Cisco cBR Converged Broadband Routers Basic Configuration Guide

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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

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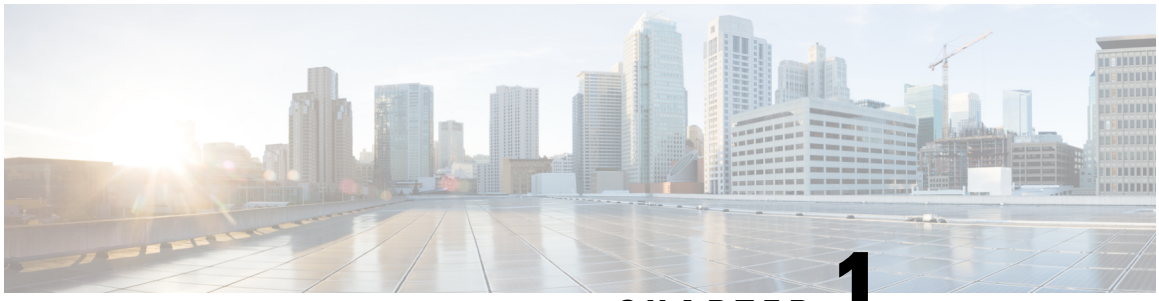

CHAPTER 1

Start Up Configuration of the Cisco cBR Router

This document describes the basic start up configuration tasks that must be completed on a Cisco cBR Series Converged Broadband Router.

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Prerequisites for Configuring the Cisco CMTS

Complete these prerequisite steps before you power on and configure the Cisco CMTS:

- Ensure that your network supports reliable broadband data transmission. Your plant must be swept, balanced, and certified based on National Television Standards Committee (NTSC) or appropriate international cable plant recommendations. Ensure your plant meets all Data-over-Cable Service Interface Specifications (DOCSIS) downstream and upstream radio frequency (RF) requirements.
- Ensure that your Cisco CMTS is installed according to the instructions in the hardware installation guide available on Cisco.com.
- Ensure that all other required headend or distribution hub routing and network interface equipment is installed, configured, and operational (based on the supported services). This includes:
  - All routers
  - Servers (Dynamic Host Configuration Protocol (DHCP) servers, Trivial File Transfer Protocol (TFTP) servers, and time-of-day (ToD) servers)
  - Network management systems
  - Other configuration or billing systems
- Ensure that DHCP and DOCSIS configuration files have been created and pushed to appropriate servers so that each CM, when initialized, can:
  - Transmit a DHCP request
  - Receive an IP address
  - Obtain TFTP and ToD server addresses
  - Download a DOCSIS configuration file (or updated software image if using Cisco uBR924 cable access routers or Cisco uBR910 cable data service units (DSUs) in your network)
- Ensure that customer premises equipment (CPE)—CMs or set-top boxes (STBs), PCs, telephones, or facsimile machines—meet requirements for your network and service offerings.
- Be familiar with your channel plan to assign appropriate frequencies. Outline your strategies for setting up bundling, if applicable to your headend or distribution hub. As appropriate, obtain:
  - Passwords
  - IP addresses
  - Subnet masks
  - Device names

After these prerequisites are met, you are ready to configure the Cisco CMTS. This includes, at a minimum:

- Configuring a host name and password for the Cisco CMTS
- Configuring the CMTS to support IP over the cable plant and network backbone

Note If you plan to use service-class-based provisioning, the service classes must be configured at the CMTS before CMs attempt to make a connection.

Booting and Logging onto the Cisco CMTS

The Cisco CMTS is administered using the Cisco command interpreter, called the EXEC. You must boot and log in to the router before you can enter an EXEC command.

Step 1 Connect to the console port on the Supervisor PIC and the Supervisor card.

Step 2 Establish a terminal session. You can open terminal application (Hyper Terminal) on a PC as follows:

a) Connect using: Direct to Com 1
b) Set bits per second:9600
c) Set data bits: 8
d) Set parity: none
e) Set stop bit: 1
f) Set flow control: none

Type **no** when the following message is displayed:

```
Would you like to enter the initial dialog?[yes]: no
Router>
```

First Time Boot Up with ROMMON

The Cisco cBR-8 boots up with ROMMON on the console with 9600 baud default configuration. It boots image either from TFTP or from local device. Local devices supported include the bootflash and USB.

Example of the boot up display:

```
Initializing Hardware ...˘

System Bootstrap, Version 15.5(2r)S, RELEASE SOFTWARE
Copyright (c) 1994-2015  by cisco Systems, Inc.

Current image running: Boot ROM0

Last reset cause: PowerOn

CPUID: 0x000206d7
UCODE: 0x00000710_00000000
```

```
Viper version register: 0x14121111
Set Chassis Type to 13RU
Cisco cBR-8  platform with 50331648 Kbytes of main memory

rommon 1 >
```

Configuration Register

The **confreg** ROMMON command displays the configuration and allows modification of the settings.

```
rommon > confreg

           Configuration Summary
   (Virtual Configuration Register: 0x0)
enabled are:
 [ 0 ] break/abort has effect
 [ 1 ] console baud: 9600
 boot: ...... the ROM Monitor

do you wish to change the configuration? y/n  [n]:  y
 enable  "diagnostic mode"? y/n  [n]:
 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]:
change the boot characteristics? y/n  [n]:

           Configuration Summary
   (Virtual Configuration Register: 0x0)
enabled are:
 [ 0 ] break/abort has effect
 [ 1 ] console baud: 9600
 boot: ...... the ROM Monitor
do you wish to change the configuration? y/n  [n]:
Console baud rate options:
change console baud rate? y/n  [n]:  y
0=9600, 1=4800, 2=1200, 3=2400, 4=19200, 5=38400, 6=57600, 7=115200
enter rate  [0]:
Boot characteristics options:
change the boot characteristics? y/n  [n]:  y

 enter to boot:
 0 = ROM Monitor
 1 = the boot helper image
 2-15 = boot system
 [0]:
```

Setting Environment Variables

No Environment variables are required to boot the Cisco IOS-XE image.

There are variables set by default. The ROMMON command **set** displays the default variables.

```
rommon  > set
PS1=rommon ! >
```

```
?=0
rommon  >
```

To set a variable, the format is VARIABLE="value".

The**set** command displays the new variable and the **sync** command saves the variable to NVRAM.

Note If the variable value has a space in between, specify the value within quotes.

```
rommon  > set
PS1=rommon ! >
?=0
rommon  > IP_ADDRESS=1.2.3.4
rommon  > IP_SUBNET_MASK=255.255.255.128
rommon  > DEFAULT_GATEWAY=1.2.9.10
rommon  > TFTP_SERVER=1.2.3.6
rommon  > sync
```

Unsetting Environment Variables

The **unset** ROMMON command removes the Environment variables and the **sync** command saves the variable to NVRAM.

```
rommon 1 > set
PS1=rommon ! >
?=0
BSI=0
BOOT=bootflash:cbrsup-adventerprisek9.SSA.bin,12;
RANDOM_NUM=1357042312
RET_2_RTS=17:45:06 PDT Sat Dec 31 2011
RET_2_RCALTS=1325378706
rommon 2 > unset BOOT
rommon 3 > sync
rommon 4 > set
PS1=rommon ! >
?=0
BSI=0
RANDOM_NUM=1357042312
RET_2_RTS=17:45:06 PDT Sat Dec 31 2011
RET_2_RCALTS=1325378706
rommon 5 >
```

Booting from the TFTP on the Cisco cBR

ROMMON boots up with default environment variables. The BinOS image is booted up from TFTP over the management port. This requires a minimum set of environment variables: IP_ADDRESS, IP_SUBNET_MASK, DEFAULT_GATEWAY, and TFTP_SERVER.

Step 1 Type the **set** command and define the required environment variables.

```
rommon  > set
```

```
PS1=rommon ! >
?=0
rommon  > IP_ADDRESS=1.2.3.4
rommon  > IP_SUBNET_MASK=255.255.255.128
rommon  > DEFAULT_GATEWAY=1.2.9.10
rommon  > TFTP_SERVER=1.2.3.6
rommon  > sync
```

Step 2 Type the **sync** command to save the variables to NVRAM.

```
rommon 6 > sync
```

Step 3 Type the **boot** command to load the image.

```
rommon 7 > boot tftp:/tftpboot/username/cbrsup-universalk9.SSA.bin

          IP_ADDRESS: 1.2.3.4
      IP_SUBNET_MASK: 255.255.255.128
     DEFAULT_GATEWAY: 1.2.9.10
         TFTP_SERVER: 1.2.3.6
           TFTP_FILE: /tftpboot/username/cbrsup-universalk9.SSA.bin
        TFTP_MACADDR: c4:14:3c:17:e8:00
        TFTP_VERBOSE: Progress
    TFTP_RETRY_COUNT: 18
        TFTP_TIMEOUT: 7200
       TFTP_CHECKSUM: Yes
          ETHER_PORT: 2

    ETHER_SPEED_MODE: Auto Detect
link up........
Receiving /tftpboot/username/cbrsup-universalk9.SSA.bin from 172.19.211.47
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

Listing Supported Devices

The **dev** command lists the devices supported on the router.

```
rommon 1 > dev
Devices in device table:
        id  name
 harddisk:  Internal hard disk
bootflash:  Internal flash drive
     usb0:  External USB drive 0
     usb1:  External USB drive 1
rommon 2 >
```

Booting from the Device on the Cisco cBR

Step 1 Type the **dir bootflash:** command.

```
rommon  > dir bootflash:
File System: EXT2/EXT3
```

```
12          691955580 -rw-r--r--     cbrsup-xe315.SSA.bin
45          83475     -rw-r--r--     reload.log.20120103004502
```

Step 2 Type the **boot bootflash:***imagename* command.

```
rommon  > boot bootflash:cbrsup-xe315.bin
File size is 0x293e67bc
Located cbrsup-xe315.bin
Image size 691955644 inode num 145153, bks cnt 168935 blk size 8*512
########################################################################
```

Setting AUTOBOOT image in ROMMON

To set AUTOBOOT of an image from bootflash:, add the Environment Variable BOOT and then change the configuration register boot characteristics to boot and reset the system.

Step 1 Type the **boot=bootflash:***imagename* command to load the image.

```
rommon  > BOOT=bootflash:cbrsup-xe315-20150131.bin
```

Step 2 Type the **sync** command to copy the variables to NVRAM.

```
rommon  > sync
```

Step 3 Type the **confreg** command to configure and modify the settings.

```
rommon  > confreg

           Configuration Summary
   (Virtual Configuration Register: 0x0)
enabled are:
 [ 0 ] break/abort has effect
 [ 1 ] console baud: 9600
 boot: ...... the ROM Monitor

do you wish to change the configuration? y/n  [n]:  y
 enable  "diagnostic mode"? y/n  [n]:
 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]:  n
change the boot characteristics? y/n  [n]:  y

 enter to boot:
 0 = ROM Monitor
 1 = the boot helper image
 2-15 = boot system
 [0]:  2

           Configuration Summary
   (Virtual Configuration Register: 0x2)
enabled are:
 [ 0 ] break/abort has effect
```

```
 [ 1 ] console baud: 9600
 boot: ...... image specified by the boot system commands or default to: cisco2-Cisco cBR-8

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

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

Step 4 Type the **reset** command for the new configuration to take effect.

```
rommon  > reset
```

What to do next

Verifying the ROMMON Version

Use the **showmon** command to display the version of ROMMON.

```
rommon  > showmon
Current image running (0/1): Boot ROM0
System Bootstrap, Version 15.5(2r)S, RELEASE SOFTWARE
Copyright (c) 1994-2015  by cisco Systems, Inc.

Viper version register: 0x14121111
rommon  >
```

Resetting the Cisco cBR

Use the **reset** command to soft reset the Supervisor.

```
rommon  > reset

Resetting .......


Initializing Hardware ...˘

System Bootstrap, Version 15.5(2r)S, RELEASE SOFTWARE
Copyright (c) 1994-2015  by cisco Systems, Inc.

Current image running: Boot ROM0

Last reset cause: LocalSoftware

CPUID: 0x000206d7
UCODE: 0x00000710_00000000
Viper version register: 0x14121111
Set Chassis Type to 13RU
Cisco cBR-8  platform with 50331648 Kbytes of main memory

rommon  >
```

File Systems

The Cisco cBR-8 router runs on the Cisco IOS-XE image. Supported file systems include:

1. IOS File System (IFS) in IOS
2. ext2, vfs, jffs2, tmpfs, autofs, and such common file systems in Linux

Features of the File Systems:

1. Both the Harddisk and USB are hot pluggable.
2. Harddisk is not accessible under Rommon.
3. Bootflash and USB disk are accessible under Rommon.
4. The **dir**, **show**, **copy**, **delete**, **mkdir**, **rmdir**, and **fsck** commands are supported for bootflash, harddisk and USB.

File System Table in the Supervisor

Name	Device	Size	Type	Visible	Usage	Physical Description
bootflash	/dev/bootflash1	7800705024	ext2	IOS/Binos	image,IOScrasinfo,etc	Partition1 of bootflash (eUSB flash).
flash	/dev/bootflash1	7800705024	ext2	IOS	image	A copy of bootflash.
nvram	/dev/bootflash2	32M	N/A	IOS	configuretion, etc	Partition2 of bootflash (eUSB flash).
harddisk	/dev/harddisk1	98394218496	ext2	IOS/Binos	tracelog,corefile,etc	Partition1 of the 100G harddisk.
usb0	/dev/usb11	8G	vfat	IOS/Binos	image	Two USBs can be inserted into one SUP.

Verification of Hardware Bring Up

Monitoring the Cisco cBR Chassis Using CLI

- **show platform**—Verify if the installed cards are in **Ok** or **Inserted** state.

```
Router# show platform

Chassis type: CBR-8-CCAP-CHASS

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
1         CBR-CCAP-LC-40G     ok                    03:22:58
1/1       CBR-RF-PIC          ok                    03:19:40
SUP0      CBR-CCAP-SUP-160G   inserted              03:22:58
 R0                           ok, active
 F0                           ok, active
 4                            ok, active
 4/1      CBR-SUP-8X10G-PIC   ok                    03:20:30
```

```
P0         PWR-2KW-DC-V2       ok                  03:21:20
P1         PWR-2KW-DC-V2       ok                  03:21:20
P2         PWR-2KW-DC-V2       ok                  03:21:20
P3         PWR-2KW-DC-V2       ok                  03:21:20
P4         PWR-2KW-DC-V2       ok                  03:21:20
P5         PWR-2KW-DC-V2       ok                  03:21:20
P10        CBR-FAN-ASSEMBLY    ok                  03:21:10
P11        CBR-FAN-ASSEMBLY    ok                  03:21:10
P12        CBR-FAN-ASSEMBLY    ok                  03:21:10
P13        CBR-FAN-ASSEMBLY    ok                  03:21:10
P14        CBR-FAN-ASSEMBLY    ok                  03:21:10
```

- **show platform hardware slot** *slot* **serdes status**—Verify if all the links are in **locked** state.

```
Router# show platform hardware slot F1 serdes status

Slot R1-Link A
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 3-Link A
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link A
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link B
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link C
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link D
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link E
  RX link Init
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes
```

```
Slot 5-Link F
  RX link Init
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link G
  RX link Init
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link H
  RX link Init
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes
```

- **show environment all**—Verify the environmental status of each FRU after installation.

