Downstream Channel ID Assignment on the Cisco CMTS Routers

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The DOCSIS downstream channel ID (DCID) is defined as an 8-bit identifier for recognizing a Downstream Channel within a MAC Domain. All CMTS downstream channels are assigned a DCID by default that may be subsequently changed by configuration. It is used in most DOCSIS downstream packet headers and its valid range is from 1 to 255 (0 is reserved for network management purposes).

Note All downstream channels in a MAC domain must have a unique DCID within the MAC domain.

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 Downstream Channel ID Assignment on the Cisco CMTS Routers

The table below shows the hardware compatibility matrix for this feature.

Note   The hardware components introduced in a particular Cisco IOS Release are supported in all subsequent releases unless otherwise specified.

Table 1: Downstream Channel ID Assignment - Hardware Compatibility Matrix

CMTS Platform	Processor Engine	Cable Interface Cards
Cisco uBR10012 Universal Broadband Router	Cisco IOS Release 12.2(33)SCA and later releases • PRE2 Cisco IOS Release 12.2(33)SCB and later releases • PRE4 Cisco IOS Release 12.2(33)SCH and later releases • PRE5	Cisco IOS Release 12.2(33)SCA and later releases • Cisco uBR10-MC5X20S/U/H Cisco IOS Release 12.2(33)SCC and later releases • Cisco UBR-MC20X20V Cisco IOS Release 12.2(33)SCE and later releases • Cisco uBR-MC3GX60V [1]
Cisco uBR7246VXR Universal Broadband Router	Cisco IOS Release 12.2(33)SCA and later releases • NPE-G1 • NPE-G2	Cisco IOS Release 12.2(33)SCA and later releases • Cisco uBR-MC28U/X Cisco IOS Release 12.2(33)SCD and later releases • Cisco uBR-MC88V [2]

CMTS Platform	Processor Engine	Cable Interface Cards
Cisco uBR7225VXR Universal Broadband Router	Cisco IOS Release 12.2(33)SCA and later releases • NPE-G1 Cisco IOS Release 12.2(33)SCB and later releases • NPE-G2	Cisco IOS Release 12.2(33)SCA and later releases • Cisco uBR-E-28U • Cisco uBR-E-16U • Cisco uBR-MC28U/X Cisco IOS Release 12.2(33)SCD and later releases • Cisco uBR-MC88V 2

1 The Cisco uBR-MC3GX60V cable interface line card is not compatible with PRE2.

2 The Cisco uBR-MC88V cable interface line card is compatible only with NPE-G2, and not with NPE-G1.

Information About Downstream Channel ID Assignment on the Cisco CMTS Routers

These are the downstream channel ID assignment features in the Cisco IOS Release 12.2(33)SCB and later releases:

• DCID uniqueness is provided by keeping the wideband SPA DCID range unique compared to the MAC domain host card range.

• Unique DCIDs are provided for all channels within controllers, such as the wideband SPA bay controller, Cisco uBR-MC2020V controller, Cisco uBR-MC88V controller, and Cisco uBR-MC3GX60V controller.

Note All DCIDs for all controllers on a card need not be unique, since channels from multiple controllers are most likely parts of different fiber nodes. DCIDs need to be unique only for default downstream channel ID assignments. With automatic Channel ID assignment, channel IDs may repeat within a controller depending on the fiber node configuration.

• Redundancy schemes are allowed where downstream channels from different cable interface line cards are bound to the same fiber node. If one card fails, cable modems are able to lock to a frequency on a channel from the other line card. Since DCID uniqueness is enforced for channels in a fibre node, channels from both line cards should have unique DCIDs.

• ID assignment for the Cisco uBR7225 universal broadband router with a line card in slot 1 begins at DCID 1 on slot 1 and for the Cisco uBR7246 universal broadband router, which begins with cable line card slots at slot 3, the ID assignment begins with DCID 1 on slot 3. A Cisco uBR10012 router begins assigning IDs with channel 1 at slot 5 and SPA slots follow as described in .

Note   You can configure the DCIDs manually to suit your plant floor layout requirements.

- In the Cisco uBR-MC3GX60V cable line card where the channel count on the router is 576, with eight Cisco uBR-MC3GX60V line cards, or even greater if the router also includes Wideband SPAs, there is no slot-based default channel ID scheme that would avoid potential channel ID conflicts.

  The Manual DCID scheme was introduced in the Cisco IOS Release 12.2(33)SCB1 and the automatic DCID that includes the Cisco uBR-MC3GX60V line card, was introduced in Cisco IOS Release 12.2(33)SCE.

Manual Downstream Channel ID Assignment on the Cisco CMTS Routers

For the Cisco uBR10-MC5x20 cable interface line card, the manual downstream channel ID is configured on the cable interface. For controller-based line cards, such as Cisco Wideband SPA, Cisco UBR-MC20X20V, Cisco uBR-MC88V and Cisco uBR-MC3GX60V, the manual downstream channel ID is configured in the controller per RF channel.

