



Introduction

This release notes contain information about downloading and installing Cisco IOS-XE Release 3S. It also provides new and changed information, hardware support, limitations and restrictions, and caveats for Cisco IOS-XE Release 3S.

We recommend that you view the field notices for this release to see if your software or hardware platforms are affected. If you have an account on Cisco.com, you can find field notices at http://www.cisco.com/en/US/customer/support/tsd_products_field_notice_summary.html .

If you do not have a Cisco.com login account, you can find field notices at http://www.cisco.com/en/US/support/tsd_products_field_notice_summary.html .



Note Cisco IOS-XE Release 3S is generally available for field deployment. However, we recommend that you validate and qualify Cisco IOS-XE Release 3S in a limited field trial with your specific network configuration requirements in order to ensure a smoother, faster, and successful field deployment.

This chapter includes the following sections:

- [System Requirements, on page 1](#)
- [New and Changed Information, on page 9](#)
- [MIBs, on page 40](#)
- [Important Notes for Cisco IOS-XE Release 3S, on page 42](#)
- [Cisco IOS-XE Release 3S Image Upgrade Best Practice Manual of Procedure, on page 43](#)
- [Obtaining Documentation and Submitting a Service Request, on page 43](#)

System Requirements

These sections describe the system requirements for Cisco IOS-XE Release 3S:

Memory Requirements

This section describes the memory requirements for Cisco IOS-XE Release 3S.

The following table displays the memory recommendations for the Cisco cBR Series Converged Broadband Routers with Cisco IOS-XE Release 3S feature sets.

Table 1: Memory Recommendations for the Cisco cBR Series Converged Broadband Routers

Feature Set	Cisco cBR Route Processor	Software Image	RecommendedFlash Memory	RecommendedDRAM Memory	RunsFrom
CISCO IOS-XE universalk9	Cisco cBR8 (CBR) Processor	cbrsup-universalk9.03.15.00.S.155-2.S-std.SPA.bin	8G	48G	Bootflash:
CISCO IOS-XE CLC K9	Cisco cBR8 (CYLONS) Processor	cbrsup-universalk9.03.15.00.S.155-2.S-std.SPA.bin	8G	16G	Supervisor

Hardware Supported

For detailed information about the hardware supported in Cisco IOS-XE Release 3S, see:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/installation/guide/b_cbr_how_and_what_to_order.html.



Note The Cisco cBR chassis must house line cards with either Downstream DOCSIS 3.0 PHY modules or Downstream DOCSIS 3.1 PHY modules. Mixed configuration is not supported.