  This command displays the system temperature, voltage, fan, and power supply conditions.

```
Router# show environment all

Sensor List:  Environmental Monitoring
 Sensor           Location          State             Reading
 AVCC&1P2: Sens   4/1               Normal            81 mV
 AVCC&1P2: Vin    4/1               Normal            12600 mV
 AVCC&1P2: ADin   4/1               Normal            0 mV
 VP1P35: Sens     4/1               Normal            8 mV
 VP1P35: Vin      4/1               Normal            12650 mV
 VP1P35: ADin     4/1               Normal            112 mV
 VP1P0: Sens      4/1               Normal            15 mV
 VP1P0: Vin       4/1               Normal            12625 mV
 VP1P0: ADin      4/1               Normal            0 mV
 MGTAVTT: Sens    4/1               Normal            21 mV
 MGTAVTT: Vin     4/1               Normal            12625 mV
 MGTAVTT: ADin    4/1               Normal            0 mV
 VP1P8: Sens      4/1               Normal            41 mV
 VP1P8: Vin       4/1               Normal            12600 mV
 VP1P8: ADin      4/1               Normal            0 mV
 VP3P3: Sens      4/1               Normal            39 mV
 VP3P3: Vin       4/1               Normal            12625 mV
 VP3P3: ADin      4/1               Normal            0 mV
 Temp: RTMAC      4/1               Normal            34 Celsius
 Temp: INLET      4/1               Normal            29 Celsius
 Temp: OUTLET     4/1               Normal            27 Celsius
 Temp: MAX6697    4/1               Normal            50 Celsius
 Temp: TCXO       4/1               Normal            37 Celsius
 Temp: SUP_OUT    4/1               Normal            49 Celsius
 Temp: 3882_1 P   4/1               Normal            44 Celsius
 Temp: 3882_2 P   4/1               Normal            39 Celsius
 Temp: 3882_3 P   4/1               Normal            39 Celsius
 VP5P0: Sens      4/1               Normal            6 mV
 VP5P0: Vin       4/1               Normal            12650 mV
 VP5P0: ADin      4/1               Normal            0 mV
 VP1P8: Sens      4/1               Normal            33 mV
 VP1P8: Vin       4/1               Normal            12625 mV
 VP1P8: ADin      4/1               Normal            0 mV
 3P3&1P0: Sens    4/1               Normal            24 mV
 3P3&1P0: Vin     4/1               Normal            12625 mV
```

```
3P3&1P0: ADin    4/1              Normal           0 mV
Temp: INLET PD   4/1              Normal           27 Celsius
Temp: OUTLETPD   4/1              Normal           36 Celsius
Temp: 6697-DC    4/1              Normal           38 Celsius
Temp: PHYOUT     4/1              Normal           49 Celsius
Temp: PHYIN      4/1              Normal           38 Celsius
Temp: SSD        4/1              Normal           40 Celsius
Temp: SFP+       4/1              Normal           36 Celsius
Temp: 3882_1PD   4/1              Normal           42 Celsius
3882_PC1_0: VO   4/1              Normal           1198 mV
3882_PC1_1: VO   4/1              Normal           999 mV
3882_PC2_0: VO   4/1              Normal           998 mV
3882_PC3_0: VO   4/1              Normal           1349 mV
PSOC-PC1_0: VO   4/1              Normal           3300 mV
PSOC-PC1_1: VO   4/1              Normal           12590 mV
PSOC-PC1_2: VO   4/1              Normal           6997 mV
PSOC-PC1_3: VO   4/1              Normal           5000 mV
PSOC-PC1_4: VO   4/1              Normal           3299 mV
PSOC-PC1_5: VO   4/1              Normal           1000 mV
PSOC-PC1_6: VO   4/1              Normal           1010 mV
PSOC-PC1_7: VO   4/1              Normal           1801 mV
PSOC-PC1_8: VO   4/1              Normal           2000 mV
PSOC-PC1_9: VO   4/1              Normal           1198 mV
PSOC-PC1_10: V   4/1              Normal           1798 mV
PSOC-PC1_11: V   4/1              Normal           2500 mV
PSOC-PC1_12: V   4/1              Normal           1353 mV
PSOC-PC1_13: V   4/1              Normal           1223 mV
PSOC-PC1_14: V   4/1              Normal           592 mV
PSOC-PC1_15: V   4/1              Normal           596 mV
3882_PDC_0: VO   4/1              Normal           1000 mV
3882_PDC_1: VO   4/1              Normal           3300 mV
PSOC-DC1_0: VO   4/1              Normal           4998 mV
PSOC-DC1_1: VO   4/1              Normal           3280 mV
PSOC-DC1_2: VO   4/1              Normal           1005 mV
PSOC-DC1_3: VO   4/1              Normal           1801 mV
PSOC-DC1_4: VO   4/1              Normal           2500 mV
12_CUR: Sens     9                Normal           14 mV
12_CUR: Vin      9                Normal           12650 mV
12_CUR: ADin     9                Normal           267 mV
G0_CUR: Sens     9                Normal           69 mV
G0_CUR: Vin      9                Normal           12550 mV
G0_CUR: ADin     9                Normal           0 mV
G1_CUR: Sens     9                Normal           69 mV
G1_CUR: Vin      9                Normal           12575 mV
G1_CUR: ADin     9                Normal           0 mV
LB_CUR: Sens     9                Normal           11 mV
LB_CUR: Vin      9                Normal           12525 mV
LB_CUR: ADin     9                Normal           0 mV
Temp: CAPRICA    9                Normal           40 Celsius
Temp: BASESTAR   9                Normal           47 Celsius
Temp: RAIDER     9                Normal           45 Celsius
Temp: CPU        9                Normal           31 Celsius
Temp: INLET      9                Normal           25 Celsius
Temp: OUTLET     9                Normal           35 Celsius
Temp: DIGITAL    9                Normal           31 Celsius
Temp: UPX        9                Normal           29 Celsius
Temp: LEOBEN1    9                Normal           31 Celsius
Temp: LEOBEN2    9                Normal           35 Celsius
Temp: 3.3-18     9                Normal           43 Celsius
Temp: BS_1V      9                Normal           45 Celsius
Freq: 5338-49    9                Normal           0 MHz
Freq: 5338-52    9                Normal           0 MHz
Freq: 5338-89    9                Normal           0 MHz
3882_1_0: VOUT   9                Normal           3299 mV
```

```
3882_1_1: VOUT   9                Normal            1800 mV
3882_2_0: VOUT   9                Normal            2500 mV
3882_2_1: VOUT   9                Normal            1199 mV
3882_3_0: VOUT   9                Normal            1419 mV
3882_4_0: VOUT   9                Normal            1350 mV
3882_5_0: VOUT   9                Normal            1000 mV
3882_6_0: VOUT   9                Normal            1021 mV
3882_7_0: VOUT   9                Normal            1199 mV
3882_7_1: VOUT   9                Normal            1000 mV
3882_8_0: VOUT   9                Normal            1000 mV
3882_9_0: VOUT   9                Normal            999 mV
V2978: VSENSE0   9                Normal            0 mV
V2978: VSENSE1   9                Normal            0 mV
V2978: VSENSE2   9                Normal            0 mV
V2978: VSENSE3   9                Normal            6000 mV
V2978: VSENSE4   9                Normal            2400 mV
V2978: VSENSE5   9                Normal            0 mV
V2978: VSENSE6   9                Normal            6598 mV
V2978: VSENSE7   9                Normal            4998 mV
V2978: VIN       9                Normal            25218 mV
PSOC_2_0: VOUT   9                Normal            12582 mV
PSOC_2_1: VOUT   9                Normal            4985 mV
PSOC_2_2: VOUT   9                Normal            3256 mV
PSOC_2_3: VOUT   9                Normal            1982 mV
PSOC_2_4: VOUT   9                Normal            1990 mV
PSOC_2_5: VOUT   9                Normal            1782 mV
PSOC_2_6: VOUT   9                Normal            1793 mV
PSOC_2_7: VOUT   9                Normal            1786 mV
PSOC_2_8: VOUT   9                Normal            1483 mV
PSOC_2_9: VOUT   9                Normal            1193 mV
PSOC_2_10: VOU   9                Normal            995 mV
PSOC_2_11: VOU   9                Normal            987 mV
PSOC_2_12: VOU   9                Normal            994 mV
PSOC_2_13: VOU   9                Normal            707 mV
PSOC_2_14: VOU   9                Normal            592 mV
PSOC_2_15: VOU   9                Normal            593 mV
LTC4261: Power   9                Normal            340 Watts
PEM Iout         P0               Normal            5 A
PEM Vout         P0               Normal            55 V DC
PEM Vin          P0               Normal            202 V AC
Temp: INLET      P0               Normal            26 Celsius
Temp: OUTLET     P0               Normal            48 Celsius
PEM Iout         P1               Normal            6 A
PEM Vout         P1               Normal            55 V DC
PEM Vin          P1               Normal            204 V AC
Temp: INLET      P1               Normal            30 Celsius
Temp: OUTLET     P1               Normal            53 Celsius
PEM Iout         P2               Normal            3 A
PEM Vout         P2               Normal            55 V DC
PEM Vin          P2               Normal            204 V AC
Temp: INLET      P2               Normal            25 Celsius
Temp: OUTLET     P2               Normal            51 Celsius
PSOC-MB2_0: VO   R0               Normal            12758 mV
PSOC-MB2_1: VO   R0               Normal            4998 mV
PSOC-MB2_2: VO   R0               Normal            7082 mV
PSOC-MB2_3: VO   R0               Normal            3287 mV
PSOC-MB2_4: VO   R0               Normal            989 mV
PSOC-MB2_5: VO   R0               Normal            1047 mV
PSOC-MB2_6: VO   R0               Normal            1500 mV
PSOC-MB2_7: VO   R0               Normal            1800 mV
PSOC-MB2_8: VO   R0               Normal            914 mV
PSOC-MB2_9: VO   R0               Normal            885 mV
PSOC-MB2_10: V   R0               Normal            994 mV
PSOC-MB2_11: V   R0               Normal            989 mV
```

```
PSOC-MB2_12: V   R0                Normal            1479 mV
PSOC-MB2_13: V   R0                Normal            989 mV
PSOC-MB2_14: V   R0                Normal            984 mV
PSOC-MB2_15: V   R0                Normal            890 mV
PSOC-MB2_16: V   R0                Normal            2485 mV
PSOC-MB2_17: V   R0                Normal            1346 mV
PSOC-MB2_18: V   R0                Normal            1458 mV
PSOC-MB2_19: V   R0                Normal            1208 mV
PSOC-MB2_20: V   R0                Normal            1791 mV
PSOC-MB2_21: V   R0                Normal            3293 mV
PSOC-MB2_22: V   R0                Normal            3250 mV
PSOC-MB2_23: V   R0                Normal            3284 mV
PSOC-MB2_24: V   R0                Normal            4970 mV
PSOC-MB2_25: V   R0                Normal            4451 mV
PSOC-MB3_0: VO   R0                Normal            4983 mV
PSOC-MB3_1: VO   R0                Normal            4979 mV
PSOC-MB3_2: VO   R0                Normal            1500 mV
PSOC-MB3_3: VO   R0                Normal            1192 mV
PSOC-MB3_4: VO   R0                Normal            705 mV
PSOC-MB3_5: VO   R0                Normal            752 mV
PSOC-MB3_6: VO   R0                Normal            579 mV
PSOC-MB3_7: VO   R0                Normal            1500 mV
PSOC-MB3_8: VO   R0                Normal            1501 mV
PSOC-MB3_9: VO   R0                Normal            1250 mV
PSOC-MB3_10: V   R0                Normal            1247 mV
PSOC-MB3_11: V   R0                Normal            1260 mV
PSOC-MB3_12: V   R0                Normal            1038 mV
PSOC-MB3_13: V   R0                Normal            1343 mV
PSOC-MB3_14: V   R0                Normal            670 mV
PSOC-MB3_15: V   R0                Normal            1800 mV
PSOC-MB3_16: V   R0                Normal            908 mV
PSOC-MB3_17: V   R0                Normal            823 mV
PSOC-MB3_18: V   R0                Normal            992 mV
PSOC-MB3_19: V   R0                Normal            984 mV
PSOC-MB3_20: V   R0                Normal            1046 mV
PSOC-MB3_21: V   R0                Normal            1192 mV
PSOC-MB3_22: V   R0                Normal            1169 mV
PSOC-MB3_23: V   R0                Normal            1187 mV
PSOC-MB3_24: V   R0                Normal            1796 mV
PSOC-MB3_25: V   R0                Normal            1792 mV
PSOC-MB3_26: V   R0                Normal            1787 mV
PSOC-MB3_27: V   R0                Normal            1034 mV
3882_MB1_0: VO   R0                Normal            1001 mV
3882_MB1_1: VO   R0                Normal            1022 mV
3882_MB2_0: VO   R0                Normal            1197 mV
3882_MB3_0: VO   R0                Normal            1045 mV
3882_MB3_1: VO   R0                Normal            996 mV
3882_MB4_0: VO   R0                Normal            898 mV
3882_MB5_0: VO   R0                Normal            1348 mV
3882_MB6_0: VO   R0                Normal            1350 mV
3882_MB6_1: VO   R0                Normal            3297 mV
3882_MB7_0: VO   R0                Normal            998 mV
3882_MB8_0: VO   R0                Normal            1501 mV
3882_MB8_1: VO   R0                Normal            1551 mV
3882_MB9_0: VO   R0                Normal            999 mV
3882_MB9_1: VO   R0                Normal            3296 mV
15301_1: VOUT    R0                Normal            2500 mV
15301_2: VOUT    R0                Normal            1200 mV
15301_3: VOUT    R0                Normal            1200 mV
AS_VRM: Sens     R0                Normal            40 mV
AS_VRM: Vin      R0                Normal            12725 mV
AS_VRM: ADin     R0                Normal            0 mV
Y0_VRM: Sens     R0                Normal            23 mV
Y0_VRM: Vin      R0                Normal            12675 mV
```

```
Y0_VRM: ADin     R0              Normal          380 mV
CPU_VCC: Sens    R0              Normal          6 mV
CPU_VCC: Vin     R0              Normal          12725 mV
CPU_VCC: ADin    R0              Normal          0 mV
5P0_BIAS: Sens   R0              Normal          19 mV
5P0_BIAS: Vin    R0              Normal          12700 mV
5P0_BIAS: ADin   R0              Normal          0 mV
7P0_BIAS: Sens   R0              Normal          45 mV
7P0_BIAS: Vin    R0              Normal          12725 mV
7P0_BIAS: ADin   R0              Normal          0 mV
1P0_AA: Sens     R0              Normal          37 mV
1P0_AA: Vin      R0              Normal          12700 mV
1P0_AA: ADin     R0              Normal          0 mV
1P0_RT: Sens     R0              Normal          16 mV
1P0_RT: Vin      R0              Normal          12725 mV
1P0_RT: ADin     R0              Normal          0 mV
1P2: Sens        R0              Normal          37 mV
1P2: Vin         R0              Normal          12675 mV
1P2: ADin        R0              Normal          0 mV
0P9_T0: Sens     R0              Normal          7 mV
0P9_T0: Vin      R0              Normal          12750 mV
0P9_T0: ADin     R0              Normal          0 mV
1P05_CPU: Sens   R0              Normal          11 mV
1P05_CPU: Vin    R0              Normal          12700 mV
1P05_CPU: ADin   R0              Normal          0 mV
1P0_CC: Sens     R0              Normal          16 mV
1P0_CC: Vin      R0              Normal          12700 mV
1P0_CC: ADin     R0              Normal          0 mV
1P35_DDR: Sens   R0              Normal          6 mV
1P35_DDR: Vin    R0              Normal          12725 mV
1P35_DDR: ADin   R0              Normal          0 mV
1P35_RLD: Sens   R0              Normal          0 mV
1P35_RLD: Vin    R0              Normal          12675 mV
1P35_RLD: ADin   R0              Normal          2047 mV
3P3_CCC: Sens    R0              Normal          16 mV
3P3_CCC: Vin     R0              Normal          12700 mV
3P3_CCC: ADin    R0              Normal          1375 mV
1P0_R: Sens      R0              Normal          29 mV
1P0_R: Vin       R0              Normal          12700 mV
1P0_R: ADin      R0              Normal          0 mV
1P5_A0: Sens     R0              Normal          41 mV
1P5_A0: Vin      R0              Normal          12700 mV
1P5_A0: ADin     R0              Normal          0 mV
1P5: Sens        R0              Normal          34 mV
1P5: Vin         R0              Normal          12675 mV
1P5: ADin        R0              Normal          0 mV
2P5: Sens        R0              Normal          5 mV
2P5: Vin         R0              Normal          12700 mV
2P5: ADin        R0              Normal          0 mV
1P8_A: Sens      R0              Normal          10 mV
1P8_A: Vin       R0              Normal          12675 mV
1P8_A: ADin      R0              Normal          947 mV
1P0_BV: Sens     R0              Normal          24 mV
1P0_BV: Vin      R0              Normal          12700 mV
1P0_BV: ADin     R0              Normal          0 mV
3P3: Sens        R0              Normal          16 mV
3P3: Vin         R0              Normal          12725 mV
3P3: ADin        R0              Normal          0 mV
1P2_B: Sens      R0              Normal          41 mV
1P2_B: Vin       R0              Normal          12725 mV
1P2_B: ADin      R0              Normal          0 mV
ADM1075: Power   R0              Normal          329 Watts
Temp: Y0_DIE     R0              Normal          33 Celsius
Temp: BB_DIE     R0              Normal          29 Celsius
```

```
Temp: VP_DIE     R0                Normal            26 Celsius
Temp: RT-E_DIE   R0                Normal            31 Celsius
Temp: INLET_1    R0                Normal            23 Celsius
Temp: INLET_2    R0                Normal            22 Celsius
Temp: OUTLET_1   R0                Normal            25 Celsius
Temp: 3882_1     R0                Normal            46 Celsius
Temp: 3882_1A    R0                Normal            43 Celsius
Temp: 3882_1B    R0                Normal            43 Celsius
Temp: 3882_2     R0                Normal            41 Celsius
Temp: 3882_2A    R0                Normal            40 Celsius
Temp: 3882_2B    R0                Normal            41 Celsius
Temp: 3882_3     R0                Normal            37 Celsius
Temp: 3882_3A    R0                Normal            34 Celsius
Temp: 3882_3B    R0                Normal            33 Celsius
Temp: 3882_4     R0                Normal            46 Celsius
Temp: 3882_4A    R0                Normal            38 Celsius
Temp: 3882_4B    R0                Normal            35 Celsius
Temp: 3882_5     R0                Normal            32 Celsius
Temp: 3882_5A    R0                Normal            23 Celsius
Temp: 3882_5B    R0                Normal            23 Celsius
Temp: 3882_6     R0                Normal            37 Celsius
Temp: 3882_6A    R0                Normal            30 Celsius
Temp: 3882_6B    R0                Normal            32 Celsius
Temp: 3882_7     R0                Normal            38 Celsius
Temp: 3882_7A    R0                Normal            35 Celsius
Temp: 3882_7B    R0                Normal            35 Celsius
Temp: 3882_8     R0                Normal            47 Celsius
Temp: 3882_8A    R0                Normal            45 Celsius
Temp: 3882_8B    R0                Normal            41 Celsius
Temp: 3882_9     R0                Normal            37 Celsius
Temp: 3882_9A    R0                Normal            33 Celsius
Temp: 3882_9B    R0                Normal            32 Celsius
Temp: 8314_1     R0                Normal            40 Celsius
Temp: 8314_2     R0                Normal            36 Celsius
Temp: 3536_1A    R0                Normal            26 Celsius
Temp: 3536_1B    R0                Normal            26 Celsius
Temp: 15301_1A   R0                Normal            31 Celsius
Temp: 15301_1B   R0                Normal            32 Celsius
Temp: 15301_2A   R0                Normal            28 Celsius
Temp: 15301_2B   R0                Normal            34 Celsius
Temp: 15301_3A   R0                Normal            38 Celsius
Temp: 15301_3B   R0                Normal            45 Celsius
Temp: AS_DIE     R0                Normal            70 Celsius
Temp: XPT1_DTL   R0                Normal            42 Celsius
Temp: XPT1_DTR   R0                Normal            42 Celsius
Temp: XPT1_DBL   R0                Normal            42 Celsius
Temp: XPT1_DBR   R0                Normal            42 Celsius
Temp: XPT2_DTL   R0                Normal            42 Celsius
Temp: XPT2_DTR   R0                Normal            42 Celsius
Temp: XPT2_DBL   R0                Normal            42 Celsius
Temp: XPT2_DBR   R0                Normal            42 Celsius
Temp: XPT3_DTL   R0                Normal            42 Celsius
Temp: XPT3_DTR   R0                Normal            42 Celsius
Temp: XPT3_DBL   R0                Normal            42 Celsius
Temp: XPT3_DBR   R0                Normal            42 Celsius
Freq: MAX3674    R0                Normal            500 MHz
Freq: SQ420D     R0                Normal            24 MHz
```

- **show facility-alarm status** —Verify the chassis status.

```
Router# show facility-alarm status

System Totals  Critical: 4  Major: 1  Minor: 8
```

```
Source                    Time                    Severity      Description [Index]
------                    ------                  --------      -------------------
slot 3/0                  Apr 13 2015 16:25:58    CRITICAL      Active Card Removed
OIR Alarm [0]
Power Supply Bay 3        Apr 13 2015 13:41:56    CRITICAL      Power Supply/FAN
Module Missing [0]
Power Supply Bay 4        Apr 13 2015 13:41:56    CRITICAL      Power Supply/FAN
Module Missing [0]
Power Supply Bay 5        Apr 13 2015 13:41:56    CRITICAL      Power Supply/FAN
Module Missing [0]
Cable3/0/15-US0           Apr 13 2015 17:32:53    MINOR         Physical Port Link
Down [0]
Cable3/0/15-US1           Apr 13 2015 17:32:53    MINOR         Physical Port Link
Down [0]
Cable3/0/15-US2           Apr 13 2015 17:32:53    MINOR         Physical Port Link
Down [0]
Cable3/0/15-US3           Apr 13 2015 17:32:53    MINOR         Physical Port Link
Down [0]
Cable3/0/15-US4           Apr 13 2015 17:32:53    MINOR         Physical Port Link
Down [0]
```

Gigabit Ethernet Management Interface Overview

The purpose of this interface is to allow users to perform management tasks on the router; it is basically an interface that should not and often cannot forward network traffic but can otherwise access the router, often via Telnet and SSH, and perform most management tasks on the router.

The following aspects of the Management Ethernet interface should be noted:

- Each SUP has a Management Ethernet interface, but only the active SUP has an accessible Management Ethernet interface (the standby SUP can be accessed using the console port, however).
- IPv4, IPv6, and ARP are the only routed protocols supported for the interface.
- The interface provides a method of access to the router even when some software processes are down.
- The Ethernet Management Interface cannot be used as a Lawful Intercept MD source interface.
- The Management Ethernet interface is part of its own VRF.

Gigabit Ethernet Port Numbering

The Gigabit Ethernet Management port is always GigabitEthernet0.

In a dual SUP configuration, the Management Ethernet interface on the active SUP will always be Gigabit Ethernet 0, while the Management Ethernet interface on the standby SUP will not be accessible using the Cisco IOS-XE CLI in the same telnet session. The standby SUP can be telnetted to through the console port, however.

The port can be accessed in configuration mode like any other port on the Cisco cBR Series Routers:

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gigabitethernet0
Router(config-if)#
```

IP Address Handling in ROMMON and the Management Ethernet Port

Assuming the IOS-XE process has not begun running on the Cisco cBR Series Router, the IP address that was set in ROMMON acts as the IP address of the Management Ethernet interface. In cases where the IOS-XE process is running and has taken control of the Management Ethernet interface, the IP address specified when configuring the Gigabit Ethernet 0 interface in the IOS-XE CLI becomes the IP address of the Management Ethernet interface. The ROMMON-defined IP address is only used as the interface address when the IOS-XE process is inactive.

For this reason, the IP addresses specified in ROMMON and in the IOS-XE CLI can be identical and the Management Ethernet interface will function properly in single SUP configurations.

In dual SUP configurations, however, users should never configure the IP address in the ROMMON on either SUP0 or SUP1 to match each other or the IP address as defined by the IOS-XE CLI. Configuring matching IP addresses introduces the possibility for an active and standby Management Ethernet interface having the same IP address with different MAC addresses, which will lead to unpredictable traffic treatment.

Gigabit Ethernet Management Interface VRF

Placing the management Ethernet interface in its own VRF has the following effects on the Management Ethernet interface:

- Many features must be configured or used inside the VRF, so the CLI may be different for certain Management Ethernet functions on the Cisco cBR Series Routers than on Management Ethernet interfaces on other routers.
- The VRF prevents route leakage and avoids unnecessary traffic through the management port.

The Management Ethernet interface VRF supports both IPv4 and IPv6 address families.

Common Ethernet Management Tasks

Because users can perform most tasks on a router through the Management Ethernet interface, many tasks can be done by accessing the router through the Management Ethernet interface.

This section documents tasks that might be common or slightly tricky on the Cisco cBR Series Routers. It is not intended as a comprehensive list of all tasks that can be done using the Management Ethernet interface.

Viewing the VRF Configuration

The VRF configuration for the Management Ethernet interface is viewable using the **show running-config vrf** command.

This example shows the default VRF configuration:

```
Router# show running-config vrf
```

```
Building configuration...

Current configuration : 351 bytes
vrf definition Mgmt-intf
!
address-family ipv4
exit-address-family
!
address-family ipv6
exit-address-family
!
(some output removed for brevity)
```

Setting a Default Route in the Management Ethernet Interface VRF

To set a default route in the Management Ethernet Interface VRF, use the **ip route vrf Mgmt-intf 0.0.0.0 0.0.0.0** *next-hop-IP-address* command.

Setting the Management Ethernet IP Address

The IP address of the Management Ethernet port is set like the IP address on any other interface.

Below are two simple examples of configuring an IPv4 address and an IPv6 address on the Management Ethernet interface.

IPv4 Example

```
Router(config)# interface GigabitEthernet 0
Router(config-if)# ip address A.B.C.D A.B.C.D
```

IPv6 Example

```
Router(config)# interface GigabitEthernet 0
Router(config-if)# ipv6 address X:X:X:X::X /prefix-length
```

Telnetting over the Management Ethernet Interface

Telnetting can be done through the VRF using the Management Ethernet interface.

In the following example, the router telnets to 172.17.1.1 through the Management Ethernet interface VRF:

```
Router# telnet 172.17.1.1 /vrf Mgmt-intf
```

Pinging over the Management Ethernet Interface

Pinging other interfaces using the Management Ethernet interface is done through the VRF.

In the following example, the router pings the interface with the IP address of 172.17.1.1 through the Management Ethernet interface:

```
Router# ping vrf Mgmt-intf 172.17.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.17.1.1, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/1/1 ms
```

Copy Using TFTP or FTP

To copy a file using TFTP through the Management Ethernet interface, the **ip tftp source-interface GigabitEthernet 0** command must be entered before entering the **copy tftp** command because the **copy tftp** command has no option of specifying a VRF name.

Similarly, to copy a file using FTP through the Management Ethernet interface, the **ip ftp source-interface GigabitEthernet 0** command must be entered before entering the **copy ftp** command because the **copy ftp** command has no option of specifying a VRF name.

TFTP Example

```
Router(config)# ip tftp source-interface gigabitethernet 0
```

FTP Example

```
Router(config)# ip ftp source-interface gigabitethernet 0
```

NTP Server

To allow the software clock to be synchronized by a Network Time Protocol (NTP) time server over the Management Ethernet interface, enter the **ntp server vrf Mgmt-intf** command and specify the IP address of the device providing the update.

The following CLI provides an example of this procedure.

```
Router(config)# ntp server vrf Mgmt-intf 172.17.1.1
```

SYSLOG Server

To specify the Management Ethernet interface as the source IP or IPv6 address for logging purposes, enter the **logging host** *ip-address* **vrf Mgmt-intf** command.

The following CLI provides an example of this procedure.

```
Router(config)# logging host ip-address vrf Mgmt-intf
```

SNMP-Related Services

To specify the Management Ethernet interface as the source of all SNMP trap messages, enter the **snmp-server source-interface traps gigabitEthernet 0** command.

The following CLI provides an example of this procedure:

```
Router(config)# snmp-server source-interface traps gigabitEthernet 0
```

Domain Name Assignment

The IP domain name assignment for the Management Ethernet interface is done through the VRF.

To define the default domain name as the Management Ethernet VRF interface, enter the i**p domain-name vrf Mgmt-intf** *domain* command.

```
Router(config)# ip domain-name vrf Mgmt-intf cisco.com
```

DNS service

To specify the Management Ethernet interface VRF as a name server, enter the **ip name-server vrf Mgmt-intf** *IPv4/IPv6 address* command.

RADIUS or TACACS+ Server

To group the Management VRF as part of a AAA server group, enter the **ip vrf forward Mgmt-intf** command when configuring the AAA server group.

The same concept is true for configuring a TACACS+ server group. To group the Management VRF as part of a TACACS+ server group, enter the **ip vrf forwarding Mgmt-intf** command when configuring the TACACS+ server group.

RADIUS Server Group Configuration

```
Router(config)# aaa group server radius hello
Router(config-sg-radius)# ip vrf forwarding Mgmt-intf
```

TACACS+ Server Group Configuration

```
Router(config)# aaa group server tacacs+ hello
Router(config-sg-tacacs+)# ip vrf forwarding Mgmt-intf
```

VTY lines with ACL

To ensure an access control list (ACL) is attached to vty lines that are and are not using VRF, use the **vrf-also** option when attaching the ACL to the vty lines.