The tables below describe the DCID scheme per subslot:

Table 2: Downstream Channel ID Per Subslot Scheme

	8/1	8/0	7/1	7/0	6/1	6/0	5/1	5/0	slot 3	slot 1
SPA Bay 0									217-240	193-216
SPA Bay 1									217-240	193-216
SPA Bay 2									217-240	193-216
SPA Bay 3									217-240	193-216
uBR-MC520 DS/0	169	145	121	97	73	49	25	1		
uBR-MC520 DS/1	173	149	125	101	77	53	29	5		
uBR-MC520 DS/2	177	153	129	105	81	57	33	9		
uBR-MC520 DS/3	181	157	133	109	85	61	37	13		
uBR-MC520 DS/4	185	161	137	113	89	65	41	7		
uBR-MC2020V	169-188	145-164	121-140	97-116	73-92	49-68	25-44	1-20		

	8/1	8/0	7/1	7/0	6/1	6/0	5/1	5/0	slot 3	slot 1
uBR-MC3GX60V controller 0	73-96	1-24	73-96	1-24	73-96	1-24	73-96	1-24		
uBR-MC3GX60V controller 1	97-120	25-48	97-120	25-48	97-120	25-48	97-120	25-48		
uBR-MC3GX60V controller 2	121-144	49-72	121-144	49-72	121-144	49-72	121-144	49-72		

Table 3: Downstream Channel ID Per Subslot Scheme - Cisco IOS Release 12.3(23)BCx

	8/1	8/0	7/1	7/0	6/1	6/0	5/1	5/0	slot 3	slot 1
SPA Bay 0									24- 47	24-47
SPA Bay 1									48-71	48-71
uBR-MC520	188-192	180-184	168-172	160-164	148-152	140-144	128-132	120-124		

Automatic Downstream Channel ID Assignment on the Cisco CMTS Routers

Starting with Cisco IOS Release 12.2(33)SCE, it is possible to automatically assign a unique set of downstream channel IDs to meet all DOCSIS requirements. However, DCIDs are assigned automatically at the fiber node, therefore only those deployments that use fiber node configuration can use automatic DCID assignment.

DCID is computed automatically as channels are added to the fiber nodes.

Note Automatic DCID assignment is not supported on the Cisco uBR7225 and Cisco uBR7246 universal broadband routers.

Service Impact

Changing the DOCSIS downstream channel ID causes cable modems to re-register. Cable modems receive MAC Domain Descriptor (MDD) and Upstream Channel Descriptor (UCD) messages with a changed DCID in their headers.

- Enabling the automatic DCID assignment displays the following message:

```
WARNING: Enabling automatic DCID assignment will cause modems to flap and will apply
to all fiber nodes on this CMTS.
```

- Disabling the automatic DCID assignment displays the following message:

```
WARNING: Disabling automatic DCID assignment will no longer enforce channel-id uniqueness
 at fiber nodes. Channel ID changes may require manual verification to prevent conflicts.
```

- If there is a DCID conflict with another channel in the MAC Domain, the following error message is displayed:

```
ERROR: <slot>/<subslot>/<controller> rf-channel <channel>: The downstream channel id
conflicts with interface Mo<slot>/<subslot>/<controller>:channel. Downstream channel
id must be unique in a CGD.
```

- After automatic DCID assignment is configured, if there is a DCID conflict when a downstream channel that belongs to a fiber node is added to a MAC Domain, the automatic DCID feature tries to resolve the conflict by assigning another automatic DCID and the following message is displayed:

```
WARNING: The downstream channel id conflict for <slot>/<subslot>/<controller> rf-channel
 <channel> was resolved by Automatic DCID Assignment.
Please run "interface <md-slot>/<md-subslot>/<md-index>" followed by
"<slot>/<subslot>/<controller> rf-channel <channel>" again in order to add the channel.
```

To add the channel, use this channel grouping domain (CGD) command again:

cable downstream *x/y/z* **rf-channel** *channel*

> **Note** The resolved DCIDs may conflict with the other existing channels in the MAC Domain.

- If automatic DCID is configured and the channel does not belong to a fiber node, or if automatic DCID cannot resolve the conflict, the following message is displayed:

```
WARNING: The downstream channel id conflict for <slot>/<subslot>/<controller> rf-channel
 <channel> could not be resolved by Automatic DCID Assignment.
```
To resolve this issue, add the channel to a fiber node.

How to Configure Downstream Channel ID Assignment on the Cisco CMTS Routers

The following sections describe how to configure downstream channel ID assignment.

Configuring Manual Downstream Channel ID Assignment

> **Restriction**
> - Shared bonding groups on the Cisco uBR-MC2020V do not require DCID user-renumbering intervention. However, SPA-based shared bonding groups may require renumbering using the range from 241 to 255. Shared bonding groups on the Cisco uBR-MC3GX60V require DCID user-renumbering if the shared bonding group and the modems data bonding group are on the same line card.
>
>   - The DCID for a channel on a working line card must be carried forward to the channel on the protect line card upon failover. The opposite is true for revert.