Determining the Software Version

To determine the version of the Cisco IOS-XE software running on your Cisco cBR Series Converged Broadband Routers, log in to the router and enter the **show version** EXEC command:

```
Router# show version
Cisco IOS XE Software, Version 03.15.00.S - Standard Support Release
Cisco IOS Software, cBR Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Version 15.5(2)S,
RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Sun 22-Mar-15 03:32 by mcpre
Cisco IOS-XE software, Copyright (c) 2005-2015 by cisco Systems, Inc. All rights reserved.
Certain components of Cisco IOS-XE software are licensed under the GNU General Public
License ("GPL") Version 2.0. The software code licensed under GPL Version 2.0 is free
software that comes with ABSOLUTELY NO WARRANTY. You can redistribute and/or modify such
GPL code under the terms of GPL Version 2.0. For more details, see the documentation or
"License Notice" file accompanying the IOS-XE software, or the applicable URL provided on
the flyer accompanying the IOS-XE software.
ROM: IOS-XE ROMMON
Tmaker uptime is 3 hours, 23 minutes
Uptime for this control processor is 3 hours, 26 minutes
System returned to ROM by reload
System restarted at 20:19:18 PST Wed Mar 25 2015
System image file is "bootflash:cbrsup-universalk9.03.15.00.S.155-2.S-std.SPA.bin"
Last reload reason: redundancy force-switchover
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
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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/wvl/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 10483520K/6147K bytes of memory.
 Processor board ID FXS181902A9
 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:.
 Configuration register is 0x1820

Microcode Software

This section describes microcode software that is supported for the Cisco cBR Series Converged Broadband Routers.

For more information on the upgrade procedures, see the [Upgrade Guides](#).

Cisco IOS-XE Release 3.18.3aSP

There are no new microcode versions for Cisco IOS-XE Release 3.18.3aSP. Use the minimum required versions and upgrade methods for Cisco IOS-XE Release 3.18.2aSP described below.

Cisco IOS-XE Release 3.18.2aSP

Table 2: Downstream Module Firmware Version Supported in Cisco IOS-XE Release 3.18.2aSP

Component	Programmable Device	Existing Versions (In Field)	Minimum Required Version (With IOS-XE 3.18.2aSP)
Gemini-2 LC ¹	Apollo Version	44147 44141 4413D 44131 31030	44148

¹ CBR-D31-DS-MOD

Cisco IOS-XE Release 3.18.2aSP Upgrade Package:
[cbrsup-rp-programmable-firmware.156-2.r.SP2-ext.01.SPA.pkg](#)

Cisco IOS-XE Release 3.18.1aSP

Table 3: Downstream Module Firmware Versions Supported in Cisco IOS-XE Release 3.18.1aSP

Component	Programmable Device	Existing Versions (In Field)	Minimum Required Version(s) (With IOS-XE 3.18.1aSP)
CBR-CCAP-SUP-160G	CPLD version	16012711 15091511 14121111	16012711 or 15091511
CBR-CCAP-SUP-160G	Rommon version	15.5(3r)S 15.5(2r)S1 15.5(2r)S	15.5(3r)S
CBR-CCAP-LC-40G	Rommon version	2011.03.13 2011.03.12	2011.03.13
CBR-CCAP-LC-40G	PSOC 0 version	v4.6 v4.3	v4.6
CBR-CCAP-LC-40G	PSOC 1 version	v4.6 v4.3	v4.6
Gemini-1 LC ²	MicroController Version	1000c 10008 10005 10006	1000e
Gemini-2 LC ³	MicroController Version	30013 30010 2.000c 2.000a	30016
Gemini-2 LC ⁴	Apollo Version	44141 4413D 44131 31030	44147

² CBR-D30-DS-MOD

³ CBR-D31-DS-MOD

⁴ CBR-D31-DS-MOD

Cisco IOS-XE Release 3.18.1aSP Upgrade Package:
[cbrsup-rp-programmable-firmware.156-2.r.SP1-ext.01.SPA.pkg](#)

Cisco IOS-XE Release 3.18.1SP

Table 4: Downstream Module Firmware Versions Supported in Cisco IOS-XE Release 3.18.1SP

Component	Programmable Device	Existing Versions (In Field)	Minimum Required Version(s) (With IOS-XE 3.18.1SP)
CBR-CCAP-SUP-160G	CPLD version	16012711 15091511 14121111	16012711 or 15091511
CBR-CCAP-SUP-160G	Rommon version	15.5(3r)S 15.5(2r)S1 15.5(2r)S	15.5(3r)S
CBR-CCAP-LC-40G	Rommon version	2011.03.13 2011.03.12	2011.03.13
CBR-CCAP-LC-40G	PSOC 0 version	v4.6 v4.3	v4.6
CBR-CCAP-LC-40G	PSOC 1 version	v4.6 v4.3	v4.6
Gemini-1 LC ⁵	MicroController Version	1000c 10008 10005 10006	1000e
Gemini-2 LC ⁶	MicroController Version	30013 30010 2.000c 2.000a	30016
Gemini-2 LC ⁷	Apollo Version	44141 4413D 44131 31030	44147

- ⁵ CBR-D30-DS-MOD
- ⁶ CBR-D31-DS-MOD
- ⁷ CBR-D31-DS-MOD

Cisco IOS-XE Release 3.18.1SP Upgrade Package:
[cbrsup-rp-programmable-firmware.156-2.r.SP1-ext.01.SPA.pkg](#)

Cisco IOS-XE Release 3.18.0SP

Starting from Cisco IOS-XE Release 3.18.0SP, Docsis 3.1 downstream module firmware can only be upgraded via firmware upgrade package using upgrade hw-programmable command. The table below lists the newer version number of Docsis 3.1 downstream module firmware in Cisco IOS-XE Release 3.18.0SP.

Table 5: Firmware Packages and Versions Supported in Cisco IOS-XE Release 3.18.0SP

Component	Programmable Device	Existing Versions (In Field)	New Version (With IOS-XE 3.18.0SP)	Upgrade Package
CBR-D31-DS-MOD	MicroController Image	3.13	3.13	cbrsup-rp-programmable-firmware.156-2.r.SP-ext.01.SPA
	DS PHY FPGA	4.413D	4.4141	

Cisco IOS-XE Release 3.18.1S

Starting from Cisco IOS-XE Release 3.18.1S, Docsis 3.0 and Docsis 3.1 downstream module firmware can only be upgraded via firmware upgrade package using upgrade hw-programmable command. The table below lists the newer version number of Docsis 3.1 downstream module firmware in Cisco IOS-XE Release 3.18.1S.

Table 6: Downstream Module Firmware Versions Supported in Cisco IOS-XE Release 3.18.1S

Component	Programmable Device	Existing Versions (In Field)	New Version (With IOS-XE 3.18.1S)	Upgrade Package
CBR-D31-DS-MOD	MicroController Image	3.10	3.13	cbrsup-rp-programmable-firmware.156-2.r.S1-ext.01.SPA.p
	DS PHY FPGA	4.4131	4.413D	

Cisco IOS-XE Release 3.18.0Sa

There are no new firmware changes in Cisco IOS-XE Release 3.18.0Sa.

Cisco IOS-XE Release 3.18.0S

There are no new firmware changes in Cisco IOS-XE Release 3.18.0S.

Cisco IOS-XE Release 3.17.1S

There are no new firmware changes in Cisco IOS-XE Release 3.17.1S.

Cisco IOS-XE Release 3.16.2S

There are no new firmware changes in Cisco IOS-XE Release 3.16.2S.

Cisco IOS-XE Release 3.17.0S

If you are upgrading the programmable devices listed in the table below, please download the firmware packages from the [Cisco software download](#) site. For Cisco IOS-XE Release 3.17.0S, microcode upgrade is optional. The firmware packages listed in the following table are backward compatible with the older image.

Table 7: Firmware Packages and Versions Supported in Cisco IOS-XE Release 3.17.0S

Programmable Device	Existing Versions (In Field)	New Version (With IOS-XE 3.17.0S)	Upgrade Method
ROMMON	15.5(2r)S1	15.5(3r)S	HW-Prog-Pkg: cbrsub-rp-hw-programmable-firmware.156-1.r.S1-std.01.SPA.pkg
Uboot	3.12	3.13	HW-Prog-Pkg: cbrsub-rp-hw-programmable-firmware.156-1.r.S1-std.02.SPA.pkg

Cisco IOS-XE Release 3.16.1S

When Cisco IOS-XE Release 3.16.1S first loads, it will auto-upgrade the Docsis 3.0 and Docsis 3.1 downstream module firmware to a newer version. The table below lists the newer version number of Docsis 3.0 and Docsis 3.1 downstream module firmware in Cisco IOS-XE Release 3.16.1S.

Table 8: Downstream Module Firmware Versions Supported in Cisco IOS-XE Release 3.16.1S

Component	Programmable Device	Existing Versions (In Field)	New Version (With IOS-XE 3.16.1S)
CBR-D30-DS-MOD	MicroController Image	1.8	1.C
	DS PHY FPGA	2F	2F
CBR-D31-DS-MOD	MicroController Image	2.A	2.C
	DS PHY FPGA	3.8	3.103

Cisco IOS-XE Release 3.16.0S

If you are upgrading the programmable devices listed in the table below, please download the firmware packages from the [Cisco software download](#) site.

Table 9: Firmware Packages and Versions Supported in Cisco IOS-XE Release 3.16.0S

Programmable Device	Existing Versions (In Field)	New Version (With IOS-XE 3.16.0S)	Upgrade Method
ROMMON	15.5(2r)S	15.5(2r)S1	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.01.SPA.pkg
Fan-Tray firmware	1.4	1.6	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.02.SPA.pkg
CLC CPLD (Daggits)	0x1C(v28)	0x21(v33)	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.03.SPA.pkg
CLC PSOC	4.3	4.6	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.04.SPA.pkg
SUP CPLD (Viper)	0x14121111	0x15091511	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg

Cisco IOS-XE Release 3.15.0S

Table 10: Microcode Software Supported in Cisco IOS-XE Release 3S

Component	Version
ROMMON	15.5(2r)S
Supervisor CPLD	0x14121111
CLC bootloader	2011.03.12
CLC CPLD	0x1C (v28)
Supervisor PIC CPLD	0x14071504(v0.130)
RF-PIC Firmware	0x73E(v7.62)
Fan-Tray Firmware	v1.4
Supervisor DC CPLD	0x14072207
Supervisor CPLD SO	0x14091201
Supervisor CPLD SIO	0x14092901
Supervisor PSOC1	v4.0.9
Supervisor PSOC2	v4.0.8

Component	Version
Supervisor PSOC3	v4.1.0
Supervisor PSOC4	v4.0.6
Supervisor DC PSOC1	v4.0.8
Supervisor DC PSOC2	v4.0.5
Supervisor PIC PSOC1	v2.0.6
Supervisor PIC PSOC2	v2.0.6
CLC PSOC1	v4.2
CLC PSOC2	v4.2

Feature Support

Cisco IOS-XE software is packaged in feature sets that consist of software images that support specific platforms. The feature sets available for a specific platform depend on which Cisco IOS-XE software images are included in a release. Each feature set contains a specific set of Cisco IOS-XE features.



Caution

Cisco IOS-XE images with strong encryption (including, but not limited to 168-bit [3DES] data encryption feature sets) are subject to U.S. government export controls and have limited distribution. Strong encryption images to be installed outside the United States are likely to require an export license. Customer orders may be denied or subject to delay because of U.S. government regulations. When applicable, the purchaser or user must obtain local import and use authorizations for all encryption strengths. Please contact your sales representative or distributor for more information, or send an e-mail to export@cisco.com.

New and Changed Information

The following sections list the new hardware and software features supported on the Cisco cBR Series Converged Broadband Routers in Cisco IOS-XE Release 3S:

New Firmware Features in Cisco IOS-XE Release 3.18.3aSP

There are no new firmware features in Cisco IOS-XE 3.18.3aSP.

