CHAPTER 21

Upstream Scheduler Mode for the Cisco CMTS

Revised: November 10, 2008, OL-1467-08

This document describes how to configure optional upstream scheduler modes.

With this feature, you are able to select Unsolicited Grant Services (UGS), Real Time Polling Service (rtPS) or Non-Real Time Polling Service (nrtPS) scheduling types, as well as packet-based or Time Divison Multiplex (TDM)-based scheduling. Low latency queueing (LLQ) emulates a packet-mode-like operation over the TDM infrastructure of DOCSIS. As such, the feature provides the typical tradeoff between packets and TDM: with LLQ, the user has more flexibility in defining service parameters for UGS, rtPS or nrtPS, but with no guarantee (other than statistical distribution) regarding parameters such as delay and jitter.

History for the Enhanced DOCSIS Upstream Scheduler Modes Feature

Release	Modification
12.3(13)BC	This feature was introduced.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Note The Cisco uBR7100 series routers have reached end-of-life (EOL).

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Prerequisites for Upstream Scheduler Mode Configuration

This feature applies to all Cisco CMTS routers.

Restrictions for Upstream Scheduler Mode Configuration

Note the following restrictions for this feature:

- To ensure proper operation, Call Admission Control (CAC) must be enabled. When the Low Latency Queueing (LLQ) option is enabled, it is possible for the upstream path to be filled with so many calls that it becomes unusable, making voice quality unacceptable. CAC must be used to limit the number of calls to ensure acceptable voice quality, as well as to ensure traffic other than voice traffic.
- Even if CAC is not enabled, the default (DOCSIS) scheduling mode blocks traffic after a certain number of calls.
- Unsolicited Grant Services with Activity Detection (UGS-AD) is not supported by the Low Latency Queueing scheduler mode but remains supported by the default DOCSIS scheduler mode.

Information About Upstream Scheduler Mode Configuration

With UGS, a service flow is created that allows a cable modem to transmit fixed-size bursts of data at a guaranteed rate and with a guaranteed level of jitter by providing periodic transmission opportunities to the cable modem for fixed-sized frames. This kind of service flow is particularly suitable for VoIP applications.

With rtPS, a service flow is created that allows a periodic opportunity for a cable modem to request permission to transmit data by polling one cable modem for a bandwidth request, rather than all modems. This satisfies applications that have a requirement for real-time data transmission, and allows the cable modem to transmit data bursts of varying length. This kind of service flow is particularly suitable for MPEG VoIP.

With nrtPS, a service flow is created that allows a periodic opportunity for a cable modem to request permission to transmit data by polling one cable modem for a bandwidth request, rather than all modems. The data bursts may be of varying length. This kind of service flow is particularly suitable for non-interactive services such as file transfers.

How to Configure Upstream Scheduler Modes

This section describes the configuration tasks that are most commonly performed when using the upstream scheduler modes feature on the Cisco CMTS platforms.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface cable** *x/y*
   or
   interface cable *x/y/z*

4. **cable upstream** *n* **scheduling type** [**ugs** | **rtps** | **nrtps**] **mode** [**llq** | **docsis**]
5. **cable upstream** *n* **scheduling type** [**ugs** | **rtps** | **nrtps**] **mode** [**llq** | **docsis**]
6. **end**

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** *x/y* or **interface cable** *x/y/z* **Example:** `Router(config)# interface cable 5/1` `Router(config-if)#`	Enters interface configuration mode for the specified cable interface.
Step 4	**cable upstream** *n* **scheduling type** [**ugs** | **rtps** | **nrtps**] **mode** [**llq** | **docsis**] **Example:** `Router(config-if)# cable upstream 4 scheduling type ugs mode llq`	Enables LLQ-type (packet-based) scheduling for UGS services, where *n* specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card. **Note** Any combination of **ugs**, **rtps**, **nrtps**, **llq**, and **docsis** is allowed. The only default value is **docsis**.
Step 5	**cable upstream** *n* **scheduling type** [**ugs** | **rtps** | **nrtps**] **mode** [**llq** | **docsis**] **Example:** `Router(config-if)# cable upstream 4 scheduling type rtps mode docsis`	Enables standard DOCSIS (TDM-based) scheduling scheduling for rtPS services, where *n* specifies the upstream port. Valid values start with 0 for the first upstream port on the cable interface line card. **Note** Any combination of **ugs**, **rtps**, **nrtps**, **llq**, and **docsis** is allowed. The only default value is **docsis**.
Step 6	**end** **Example:** `Router(config-if)# end` `Router#`	Exits interface configuration mode and returns to privileged EXEC mode.

