



Controller Profile Configuration

This document describes how to configure the controller profile on the Cisco cBR Series Converged Broadband Router.

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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	<p>Cisco IOS-XE Release 16.5.1 and Later Releases</p> <p>Cisco cBR-8 Supervisor:</p> <ul style="list-style-type: none"> • PID—CBR-SUP-250G • PID—CBR-CCAP-SUP-160G 	<p>Cisco IOS-XE Release 16.5.1 and Later Releases</p> <p>Cisco cBR-8 CCAP Line Cards:</p> <ul style="list-style-type: none"> • 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 <p>Digital PICs:</p> <ul style="list-style-type: none"> • PID—CBR-DPIC-8X10G • PID—CBR-DPIC-2X100G <p>Cisco cBR-8 Downstream PHY Module:</p> <ul style="list-style-type: none"> • PID—CBR-D31-DS-MOD <p>Cisco cBR-8 Upstream PHY Modules:</p> <ul style="list-style-type: none"> • 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.

Information about Controller Profile Configuration

As density increases with the merging of CMTS and UEQAM functions in the same device, the current controller configuration method becomes too complex and difficult. There are too many identical lines of configuration.

To simplify the controller configuration, a new concept called controller profile is introduced. A controller profile is a group of configuration parameters that apply to downstream and upstream controller, the benefits include:

- Speed up deployment
- Simplify cBR-8 deployment, configuration and troubleshooting
- Common configurations across nodes/regions
- Consistency across Cisco products for common functions

How to Configure the Controller Profile

User configures I-CMTS controllers using legacy controller configuration commands by default. If user wants to use I-CMTS controller profile, needs to enable it first with **cable controller-profile I-CMTS enable** command.



Note

- If user wants to configure controller using profile, it is recommended to start configuration on a “clean” CMTS without any legacy command configured in Integrated-Cable and Upstream-Cable controllers. Do not switch over between legacy configuration and profile.
- When modifying controller profile, all related controllers will be changed. So if user wants to configure a specific controller, for example, modify the base-channel power of a controller, user should not bind this controller to a profile together with other controllers.
- Legacy controller configuration commands are not supported if I-CMTS controller-profile is enabled.
- Legacy controller configuration cannot be shown in running-config if I-CMTS controller-profile is enabled.

Configuring Downstream Controller Profile

To configure downstream controller profile, use the steps below:

```
enable
configure terminal
cable downstream controller-profile id [RPHY|I-CMTS]
base-channel-power value
max-carrier value
freq-profile id
max-ofdm-spectrum value
```

```

ofdm-freq-excl-band start-frequency value width value
rf-chan start_id [end_id]
type value
rf-output value
power-adjust value
qam-profile id
docsis-channel-id id
power-profile id
ofdm channel-profile id start-frequency value width value [plc value]

enable
configure terminal
controller integrated-cable slot/subslot/port
profile id

```

Below is an example:

```

cable downstream controller-profile 0 I-CMTS
max-carrier 32
base-channel-power 34
rf-chan 0 3
type DOCSIS
frequency 111000000
rf-output NORMAL
qam-profile 1
docsis-channel-id 1

controller integrated-cable 2/0/0
profile 0

```



Note

- When configure a new I-CMTS controller profile, keyword I-CMTS is needed. If input RPHY or do not input any keyword, the system will consider it as a RPHY controller profile. Once a profile type (RPHY/I-CMTS) is set, it cannot be modified.
- Updating a profile will affect all the controllers bond with it. To delete a profile that bond with controller, user must unbind all the controllers first. All rf-channel configuration in controller will be deleted after unbind.
- At least 8 QAM channels should be configured to get the right power. Single continuous wave (CW) mode is not supported.

Verifying Downstream Controller Profile Configuration

Use the **show cable downstream controller-profile** command to verify the configuration of the downstream controller profile.

```

Router# show cable downstream controller-profile 0
Downstream controller-profile 0, type I-CMTS
Description:
Downstream controller-profile 0 is being used by controller Integrated-Cable:
  2/0/0,
  Admin: UP
  MaxOfdmSpectrum: 192000000
  MaxCarrier: 128

```

```

BasePower: 33.0 dBmV
Mode: normal
Frequency profile: unconfigured
DS Splitting: No
OFDM frequency exclusion bands: None

```

Configured RF Channels:

Chan	Admin	Frequency	Type	Annex	Mod	srates	Qam-profile	dcid	power	output
0	UP	213000000	DOCSIS	B	256	5361	1	1	33.0	NORMAL
1	UP	219000000	DOCSIS	B	256	5361	1	2	33.0	NORMAL
2	UP	225000000	DOCSIS	B	256	5361	1	3	33.0	NORMAL
3	UP	231000000	DOCSIS	B	256	5361	1	4	33.0	NORMAL
4	UP	237000000	DOCSIS	B	256	5361	1	5	33.0	NORMAL
5	UP	243000000	DOCSIS	B	256	5361	1	6	33.0	NORMAL

In the above output, integrated-cable 2/0/0 is bond to profile 0. So the output of the **show controllers integrated-Cable 2/0/0 rf-channel 0 5** should match the above output. See the example below:

```
Router# show controllers integrated-cable 2/0/0 rf-channel 0-5
```

```

...
Chan Admin Frequency Type Annex Mod srates Qam-profile dcid power output
0 UP 213000000 DOCSIS B 256 5361 1 1 33.0 NORMAL
1 UP 219000000 DOCSIS B 256 5361 1 2 33.0 NORMAL
2 UP 225000000 DOCSIS B 256 5361 1 3 33.0 NORMAL
3 UP 231000000 DOCSIS B 256 5361 1 4 33.0 NORMAL
4 UP 237000000 DOCSIS B 256 5361 1 5 33.0 NORMAL
5 UP 243000000 DOCSIS B 256 5361 1 6 33.0 NORMAL

```

To check if the parameters in a profile match with the ones configured, use the **show running-config [all] | section cable downstream controller-profile** command as shown in the example below:

```

Router# show running-config | section downstream controller-profile
cable downstream controller-profile 0 I-CMTS
max-carrier 32
base-channel-power 34
rf-chan 0 3
type DOCSIS
frequency 111000000
rf-output NORMAL
qam-profile 1
docsis-channel-id 1

```

Configuring Upstream Controller Profile

To configure upstream controller profile, use the steps below:

```

enable
configure terminal
cable upstream controller-profile id [RPHY|I-CMTS]
us-channel id {chan-class-id id}channel-width {first-choice-width
[last-choice-width]}|docsis-mode{atdma | tdma |
tdma-atdma}|equalization-coefficient|frequencyvalue|hop-priority{frequency
modulation channel-width| modulation frequency channel-width| frequency
channel-width modulation}|ingress-noise-cancellation
interval|maintain-psd|max-logical-chans id|minislot-size
value|modulation-profile
primary-profile-number[secondary-profile-number] [tertiary-profile-number] |power-level
value|rng-holdoff priority|specsvl error-adaptive-profile id|spectrum-group

```

```
id|threshold {cnr-profiles value [value]|corr-fec value|hysteresis
value|snr-profiles value [value]|corr-fec value}
```

```
enable
configure terminal
controller upstream-cable slot/subslot/port
profile id
```

**Note**

- When configure a new I-CMTS controller profile, keyword I-CMTS is needed. If input RPHY or do not input any keyword, the system will consider it as a RPHY controller profile. Once a profile type (RPHY/I-CMTS) is set, it cannot be modified.
- Updating a profile will affect all the controllers bond with it. To delete a profile that bond with controller, user must unbind all the controllers first.
- OFDMA does not support the use of profile in this release.

Verifying Upstream Controller Profile Configuration

Use the **show cable upstream controller-profile** command to verify the configuration of the upstream controller profile.

```
Router# show cable upstream controller-profile 0
Upstream controller-profile 0, type I-CMTS
Description:
Upstream controller-profile 0 is being used by controller Upstream-Cable:
9/0/0

Controller Upstream-Cable
...
Upstream-channel 0
  chan-class-id           : 0x0
  channel-width           : 1600000 1600000
  docsis-mode             : atdma
  equalization-coefficient : TRUE
  frequency                : 5000000
  ...
  modulation-profile      : 221
  ...
  shutdown                : FALSE
  ...
```

In the above output, upstream-cable 9/0/0 is bond to profile 0. So the output of the **show controllers upstream-Cable 9/0/0 us-channel 0** should match the above output. See the example below:

```
Router# show controllers upstream-Cable 9/0/0 us-channel 0
...
Controller 9/0/0 upstream 0 AdminState:UP OpState: UP
  atdma mode enabled
  Frequency 5.000 MHz, Channel Width 1.600 MHz, Symbol Rate 1.280 Msps
  Modulation Profile Group 221
```

