DOCSIS Interface and Fiber Node Configuration

Hardware Compatibility Matrix for Cisco cBR Series Routers

Note The hardware components 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 3.15.0S and Later Releases** Cisco cBR-8 Supervisor : • PID—CBR-CCAP-SUP-160G • PID—CBR-CCAP-SUP-60G[1] • PID—CBR-SUP-8X10G-PIC	**Cisco IOS-XE Release 3.15.0S 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 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

[1] Effective with Cisco IOS-XE Release 3.17.0S, CBR-CCAP-SUP-60G supports 8 cable line cards. The total traffic rate is limited to 60Gbps, the total number of downstream service flow is limited to 72268, and downstream unicast low-latency flow does not count against the limits.

Overview of DOCSIS Interfaces and Fiber Node Configurations

The Interface line card used in the Cisco cBR chassis is an integrated line card that has two downstream modules and one upstream module. The line cards support DOCSIS 3.0 features including downstream bonding groups, and upstream bonding groups.

Downstream Features

Physically, the DS (downstream) modules support eight physical connectors or ports. The DS modules support the following features:

- The DS modules support eight downstream integrated-cable controllers for these eight ports. Each downstream integrated-cable controller is associated with an RF port.
- Each downstream controller supports up to 128 downstream channels (0-127).
- Each downstream controller can be configured with 128 integrated-cable interfaces. Therefore, each line card has 1024 integrated-cable interfaces.
- Each integrated-cable interface has a static mapping to an integrated-cable controller RF channel. For example, Integrated-Cable interface 3/0/0:0 is mapped to RF Channel 0 on Integrated-Cable controller 3/0/0.

- 768 downstream DOCSIS channels may be configured on each line card.
- A total of 512 wideband-cable interfaces (downstream bonding groups) may be configured on each line card.

    - Each wideband-cable interface supports a maximum of 64 downstream channels.
    - 128 of the 512 wideband-cable interfaces (downstream bonding groups) may contain 33 or more channels.

Upstream Features

The Interface line card has one upstream module supporting 16 physical connectors or ports. The upstream features are as follows:

- The line card supports 16 upstream-cable controllers, each mapping to one upstream connector.
- 12 upstream channels can be configured per upstream controller.
- 12 upstream channels can be enabled per pair of upstream controllers.

For more details on the upstream features, see the *Downstream Upstream Guide*.

MAC Domains (Cable Interfaces)

1. 16 MAC domains (cable interfaces) may be configured per line card.
2. Maximum of 8 upstream channels can be configured in each MAC domain.

Note Starting from Cisco IOS-XE 3.18.0S release for cBR Series Converged Broadband Router, maximum of 16 upstream channels can be configured for each MAC domain.

3. A maximum of 255 downstream channels may be added to a MAC domain.
4. Maximum number of primary capable downstream channels per MAC Domain is 32. Non Primary downstream channels are added automatically to the MAC domains when the fiber nodes are configured.

Fiber Nodes

512 fiber nodes may be configured for each Cisco cBR-8 chassis.

Configuring DOCSIS Interfaces and Fiber Nodes

Configuring Upstream Channels

Verifying the Controller Configuration

Use the **show controllers upstream-cable** command to verify the configuration of the upstream channels in the controllers. Use the modifier | **include upstream** to see the administrative and operational state of the controllers.

```
Router#show controllers upstream-Cable 1/0/0 | include upstream
Controller 1/0/0 upstream 0  AdminState:UP OpState: UP
Controller 1/0/0 upstream 1  AdminState:UP OpState: UP
Controller 1/0/0 upstream 2  AdminState:UP OpState: UP
Controller 1/0/0 upstream 3  AdminState:UP OpState: UP
Controller 1/0/0 upstream 4  AdminState:DOWN Opstate: DOWN (Reason: Default)
Controller 1/0/0 upstream 5  AdminState:DOWN Opstate: DOWN (Reason: Default)
Controller 1/0/0 upstream 6  AdminState:DOWN Opstate: DOWN (Reason: Default)
Controller 1/0/0 upstream 7  AdminState:DOWN Opstate: DOWN (Reason: Default)
Router#
```

Binding Upstream Channels to MAC Domain

By default, a MAC domain does not contain any upstream channels. This section describes the configurations necessary to bind one or more upstream channels to a MAC domain. Each upstream channel is bound to only one MAC domain. The MAC domain and the upstream channel must reside on the same line card (same slot). If required, the upstream channels within the same upstream controller can be bound to different MAC domains.