New Firmware Features in Cisco IOS-XE Release 3.18.2aSP

There are no new firmware features in Cisco IOS-XE 3.18.2aSP.

New Firmware Features in Cisco IOS-XE Release 3.18.1aSP

There are no new firmware features in Cisco IOS-XE Release 3.18.1aSP.

New Firmware Features in Cisco IOS-XE Release 3.18.1SP

There are no new firmware features in Cisco IOS-XE Release 3.18.1SP.

New Firmware Features in Cisco IOS-XE Release 3.18.0SP

There are no new firmware features in Cisco IOS-XE Release 3.18.0SP

New Firmware Features in Cisco IOS-XE Release 3.18.1S

There are no new firmware features in Cisco IOS-XE Release 3.18.1S.

New Firmware Features in Cisco IOS-XE Release 3.18.0Sa

There are no new firmware features in Cisco IOS-XE Release 3.18.0Sa.

New Firmware Features in Cisco IOS-XE Release 3.18.0S

Upstream DOCSIS 3.1 PHY Module

The Upstream DOCSIS 3.1 PHY, a plug-and-play module, provides the hardware support for enabling DOCSIS 3.1 features in the Cisco cBR router.

For more information about this feature, see the following URL:

<http://www.cisco.com/c/en/us/td/docs/cable/cbr/Cisco-cBR/index.html>

New Firmware Features in Cisco IOS-XE Release 3.17 0S

- SSD (hard disk) access in ROMMON is supported.
- HA PLL chip on the newly shipped line card is supported.

New Hardware Features in Cisco IOS-XE Release 3.18.3aSP

There are no new hardware features in Cisco IOS-XE Release 3.18.3aSP.

New Hardware Features in Cisco IOS-XE Release 3.18.2aSP

There are no new hardware features in Cisco IOS-XE Release 3.18.2aSP.

New Hardware Features in Cisco IOS-XE Release 3.18.1aSP

There are no new hardware features in Cisco IOS-XE Release 3.18.1aSP.

New Hardware Features in Cisco IOS-XE Release 3.18.1SP

There are no new hardware features in Cisco IOS-XE Release 3.18.1SP.

New Hardware Features in Cisco IOS-XE Release 3.18.0SP

There are no new hardware features in Cisco IOS-XE Release 3.18.0SP.

New Hardware Features in Cisco IOS-XE Release 3.18.1S

There are no new hardware features in Cisco IOS-XE Release 3.18.1S.

New Hardware Features in Cisco IOS-XE Release 3.18.0Sa

There are no new hardware features in Cisco IOS-XE Release 3.18.0Sa.

New Hardware Features in Cisco IOS-XE Release 3.18.0S

Cisco cBR DOCSIS 3.1 Upstream PHY Module

Effective with Cisco IOS-XE Release 3.18.0S, the Cisco cBR router supports the Cisco Upstream D3.1 PHY module (PID: CBR-D31-US-MOD).

For more information about this feature, see the following URL:

<http://www.cisco.com/c/en/us/td/docs/cable/cbr/Cisco-cBR/index.html>

New Hardware Features in Cisco IOS-XE Release 3.17.1S

There are no new hardware features in Cisco IOS-XE Release 3.17.1S.

New Hardware Features in Cisco IOS-XE Release 3.16.2S

There are no new hardware features in Cisco IOS-XE Release 3.16.2S.

New Hardware Features in Cisco IOS-XE Release 3.17 0S

Sup-60 Productization

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.

For more information about this feature, see the following URL:

<http://www.cisco.com/c/en/us/td/docs/cable/cbr/Cisco-cBR/index.html>

Single Downstream PHY Module Line Card Configuration Support

The system sends warning message when Downstream PHY module version is inconsistent.

For more information about this feature, see the following URL:

<http://www.cisco.com/c/en/us/td/docs/cable/cbr/cisco-cbr/index.html>

New Hardware Features in Cisco IOS-XE Release 3.16.1S

There are no new hardware features in Cisco IOS-XE Release 3.16.1S.

New Hardware Features in Cisco IOS-XE Release 3.16.0S

CBR-CCAP-SUP-60G

The Supervisor card with 60 Gbps forwarding capacity (PID CBR-CCAP-SUP-60G) is introduced on the Cisco cBR-8 router. This Supervisor card supports a maximum of four interface cards, working in 3+1 protection mode, on the Cisco cBR-8 router.



Note The Cisco cBR-8 router does not support redundancy if different Supervisor cards are installed in the chassis. We recommend that you install the Supervisor cards with the same capacity in a Cisco cBR-8 router.

This Supervisor card supports a maximum of 72268 downstream unicast flows or 88268 downstream modular quality of service (MQoS) flows. The maximum number of downstream unicast and MQoS flows supported is 88268.

The output of the **show inventory** command was modified.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/installation/guide/b_cbr_overview.html

Downstream DOCSIS 3.1 PHY Module

The Downstream DOCSIS 3.1 PHY, a plug-and-play module, provides the hardware support for enabling DOCSIS 3.1 features in the Cisco cBR router.

For more information about this feature, see the following URL:

<http://www.cisco.com/c/en/us/td/docs/cable/cbr/cisco-cbr/index.html>

New Hardware Features in Cisco IOS-XE Release 3.15.1S

There are no new hardware features in Cisco IOS-XE Release 3.15.1S.

New Hardware Features in Cisco IOS-XE Release 3.15.0S

This is the first release of the Cisco cBR Series Converged Broadband Routers and its FRUs.

For more information about the new hardware feature, see:

<http://www.cisco.com/c/en/us/td/docs/cable/cbr/cisco-cbr/index.html>

New Software Features in Cisco IOS-XE Release 3.18.3aSP

There are no new software features in Cisco IOS-XE Release 3.18.3aSP.

New Software Features in Cisco IOS-XE Release 3.18.2aSP

There are no new software features in Cisco IOS-XE Release 3.18.2aSP.



Note ISSU from Cisco IOS XE 3.18.0SP to Cisco IOS XE 3.18.2aSP with OFDM channels, might not recover channel operation after a linecard switchover. ISSU from Cisco IOS XE 3.18.1aSP to Cisco IOS XE 3.18.2aSP has no limitations.

New Software Features in Cisco IOS-XE Release 3.18.1aSP

There are no new software features in Cisco IOS-XE Release 3.18.1aSP.

New Software Features in Cisco IOS-XE Release 3.18.1SP

MAC Filtering

This feature enables/disables MAC address filter on the backhaul interface. It supports 32 unicast filter entries per interface.

For more information, see:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_sec_and_cable_mon_features_cbr/mac_filtering.html

AES-128 for non-MTC DOCSIS3.0 Cable Modem

This feature allows DOCSIS3.0 cable modem working on non-MTC mode to use AES-128 as BPI encryption Algorithms. It also allows DOCSIS3.0 cable modem to use AES-128 as encryption algorithms when EAE is enabled.

For more information, see:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_sec_and_cable_mon_features_cbr/cable_duplicate_map_address_reject.html

DOCSIS 3.1 Downstream OFDMA Guardband Enhancements

This feature allows user to configure the guard band of an OFDM channel.

For more information, see:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis31/ofdm_channel_configuration.html

New Software Features in Cisco IOS-XE Release 3.18.0SP

DOCSIS 3.1 2000 Bytes Data PDUs

Cisco cBR-8 router supports 2000 bytes layer 2 MTU and 1982 bytes layer 3 MTU in Cisco IOS-XE 3.18.0SP release.

For more information about this feature, see the following URLs:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_layer2_layer3_vpn/2vpn_support_on_cable.html#con_1056996

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer3_config/virtual_interface_bundling.html#con_1065039

DOCSIS 3.1 Adaptive CIR, Fair EIR (ACFE)

DOCSIS 3.1 introduces the following new modes for higher throughput and higher spectral efficiency while still allowing backward compatibility to DOCSIS 3.0:

- OFDM channel
- OFDM channel rate
- Interface bandwidth

The following commands were modified:

- **show interface {wideband-cable | modular-cable | integrated-cable}**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_quality_of_services/fairness_across_docsis_interfaces.html

DOCSIS 3.1 BPI Authorization Changes

A new security specification is introduced for DOCSIS 3.1. A new certificate public key infrastructure (PKI) is defined, that strengthens the security of cable modem authentication and secures software download features. The following features are supported:

- Support for 256-bit encrypted authentication key.
- Support for 2048-bit encrypted RSA public key.
- Certificates use RSA3 signature algorithm with a SHA-256 hash [FIPS 180-4] (vs D3.0 SHA-1).

DOCSIS 3.1 DS: Commanded Power for US SC-QAMs

Commanded Power for upstream SC-QAMs supports a new method during ranging, to dynamically set the transmit power level of a DOCSIS 3.1 cable modem. The following command displays the new DOCSIS 3.1 Commanded Power levels per upstream:

- **show cable modem**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis31/docsis_31_commanded_power_for_upstream_sc_qam.html

DOCSIS 3.1 DS LCHA HA

Line Card High Availability (LCHA) for D3.1 DS features with LCHA feature parity to Cisco IOS-XE 3.18.0S Release has been introduced. There are dependencies on cable modem (CM) firmware performance, so some D3.1 cable modems may fall offline or come up in partial mode due to known CM issues. The Cisco cBR Converged Broadband Routers Series attempt to reset D3.1 CMs that are not w-online after linecard switchover.

DOCSIS 3.1 DS LCPR

Cable Line Card Process Restart (LCPR) support (both CLC IOSd and cdman) for D3.1 DS features with LCPR feature parity to Cisco IOS-XE 3.18.0S Release has been introduced.

DOCSIS 3.1 DS Profile Selection

DOCSIS 3.1 introduces the concept of downstream profiles for OFDM channels. A profile is a list of modulation orders that are defined for each of the subcarriers within an OFDM channel. The CMTS can define multiple profiles for use in an OFDM channel, where the profiles differ in the modulation orders assigned to each subcarrier. The CMTS can assign different profiles for different groups of CMs. To enable or configure profile selection feature, following commands were introduced or modified:

- **cable downstream ofdm-flow-to-profile**
- **cable downstream ofdm-prof-mgmt exempt-sc-pct**
- **cable downstream ofdm-prof-mgmt mer-margin-qdb**
- **cable downstream ofdm-prof-mgmt prof-dwngrd-auto**
- **cable downstream ofdm-prof-mgmt recommend-profile-age**
- **cable downstream ofdm-prof-mgmt rxmer-poll-interval**
- **cable downstream ofdm-prof-mgmt unfit-profile-age**
- **show controller integrated-cable**
- **show cable modem phy ofdm-profile**
