Controller Profile Configuration

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

Hardware Compatibility Matrix for the Cisco cBR Series Routers

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

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

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

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

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

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  srate 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  srate 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**|**frequency***value*|**hop-priority**{**frequency modulation channel-width| modulation frequency channel-width| frequency channel-width modulation**}|**ingress-nosie-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 minislot-size 4
 us-channel 0 modulation-profile 221
 us-channel 0 shutdown
 ...
```

Support for RPHY GCP TLV 98.3 (BaseTargetRxPower)

Table 2: Feature History

Feature Name	Release Information	Feature Description
Support for RPHY GCP TLV 98.3 (BaseTargetRxPower)	Cisco IOS XE Cupertino 17.9.1w	This feature introduces TLV 98.3 support for cBR-8 routers. Use the **base-power-rx-level-1_6Mhz** option under **cable upstream controller-profile** *controller-profile-number* to enable the base power configuration for the entire upstream port.

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 that is 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.
- **Upstream Power**: Cisco RPD supports **total absolute power** per channel in reference to 0dBmV/6.4MHz. 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.

  The implementation of upstream power for different channel widths is as specified below:

  - For the 1.6-MHz channel, power per 1.6MHz bandwidth is 0dBmV, total power is 0 dBmV.
  - For the 3.2-MHz channel, power per 1.6MHz bandwidth is -3dBmV, total power is 0 dBmV.
  - For the 6.4-MHz channel, power per 1.6MHz bandwidth is -6 dBmV, total power is 0 dBmV.

  (Or)

  - For the 1.6-MHz channel, power per 6.4MHz bandwidth is +6dBmV, total power is 0 dBmV.
  - For the 3.2-MHz channel, power per 6.4MHz bandwidth is +3dBmV, total power is 0 dBmV.

TLV 98.3 BaseTargetRxPower

Starting with Cisco IOS XE Cupertino 17.9.1w, TLV 98.3 is supported on cBR-8 routers.

- If the target rx base power is configured on an upstream RF port in cbr8, upstream power calculations are done with reference to 1.6MHz bandwidth per the CableLabs specification.

- The upstream base power configuration is configured on cbr8 in units of dBmV per 1.6MHz bandwidth. The total channel power increases with increasing channel width.
- The DOCSIS CableLabs specification defines TLV 98.3 as: *This attribute is used to configure the base target power reference level for upstream signals received on all upstream channels from the selected US RF port. The value of this attribute is specified as average power in units of 0.1 dBmV per 1.6 MHz of RF bandwidth*.
- The supported range for TLV 98.3 is from -200 to +400 (-20 dBmV to +40 dBmV] per 1.6 MHz of RF spectrum per the CableLabs specification.
- The actual range supported by the Cisco RPD for this TLV 98.3 attribute varies based on the rpd type and is specified in the cli helpstrings during configuration of this parameter.
- The OOB-55d1 feature uses a constant value for VGA gain setting from internal calibration data. It does not follow the change in port VGA due to any DOCSIS channel power level configuration changes. The per channel gain can be modified to compensate for VGA port gain changes for tlv98.3 configuration on OOB-55d1 channels. We do not support setting up the power adjust for 55-D2 US channels.
- In releases before Cisco IOS XE Cupertino 17.9.1w, the NDR/NDF feature power adjust follows the change in VGA gain settings. In Cisco IOS XE Cupertino 17.9.1w and later, the power adjust for NDR/NDF in TLV 95.5 follows similar behavior with change in VGA if any from TLV 98.3.
- With TLV 98.3 enabled, the per channel power config TLVs are **true power adjusts**. The TLVs for different upstream channel types are the following:
  - UsScQamChannelConfig.TargetRxPowerAdjust (TLV 65.9)
  - UsOfdmaChannelConfig.TargetRxPowerAdjsut (TLV 66.13)
  - UsOob55d1.TargetRxPowerAdjust (TLV 92.7)
  - NdrConfig.TargetRxPowerAdjust (TLV 95.5)

Table 3: TLV 98.3 BaseTargetRxPower Supported Releases

Platform	Release
c-BR8	Cisco IOS XE Cupertino 17.9.1w and later
Cisco RPHY	RPD v10.4. Supported on Cisco RPD 1x2, 3x6, and 6x12

Note TLV 98.3 BaseTargetRxPower does not support HAshelf and cnBR.

RPD Modules for TLV 98.3 BaseTargetRxPower

- RPD has a port level amplifier VGA which affects the power levels on the entire upstream RF port – for all the channels on the US port.
- RPD also has a module that is called nb-gain which is used to fine tune the per-channel power adjustments if any configured on the core.

- TLV 98.3 defines the upstream power for the whole port – it is used to directly configure the value of the VGA on the RPD.
- With TLV 98.3 enabled, the per-channel power adjusts on the core directly modifies the nb-gain for that channel on the RPD and has no effect on the overall port power.

In releases before Cisco IOS XE Cupertino 17.9.1w, Cisco RPD supports **total absolute power** per channel in reference to 0dBmV/6.4MHz. 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.

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.

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 the tlv98.3 configuration: -10 to +29 dBmV/1.6MHz for rphy-node and -25 to +10 dBmV/1.6MHz 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.

US RF Port Power Command

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. SUP HA is supported for this TLV. The new CLI for upstream controller profile to configure upstream RF port base power (TLV 98.3)

Use the **base-power-rx-level-1_6Mhz** option (*Base target power level in units of dBmV/1.6MHz*) under **cable upstream controller-profile** to enable base power configuration for the entire upstream port.
base-power-rx-level-1_6Mhz - Base target power level in in units of dBmV/1.6MHz.

