



Dynamic Bandwidth Sharing on the Cisco CMTS Router

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The Cable Modem Termination Service (CMTS) new feature enables dynamic bandwidth sharing (DBS) on modular cable and wideband cable interfaces.

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 see a list of the releases in which each feature is supported, see the [“Feature Information for CMTS Dynamic Bandwidth Sharing”](#) section on page 11.

Use Cisco Feature Navigator to find information about platform support and Cisco IOS, Catalyst OS, and Cisco IOS XE software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required

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Prerequisites for CMTS Dynamic Bandwidth Sharing

Table 1 shows the hardware compatibility prerequisites for the Dynamic Bandwidth Sharing on the Cisco CMTS Router feature.

Table 1 Cable Hardware Compatibility Matrix for CMTS Dynamic Bandwidth Sharing

CMTS Platform	Processor Engine	Cable Interface Line Cards
Cisco uBR10012 Universal Broadband Router	Cisco IOS Release 12.3(23)BC1 or later <ul style="list-style-type: none"> • PRE2 Cisco IOS Release 12.2(33)SCB or later <ul style="list-style-type: none"> • PRE2 • PRE4 	Cisco uBR10-MC5X20S/U/H

Restrictions for CMTS Dynamic Bandwidth Sharing

- DBS is not supported on the Cisco uBR7200 series universal broadband routers.
- The bandwidth sharing state of a modular cable (MC) or wideband cable interface can be changed only when the interface is administratively down.
- Dynamic MC interfaces do not support interface utilization-based load balancing.

Information About CMTS Dynamic Bandwidth Sharing

DBS can be enabled on wideband or modular cable interfaces. The benefits of DBS are:

- [DBS for Wideband and Modular Cable Interfaces, page 2](#)
- [DBS Configuration, page 3](#)

DBS for Wideband and Modular Cable Interfaces

Prior to DOCSIS 3.0 standards, cable service flows were associated with a single cable interface, which in turn corresponded to a physical downstream on a line card. Under DOCSIS 3.0 standards, cable service flows can be associated with more than one downstream channel. Dynamic bandwidth sharing (DBS) is the dynamic allocation of bandwidth for wideband (WB) and modular cable (MC) interfaces sharing the same downstream channel. The bandwidth available to each WB, MC, or narrowband channel is not a fixed value—it depends on the configuration and the traffic load on the WB or MC. DBS enables high burst rates with DOCSIS 2.0 cable modems as well as DOCSIS 3.0 cable modems. The DBS feature continues working across line card and performance routing engine (PRE) switchovers with no loss of functionality.

DBS Configuration

Dynamic bandwidth sharing is achieved using a new type of modality called a link queue. Link queues represent a specific share of bandwidth on a particular channel. Link queues are only used to calculate the effective bandwidth of a channel, and such link queues are activated and deactivated according to the state of activity on a specific channel.

Dynamic bandwidth sharing and static bandwidth allocations are configured at the WB or MC interface level. By default, bandwidth for a WB or MC channel is statically allocated. When DBS is enabled on an interface, the static bandwidth percentage is converted to a committed information rate (CIR) value for the corresponding link queue. The interface CIR value represents the guaranteed portion of the interface bandwidth and is used for admission control of the service flows with minimum reserved rate. When DBS is enabled, you can also specify the remaining ratio value of the excess bandwidth for the link queue. If DBS is enabled and no bandwidth percentage is specified, no bandwidth is reserved for the WB or MC interface and the interface is effectively in protocol down state where link queues are not created.

Dynamic bandwidth sharing does not preclude static bandwidth configuration. If a static portion of bandwidth is configured on any radio frequency (RF) channel that one or more DBS-enabled channel utilizes, that portion is subtracted from the RF link's CIR. Therefore, such a portion is always reserved and is not available to dynamic WB or MC interfaces.

How to Configure CMTS Dynamic Bandwidth Sharing

This section contains the following procedures:

- [Configuring DBS for a Modular Cable Interface, page 3](#)
- [Configuring DBS for a Wideband Cable Interface, page 4](#)
- [Verifying Configuration of DBS, page 7](#)
- [Enabling DBS Debug, page 7](#)

Configuring DBS for a Modular Cable Interface

To configure DBS for an MC interface use the **cable dynamic-bw-sharing** command in interface configuration mode.