- **show cable modem prof-mgmt**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis31/docsis_31_downstream_profile_selection.html

For more information on commands, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref.html

DOCSIS 3.1 DS SUP HA

Support for D3.1 DS features with SUP HA feature parity to Cisco IOS-XE 3.18.0S has been introduced.

DOCSIS 3.1 Interop with Intel Puma7 based CM

The cBR8 D3.1 DS features have gone through interoperability testing with both Broadcom 3390 based D3.1 CMs and Intel Puma7 based D3.1 CMs. Both are supported for D3.1 DS operation with Cisco cBR Converged Broadband Routers Series.

DOCSIS 3.1 OFDM Channel Licensing

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

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_sw_config_features/cisco_smart_licensing.html

DOCSIS 3.1 Path Selection

RCC template, RCC management, and path selection is enhanced to support OFDM downstream channels and OFDMA upstream channels. RCC/TCS decision process is enhanced to include OFDM and OFDMA channels. Path selection is integrate with the new simplified RCC encoding process and enables the assignment of downstream Profiles. The following commands are introduced:

- **show cable modem path-sel**
- **clear cable modem path-sel**
- **show cable mac-domain rcc simplified**

The following command is updated:

- **show cable mac-domain rcc**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref.html

DOCSIS 3.1 Protocol Enable or Disable

This feature allows the user to enable and disable the DOCSIS 3.1 mode on a cable modem. By default, the DOCSIS 3.1 mode is enabled. If the user does not want to support the DOCSIS 3.1 cable modem, the DOCSIS 3.1 mode can be disabled on a MAC domain. Then the DOCSIS 3.1 cable modem will connect in DOCSIS 3.0 mode. The following command is introduced:

- **cable d31-mode**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref.html

DOCSIS 3.1 QoS

DOCSIS 3.1 defines the framework for QoS The aggregation could be per subscriber or based on traffic type, for example; video or data. The following commands were modified:

- **show cable acfe interface**
- **show cable admission-control**
- **show interface wideband-cable**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_quality_of_services/fairness_across_docsis_interfaces.html

DOCSIS 3.1 SGAC

Effective from 3.18.0SP Release, for DOCSIS 3.1, if bonding group contains an OFDM channel, the bonding group's total bandwidth that can be reserved (its capacity), is calculated using the least efficient OFDM profile it can use.

Full Spectrum 108-1218 MHz Support

An OFDM channel can be configured within the frequency range of 108 - 1218 MHz.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis31/ofdm_channel_configuration.html

IPv6 DQoS Lite

IPv6 DQoSLite is a modem centric solution without notion of gates, to validate and deliver residential voice services over IPv6 to reclaim IPv4 address space.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_pktcbl_pktcblmm/packetcable_and_packetcable_multimedia.html

Lawful Intercept- Overlapping Taps and Redundant MDs

The Cisco cBR Series Converged Broadband Routers supports replicating Lawful Intercept (LI) packets to multiple Mediation Devices (MDs). To use this feature, multiple identical taps are configured.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_sec_and_cable_mon_features_cbr/lawful_intercept_architecture.html

MTPS Pass-Through

Switched digital video (SDV) sessions are typically multicast STPS remap type. The Cisco CBR-8 router also supports multicast MTPS pass-through and data-piping session types.

OFDM Channel Support for All Ports

DOCSIS 3.1 introduces modes for higher throughput and higher spectral efficiency while still allowing backward compatibility to DOCSIS 3.0. OFDM Channel support includes 1 OFDM channel per port with channel bandwidth from 24 MHz to 192 MHz. The following commands are introduced:

- **cable downstream ofdm-modulation-profile**
 - **assign**
 - **description (config-ofdm-mod-prof)**
 - **start-frequency**
 - **subcarrier-spacing**
 - **width**
- **show cable ofdm-modulation-profiles**
- **cable downstream ofdm-chan-profile**
 - **cyclic-prefix**
 - **description (config-ofdm-chan-prof)**
 - **interleaver-depth**
 - **pilot-scaling**
 - **profile-control**
 - **profile-data**
 - **profile-ncp**
 - **roll-off**

- **show cable ofdm-chan-profiles**
- **max-ofdm-spectrum**
- **ofdm-freq-excl-band**
- **ofdm channel-profile**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis31/ofdm_channel_configuration.html

QAM Replication

Multicast sessions can be replicated from one port to other ports on the same line card and/ or across line cards.

Show Patch Info in One CLI

Effective from 3.18.0SP Release, the show platform software patch info command is used to determine the detailed patch information for all the FRUs. The following command was modified:

- **show platform software patch info**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref.html

Switched Digital Video

The Switched Digital Video (SDV) services are supported for the MPEG video subsystem on the Cisco cBR-8 router. It consists of Multicast IP Packet based video streams that are managed as "Video Sessions". The Cisco cBR-8 router supports both Any Source Multicast (ASM) and Source Specific Multicast (SSM) sessions.

The following commands were introduced or modified:

- **multicast-uplink** interface-name
- **multicast-label** label
- **session** session-name
- **rf-channel** number
- **show cable video session logical-edge-device**

For more information, see the Switched Digital Video feature guide at:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_video_features/switched_digital_video.html

UCD TLV for Device Type (Ranging Hold Off)

The cable modem steering feature helps to redirect or steer cable modems to multiple CMTS routers using downstream frequency overrides. A configurable string is used to bond the cable modem to the proper CMTS. Once the bonding is done, the CMTS can move the cable modem within itself for load balancing.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis30/b_cbr_layer2_docsis_chapter_010010.html

Video ISSU Improvement

The ISSU process performance is improved, time consumed is much less, and the secondary linecard is reloaded for upgrade at first.

New Software Features in Cisco IOS-XE Release 3.18.1S

There are no new software features in Cisco IOS-XE Release 3.18.1S.

New Software Features in Cisco IOS-XE Release 3.18.0Sa

Using VRF for Video Session Traffic

Effective with Cisco IOS-XE release 3.18.0Sa, the **virtual-edge-input** CLI command now supports using a VRF for video session traffic.

For more information, see *Video Virtual Carrier Group and Virtual Edge Input* section at:

https://www.cisco.com/en/US/d/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/virtual_carrier_group_and_virtual_edge_input_configuration.html

New Software Features in Cisco IOS-XE Release 3.18.0S

Video Services Provisioning Model

The Cisco cBR-8 router offers the next generation CCAP platform supporting converged CMTS and EQAM functionality. The redesigned video data model supports the creation of virtual edge devices within the platform. This data model simplifies the provisioning procedure and enables seamless migration to virtualized video service management in the future. The video provisioning constructs of the new data model provide hardware abstraction and divides services into virtual edge devices for easier provisioning at scale. It also provides isolation between the service applications at the software layer. A bind-operation connects these constructs to the physical resources.

For more information, see the *Video Services Provisioning Model* guide at:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/video_services_provisioning_model.html

Video Virtual Carrier Group and Virtual Edge Input

A Virtual Carrier Group (VCG) is a collection of virtual QAM carriers (RF channels) provisioned on a Logical Edge Device (LED). A Virtual Edge Input (VEI) is a customer assigned IP address that is used, from the Head End, as a destination IP address for unicast video IP packets.

The following commands were introduced:

- **virtual-carrier-group**
- **virtual-edge-input-ip**
- **Encrypt**
- **service-type**
- **rf-channel**
- **show cable video virtual-carrier-group**
- **logical-edge-device**
- **protocol**

- **virtual-edge-input-ip**
- **vcg**
- **active**
- **show cable video logical-edge-device**

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/virtual_carrier_group_and_virtual_edge_input_configuration.html

Advanced Video MPEG Features

Cisco cBR Series Converged Broadband Router supports these video features for the MPTS pass-through video sessions: Reserved Output PID Range, PID Filtering, and Program Filtering.

The following commands were introduced:

- **reserve-pid-range**
- **filter pid vcg**
- **ip**
- **pid**
- **filter program vcg**
- **program**
- **show cable video session logical-edge-id**

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/advanced_video_mpeg_features.html

Important Notes

For more information about the important notes for Management IP Interface and Virtual Routing Interface, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/important_notes.html

PME Video On Demand

The VoD Privacy Mode Encryption system integrates the encrypted VoD content within a ARRIS digital cable headend. The Cisco CBR-8 and CEM provides encryption for the content received from the VoD system.

The following commands were introduced:

- **protocol table-based**
- **show cable video session logical-edge-device id**
- **show controllers integrated-cable**
- **show interfaces tenGigabitEthernet**

For more information on this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_video_features/table_based_video_and_vpme_encryption.html

Video QAM Replication

The Video QAM replication feature allows video carriers to be replicated to support service group alignment between DOCSIS and Video service groups. This feature is internal to the cBR-8 and replaces the need for external splitters, allowing content to be replicated across multiple ports on a line card.

