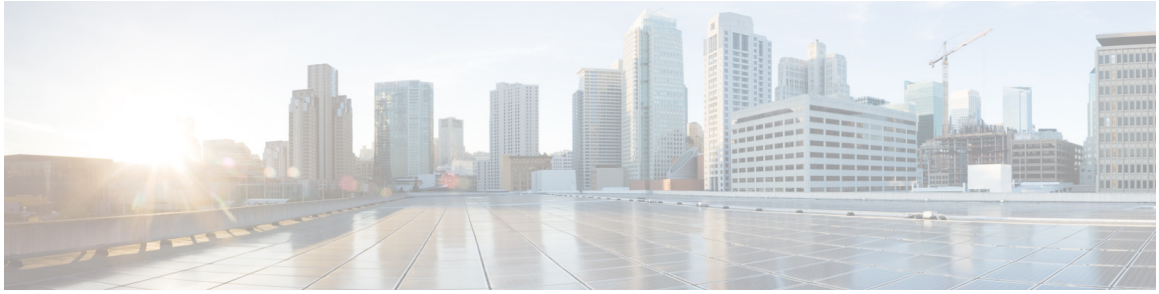

Configuring the Cisco uBR-MC3GX60V Cable Interface Line Card

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The Cisco uBR-MC3GX60V cable interface line card is a Cisco modular cable modem termination system (M-CMTS) DOCSIS 3.0-compliant line card designed for the Cisco uBR10012 universal broadband router. It supports 60 upstream and 72 downstream channels.

The Cisco uBR-MC3GX60V cable interface line card offers increased configuration flexibility and provides up to 14 times the downstream data density when compared to earlier generations of cable line cards.

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 for the Cisco uBR-MC3GX60V Cable Interface Line Card" section on page 59.

Use Cisco Feature Navigator to find information about platform support and Cisco 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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www.cisco.com

Contents

Prerequisites for Configuring the Cisco uBR-MC3GX60V Cable Interface Line Card

The Cisco uBR10012 universal broadband router must have two DOCSIS Timing, Communication and Control (DTCC) cards configured in the DOCSIS Timing Interface (DTI) mode to make the Cisco uBR-MC3GX60V cable interface line card work with an Edge QAM (EQAM) device.

Table 1 lists the general compatibility prerequisites for the Cisco uBR-MC3GX60V cable interface line card.

Table 1 Software and Hardware Compatibility Matrix for the Cisco uBR-MC3GX60V Line Card

Cisco CMTS Platform	Processor Engine	Cisco IOS Release
Cisco uBR10012 router	PRE4	12.2(33)SCE and later releases
Cisco uBR10012 router	PRE5	12.2(33)SCH and later releases

Restrictions for Configuring the Cisco uBR-MC3GX60V Cable Interface Line Card

- The Downstream External PHY Interface (DEPI) control plane and Manual DEPI features cannot be configured on the same Cisco uBR-MC3GX60V line card.
- High Availability for Cisco Wideband SPA with Cisco uBR-MC3GX60V line card is not supported.
- If Cisco uBR10-MC5X20 line card is used as working line card and Cisco uBR-MC3GX60V line card used as protect line card, the HCCP feature is not supported when the working line card is replaced (using Online Insertion and Removal (OIR)) with a Cisco uBR-MC3GX60V line card.
- Port Channel configuration is not supported on Gigabit Ethernet interface of Cisco uBR-MC3GX60 line card.

Information About the Cisco uBR-MC3GX60V Cable Interface Line Card

With 72 downstream and 60 upstream channels, the Cisco uBR-MC3GX60V line card supports 9 service groups (SGs) for 8-channel downstream bonding, and 18 SGs for 4-channel downstream bonding. This line card can provide up to 72 SGs of 8 downstreams for a Cisco uBR10012 router. A larger number of SGs may be supported when downstream channels are shared between MAC domains.

The Cisco uBR-MC3GX60V cable line card has 4 connector inputs and 12 PHY receivers. The upstream channel-to-physical connector assignment is flexible enough to provide any combination of 1 to 12 channels per connector from the 4-connector bundle. This means four separate connectors could provide three US channels each, or two of the four connectors could provide six US channels each, and so on.

Note The Cisco uBR-MC3GX60V line card supports the same number of cable modems and other devices as those supported on other M-CMTS and I-CMTS line cards, on Cisco uBR10012 routers.

The Cisco uBR10012 chassis with the Cisco uBR-MC3GX60V line card offers high density downstream solutions for IP Video over DOCSIS (VDOC) and cable high speed data (HSD) applications.