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** *slot*/*subslot*/*port* **Example:** `Router(config)# ` **`interface cable 6/0/1`**	Enters interface configuration mode for the Channel Grouping Domain host line card.
Step 4	**cable downstream-channel-id** *id* **Example:** `Router(config-if)# ` **`cable downstream channel-id 44`**	Configures the downstream channel ID.

Configuring Automatic Downstream Channel ID Assignment

Automatic DCID assignment should be permanently configured. However, if you need to remove the feature, use the **no** or **default** commands.

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Note   The **no** or **default** form of the command is not written to startup-config file.

In this case, the DCIDs are retained as computed for all channels, and are not set to the defaults of the channels. Save the configuration containing the newly-assigned DCIDs to the startup-config file by using the **write memory** command.

When you enable automatic DCID assignment, any DCID conflict arising due to adding a channel in a fiber-node is resolved automatically.

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Restriction
- After running the **cable downstream-channel-id automatic** command in the configuration, manually editing the configuration file in an editor to add RF channels to the fiber nodes could cause DCID conflicts. The feature assumes all channels in fiber nodes have unique automatic DCIDs in global configuration mode. If the configuration is manually edited and the feature does not verify the unique DCIDs, the DCIDs of the newly-added channels may conflict with those of the existing channels. To fix any DCID conflicts, undo and re-apply the global automatic DCID configuration.

✎

Note   Re-applying global automatic DCID configuration is a disruptive operation.

To avoid DCID conflicts, edit the configuration to configure the fiber nodes, then run the **cable downstream-channel-id automatic** command so all channels have unique automatic DCIDs.

Make additions to the fiber nodes on the Cisco uBR10012 router command line interface with the automatic DCID configured.

- The **cable downstream-channel-id automatic** command can be configured only on the Cisco uBR10012 universal broadband router.

- The **cable downstream-channel-id automatic** command should not be manually edited in to the startup-config file, since it does not guarantee unique DCIDs for channels in the fiber node.

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	**cable downstream-channel-id automatic** **Example:** Router(config)# **cable downstream-channel-id automatic**	Specifies automatic assignment of the DCIDs by the Cisco CMTS.

Example

This example displays the restriction on manually editing configurations:

```
Router# show run | include automatic
cable downstream-channel-id automatic

Router# show cable fiber-node 3
```

```
--------------------------------------------------------------------------------
Fiber-Node 3
Channel(s) : downstream Modular-Cable 1/1/0: 0
Channel ID(s): 3
Channel : downstream Cable 6/1/0
Channel ID : 1
upstream Cable 6/1: 0-3
FN Config Status: Configured (status flags = 0x01)
MDD Status: Valid
router#
```

If you manually edit the startup-config file in an editor to add a downstream channel, for example, 5/0/0 rf-channel 0, from a newly-added line card, 5/0, it causes a conflict.

```
Router> configure terminal
Router# cable fiber-node 3
Router# downstream Modular-Cable 5/0/0 rf-channel 0
```

If this downstream channel is added on the Cisco uBR10012 router, the automatic DCID assignment feature automatically resolves it. However, since the startup-config file was manually edited to add the downstream channel, the automatic DCID assignment feature is unable to resolve it. This causes a DCID conflict when the edited startup-config file is loaded on the Cisco uBR10012 router and invalidates the fiber node.

```
down Modular-Cable 5/0/0 rf-channel 0
Fiber node 3 is invalid for:
DS frequency is not unique.
DS channel id is not unique.
Warning: D3.0 CMs cannot get w-online with an invalid fiber-node.
router#
```

What to Do Next

Run the **show cable fibernode** command to view DCIDs assigned to all the channels in the fiber node.

```
Router# show cable fiber-node 5
Fiber-Node         Config Status
Fiber-Node 5
   Description: Interface c5/0/4
   Channels                      DOCSIS Channel-IDs
 ----------------------------------------------------
     Modular-Cable 3/3/0:  1-3     2,3,4
     Cable 5/0/4       1
   FN Config Status: Configured (status flags = 0x01)
   MDD Status: Valid
```

Additional References

Related Documents

Related Topic	Document Title
CMTS Command Reference	Cisco IOS CMTS Cable Command Reference, at the following URL: http://www.cisco.com/en/US/docs/ios/cable/command/reference/cbl_book.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 Downstream Channel ID Assignment on the Cisco CMTS Routers

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://tools.cisco.com/ITDIT/CFN/. An account on http://www.cisco.com/ is not required.

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 4: Feature Information for Downstream Channel ID Assignment on the Cisco CMTS Routers

Feature Name	Releases	Feature Information
Downstream Channel ID Assignment on the Cisco CMTS Routers	12.2(33)SCE	This feature was introduced.