The following commands were introduced:

- **controller Integrated-Cable**
- **type**
- **scrambler**
- **encrypt**
- **show cable video encryption linecard**

For more information on this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_video_features/replication.html

PowerKEY Video On Demand

PowerKEY Video On Demand is the video content that is chosen by the subscriber and streamed specifically to the subscriber. The content is encrypted using PowerKEY conditional access through a video session that is created on the Cisco cBR-8 specifically for each request.

The following commands were introduced:

- **show cable video encryption linecard**
- **virtual carrier group**
- **virtual edge input**
- **show cable video virtual-carrier-group name**
- **service-distribution-group**
- **onid**
- **logical-edge-device**
- **show cable video logical-edge-device name**
- **show cable video logical-edge-device id**
- **show cable video gqi connections**
- **show cable video session logical-edge-device id**
- **show cable video session logical-edge-device name**
- **show cable video output-port**
- **show cable video scg logical-edge-device id**
- **show cable video scg id**

For more information on this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_video_features/powerkey_vod.html

Video Encryption

The Cisco cBR-8 provides encryption for Video On Demand (VoD) sessions to address security concerns. The encrypted sessions can be created on any QAM carriers on a linecard.

The following commands were introduced:

- **encryption**

- **ca-system**
- **scrambler**
- **encrypt**
- **show cable video encryption linecard**
- **pme vodsids**
- **pme cem**
- **pme mgmt-ip**
- **show cable video encryption pme status**
- **show cable video encryption pme version**
- **show cable video encryption pme linecard**

For more information on this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/encryption.html

Table Based Configuration

The Table-based video session configurations can be performed for a range or an individual session under each Quadrature Amplitude Modulation (QAM) carrier that is being assigned to a table-based Logical Edge Device (LED).

The following commands were introduced:

- **table based**
- **session**
- **start-udp-port**
- **num-sessions-per-qam**
- **processing-type**
- **start-program**
- **bitrate**
- **jitter**
- **show cable video logical-edge-device**
- **show cable video vei-bundle all**

For more information on this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/table_based_configuration.html

PacketCable and PacketCable Multimedia Multicast

The PacketCable and PacketCable Multimedia feature provides support for multicast transmission.

The following command is implemented on Cisco cBR Series Converged Broadband Routers:

- **cable multicast source**

For more information, see the cable multicast source command at the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref/b_cmts_cable_cmd_ref_chapter_0101.html#wp1998501503

Physical to Virtual Binding

The Virtual Carrier Group (VCG) is bound to a Service Distribution Group (SDG) using a bind command (bind-vcg). This connects the virtual carriers to the physical ports listed in the SDG.

The following command was introduced:

- **bind-veg**

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/physical_to_virtual_binding.html

Online Offline Diagnostics

Online Offline Diagnostics (OOD) Field Diagnostics feature allows the customer to test and verify hardware-related issues on a line card deployed in the field. The test results can be used to verify whether a line card is fault and troubleshoot network issues.

The following commands were introduced:

- **request platform hardware diagnostic load**
- **request platform hardware diagnostic unload**
- **show platform hardware diagnostic status**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cisco_cmts_networkmgmt_trblshng_cbr/online_offline_diagnostics.html

Voice over IPv6

Effective with Cisco IOS-XE release 3.18.0S, Voice over IPv6 is supported on Cisco cBR-8 routers. PacketCable Multimedia needs to be enabled before using this feature.

The following commands were supported:

- **show cable modem ipv6**
- **show packetcable gate ipv6**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer3_config/ipv6_on_cable.html

Cable Line Card Process Restart on Crash

The SNMP Background Synchronization features provides periodic background synchronization of DOCSIS MIB data from line card to Supervisor in order to improve the performance of the SNMP polling of these MIB tables.

The following commands were introduced:

- **show platform software ios socket statistics**
- **show cable bgsync sync-info cable**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cisco_cmts_networkmgmt_trblshng_cbr/snmp_background_synchronization.html

BSoD VLAN Redundancy

BSoD VLAN redundancy feature is introduced to configure a backup Network System Interface (NSI) interface and a default primary interface for dot1q L2VPN. When the primary NSI interface goes down, the backup NSI interface takes over and the traffic flows through the second interface.

The following commands were introduced:

- **cable l2-vpn dot1q-nsi-redundancy force-switchover**
- **show cable l2-vpn dot1q-nsi-redundancy**

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_layer2_layer3_vpn/l2vpn_support_on_cable.html

To configure dot1q L2VPN backup WAN interface for TLS, see the following URL:

<http://www.cisco.com/c/en/us/td/docs/cable/cmts/feature/tls-cmts.html#wp1075949>

L2VPN Over Port-Channel

The Layer 2 VPN (L2VPN) over port-channel feature supports IEEE 802.1Q (dot1q) L2VPN WAN interface port-channel. Using this feature, you can configure the dot1q L2VPN traffic to pass through port-channel uplink.

The following commands were introduced:

- **cable l2-vpn-service xconnect nsi dot1q interface port-channel**
- **cable dot1q-vc-map port-channel**

For more information, see the L2VPN Over Port-Channel chapter at the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_layer2_layer3_vpn.html

Energy Management

Data-over-Cable Service Interface Specifications (DOCSIS) cable modems (CM) and CMTS support a low power energy mode referred to as the Energy Management (EM) 1x1 mode. During idle times, when the data rate demand of a user is met by the available capacity on a single upstream and downstream channel pair to which it is assigned, the CM switches to the Energy Management 1x1 mode. When the CM requires a higher data rate than that can be reliably provided on the single channel pair, the CMTS instructs the CM to return to the larger transmit and receive channel set.

The following commands were introduced:

- **cable reduction-mode energy-management enable**
- **cable reduction-mode energy-management dynamic-channel-percent**
- **cable reduction-mode energy-management process-queue-size**
- **cable reduction-mode energy-management ranging-init-technique**
- **show cable modem reduction-mode energy-management-param**
- **show cable modem reduction-mode energy-management-mode**
- **show cable modem reduction-mode energy-management-status**

For more information, see the Energy Management Mode chapter at the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis30.html

Show Command to display SF Counts

Displays system level service flow and downstream classifier summary and detailed information per line card basis.

The following commands were introduced:

- **show cable service-flow summary**
- **show cable service-flow summary detail**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref/b_cmts_cable_cmd_ref_chapter_01111.html

Service Distribution Group

The Service Distribution Group (SDG) is a collection of one or more RF ports and defines the physical slot/bay/port to be used in a video service.

The following commands were introduced:

- **service-distribution-group**
- **show cable video service-distribution-group all**
- **psi-interval**
- **onid**

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/service_distribution_group.html

Video QAM Carriers

For video provisioning, the carriers must be of type “video” in the controller integrated-cable configuration.

The following commands were introduced:

- **rf-channel**
- **type**
- **start-frequency**
- **rf-output**
- **power-adjust**
- **qam-profile**

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/video_qam_carriers.html

Management IP Interface

The management interface is used for the video control plane messages, such as session creation and deletion, between the LED and the external Edge Resource Manager (ERM) server.

The following commands were introduced:

- **interface VirtualPortGroup**
- **show run interface VirtualPortGroup**
- **mgmt-interface VirtualPortGroup**
- **show run | in mgmt-intf**
- **show interfaces VirtualPortGroup**
- **show ip interface brief | in VirtualPortGroup**
- **show ip route | in**
- **sh run | begin logical-edge-device test**
- **show arp | in VirtualPortGroup**

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/management_ip_interface.html

Logical Edge Devices

A Logical Edge Device (LED) is a virtual edge device within the cBR-8 and can be provisioned for static or dynamic sessions.

The following commands were introduced:

- **logical-edge-device**
- **virtual-edge-input input-port-number**
- **vcg**
- **keepalive retry interval**
- **reset interval**
- **show cable video logical-edge-device id**

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/logical_edge_devices.html

Global Video Configuration

For provisioning video services you can perform some global configurations. These configurations have some default values. If you do not choose to change those, the default values are used. The following sections describe the procedures for global configurations.

The following commands were introduced:

- **default-onid**
- **default-psi-interval**
- **timeout init-session**
- **timeout idle-session**
- **timeout off-session**

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/global_video_configuration.html