Before you begin

Restrictions

- A maximum of 8 upstream channels may be bound to one MAC domain.

Note Starting from Cisco IOS-XE 3.18.0S release for cBR Series Converged Broadband Router, maximum of 16 upstream channels may be configured in each MAC domain.

- The MAC domain and channels must share the same slot. That is, a MAC Domain may include channels from any controller on the same slot.

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	**interface cable** **Example:** Router#**interface cable 1/0/0**	Enters MAC Domain configuration mode. Values for slot are 0-3 and 6-9, for subslot is always 0, for MD Index is 0-15.
Step 4	**upstream upstream-Cable us-channel** **Example:**	Binds the specified upstream channel to the MAC Domain.

	Command or Action	Purpose
	`Router(config-if)#`**`upstream 4 upstream-Cable 1/0/0 us-channel 7`**	
Step 5	**end** **Example:** `Router#` **`end`**	Returns to privileged EXEC mode.

What to do next

To verify MAC Domain configurations for upstream, use the **show cable mac-domain** command with **cgd-associations** keyword.

The MD US Binding table shows the upstream channel binding.

```
Router#show cable mac-domain c1/0/0 cgd-associations
Load for five secs: 1%/0%; one minute: 2%; five minutes: 2%
Time source is NTP, *13:36:26.209 PST Fri Jan 20 2012
CGD Host  Resource  DS Channels          Upstreams   (ALLUS)   Active DS
Ca1/0/0   1/0/0     8                    0-1         Yes       8

                    16                   0-1         Yes       16

                    24                   0-1         Yes       24

                    32-33                0-1         Yes       32-33

                    40                   0-1         Yes       40


MD US binding:
Host     MD Controller US channel State
Ca1/0/0 U0 1/0/0       0           UP
Ca1/0/0 U1 1/0/0       1           UP
Ca1/0/0 U2 1/0/0       2           UP
Ca1/0/0 U3 1/0/0       3           UP
Ca1/0/0 U4 1/0/1       0           UP
Ca1/0/0 U5 1/0/1       1           UP
Ca1/0/0 U6 1/0/1       2           UP
Ca1/0/0 U7 1/0/1       3           UP

Router#
```

Configuring Primary Capable Downstream Channels

Verifying Downstream Configuration in Controller

Use the **show controller Integrated-Cable** command to verify the status of the downstream channels configured on an Integrated-cable controller.

```
Router# show controller Integrated-Cable 1/0/0 rf-channel 0-127
Chan State Admin Frequency Type    Annex Mod srate Interleaver dcid power output
0 UP UP    381000000       DOCSIS B      256 5361 I32-J4        1    32    NORMAL
1 UP UP    387000000       DOCSIS B      256 5361 I32-J4        2    34    NORMAL
2 UP UP    393000000       DOCSIS B      256 5361 I32-J4        3    34    NORMAL
```

```
          3 UP UP    399000000     DOCSIS B    256 5361  I32-J4      4   34     NORMAL
```

Configuring Integrated-cable Interface

Configure an integrated-cable interface to prepare a downstream channel for inclusion within a MAC Domain as a primary-capable downstream channel. The interface configuration provides the following advantages:

- It enables the allocation of bandwidth to the downstream channel.
- It enables the control of the administrative state (shut/no shut) of the channel interface.

Each integrated-cable interface is mapped statically to an integrated-cable controller RF channel. For example, IC interface 1/0/0:0 is mapped to IC controller 1/0/0 RF channel 0. Similarly, IC interface 1/0/0:1 is mapped to IC controller 1/0/0 RF channel 1.

IC controllers are numbered 0-7 and RF Channels on each controller are numbered 0-127.

Before you begin

Determine the percentage of bandwidth to allocate to a channel. The bandwidth percentage configured is converted to a committed information rate (CIR) value for the interface. The value is used to admit non-bonded service flows on this channel. For more information, see the *Dynamic Bandwidth Sharing on the Cisco CMTS Router*.