To check if the parameters in a profile match with the ones configured, use the **show running-config [all] | section cable upstream controller-profile** command as shown in the example below:

```
Router# show running-config | s cable upstream controller-profile 0
cable upstream controller-profile 0 I-CMTS
  us-channel 0 channel-width 1600000 1600000
  us-channel 0 docsis-mode atdma
  us-channel 0 minislots-size 4
  us-channel 0 modulation-profile 221
  us-channel 0 shutdown
  ...
```

Support for RPHY GCP TLV 98.3 (BaseTargetRxPower)

In releases before Cisco IOS XE Cupertino 17.9.1w, On cBR-8 routers, the MSOs have the option to configure the upstream power only at the upstream channel level on the RPD. Cisco RPD solution implements the total absolute power per channel calculated with reference to 0dBmV/6.4 MHz. This means that the total power of the entire upstream channel is always constant irrespective of the channel width and therefore the power spectral density of the channel decreases for larger channels.

In releases before Cisco IOS XE Cupertino 17.9.1w the implementation of upstream power for different channel widths is as specified below:

For 1.6 MHz channel, power per 1.6MHz bandwidth is 0dBmV, total power is 0 dBmV

For 3.2 MHz channel, power per 1.6MHz bandwidth is -3dBmV, total power is 0 dBmV

For 6.4 MHz channel, power per 1.6MHz bandwidth is -6 dBmV, total power is 0 dBmV

(or)

For 1.6 MHz channel, power per 6.4MHz bandwidth is +6dBmV, total power is 0 dBmV

For 3.2 MHz channel, power per 6.4MHz bandwidth is +3dBmV, total power is 0 dBmV

Cable labs RPHY specification has an option to configure the upstream base port RF power in units of 0.1dBmV per 1.6Mhz RF bandwidth.

cBR-8 routers support RPHY GCP TLV 98.3 - BaseTargetRxPower for the upstream controller port on the RPD. The base power config can be applied to both `cable upstream controller-profile` and `cable rpd` level. If configured at both levels, the configuration at the `cable rpd` level takes priority for that rpd.

At the RPD upstream port (service group) level, the Remote PHY standard allows a CCAP core to configure a base target power reference level for all upstream signals from a given US RF port. This reference level is specified as a power spectral density (dBmV per 1.6 MHz) through GCP TLV 98.3, which corresponds to `UsRfPort.BaseTargetRxPower`.

Use the **base-power-rx-level-1_6Mhz** option under **cable upstream controller-profile** to enable base power configuration for the entire upstream port.

```
router(config)#cable upstream controller-profile 499
router(config-controller-profile)#base-power-rx-level-1_6Mhz ?
  <-20 - 40>          Supported ranges: -15~24 for rphy-node, -15~20 for
                    rphy-shelf(ref pt:0dBmV/1.6Mhz)
```

Use the following command to disable TLV 98.3 on cBR-8: `router(config-controller-profile)#no base-power-rx-level-1_6Mhz`

The allowed range for upstream controller port base power configuration per CableLabs specification is -20 to +40 dBmV/1.6MHz. Cisco RPD 1x2 supports only the following ranges for pga gain configuration: -9 to +30 dBmV/6.4MHz for rphy-node and -9 to +26 dBmV/6.4MHz for rphy-shelf. Since there can be multiple RPDs per upstream controller port, you must pay attention to the RPD-specific capabilities, to correctly

configure the base port power values. The software does not restrict the configuration to allow multiple RPD vendors using the same upstream controller profile. You can reconfigure the power levels at the per-channel level appropriately.

The option to configure the base port power config at the profile level, affects all RPDs using that profile; while the configuration at the `cable rpd` level fine tunes the base power configuration only for that upstream port on that RPD. It also takes precedence over the profile configuration for base power if present.

At the RPD level, use the **base-power-rx-level-1_6Mhz** option under **cable rpd** to enable base power configuration.

```
router(config)#cable rpd node1
router(config-rpd)#identifier aaaa.bbbb.cccc
router(config-rpd)#rpd-us 0 base-power-rx-level-1_6Mhz ?
<-20 -40> Supported ranges : -15~24 for rphy-node, -15~20 for rphy-shelf
(refpt:0dBmV/1.6Mhz)
```

Configuring the base power using either of the preceding commands, trigger the TLV 98.3 message from CBR8 to RPD and the implementation on RPD changes to reflect new power calculations based on 0dBmV/1.6MHz reference.

