Cold 0        -        Active   Primary
 3   -        0      Active     Stdby Cold 0        -        Active   Primary
 2   -        0      Active     Stdby Cold 0        -        Active   Primary
 1   -        0      Active     Stdby Cold 0        -        Active   Primary
```

```
 0   -        0      -          -          Multiple None     Standby  Secondary
```

Note The secondary card does not have a valid *My State* when it is in *Standby* role as it is the peer for *N* primary cards. The secondary card has *N* peer states. For example, it can be cold standby for some primary cards and warm standby for the other primary card.

Following is a sample output of the command when secondary card becomes active for a primary card, and the N+1 redundancy is changed to 1+1 redundancy:

```
Router# show redundancy linecard all

              LC     My         Peer       Peer     Peer
Slot Subslot  Group  State      State      Slot     Subslot  Role     Mode
-------------------------------------------------------------------------------
 9   -        0      Stdby Hot  Active     0        -        Standby  Primary
 8   -        0      Active     Unavail    0        -        Active   Primary
 7   -        0      Active     Unavail    0        -        Active   Primary
 6   -        0      Active     Unavail    0        -        Active   Primary
 3   -        0      Active     Unavail    0        -        Active   Primary
 2   -        0      Active     Unavail    0        -        Active   Primary
 1   -        0      Active     Unavail    0        -        Active   Primary
 0   -        0      Active     Stdby Hot  9        -        Active   Secondary
```

- **show redundancy linecard slot**—Displays the redundancy information for the line card.

  Following is a sample output of the command:

```
Router# show redundancy linecard slot 9

 LC Redundancy Is Configured:
 LC Group Number: 0
 LC Slot: 9 (idx=9)
 LC Peer Slot: 0
 LC Card Type: 0x4076 , 16502
 LC Name: 9
 LC Mode: Primary
 LC Role: Active
 LC My State: Active
 LC Peer State: Stdby Warm
```

- **show redundancy linecard history**—Displays the state change history for all line cards.

  Following is a sample output of the command:

```
Router# show redundancy linecard history

Jan 05 2012 12:24:27 20559 - st_mem(9): MY State Change, (Active Wait) -> (Active)
Jan 05 2012 12:24:27 20559 - st_mem(9): MY FSM execution, Active Wait:Init:State Ntfy
Jan 05 2012 12:24:27 20559 - st_mem(9): MY State Change, (Active LC Cfg Dnld) -> (Active
 Wait)
Jan 05 2012 12:24:27 20559 - st_mem(9): MY FSM execution, Active LC Cfg Dnld:Init:Cfg
Dnld Done
Jan 05 2012 12:24:27 20559 - st_mem(9): MY State Change, (Active Cold) -> (Active LC
Cfg Dnld)
Jan 05 2012 12:23:09 12763 - st_mem(9): MY FSM execution, Active Cold:Init:Cfg Dnld
Jan 05 2012 12:23:09 12760 - st_mem(9): MY State Change, (Init) -> (Active Cold)
Jan 05 2012 12:23:09 12760 - st_mem(9): MY FSM execution, Init:Init:Up
```

```
Jan 05 2012 12:21:39 3746 - st_mem(9): PEER FSM Execution , Init:Init:Reset
```

- **show lcha rfsw**—Displays the internal RF switch PIC state information.

  Following is a sample output of the command:

```
Router# show lcha rfsw

Slot 0 ===================================
Type : Secondary PIC State: normal
Slot 1 ===================================
Type : Primary PIC State: normal
```

- **show lcha logging level**—Displays the cable modem line card logs.

  Following is a sample output of the command:

```
Router# show lcha logging level noise

11:02:03.313 CST Tue Nov 18 2014 [error] [slot=3] [txn=229] Peer-Up Message [tag=1011]
 to slot 3 complete [36144 ms]; status=nak response
11:02:03.313 CST Tue Nov 18 2014 [error] [slot=0] [txn=229] Slot 0 downloaded
configuration for slot 3; result=peer-up notification failed
11:02:03.316 CST Tue Nov 18 2014 [noise] [slot=0] [txn=none]
lcha_plfm_get_max_port_count_for_slot: slot 0 maximum port count is 1794
11:02:03.316 CST Tue Nov 18 2014 [noise] [slot=0] [txn=none]
lcha_plfm_get_starting_port_index: slot 0 starting port count is 0
11:02:03.331 CST Tue Nov 18 2014 [note]  [slot=0] [txn=none] Slot 0 is being reset
11:02:04.352 CST Tue Nov 18 2014 [note]  [slot=0] [txn=none] slot 0 removed
```

- When the secondary card is active, you can use the slot number of either the primary or secondary card in the **show** commands.

  Following is a sample output of the **show interfaces** command after the primary card in slot 8 switches over to secondary card in slot 0:

```
Router# show interfaces c0/0/0

Cable0/0/0 is up, line protocol is up
  Hardware is CMTS MD interface, address is 0000.0000.031e (bia 0000.0000.031e)
  MTU 1500 bytes, BW 26000 Kbit/sec, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation MCNS, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 19500 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 13000 bits/sec, 17 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts (0 multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     140520 packets output, 14052672 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 unknown protocol drops
```

```
     0 output buffer failures, 0 output buffers swapped out

Router# show interfaces c8/0/0

Cable0/0/0 is up, line protocol is up
  Hardware is CMTS MD interface, address is 0000.0000.031e (bia 0000.0000.031e)
  MTU 1500 bytes, BW 26000 Kbit/sec, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation MCNS, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 19500 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 14000 bits/sec, 18 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts (0 multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     140616 packets output, 14062272 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 unknown protocol drops
     0 output buffer failures, 0 output buffers swapped out
```

- When the secondary card is active, the **show running-config** command displays the output for the secondary card.

Note The output of the **show running-config** command is empty for the primary card when the secondary card is active.

Following is a sample output of the **show running-config** command after the primary card in slot 8 switches over to secondary card in slot 0:

```
Router# show running-config | begin controller Upstream-Cable 0

controller Upstream-Cable 0/0/0
 us-channel 0 channel-width 1600000 1600000
 us-channel 0 docsis-mode atdma
 us-channel 0 minislot-size 4
 us-channel 0 modulation-profile 221
 no us-channel 0 shutdown
 us-channel 1 channel-width 1600000 1600000
 us-channel 1 docsis-mode atdma

Router# show running-config | begin controller Upstream-Cable 8
Router#
Router#
```

Additional References

Related Documents

Related Topic	Document Title
CMTS commands	Cisco CMTS Cable Command Reference

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. 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. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support

Feature Information for Line Card Redundancy

Use Cisco Feature Navigator to find information about the platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to the https://cfnng.cisco.com/ link. An account on the Cisco.com page is not required.

Note The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 8: Feature Information for Line Card Redundancy

Feature Name	Releases	Feature Information
Line Card Redundancy	Cisco IOS XE Fuji 16.7.1	This feature was integrated on theCisco cBR Series Converged Broadband Routers.