```
Router(config)# line vty 0 4
Router(config-line)#access-class 90 in vrf-also
```

Configuring the AUX Port for Network Management

Step 1 AUX port is used for IOSd command prompt. Type the **set** command at the rommon prompt.

Step 2 Verify if BOOT_PARAM is defined. It must not be defined.

Step 3 If the BOOT_PARAM is defined, do the following:

a) Type **unset BOOT_PARAM**.
b) Type **sync**.
c) Type **reset**.

Step 4 Boot with the latest image. The AUX port will show IOS command prompt.

Preprovisioning the Supervisor in the Cisco cBR Chassis

Preprovisioning on the Cisco cBR allows you to configure the Supervisors without their physical presence in the chassis.

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	**card** *slot*/**1** **sup-pic-8x10g** **Example:** `Router(config)# card 4/1 sup-pic-8x10g`	Preprovisions the Supervisor in the Cisco cBR chassis. • *slot*—Identifies the chassis slot number for the Supervisor PIC. The valid values are 4 and 5.

Configuring the Gigabit Ethernet Interface for Network Management

You must configure the GigabitEthernet0 interface and enable it to use the NME port.

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:**	Enters global configuration mode.

	Command or Action	Purpose
	`Router# configure terminal`	
Step 3	**interface GigabitEthernet0** **Example:** `Router(config)# interface GigabitEthernet0`	Enters the Gigabit Ethernet interface configuration mode.
Step 4	**vrf forwarding** *vrf-name* **Example:** `Router(config-if)# vrf forwarding Mgmt-intf`	Associates a Virtual Routing and Forwarding (VRF) instance with the interface. • *vrf-name*—The interface name to be associated with the specified VRF.
Step 5	**ip address** *ip-address subnet-mask* **Example:** `Router(config-if)# ip address 192.71.0.1 255.255.255.0`	Sets the IP address of the Gigabit Ethernet interface. • *ip-address*—IP address of the Gigabit Ethernet interface. • *subnet -mask*—Subnet mask for the network.
Step 6	**no shutdown** **Example:** `Router(config-if)# no shutdown`	Enables the Gigabit Ethernet interface.
Step 7	**speed 1000** [**negotiate**] **Example:** `Router(config-if)# speed 1000`	Configures the speed for the Gigabit Ethernet interface.
Step 8	**duplex full** **Example:** `Router(config-if)# duplex full`	Configures full duplex operation on the Gigabit Ethernet interface.
Step 9	**negotiation auto** **Example:** `Router(config-if)# negotiation auto`	Selects the auto-negotiation mode.
Step 10	**end** **Example:** `Router(config-if)# end`	Exits Gigabit Ethernet interface configuration mode. Returns to privileged EXEC mode.

Configuring the DTI Port on the Supervisor PIC

The Cisco cBR router can run in standalone mode, which uses internal clock and does not require any external reference clock source. The Cisco cBR router also supports DTI server as an external clocking source. To use a DTI server as a reference clock source, you must enable the DTI port on the Supervisor PIC.

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	**cable clock dti** **Example:** `Router(config)# cable clock dti`	Configures the DTI clock reference mode for the Supervisor PIC.

Configuring the TenGigabit Ethernet Interface for Network Management

You must configure the TenGigabitEthernet interface and enable it to use the NME port.

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	**interface TenGigabitEthernet** **Example:** `Router(config)# interface TenGigabitEthernet4/1/0`	Enters the TenGigabit Ethernet interface configuration mode.
Step 4	**ip address** *ip-address subnet-mask* **Example:** `Router(config-if)# ip address 1.2.3.4 255.255.255.0`	Sets the IP address of the TenGigabit Ethernet interface.
Step 5	**load-interval** *seconds* **Example:** `Router(config-if)# load-interval 30`	Changes the length of time for which data is used to compute load statistics.

	Command or Action	Purpose
Step 6	**no shutdown** **Example:** `Router(config-if)# no shutdown`	Enables the TenGigabit Ethernet interface.
Step 7	**end** **Example:** `Router(config-if)# end`	Exits TenGigabit Ethernet interface configuration mode. Returns to privileged EXEC mode.

Connecting the New Router to the Network

Connect the new router to the network using a n Ethernet interface. After the router successfully resolves its host name, new router sends a TFTP broadcast requesting the file name-confg or name.cfg. The router name must be in all lowercase, even if the true host name is not. The file is downloaded to the new router, where the configuration commands take effect immediately. If the configuration file is complete, the new router should be fully operational.

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

Procedure

	Command or Action	Purpose
Step 1	**enable password**	Enters privileged mode on the new router.
Step 2	**copy running-config startup-config**	Saves the information from the name-config file into your startup configuration. On most platforms, this step saves the configuration to NVRAM. **Note** Verify that the existing and new routers (or access servers) are connected before entering the **copy running-config startup-config** EXEC command to save configuration changes. Use the **ping** EXEC command to verify connectivity. If an incorrect configuration file is downloaded, the new router will load NVRAM configuration information before it can enter AutoInstall mode. If the configuration file is a minimal configuration file, the new router comes up, but with only one interface operational. Use the following commands to connect to the new router and configure it.
Step 3	**telnet existing**	Establishes a Telnet connection to the existing router.
Step 4	**telnet newrouter**	From the existing router, establishes a Telnet connection to the new router.
Step 5	**enable password**	Enters privileged EXEC mode.

	Command or Action	Purpose
Step 6	**setup**	Enters setup mode to configure the new router.

Setting Password Protection on the Cisco CMTS

Note For security purposes, the EXEC has two levels of access to commands: user EXEC mode and privileged EXEC mode. The commands available at the user level are a subset of those available at the privileged level.

Tip Because many privileged-level EXEC commands are used to set operating parameters, password-protect these commands to prevent unauthorized use.

Note An enable secret password can contain from 1 to 25 uppercase and lowercase alphanumeric characters. An enable password can contain any number of uppercase and lowercase alphanumeric characters. A number cannot be the first character. Spaces are valid password characters; for example, “two words” is a valid password. Leading spaces are ignored. Trailing spaces are recognized. Alphanumeric characters are recognized as uppercase or lowercase.

Passwords should be different for maximum security. If you enter the same password for both during the setup script, the system accepts it, but you receive a warning message indicating that you should enter a different password.

At the EXEC prompt, enter one of the following two commands to set password protection:

- **enable secret password**—a very secure encrypted password.
- **enable**—is a less secure and nonencrypted password.

To gain access to privileged-level commands, enter the desired password.

Recovering Lost Password on the Cisco CMTS

Complete the following steps to recover or replace a lost enable, enable secret, or console login password:

Step 1 Attach an ASCII terminal to the console port on your Cisco CMTS.

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

Step 3 If you can log in to the router as a nonprivileged user, enter the **show version** command to display the existing configuration register value. Note the value for later use. If you cannot log in to the router at all, continue with the next step.

Step 4 Press the **Break** key or send a **Break** from the console terminal.

- If Break is enabled, the router enters the ROM monitor, indicated by the ROM monitor prompt (rommon n>), where n is the number of the command line. Proceed to configuring the register.
- If Break is disabled, power cycle the router (turn the router off or unplug the power cord, and then restore power). Within 60 seconds of restoring the power to the router, press the **Break** key or send a **Break**. This action causes the router to enter the ROM monitor and display the ROM monitor prompt (rommon 1>).

Step 5 To set the configuration register on a Cisco CMTS, use the configuration register utility by entering the **confreg** command at the ROM monitor prompt as follows:

```
rommon 1> confreg
```

Answer **yes** to the *enable ignore system config info?* prompt and note the current configuration register settings.

Step 6 Initialize the router by entering the **reset** command as follows:

```
rommon 2> reset
```

The router initializes, the configuration register is set to 0x142, the router boots the system image from Flash memory and enters the System Configuration dialog (setup), as follows:

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

Step 7 Enter **no** in response to the System Configuration dialog prompts until the following message appears:

```
Press RETURN to get started!
```

Step 8 Press **Return**. The user EXEC prompt appears as follows:

```
Router>
```

Step 9 Enter the **enable** command to enter privileged EXEC mode.

Step 10 Enter the **show startup-config** command to display the passwords in the configuration file as follows:

```
Router# show startup-config
```

Step 11 Scan the configuration file display looking for the passwords; the enable passwords are usually near the beginning of the file, and the console login or user EXEC password is near the end. The passwords displayed will look something like this:

```
enable secret 5 $1$ORPP$s9syZt4uKn3SnpuLDrhuei
enable password 23skiddoo
.
.
line con 0
 password onramp
```

Note The enable secret password is encrypted and cannot be recovered; it must be replaced. The enable and console passwords can be encrypted text or clear text.

Proceed to the next step to replace an enable secret, console login, or enable password. If there is no enable secret password, note the enable and console login passwords if they are not encrypted and proceed to set the configuration register to the original value.

Caution Do not perform the next step unless you have determined that you must change or replace the enable, enable secret, or console login passwords. Failure to follow the steps as presented here could cause your router configuration to be erased.

Step 12 (Optional) Enter the configure memory command to load the startup configuration file into running memory. This action allows you to modify or replace passwords in the configuration.

```
Router# configure memory
```

Step 13 Enter the **configure terminal** command for configuration mode:

```
Router# configure terminal
```

Step 14 To change all three passwords, enter the following commands:

```
Router(config)# enable secret newpassword1

Router(config)# enable password newpassword2
Router(config)# line con 0

Router(config)# password newpassword3
```

Change only the passwords necessary for your configuration. You can remove individual passwords by using the **no** form of the previous commands. For example, entering the **no enable secret** command removes the enable secret password.

Step 15 You must configure all interfaces to not be administratively shut down as follows:

```
Router(config)# interface gigabitethernet 0

Router(config)# no shutdown
```

Enter the equivalent commands for all interfaces that were originally configured. If you omit this step, all interfaces are administratively shut down and unavailable when the router is restarted.

Step 16 Use the **config-register** command to set the configuration register to the original value noted earlier.

Step 17 Press **Ctrl-Z** or type **end** to exit configuration mode:

```
Router(config)# end
```

Caution Do not perform the next step unless you have changed or replaced a password. If you skipped changing or replacing the enable, enable secret, or console login passwords previously, then proceed now to reload. Failure to observe this sequence causes the system to erase your router configuration file.

Step 18 Enter the **copy running-config startup-config** command to save the new configuration to nonvolatile memory:

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

Step 19 Enter the **reload** command to reboot the router:

```
Router# reload
```

Step 20 Log in to the router with the new or recovered passwords.

Saving Your Configuration Settings

To store the configuration or changes to your startup configuration in NVRAM, enter the **copy running-config startup-config** command at the *Router#* prompt.

This command saves the configuration settings you set using configuration mode, the Setup facility, or AutoInstall.

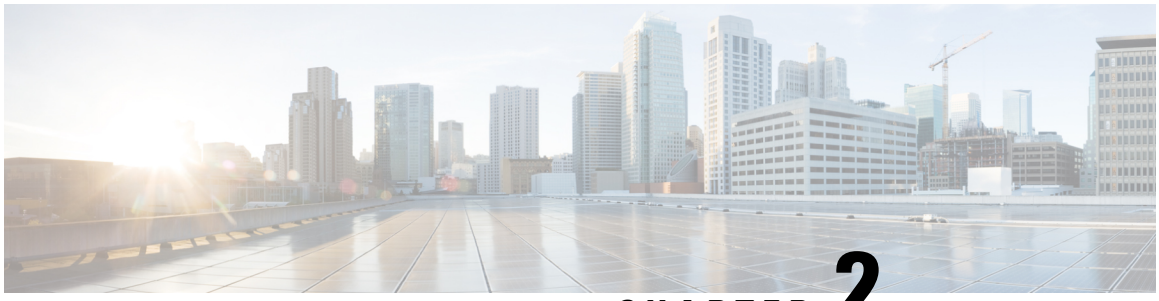
Note If you do not save your settings, your configuration will be lost the next time you reload the router.

Example

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

Reviewing Your Settings and Configurations

- To view the current configuration of a Cisco CMTS, run the **show running-config** command at the command-line interface (CLI) prompt in EXEC mode or privileged EXEC mode.
- To review changes you make to the configuration, use the EXEC **show startup-config** command to display the information stored in NVRAM.



CHAPTER 2

Cisco Smart Licensing

A new licensing model, based on a single technology, has been designed for Cisco called Smart Licensing that is intended to provide Enterprise Level Agreement-like capabilities for all Cisco products. The Cisco Smart Licensing is based on the Trust but Verify model.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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.

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- Prerequisites for Cisco Smart Licensing, on page 32
- Information About Cisco Smart Licensing, on page 33
- How to Configure Cisco Smart Licensing, on page 34
- How to Configure Cisco Smart Licensing using Transport Gateway Solution, on page 45
- Verifying Cisco Smart Licensing Configuration, on page 46
- Troubleshooting Cisco Smart Licensing, on page 52
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Hardware Compatibility Matrix for Cisco cBR Series Routers

Note The hardware components 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 3.15.0S and Later Releases** Cisco cBR-8 Supervisor: • PID—CBR-CCAP-SUP-160G • PID—CBR-CCAP-SUP-60G[1] • PID—CBR-SUP-8X10G-PIC	**Cisco IOS-XE Release 3.15.0S 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 Cisco cBR-8 Downstream PHY Modules: • PID—CBR-D30-DS-MOD • PID—CBR-D31-DS-MOD Cisco cBR-8 Upstream PHY Modules: • PID—CBR-D30-US-MOD

[1] Effective with Cisco IOS-XE Release 3.17.0S, CBR-CCAP-SUP-60G supports 8 cable line cards. The total traffic rate is limited to 60Gbps, the total number of downstream service flow is limited to 72268, and downstream unicast low-latency flow does not count against the limits.

Prerequisites for Cisco Smart Licensing

- You must configure the DNS server using the **ip name-server** global configuration command.
- You must configure the IP DNS-based hostname-to-address translation using the **ip domain-lookup** global configuration command.
- Cisco Smart Licensing is enabled by default on the Cisco cBR router. However, you must ensure that the CiscoTAC-1 call-home profile points to the Cisco Smart Software Manager at the following URL using the **show call-home profile CiscoTAC-1** command:

  https://tools.cisco.com/its/service/oddce/services/DDCEService

  The following is a sample output of the **show call-home profile CiscoTAC-1** command:

```
Router# show call-home profile CiscoTAC-1

Load for five secs: 10%/1%; one minute: 9%; five minutes: 8%
Time source is NTP, 16:49:35.525 PDT Thu Oct 29 2015

Profile Name: CiscoTAC-1
    Profile status: ACTIVE
    Profile mode: Anonymous Reporting Only
    Reporting Data: Smart Call Home, Smart Licensing
```

```
Preferred Message Format: xml
Message Size Limit: 3145728 Bytes
Transport Method: http
Email address(es): callhome@cisco.com
HTTP  address(es): https://tools.cisco.com/its/service/oddce/services/DDCEService

Periodic configuration info message is scheduled every 19 day of the month at 11:41


Periodic inventory info message is scheduled every 19 day of the month at 11:26

Alert-group               Severity
------------------------  ------------
crash                     debug
diagnostic                minor
environment               minor
inventory                 normal