```
router(config)#cable upstream controller-profile 499
router(config-controller-profile)#base-power-rx-level-1_6Mhz ?
<-20 - 40>  Supported ranges: -10~29 for rphy-node, -25~10 for rphy-shelf(ref pt:0dBmV/1.6Mhz)
```

Note

- This configuration affects all RPDs using the configured profile.
- Configuring US port power may require reconfiguration of channel power levels.

With TLV 98.3 enabled, the existing CLI is overloaded to implement changes for per-channel power TLV 65.9 / 66.13

NDR/NDF channel power adjusts are already true power adjusts.

Capture power levels per 6.4MHz or simply **power adjust** levels per 1.6MHz depending on whether the **base-power-rx-level-1_6Mhz** is configured.

If **base-power-rx-level-1_6Mhz** is configured, then per-channel CLI has enhanced help strings for clarification:

```
router(config)#cable upstream controller-profile 499
router(config-controller-profile)#us-channel 0 power-level ?
<-13 - 25>  Power level in dBmV-total power in PSD 6.4Mhz if base-power-rx-level-1.6Mhz NOT

            configured(-4~25 for rphy- node, -13~23 for rphy-shelf) [OR] true power adjust
 if
            base-power-rx-level-1_6Mhz configured
```

Here **us-channel** indicates Upstream channel configuration and **power-level** indicates Input power level.

Note The end-user is responsible for reconfiguring the individual upstream channel power levels as needed if the upstream RF port base power configuration is enabled.

US RF Port Power CLI - RPD Configuration Level

To configure upstream RF port base power (TLV 98.3) 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: -10~29 for rphy-node, -25~10 for rphy-shelf(ref
pt:0dBmV/1.6Mhz)
```

The RPD config CLI base power config allows per upstream RF port on that RPD as shown above. This gives you finer control over a specific RPD's upstream port power.

The upstream port base power config can be applied to both rpd configuration block as well as the upstream controller profile as shown earlier. If configured at both levels, the config in the rpd block takes precedence for the given rpd upstream RF port.

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.

Note 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.

RPD Show Command

The RPD **show vga** CLI can be used to see the details of port power configurations including per port vga settings, per port per channel nb-gain settings, per port TLV 98.3 settings and user configured values.

```
R-PHY#show vga
 OOB US S/W VGA Gain:
    Port0: 7
    Port1: -16

 OOB US Default Gain Calculated:
    Port0: 7
    Port1: 7
```

```
 Enable Upstream Calibration: TRUE

Upstream Calibration - Port0: 6 0 Port1: 6 0
VGA of platform: CSHELF
VGA Setting: Power values below in reference to 0dBmV/6.4Mhz
Port0: 0x23 (-9db)
Port1: 0x10 (+10db)
NB-GAIN Setting:
 Port 0 (SCQAM0)
  receiver 0 : 36(0x24) adj:+1.0:+1.1 db
  receiver 1 : 36(0x24) adj:+1.0:+1.1 db
  receiver 2 : 32(0x20) adj:-0.1:+0.1 db
  receiver 3 : 25(0x19) adj:-2.0 db
  receiver 4 : 32(0x20) adj:-0.1:+0.1 db
  receiver 5 : 32(0x20) adj:-0.1:+0.1 db
 Port 1 (SCQAM1)
  no scqam receiver configured in port 1
TLV 98.3 Setting:
Supp range for TLV 98.3: -200 to 100 TenthdBmV per 1.6MHz
 Port 0 : Enabled
 User Config value: 100
 Port 1 : Disabled
 User Config value: --
OFDMA pwrAdjust Setting:
 Port 0
  receiver 0 : 25(0x19) adj:-2.0 db
 Port 1
  Value not set as tlv98.3 disabled for this port
```