Procedure

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 integrated-cable**

Example:

Router(config)# **interface integrated-cable 1/0/0:0**

Enter the integrated-cable interface configuration mode for specified integrated-cable interface.

Step 4 **cable rf-bandwidth-percent** *percentage-number*

Example:

Router(config-if)# **cable rf-bandwidth-percent 30**

Configures the bandwidth allocation to the specified integrated-cable interface.

Step 5   **end**

Example:

```
Router# end
```

Returns to privileged EXEC mode.

What to do next

The following conditions are used to determine if an IC (Integrated-Cable) interface is up in current software.

- The IC interface is associated to a MD (MAC Domain) interface.
- The MD interface, which the IC interface associated to, is in UP state.
- The IC interface is not configured shut down.
- The IC interface is configured with bandwidth.
- The associated downstream channel within the IC controller is operationally up.

Use the **show interface Integrated-Cable controller** command to verify the status of the specified integrated-cable interface. The State info table provides information to diagnose issues affecting the operational state of the interface.

```
Router# show interface Integrated-Cable 1/0/0:0 controller
Integrated-Cable1/0/0:0 is up, line protocol is up
…
----------------------------------------------
State info (DSNB if and its underlying states)
----------------------------------------------
DSNB IF state : UP
RF Chan state : UP
RF Chan frequency : 381000000
Bandwidth configured on DSNB IF : YES
Inject Header/HW flow creation status : DSNB_IF_SM_UP
MD state (9/0/0) : UP
*DSNB i/f Line State : UP
----------------------------------------------
```

Binding Primary Capable Downstream Channels to a MAC Domain

After a downstream channel has a properly configured Integrated-cable interface, it may be bound to a MAC Domain as a primary capable channel. The Channel Grouping Domain (CGD) configuration allows specified downstream channels to be bound to a MAC Domain as primary capable channels. Optionally, it also allows downstream channels to be associated with a subset of upstream channels within the MAC domain.

Before you begin

Restrictions

- The downstream channel and MAC domain must reside on the same line card (same slot)

- A maximum of 32 primary capable downstream channels may be bound to a single MAC domain

Procedure

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#**interface cable 1/0/0**

Enters MAC domain configuration mode.

- *slot*—Specifies the chassis slot number of the interface line card. Valid values are 0-3 and 6-9

- *subslot*—Specifies the secondary slot number of the interface line card. Valid subslot is 0.

- *MD index*—Specifies the MAC Domain index number. Valid values are 0-15.

Step 4   **downstream Integrated-Cable** *slot/subslot/port* **rf-channels** *grouplist*

Example:

Router#**downstream Integrated-Cable 1/0/0 rf-channels 1-6**

Configures the downstream primary capable channels.

- *grouplist*—Specify the range of downstream rf-channels.

Step 5   **end**

Example:

Router# **end**

Returns to privileged EXEC mode.

What to do next

To verify the downstream primary capable channels, use the **show cable mac-domain** command with **cgd-associations** keyword.

Router#**show cable mac-domain c1/0/0 cgd-associations**

```
Load for five secs: 1%/0%; one minute: 2%; five minutes: 2%
Time source is NTP, *13:36:26.209 PST Fri Jan 20 2012
CGD Host   Resource   DS Channels          Upstreams   (ALLUS)   Active DS
Ca1/0/0    1/0/0      8                    0-1         Yes       8

                      16                   0-1         Yes       16

                      24                   0-1         Yes       24

                      32-33                0-1         Yes       32-33

                      40                   0-1         Yes       40


MD US binding:
Host    MD Controller US channel State
Ca1/0/0 U0 1/0/0      0          UP
Ca1/0/0 U1 1/0/0      1          UP
Ca1/0/0 U2 1/0/0      2          UP
Ca1/0/0 U3 1/0/0      3          UP
Ca1/0/0 U4 1/0/1      0          UP
Ca1/0/0 U5 1/0/1      1          UP
Ca1/0/0 U6 1/0/1      2          UP
Ca1/0/0 U7 1/0/1      3          UP

Router#
```

Configuring MAC Domain Service Groups

Configuring the Fiber Nodes

A maximum of 512 fiber nodes may be configured per CMTS. A fiber node configured on the CMTS represents one or more matching physical fiber nodes in the HFC plant. The CMTS uses the fiber node configuration to identify the DOCSIS downstream service group (DS-SG) and DOCSIS upstream Service Group (US-SG) of the physical fiber nodes in the plant. The Service Group information is compared with MAC Domain channel configuration to automatically calculate the MAC Domain downstream and upstream service groups (MD-DS-SGs and MD-US-SGs respectively) within the MAC Domains.