Syslog-Pattern            Severity
------------------------  ------------
.*                        major
```

- Ensure that you can ping the DNS server. If you are unable to ping the server, verify the connectivity to the NME port on the Cisco cBR router.

Note If you are using a Virtual Routing and Forwarding (VRF) instance, ensure that you can ping the VRF instance.

Information About Cisco Smart Licensing

Cisco Smart Licensing is software-based licensing that consists of tools and processes to authorize the customers for the usage and reporting of the Cisco products. The feature has the capability to capture the customer order and communicate with the Cisco Cloud License Service through Smart Call Home transport media to complete the product registration and authorization. If the Cisco products stop communicating with the Cisco Cloud License Service for 90 days, the cable interfaces in the Cisco products will be locked, which means the customer can no longer enable/disable the cable interfaces.

The Cisco Smart Licensing feature is aimed at giving users an experience of a single, standardized licensing solution for all Cisco products.

In the Cisco Smart Licensing Model, you can activate licensed features (also known as entitlements) without the use of a special software key or upgrade license file. You can activate the new functionality using the appropriate product commands and configurations and the functionality is activated. A software reboot is not required for the Cisco cBR router.

Effective with Cisco IOS-XE Release 3.15, the Cisco cBR router supports software activation using Cisco Smart Licensing. The Cisco Smart Licensing is enabled by default on the Cisco cBR router.

Note A LCHA license is needed for each working linecard that is protected by the protect linecard.

Downstream License

The DOCSIS 3.1 license scheme provides support to identify the DOCSIS 3.1 channels and their width. The DOCSIS 3.1 entitlement is DOCSIS 3.1 Downstream Channel License.

Out of Compliance Enforcement

Effective Cisco IOS-XE 3.18.0SP Release, the following two events are responsible for triggering a DOCSIS configuration lock enforcement.

Eval-Expired (Evaluation Period Expired)

When a router is not registered with Smart License Manager for more than ninety days.

Auth-Expired (authorization Period Expired)

When a registered router fails to communicate with the Smart License Manager for more than ninety days.

When either of the above mentioned events occur, the Smart Agent sends a notification to the platform. The platform, upon receiving such notification, **locks** the following CLI commands:

- **[no] cable upstream shutdown** *upstream-port-number*
- **contoller upstream-cable** *slot/subslot/controller-port-number*
- **rf-chan***channel-number*

Any attempt to configure the above mentioned CLIs in this condition would fail and a warning message will be displayed. Under this condition all other CLIs are configurable, some of which may be required to configure Cisco License Call Home, connect to cisco and register the device to come out of either of the above two events and enter into authorized or Out of Compliance (OOC) state.

You can copy the modified configuration file to the startup configuration file and reload the device to make that configuration effective. However, when the device is in enforced state, you can only copy the running configuration file to the startup configuration file.

Note Any attempt to copy any other file fails and a warning message is displayed.

How to Configure Cisco Smart Licensing

This section contains the following:

Using Cisco Smart Licensing Agent on the Router

Step 1 Set up a Cisco Smart Account. See Setting Up a Cisco Smart Account, on page 35.

Step 2 Log in to the Cisco Smart Software Manager.

Step 3 (Optional) Create a virtual account. See Creating Virtual Accounts, on page 41.

Note A single default virtual account is always available.

Step 4 Create a product instance registration token. See Creating a Product Instance Registration Token, on page 42.

Step 5 Register the router with the Cisco Licensing Cloud using the product instance registration token. See Registering the Router with the Cisco Licensing Cloud Using the Registration Token, on page 44.

Step 6 Log in to the Cisco Smart Software Manager for managing licenses.

For more information, see the *Cisco Smart Software Manager User Guide*, which is accessible from the Cisco Smart Software Manager tool.

Setting Up a Cisco Smart Account

Cisco Smart Account enables you to fully utilize the license management features of the smart-enabled products.

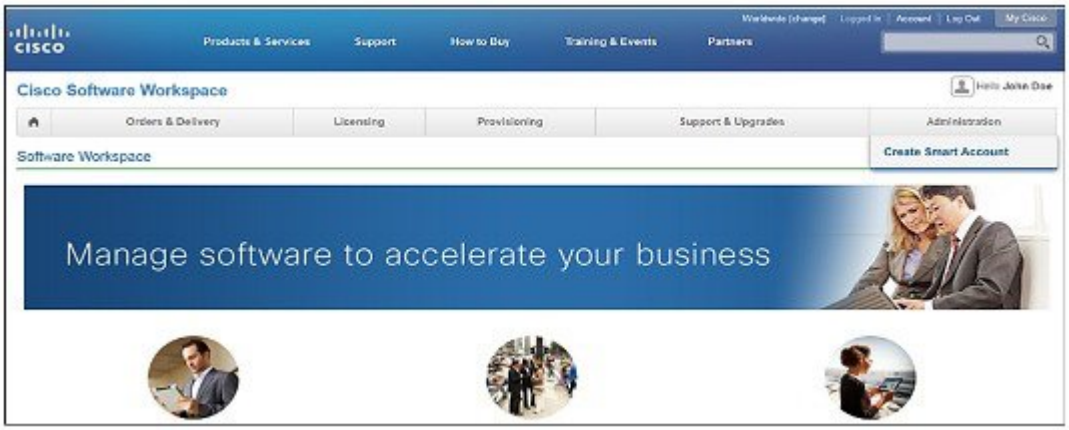
Before you begin

- Ensure that you have a CCO ID.

Step 1 Log in to Cisco Software Workspace (CSW) with your CCO ID.

Step 2 Hover the cursor over the *Administration* tab and click **Create Smart Accounts**.

Figure 1: Creating Smart Account

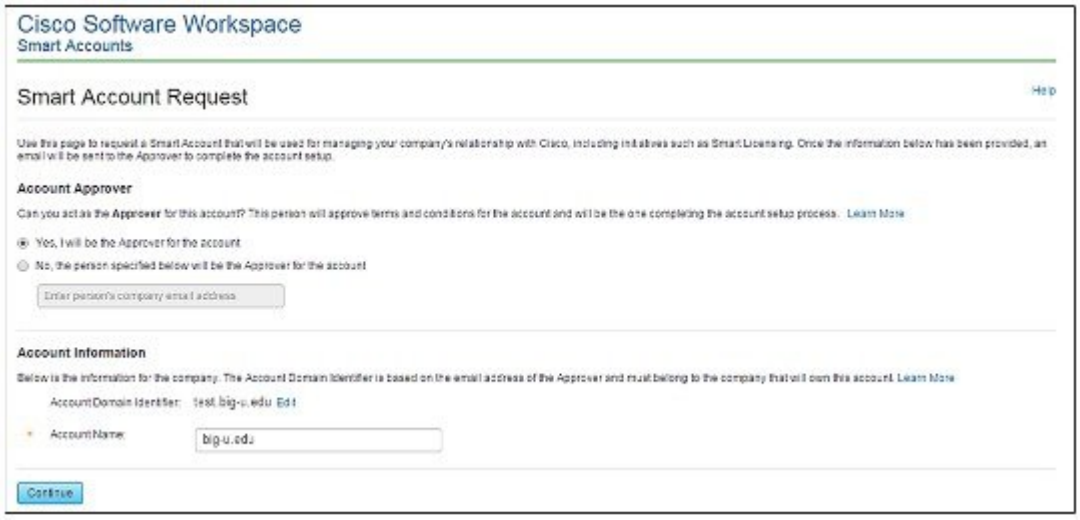


Step 3 Perform one of the following to select the Account Approver:

- To select yourself as the Approver, click the **Yes, I will be the Approver for the account** radio button.
- To select other person as the Approver, click the **No, the person specified below will be the Approver for the account** radio button and specify the person's e-mail ID.

Note The specified Approver must have the authority to enter legal agreements. The Approver serves as the primary owner and nominates account administrators.

Figure 2: Selecting the Approver



Step 4 If you are the Approver, perform the following:

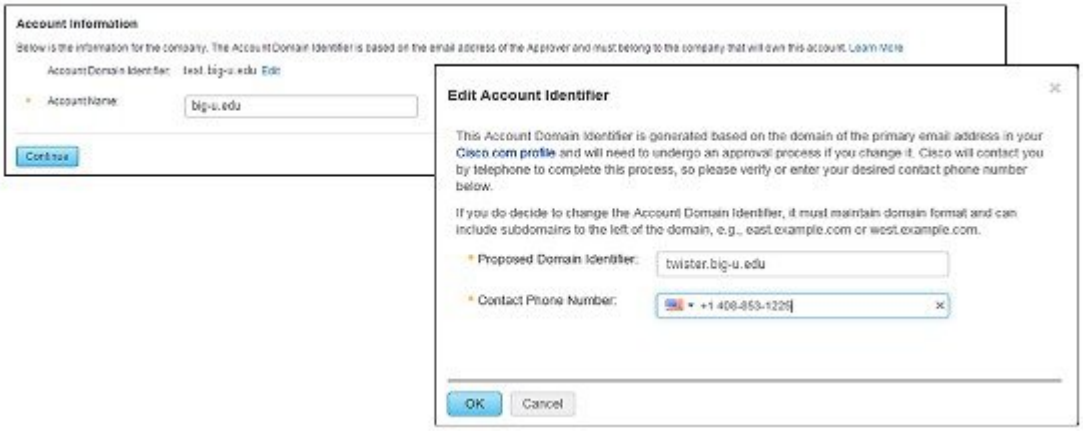
a) Enter the Account Name, Company/Organization Name, Country, and State/Province/Region information.

b) (Optional) Click **Edit**. In the *Edit Account Identifier* window, enter a valid Proposed Domain Identifier and Contact Phone Number. Click **OK**.

Note The default domain identifier is the Approver e-mail domain. If you edit the domain identifier, the change goes through a manual approval process.

c) Click **Continue** to select the legal address to be linked to your Cisco Smart Account.

Figure 3: Setting Up Account Information When You Are The Approver



Step 5 If you are not the Approver, perform the following:

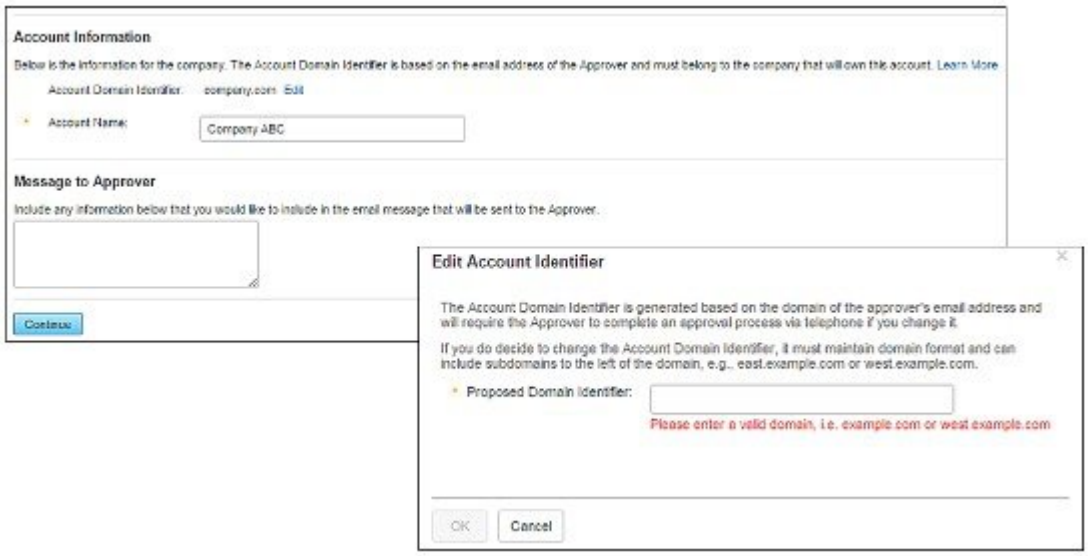
a) Enter the Account Name and an optional Message to Approver.

b) (Optional) Click **Edit**. In the *Edit Account Identifier* window, enter a valid Proposed Domain Identifier. Click **OK**.

Note The default domain identifier is the Approver e-mail domain. If you edit the domain identifier, the change goes through a manual approval process.

c) Click **Continue**.

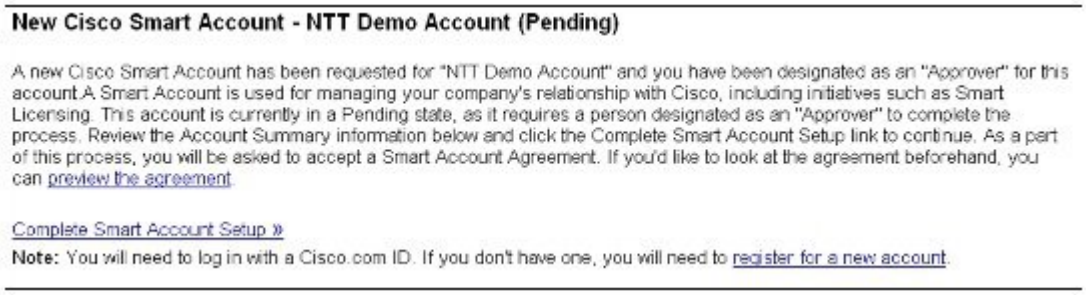
Figure 4: Setting Up Account Information When You Are Not The Approver



Step 6 If you are not the Approver, the Approver will receive an e-mail and must perform the following:

a) Click **Complete Smart Account Setup** in the received e-mail.

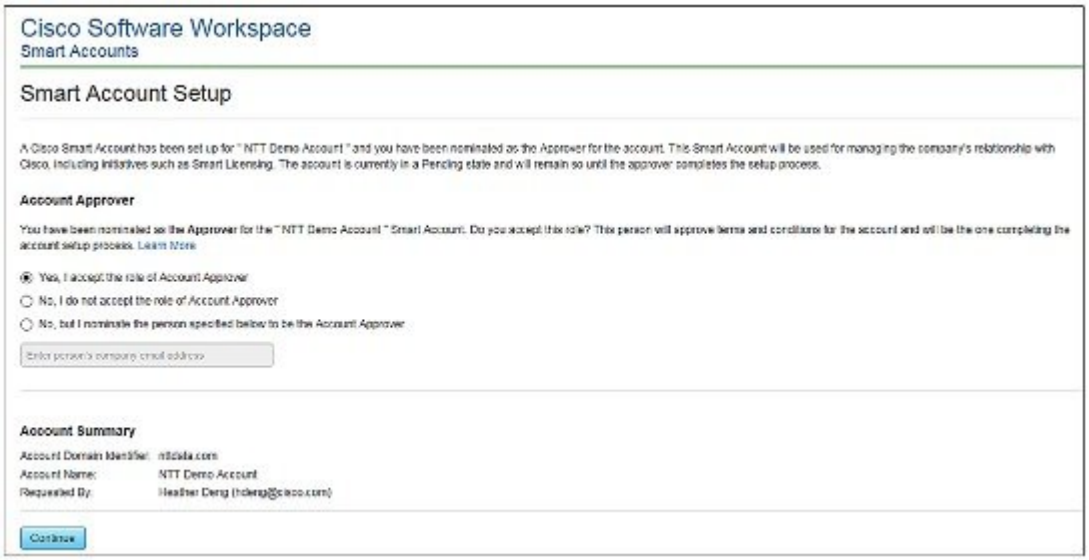
Figure 5: Complete Smart Account Setup Link in E-mail



b) Click the appropriate radio button to accept, decline, or nominate another Approver. To nominate another Approver, enter the person's e-mail address. Click **Continue**.

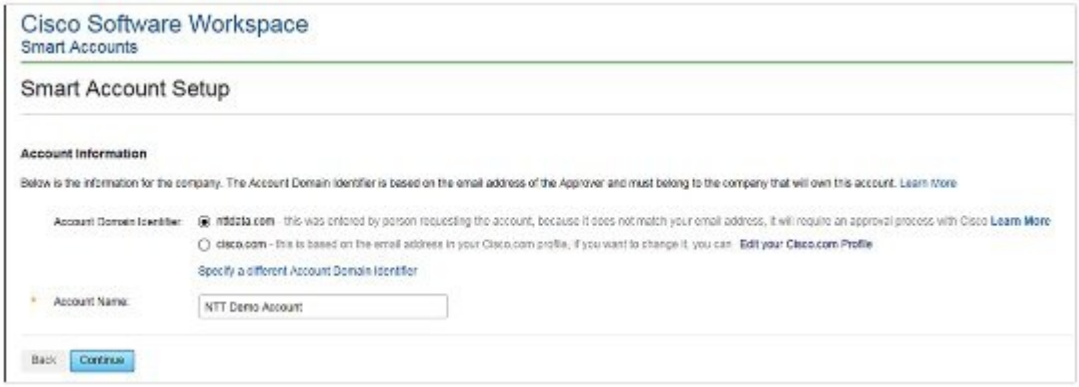
Note If the Approver declines, the Cisco Smart Account is deleted. If the Approver nominates another approver, the new Approver must accept the role.

Figure 6: Accepting the Account Approver Role



c) After accepting the Approver role, click the appropriate radio button to select the Account Domain Identifier or specify a different Account Domain Identifier.

Figure 7: Completing the Account Information



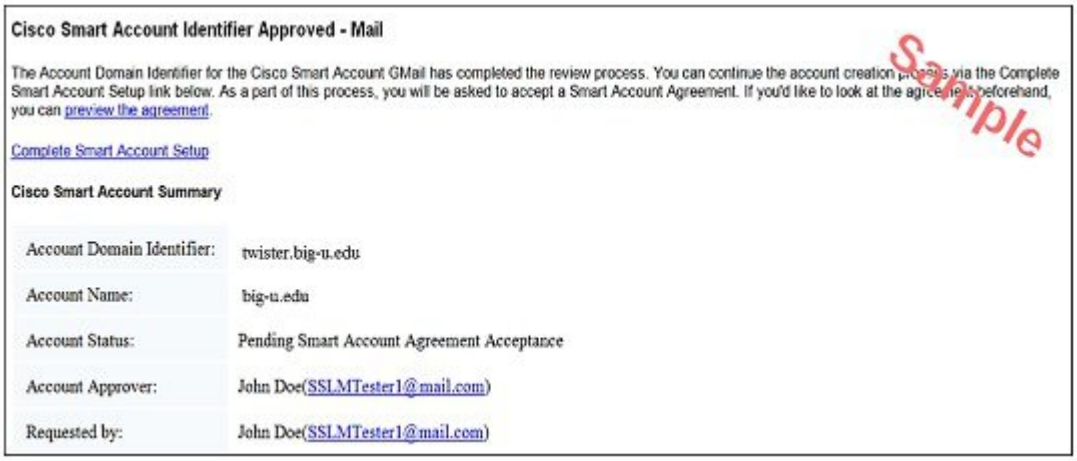
d) Enter the Account Name and click **Continue**.

The Approver role is accepted and Cisco Smart Account is pending Account Domain approval.

Step 7 After the Account Domain is approved, the Approver will receive an e-mail and must perform the following:

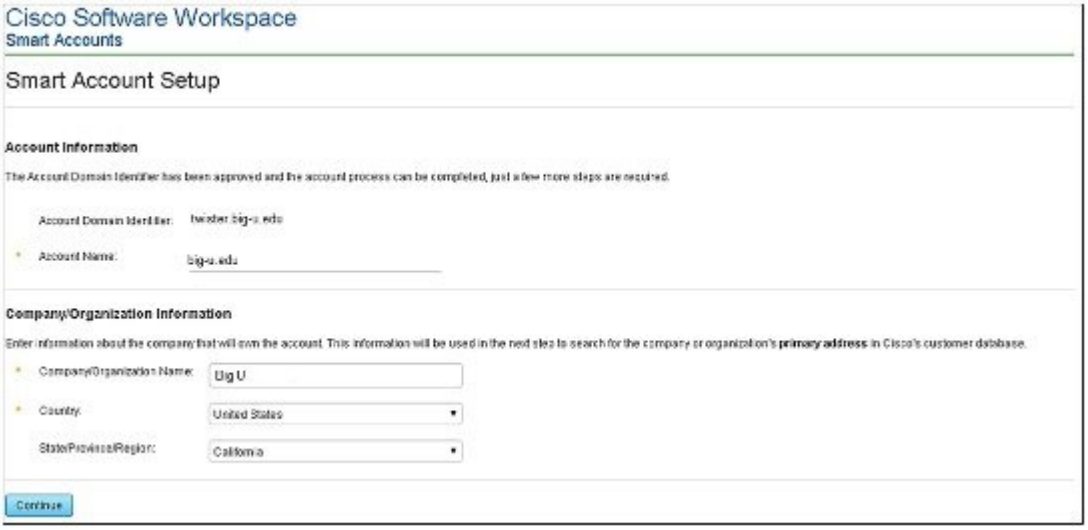
a) Click **Complete Smart Account Setup** in the received e-mail.

Figure 8: Cisco Smart Account Identifier Approved E-mail



b) Enter the Account Name, Company/Organization Name, Country, and State/Province/Region information.

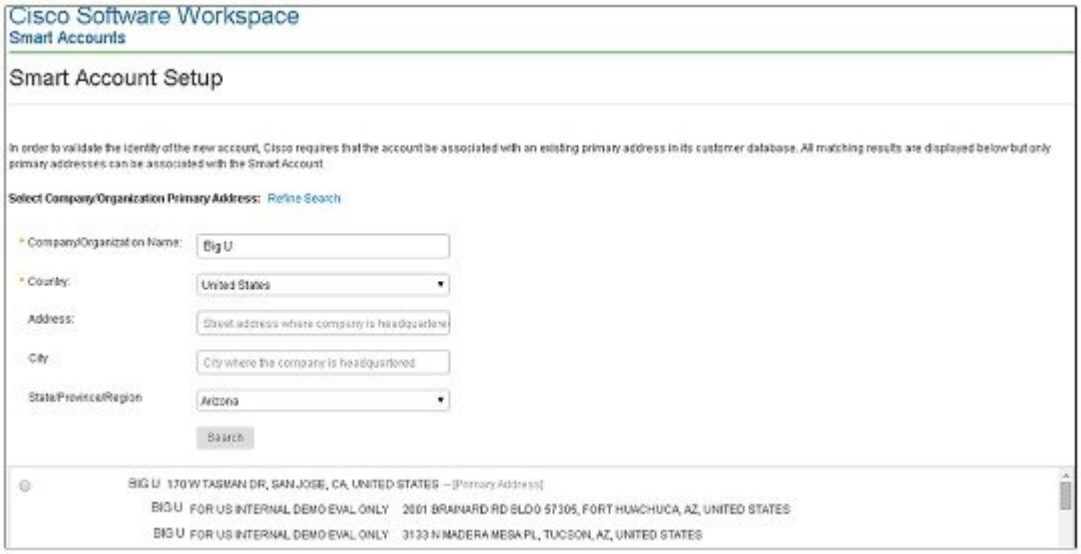
Figure 9: Completing the Account Information and Company/Organization Information



c) Click **Continue** to select the legal address to be linked to the Cisco Smart Account.

d) Select the Company/Organization Primary Address using the Refine Search option and click **Continue**.

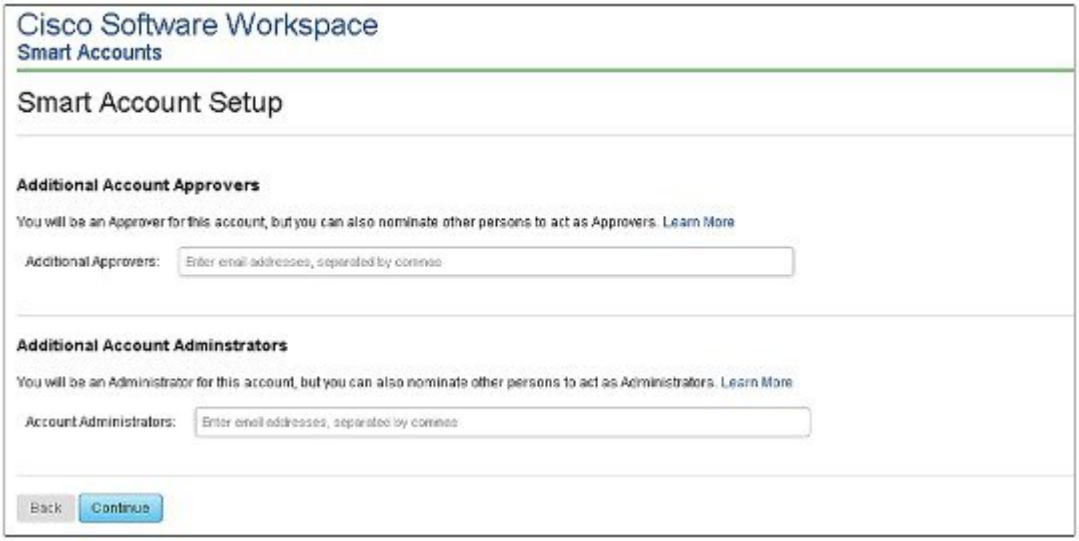
Figure 10: Selecting the Company/Organization Primary Address



e) (Optional) Enter the e-mail addresses of the Additional Account Approvers and Additional Account Administrators.

The initial Approver automatically becomes an Administrator. Additional Administrators can be created or assigned separately from the Approver creation process.

Figure 11: Nominating Additional Account Approvers and Administrators



f) Click **Continue**.
g) Review the agreement and check the **I agree to the terms above** check box to accept.
h) Click **Accept and Create Account** to create the Cisco Smart Account.

Figure 12: Accepting the Agreement and Creating the Cisco Smart Account

You will receive an e-mail confirming the creation of the Cisco Smart Account.

Creating Virtual Accounts

This procedure is optional. Virtual accounts are collections of licenses and product instances. You can create virtual accounts in Cisco Smart Software Manager to organize the licenses for your company into logical entities. A single virtual account is available by default.

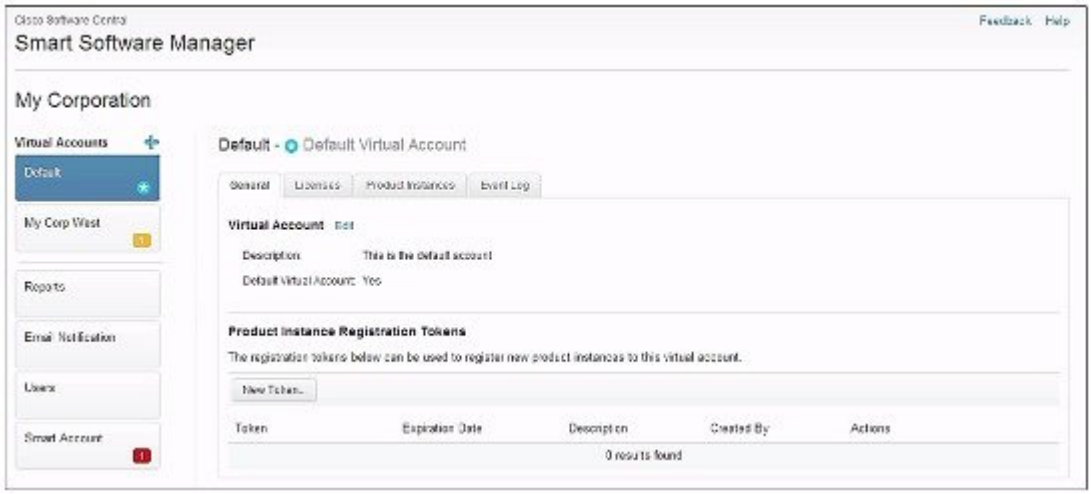
Before you begin

Set up a Cisco Smart Account. See Setting Up a Cisco Smart Account, on page 35.

Step 1 Log in to the Cisco Smart Software Manager.

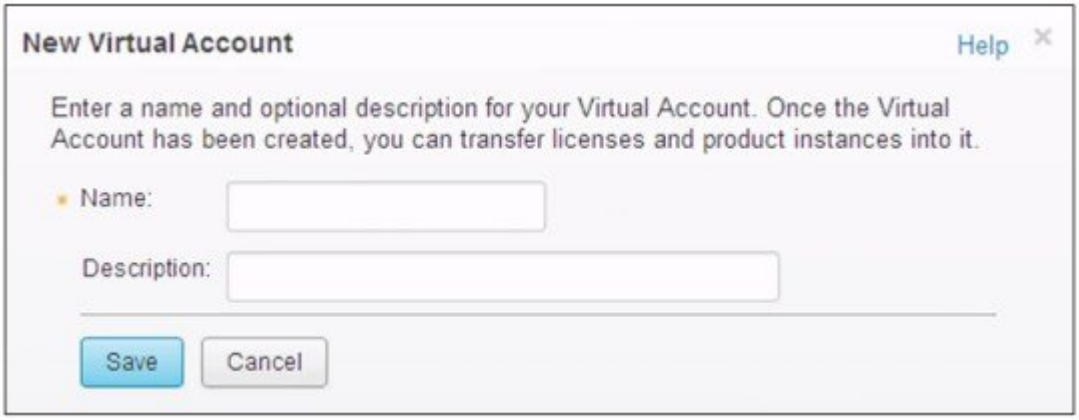
Step 2 Click the + (plus) symbol to create a virtual account.

Figure 13: Creating a Virtual Account



Step 3 In the **New Virtual Account** dialog box, enter the Name and Description.

Figure 14: New Virtual Account Dialog Box



Step 4 Click **Save**.

Creating a Product Instance Registration Token

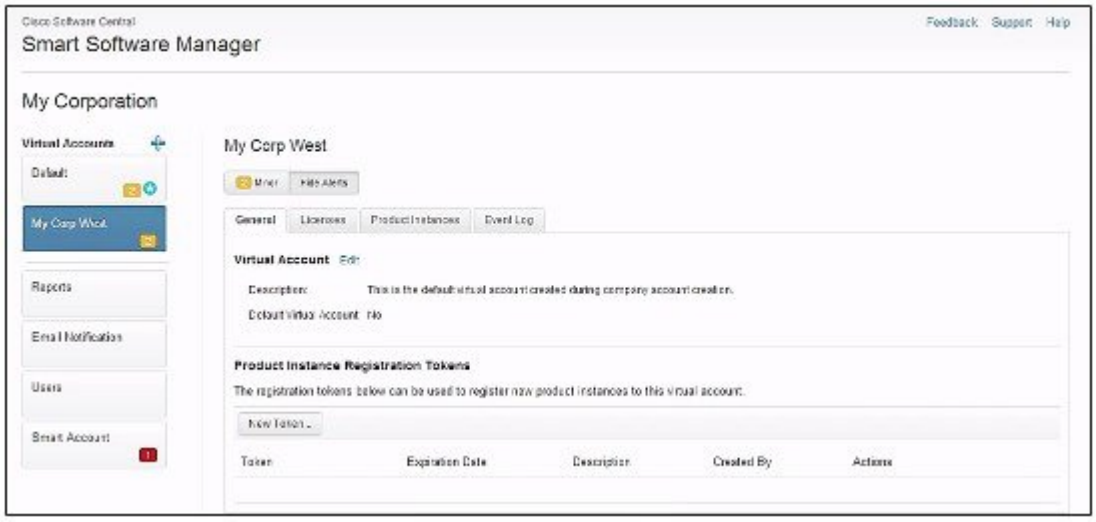
Product instance registration tokens are used to register and consume a product for Cisco Smart Licensing. You must generate a token to register the product and add the product instance to a specified virtual account. Registration tokens can be valid from 1 to 365 days.

Step 1 Log in to the Cisco Smart Software Manager.

Step 2 Click an existing virtual account.

Step 3 In the **General** tab, click **New Token**.

Figure 15: Creating a New Registration Token



Step 4 In the **Create Registration Token** dialog box, enter the Description and Expire After information and click **Create Token**.

Figure 16: Create Registration Token Dialog Box

What to do next

Register the router with the Cisco Licensing Cloud. For more details, see the Registering the Router with the Cisco Licensing Cloud Using the Registration Token, on page 44 section.

Registering the Router with the Cisco Licensing Cloud Using the Registration Token

The router registration is performed only once for each product instance.

Note Ensure that you have the product instance registration token.

To register the router with the Cisco Licensing Cloud using a registration token, use the following commands:

