Upstream Utilization Optimization on the Cisco CMTS Routers

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The Upstream Utilization Optimization feature on the Cisco Cable Modem Termination System (CMTS) provides higher upstream throughput.

Note Cisco IOS Release 12.2(33)SCB integrates support for this feature on the Cisco CMTS routers. This feature is also supported in Cisco IOS Release 12.3BC, and this document contains information that references many legacy documents related to Cisco IOS 12.3BC. In general, any references to Cisco IOS Release 12.3BC also apply to Cisco IOS Release 12.2SC.

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.

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Prerequisites for Upstream Utilization Optimization

You must have Advanced Time Division Multiple Access (A-TDMA)-capable line cards.

For optimum performance, do the following:

- Set the maximum upstream burst on the cable modem to a large number; for example, 28,000 bytes.
- Set the maximum concatenation burst on the cable modem to a large number; for example, 28,000 bytes.
- Set the cable modem upstream maximum traffic burst parameter to a large number (for example, zero means no limit) using the **cable default-phy-burst** command.

The Upstream Utilization Optimization feature is supported on the Cisco CMTS routers in Cisco IOS Release 12.3BC and 12.2SC. The table below shows the hardware compatibility prerequisites for this feature.

Table 1: Upstream Utilization Optimization Hardware Compatibility Matrix

CMTS Platform	Processor Engine	Cable Interface Cards
Cisco uBR10012 Universal Broadband Router	Cisco IOS Release 12.3(23)BC2 • PRE-1 • PRE-2 Cisco IOS Release 12.2(33)SCB • PRE-2 • PRE-4 Cisco IOS Release 12.2(33)SCH and later releases • PRE5	Cisco IOS Release 12.3(23)BC2 • Cisco uBR10-MC5X20S/U/H Cisco IOS Release 12.2(33)SCB • Cisco uBR10-MC5X20S/U/H
Cisco uBR7200 Series Universal Broadband Routers	Cisco IOS Release 12.3(23)BC2 • NPE-G1 Cisco IOS Release 12.2(33)SCB • NPE-G1 • NPE-G2	Cisco IOS Release 12.3(23)BC 2 • Cisco uBR-MC28U/X • Cisco uBR-MC16U/X Cisco IOS Release 12.2(33)SCB • Cisco uBR-MC28U/X • Cisco uBR-MC16U/X

CMTS Platform	Processor Engine	Cable Interface Cards
Cisco uBR7225VXR Universal Broadband Router	Cisco IOS Release 12.2(33)SCB • NPE-G1 • NPE-G2	Cisco IOS Release 12.2(33)SCB • Cisco uBR-E-28U • Cisco uBR-E-16U • Cisco uBR-MC28U/X • Cisco uBR-MC16U/X

Information about Upstream Utilization Optimization

Upstream utilization optimization provides the following benefits and functions on a Cisco CMTS router:

- Group configuration mode enables upstream utilization optimization eligibility on all cable modem upstream flows.
- Local configuration mode enables upstream utilization optimization eligibility on a specific upstream, provides configuration of selective parameters, and provides that local configuration overrides any global configuration.

How to Configure Upstream Utilization Optimization

The following tasks describe how to configure the Upstream Utilization Optimization feature:

Configuring Upstream Utilization Optimization Globally

By default, the Upstream Utilization Optimization feature is turned off. To globally enable upstream utilization optimization, use the **cable upstream rate-adapt** command in global configuration mode. All upstream flows created after this feature is enabled globally are eligible to rate-adapt. Using the **priority** or **rate** option allows you to restrict upstream utilization optimization to service flows that meet or exceed specified levels for priority or rate.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**cable upstream rate-adapt** [**local** | **priority** *value* | **rate** *number*] **Example:** `Router(config)# cable upstream rate-adapt priority 6`	Enables upstream utilization optimization globally on all upstream flows. • **local—**(Optional) Enables upstream utilization optimization eligibility and configuration for a specific upstream flow. • **priority—**(Optional) Enables upstream utilization optimization on flows that meet or exceed a configured priority. The valid range is 0–7. • **rate—**(Optional) Enables upstream utilization optimization on flows that meet or exceed a specified minimum max-rate. The valid range is 0–30000000.

Configuring Upstream Utilization Optimization Locally Per Upstream

To configure a specific local upstream for upstream utilization optimization, use the **cable upstream rate-adapt** command in cable interface configuration mode for a specified upstream flow. You can configure several parameters for specific local upstream utilization optimization. By default, upstream utilization optimization uses the global configuration. However, when rate-adapt is configured on a local upstream, the local configuration parameters override the global configuration parameters.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface cable** **Example:** `Router(config)#: interface cable 4/0/0`	Enters cable interface configuration mode.
Step 4	**cable upstream** *port* **rate-adapt** [**bcs** *slots* | **duration** *millisecs* | **fcms-off** | **priority** *value* | **rate** *number*]	Enables upstream utilization optimization configuration on specific upstream flows. • **bcs—**(Optional) Specifies the number of broadcast contention minislots (BCS). MAPs that have gaps are filled with BCS. By default, 10 BCS slots