US RF Port Power Configuration Examples

Sample Profile Configuration Block with TLV 98.3 Enabled

The configuration on both the controller profile and rpd block is saved in NVRAM and available on reboot. SUPHA is supported for TLV 98.3. The config under the cable rpd block for an rpd takes precedence over the controller profile config if the upstream base power value is configured under both sections.

```
router(config)#cable upstream controller-profile 499
router(config-controller-profile)#base-power-rx-level-1_6Mhz 10  << US Base target power
level in units of dBmV/1.6MHz (tlv 98.3)
router(config-controller-profile)# us-channel 0 channel-width 3200000 3200000
router(config-controller-profile)# us-channel 0 docsis-mode atdma
router(config-controller-profile)# us-channel 0 power-level 5 << US target rx power adjust
 level in units of dBmV/1.6MHz (tlv 65.9)
```

Sample RPD Configuration Block with Tlv 98.3 Enabled

The base power config for rpd aaaa.bbbb.cccc, based on the following configuration is 50dbmV/1.6Mhz on upstream port 0 while all the other rpds using profile 499 has the base power config on their upstream port 0 to be 10dBmV/1.6Mhz.

```
 cable rpd node1
identifier aaaa.bbbb.cccc
rpd-us 0 base-power-rx-level-1_6Mhz 5
core-interface Te8/1/0
rpd-ds 0 downstream-cable 8/0/0 profile 2
rpd-us 0 upstream-cable 8/0/0 profile 499
```

```
...
...
```

Disabling TLV 98.3

Disabling TLV 98.3 via CLI causes cBR-8 to switch to legacy power implementation with reference to 0dBmV/6.4MHz

Note All the RPDs MUST reboot if the 98.3 CLI above is disabled. Disabling TLV 98.3 can be done both at the controller profile as well as cable rpd configuration level. If the RPD is not rebooted post disabling base power config on cbr8, upstream power behavior on RPD is undefined.

Controller Profile

```
router(config)#cable upstream controller-profile 499
router(config-controller-profile)#no base-power-rx-level-1_6Mhz
Warning: Upstream RfPort BasePower config removed on ctrlr profile. Please reboot ALL RPDs

associated with this profile manually otherwise the upstream power behavior is undefined
```

cable rpd configuration level

```
router(config)#cable rpd node1
router(config-rpd)#no rpd-us 1 base-power-rx-level-1_6Mhz
Warning: Upstream RfPort BasePower config removed. Please reboot this RPD manually otherwise
 the upstream power behavior is undefined
```

Clarifying help strings are used in per-channel upstream power CLI – the onus is on the user to configure the ‘per-channel’ CLI value accordingly. If the user removes the base power that is configured by issuing cli ‘no base-power-rx-level-1_6Mhz’, the user MUST update the ‘per-channel power level’ to use the appropriate desired value.

MIBs Information

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 an upstream RF port base power if configured (applicable to rphy only). The following MIBs have been updated: • **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 line cards. 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 the IOS-XE 17.9.1y release.

