DOCSIS 3.1 Upstream Profile Selection

DOCSIS 3.1 introduces the concept of upream profiles for OFDMA channels. This document describes how to configure the DOCSIS 3.1 Upstream Profile Selection on the Cisco cBR Series Converged Broadband Router.

Finding Feature Information

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

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

- Hardware Compatibility Matrix for Cisco cBR Series Routers, page 1
- Information about Upstream Profiles, page 2
- How to Configure Upstream Profiles, page 3
- Feature Information for Upstream Profile Selection, page 4

Hardware Compatibility Matrix for Cisco cBR Series Routers

Note

The hardware components introduced in a given Cisco IOS-XE Release are supported in all subsequent releases unless otherwise specified.
Table 1: Hardware Compatibility Matrix for the Cisco cBR Series Routers

<table>
<thead>
<tr>
<th>Cisco CMTS Platform</th>
<th>Processor Engine</th>
<th>Interface Cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco cBR-8 Converged</td>
<td>Cisco IOS-XE Release 16.5.1 and</td>
<td>Cisco IOS-XE</td>
</tr>
<tr>
<td>Broadband Router</td>
<td>Later Releases</td>
<td>Release 16.5.1</td>
</tr>
<tr>
<td></td>
<td>Cisco cBR-8 Supervisor:</td>
<td>and Later</td>
</tr>
<tr>
<td></td>
<td>• PID—CBR-CCAP-SUP-160G</td>
<td>Releases</td>
</tr>
<tr>
<td></td>
<td>• PID—CBR-CCAP-SUP-60G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PID—CBR-SUP-8X10G-PIC</td>
<td></td>
</tr>
</tbody>
</table>

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-R

Cisco cBR-8 Downstream PHY Modules:

- PID—CBR-D30-DS-MOD
- PID—CBR-D31-DS-MOD

Cisco cBR-8 Upstream PHY Modules:

- PID—CBR-D30-US-MOD
- PID—CBR-D31-US-MOD

Information about Upstream Profiles

A modulation profile is a list of interval usage codes (IUCs) that are defined for an OFDMA channel. Each IUC will have a modulation order and pilot pattern. Multiple IUCs within a modulation profile allow for different modulation orders on the same OFDMA channel. The CMTS can define multiple profiles for use in an OFDMA channel, where the profiles differ in the modulation orders assigned to each minislot.

You can use the following commands to view the profiles:

- To display the profiles associated with the cable modems (CMs), use the `show cable modem [ip-address|mac-address|cable|slot|subslot|cable-interface-index] phy ofdm-profile upstream` command.
- To display detailed profile management data associated with specific cable modem, use the `show cable modem [ip-address|mac-address] prof-mgmt upstream` command.

The CMTS can assign different data IUCs for different groups of CMs.
A DOCSIS 3.1 CM can only have two active OFDMA Upstream Data Profile IUCs on a given channel.
Default Data IUC

Data IUC 13 is intended to be the most robust IUC and able to be used by all cable modems.

Recommended Interval Usage Code (IUC)

Based on the receive modulation error ratio (RxMER) values collected periodically during upstream probing, the CMTS finds among the existing IUCs up to two that provide the highest speed while having sufficient signal to noise ratio (SNR) margin for the CMTS to receive code words with acceptable error rates. The `show cable modem phy ofdm-profile upstream` command displays the one or two recommended IUCs for each CM.

In Cisco IOS XE Everest 16.6.1 release, data IUC 13 will be one of the IUCs assigned to the CM.

To disable the automatic profile downgrade, use `no cable upstream ofdma-prof-mgmt prof-upgrade-auto` command in global configuration mode.

How to Configure Upstream Profiles

Configuring RxMER to Bit Loading Mapping

There are many ways to map the Receive Modulation Error Ratio (RxMER) values to bit loading values. We use the following mapping recommended in DOCSIS 3.1 OSSI, as our baseline mapping:

<table>
<thead>
<tr>
<th>RxMER (in 1/4 DB)</th>
<th>QAM</th>
<th>Bit Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>84</td>
<td>64</td>
<td>6</td>
</tr>
<tr>
<td>96</td>
<td>128</td>
<td>7</td>
</tr>
<tr>
<td>108</td>
<td>256</td>
<td>8</td>
</tr>
<tr>
<td>122</td>
<td>512</td>
<td>9</td>
</tr>
<tr>
<td>136</td>
<td>1024</td>
<td>10</td>
</tr>
<tr>
<td>148</td>
<td>2048</td>
<td>11</td>
</tr>
<tr>
<td>164</td>
<td>4096</td>
<td>12</td>
</tr>
<tr>
<td>184</td>
<td>8192</td>
<td>13</td>
</tr>
<tr>
<td>208</td>
<td>16384</td>
<td>14</td>
</tr>
</tbody>
</table>
To configure a margin to adjust the RxMER to bit loading mapping, use the following command:

```cable upstream ofdma-prof-mgmt mer-margin-qdb interval-in-minutes```

This configured value (quarter-DB) is added to the RxMER values collected by CMTS before using the above mapping table, thus giving a user more control in selecting the recommended profiles.

To specify the percentage of minislot average RxMER that can be ignored in the recommended profile calculation, use the following command:

```cable upstream ofdma-prof-mgmt exempt-mslot-pct percent```

This provides a way to specify the extent that the outliers can be ignored.

To configure the RxMER poll interval, use the following command:

```cable upstream ofdma-prof-mgmt rxmer-poll-interval interval-in-minutes```

The CMTS uses upstream probing to collect RxMER data per CM. This occurs during registration and periodically thereafter. The collected RxMER data is averaged per minislot and used to compute the recommended IUCs for each CM.

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**Feature Information for Upstream Profile Selection**

Use Cisco Feature Navigator to find information about 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 [http://www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

**Note**

The table below lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

**Table 2: Feature Information for Upstream Profile Selection**

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOCSIS3.1 US Profile Selection</td>
<td>Cisco IOS XE Fuji 16.7.1</td>
<td>This feature was integrated into Cisco IOS XE Fuji 16.7.1 on the Cisco cBR Series Converged Broadband Routers.</td>
</tr>
</tbody>
</table>