The following is required to create a valid fiber node configuration.

- Each fiber node configuration must include at least one downstream controller and one upstream controller.
- Every MAC Domain and Wideband Interface including channels within the fiber node must use the same bundle interface.
- All downstream channels included within the fiber node must be assigned a unique frequency.
- All downstream channels associated with a particular MAC Domain must be assigned a unique DOCSIS channel ID.

If automatic DOCSIS channel ID allocation is preferred over manual DOCSIS channel ID configuration, the **cable downstream-channel-id automatic** command may be used to enable automatic DOCSIS channel ID allocation for the CMTS.

For details, see the *Cisco CMTS Cable Command Reference*.

Procedure

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 fiber-node** *id*

Example:

Router(config)#**cable fiber-node 1**
Router(config-fiber-node)#

Enters cable fiber-node configuration mode to configure a fiber node

- *id*— cable fiber node ID. The valid range is 1-512.

Step 4   **downstream Integrated-Cable** *slot/subslot/port*

Example:

Router(config-fiber-node)#**downstream Integrated-Cable 1/0/0**

Adds the DOCSIS downstream channels within the controller to the fiber node.

Step 5   **upstream upstream-Cable** *slot/subslot/port*

Example:

Router(config-fiber-node)#**upstream upstream-Cable 1/0/0**

Adds the upstream channels within the controller to the fiber node.

Step 6   **end**

Example:

Router# **end**

Returns to privileged EXEC mode.

What to do next

To verify the fiber-node configuration use the **show cable fiber-node** command.

```
Router# show cable fiber-node 1
--------------------------------------------------------------------------------
--
Fiber-Node 1
Description: Feed Mac Domain: Cable1/0/0
Channel(s) : downstream Integrated-Cable 1/0/0: 0-3, 32-35, 64-67,
96-99
Channel ID(s): 1 2 3 4 33 34 35 36 65 66 67 68 97 98
99 100
Upstream-Cable 1/0/0
FN Config Status: Configured (status flags = 0x01)
MDD Status: Valid
Router#
```

The output shows the downstream channel IDs configured on a fiber node. It also shows the status of the upstream-cable configured on the fiber node. Further, it shows the status of MAC Domain Descriptor (MDD) messaging.

Verify MD-DS-SG Channel Membership

Once the fiber node is valid, the MD-DS-SGs within the associated MAC domains will be automatically populated with downstream channels. The MD-DS-SGs will include the active primary downstream channels within the MAC domain as well as non-primary downstream channels automatically associated with the MAC domain through the fiber node configuration. The non-primary channels must be properly configured within the controller (that are operationally up) to be included in MD-DS-SGs

Use the **show cable mac-domain** command with the **downstream-service-group** option to display the MD-DS-SG channel membership.

```
outer#show cable mac-domain c1/0/0 downstream-service-group
Cable MD-DS-SG RF
IF Id Resource Chan  Primary Chan
C1/0/0 5 1/0/0 0-3   0-3
               32-35 32-35
               64-67
               96-99
```

To verify that the primary downstream channels are transmitting MAC Management Messages (MMMs) use the **show controller Integrated-Cable counter rf-channel** command.

```
Router#show controller Integrated-Cable 1/0/0 counter rf-channel
```