**Note**

The interface must be administratively down before DBS can be configured on the MC interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface modular-cable *x/y/z:w***
4. **shutdown**
5. **cable dynamic-bw-sharing**
6. **no shutdown**

7. `cable rf-bandwidth-percent percent-value [remaining ratio excess-value]`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.
Step 3	<code>interface modular-cable x/y/z:w</code> Example: Router(config)# interface modular-cable 1/0/0:1	Configures a modular cable interface.
Step 4	<code>shutdown</code> Example: Router(config-if)# shutdown	Shuts down the interface selected in Step 3 prior to configuring dynamic bandwidth sharing.
Step 5	<code>cable dynamic-bw-sharing</code> Example: Router(config-if)# cable dynamic-bw-sharing	Enables dynamic bandwidth sharing (DBS) on the modular cable interface.
Step 6	<code>no shutdown</code> Example: Router(config-if)# no shutdown	Enables the interface on which dynamic bandwidth sharing is configured.
Step 7	<code>cable rf-bandwidth-percent percent-value [remaining ratio excess-value]</code> Example: Router(config-if)# cable rf-bandwidth-percent 45 remaining ratio 22	Enables either static or dynamic bandwidth sharing for modular cable interfaces. The default <i>percent-value</i> is 0. The <i>percent-value</i> range is 1–96. <ul style="list-style-type: none">If dynamic bandwidth sharing is enabled, the remaining ratio option is available. The bandwidth percentage is converted to a committed information rate (CIR) value for the corresponding link queue.The <i>excess-value</i> argument specifies the ratio of the excess bandwidth that can be allocated to the modular cable channel. The default <i>excess-value</i> is 1. The <i>excess-value</i> range is 1–100.

Configuring DBS for a Wideband Cable Interface

To configure DBS for a wideband cable interface use the `cable dynamic-bw-sharing` command in interface configuration mode for WB cable.

**Note**

The interface must be administratively down before DBS can be configured on the wideband cable interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface wideband-cable *x/y/z:w***
4. **shutdown**
5. **cable dynamic-bw-sharing**
6. **no shutdown**
7. **cable rf-channel *rf-port* [**bandwidth-percent *bw-percent***] [**remaining ratio *excess-value***]**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface wideband-cable <i>x/y/z:w</i> Example: Router(config)# interface wideband-cable 1/0/0:0	Configures a wideband cable interface.
Step 4	shutdown Example: Router(config-if)# shutdown	Shuts down the interface selected in Step 3 prior to configuring dynamic bandwidth sharing.
Step 5	cable dynamic-bw-sharing Example: Router(config-if)# cable dynamic-bw-sharing	Enables dynamic bandwidth sharing (DBS) on the wideband cable interface.

	Command or Action	Purpose
Step 6	<p>no shutdown</p> <p>Example: Router(config-if)# no shutdown</p>	Enables the interface on which dynamic bandwidth sharing is configured.
Step 7	<p>cable rf-channel <i>rf-port</i> [bandwidth-percent <i>bw-percent</i>] [remaining ratio <i>excess-value</i>]</p> <p>Example: Router(config-if)# cable rf-channel 10 bandwidth-percent 50 remaining-ratio 5</p>	Associates an RF channel on a Wideband SPA with a wideband channel and allocates bandwidth. The range for bandwidth-percent is 1–100. If bandwidth-percent is not used, the default bandwidth value is 100 percent. The remaining-ratio option is only available if DBS is enabled. The default <i>excess-value</i> is 1. The range for <i>excess-value</i> is 1–100.

Verifying Configuration of DBS

To verify the configuration of the CMTS DBS, use the **show** commands described below.

- To show the Versatile Traffic Management System (VTMS) link of an RF channel and its link queues, use the **show pxf cable controller** command as shown in the following example:

```
Router# show pxf cable controller modular-cable 1/0/0 rf-channel 3 link-queues
Link ID is 32259
      link next_send:    0x00000000    channel number:    0
      temporary bgbw:    0x00000000    reserved bgbw:    0x00000000
col.6 link bandwidth mult: 55778                                shift:    18
col.7 link bandwidth mult: 55778                                shift:    18
      link aggregate cir: 0x00000000    aggregate eir:    0x00000000
      bw reclaimed/trunc eir:    0/0            link cir_max:    0xFFFF
      link cir_sum:    70                link eir_sum:    2
      link bw_sum:    0                act. link q num:    0

Link Queues :
  QID  CIR(act/conf)      EIR      MIR      WB Chan.  Status
   420  13107/13107         1/1      65535/65535    0      Inactive
   423  32768/32768         1/1      65535/65535    2      Inactive
```