```
enable
license smart register idtoken id-token
```

For example:

```
Router#license smart register idtoken
YjBkOWM5YTItMDFiOS00ZjBmLTllY2YtODEzMzg1YTMyZDVhLTEz
ODE0MjE0%0ANzc5NDF8U1BDUTAySWFRTmJqa1NnbmlzRUIyaGlYU
053L0pHZTNvUW9VTFpE%0AekxCOD0%3D%0A
```

The system contacts the Cisco Smart Licensing servers to obtain authorization for Smart Licensing.

The license agent registers the product with Cisco and receives an identity certificate. This certificate is saved and automatically used for all future communications with Cisco. The license agent automatically renews the registration information with Cisco every 30 days.

Note Smart licensing may fail if IPv6 is configured on any interface, and the router does not have IPv6 connectivity to the Internet or Cisco Smart Software Agent (at tools.cisco.com). Log file error messages similar to the following may appear.

(These messages may also appear as a result of other conditions being true.)

```
%SMART_LIC-3-AGENT_REG_FAILED: Smart Agent for Licensing Registration with Cisco licensing
 cloud failed: Fail to send out Call Home HTTP message.
%SMART_LIC-3-COMM_FAILED: Communications failure with Cisco licensing cloud: Fail to send
out Call Home HTTP message.
```

If connectivity fails due to this issue, see the Re-establishing Connectivity to Cisco Smart Call Home Server section.

This issue does not apply to Cisco IOS XE 3.18.2aSP and later.

After connectivity is established, register the router with the Cisco Licensing Cloud.

Re-establishing Connectivity to Cisco Smart Call Home Server

This section describes what to do when the router fails to connect to the Cisco Smart Call Home Server and IPv6 is configured.

The following scenarios are applicable:

- If the interface is configured using the **ip http client source-interface interface** CLI and has the IPv6 address, the router establishes a session with the remote server with IPv6 connectivity.
- If the interface is configured using the **ip http client source-interface interface** command and has the IPv4 address, the router establishes a session with the remote server with IPv4 connectivity.

- If the interface is configured using **ip http client source-interface interface**command, and has an IPv6 address and an IPv4 address, the router establishes a session with the remote server with IPv6 connectivity.
- If the interface is not configured using the **ip http client source-interface interface**, the router establishes a session with the remote server with the IPv6 address.

If an IPv6 address is available for an interface and the router cannot connect to the Internet or Cisco Smart Software Agent, you can configure the interface to only use IPv4 for smart licensing.

Cisco IOS XE 3.18.2aSP and Later

For Cisco IOS XE 3.18.2a.SP and later, run the following configuration mode command.

```
ip http client source-interface interface
```

Cisco IOS-XE 3.18.1aSP and Earlier

For Cisco IOS XE 3.18.1aSP and earlier, to establish a connection if the IPv6 connectivity fails, use the local DNS resolution by using the IP host command.

How to Configure Cisco Smart Licensing using Transport Gateway Solution

The steps below describe how to configure Cisco smart licensing using transport gateway solution.

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	**crypto pki trustpoint** **Example:** `Router(config)# crypto pki trustpoint cisco`	Declare the trustpoint that the router should use.
Step 4	**enrollment terminal** **Example:** `Router(ca-trustpoint)# enrollment terminal`	Specify manual cut-and-paste certificate enrollment.
Step 5	**revocation-check** *method* **Example:** `Router(ca-trustpoint)# revocation-check none`	Check the revocation status of a certificate. Method **none** means certificate checking is not required.

	Command or Action	Purpose
Step 6	**crypto pki authenticate** **Example:** `Router(config)# crypto pki authenticate cisco`	Authenticate the certification authority.

Step 7	**no reporting smart-licensing-data**
	Example:
	`Router(config)# call-home`
	`Router(cfg-call-home)# profile CiscoTAC-1`
	`Router(cfg-call-home-profile)# no reporting smart-licensing-data`
		Configure the default profile to not to communicate with tools.cisco.com.

Step 8	**destination address http** *address*
	Example:
	`Router(config)# call-home`
	`Router(cfg-call-home)# profile Custom-Profile-1`
	`Router(cfg-call-home-profile)# reporting smart-licensing-data`
	`Router(cfg-call-home-profile)# destination transport-method http`
	`Router(cfg-call-home-profile)# no destination transport-method email`
	`Router(cfg-call-home-profile)# destination address http https://TDS.IP.HERE:8443/Transportgateway/services/DeviceRequestHandler`
		Configure the custom profile to communicate with the transport server, here we use Custom Profile 1 as the name of the custom profile.

Verifying Cisco Smart Licensing Configuration

Use the following commands to verify the Cisco Smart Licensing Configuration on the Cisco cBR router:

- **show license all**—Displays all the license information.

  The following is a sample output of this command:

```
Router# show license all

Smart Licensing Status
======================

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Virtual Account: auto-test-1
  Initial Registration: SUCCEEDED on Mar  5 02:01:03 2015 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Sep  1 02:03:51 2015 UTC
  Registration Expires: Never

License Authorization:
  Status: OUT OF COMPLIANCE on Mar  5 03:34:54 2015 UTC
  Last Communication Attempt: SUCCEEDED on Mar  5 03:35:57 2015 UTC
```

```
  Next Communication Attempt: Mar  5 15:35:57 2015 UTC
  Communication Deadline: Jun  3 03:32:51 2015 UTC

License Usage
==============

(US_License):
  Description:
  Count: 64
  Version: 1.0
  Status: AUTHORIZED

(DS_License):
  Description:
  Count: 768
  Version: 1.0
  Status: AUTHORIZED

(WAN_License):
  Description:
  Count: 8
  Version: 1.0
  Status: OUT OF COMPLIANCE

Product Information
===================
UDI: PID:CBR-8-CCAP-CHASS,SN:FXS1739Q0NT

HA UDI List:
    Active:PID:CBR-8-CCAP-CHASS,SN:FXS1739Q0NT
    Standby:PID:CBR-8-CCAP-CHASS,SN:FXS1739Q0NT

Agent Version
=============
Smart Agent for Licensing: 1.2.1_throttle/5
Component Versions: SA:(1_2_1_throttle)1.1.0, SI:(rel20)1.0.1, CH:(rel4)1.0.15,
PK:(rel16)1.0.7
```

- **show license status**—Displays the license status information.

  The following is a sample output of this command:

```
Router# show license status

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Virtual Account: auto-test-1
  Initial Registration: SUCCEEDED on Mar  5 02:01:03 2015 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Sep  1 02:03:51 2015 UTC
  Registration Expires: Never

License Authorization:
  Status: OUT OF COMPLIANCE on Mar  5 03:34:54 2015 UTC
  Last Communication Attempt: SUCCEEDED on Mar  5 03:35:57 2015 UTC
  Next Communication Attempt: Mar  5 15:35:56 2015 UTC
  Communication Deadline: Jun  3 03:32:50 2015 UTC
```

- **show license summary**—Displays the license summary information.

  The following is a sample output of this command:

```
Router# show license summary

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Virtual Account: auto-test-1
  Last Renewal Attempt: None
  Next Renewal Attempt: Sep  1 02:03:51 2015 UTC

License Authorization:
  Status: OUT OF COMPLIANCE
  Last Communication Attempt: SUCCEEDED
  Next Communication Attempt: Mar  5 15:35:56 2015 UTC

License Usage:
               License       Entitlement tag    Count Status
  -----------------------------------------------------------------
                               (US_License) 64       AUTHORIZED
                               (DS_License) 768      AUTHORIZED
                              (WAN_License) 8        OUT OF COMPLIANCE
```

- **show license tech support**—Displays the license technical support information.

  The following is a sample output of this command:

```
Router# show license tech support

Smart Licensing Tech Support info

Smart Licensing Status
======================

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Virtual Account: auto-test-1
  Initial Registration: SUCCEEDED on Mar  5 02:01:03 2015 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Sep  1 02:03:51 2015 UTC
  Registration Expires: Never

License Authorization:
  Status: OUT OF COMPLIANCE on Mar  5 03:34:54 2015 UTC
  Last Communication Attempt: SUCCEEDED on Mar  5 03:35:57 2015 UTC
  Next Communication Attempt: Mar  5 15:35:57 2015 UTC
  Communication Deadline: Jun  3 03:32:51 2015 UTC

Evaluation Period:
  Evaluation Mode: Not In Use
  Evaluation Period Remaining: 89 days, 23 hours, 25 minutes, 40 seconds

License Usage
=============
Handle: 1
    License: 'nullPtr'
    Entitlement Tag:
regid.2014-11.com.cisco.US_License,1.0_a3f32909-2c71-426c-b3e0-eeefc946f9b3
    Description: <empty>
    Count: 64
    Version: 1.0
    Status: AUTHORIZED(3)
    Status time: Mar  5 03:34:54 2015 UTC
```

```
    Request Time: Mar  5 03:34:17 2015 UTC

Handle: 2
    License: 'nullPtr'
    Entitlement Tag:
regid.2014-11.com.cisco.DS_License,1.0_71ad0ae1-5e5e-4f02-b380-d2e1b8dcfa03
    Description: <empty>
    Count: 768
    Version: 1.0
    Status: AUTHORIZED(3)
    Status time: Mar  5 03:34:54 2015 UTC
    Request Time: Mar  5 03:34:17 2015 UTC

Handle: 3
    License: 'nullPtr'
    Entitlement Tag:
regid.2014-11.com.cisco.WAN_License,1.0_3d8bb7ba-1a92-4f01-a4aa-a4479f1d7612
    Description: <empty>
    Count: 8
    Version: 1.0
    Status: OUT OF COMPLIANCE(4)
    Status time: Mar  5 03:34:54 2015 UTC
    Request Time: Mar  5 03:34:17 2015 UTC

Product Information
===================
UDI: PID:CBR-8-CCAP-CHASS,SN:FXS1739Q0NT

HA UDI List:
    Active:PID:CBR-8-CCAP-CHASS,SN:FXS1739Q0NT
    Standby:PID:CBR-8-CCAP-CHASS,SN:FXS1739Q0NT

Agent Version
=============
Smart Agent for Licensing: 1.2.1_throttle/5
Component Versions: SA:(1_2_1_throttle)1.1.0, SI:(rel20)1.0.1, CH:(rel4)1.0.15,
PK:(rel16)1.0.7

Upcoming Scheduled Jobs
=======================
Current time: Mar  5 03:37:46 2015 UTC
IdCert Expiration Warning: Jan  4 02:00:41 2016 UTC (304 days, 22 hours, 22 minutes,
55 seconds remaining)
Daily: Mar  6 03:21:11 2015 UTC (23 hours, 43 minutes, 25 seconds remaining)
Certificate Renewal: Sep  1 02:03:51 2015 UTC (179 days, 22 hours, 26 minutes, 5 seconds
 remaining)
Certificate Expiration Check: Mar  4 02:00:41 2016 UTC (364 days, 22 hours, 22 minutes,
 55 seconds remaining)
Authorization Renewal: Mar  5 15:35:57 2015 UTC (11 hours, 58 minutes, 11 seconds
remaining)
Authorization Expiration Check: Jun  3 03:32:51 2015 UTC (89 days, 23 hours, 55 minutes,
 5 seconds remaining)
Init Flag Check: Not Available

License Certificates
====================
Production Cert: True
PIID: 36bf91ae-0577-4213-9e62-1b6ee0add02f
Licensing Certificated:
    Id certificate Info:
        Start Date: Mar  5 01:57:54 2015 UTC
        Expiry Date: Mar  4 01:57:54 2016 UTC
        Version Number: 3
        Serial Number: 134418
```

```
        Common Name: 05FB26B1A58A106DEA6878C346432186D08BC1C5::1,2

    Signing certificate Info:
        Start Date: Jun 14 20:18:52 2013 UTC
        Expiry Date: Apr 24 21:55:42 2033 UTC
        Version Number: 3
        Serial Number: 3
        Common Name: MMI Signer

    Sub CA Info:
        Start Date: Apr 24 22:19:15 2013 UTC
        Expiry Date: Apr 24 21:55:42 2033 UTC
        Version Number: 3
        Serial Number: 2
        Common Name: Smart Licensing CA - DEV


HA Info
==========
RP Role: Active
Chassis Role: Active
Behavior Role: Active
RMF: True
CF: True
CF State: Stateless

Other Info
==========
Software ID: regid.2014-12.com.cisco.CBR8V1,1.0_95948658-0b8b-4e8f-838d-b17020364ca9
Agent State: OOC
TS enable: True
Transport: Callhome
Locale: en_US.UTF-8
Debug flags: 0x7
Privacy Send Hostname: True
Privacy Send IP: True
Build type:: Production
sizeof(char)  : 1
sizeof(int)   : 4
sizeof(long)  : 4
sizeof(char *): 8
sizeof(time_t): 4
sizeof(size_t): 8
Endian: Big
enableOnInit: True
routingReadyByEvent: True
systemInitByEvent: True
WaitForHaRole: False
standbyIsHot: True
chkPtType: 2
delayCommInit: False
roleByEvent: True
maxTraceLength: 150
traceAlwaysOn: False
debugFlags: 7
```

- **show license udi**—Displays the license Unique Device Identifier (UDI) information.

  The following is a sample output of this command:

```
Router# show license udi

UDI: PID:CBR-8-CCAP-CHASS,SN:FXS1739Q0NT

HA UDI List:
```

```
    Active:PID:CBR-8-CCAP-CHASS,SN:FXS1739Q0NT
    Standby:PID:CBR-8-CCAP-CHASS,SN:FXS1739Q0NT
```

- **show license usage**—Displays the license usage information.

  The following is a sample output of this command:

```
Router# show license usage

License Authorization:
  Status: OUT OF COMPLIANCE on Mar  5 03:34:54 2015 UTC

(US_License):
  Description:
  Count: 64
  Version: 1.0
  Status: AUTHORIZED

(DS_License):
  Description:
  Count: 768
  Version: 1.0
  Status: AUTHORIZED

(WAN_License):
  Description:
  Count: 8
  Version: 1.0
  Status: OUT OF COMPLIANCE
```

- **show call-home profile all**—Displays the call home profile information for all configured profiles.

  The following is a sample output of this command:

```
Router# show call-home profile all

Profile Name: CiscoTAC-1
    Profile status: ACTIVE
    Profile mode: Full Reporting
    Reporting Data: Smart Call Home, Smart Licensing
    Preferred Message Format: xml
    Message Size Limit: 3145728 Bytes
    Transport Method: http
    Email address(es): callhome@cisco.com
    HTTP  address(es): https://tools.cisco.com/its/service/oddce/services/DDCEService

    Periodic configuration info message is scheduled every 25 day of the month at 10:03


    Periodic inventory info message is scheduled every 25 day of the month at 09:48

    Alert-group               Severity
    ------------------------  ------------
    crash                     debug
    diagnostic                minor
    environment               minor
    inventory                 normal

    Syslog-Pattern            Severity
    ------------------------  ------------
    .*                        major
```

- **show call-home smart-licensing statistics**—Displays the call home smart licensing statistics information.

  The following is a sample output of this command:

```
Router# show call-home smart-licensing statistics

Success: Successfully sent and response received.
Failed : Failed to send or response indicated error occurred.
Inqueue: In queue waiting to be sent.
Dropped: Dropped due to incorrect call-home configuration.

Msg Subtype      Success Failed  Inqueue Dropped Last-sent (GMT-06:00)
-------------------------------------------------------------------------
REGISTRATION     1       0       0       0       2015-03-13 13:12:13
ACKNOWLEDGEMENT  1       0       0       0       2015-03-13 13:12:20
ENTITLEMENT      5       0       0       0       2015-03-13 13:22:18
```

Use the following commands to verify the DOCSIS 3.1 Downstream License on the Cisco cBR router:

- **show cable license all | begin D3.1**—Displays all the DOCSIS 3.1 downstream license information.

  The following is a sample output of this command:

```
Router# show cable license all | begin D3.1

Load for five secs: 21%/1%; one minute: 52%; five minutes: 52%
Time source is NTP, 10:41:11.175 PST Mon May 9 2016
-------------------------------------------
Entitlement:  DOCSIS 3.1 Downstream Channel License
Consumed count: 31
Consumed count reported to SmartAgent: 0
Enforced state: No Enforcement
```

Troubleshooting Cisco Smart Licensing

Before taking the steps below to troubleshoot the Cisco Smart Licensing, the customers should first make sure the configuration is correct and see if they are able to ping the HTTP address they have configured for the smart license. The output of the **show call-home smart-licensing statistics** command should have REGISTERED and ACKNOWLEDGE information. And check the output of **show logging | include SMART | CALL**.

Manually Renewing the Smart License Registration

The license agent automatically renews the registration information with Cisco every 30 days. You may need to manually renew the registration if the license is out of compliance and it needs to be registered immediately.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**license smart renew** **Example:** `Router# license smart renew`	Manually renews the license registration of the device instance with Cisco.

Unregistering the Router from Cisco Smart Licensing

You can unregister the router from Cisco Smart Licensing. You may need to unregister the router for the Return Material Authorization (RMA) of the router.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**license smart deregister** **Example:** `Router# license smart deregister`	Removes the Cisco Smart Licensing registration for the device instance. All Cisco Smart Licensing certificates and entitlements are removed.

Additional References

Related Documents

Related Topic	Document Title
Cisco Smart Licensing	Cisco Smart Software Licensing

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

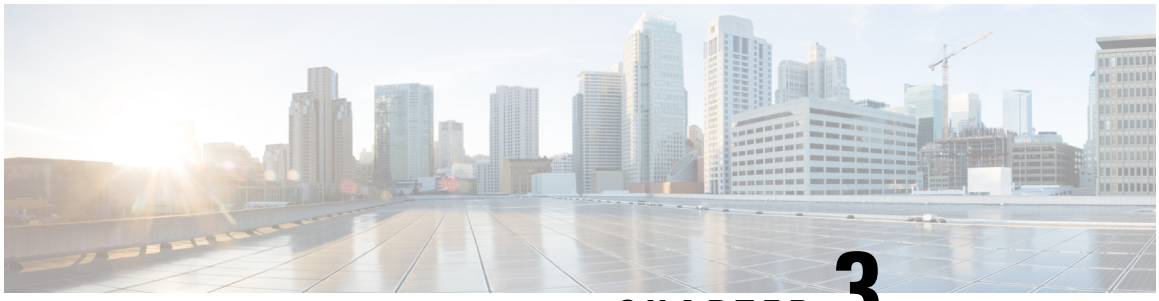
Feature Information for Cisco Smart Licensing

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 www.cisco.com/go/cfn 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 Cisco Smart Licensing

Feature Name	Releases	Feature Information
Downstream License	Cisco IOS-XE Release 3.18.0SP	This feature was introduced on the Cisco cBR Series Converged Broadband Routers.
Cisco Smart Licensing	Cisco IOS-XE Release 3.15.0S	This feature was introduced on the Cisco cBR Series Converged Broadband Routers.
Out of Compliance Enforcement	Cisco IOS-XE Release 3.18.0SP	This feature was introduced on the Cisco cBR Series Converged Broadband Routers.



CHAPTER 3

Supervisor Redundancy

Supervisor redundancy reduces unplanned downtime. It enables a quicker switchover between active and standby Supervisors in the event of a fatal error on the active Supervisor. When you configure Supervisor redundancy, the standby Supervisor is synchronized with the active Supervisor. In the event of a fatal error on the active Supervisor, the system immediately switches to the standby Supervisor.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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 Cisco cBR Series Routers, on page 55
- Prerequisites for Supervisor Redundancy, on page 56
- Information About Supervisor Redundancy, on page 56
- How to Configure Supervisor Redundancy, on page 60
- Verifying the Supervisor Redundancy Configuration, on page 64
- Configuration Example for Supervisor Redundancy, on page 67
- Additional References, on page 68
- Feature Information for Supervisor Redundancy, on page 68

Hardware Compatibility Matrix for Cisco cBR Series Routers

Note The hardware components 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 3.15.0S and Later Releases** Cisco cBR-8 Supervisor: • PID—CBR-CCAP-SUP-160G • PID—CBR-CCAP-SUP-60G[2] • PID—CBR-SUP-8X10G-PIC	**Cisco IOS-XE Release 3.15.0S 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 Cisco cBR-8 Downstream PHY Modules: • PID—CBR-D30-DS-MOD • PID—CBR-D31-DS-MOD Cisco cBR-8 Upstream PHY Modules: • PID—CBR-D30-US-MOD

[2] Effective with Cisco IOS-XE Release 3.17.0S, CBR-CCAP-SUP-60G supports 8 cable line cards. The total traffic rate is limited to 60Gbps, the total number of downstream service flow is limited to 72268, and downstream unicast low-latency flow does not count against the limits.

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.

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.
• 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 65.

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 60, 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 to modify how the system behaviors at power-on or reboot. 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 should 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. You must specify the new value as a 16-bit hexadecimal bitmask, using the values shown in the table below.

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 a default Cisco IOS software image required to run the router: • 00—On powerup, the system remains at the ROM monitor prompt (rommon>), awaiting a user command to boot the system manually by means of the rommon **boot** command. • 01—On powerup, the system automatically boots the first system image found in the Flash memory single inline memory module (SIMM) on the Supervisor. • 02 to 0F—On powerup, the system automatically boots from a default Cisco IOS software image stored on a TFTP server in the network. For this setting, the Network Management Ethernet port on the Supervisor must be configured and operational. This setting also enables boot system commands that 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 setting is 9600 baud).
13	0x2000	Boots an image from the bootflash memory.
14	0x4000	Specifies that broadcast packets 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, which specifies that the router loads the Cisco IOS software from the Flash memory and boots to the Cisco IOS CLI prompt. The Break key is enabled for only 30 seconds, so that the user can break to the ROM monitor prompt if desired.

Step 2 Exit the global configuration mode by entering the **exit** command.

Example:

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

Step 3 Display 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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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 change the configuration register, the **show version** command shows both the current value of the register, as well as the value that will be used on the next reboot or reload.

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

- 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 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:

Verifying Supervisor Redundancy

Step 1 Display the startup configuration and verify that the lines configuring redundancy appear:

Example:

```
Router# show startup-config

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

Step 2 Display the current Supervisor redundancy state using the **show redundancy** command. The active Supervisor typically is 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]
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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 has occurred, the **show redundancy** command will produce a display similar to the following, showing that the active Supervisor has changed slots that is, moving from slot 4 (SUP0) to slot 5 (SUP1).

```
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 will produce a display similar to the following:

```
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
```

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

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 To verify that a switchover has occurred, use the **show redundancy switchover history** command. Assuming that the original Supervisor had been in slot 4 (SUP0), and that the standby Supervisor is in slot 5 (SUP1), the following is the sample output:

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
```

where, 48 indicates SUP0 and 49 indicates SUP1.