Use the following command to disable TLV 98.3 on cBR-8: `router (config-rpd)#no rpd-us 0 base-power-rx-level-1_6Mhz`. Use this option to configure US Base target power level in units of dBmV/1.6MHz (TLV 98.3).

Feature Name	Release Information	Feature Description
Received power MIB Update for SCQAM and OFDMA channels	Cisco IOS XE Dublin 17.12.1y	In this release, the received power for all the upstream channels, SCQAM and OFDMA, will be reported in 1.6MHz reference. It will also include upstream RF port basepower if configured (applicable to rphy only). The following MIBs has been updated: <ul style="list-style-type: none"> • DocsIf3CmtsCmUsStatusRxPower • docsIf31CmtsCmUsOfdmaChannelRxPower

In the release Cisco IOS XE Dublin 17.12.1y, on CBR8, the per CM MIB reporting upstream channel received power - `docsIf3CmtsCmUsStatusRxPower` and `docsIf31CmtsCmUsOfdmaChannelRxPower` - will now report the received power of the SCQAM and OFDMA upstream channels respectively at 1.6MHz PSD reference per the cable labs specification. This is applicable to all CMs online on both ICMTS and RPHY linecards. Also both the MIBs now also include the base power, if configured on the RPHY upstream RF port along with the per channel power level in the Received Power reporting. The upstream RF port base power feature was introduced for RPHY cards in IOS-XE 17.9.1y release.

The implementation of upstream power for different channel widths is as specified below for the release Cisco IOS XE Dublin 17.12.1y:

```
CBR8#scm b42a.0e85.4339 verbose | i Received Power
Received Power Delta (dBmV)           : 0.00      0.00      0.00      -0.25
Config Received Power (dBmV@chw)      : -6.00     -3.00     0.00     0.00
Received Power (dBmV@chw)             : -6.00     -3.00     0.00     -0.25
Config Received Power (dBmV@1.6MHz)   : -6.00     -6.00    -6.00    -6.00
Received Power (dBmV@1.6MHz)          : -6.00     -6.00    -6.00    -6.25
CBR8r#
SCQAM:
lwr-lnx-util-1:~ > snmpwalk -v 2c -c public 2.29.1.1 1.3.6.1.4.1.4491.2.1.20.1.4.1.3 |
more
SNMPv2-SMI::enterprises.4491.2.1.20.1.4.1.3.4718593.494952 = INTEGER: -60
```



```
SNMPv2-SMI::enterprises.4491.2.1.20.1.4.1.3.4718593.494953 = INTEGER: -60
SNMPv2-SMI::enterprises.4491.2.1.20.1.4.1.3.4718593.494954 = INTEGER: -60
SNMPv2-SMI::enterprises.4491.2.1.20.1.4.1.3.4718595.494952 = INTEGER: -60
OFDMA: (Actual + config Received Power)
lwr-lnx-util-1:~ > snmpwalk -v 2c -c public 2.29.1.1 1.3.6.1.4.1.4491.2.1.28.1.4.1.1
SNMPv2-SMI::enterprises.4491.2.1.28.1.4.1.1.4718593.494955 = INTEGER: -62
SNMPv2-SMI::enterprises.4491.2.1.28.1.4.1.1.4718594.494955 = INTEGER: -60
```

Upstream Per-Channel TLVs

For the per-channel upstream power config, it captures either the total absolute power levels per 6.4MHz or true power adjust levels depending on whether the upstream base power command

`base-power-rx-level-1_6Mhz` is configured. The per-channel command has enhanced help strings to display the changes if `base-power-rx-level-1_6Mhz` is configured.

```
Router (config-controller-profile)#us-channel 0 power-level ?
<7 -25> Power level in dBmV-total power in units of dBmV per 6.4 Mhz if
base-power-rx-level-1.6Mhz NOT configured (-x~y for rphy-node, x~y for rphy-shelf)
[OR] power adjust in units of dBmV per 1.6 Mhz if base-power-rx-level-1_6Mhz configured
```

Configuration With SC-QAM Upstream Channel

```
router(config)#cable upstream controller-profile 499
CBR8(config-controller-profile)#base-power-rx-level-1_6Mhz 10
CBR8(config-controller-profile)# us-channel 0 channel-width 3200000 3200000
CBR8(config-controller-profile)# us-channel 0 docsis-mode atdma
CBR8(config-controller-profile)# us-channel 0 power-level 5
```

Here `us-channel 0 power-level 5` indicates US target rx power adjust level - true power adjust with above upstream base power config(TLV 65.9).