Controller	RF Chan	MPEG Packets Tx	MPEG bps	MPEG Mbps	Sync Packets Tx	MAP/UCD Packets Tx
1/0/0	0	51256	1504	0.001504	0	51256
1/0/0	1	51256	1504	0.001504	0	51256
1/0/0	2	51256	1504	0.001504	0	51256
1/0/0	3	51256	1504	0.001504	0	51256
1/0/0	4	51256	1504	0.001504	0	51256
1/0/0	5	51256	1504	0.001504	0	51256
1/0/0	6	51256	1504	0.001504	0	51256
1/0/0	7	51256	1504	0.001504	0	51256
1/0/0	8	47625214	1416567	1.367991	5124345	50884388
1/0/0	9	51256	1504	0.001504	0	51256
1/0/0	10	51256	1504	0.001504	0	51256
1/0/0	11	51256	1504	0.001504	0	51256

```
1/0/0      12    51256      1504      0.001504   0          51256
1/0/0      13    51256      1504      0.001504   0          51256
1/0/0      14    51256      1504      0.001504   0          51256
1/0/0      15    51256      1504      0.001504   0          51256
1/0/0      16    47627672   1414913   1.366337   5124342    50884344
1/0/0      17    51256      1504      0.001504   0          51256
1/0/0      18    51256      1504      0.001504   0          51256
1/0/0      19    51256      1504      0.001504   0          51256
1/0/0      20    51256      1504      0.001504   0          51256
1/0/0      21    51256      1504      0.001504   0          51256
1/0/0      22    51256      1504      0.001504   0          51256
1/0/0      23    51256      1504      0.001504   0          51256
1/0/0      24    47629532   1414862   1.366286   5124341    50884325
1/0/0      25    51256      1504      0.001504   0          51256
1/0/0      26    51256      1504      0.001504   0          51256
1/0/0      27    51256      1504      0.001504   0          51256
1/0/0      28    51253      1504      0.001504   0          51253
1/0/0      29    51253      1504      0.001504   0          51253
1/0/0      30    51253      1504      0.001504   0          51253
1/0/0      31    51253      1504      0.001504   0          51253
1/0/0      32    47642351   1412005   1.363429   5124337    50891994
1/0/0      33    47646042   1412757   1.364181   5124336    50892055
1/0/0      34    51251      1504      0.001504   0          51251
1/0/0      35    51251      1504      0.001504   0          51251
1/0/0      36    51251      1504      0.001504   0          51251
1/0/0      37    51251      1504      0.001504   0          51251
1/0/0      38    51251      1504      0.001504   0          51251
1/0/0      39    51251      1504      0.001504   0          51251
1/0/0      40    47634991   1409649   1.361073   5124329    50884177
1/0/0      41    51251      1504      0.001504   0          51251
```

Verify MD-US-SG Channel Membership

Use the **show cable mac-domain** command with the **upstream-service-group** option to display the MD-US-SG channel membership.

```
Router#show cable mac-domain c1/0/0 upstream-service-group
Cable MD 1/0/0
US-SG-ID : 5 US-Chan : U0,1,2,3
Primary-DS: 1/0/0:0 US-SG-ID: 5
MDD US-List : U0,1,2,3
MDD Ambiguity : U0,1,2,3
Primary-DS: 1/0/0:1 US-SG-ID: 5
MDD US-List : U0,1,2,3
MDD Ambiguity : U0,1,2,3
Primary-DS: 1/0/0:2 US-SG-ID: 5
MDD US-List : U0,1,2,3
MDD Ambiguity : U0,1,2,3
Primary-DS: 1/0/0:3 US-SG-ID: 5
MDD US-List : U0,1,2,3
MDD Ambiguity : U0,1,2,3
```

Downstream Bonding Group Configuration

Configuring Wideband-cable Interface (Downstream Bonding Grouping)

A Wideband-Cable interface forwards bonded traffic in the downstream direction. A set of downstream RF channels is configured under the Wideband interface. Each line card will support up to 512 Wideband interfaces.

Although there is no real relationship between these wideband interfaces and the 8 controllers (ports), there is a convention of dividing the wideband interfaces into groups per controller.

The 512 wideband interfaces are divided among the 8 controllers - 64 interfaces per controller.

You can create a wideband-cable interface to define a downstream bonding group. A downstream bonding group bonds together a set of downstream RF channels. It can only contain the RF channels from the same line card.

Associations between bonding groups and MAC Domains are automatically created. Associations occur when a bonding group channel set is found to be a subset of a MAC Domain Downstream Service Group (MD-DS-SG) within a MAC Domain. The automatic associations will trigger the creation of an RCC that contains the bonding group's channel set within the MAC Domain.