- To show the parallel express forwarding (PXF) queuing and link queue statistics, use the **show pxf cpu queue** command for either modular cable or wideband cable interfaces as shown in the following examples:

Modular cable interface

```
Router(config)# interface modular-cable 1/0/0:1
...
Router(config-if)# cable dynamic-bw-sharing
...
Router# show pxf cpu queue modular-cable 1/0/0:1

Link Queues :
  QID  CIR(act/conf)      EIR      MIR      RF Chan.  Status
   420  19661/19661         1/1      65535/65535    0      Inactive
```

Wideband cable interface

```
Router(config)# interface wideband-cable 1/0/0:0
...
Router(config-if)# cable dynamic-bw-sharing
...
Router# show pxf cpu queue wideband-cable 1/0/0:0

Link Queues :
  QID  CIR(act/conf)      EIR      MIR      RF Chan.  Status
   419  32768/32768         1/1      65535/65535    0      Inactive
   566  19661/19661         1/1      65535/65535    1      Inactive
```

Enabling DBS Debug

To enable specific DBS debug output, use the **debug cr10k-rp dbs-queue** command as shown in the following example:

```
Router# debug cr10k-rp dbs-queue
CR10K RP debug dynamic BG link queue setup debugging is on
```

**Note**

Routine use of the **debug cr10k-rp dbs-queue** command is not recommended. If you require further information, contact Cisco technical assistance at <http://www.cisco.com/techsupport>.

Configuration Examples for CMTS Dynamic Bandwidth Sharing

This section provides the following configuration examples:

- [Configuring DBS on a Modular Cable Interface: Example, page 8](#)
- [Configuring DBS on a Wideband Cable Interface: Example, page 8](#)

Configuring DBS on a Modular Cable Interface: Example

In the following example, DBS is enabled on modular cable interface 1. Because DBS is enabled, the percent value is converted to a committed information rate (CIR) of 45, which means the modular cable channel is guaranteed 45 percent of the bandwidth. The ratio of excess bandwidth is assigned a value of 22, which means that if there is excess bandwidth available, a remaining ratio of 22 can be assigned to the MC channel.

```
configure terminal
interface modular-cable 1/0/0:1
shutdown
cable dynamic-bw-sharing
no shutdown
cable rf-bandwidth-percent 45 remaining ratio 22
```

Configuring DBS on a Wideband Cable Interface: Example

In the following example, DBS is enabled on wideband channel 0. Because DBS is enabled, the percent value is converted to a CIR value of 50, which means the wideband cable channel is guaranteed 50 percent of the bandwidth. The *excess-value* is assigned a value of 5, which means that if there is excess bandwidth available, a remaining ratio of 5 can be assigned to the wideband channel.

```
configure terminal
interface wideband-cable 1/0/0:0
shutdown
cable dynamic-bw-sharing
no shutdown
cable rf-channel 10 bandwidth-percent 50 remaining ratio 5
```

Where to Go Next

For further information on the commands required to configure, maintain, and troubleshoot Cisco uBR10012 universal broadband router and Cisco cable modems, see the *Cisco IOS CMTS Cable Command Reference* at:

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

Additional References

The following sections provide references related to the CMTS Dynamic Bandwidth Sharing.

Related Documents

Related Topic	Document Title
Cisco IOS CMTS cable commands	See the <i>Cisco IOS CMTS Cable Command Reference</i> at: http://www.cisco.com/en/US/docs/ios/cable/command/reference/cmts_cable_cref_wrapper.html

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>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.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<p>http://www.cisco.com/techsupport</p>

Feature Information for CMTS Dynamic Bandwidth Sharing

Table 2 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.



Note

Table 2 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release. Unless noted otherwise, subsequent releases of that Cisco IOS software release also support that feature.

Table 2 Feature Information for CMTS Dynamic Bandwidth Sharing

Feature Name	Releases	Feature Information
CMTS Dynamic Bandwidth Sharing	12.3(23)BC1	<p>The CMTS new feature enables dynamic bandwidth sharing on a modular cable or wideband cable interface.</p> <p>The following commands were introduced or modified by this feature:</p> <ul style="list-style-type: none"> • cable dynamic-bw-sharing • cable rf-bandwidth-percent • cable rf-channel • debug cr10k-rp dbs-queue • show pxf cable controller • show pxf cpu queue

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