	Command or Action	Purpose
	Example: `Router(config-if)# cable upstream 0 rate-adapt priority 6`	are saved. You can override the default of 10 with a larger or smaller number. The valid range is 0–80. The default is 10. • **duration—**(Optional) Enables configuration of the duration of a flow rate-adapt in milliseconds. You can override the default of one second for rate-adapt grants to a flow. A larger or smaller duration can be chosen. The valid range is 0–2000. • **fcms-off—**(Optional) Enables an override to the default forced broadcast contention minislot that follows each filled MAP. By default, fcms is turned on. • **priority—**(Optional) Enables upstream utilization optimization on flows that meet or exceed a configured priority. This overrides a globally configured rate-adapt priority. The valid range is 0–7. • **rate—**(Optional) Enables upstream utilization optimization on flows that meet or exceed a specified minimum max-rate. This overrides a globally configured rate-adapt rate. The valid range is 0–30000000.

Verifying Upstream Utilization Optimization Configuration

To verify the cable upstream utilization optimization configuration for cable modem upstream, use the **show** commands described below.

- To display upstream utilization optimization parameters, use the **show cable rate-adapt** command as shown in the following example. Global upstream utilization optimization is enabled, local upstream utilization optimization is disabled. The duration is 500 and there is no rate or priority configured.

```
router# show cable rate-adapt
show_cable_rate-adapt_command: Global:Enabled Local-Only:Disabled
:maps 500 flags 0x1 priority -1, rate -1 bcs 10 fcms On
```

- To display the upstream utilization optimization settings and the parameters for a specific upstream, use the **show interface cable upstream** command as shown in the following example. On upstream 0, global and local upstream utilization optimization are enabled, the duration is 250, priority is 255, bcs is set to 0, rate is not configured, and the fcms feature is turned off.

```
router# show interface cable 8/0/0 upstream 0 rate-adapt
cmts_rate-adapt_show: Global:Enabled US[0]:Enabled
local:maps 250 pri 255, rate -1 bcs 0 (0) fcms Off
```

- To display service identifier (SID) and upstream utilization optimization information for a service flow, use the **show interface cable sid** command with the **counter** and **verbose** options as shown in the following example. On 8/0/0, upstream utilization optimization is enabled, 35542 rate-adapt requests were received, and there was one piggy-back request received from the upstream.

```
router# show interface cable 8/0/0 sid counters verbose
Sid : 1
Request polls issued : 0
BWReqs {Cont,Pigg,RPoll,Other} : 7, 146975, 0, 0
No grant buf BW request drops : 0
```

```
Rate exceeded BW request drops : 0
Grants issued : 1264300
Packets received : 2199040
Bytes received : 3241369899
rate-adapt : Enabled
rate-adapt {rcvd, Consec-PB} : 35542, 1
Fragment reassembly completed : N/A
Fragment reassembly incomplete : N/A
Concatenated packets received : N/A
Queue-indicator bit statistics : 0 set, 0 granted
Good Codewords rx : 14615740
Corrected Codewords rx : 1
Uncorrectable Codewords rx : 0
Concatenated headers received : 146807
Fragmentation headers received : 1296069
Fragmentation headers discarded: 240
```

Additional References

The following sections provide references related to the Upstream Utilization Optimization feature on the Cisco CMTS routers.

Related Documents

Related Topic	Document Title
Cable commands	*Cisco IOS CMTS Cable Command Reference,* http://www.cisco.com/en/US/docs/ios/cable/command/reference/cbl_book.html
Line card configuration information	• *Configuring the Cisco uBR10-MC5X20U/H Broadband Processing Engine* http://www.cisco.com/en/US/docs/interfaces_modules/cable/broadband_processing_engines/ubr10_mc5x20s_u_h/feature/guide/mc5x20u.html

Related Topic	Document Title
Software configuration information	• *Cisco IOS CMTS Cable Software Configuration Guide, Release 12.2SC* http://www.cisco.com/en/US/docs/ios/cable/configuration/guide/12_2sc/cbl_12_2sc_book.html • *Cisco uBR10012 Universal Broadband Router Software Configuration Guide* (for Cisco IOS Release 12.3BC) http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/configuration/guide/scg.html • *Cisco uBR7200 Series Software Configuration Guide* (for Cisco IOS Release 12.3BC) http://www.cisco.com/en/US/docs/cable/cmts/ubr7200/configuration/guide/cr72scg.html

Technical Assistance

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

Feature Information for Upstream Utilization Optimization

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Note The below table 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 Utilization Optimization

Feature Name	Releases	Feature Information
Upstream Utilization Optimization	12.3(23)BC2	This feature was introduced and provides increased upstream CM throughput. The following commands were introduced or modified: • **cable upstream rate-adapt (global)** • **cable upstream rate-adapt (interface)** • **show cable rate-adapt** • **show interface cable sid** • **show interface cable upstream**
Upstream Utilization Optimization	12.2(33)SCB	This feature was integrated into Cisco IOS Release 12.2(33)SCB.