For the per-channel upstream power config, if the base port power level is configured via TLV 98.3, the channel adjusts automatically become true channel adjusts in Cisco 1x2 RPD. You must reconfigure the per channel power adjust if needed by taking the new port base power configuration into consideration.

NVGEN For cBR-8

All the upstream RF port base power configurations are nv-generated. The base power configuration is available in `show running-configuration` once you enable it. The default configuration for the CBR8 is the `no` version of the base power command for the TLV 98.3. If you do not enable the feature or explicitly disable the feature, then the default configuration can be verified by using the `no` version of this feature in `show running-config all`.

For example, with no base power config on the upstream RF port, see the following sample outputs for the `show run` and the `show run all`:

```
Router#show run all | sec cable upstream controller-profile 3
cable upstream controller-profile 3
  description Cox-upstream-prof-eg
  no base-power-rx-level-1_6Mhz
cable def-phy-burst 0
  us-channel 0 chan-class-id 7
  us-channel 0 channel-width 6400000 6400000
<<!snip>
Router#show run | sec cable upstream controller-profile 3
cable upstream controller-profile 3
  description Cox-upstream-prof-eg
  us-channel 0 chan-class-id 7
```

```

us-channel 0 channel-width 6400000 6400000
us-channel 0 docsis-mode atdma
us-channel 0 equalization-coefficient
<<!snip>

```

```

Router#show run all | sec node1
cable rpd node1
description rpd-cbr8-4
identifier aaaa.bbbb.cccc
type node
<<!snip>>
no rpd-ds 1 mute
no rpd-ds 1 shutdown
no rpd-us 0 base-power-rx-level-1_6Mhz
no rpd-us 1 base-power-rx-level-1_6Mhz
<<!snip>>

```

```

Router#show run | sec node1
cable rpd node1
description TB17-RPD2-3 HWaddr F4:DB:E6:FE:CC:E2
identifier aaaa.bbbb.cccc
core-interface Hu9/1/8
principal
rpd-ds 0 downstream-cable 9/0/4 profile 25
rpd-us 0 upstream-cable 9/0/4 profile 3
rpd-us 1 upstream-cable 9/0/5 profile 3
r-dti 1
rpd-event profile 0
rpd-55d1-us-event profile 0

```

Sample CLI Configuration with TLV 98.3 for 0dBmV/6.4MHz

The following table shows examples of setting up the CLI to configure total absolute power level of 0dBmV/6.4MHz (current Cisco implementation) using the new CLI for base power config and corresponding TLV 98.3 sent to RPD.

Table 2:

Cisco IOS XE Version	CLI configuration on cBR-8	TLV 98.3 and TLV 65.9 sent to RPD	Description
Cisco IOS XE Cupertino 17.9.1w and later	<pre> router(config)#cable upstream controller-profile 499 rpd-us 0 base-power-rx-level-1_6Mhz -6 rpd-us 1 base-power-rx-level-1_6Mhz -6 rpd-ds 0 channel-width 1600000 1600000 rpd-ds 0 power-level 0 </pre>	<pre> TLV 98.3 -> -60 TLV 65.9 -> 0 </pre>	The base power value of -6 dbmV per 1.6Mhz translates 0 dbmV per 6.4Mhz and the channel power adjusts are true power adjusts now. This config on BOTH RPD and CBR8 are aligned with cable lab spec power level definition.
Releases before Cisco IOS XE Cupertino 17.9.1w	<pre> router(config)#cable upstream controller-profile 499 rpd-us 0 channel-width 1600000 1600000 rpd-ds 0 power-level 0 </pre>	<pre> TLV 65.9 -> 0 </pre>	This Cisco IOS XE version does not support tlv 98.3, so cBR-8 and cisco rpd config are aligned with current legacy implementation.

Feature Information for Controller Profile Configuration

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://cfng.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 3: Feature Information for Controller Profile Configuration

Feature Name	Releases	Feature Information
SG Based Config (OpSimp) Phase 2	Cisco IOS XE Fuji 16.7.1	This feature was introduced on Cisco IOS XE Fuji 16.7.1 on the Cisco cBR Series Converged Broadband Routers.