D6 Discovery Protocol

The D6 discovery protocol is part of the Comcast Next Generation on Demand (NGOD) specification. This protocol helps in advertising the video QAM carrier information like frequency, modulation mode, annex, and edge input for the video traffic such as IP address, group name, maximum bandwidth, and so on, to an Edge Resource Manager (ERM). The D6 discovery protocol also sends unique structured names (topological location information) for each edge input or carrier output. From these structured names, and input and RF port numbers, the ERM can infer the topological network location of both the QAM streaming input port (IP) and RF output port (MPEG).

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_video_features/d6_discovery_protocol.html

Cisco Smart Licensing for Video

The Cisco Smart Licensing for Video on the Cisco cBR router leverages existing Cisco cBR Smart Licensing framework that includes Call Home and SLA capabilities. For more information, see the *Cisco Smart Licensing for Video* guide at:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_config_prov_construct/cisco_smart_licensing_for_video.html

New Software Features in Cisco IOS-XE Release 3.17.1S

There are no new software features in Cisco IOS-XE Release 3.17.1S

New Software Features in Cisco IOS-XE Release 3.16.2S

There are no new software features in Cisco IOS-XE Release 3.16.2S.

New Software Features in Cisco IOS-XE Release 3.17.0S

MPLS QoS via TLV for non-L2VPN

The MPLS QoS via TLV for non-L2VPN Service Flow feature allows to mark TC bits for MPLS L3VPN imposition packets and classify downstream packets based on TC bits of MPLS disposition packets, using vendor-specific TLVs.

The following commands were introduced:

- **show platform hardware qfp active feature docsis mpls tc-precfy db**
- **show platform hardware qfp active cable us-mpls-tc**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_layer2_layer3_vpn/mpls_qos_tlv_non_l2vpn_service_flow.html

Service Flow Priority in Downstream Extended Header

The service flow priority in downstream extended header feature is supported on Cisco cBR-8 Converged Broadband Router. The purpose of the feature is to be able to reflect the traffic priority of downstream packets into the DOCSIS extended header.

The following commands were introduced or modified:

- **cable service flow priority**
- **show cable modem**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis/docsis_3_downstream_bonding.html

Configuring UCSB Required Attribute

If the CM configuration file has TLV 43.9.3 (CM upstream required attribute mask) configured and bonded bit is set to 1, then the modem comes UB-online on a MAC domain basis. If the CM configuration file has no TLV 43.9.3 or the bonded bit is not set to 1, then the modem comes online with a single upstream channel on a MAC domain basis.

You can configure the required CM attribute on UCSB using the following command:

- **cable mtc-mode required-attribute**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/config_guide/b_cmts_ds_us_features/b_cmts_ds_us_features_chapter_010010.html

IPDR CM-STATUS-2008

The IPDR CM-STATUS 2008 version is introduced for forward compatibility to support old IPDR collectors. In the IPDR CM-STATUS 2008 version, the CmtsRcsId and CmtsTcsId objects are 16 bits in length whereas in the CM-STATUS version both these objects are 32 bits in length. The CmtsRcsId object in the CM-STATUS-2008 version returns the lower 16 bits of value from the CM-STATUS version. But, the CmtsTcsId object returns the same value for both the CM-STATUS-2008 and CM-STATUS version since the value does not exceed 16 bits in both the schemas.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cisco_cmts_networkmgmt_trblshting_cbr.html

Service Group Profile Based Configuration

To simplify and speed up the process of configuring the physical and logical interfaces required to deploy the Cisco cBR router quickly, a service group (SG) profile based approach is adopted.

To configure the interfaces and quickly operationalize the Cisco cBR router, a set of common profiles are created and configured into global service group profiles. These global service group profiles may be applied to fiber node interfaces along with a mapping of the service group interfaces to the physical interfaces.

The following commands were introduced or modified:

- **cable profile service-group**
- **cable fiber-node**
- **Show cable fiber-node**
- **Show cable modem fiber-node mac-domain**
- **Show cable mac-domain fiber-node**
- **Show cable profile**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis30.html

Subscriber Traffic Management

The Subscriber Traffic Management (STM) feature allows a service provider to configure a maximum bandwidth threshold over a fixed period for a specific service class (or quality of service [QoS] profile). The subscribers who exceed this configured threshold can then be identified and allocated reduced QoS. STM works as a low-CPU alternative to Network-Based Application Recognition (NBAR) and access control lists (ACLs). You can configure the STM feature on the Cisco CMTS routers using the following command:

- **cable qos enforce-rule**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/config_guide/b_cmts_Quality_Service_Features.html

New Software Features in Cisco IOS-XE Release 3.16.1S

There are no new Software features in Cisco IOS-XE Release 3.16.1S.

New Software Features in Cisco IOS-XE Release 3.16.0S

Battery Backup 1x1 Mode

Cisco CMTS supports downgrading the channel bonding for cable modems and media terminal adapters (MTAs) in battery backup mode. When this feature is enabled and the cable modem enters the battery backup mode, channel bonding is downgraded to one downstream and one upstream channels (battery backup 1x1 mode). This feature reduces the power usage when the cable modem is running on battery backup. When the cable modem returns to the AC power mode, the channel bonding is returned to its original configuration.

The following commands were introduced:

- **cable reduction-mode mta-battery**
- **show cable modem reduction-mode mta-battery**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis/downgrading_channel_bonding_battery_mode.html

Downstream and Upstream JIB Partial Reset

The fatal interrupts received from the hardware components on the line cards result in reset and reload of the line cards, which triggers switchover and partial system downtime. The Downstream and Upstream JIB Partial Reset feature significantly reduces this recovery time.

N+1 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. 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).

The following commands were introduced or modified:

- **class**
- **description**
- **linecard-group**
- **member slot**
- **redundancy**
- **redundancy linecard-group switchover from slot**
- **revertive**
- **show lcha logging level**
- **show lcha rfs**
- **show redundancy linecard**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_sw_config_features/line_card_redundancy.html

Cable IOSd Restart

When an upgrade is done to a package or sub-package, the RF line card must be rebooted. The time taken for the package upgrade on N number of active RF line cards, the total number of reboots would be 2xN. This is time-consuming and may affect services on the rebooting RF line cards. The Cable IOSd Restart feature or Line Card Process Restart (LCPR) supports the restart of specific processes without service disruption and simplified package upgrade without LCHA based reboot.

The following command was introduced:

- **request platform software process restart**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_sw_config_features/consolidated_packages_and_subpackages_management.html

US Channel Scaling from 64 to 96 channels

Effective with Cisco IOS-XE Release 3.16.0S, 96 upstream channels are supported on each line card in the Cisco cBR-8 routers.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis/docsis_interface_fn_configuration.html

RP only ISSU

Effective with Cisco IOS-XE Release 3.16.0S, Cisco cBR-8 Routers support In-Service Software Upgrades (ISSU) for redundant platforms. The ISSU process allows software to be updated or otherwise modified while packet forwarding continues with minimal interruption.

The following commands were introduced:

- **request platform software package install rp**
- **request platform software package install node**
- **request platform software package expand**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_ha_features_cbr/cisco_ios_xe_in_service_software_upgrade_process.html

Service Group Admission Control

Service Group Admission Control (SGAC) is a mechanism that gracefully manages service group based admission requests when one or more resources are not available to process and support the incoming service request.

The following commands were introduced:

- **admission-control application-type**
- **cable application-type**
- **show cable admission-control**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_quality_of_services/Service_Group_Admission_Control.html

New Software Features in Cisco IOS-XE Release 3.15.1S

There are no new Software features in Cisco IOS-XE Release 3.15.1S.

New Software Features in Cisco IOS-XE Release 3.15.0S

The following table lists the features supported on Cisco cBR Series Converged Broadband Routers in Cisco IOS-XE Release 3.15.0S.

Table 11: Supported Features

Cisco IOS-XE Release	Supported Features
3.15.0S	<ul style="list-style-type: none"> • 16x4 CM support • 4293 IP-MIB (IPv6 only) and RFC 4292 IP-FORWARD-MIB (IPv6 only) • ACL IPV4 for cBR • ACL IPV6 for cBR • Adaptive CIR and Fair EIR • Add Channel Interface for physical RF channel • Advanced Mode DSG with MIB Support • Alarm Filtering Support in the Cisco Entity Alarm MIB • Allow Dynamic SF For L2VPN Provisioned Modems • ARP Filter for CBR • ATOM on CBR • Automatic Initial Ranging Insertion Interval for CBR8 • Basic cBR-8 Sup HA • Bundle Flood for cBR (Infrastructure) • Cable Duplicate-MAC Reject • Cable Lease Query IPV6 and IPV4 for cBR • cable logging layer2events • cable modem remote-query enhancements • Cable Source Verify and Source Address Verification IPV6 and IPV6 for cBR • CBR8 DTI Client • CBR8 Platform (Infrastructure) • cbr8 ROMMON field Upgrade • Cisco Express Forwarding - SNMP CEF-MIB Support • Cisco Extension to the Interfaces MIB (CISCO-IF-EXTENTION-MIB) • Cisco Memory Pool Mib • Cisco SYSLOG Mib • CISCO-BULK-FILE-MIB enhancements • CISCO-CABLE-AVAILABILITY-MIB • CISCO-CABLE-SPECTRUM-MIB for CBR • CISCO-CABLE-WIDEBAND-MIB • CISCO-CDP-MIB