Configuration Example for Supervisor Redundancy

The following example shows the relevant portion of the Cisco IOS configuration file for the default configuration for the Supervisor redundancy feature, which should be used for most 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

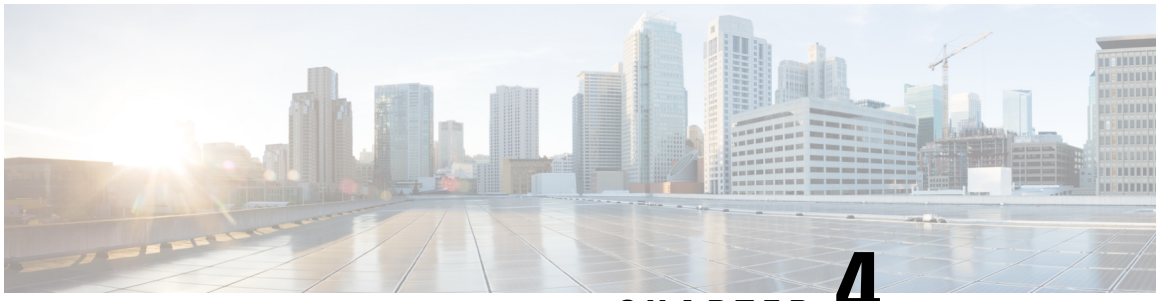
Feature Information for Supervisor Redundancy

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 www.cisco.com/go/cfn 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 5: Feature Information for Supervisor Redundancy

Feature Name	Releases	Feature Information
Supervisor Redundancy	Cisco IOS-XE Release 3.15.0S	This feature was introduced on the Cisco cBR Series Converged Broadband Routers.



CHAPTER 4

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.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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.

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- Feature Information for Line Card Redundancy, on page 78

Hardware Compatibility Matrix for Cisco cBR Series Routers

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

Table 6: 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 3.15.0S and Later Releases** Cisco cBR-8 Supervisor: • PID—CBR-CCAP-SUP-160G • PID—CBR-CCAP-SUP-60G[3] • PID—CBR-SUP-8X10G-PIC	**Cisco IOS-XE Release 3.15.0S 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 Cisco cBR-8 Downstream PHY Modules: • PID—CBR-D30-DS-MOD • PID—CBR-D31-DS-MOD Cisco cBR-8 Upstream PHY Modules: • PID—CBR-D30-US-MOD

[3] Effective with Cisco IOS-XE Release 3.17.0S, CBR-CCAP-SUP-60G supports 8 cable line cards. The total traffic rate is limited to 60Gbps, the total number of downstream service flow is limited to 72268, and downstream unicast low-latency flow does not count against the limits.

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

- The line cards installed in slot 3 and 6 of the Cisco cBR-8 router cannot be configured as the secondary card.
- 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.

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:**	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
	`Router> enable`	
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.
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

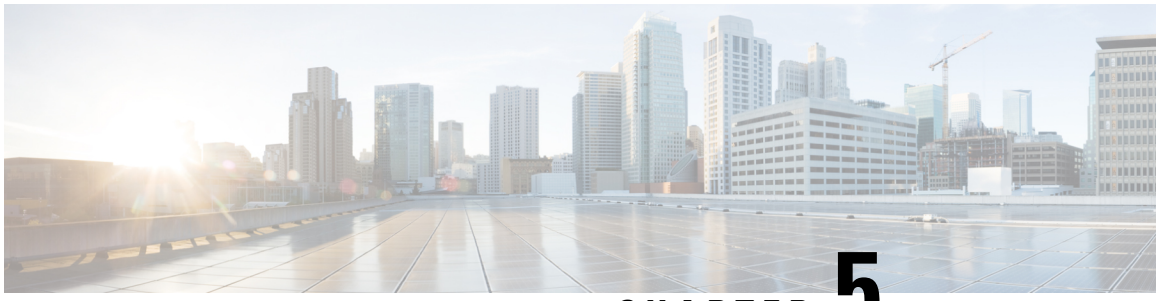
Feature Information for Line Card Redundancy

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 www.cisco.com/go/cfn 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 7: Feature Information for Line Card Redundancy

Feature Name	Releases	Feature Information
N+1 Line Card Redundancy	Cisco IOS-XE Release 3.16.0S	This feature was introduced on the Cisco cBR Series Converged Broadband Routers.



CHAPTER 5

Consolidated Packages and SubPackages Management

This document discusses how consolidated packages and software subpackages (individual and optional) are run and managed on the Cisco cBR Series Converged Broadband Router. It contains the following sections:

- Finding Feature Information, on page 79
- Running the Cisco cBR Series Routers Using Individual and Optional SubPackages: An Overview , on page 80
- Running the Cisco cBR Series Routers Using a Consolidated Package: An Overview , on page 80
- Running the Cisco cBR Series Routers: A Summary , on page 81
- Software File Management Using Command Sets , on page 82
- Managing and Configuring the Router to Run Using Consolidated Packages and Individual SubPackages, on page 83
- Upgrading Individual SubPackages, on page 102
- Additional References, on page 110
- Feature Information for Consolidated Packages and SubPackages Management, on page 111

Finding Feature Information

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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.

Running the Cisco cBR Series Routers Using Individual and Optional SubPackages: An Overview

The Cisco cBR Series Converged Broadband Router can be configured to run using individual subpackages and optional subpackages.

When the router is configured to run using individual and optional subpackages:

- Each individual subpackage within a consolidated package is extracted onto the router as its own file.
- Additionally, any optional subpackages must be separately downloaded and stored in the same directory with the provisioning file and the other individual subpackages that have been extracted.
- The router then runs by accessing each file as needed for operational purposes. All individual and optional subpackage files must be stored in the same directory on the router for the router to run properly using individual subpackages.

When the router runs using the individual and optional subpackages, the router needs to be configured to boot using the provisioning file that was included in the consolidated package with the individual subpackage files. This provisioning file must also be in the same directory as the individual and optional subpackage files. The router boots faster when configured to run using individual and optional subpackages than it does when configured to run using a consolidated package.

A Cisco cBR Series Router cannot be configured to run individual and optional subpackages stored on a TFTP or any other network server. To use this method of running the router, copy the individual and optional subpackages along with the provisioning file onto the bootflash: file system.

Running the Cisco cBR Series Routers Using a Consolidated Package: An Overview

The Cisco cBR Series Converged Broadband Router can also be configured to run using a consolidated package.

Note Booting the router from a consolidated package is not supported for installation of optional subpackages.

When the router is configured to run using a consolidated package, the entire consolidated package file is copied onto the router or accessed by the router via TFTP or another network transport method. The router runs using the consolidated package file.

A router configured to run using a consolidated package is booted by booting the consolidated package file. Because this file is large, the boot process for routers running using the consolidated package is slower than the boot process for routers running individual subpackages.

A router configured to run using a consolidated package does have some advantages over a router configured to run individual subpackages. First, a consolidated package can be booted and utilized using TFTP or another network transport method. Secondly, configuring the router to use the one consolidated package file is easier

than managing several individual subpackage files. Running the router using a consolidated package may be the right method of running the router in certain networking environments.

The consolidated package should be stored on bootflash:, usb[0-1]:, or a remote file system when this method is used to run the router.

Running the Cisco cBR Series Routers: A Summary

The advantages of running your router using individual subpackages include:

- The router boots fastest when booted using the individual subpackage boot approach.
- Individual subpackages can be upgraded instead of the complete consolidated image.

The advantages of running your router using a consolidated package include:

- Simplified installation—Only one software file needs to be managed instead of several separate images.
- Storage—A consolidated package, unlike individual subpackages, can be used to run the router while being stored in bootflash:, on a USB Flash disk, or on a network server. A consolidated package can be booted and utilized using TFTP or another network transport method, while the individual subpackage method requires the individual subpackage files to be copied into the bootflash: file directory on the router.

Approach	Advantages	Disadvantages
Individual and optional subpackages **Note** This method is required if you need to install any optional subpackages for your system.	Faster boot time.	• Multiple software subpackages more difficult to manage. • Cannot be booted from TFTP or any other network server. If you are going to use the individual subpackage boot method, each individual subpackage file must be placed in the bootflash: directory. • Individual and optional subpackage files and the provisioning file must be stored in bootflash:.
Consolidated Package	• Easier management. Only have to manage one file instead of many files. • A consolidated package file can be stored in bootflash:, on any TFTP or other network server.	Slower boot times and lessened maximum system scalability because the larger image must be processed at all times.

Software File Management Using Command Sets

Software files can be managed on the Cisco cBR Series Converged Broadband Router using the following distinct command sets.

The request platform Command Set

The **request platform software package** command is part of the larger request platform command set being introduced on the Cisco cBR Series Converged Broadband Router.

The **request platform software package** command, which can be used to upgrade individual subpackages and a complete consolidated package, is used to upgrade software on the Cisco cBR Series Converged Broadband Router. Notably, the **request platform software package** command is the recommended way of performing an individual subpackage upgrade, and also provides the only method of no-downtime upgrades of individual subpackages on the router when the router is running individual subpackages.

The **request platform software package** command requires that the destination device or process be specified in the command line, so the commands can be used to upgrade software on both an active or a standby processor.

Command Syntax

request platform software package install rp *rp-slot-number* **file** *file-URL*

where

- *rp-slot-number* is the number of the RP slot and
- *file-URL* is the path to the file being used to upgrade the Router.

The copy Command

The **copy** command can be used to move consolidated packages and individual subpackages onto the router, though using this command to move individual subpackage files from one storage area to another is often inefficient (in these scenarios, it is almost always preferable to move the consolidated package, then extract the subpackages, or to extract the subpackages without moving the consolidated package).

To upgrade a consolidated package on the Cisco cBR Series Converged Broadband Router, copy the consolidated package onto a file system, usually bootflash: , using the **copy** command as you would on most other Cisco routers. After making this copy, configure the router to boot using the consolidated package file.

To upgrade the router and reboot using individual subpackages, copy the consolidated package onto the router using the **copy** command, enter the **request platform software package expand** command to extract the individual subpackages, and configure the router to boot using subpackages. Other methods, such as copying each individual subpackage in the same consolidated package from a directory or using the request platform software package command to extract the subpackages onto a router directory are also usable, though copying individual subpackages is often inefficient.

Managing and Configuring the Router to Run Using Consolidated Packages and Individual SubPackages

This section describes methods that are used to manage and configure the packages, sub-packages and patches on the router.

Cable Line Card Process Restart

The last step, in many of the methods used to upgrade and manage the packages and sub-packages, is to reload the router or the component for which the software is being configured or upgraded. Reloading the router or the components involves the following disadvantages:

- service disruption (limited)
- loss of modem configuration data
- time consumption in rebooting the line cards and other components

The N+1 line card high availability (LCHA) system reboots the active and the standby line cards whenever a package is upgraded on a line card. This occurs for sub-package upgrade for Field Replaceable Units (FRUs) on the line card as well. Every time an upgrade is done to a package or sub-package, the line card must be rebooted. The time taken for the package upgrade on N number of active line cards, the total number of reboots would be 2xN. This is time-consuming and may affect services on the rebooting line cards.

To avoid the disadvantages of reloading the router and the line cards, use the Cable Line Card Process Restart features when you upgrade packages on the RF line cards.

Note Do not use the process restart features without upgrading or installing packages on the RF line cards.

Primarily there are two features that allow you to restart Cable Line Card processes:

- Cable Line Card Control Plane Process Restart
- Cable Line Card Upstream Scheduler Process Restart

Cable Line Card Control Plane Process Restart

The Cable Line Card Control Plane Process Restart feature provides the following advantages:

- Simplified package upgrade without LCHA based reboot of active and standby line cards.
- Restart of specific processes without service disruption.
- All the modem configuration data is recovered after the IOSd process restarts.
- Changes in the modem configuration data during the IOSd process restart is reconciled after the IOSd process is restarted.
- Effective with Cisco IOS-XE 3.17.0S, the secondary line card shutdown and un-shutdown processes occur automatically.

Restrictions:

- Effective with Cisco IOS-XE Release 3.16.0S, to upgrade a line card IOS using the Cable Line Card Control Plane Process Restart feature, the sub-package must have the patches for cbrsup-clcios and cbrsup-clciosdb.
- Effective with Cisco IOS-XE 3.17.0S, both IOSd and us-scheduler restart are supported. You can restart IOSd only, which requires IOSd/IOSdb packages or restart the us-scheduler only, which requires clc-docsis package. You can also restart both using a single command, where the us-scheduler is restarted first and then the IOSd is restarted. In this case, IOSd/IOSdb and clc-docsis packages are required.

Other restrictions include the following:

- The IOSd process can be restarted only on the primary active RF line cards.
- Effective with Cisco IOS-XE 3.16.0S, any secondary RF line card must be shut down before restarting the IOSd process.
- The IOSd process restart does not work when double failures (i.e. termination of IOSd and one or more process at the same time) occur. The double failures result in line card reload.
- The restart of the next IOSd (i.e. IOSd process on the next RF line card) does not occur until the current IOSd process recovers fully.

The Cable Line Card Control Plane Process Restart feature provides the following restart options:

- Restart a specific slot using the **request platform software process restart** command with the **slot** *slot number* option.
- Restart all the line cards without specifying a specific slot, using the **request platform software process restart** command without the **slot** *slot number* option.
- Interval based restart option of all line card using the **request platform software process restart** command with the **interval** *secs* option.

Important points to remember:

- With Cisco IOS-XE Release 3.16.0S, beforeBefore using the Cable Line Card Control Plane Process Restart feature, shut down the secondary line card, using the **hw-module slot shutdown** command.
- With Cisco IOS-XE Release 3.17.0S, whenWhen the Cable Line Card Control Plane Process Restart feature is started, the secondary line card shuts down automatically.
- Before using the Cable Line Card Control Plane Process Restart feature, shut down the secondary line card, using the **hw-module slot shutdown** command.
- When the Cable Line Card Control Plane Process Restart feature is started, the secondary line card shuts down automatically.
- To prevent reloading the line card after sub-package upgrade, use the **request platform software package install node file** command with the **noreload linecard** option.
- Verify the restart process using the **show platform software ios slot** *slot number* **restart info** command.

Restart on Crash

Effective from Cisco IOS-XE Release 3.18.0S, theThe cable line card control plane and upstream scheduler process restarts automatically after a crash. After restarting process, secondary line card is reset.

Restrictions:

- Restart on crash supported only on primary active line cards

The table below lists the cable line card behaviors when crash happens under different rules.

Table 8: Cable Line Card Process Restart Policy Matrix

	Secondary Cable Line Card Present	Crash	Secondary Cable Line Card state
LCHA or LCPR	Yes	Cable line card reset	Active after switchover
Process restart enabled	No	Restart	N/A
LCHA or LCPR	Yes	Cable line card reset	Active after switchover
Process restart Disabled	No	Cable line card reset	N/A
No LCHA Preferred or LCPR	Yes	Process restart	Secondary cable line card resets after process restart on primary cable line card
Process restart Enabled	No	Process restart	N/A
No LCHA Preferred or LCPR	Yes	Cable line card reset	Active after switchover
Process restart Disabled	No	Cable line card reset	N/A

Note

- Manual process restart does not depend on policy configured, and will shut/unshut secondary cable line card if present.
- “LCHA preferred” and “process restart enable” are default. User can set these two parameters using disable-auto-restart and lcha-preferred commands. For the details, see http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref.html.
- Behavior is the same for Control Plane Process Restart and Upstream Scheduler Process Restart.
- Secondary cable line card in standby mode is considered present.

Effective with Cisco IOS-XE Release 3.18.0S, theThe restart retry limit feature is added to the Cable Line Card Process Restart, it is applicable only to restart on crash. Using this feature, the customer can set a restart retry time limit, if the process cannot restart successfully within this limit, the line card will reload. This feature can prevent the line card from continuous restart when restart failed.

Using the Cable Line Card Control Plane Process Restart Feature

To use the Cable Line Card Control Plane Process Restart Feature, install the RF line card sub-package upgrade using the command.

Step 1 Install the RF line card sub-package upgrade using the **request platform software package install node file noreload linecard** command.

```
Router#request platform software package install node file bootflash:sp/cbr_patch.9.0.tar noreload
linecard
```

Step 2 Use the **request platform software process restart** command to restart the RF line card IOSd process on all the cable line cards sequentially.

```
Router# request platform software process restart
```

Step 3 Use the **request platform software process restart slot** *slot#* command to restart the RF line card IOSd process on a specific cable line card.

```
Router# request platform software process restart slot 7
```

Configuring the Cable Line Card Control Plane Process Restart Retry Limit

To configure the Cable Line Card Control Plane Process Restart Retry Limit, complete the following procedure:

```
enable
configure terminal
process-restart
lc-control-plane-timeout time
restart-retry retry-times
exit
```

Examples for Cable Line Card Control Plane Process Restart Feature

This section provides the sample outputs for the commands used in the Cable Line Card Control Plane Process.