Troubleshooting Tips

To confirm whether the scheduler is operating in LLQ or DOCSIS, mode, use the **show interface cable mac-scheduler** command. A new queue is added when LLQ mode is enabled, as shown below. For the complete syntax of this command, refer to the following document on Cisco.com:

- *Cisco IOS CMTS Cable Command Reference*

  http://www.cisco.com/en/US/docs/ios/cable/command/reference/cbl_book.html

```
Router# show int cab 4/0 mac-sched 0
     DOCSIS 1.1 MAC scheduler for Cable4/0/U0
     Queue[Rng Polls] 0/128, 0 drops, max 1
     Queue[CIR Grants] 0/64, 0 drops, max 0
     Queue[BE(7) Grants] 0/64, 0 drops, max 0
     Queue[BE(6) Grants] 0/64, 0 drops, max 0
     Queue[BE(5) Grants] 0/64, 0 drops, max 0
     Queue[BE(4) Grants] 0/64, 0 drops, max 0
     Queue[BE(3) Grants] 0/64, 0 drops, max 0
     Queue[BE(2) Grants] 0/64, 0 drops, max 0
     Queue[BE(1) Grants] 0/64, 0 drops, max 0
     Queue[BE(0) Grants] 0/64, 0 drops, max 0
     Queue[LLQ Grants] 0/64, 0 drops, max 0   <--- This queue is added in LLQ mode.
     Req Slots 153607143, Req/Data Slots 0
     Init Mtn Slots 1305584, Stn Mtn Slots 145897
     Short Grant Slots 47, Long Grant Slots 2939
     ATDMA Short Grant Slots 0, ATDMA Long Grant Slots 0
     ATDMA UGS Grant Slots 0
     Awacs Slots 0
     Fragmentation count 3
     Fragmentation test disabled
     Avg upstream channel utilization : 0%
     Avg percent contention slots : 98%
     Avg percent initial ranging slots : 1%
     Avg percent minislots lost on late MAPs : 0%
     Sched Table Adm-State: Grants 0, Reqpolls 0, Util 1%
     UGS    : 0 SIDs, Reservation-level in bps 0
     UGS-AD : 0 SIDs, Reservation-level in bps 0
     RTPS   : 0 SIDs, Reservation-level in bps 0
     NRTPS  : 0 SIDs, Reservation-level in bps 0
     BE     : 2 SIDs, Reservation-level in bps 0
     r4k ticks in 1ms 131000
     Total scheduling events 0
     No search was needed 0
     Previous entry free 0
     Next entry free0
     Could not schedule 0
     Recovery failed 0
Curr time 8282 entry 90
Router#
```

Additional References

The following sections provide references related to the Cisco CMTS routers. Related Documents

Related Documents

Related Topic	Document Title
Cisco CMTS command reference	*Cisco IOS CMTSCable Command Reference,* at the following URL: http://www.cisco.com/en/US/docs/ios/cable/command/reference/cbl_book.html
Cisco IOS Release 12.2 configuration guide	Cisco IOS Release 12.2 Configuration Guides References, at the following URL: http://www.cisco.com/en/US/products/sw/iosswrel/ps1835/products_installation_and_configuration_guides_list.html
Cisco IOS Release 12.2 command reference	Cisco IOS Release 12.2 Command References, at the following URL: http://www.cisco.com/en/US/products/sw/iosswrel/ps1835/prod_command_reference_list.html
Configuring cable features	*Cisco CMTS Feature Guide*, at the following URL: http://www.cisco.com/en/US/docs/cable/cmts/feature/guide/cmtsfg.html
Installing and configuring Cisco uBR7100 Series Universal Broadband Routers	Cisco uBR7100 Universal Broadband Routers, at the following URL: http://www.cisco.com/en/US/products/hw/cable/ps2211/tsd_products_support_eol_series_home.html
Installing and configuring Cisco uBR7200 Series Universal Broadband Routers	Cisco uBR7200 Universal Broadband Routers, at the following URL: http://www.cisco.com/en/US/products/hw/cable/ps2217/tsd_products_support_series_home.html
Installing and configuring the Cisco uBR10012 Router	Cisco uBR10012 Universal Broadband Router, at the following URL: http://www.cisco.com/en/US/products/hw/cable/ps2209/index.html

Standards

Standard	Title
DOCSIS	*Data-Over-Cable Service Interface Specifications, DOCSIS 2.0, Radio Frequency Interface Specification, CM-SP-RFIv2.0-I08-050408*

MIBs

No new or modified MIBs are supported by this feature.

RFCs

No new or modified RFCs are supported by this feature.

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/cisco/web/support/index.html