Line Card Redundancy

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

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

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

Contents

Hardware Compatibility Matrix for the Cisco cBR Series Routers

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

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

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

Note Do not use DPICs (8X10G and 2x100G) to forward IP traffic, as it may cause buffer exhaustion, leading to line card reload.

The only allowed traffic on a DPIC interface is DEPI, UEPI, and GCP traffic from the Cisco cBR-8 router to Remote PHY devices. Other traffic such as DHCP, SSH, and UTSC should flow via another router, since DPICs cannot be used for normal routing.

Prerequisites for Line Card Redundancy

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

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

Restrictions for Line Card Redundancy

- For Supervisor 160G, the line cards installed in slot 3 and 6 of the Cisco cBR-8 router cannot be configured as the secondary card. The limitation does not apply for Supervisor 250G.

- The RF Protect PIC can send RF signals only to the lower slots (with larger slot number). So, the slot number of the secondary card must be the smallest in the redundancy group.

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

- The RF Through PIC can send RF signal only from upper slot to lower slot. So, do not install any RF blank PICs between the secondary card and primary cards.

- You cannot change any configuration on the primary or secondary card when the secondary card is active.

- You cannot remove the last primary card if there is a secondary card in the redundancy group. You must remove the secondary card and then remove the primary card.

- If the primary card is in the standby role, you must revert to the primary card before removing it from the redundancy group.

- For CBR-CCAP-LC-40G high availability domain, ensure that all CBR-CCAP-LC-40G Line Cards are in continuous slots and using the lowest slot number as secondary Line Card. The limitation does not apply for CBR-CCAP-LC-40G-R or CBR-CCAP-LC-G2-R Line Cards.

- CBR-CCAP-LC-G2-R provides protection only to CBR-CCAP-LC-G2-R.

Note
- From Cisco IOS XE Bengaluru 17.6.1, CBR-CCAP-LC-G2-R and CBR-CCAP-LC-40G-R line cards must not be part of the same redundancy group.

- In Cisco IOS XE Amsterdam 17.3.1 and earlier releases, CBR-CCAP-LC-G2-R provides protection to CBR-CCAP-LC-G2-R or CBR-CCAP-LC-40G-R.

- Protection for CBR-CCAP-LC-G2-R by CBR-CCAP-LC-40G-R is not supported.

Information About Line Card Redundancy

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

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

- Manual switchover using the **redundancy linecard-group switchover from slot** *slot*command.

- Line card reload using the **hw-module slot reload** command.

- Line card crash.

- Line card Online Insertion and Removal (OIR).

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

Following are the line card redundancy states:

- **Unavail**—The line card state is not available.

- **Init**—The line card did not boot up.

- **Active Cold**—The active card is downloading the configuration.

- **Active**—The active card is fully configured and working.

- **Stdby Cold**—The standby card configuration is synchronizing with the active card.

- **Stdby Warm**—(Only for the secondary card) The standby card is fully synchronized and ready for switchover. It is the stable state of a secondary standby card.

- **Stdby Hot**—The primary standby card is fully synchronized. It is the stable state of a primary standby card. The secondary standby card is chosen to switchover for a primary card, and will be active soon. It is a transient state when secondary card is becoming active.

N+1 Line Card Redundancy

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

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

How to Configure Line Card Redundancy

This section contains the following:

Configuring Line Card Manual Switchover

Before you begin

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

Restrictions

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

- You cannot auto revert the switchover triggered manually.

Procedure

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

Configuring N+1 Line Card Redundancy

Procedure

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

	Command or Action	Purpose
	Router(config-red)# **linecard-group 0 internal-switch**	
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#
```

Enabling LCHA When DPIC Fails

Table 2: Feature History

Feature Name	Release Information	Feature Description
Enabling Line Card Redundancy When DPIC Fails	Cisco IOS XE Dublin 17.12.1x	In this release, Line Card Redundancy (LCHA) triggers when Digital Physical Interface Cards (DPIC) encounters a hardware failure. This action ensures that the service is not impacted when a DPIC has a Hardware failure. This feature supports the **CBR-DPIC-8X10G** and **CBR-DPIC-2X100G** Interface Cards. In previous releases, when a DPIC encounters a hardware failure, the DPIC state moves to **out of service** and LCHA cannot be triggered. Triggering of LCHA was based on the state of the line card.

This feature follows the LCHA configuration. The following table shows the actions that are performed based as per the following conditions:

Table 3: LCHA Trigger Conditions

Condition	Action
The DPIC which has a Hardware failure is not in the LCHA group	No Action
The DPIC which has a Hardware failure is on standby	No Action
The DPIC which has a Hardware failure is active and the standby line card is ready to do LCHA	LCHA is triggered
The DPIC which has a Hardware failure is active, and the secondary line card is protecting another line card	Cisco IOS waits for the Secondary line card to move into the standby role, and then trigger LCHA.

When s DPIC fails, Cisco IOS resets the DPIC 5 times to confirm it has failed to boot. Post this process, the DPIC state is moved to **out of service** and decides if it is possible to trigger LCHA. During this time period, the DPIC goes offline for approximately 5–10 mins.

In the example log below, **DPIC 8/1** encounters a hardware failure.