This example shows the output of the **request platform software package install node file** command with the **noreload linecard** option that installs the sub-package upgrade:

```
Router# request platform software package install node file bootflash:sp/cbr_patch.9.0.tar
noreload linecard
Image file expanded and copied
Expanding image file: stby-bootflash:sp/cbr_patch.9.0.tar
Image file expanded and copied
Finished image file expansion
Found clc package
STAGE 1: Installing software on standby RP
==========================================
--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0
--- Starting installation state synchronization ---
```

```
Finished installation state synchronization
--- Starting local lock acquisition on R1 ---
Finished local lock acquisition on R1
--- Starting file path checking ---
Finished file path checking
--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
Found cbrsup-clcios.2015-03-23_17.53_haolin2.SSA.pkg
Found cbrsup-clciosdb.2015-03-23_17.53_haolin2.SSA.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification
--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction
--- Starting ISSU compatibility verification ---
Verifying image type compatibility
Checking IPC compatibility with running software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking package specific compatibility
Finished ISSU compatibility verification
--- Starting list of software package changes ---
Old files list:
Removed cbrsup-clcios.2015-03-23_17.28_haolin2.SSA.pkg
Removed cbrsup-clciosdb.2015-03-23_17.28_haolin2.SSA.pkg
New files list:
Added cbrsup-clcios.2015-03-23_17.53_haolin2.SSA.pkg
Added cbrsup-clciosdb.2015-03-23_17.53_haolin2.SSA.pkg
Finished list of software package changes
--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes
--- Starting analysis of software changes ---
Finished analysis of software changes
--- Starting update running software ---
Blocking peer synchronization of operating information
Creating the command set placeholder directory
Finding latest command set
Finding latest command shortlist lookup file
Finding latest command shortlist file
Assembling CLI output libraries
Assembling CLI input libraries
Assembling Dynamic configuration files
Applying interim IPC and database definitions
Replacing running software
Replacing CLI software
Restarting software
Restarting software: target frus filtered out ... skipped
Applying final IPC and database definitions
Generating software version information
Notifying running software of updates
Unblocking peer synchronization of operating information
```

```
Unmounting old packages
Cleaning temporary installation files
Finished update running software
SUCCESS: Finished installing software.
STAGE 2: Installing software on active RP
========================================
--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0
--- Starting installation state synchronization ---
Finished installation state synchronization
--- Starting file path checking ---
Finished file path checking
--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
Found cbrsup-clcios.2015-03-23_17.53_haolin2.SSA.pkg
Found cbrsup-clciosdb.2015-03-23_17.53_haolin2.SSA.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification
--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction
--- Starting ISSU compatibility verification ---
Verifying image type compatibility
Checking IPC compatibility with running software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking package specific compatibility
Finished ISSU compatibility verification
--- Starting impact testing ---
Checking operational impact of change
Finished impact testing
--- Starting list of software package changes ---
Old files list:
Removed cbrsup-clcios.2015-03-23_17.28_haolin2.SSA.pkg
Removed cbrsup-clciosdb.2015-03-23_17.28_haolin2.SSA.pkg
New files list:
Added cbrsup-clcios.2015-03-23_17.53_haolin2.SSA.pkg
Added cbrsup-clciosdb.2015-03-23_17.53_haolin2.SSA.pkg
Finished list of software package changes
--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes
--- Starting analysis of software changes ---
Finished analysis of software changes
--- Starting update running software ---
Blocking peer synchronization of operating information
Creating the command set placeholder directory
Finding latest command set
Finding latest command shortlist lookup file
Finding latest command shortlist file
Assembling CLI output libraries
Assembling CLI input libraries
```

```
Assembling Dynamic configuration files
Applying interim IPC and database definitions
Replacing running software
Replacing CLI software
Restarting software
Restarting software: target frus filtered out ... skipped
Applying final IPC and database definitions
Generating software version information
Notifying running software of updates
Unblocking peer synchronization of operating information
Unmounting old packages
Cleaning temporary installation files
Finished update running software
SUCCESS: Finished installing software.
Found clc package
SUCCESS: node ISSU finished successfully.
Invoking cleanup routine
```

This example shows the output of the **show platform software ios restart info** command:

```
Router#show platform software ios 6 restart info
IOSD process restart info:
Process restartable: Yes
IOSD restart state : ACTIVE
Total Modem Count : 31
Active Modem Count : 31
```

This example shows the output of the **request platform software process restart** command:

```
Router# request platform software process restart
--- Upgrading/Restarting LineCard-2 Packages/Processes ---
NOTICE: No upgrades available.
Provide process name in cli if you wish to restart a process
--- Upgrading/Restarting LineCard-3 Packages/Processes ---
Available upgrades
cbrsup-clcios.2015-03-23_17.53_haolin2.SSA.pkg
cbrsup-clciosdb.2015-03-23_17.53_haolin2.SSA.pkg
--- Checking for ready state before IOSD upgrade on LineCard-3
Updating Package cbrsup-clcios.2015-03-23_17.28_haolin2.SSA.pkg
---> cbrsup-clcios.2015-03-23_17.53_haolin2.SSA.pkg
Restarting ubrclc_k9lc_ms
--- Checking for ready state before IOSDB upgrade on LineCard-3
Updating Package cbrsup-clciosdb.2015-03-23_17.28_haolin2.SSA.pkg
---> cbrsup-clciosdb.2015-03-23_17.53_haolin2.SSA.pkg
Restarting iosdb
SUCCESS: Finished
```

```
Router#show platform software patch 2 info
cbrsup-clciosdb: 3.17.0 (3.0)
cbrsup-clc-firmware: 3.17.0 (0.0)
cbrsup-clcvideo: 3.17.0 (0.0)
cbrsup-clcios: 3.17.0 (3.0)
cbrsup-clccontrol: 3.17.0 (0.0)
cbrsup-clcdocsis: 3.17.0 (0.0)
```

Cable Line Card Upstream Scheduler Process Restart

The Cable Line Card Upstream Scheduler Process Restart feature is used to restart the upstream scheduler process on the RF line cards.

The Cable Line Card Upstream Scheduler Process Restart feature provides the following advantages:

- Allows to restart line card US- Scheduler (CDMAN) process with minimum impact to upstream traffic and no impact to downstream traffic.
- All modem configuration data recovered to the state before restart.
- Changes in modem configuration data during restart are reconciled.
- New modems coming online are blocked during restart.
- The **request platform software package restart** command is used to upgrade the new DOCSIS sub-pkg patch without reloading the line card.
- Effective with Cisco IOS-XE Release 3.18.0S, the card restarts automatically after a crash. For more information, see Restart on Crash, on page 85 section.

Restrictions:

The following restrictions apply to the :

- The Upstream Scheduler process can be restarted only on the primary active RF line cards.
- The Upstream Scheduler process restart does not work when double failures (i.e. termination of Upstream Scheduler and one or more process at the same time) occur. The double failures result in line card reload.
- The restart of the next Upstream Scheduler (i.e. Upstream Scheduler process on the next RF line card) does not occur until the current Upstream Scheduler process recovers fully.

Important points to remember:

- With Cisco IOS-XE Release 3.17.0S, when the Cable Line Card Upstream Scheduler Process Restart feature is started, the secondary line card shuts down automatically.
- To prevent reloading the line card after sub-package upgrade, use the **request platform software package install node file** command with the **noreload linecard** option.
- Verify the restart process using the **show platform software us-scheduler restart info** command.

```
Router# show platform software us-scheduler 3 restart info
us-scheduler process restart info:
Process restartable : Yes
us-scheduler state : RESTART_OPERATIONAL
Features bit map : 0x001e
us-scheduler restart count : 4
```

Using the Cable Line Card Upstream Scheduler Process Restart Feature

To use the Cable Line Card Upstream Scheduler Process Restart Feature, install the RF line card sub-package upgrade using the command.

Step 1 Install the RF line card sub-package upgrade using the **request platform software package install node file noreload linecard** command.

```
Router#request platform software package install node file bootflash:sp/cbr_patch.9.0.tar noreload
linecard
```

Step 2 Use the **request platform software process restart** command to restart the Upstream Scheduler process on all the cable line cards sequentially.

```
Router# request platform software process restart
```

Step 3 Use the **request platform software process restart slot** *slot#* command to restart the Upstream Scheduler process on a specific cable line card.

```
Router# request platform software process restart slot 7
```

Configuring the Cable Line Card Control Plane Process Restart Retry Limit

To configure the Cable Line Card Control Plane Process Restart Retry Limit, complete the following procedure:

```
enable
configure terminal
process-restart
lc-us-scheduler-timeout time
restart-retry retry-times
exit
```

Examples for Cable Line Card Upstream Scheduler Process Restart Feature

This section provides the sample outputs for the commands used in the Cable Line Card Upstream Scheduler Process Restart Feature.

This example shows the output of the **show platform software us-scheduler restart info** command.

```
Router#show platform software us-scheduler 6 restart info
us-scheduler process restart info:
Process restartable : Yes
us-scheduler state : RESTART_OPERATIONAL
Features bit map : 0x001e
us-scheduler restart count : 1
```

This example shows the output when the upstream scheduler process is restarted.

```
Router# request platform software package install node file
bootflash:subpkg/cbr_patch-3.17.0-patch2.tar noreload linecard
NOTE: Currently node has booted from a provisioning file
NOTE: Going to start a dual rp sub-packages node ISSU install
```

```
--- Starting initial file path checking --- Copying
bootflash:subpkg/cbr_patch-3.17.0-patch2.tar to
stby-bootflash:subpkg/cbr_patch-3.17.0-patch2.tar
Finished initial file path checking
--- Starting config-register verification --- Finished config-register verification
--- Starting Checking noreload options --- Finished Checking noreload options
--- Starting image file expansion ---
Expanding image file: bootflash:subpkg/cbr_patch-3.17.0-patch2.tar
Image file expanded and copied
Expanding image file: stby-bootflash:subpkg/cbr_patch-3.17.0-patch2.tar
Image file expanded and copied
Finished image file expansion
Found clc package
STAGE 1: Installing software on standby RP ========================================
--- Starting local lock acquisition on R0 --- Finished local lock acquisition on R0
--- Starting installation state synchronization --- Finished installation state
synchronization
--- Starting local lock acquisition on R1 --- Finished local lock acquisition on R1
--- Starting file path checking ---
Finished file path checking
--- Starting image file verification --- Checking image file names Locating image files and
validating name syntax
Found cbrsup-clcdocsis.2015-10-08_18.10_haolin2.SSA.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification
--- Starting candidate package set construction --- Verifying existing software set Processing
candidate provisioning file Constructing working set for
candidate package set Constructing working set for running package set Checking command
output Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete Finished candidate package
set construction
--- Starting ISSU compatibility verification ---
WARNING:
WARNING: ISSU between engineering builds with release strings in non-standard fo rmat.
Skipping ISSU Software Compatibility checks.
WARNING:
WARNING:
WARNING: ISSU between engineering builds with release strings in non-standard fo rmat.
Skipping ISSU Software Compatibility checks.
WARNING:
WARNING:
WARNING: ISSU between engineering builds with release strings in non-standard fo rmat.
Skipping ISSU Software Compatibility checks.
WARNING:
WARNING:
WARNING: ISSU between engineering builds with release strings in non-standard fo rmat.
Skipping ISSU Software Compatibility checks.
WARNING:
Verifying image type compatibility
Checking IPC compatibility with running software Checking candidate package set infrastructure
compatibility Checking infrastructure compatibility with running
software Checking package specific compatibility Finished ISSU compatibility verification
--- Starting list of software package changes --- Old files list:
Removed cbrsup-clcdocsis.BLD_MCP_DEV_LATEST_20151006_133623.SSA.pkg
New files list:
Added cbrsup-clcdocsis.2015-10-08_18.10_haolin2.SSA.pkg
Finished list of software package changes
--- Starting commit of software changes --- Updating provisioning rollback files Creating
pending provisioning file Committing provisioning file Finished
commit of software changes
--- Starting analysis of software changes --- Finished analysis of software changes
```

```
--- Starting update running software --- Blocking peer synchronization of operating
information Creating the command set placeholder directory
Finding latest command set
Finding latest command shortlist lookup file
Finding latest command shortlist file
Assembling CLI output libraries
Assembling CLI input libraries
Assembling Dynamic configuration files
Applying interim IPC and database definitions
Replacing running software
Replacing CLI software
Restarting software
Restarting software: target frus filtered out ... skipped
Applying final IPC and database definitions
Generating software version information
Notifying running software of updates
Unblocking peer synchronization of operating information Unmounting old packages Cleaning
temporary installation files
Finished update running software
SUCCESS: Finished installing software.
STAGE 2: Installing software on active RP ========================================
--- Starting local lock acquisition on R0 --- Finished local lock acquisition on R0
--- Starting installation state synchronization --- Finished installation state
synchronization
--- Starting file path checking ---
Finished file path checking
--- Starting image file verification --- Checking image file names Locating image files and
validating name syntax
Found cbrsup-clcdocsis.2015-10-08_18.10_haolin2.SSA.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification
--- Starting candidate package set construction --- Verifying existing software set Processing
candidate provisioning file Constructing working set for candidate
package set Constructing working set for running package set Checking command output
Constructing merge of running and candidate packages Checking if resulting
candidate package set would be complete Finished candidate package set construction
--- Starting ISSU compatibility verification ---
WARNING:
WARNING: ISSU between engineering builds with release strings in non-standard fo rmat.
Skipping ISSU Software Compatibility checks.
WARNING:
WARNING:
WARNING: ISSU between engineering builds with release strings in non-standard fo rmat.
Skipping ISSU Software Compatibility checks.
WARNING:
WARNING:
WARNING: ISSU between engineering builds with release strings in non-standard fo rmat.
Skipping ISSU Software Compatibility checks.
WARNING:
WARNING:
WARNING: ISSU between engineering builds with release strings in non-standard fo rmat.
Skipping ISSU Software Compatibility checks.
WARNING:
Verifying image type compatibility
Checking IPC compatibility with running software Checking candidate package set infrastructure
compatibility Checking infrastructure compatibility with running
software Checking package specific compatibility Finished ISSU compatibility verification
--- Starting impact testing ---
Checking operational impact of change
Finished impact testing
--- Starting list of software package changes --- Old files list:
```

```
Removed cbrsup-clcdocsis.BLD_MCP_DEV_LATEST_20151006_133623.SSA.pkg
New files list:
Added cbrsup-clcdocsis.2015-10-08_18.10_haolin2.SSA.pkg
Finished list of software package changes
--- Starting commit of software changes --- Updating provisioning rollback files Creating
pending provisioning file Committing provisioning file Finished
commit of software changes
--- Starting analysis of software changes --- Finished analysis of software changes
--- Starting update running software --- Blocking peer synchronization of operating
information Creating the command set placeholder directory
Finding latest command set
Finding latest command shortlist lookup file
Finding latest command shortlist file
Assembling CLI output libraries
Assembling CLI input libraries
Assembling Dynamic configuration files
Applying interim IPC and database definitions
Replacing running software
Replacing CLI software
Restarting software
Restarting software: target frus filtered out ... skipped
Applying final IPC and database definitions
Generating software version information
Notifying running software of updates
Unblocking peer synchronization of operating information Unmounting old packages Cleaning
temporary installation files
Finished update running software
SUCCESS: Finished installing software.
Found clc package
SUCCESS: node ISSU finished successfully.
Invoking cleanup routine
Router#

Router#show platform software us-scheduler 2 restart info
us-scheduler process restart info:
Process restartable : Yes
us-scheduler state : RESTART_OPERATIONAL
Features bit map : 0x001e
us-scheduler restart count : 1

Router#request platform software process restart slot 2
--- Upgrading/Restarting LineCard-2 Packages/Processes ---
Available upgrades
cbrsup-clcdocsis.BLD_MCP_DEV_LATEST_20151006_13362
Updating Package cbrsup-clcdocsis.BLD_MCP_DEV_LATEST_20151006_13362
---> cbrsup-clcdocsis.2015-10-08_18.10_haolin2.SSA.pkg
Restarting us-scheduler
SUCCESS: Finished upgrading the LineCard-2

Router#show platform software patch 2 info
cbrsup-clciosdb: 3.17.0 (0.0)
cbrsup-clc-firmware: 3.17.0 (0.0)
cbrsup-clcvideo: 3.17.0 (0.0)
cbrsup-clcios: 3.17.0 (0.0)
cbrsup-clccontrol: 3.17.0 (0.0)
cbrsup-clcdocsis: 3.17.0 (2.0)
```

Note If the upgrade package includes both IOSD-CLC and US-scheduler sub-packages, the **request platform software process restart** command first restarts the Cable Line Card Upstream Scheduler process and then the Cable Line Card Control Plane process.

This example shows the output of the **request platform software process restart** command when the Control Plane and the upstream scheduler process are restarted:

Note If the **slot** keyword is not used, the upstream scheduler process on all the line cards are restarted sequentially.

```
Router#request platform software process restart


--- Upgrading/Restarting LineCard-1 Packages/Processes ---

    Available upgrades
        cbrsup-clcdocsis.2015-09-24_03.09_johuynh.SSA.pkg
        cbrsup-clcios.2015-09-24_03.09_johuynh.SSA.pkg
        cbrsup-clciosdb.2015-09-24_03.09_johuynh.SSA.pkg

    Updating Package  cbrsup-clcdocsis.2015-09-24_03.09_johuynh.SSA.pkg
               ---> cbrsup-clcdocsis.2015-09-24_19.04_haolin2.SSA.pkg
    Restarting us-scheduler
--- Checking for ready state before IOSD upgrade on LineCard-1
    Updating Package  cbrsup-clcios.2015-09-24_03.09_johuynh.SSA.pkg
               ---> cbrsup-clcios.2015-09-24_19.04_haolin2.SSA.pkg
    Restarting ubrclc_k9lc_ms
--- Checking for ready state before IOSDB upgrade on LineCard-1
    Updating Package  cbrsup-clciosdb.2015-09-24_03.09_johuynh.SSA.pkg
               ---> cbrsup-clciosdb.2015-09-24_19.04_haolin2.SSA.pkg
    Restarting iosdb

    SUCCESS: Finished upgrading the LineCard-1


--- Upgrading/Restarting LineCard-2 Packages/Processes ---

    Available upgrades
        cbrsup-clcdocsis.2015-09-24_03.09_johuynh.SSA.pkg
        cbrsup-clcios.2015-09-24_03.09_johuynh.SSA.pkg
        cbrsup-clciosdb.2015-09-24_03.09_johuynh.SSA.pkg

    Updating Package  cbrsup-clcdocsis.2015-09-24_03.09_johuynh.SSA.pkg
               ---> cbrsup-clcdocsis.2015-09-24_19.04_haolin2.SSA.pkg
    Restarting us-scheduler
--- Checking for ready state before IOSD upgrade on LineCard-2
    Updating Package  cbrsup-clcios.2015-09-24_03.09_johuynh.SSA.pkg
               ---> cbrsup-clcios.2015-09-24_19.04_haolin2.SSA.pkg
    Restarting ubrclc_k9lc_ms
--- Checking for ready state before IOSDB upgrade on LineCard-2
    Updating Package  cbrsup-clciosdb.2015-09-24_03.09_johuynh.SSA.pkg
               ---> cbrsup-clciosdb.2015-09-24_19.04_haolin2.SSA.pkg
    Restarting iosdb

    SUCCESS: Finished upgrading the LineCard-2
Router#
```

You can specify a time interval in seconds using the **interval** keyword, between the restarting of two line card processes in the sequence. The default interval is five seconds.

This example shows the configuration of an interval of six seconds.

```
Router#request platform software process restart interval 6
```

Quick Start Software Upgrade

The following instructions provide a quick start version of upgrading the software running the Cisco cBR Series Converged Broadband Router. These instructions assume you have access to the consolidated package and that the files will be stored in a bootflash: file system that is not storing any previously installed subpackages or consolidated packages and that has enough room for the file or files.

Step 1 Copy the consolidated package into bootflash: using the **copy** *URL-to-image* **bootflash:** command.

Step 2 If you want to run the router using individual subpackages, enter the **request platform software package expand file bootflash:**/*sub_dir*/*base_image* command. If you want to run the router using a consolidated package, skip this step.

Step 3 Enter the **dir bootflash:** command to verify your consolidated package or your extracted subpackages are in the directory.

Step 4 If you are trying to run individual subpackages, use the **delete bootflash:***base_image* to delete the consolidated package. If you want to run the router using the consolidated package, skip this step.

Step 5 Set up the boot parameters for your boot. Set the configuration register to 0x2 by entering the **config-register 0x2102** global configuration command, and enter the **boot system flash bootflash:***base_image* (if running using the consolidated package) or **boot system flash bootflash:***provisionging-file-name* (if running using individual subpackages) global configuration command.

Step 6 Enter **copy running-config startup-config** to save your configuration.

Step 7 Enter the **reload** command to reload the router and finish the boot. The upgraded software should be running when the reload completes.

Managing and Configuring a Consolidated Package Using the copy Command

To upgrade a consolidated package on the Cisco cBR Series Routers using the **copy** command, copy the consolidated package into the bootflash: directory on the router using the **copy** command as you would on most other Cisco routers. After making this copy, configure the router to boot using the consolidated package file.

In the following example, the consolidated package file is copied onto the bootflash: file system from TFTP. The config-register is then set to boot using **boot system** commands, and the **boot system** commands instruct the router to boot using the consolidated package stored in the bootflash: file system. The new configuration is then saved using the **copy running-config startup-config** command, and the system is then reloaded to complete the process.

```
Router# dir bootflash:
Directory of bootflash:/

11 drwx 16384 Dec 4 2007 04:32:46 -08:00 lost+found
86401 drwx 4096 Dec 4 2007 06:06:24 -08:00 .ssh
14401 drwx 4096 Dec 4 2007 06:06:36 -08:00 .rollback_timer
28801 drwx 4096 Mar 18 2008 17:31:17 -07:00 .prst_sync
43201 drwx 4096 Dec 4 2007 04:34:45 -08:00 .installer
13 -rw- 45977 Apr 9 2008 16:48:46 -07:00 target_support_output.tgz.tgz

928862208 bytes total (712273920 bytes free)
```

```
Router# copy tftp bootflash:
Address or name of remote host []? 172.17.16.81
Source filename []?
/auto/tftp-users/user/cbrsup-universal*.bin Destination filename [cbrsup-universal*.bin]?
Accessing
tftp://172.17.16.81//auto/tftp-users/user/ cbrsup-universal*.bin...

Loading /auto/tftp-users/user/cbrsup-universal*.bin from
172.17.16.81 (via GigabitEthernet0):
!!!
```

Extracting a Consolidated Package and Booting Using the Provisioning File

T o extract a consolidated package and to boot using provisioning file, perform the following steps:

Step 1 Perform one of the following tasks:

a) Copy the consolidated package file (or, in cases where you have every individual subpackage and a provisioning file for the subpackages available, each individual subpackage and the provisioning file) onto the bootflash: file system using the **copy** command. Make sure to copy the consolidated package into the bootflash: file system and directory where you want to store the provisioning file and the individual image subpackages. Enter the **request platform software package expand file bootflash:***url-to-Cisco-IOS-XE-imagename* command with no other option to extract the provisioning file and the individual subpackages out of the consolidated package file and into the current directory in bootflash:. We recommend that you extract the sub packages to an empty directory to simplify the management of these files.

b) Copy the consolidated package file onto any file system on your router, then enter the **request platform software package expand file file-system:***url-to-Cisco-IOS-XE-imagename* **to bootflash:** command to extract the provisioning file and the individual image subpackages onto the bootflash: file system.

Note After performing this step, do not move any of the files. The bootup process cannot function properly unless all of the subpackages and the provisioning file are located in the same directory. Also, do not rename the subpackage files. Only the provisioning file can be renamed, and the renaming of the provisioning file, if desired, should be done at this step before the router is rebooted.

Step 2 Configure the router to boot using the provisioning file.

The sequence below provides an example that would boot the router using the provisioning file named packages.conf that was stored with the other subpackages in the bootflash: file system:

```
Router(config)# no boot system
Router(config)# config-register 0x2102
Router(config)# boot system flash bootflash:packages.conf
Router(config)# exit
*May 11 01:31:04.815: %SYS-5-CONFIG_I: Configured from console by con
Router# copy running-config startup-config
Building configuration... [OK]
Router# reload
```

Extracting the SubPackages and the Provisioning File: Example 1

The following example shows how to extract the individual subpackages and the provisioning file from a consolidated package that has already been placed in the directory where you want to store the individual subpackages and the provisioning file. We recommend that you extract the sub packages to an empty directory to simplify the management of these files.