A sample MIB output of upstream received power implementation for the configuration is as specified below for different channel widths for the release Cisco IOS XE Dublin 17.12.1y:

```
CBR8#show cable modem rpd name node2
MAC Address    IP Address     I/F         MAC             Prim  RxPwr  Timing Num I Dev
                                           State           Sid   (dBmV) Offset CPE P Class
9058.515c.9e3c 9.8.8.64       C8/0/2/UB   w-online(pt)    5     -0.25  1265   0   N CM
cable upstream controller-profile 22
base-power-rx-level-1_6Mhz -6
us-channel 0 channel-width 3200000 3200000
us-channel 0 docsis-mode atdma
us-channel 0 equalization-coefficient
us-channel 0 frequency 11400000
us-channel 0 minislot-size 2
us-channel 0 modulation-profile 223
 no us-channel 0 shutdown
us-channel 1 channel-width 1600000 1600000
us-channel 1 docsis-mode atdma
us-channel 1 equalization-coefficient
us-channel 1 frequency 14600000
us-channel 1 minislot-size 4
us-channel 1 modulation-profile 223
 no us-channel 1 shutdown
us-channel 2 channel-width 6400000 6400000
us-channel 2 docsis-mode atdma
us-channel 2 equalization-coefficient
us-channel 2 frequency 20000000
us-channel 2 minislot-size 1
us-channel 2 modulation-profile 223
 no us-channel 2 shutdown
us-channel 3 channel-width 6400000 6400000
us-channel 3 docsis-mode atdma
us-channel 3 equalization-coefficient
us-channel 3 frequency 32400000
us-channel 3 minislot-size 8
us-channel 3 modulation-profile 223
 us-channel 3 specsvl error-adaptive-profile 3
no us-channel 3 shutdown
us-channel 4 channel-width 3200000 3200000
us-channel 4 docsis-mode atdma
us-channel 4 frequency 24200000
us-channel 4 minislot-size 2
us-channel 4 modulation-profile 221
 us-channel 4 shutdown
us-channel 5 channel-width 3200000 3200000
us-channel 5 docsis-mode atdma
us-channel 5 frequency 27400000
us-channel 5 minislot-size 2
us-channel 5 modulation-profile 221
 no us-channel 5 shutdown
us-channel 12 docsis-mode ofdma
us-channel 12 subcarrier-spacing 25KHz
us-channel 12 modulation-profile 421
 us-channel 12 frequency-range 40000000 85000000
us-channel 12 cyclic-prefix 128 roll-off-period 32
us-channel 12 symbols-per-frame 9
no us-channel 12 shutdown
```

```
CBR8#show cable modem 9058.515c.9e3c wideband channel
MAC Address    IP Address      I/F           MAC                DSxUS Primary
                                             State                    WB
9058.515c.9e3c 9.8.8.64        C8/0/2/UB     w-online(pt)       9x5   Wi8/0/2:0


CBR8#show cable modem 9058.515c.9e3c verbose | i Received Power
```

```
Received Power Delta (dBmV)        : 0.00       0.00       0.00       0.00
Config Received Power(dBmV@chw)    : -3.00      -6.00      0.00       0.00
Received Power(dBmV@chw)           : -3.00      -6.00      0.00       0.00
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      -6.00
Received Power Delta (dBmV)        : -0.25
Config Received Power(dBmV@chw)    : 0.00
Received Power(dBmV@chw)           : -0.25
Config Received Power(dBmV@1.6MHz) : -6.00
Received Power(dBmV@1.6MHz)        : -6.25
```

```
Associated MIB outputs:
server > snmpwalk -v2c -c <community_string> <cbr8_ip> docsIf3CmtsCmRegStatusMacAddr | grep
 6324229
docsIf3CmtsCmRegStatusMacAddr.6324229 = 90 58 51 5c 9e 3c


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 ?
  <-13 - 25>  Power level in dBmV-total power in PSD 6.4Mhz if base-power-rx-level-1.6Mhz
NOT
             configured(-4~25 for rphy- node, -13~23 for rphy-shelf) [OR] true power adjust
 if
              base-power-rx-level-1_6Mhz configured
```

Configuration With SC-QAM Upstream Channel

```
router(config)#cable upstream controller-profile 499
router(config-controller-profile)#base-power-rx-level-1_6Mhz 10
router(config-controller-profile)# us-channel 0 channel-width 3200000 3200000
router(config-controller-profile)# us-channel 0 docsis-mode atdma
router(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-gened. 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 | 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. The first row in the table above refer to CMTS and RPHY release versions which support TLV 98.3 and the older versions refer to releases which do not have TLV 98.3 support. The example above shows the configuration for the current implementation of **0dBmV/6.4MHz for a 1.6-MHz channel**. This shows how the configured TLV values on the CLI is interpreted and sent to RPD which supports TLV 98.3 for different versions of CBR8.

Table 4:

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	`router(config)#cable upstream controller-profile 499`
	`router(config-controller-profile)#base-power-rx-level-1_6Mhz -6`
	`router(config-controller-profile)#us-channel 0 channel-width 1600000 1600000`
	`router(config-controller-profile)#us-channel 0 power-level 0`
		TLV 98.3 -> -60
		TLV 65.9 -> 0
			The base power value of -6 dbmV per 1.6Mhz translates to 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	`router(config)#cable upstream controller-profile 499`
	`router(config-controller-profile)#us-channel 0 channel-width 1600000 1600000`
	`router(config-controller-profile)#us-channel 0 power-level 0`
		TLV 65.9 -> 0	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://cfnng.cisco.com/ link. An account on the Cisco.com page is not required.

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

Table 5: Feature Information for 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.