```
Nov 17 14:37:37.045 CST: %SPA_OIR-3-SPA_POWERED_OFF: subslot 8/1: SPA Digital PIC powered
off after 5 failures within 1200 seconds
Nov 17 14:37:37.046 CST: %SPA_OIR-6-OFFLINECARD: SPA (CBR-DPIC-8X10G) offline in subslot
8/1
Nov 17 14:37:37.026 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "CPU PowerOn Reset"(value: 1, should be 1)
Nov 17 14:37:37.027 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "HA PLL Reset"(value: 1, should be 1)
Nov 17 14:37:37.029 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "HA PLL Lock"(value: 1, should be 1)
Nov 17 14:37:37.029 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "Local PLL Reset"(value: 1, should be 1)
Nov 17 14:37:37.030 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "Local PLL Lock"(value: 1, should be 1)
Nov 17 14:37:37.031 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "Local PLL Lock2"(value: 1, should be 1)
Nov 17 14:37:37.038 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "54v Input"(value: 0, should be 0)
Nov 17 14:37:37.039 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "Ready"(value: 1, should be 1)
Nov 17 14:37:37.040 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "Mechanical OK"(value: 1, should be 1)
Nov 17 14:37:37.042 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "Power OK"(value: 1, should be 1)
Nov 17 14:37:37.043 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "Luzon FPGA Init"(value: 1, should be 1)
Nov 17 14:37:37.044 CST: %CBR_SPA-3-DPIC_BOOT_REASON: C4/8: iomd: DPIC 8/1: DPIC cannot
boot due to "Luzon FPGA Load Done"(value: 1, should be 1)
Nov 17 14:38:59.699 CST: %CBR_SPA-5-DPIC_HW_FAIL: C4/8: iomd: DPIC 8/1 hit Hardware Failure!
Nov 17 14:39:59.442 CST: %CARD_STATE-3-DPIC_HW_FAIL: DPIC 8/1 hit Hardware Failure, reset
this LC to trigger lcha
Nov 17 14:40:05.507 CST: %IOSXE_OIR-6-OFFLINECARD: Card (cc) offline in slot 8
Nov 17 14:40:05.514 CST: %CABLE_CLC-5-LOGGER_LC_REMOVED: Carrier Card 8 removed
Nov 17 14:40:05.523 CST: %BIPC-6-SESSION_DOWN: IPCCL Session to CLC8 is DOWN
```

The line card **LC8** triggers LCHA and becomes a standby line card.

```
Router#show redundancy linecard all
Load for five secs: 61%/5%; one minute: 53%; five minutes: 52%
Time source is NTP, 15:00:52.040 CST Fri Nov 17 2023
```

Slot	Subslot	LC Group	My State	Peer State	Peer Slot	Peer Subslot	Role	Mode
1	-	0	Active	Unavail	0	-	Active	Primary
8	-	0	Stdby Hot	Active	0	-	Standby	Primary
2	-	0	Active	Unavail	0	-	Active	Primary
3	-	0	Active	Unavail	0	-	Active	Primary
0	-	0	Active	Stdby Hot	8	-	Active	Secondary
6	-	None	Active	-	None	None	Active	None
7	-	None	Active	-	None	None	Active	None

Legacy LCHA

The following table shows the actions that are performed based on the conditions for LCHA:

Table 4: Legacy LCHA

Condition	Action
LCHA: Cisco IOS checks the standby line card's DPIC state, and if the DPIC has a Hardware failure	LCHA is not allowed.
LCHA Revert Back: Cisco IOS checks the revert back line card's DPIC state, and if the DPIC has a Hardware failure	LCHA revert back is not allowed.

Note
- This feature is enabled by default and does not require any configuration.
- This feature only supports the triggering of LCHA when DPIC has a Hardware failure.

  LCHA is not triggered for any other scenarios. For example:
    - Software configured dpic shutdown.
    - Physical remove of the dpic.
    - Other software problems which result in the DPIC's unexpected state.

Additional References

Related Documents

Related Topic	Document Title
CMTS commands	Cisco CMTS Cable Command Reference

Technical Assistance

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

Feature Information for Line Card Redundancy

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

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

Table 5: Feature Information for Line Card Redundancy

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