Output of the directory before and after the extraction is given to confirm the files were extracted.

```
Router# dir bootflash:
Directory of bootflash:/

11 drwx 16384 Dec 4 2007 04:32:46 -08:00 lost+found
86401 drwx 4096 Dec 4 2007 06:06:24 -08:00 .ssh
14401 drwx 4096 Dec 4 2007 06:06:36 -08:00 .rollback_timer
28801 drwx 4096 Mar 18 2008 17:31:17 -07:00 .prst_sync
43201 drwx 4096 Dec 4 2007 04:34:45 -08:00 .installer
```

```
12 -rw- 208904396 May 9 2008 14:36:31 -07:00
cbrsup-universal*.bin
13 -rw- 45977 Apr 9 2008 16:48:46 -07:00 target_support_output.tgz.tgz

928862208 bytes total (503156736 bytes free)

Router# request platform software package expand file bootflash:cbrsup-universal*.bin
Verifying parameters
Validating package type
Copying package files
SUCCESS: Finished expanding all-in-one software package.

Router# dir bootflash:
Directory of bootflash:/

11 drwx 16384 Dec 4 2007 04:32:46 -08:00 lost+found
86401 drwx 4096 Dec 4 2007 06:06:24 -08:00 .ssh
14401 drwx 4096 Dec 4 2007 06:06:36 -08:00 .rollback_timer
28801 drwx 4096 Mar 18 2008 17:31:17 -07:00 .prst_sync
43201 drwx 4096 Dec 4 2007 04:34:45 -08:00 .installer
12 -rw- 208904396 May 9 2008 14:36:31 -07:00
cbrsup-universal*.bin
57611 -rw- 47071436 May 22 2008 11:26:23 -07:00 cbr000rp1-espbase.02.01.00.122-33.XNA.pkg
57602 -rw- 5740 May 22 2008 11:26:22 -07:00 cbr000rp1-packages-adventerprisek9.02.01.00.122-33.XNA.conf
57612 -rw- 20334796 May 22 2008 11:26:24 -07:00
cbr000rp1-rpaccess.02.01.00.122-33.XNA.pkg
57613 -rw- 22294732 May 22 2008 11:26:24 -07:00 cbr000rp1-rpbase.02.01.00.122-33.XNA.pkg
57614 -rw- 21946572 May 22 2008 11:26:25 -07:00 cbr000rp1-rpcontrol.02.01.00.122-33.XNA.pkg
57615 -rw- 48099532 May 22 2008 11:26:26 -07:00
cbr000rp1-rpios-adventerprisek9.02.01.00.122-33.XNA.pkg
57616 -rw- 34324684 May 22 2008 11:26:27 -07:00 cbr000rp1-sipbase.02.01.00.122-33.XNA.pkg
57617 -rw- 22124748 May 22 2008 11:26:28 -07:00 cbr000rp1-sipspa.02.01.00.122-33.XNA.pkg
57603 -rw- 6256 May 22 2008 11:26:28 -07:00 packages.conf
13 -rw- 45977 Apr 9 2008 16:48:46 -07:00 target_support_output.tgz.tgz

928862208 bytes total (286662656 bytes free)
```

Extracting the SubPackages, Configuring the Router to Boot Using the Provisioning File, and Reloading the Router: Example 2

In the following example, the provisioning file and the individual subpackages are extracted from a consolidated package. The router is then configured to boot using the provisioning file. This example also shows the config-register being set and the running configuration being saved because these tasks must be performed for the router to reload properly. The router is then reloaded to complete the process.

```
Router# dir bootflash:
Directory of bootflash:/

11 drwx 16384 Dec 4 2007 04:32:46 -08:00 lost+found
86401 drwx 4096 Dec 4 2007 06:06:24 -08:00 .ssh
14401 drwx 4096 Dec 4 2007 06:06:36 -08:00 .rollback_timer
28801 drwx 4096 Mar 18 2008 17:31:17 -07:00 .prst_sync
43201 drwx 4096 Dec 4 2007 04:34:45 -08:00 .installer
12 -rw- 208904396 May 9 2008 14:36:31 -07:00
cbrsup-universal*.bin
13 -rw- 45977 Apr 9 2008 16:48:46 -07:00 target_support_output.tgz.tgz

928862208 bytes total (503156736 bytes free)

Router# request platform software package expand file bootflash:cbrsup-universal*.bin
Verifying parameters
```

```
Validating package type
Copying package files
SUCCESS: Finished expanding all-in-one software package.

Router# dir bootflash:
Directory of bootflash:/

11 drwx 16384 Dec 4 2007 04:32:46 -08:00 lost+found
86401 drwx 4096 Dec 4 2007 06:06:24 -08:00 .ssh
14401 drwx 4096 Dec 4 2007 06:06:36 -08:00 .rollback_timer
28801 drwx 4096 Mar 18 2008 17:31:17 -07:00 .prst_sync
43201 drwx 4096 Dec 4 2007 04:34:45 -08:00 .installer
12 -rw- 208904396 May 9 2008 14:36:31 -07:00
cbrsup-universal*.bin
57611 -rw- 47071436 May 22 2008 11:26:23 -07:00 cbr000rp1-espbase.02.01.00.122-33.XNA.pkg
57602 -rw- 5740 May 22 2008 11:26:22 -07:00
cbr000rp1-packages-adventerprisek9.02.01.00.122-33.XNA.conf
57612 -rw- 20334796 May 22 2008 11:26:24 -07:00 cbr000rp1-rpaccess.02.01.00.122-33.XNA.pkg
57613 -rw- 22294732 May 22 2008 11:26:24 -07:00 cbr000rp1-rpbase.02.01.00.122-33.XNA.pkg
57614 -rw- 21946572 May 22 2008 11:26:25 -07:00
cbr000rp1-rpcontrol.02.01.00.122-33.XNA.pkg
57615 -rw- 48099532 May 22 2008 11:26:26 -07:00 cbr000rp1-rpios-adventerprisek9.02.01.00.122-33.XNA.pkg
57616 -rw- 34324684 May 22 2008 11:26:27 -07:00 cbr000rp1-sipbase.02.01.00.122-33.XNA.pkg
57617 -rw- 22124748 May 22 2008 11:26:28 -07:00
cbr000rp1-sipspa.02.01.00.122-33.XNA.pkg
57603 -rw- 6256 May 22 2008 11:26:28 -07:00 packages.conf
13 -rw- 45977 Apr 9 2008 16:48:46 -07:00 target_support_output.tgz.tgz

928862208 bytes total (286662656 bytes free)

Router(config)# no boot system
Router(config)# config-register 0x2102
Router(config)# boot system flash bootflash:packages.conf
Router(config)# exit
Router# copy run start
Router# reload
```

Copying a Set of Individual SubPackage Files, and Booting Using a Provisioning File

To copy a set of individual subpackage files and to boot using a provisioning file, perform the following steps:

Note Although this upgrade method works, it is less efficient than other methods of upgrading the router's software.

Step 1 Copy each individual subpackage and the provisioning file into the bootflash: directory using the **copy** command. Note that this method of running the router will only work if all the individual subpackages for a release and a provisioning file are downloaded onto the router and stored in the bootflash: directory. No other file directories should be used for booting the router using individual subpackages.

The files can also be moved on the router physically using a USB Flash drive.

Step 2 Configure the router to boot using the provisioning file.

The sequence below provides an example that describes how to boot the router using the provisioning file named packages.conf that was stored with the other subpackages in the bootflash: file system. The router runs using individual subpackages once the reload is complete.

```
Router(config)# no boot system
Router(config)# config-register 0x2102
Router(config)# boot system flash bootflash:packages.conf
Router(config)# exit
*May 11 01:31:04.815: %SYS-5-CONFIG_I: Configured from console by con
Router# write memory Building configuration... [OK]
Router# reload
```

Installing an Optional SubPackage

To run the router using an optional subpackage, perform the following steps for each Supervisor in the chassis:

Step 1 Verify that the Supervisor is running in individual subpackage mode and was booted from a provisioning file.

Step 2 Verify that the version of the optional subpackage that you want to install is the same version as the software running on the active Supervisor.

Step 3 Download the optional subpackage that you want to install. Optional subpackages must be downloaded independently from consolidated packages for the Cisco cBR Series Routers.

Step 4 On each Supervisor, copy the optional subpackage to the directory where any other individual subpackages and the provisioning file is located.

Step 5 Run the **request platform software package install rp file** command, as shown in the following example.

Note Do not use the optional slot or bay keywords for the initial installation.

```
Router# request platform software package install rp 0 file
bootflash: cbrsup-universal*.bin
--- Starting local lock acquisition on R0 --- Finished local lock acquisition on R0

--- Starting file path checking --- Finished file path checking

--- Starting image file verification --- Checking image file names Verifying image file locations
Locating image files and validating name syntax
Found cbrsup-universal*.bin
Inspecting image file types Processing image file constraints Creating candidate provisioning file

WARNING: No package of type sipspawmak9 is installed.
WARNING: Package will be installed for all SIP slots and bays. Finished image file verification
--- Starting candidate package set construction --- Verifying existing software set Processing
candidate provisioning file Constructing working set for candidate package set Constructing working
 set for running package set Checking command output Constructing merge of running and candidate
packages Checking if resulting candidate package set would be complete Finished candidate package
set construction

--- Starting compatibility testing ---
Determining whether candidate package set is compatible

WARNING:
WARNING: Candidate software combination not found in compatibility database
WARNING:
```

```
Determining whether installation is valid

WARNING:
WARNING: Candidate software combination not found in compatibility database
WARNING:

Software sets are identified as compatible Checking IPC compatibility with running software Checking
 candidate package set infrastructure compatibility Checking infrastructure compatibility with running
 software Checking package specific compatibility Finished compatibility testing

--- Starting impact testing --- Checking operational impact of change Finished impact testing

--- Starting list of software package changes --- No old package files removed New files list:
Added cbrsup-universal*.bin Finished list of software package changes

--- Starting commit of software changes --- Updating provisioning rollback files Creating pending
provisioning file Committing provisioning file Finished commit of software changes

--- Starting analysis of software changes --- Finished analysis of software changes

--- Starting update running software --- Blocking peer synchronization of operating information
Creating the command set placeholder directory
Finding latest command set
Finding latest command shortlist lookup file Finding latest command shortlist file Assembling CLI
output libraries
Assembling CLI input libraries
Applying interim IPC and database definitions
Replacing running software Replacing CLI software Restarting software
Restarting software: target frus filtered out ... skipped
Applying final IPC and database definitions Generating software version information Notifying running
 software of updates
Unblocking peer synchronization of operating information Unmounting old packages
Cleaning temporary installation files
Finished update running software

SUCCESS: Finished installing software.
```

Upgrading Individual SubPackages

Patch Installation

Individual subpackages can be upgraded in subpackage mode. Patch releases consist of one or more subpackages. After a patch has been installed, a message is displayed indicating whether the entire chassis or only the line cards must be rebooted for the updates to take effect.

Installing a Patch that Affects Both Line Card and Supervisor Card

Step 1 The Cisco cBR router must be in subpackage mode.

Step 2 Copy the patch file to the same location as the active subpackages on both the active and standby supervisor cards.

Step 3 Install the patch using the **request platform software package install rp** *slot* **file** *patch file* command on the standby card.

Step 4 Install the patch using the**request platform software package install rp** *slot* **file** *patch file* command on the active card.

Step 5 Reload the chassis.

Installing a Patch that Affects Only Line Cards

Step 1 The Cisco cBR router must be in subpackage mode.

Step 2 Copy the patch file to the same location as the active subpackages on both the active and standby supervisor cards.

Step 3 Install the patch using the **request platform software package install rp** *slot* **file** *patch file* command on the standby card.

Step 4 Install the patch using the**request platform software package install rp** *slot* **file** *patch file* command on the active card.

Step 5 Reload the line cards.

Installing a Patch that Affects Only Supervisor Cards

Step 1 The Cisco cBR router must be in subpackage mode.

Step 2 Copy the patch file to the same location as the active subpackages on both the active and standby supervisor cards.

Step 3 Install the patch using the **request platform software package install rp** *slot* **file** *patch file* command on the standby card.

Step 4 Switch over to the standby card. This will make it the active card.

Step 5 Install the patch using the **request platform software package install rp** *slot* **file** *patch file* command on the standby card.

Upgrading a Line Card SubPackage

Use the **request platform software package install node file** *filename* command to upgrade a line card subpackage.

```
Router# request platform software package install node file
bootflash:/subpkg/cbr_patch.5.0.tar

NOTE: Currently node has booted from a provisioning file
NOTE: Going to start a dual rp sub-packages node ISSU install

--- Starting initial file path checking ---
Copying bootflash:/subpkg/cbr_patch.5.0.tar to stby-bootflash:/subpkg/cbr_patch.5.0.tar
Finished initial file path checking

--- Starting config-register verfication ---
Finished config-register verfication

--- Starting image file expansion ---
Expanding image file: bootflash:/subpkg/cbr_patch.5.0.tar
Image file expanded and copied
Expanding image file: stby-bootflash:/subpkg/cbr_patch.5.0.tar
Image file expanded and copied
```

```
Finished image file expansion


STAGE 1: Installing software on standby RP
==========================================
--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0

--- Starting installation state synchronization ---
Finished installation state synchronization

--- Starting local lock acquisition on R1 ---
Finished local lock acquisition on R1

--- Starting file path checking ---
Finished file path checking

--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
  Found cbrsup-clcdocsis.2015-02-20_01.02.SSA.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification

--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction

--- Starting ISSU compatiblity verficiation ---
Verifying image type compatibility
Checking IPC compatibility with running software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking package specific compatibility
Finished ISSU compatiblity verficiation

--- Starting list of software package changes ---
Old files list:
  Removed cbrsup-clcdocsis.BLD_V155_2_S_XE315_THROTTLE_LATEST_20150217_110041-st
d.SSA.pkg
New files list:
  Added cbrsup-clcdocsis.2015-02-20_01.02.SSA.pkg
Finished list of software package changes

--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes

--- Starting analysis of software changes ---
Finished analysis of software changes

--- Starting update running software ---
Blocking peer synchronization of operating information
```

```
Creating the command set placeholder directory
  Finding latest command set
  Finding latest command shortlist lookup file
  Finding latest command shortlist file
  Assembling CLI output libraries
  Assembling CLI input libraries
  Assembling Dynamic configuration files
  Applying interim IPC and database definitions
  Replacing running software
  Replacing CLI software
  Restarting software
  Restarting software: target frus filtered out ... skipped
  Applying final IPC and database definitions
  Generating software version information
  Notifying running software of updates
  Unblocking peer synchronization of operating information
Unmounting old packages
Cleaning temporary installation files
  Finished update running software

SUCCESS: Finished installing software.

STAGE 2: Installing software on active RP
========================================
--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0

--- Starting installation state synchronization ---
Finished installation state synchronization

--- Starting file path checking ---
Finished file path checking

--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
  Found cbrsup-clcdocsis.2015-02-20_01.02.SSA.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification

--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction

--- Starting ISSU compatiblity verficiation ---
Verifying image type compatibility
Checking IPC compatibility with running software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking package specific compatibility
Finished ISSU compatiblity verficiation

--- Starting impact testing ---
Checking operational impact of change
Finished impact testing
```

```
--- Starting list of software package changes ---
Old files list:
  Removed cbrsup-clcdocsis.BLD_V155_2_S_XE315_THROTTLE_LATEST_20150217_110041-st
d.SSA.pkg
New files list:
  Added cbrsup-clcdocsis.2015-02-20_01.02.SSA.pkg
Finished list of software package changes

--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes

--- Starting analysis of software changes ---
Finished analysis of software changes

--- Starting update running software ---
Blocking peer synchronization of operating information
Creating the command set placeholder directory
  Finding latest command set
  Finding latest command shortlist lookup file
  Finding latest command shortlist file
  Assembling CLI output libraries
  Assembling CLI input libraries
  Assembling Dynamic configuration files
  Applying interim IPC and database definitions
  Replacing running software
  Replacing CLI software
  Restarting software
  Restarting software: target frus filtered out ... skipped
  Applying final IPC and database definitions
  Generating software version information
  Notifying running software of updates
  Unblocking peer synchronization of operating information
Unmounting old packages
Cleaning temporary installation files
  Finished update running software

SUCCESS: Finished installing software.
Found clc package
Found clc package
Found clcdocsis package
SUCCESS: Reload Cable Linecard at slot 1
SUCCESS: Reload Cable Linecard at slot 2
SUCCESS: node ISSU finished successfully.
Invoking cleanup routine
```

Use the **request platform software package install node file** *filename* **noreload linecard** command to upgrade a line card subpackage.

```
Router#request platform software package install node file bootflash:/subpkg/cbr_patch.5.0.tar
 noreload linecard
NOTE: Currently node has booted from a provisioning file
NOTE: Going to start a dual rp sub-packages node ISSU install

--- Starting initial file path checking ---
Copying bootflash:/subpkg/cbr_patch.5.0.tar to stby-bootflash:/subpkg/cbr_patch.
5.0.tar
Finished initial file path checking
```

```
--- Starting config-register verfication ---
Finished config-register verfication

--- Starting Checking noreload options ---
Finished Checking noreload options

--- Starting image file expansion ---
Expanding image file: bootflash:/subpkg/cbr_patch.5.0.tar
Image file expanded and copied
Expanding image file: stby-bootflash:/subpkg/cbr_patch.5.0.tar
Image file expanded and copied
Finished image file expansion

Found clc package

STAGE 1: Installing software on standby RP
==========================================
--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0

--- Starting installation state synchronization ---
Finished installation state synchronization

--- Starting local lock acquisition on R1 ---
Finished local lock acquisition on R1

--- Starting file path checking ---
Finished file path checking

--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
  Found cbrsup-clcdocsis.2015-03-01_01.40.SSA.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification

--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction

--- Starting ISSU compatiblity verficiation ---
Verifying image type compatibility
Checking IPC compatibility with running software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking package specific compatibility
Finished ISSU compatiblity verficiation

--- Starting list of software package changes ---
Old files list:
  Removed cbrsup-clcdocsis.2015-03-01_03.43.SSA.pkg
New files list:
  Added cbrsup-clcdocsis.2015-03-01_01.40.SSA.pkg
Finished list of software package changes
```

```
--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes

--- Starting analysis of software changes ---
Finished analysis of software changes

--- Starting update running software ---
Blocking peer synchronization of operating information
Creating the command set placeholder directory
  Finding latest command set
  Finding latest command shortlist lookup file
  Finding latest command shortlist file
  Assembling CLI output libraries
  Assembling CLI input libraries
  Assembling Dynamic configuration files
  Applying interim IPC and database definitions
  Replacing running software
  Replacing CLI software
  Restarting software
  Restarting software: target frus filtered out ... skipped
  Applying final IPC and database definitions
  Generating software version information
  Notifying running software of updates
  Unblocking peer synchronization of operating information
Unmounting old packages
Cleaning temporary installation files
  Finished update running software

SUCCESS: Finished installing software.

STAGE 2: Installing software on active RP
=========================================
--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0

--- Starting installation state synchronization ---
Finished installation state synchronization

--- Starting file path checking ---
Finished file path checking

--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
  Found cbrsup-clcdocsis.2015-03-01_01.40.SSA.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification

--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction
```

```
--- Starting ISSU compatiblity verficiation ---
Verifying image type compatibility
Checking IPC compatibility with running software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking package specific compatibility
Finished ISSU compatiblity verficiation

--- Starting impact testing ---
Checking operational impact of change
Finished impact testing

--- Starting list of software package changes ---
Old files list:
  Removed cbrsup-clcdocsis.2015-03-01_03.43.SSA.pkg
New files list:
  Added cbrsup-clcdocsis.2015-03-01_01.40.SSA.pkg
Finished list of software package changes

--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes

--- Starting analysis of software changes ---
Finished analysis of software changes

--- Starting update running software ---
Blocking peer synchronization of operating information
Creating the command set placeholder directory
  Finding latest command set
  Finding latest command shortlist lookup file
  Finding latest command shortlist file
  Assembling CLI output libraries
  Assembling CLI input libraries
  Assembling Dynamic configuration files
  Applying interim IPC and database definitions


  Replacing running software
  Replacing CLI software
  Restarting software
  Restarting software: target frus filtered out ... skipped
  Applying final IPC and database definitions
  Generating software version information
  Notifying running software of updates
  Unblocking peer synchronization of operating information
Unmounting old packages
Cleaning temporary installation files
  Finished update running software

SUCCESS: Finished installing software.
Found clc package
SUCCESS: node ISSU finished successfully.
Invoking cleanup routine
```

Use the **show platform software patch** *n* **info** command to verify completion of this upgrade.

```
Router#show platform software patch 1 info
```

```
cbrsup-clciosdb: 3.15 (0.0)
cbrsup-clc-firmware: 3.15 (0.0)
cbrsup-clcvideo: 3.15 (0.0)
cbrsup-clcios: 3.15 (0.0)
cbrsup-clccontrol: 3.15 (0.0)
cbrsup-clcdocsis: 3.15 (1.0)
cbrsup-clcmipsbase: 3.15 (0.0)


Router#show platform software patch 2 info
cbrsup-clciosdb: 3.15 (0.0)
cbrsup-clc-firmware: 3.15 (0.0)
cbrsup-clcvideo: 3.15 (0.0)
cbrsup-clcios: 3.15 (0.0)
cbrsup-clccontrol: 3.15 (0.0)
cbrsup-clcdocsis: 3.15 (1.0)
cbrsup-clcmipsbase: 3.15 (0.0)
```

Use the **show platform software ios** *slot-number* **restart info** command to verify completion of this upgrade. This example shows the output of this **show** command for the RF line card slot number 2.

```
Router#show platform software ios 2 restart info
IOSD process restart info:
  Process restartable: Yes
  IOSD restart state : NOT_RESTARTED_YET
  Total Modem Count  : 251
  Active Modem Count : 251


Router#
```

Additional References

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 Consolidated Packages and SubPackages Management

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 www.cisco.com/go/cfn 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 9: Feature Information for Consolidated Packages and SubPackages Management

Feature Name	Releases	Feature Information
Consolidated Packages and SubPackages Management	Cisco IOS-XE 3.15.0S	This feature was introduced on the Cisco cBR Series Converged Broadband Router.
Cable Line Card Control Plane Restart	Cisco IOS-XE 3.16.0S	This feature was introduced on the Cisco cBR Series Converged Broadband Router.