Before you begin

Restrictions:

1. Included downstream channels must be a part of the same line card slot.
2. All the downstream channels must be from the integrated-cable controllers 0-3 or 4-7.

Procedure

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 wideband-Cable**

Example:

```
Router(config)#interface wideband-Cable 1/0/0:1
Router(config-if)#
```

Enter the wideband-cable interface configuration mode for specified wideband-cable interface.

Step 4 **cable bundle** *id*

Example:

```
Router(config-if)#cable bundle 1
```

Configures the cable bundle id for this wideband-cable interface. The configured cable bundle id must match the cable bundle id configured in associated MAC domains.

- *Bundle number*— cable bundle number. The valid range is 1-255.

Step 5 **cable rf-channels channel-list** *grouplist* **bandwidth-percent** *percentage-bandwidth*

Example:

```
Router(config-if)#cable rf-channel channel-list 1-3 bandwidth-percent 10
```

Configures the bandwidth allocation for specified channel-list and includes the channels in the downstream bonding group. Range for channel numbers are 0-127 (<first channel num-last channel num>).

- *grouplist*—Specify the range of downstream rf-channels.

Step 6 **cable rf-channels controller** *controller number* **channel-list** *grouplist* **bandwidth-percent** *percentage-bandwidth*

Example:

```
Router(config-if)#cable rf-channel controller 1 channel-list 1-3 bandwidth-percent 10
```

Configures the bandwidth allocation for specified channel-list on downstream controllers and includes the channels in the downstream bonding group. Range for channel numbers are 0-127.

- *controller number*—Downstream controller number. The valid numbers are 0-7.

- *grouplist*—Specify the range of downstream rf-channels.

Step 7 **end**

Example:

```
Router# end
```

Returns to privileged EXEC mode.

What to do next

Verify the Bonding Group Interfaces.

Verifying the Bonding Group Interfaces

Use **wideband-channel** option of the **show controllers integrated-Cable** command to display bonding group interfaces:

```
Router# show controllers integrated-cable 1/0/0 wideband-channel
Load for five secs: 2%/0%; one minute: 2%; five minutes: 2%
Time source is NTP, *17:45:51.964 PST Thu Jan 12 2012
WB                       BG    Primary
channel                  ID    BG
Wideband-Cable1/0/0:0    12289 Yes
Wideband-Cable1/0/0:1    12290 Yes
Wideband-Cable1/0/0:2    12291 Yes
Wideband-Cable1/0/0:3    12292 Yes
Wideband-Cable1/0/0:4    12293 Yes
Wideband-Cable1/0/0:5    12294 Yes
Wideband-Cable1/0/0:6    12295 Yes
Wideband-Cable1/0/0:7    12296 Yes
Wideband-Cable1/0/0:8    12297 Yes
Wideband-Cable1/0/0:9    12298 Yes
Wideband-Cable1/0/0:10   12299 Yes
Wideband-Cable1/0/0:11   12300 Yes
Wideband-Cable1/0/0:12   12301 Yes
Wideband-Cable1/0/0:13   12302 Yes
Wideband-Cable1/0/0:14   12303 Yes
Wideband-Cable1/0/0:15   12304 Yes
Wideband-Cable1/0/0:16   12305 Yes
Wideband-Cable1/0/0:17   12306 Yes
Wideband-Cable1/0/0:18   12307 Yes
Wideband-Cable1/0/0:19   12308 Yes
Wideband-Cable1/0/0:20   12309 Yes
Wideband-Cable1/0/0:21   12310 Yes
Wideband-Cable1/0/0:22   12311 Yes
Wideband-Cable1/0/0:23   12312 Yes
Wideband-Cable1/0/0:24   12313 Yes
Wideband-Cable1/0/0:25   12314 Yes
```

- To display the RF-channel mapping to wideband channels, use **mapping wb-channel** option.

```
Router# show controllers Integrated-Cable 1/0/0 mapping wb-channel 0
Ctrlr   WB      RF        WB %   WB Rem
1/0/0   0       1/0/0:0   40     1
                1/0/0:1   40     1
```