Cisco IOS-XE Release	Supported Features
3.15.0S	<ul style="list-style-type: none"> • CISCO-CONFIG-COPY-MIB: FTP and RCP support • CISCO-CONFIG-COPY-MIB: Secure Copy Support • CISCO-DOCS-EXT-MIB for CBR • CISCO-DOCS-REMOTE-QUERY-MIB for CBR • CISCO-ENHANCED-MEMPOOL-MIB • CISCO-ENTITY-EXT-MIB test for cBR • CISCO-ENTITY-FRU-CONTROL-MIB enhancement for • CISCO-ENTITY-SENSOR-MIB Enhancement • CISCO-IP-URPF-MIB Support • CISCO-PROCESS-MIB on CBR Line Cards • CISCO-QINQ-VLAN-MIB • CISCO-RF-MIB (REVISION) • CLAB-TOPO-MIB • CM VRF Steering • CMTS static CPE • Configurable DFO Retry Count • Control Point Discovery • D3.0 Load Balancing • Database Library for Converged Broadband Router cBR (Infrastructure) • Default DOCSIS 1.0 ToS Overwrite • DHCPv6 Relay - MPLS VPN Support • Differential DHCP GiAddr Assignment per device type • DOCS-CABLE-DEVICE-MIB for CBR8 • DOCS-DIAG-MIB for CBR • DOCS-DRF-MIB For CBR • DOCS-IF3-MIB for CBR • DOCS-IFEXT-MIB for CBR8 • DOCS-IF-MIB for CBR • DOCSIS 1.0 CM Concatonation Disable • DOCSIS 2.0 • DOCSIS 2.0 Load Balancing • DOCSIS 3.0 BPI+ policy enforcement • DOCSIS 3.0 CM Registration (Infrastructure) • DOCSIS 3.0 Downstream Bonding Protocol

Cisco IOS-XE Release	Supported Features
3.15.0S	<ul style="list-style-type: none"> • DOCSIS 3.0 Downstream Bonding Protocol • DOCSIS 3.0 Downstream Channel Bonding • DOCSIS Admission Control • DOCSIS Baseline Privacy • DOCSIS Classifiers • DOCSIS DSX Support (Infrastructure) • DOCSIS High Power USCB CM Capability • DOCSIS MAP Replication • DOCSIS Packet Filtering • DOCSIS Service Class Feature • DOCS-MCAST-MIB • DOCS-MCAST-MIB • DOCS-QOS3-MIB for CBR • DOCS-SUBMGT3-MIB • DOCS-SUBMGT-MIB • Downstream Channel Management Module • Dynamic Bandwidth Sharing • Dynamic Bonding Change • Dynamic Cable Helper Address Selection • Dynamic Channel Change • Dynamic Message Integrity Check (DMIC) • EIGRP MIB • Embedded Event Manager (EEM) 4.0 • Entity MIB for cBR • Environment Monitoring Daemon for cBR8 (Infrastructure) • EtherChannel Support on CBR8 • Event MIB and Expression MIB Enhancements • Extended Message Integrity Check (EMIC) • Facility-Alarm Command • FileType support in CISCO-FLASH-MIB • FN-SG(fibre node and SG management) • Fully supported L3-mobility solution for CBR • Generic Routing Encapsulation (GRE) • GRE IPv6 Tunnels • High Speed Data QOS for CBR

Cisco IOS-XE Release	Supported Features
3.15.0S	<ul style="list-style-type: none"> • HotIce CLI • IGMP MIB Support Enhancements for SNMP • Ingress noise cancellation for CBR8 • Input MQC on cable interfaces • Inter-area MPLS TE Tunnel Support On CMTS • Interfaces MIB: SNMP context based access • IPDR for CBR8 • IPSLA for CBR • IP-TUNNEL-MIB • IPv6 Device Class Identification • IPv6 eRouter Support • IPv6 Policy-Based Routing • IPv6 Prefix Delegation Support on CMTS • IPv6 QoS: (Quality of Service) • IPv6 SISF (Internet Protocol Version 6) • IPv6/IPv4/Dual stack CPE for cBR • IPv6: 6PE & 6VPE • L2VPN PW redundancy on CMTS • Map Advance for CBR8 • MD(Mac-Domain interface func) • Modular Ranging (Infrastructure) • MPLS P2P L2VPN support over DOCSIS, on cBR-8 • MPLS VPLS support over DOCSIS, on cBR • Multicast on CBR • Multicast VPN and DOCSIS 3.0 Multicast QoS support • Netflow on CBR8 • NTP MIB • OIR for Cable Line cards on cBR8 • Onboard Failure Logging • OSPF MIB Support of RFC 1850 and Latest Extensions • OSPFv3 MIB • Packetcable Multimedia for cbr • PacketCable Support on cBR • Per Downstream Static Multicast • PING MIB

Cisco IOS-XE Release	Supported Features
3.15.0S	<ul style="list-style-type: none"> • Policy Based Routing • PROCESS-MIB for CBR • Punt-Path Rate Limiting • RCC Template • SAMIS Inactive service flow, and Channel Utilization Interval CLI • SAMIS Source Address Management • Secure Boot Support • Security Features For CBR8 • Service Class Relay Agent Option • SII - Service Independent Intercept • SII Routed CPE Support • Smart Call Home for CBR • SMART license for cBR • Smart Licensing PRE-HA • SNMP Notification Logging • SNMP support for virtual interface for CBR8 • SNMPv2C • SNMPv3 Community MIB Support • Source Specific Multicast (SSM) • Sub Packaging • Subinterfaces for CBR8 • Subscriber management for cBR • TCP MIB for RFC4022 support • TLV63 Support • Upstream Buffer Control • Upstream Channel Bonding • Upstream drop classifier • Upstream Peak Rate • US WFQ • VDOC scaling and advanced feature support • VDOC: Robustness, Scalability & Debugability • Voice MGPI support • Voice support over D3.0 MTA • Voltage table support for CISCO-ENVMON-MIB • Wideband Modem Resiliency

Modified Software Features in Cisco IOS-XE Release 3.18.3aSP

There are no modified software features in Cisco IOS-XE Release 3.18.3aSP.

Modified Software Features in Cisco IOS-XE Release 3.18.2aSP

There are no modified software features in Cisco IOS-XE Release 3.18.2aSP.

Modified Software Features in Cisco IOS-XE Release 3.18.1aSP

There are no modified software features in Cisco IOS-XE Release 3.18.1aSP.

Modified Software Features in Cisco IOS-XE Release 3.18.1SP

DOCSIS 3.1 Downstream OFDM Graceful Profile Assignment

This feature dynamically adjusts downstream data profile for each cable modem.

For more information, see:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis31_downstream_profile_selection.html

Usage-Based Billing

This feature enables IPDR to automatically generate sflogs during a line card switchover or a line card process restart.

For more information, see Usage-Based Billing (SAMIS) guide at:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cisco_cmts_networkmgmt_trblshtng_cbr/usage_based_billing_samis.html

show cable modem summary scn

The feature enables the user to get the details of the total number of users on each node using the **show cable modem summary** command on the Cisco cBR-8 router.

For more information, see the Cisco CMTS Cable Command Reference:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref/b_cmts_cable_cmd_ref_chapter_01111.html

show cable modem service-flow

The feature enables the user to get more details of the active cable filter group for the cable modem using the **show cable modem service-flow verbose** command on the Cisco cBR-8 router.

For more information, see the Cisco CMTS Cable Command Reference:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref/b_cmts_cable_cmd_ref_chapter_01111.html

Enhanced Cable modem provisioning

The following commands were introduced for enhancing cable modem provisioning:

- **clear cable modem device-class**
- **show cable modem wideband**
- **show cable modem docsis device-class**
- **show cable modem wideband**

Modified Software Features in Cisco IOS-XE Release 3.18.0SP

There are no modified software features in Cisco IOS-XE Release 3.18.0SP.

Modified Software Features in Cisco IOS-XE Release 3.18.1S

There are no modified software features in Cisco IOS-XE Release 3.18.1S.

Modified Software Features in Cisco IOS-XE Release 3.18.0Sa

There are no modified software features in Cisco IOS-XE Release 3.18.0Sa.

Modified Software Features in Cisco IOS-XE Release 3.18.0S

16 US per MAC Domain

Starting from Cisco IOS-XE 3.18.0S release, maximum of 16 upstream channels can be configured for each MAC Domain, which are divided into two groups:

- Group 1: upstream channel 0-7
- Group 2: upstream channel 8-15

An upstream bonding-group should include all the upstream channels either from Group 1 or Group 2 only.

For more information about this feature, see the following URL:

https://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref/b_cmts_cable_cmd_ref_chapter_01001.html#wp2533370910

SNMP Cache Engine Enhancement

Cisco IOS-XE Release 3.18.0S introduces SNMP multiple buffer which can improve the SNMP performance under multiple SNMP sessions.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cisco_cmts_networkmgmt_trblshing_cbr/snmp_engine_enhancement.html

Configurable Burst mode MER

The configurable data-burst mode feature provides support to loop all the upstream bonding modems for global time interval.

The following command is modified on Cisco cBR Series Converged Broadband Routers:

- **cable upstream resiliency**

For more information about this feature, see the Configuring Cable Upstream Resiliency section at the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/config_guide/b_cmts_ds_us_features/b_cmts_ds_us_features_chapter_010010.html#task_1182573

Three Step Dynamic Modulation

The criteria for switching modulation profiles is modified to determine whether it should switch from the primary modulation to the secondary modulation profile or to the tertiary modulation profile.

For more information about this feature, see the Spectrum Management and Advanced Spectrum Management for the Cisco CMTS chapter at the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/config_guide/b_cmts_ds_us_features/b_cmts_ds_us_features_chapter_01111.html

Modified Software Features in Cisco IOS-XE Release 3.17.1S

There are no modified software features in Cisco IOS-XE Release 3.17.1S

Modified Software Features in Cisco IOS-XE Release 3.16.2S

There are no modified software features in Cisco IOS-XE Release 3.16.2S.

Modified Software Features in Cisco IOS-XE Release 3.17.0S

Smart Licensing Enforcement

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 you can no longer enable/disable the cable interfaces.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_sw_config_features/cisco_smart_licensing.html

Adaptive CIR, Fair EIR

