Upstream Scheduler Mode

This document describes how to configure optional upstream (US) scheduler modes.

With this feature, you can 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 Division Multiplex (TDM) based scheduling. Low latency queuing (LLQ) emulates a packet-mode-like operation over the TDM infrastructure of DOCSIS. As such, the feature provides the typical trade-off between packets and TDM. With LLQ, you have 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.

Finding Feature Information

Finding Feature Information

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

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 • PID—CBR-CCAP-SUP-60G • PID—CBR-SUP-8X10G-PIC	**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 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

Restrictions for Upstream Scheduler Mode

• To ensure proper operation, Interface-based Admission Control must be enabled. When the 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. Interface-based admission control 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 Interface-based admission control is not enabled, the default (DOCSIS)scheduling mode blocks traffic after a certain number of calls.

• UGS with Activity Detection (UGS-AD) is not supported by the LLQ scheduler mode but remains supported by the default DOCSIS scheduler mode.

Information About Upstream Scheduler Mode for the Cisco CMTS Routers

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

The rtPS requests, by default, are internally treated as priority 7—the highest priority for all Best Effort traffic. This high priority reduces the latency of rtPS traffic under congestion.

With nrtPS, a service flow is created that provides a periodic opportunity for a cable modem to request permission to transmit data by polling a single cable modem for a bandwidth request, rather than all the cable 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

Procedure

	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	Use one the following commands:
	
	   • **interface cable** *slot/subslot/port*
	
	   • **interface cable** *slot/port*
	
	Example:
	Router(config)# **interface cable 7/0/1**
		Enters interface configuration mode for the specified cable interface.

Step 4	**cable upstream** *n* **scheduling type ugs mode** [**llq** | **docsis**] **Example:**	Enables LLQ-type (packet-based) scheduling for UGS services.

	Command or Action	Purpose		
	Router(config-if)# **cable upstream 4 scheduling type ugs mode llq**	**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 rtps mode** [**llq** | **docsis**] **Example:** Router(config-if)# **cable upstream 4 scheduling type rtps mode docsis**	Enables standard DOCSIS (TDM-based) scheduling for rtPS services. **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**	Exits interface configuration mode and returns to privileged EXEC mode.		

What to do next

To confirm whether the scheduler is operating in DOCSIS mode, use the **show interface cable mac-scheduler** command.

```
Router# show interface cable 7/0/1 mac-scheduler 0
    DOCSIS 1.1 MAC scheduler for Cable7/0/1/U0 : rate 30720000
    wfq:None
    us_balance:OFF
    fairness:OFF
    Queue[Rng Polls] flows 0
    Queue[CIR Grants] flows 0
    Queue[BE(07) Grants] flows 0
    Queue[BE(06) Grants] flows 0
    Queue[BE(05) Grants] flows 0
    Queue[BE(04) Grants] flows 0
    Queue[BE(03) Grants] flows 0
    Queue[BE(02) Grants] flows 0
    Queue[BE(01) Grants] flows 0
    Queue[BE(00) Grants] flows 0
    Req Slots 2601578997, Req/Data Slots 4484512
    Init Mtn Slots 38265829, Stn Mtn Slots 78753
    Short Grant Slots 0, Long Grant Slots 0
    Adv Phy Short Grant Slots 412, Adv Phy Long Grant Slots 5519087
    Adv Phy UGS Grant Slots 0
    Avg upstream channel utilization : 1%
    Avg percent contention slots : 98%
    Avg percent initial ranging slots : 1%
    Avg percent minislots lost on late MAPs : 0%

    MAP TSS: lch_state 9, init_retries 0
            late_initial_maps 0, late_ucd_maps 0
            mac-phy tss errors 0, missed ccc 0
```

Additional References

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

Related Documents

Related Topic	Document Title
Cisco CMTS command reference	*Cisco CMTS Cable Command Reference* http://www.cisco.com/c/en/us/td/docs/cable/cmts/cmd_ref/b_cmts_cable_cmd_ref.

Standards

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

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Upstream Scheduler Mode

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 2: Feature Information for Upstream Scheduler Mode

Feature Name	Releases	Feature Information
Upstream Scheduler Mode	Cisco IOS XE Fuji 16.7.1	This feature was integrated on the Cisco cBR Series Converged Broadband Routers.

Feature Information for Upstream Scheduler Mode