- To display the downstream MAC Domain service groups, use the **dsbg-associations** option of the **show cable mac-domain** command.

```
Router# show cable mac-domain c1/0/0 dsbg-associations
Wi1/0/0:0      Wi1/0/0:1
```

Use the **show interface Wideband-Cable controller** command to verify the bonding group configurations. The State info table shows the downstream bonding group state information.

```
Router#show interface Wideband-Cable 1/0/0:0 controller
Wideband-Cable1/0/0:0 is up, line protocol is up
  Hardware is CMTS WB interface, address is c414.3c17.1dcb (bia c414.3c17.1dcb)
  MTU 1500 bytes, BW 150000 Kbit/sec, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation MCNS, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
```

```
Last clearing of "show interface" counters never
Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations  0/0/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 112500 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts (0 multicasts)
    0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 3 interface resets
    0 unknown protocol drops
    0 output buffer failures, 0 output buffers swapped out


BG controller details
Wi1/0/0:0 BGID: 12289
Member RFIDs:
  Config RFIDs: 12288-12291 Count: 4
  Active RFIDs: 12288-12291 Count: 4
Attribute mask: 0x80000000
----------------------------------------------
State info (DSBG if and its underlying states)
----------------------------------------------
DSBG IF state               : UP
DSBG Member RF chan states  : UP (4 out of 4 chans are UP)
DSBG HWID(FCID)             : 0x3800
*DSBG i/f Line State        : UP
----------------------------------------------
------------------------------
DMP Resources
DMP handle    : 0x10000800
------------------------------
DMP BG pool entry details
HW-id   BGid  BGSize  Enabled
------------------------------
0     : 12289 4        1
------------------------------
Bgid  BGecnt BGaddr Channels (1023 means invalid/Unused)
    0     0     0:   0    1    2    3 1023 1023 1023 1023
BG         Rate   Neg   Pos     LastTS  CurrCr  Pos
    0      25000 65535 65535        0      0    N

------------------------------
RFID - JIB chan mapping for active RFIDs: [rfid:jib-chan-no]
[12288:0] [12289:1] [12290:2] [12291:3]

Router#
```

Upstream Bonding Group Configuration

Restrictions for Upstream Bonding Groups

- Upstream bonding groups are configured within the MAC Domain interface
- Upstream bonding groups consist of a set of upstream channels that are bonded together.

- Starting from Cisco IOS-XE 3.18.0S release, maximum of 16 upstream channels can be configured for each MAC Domain, which are divided into two groups:

    - Group 1: upstream channel 0-7
    - Group 2: upstream channel 8-15

The **upstream bonding-group** should include all the upstream channels either from Group 1 or Group 2 only.

Configuring Upstream Bonding Groups

Before you begin

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	**interface cable** *slot*/*subslot*/*MD index* **Example:** `Router(config)# ` **`interface cable 1/0/0`**	Enters MAC domain configuration mode. • *slot*—Specifies the chassis slot number of the interface line card. Valid values are 0-3 and 6-9 • *subslot*—Specifies the secondary slot number of the interface line card. Valid subslot is 0. • *MD index*—Specifies the MAC Domain index number. Valid values are 0-15.
Step 4	**cable upstream bonding-group** **Example:** `Router(config-if)#`**`cable upstream bonding-group 7`** `Router(config-upstream-bonding)#`	Creates a static upstream bonding group on a MAC Domain.
Step 5	**upstream** **Example:** `Router(config-upstream-bonding)#`**`upstream 7`**	Add upstream channels to an upstream bonding group. Starting from Cisco IOS-XE 3.18.0S release, maximum of 16 upstream channels can be

	Command or Action	Purpose
		configured for each MAC Domain, which are divided into two groups: • Group 1: upstream channel 0-7 • Group 2: upstream channel 8-15 The **upstream bonding-group** should include all the upstream channels either from Group 1 or Group 2 only.
Step 6	**end** **Example:** `Router# `**`end`**	Returns to privileged EXEC mode.