When multiple bonding groups sharing the RF-channel bandwidth and the current bonding group's guaranteed bandwidth is insufficient, On-demand CIR Acquisition feature can “borrow” neighbor bonding group's non-reserved guaranteed bandwidth for current bonding group's CIR. Fairness Across DOCSIS Interfaces feature use the weight value of the aggregated active flow count, that is EIR demand, to periodically re-balance the reservable bandwidth. So that the service flows with the same weight in different bonding groups will have roughly the same throughput.

The following commands were modified:

- **show cable acfe summary**
- **show controllers integrated-cable acfe cluster**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_quality_of_services/fairness_across_docsis_interfaces.html

ISSU with N+1

Cisco cBR-8 Routers support the In-Service Software Upgrades (ISSU) for redundant platforms. The ISSU process allows software to be updated or otherwise modified while packet forwarding continues with the benefit of LCHA. ISSU supports two different software upgrade modes: Consolidated package mode and Subpackages mode.

The following commands were modified:

- **request platform software package install rp**
- **request platform software package install node**
- **request platform software package expand**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_ha_features_cbr/cisco_ios_xe_in_service_software_upgrade_process.html

Upstream Bonding Support for D-PON

Upstream bonding support for D-PON is enabled on a MAC domain basis on the Cisco cBR Series Converged Broadband Routers. By default, upstream bonding support for D-PON is disabled. In addition, the USCB can support a maximum of 4 US channels in RFOG MAC domain in the following combination:

- US0
- US0, US1
- US0, US1, US2
- US0, US1, US2, US3

You can configure upstream bonding support for D-PON using the following command:

- **cable upstream dpon**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/config_guide/b_cisco_cmts_scg/b_cisco_cmts_scg_chapter_011000.html

Dynamic Downstream DOCSIS 3.0 Load Balancing

The existing load balancing (LB) feature is enhanced to cope with the increase in the number of downstream and upstream channels by multi service operators (MSO) and wider deployment of 16-channel, 24-channel and multiple downstream channel cable modems (CMs). The enhancements include:

- Utilization based dynamic downstream LB for DOCSIS 3.0
- Support for DOCSIS 3.0 LB statistics
- Enable or disable DOCSIS 3.0 LB feature

The following commands were introduced:

- **cable load-balance docsis30-enable dynamic downstream**
- **cable load-balance docsis20-enable**
- **cable load-balance docsis30-enable static**
- **show cable load-balance docsis-group rfch-util**
- **show cable load-balance docsis-group load wideband**
- **show cable load-balance docsis-group modem-list wideband**
- **show cable load-balance docsis-group statistics wideband**
- **show cable load-balance docsis-group target wideband**

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis/docsis_load_balancing_movement.html

Priority Queues

All low latency flows on a DOCSIS downstream are aggregated to the single priority queue.

For more information about this feature, see the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_quality_of_services/docsis_wfq_scheduler.html

Flexible Bandwidth Allocation

To address the issue of restricted bandwidth allocation for different application types, admission control can be applied for both normal priority and emergency voice flows. This is done by extending the threshold and assigning a group of application types in a fiber node. Each downstream service flow continues to be categorized to a single application type. However, the one-to-one mapping between an application type and a threshold no longer exists. Each configured threshold and its associated group of application types can thus be treated as a constraint. A service flow categorized to a certain application type must pass all the constraints associated with that application type.

The following command was modified:

- **admission-control application-type**

For more information, see the *Service Group Admission Control* feature guide at:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cmts_quality_of_services/Service_Group_Admission_Control.html

Cable Line Card Upstream Scheduler Process Restart

The Cable Line Card process restart feature eliminates service disruption, loss of modem configuration data, and time consumption in rebooting the line cards and other components.

For more information, see the *Consolidated Packages and SubPackages Management* feature guide at:

http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_basic_sw_config_features/consolidated_packages_and_subpackages_management.html

Modified Software Features in Cisco IOS-XE Release 3.16.1S

There are no modified Software features in Cisco IOS-XE Release 3.16.1S.

Modified Software Features in Cisco IOS-XE Release 3.16.0S

Downstream DOCSIS 3.1 PHY Module Upgrade

The Downstream DOCSIS 3.1 PHY module on the RF line card may be upgraded from downstream DOCSIS 3.0 module to downstream DOCSIS 3.1 module. Alternatively, the installed RF line card in the Cisco cBR chassis may be replaced with another RF line card that has the downstream DOCSIS 3.1 modules already installed. The upgrade is required to provide DOCSIS 3.1 readiness to the Cisco cBR router. This hardware upgrade requires that the RF line card, on which the downstream PHY module was upgraded, be reloaded using the following command:

- **hw-module slot reload**

For more information about this feature, see the following URL:

<http://www.cisco.com/c/en/us/td/doc/cable/cbr/Cisco-cBR/index.html>

MIBs

To locate and download MIBs for selected platforms, Cisco IOS-XE releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check verifies that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password is e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://tools.cisco.com/RPF/register/register.do>

New and Changed MIB Information in Cisco IOS-XE Release 3.18.3aSP

There are no new and changed MIB information in Cisco IOS-XE Release 3.18.3aSP

New and Changed MIB Information in Cisco IOS-XE Release 3.18.2aSP

There are no new or changed MIB information in Cisco IOS-XE Release 3.18.2aSP.

New and Changed MIB Information in Cisco IOS-XE Release 3.18.1aSP

There are no new or changed MIB information in Cisco IOS-XE Release 3.18.1aSP.

New and Changed MIB Information in Cisco IOS-XE Release 3.18.1SP

There are no new or changed MIB information in Cisco IOS-XE Release 3.18.1SP.

New and Changed MIB Information in Cisco IOS-XE Release 3.18.0SP

The following MIB was added in Cisco IOS-XE Release 3.18.0SP:

- DOCS-IF31-MIB

New and Changed MIB Information in Cisco IOS-XE Release 3.18.1S

There are no new and changed MIB information in Cisco IOS-XE Release 3.18.1S.

New and Changed MIB Information in Cisco IOS-XE Release 3.18.0Sa

There are no new and changed MIB information in Cisco IOS-XE Release 3.18.0Sa.

New and Changed MIB Information in Cisco IOS-XE Release 3.18.0S

The following MIBs were added in Cisco IOS-XE Release 3.18.0S:

- SCTE-HMS-MPEG-MIB
- SCTE-HMS-QAM-MIB

New and Changed MIB Information in Cisco IOS-XE Release 3.17.1S

There are no new and changed MIB information in Cisco IOS-XE Release 3.17.1S.

New and Changed MIB Information in Cisco IOS-XE Release 3.16.2S

There are no new and changed MIB information in Cisco IOS-XE Release 3.16.2S.

New and Changed MIB Information in Cisco IOS-XE Release 3.17.0S

The following MIBs were changed in Cisco IOS-XE Release 3.17.0S:

- get the whole table-MIB
- get each entry-MIB
- CISCO-CABLE-QOS-MONITOR-MIB
- DOSCIS-QOS-MIB

New and Changed MIB Information in Cisco IOS-XE Release 3.16.0S

The following MIB was changed in Cisco IOS-XE Release 3.16.0S:

- Entity-MIB

Important Notes for Cisco IOS-XE Release 3S

Important Notes for Cisco IOS-XE Release 3.18.0SP

- Load Balancing is not supported on DOCSIS 3.1 cable modems.
- It is recommended to use only technique zero to move cable modem from one MAC domain to the other. Avoid using DCC to move cable modem with non-zero ranging technique within a MAC-domain.

Important Notes for Cisco IOS-XE Release 3.18.0S

- Effective with Cisco IOS-XE Release 3.18.0S, a warning message is displayed when you configure a value greater than the maximum value specified by the DRFI in the **base-channel-power** *value* command.
- Effective with Cisco IOS-XE Release 3.18.0S, the **ARP-filter drops** field is also displayed as output for the **show plat hard qfp active infra punt summary** command.

Important Notes for Cisco IOS-XE Release 3.16.0S

- Effective with Cisco IOS-XE Release 3.16.0S, do not configure the **logging event link-status** command until the system is in the stable state.

Important Notes for Cisco IOS-XE Release 3.15.0S

- Effective with Cisco IOS-XE Release 3.15.0S, **cable l2-vpn xconnect backup force-switchover** command is modified as **xconnect backup force-switchover**.
- Effective with Cisco IOS-XE Release 3.15.0S, to turn *fragment-threshold* to default value (2,000 bytes), use **no** form of the **cable upstream n fragment-force [fragment-threshold [number-of-fragments]]** command.
- Effective with Cisco IOS-XE Release 3.15.0S, for **cable service flow activity-timeout** command, the default timeout length for a DOCSIS 1.0+ cable service flow is 0 seconds.
- Effective with Cisco IOS-XE Release 3.15.0S, the **show interface cable { slot /subslot /cable-interface-index } modem** command displays the number of **Active Modems** and **Total active devices** also.
- Effective with Cisco IOS-XE Release 3.15.0S, the **show cable modem vendor** command does not display **Timing Offset** column.
- Effective with Cisco IOS-XE Release 3.15.0S, the **show cable load-balance docsis-group** command does not display the **Flows** column (number of service flows currently active on the cable interface).

Cisco IOS-XE Release 3S Image Upgrade Best Practice Manual of Procedure

See the [Upgrading the Cisco cBR Series Converged Broadband Routers for Cisco IOS XE Release 3.18SP](#) guide.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see [What's New in Cisco Product Documentation](#) .

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