What to do next

Use the **show interface cable upstream bonding-group** command to display upstream bonding group information.

```
Router#show interface cable 1/0/0 upstream bonding-group
Load for five secs: 1%/0%; one minute: 2%; five minutes: 2%
Time source is NTP, *10:47:17.142 PST Thu Jan 12 2012

Cable1/0/0: Upstream Bonding Group 1
     0 packets input, 0 octets input
     Segments: 0 valid, 0 discarded, 0 lost
     Reserved Bandwidth Max : 0 bits/sec
     Reserved Bandwidth     : 0 bits/sec
     Available Bandwidth    : 46080000 bits/sec
     Total Service Flows On This Bonding Group: 0
Cable1/0/0: Upstream Bonding Group 2
     0 packets input, 0 octets input
     Segments: 0 valid, 0 discarded, 0 lost
     Reserved Bandwidth Max : 0 bits/sec
     Reserved Bandwidth     : 0 bits/sec
     Available Bandwidth    : 46080000 bits/sec
     Total Service Flows On This Bonding Group: 0
Cable1/0/0: Upstream Bonding Group 65536
     0 packets input, 0 octets input
     Segments: 0 valid, 0 discarded, 0 lost
     Reserved Bandwidth Max : 0 bits/sec
     Reserved Bandwidth     : 0 bits/sec
     Available Bandwidth    : 15360000 bits/sec
     Total Service Flows On This Bonding Group: 0
Cable1/0/0: Upstream Bonding Group 65537
     0 packets input, 0 octets input
     Segments: 0 valid, 0 discarded, 0 lost
     Reserved Bandwidth Max : 0 bits/sec
     Reserved Bandwidth     : 0 bits/sec
     Available Bandwidth    : 15360000 bits/sec
     Total Service Flows On This Bonding Group: 0

Router#
```

Verifying Upstream Bonding Groups

Use the **show cable upstream bonding-group** command.

```
Router#show interface cable 1/0/0 upstream bonding-group
Load for five secs: 1%/0%; one minute: 2%; five minutes: 2%
Time source is NTP, *10:47:17.142 PST Thu Jan 12 2012

Cable1/0/0: Upstream Bonding Group 1
     0 packets input, 0 octets input
     Segments: 0 valid, 0 discarded, 0 lost
     Reserved Bandwidth Max : 0 bits/sec
     Reserved Bandwidth     : 0 bits/sec
     Available Bandwidth    : 46080000 bits/sec
     Total Service Flows On This Bonding Group: 0
Cable1/0/0: Upstream Bonding Group 2
     0 packets input, 0 octets input
     Segments: 0 valid, 0 discarded, 0 lost
     Reserved Bandwidth Max : 0 bits/sec
     Reserved Bandwidth     : 0 bits/sec
     Available Bandwidth    : 46080000 bits/sec
     Total Service Flows On This Bonding Group: 0
Cable1/0/0: Upstream Bonding Group 65536
     0 packets input, 0 octets input
     Segments: 0 valid, 0 discarded, 0 lost
     Reserved Bandwidth Max : 0 bits/sec
     Reserved Bandwidth     : 0 bits/sec
     Available Bandwidth    : 15360000 bits/sec
     Total Service Flows On This Bonding Group: 0
Cable1/0/0: Upstream Bonding Group 65537
     0 packets input, 0 octets input
     Segments: 0 valid, 0 discarded, 0 lost
     Reserved Bandwidth Max : 0 bits/sec
     Reserved Bandwidth     : 0 bits/sec
     Available Bandwidth    : 15360000 bits/sec
     Total Service Flows On This Bonding Group: 0

Router#
```

Additional References

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/support

Feature Information for DOCSIS Interface and Fiber Node Configuration on the Cisco cBR Router

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://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note The table below 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 DOCSIS Interface and Fiber Node Configuration

Feature Name	Releases	Feature Information
DOCSIS Interface and Fiber Node Configuration	Cisco IOS-XE 3.15.0S	This feature was introduced on the Cisco cBR Series Converged Broadband Router .
Upstream Channel Scaling from 64 to 96 Channels	Cisco IOS-XE 3.16.0S	This feature was introduced on the Cisco cBR Series Converged Broadband Router.
Upstream Channel Scaling up to 16 channels for each MAC Domain	Cisco IOS-XE 3.18.0S	The valid range of upstream channels for each MAC Domain was increased to 0-15.