The Cisco uBR10012 router can include:

- Up to eight Cisco uBR-MC3GX60V line cards and up to six Cisco Wideband SPAs, or both
- A mix of older line cards and up to six Cisco Wideband SPAs, or both
- Cisco uBR-MC3GX60V line card must use PRE4 with SIP-600
- Dual DTCCs are required even when connected to a single DTI server

The Cisco uBR-MC3GX60V line card offers high availability through:

- N+1 redundancy for the Cisco uBR-MC3GX60V line card. A Cisco uBR-MC3GX60V can serve as a protect line card for up to seven Cisco uBR-MC3GX60V line cards.

  Note Starting with Cisco IOS Release 12.2(33)SCE1, N+1 redundancy feature including DEPI redundancy is supported on the Cisco uBR-MC3GX60V cable interface line card.

- External RF switch for upstream connectivity.
- DEPI Path Redundancy (DPR) for M-CMTS interfaces:
  - A protocol solution that allows for redundant DEPI connections in N+1 redundancy.
  - Minimal packet loss during failovers.
- PRE redundancy.
- Six Gigabit Ethernet (GigE) small form-factor pluggable (SFP) ports, organized in three pairs for 1+1 network connectivity redundancy.

  Note The GigE ports on the Cisco uBR-MC3GX60V line card support only Layer 2 CIN routing protocols.

Effective with Cisco IOS Release 12.2(33)SCG, you can configure the MAC domain to include the SPA cards and the Cisco uBR-MC3GX60V line card.

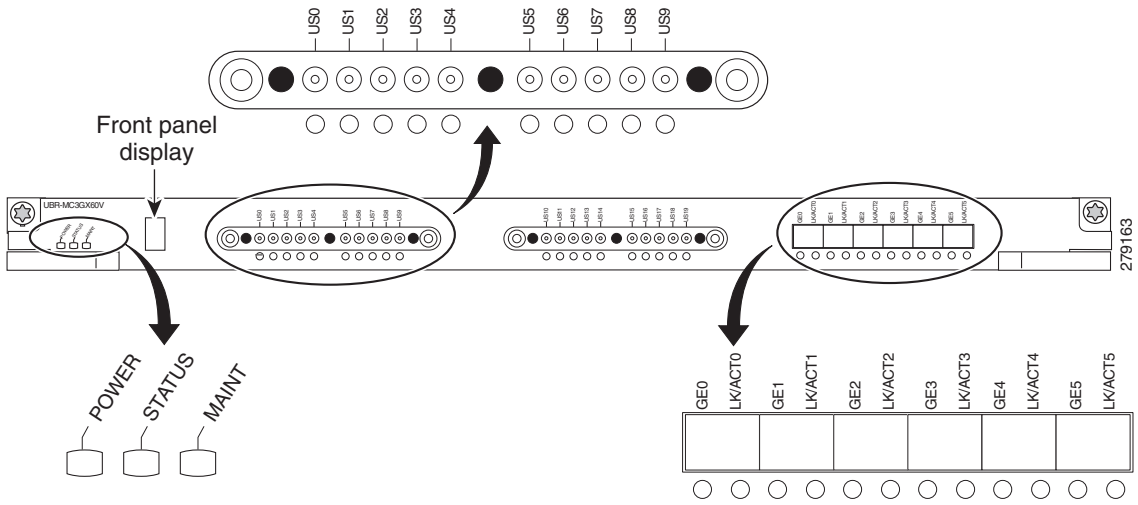
In a scenario, where 6 SPA cards and a single Cisco uBR-MC3GX60V line card are present in a chassis, 6 SPA rf-channels and 3 controller rf-channel can be configured as primary channels in a single MAC domain. However, we recommend that *not* more than 3 primary rf-channel controllers are configured in one MAC domain on the Cisco uBR-MC3GX60V line card.

Effective with Cisco IOS Release 12.2(33)SCG1, the Cisco uBR-MC3GX60V line card and up to five shared port adapters (SPAs) can be configured to the same LBG. You can:

- Include all the downstreams and upstreams of the SPA cards and the Cisco uBR-MC3GX60V line card in the LBG.
- Configure the fiber-node to include all the downstreams and upstreams of the SPA cards and the Cisco uBR-MC3GX60V line card.

Figure 1 shows the Cisco uBR-MC3GX60V cable interface line card faceplate.

Figure 1 Cisco uBR-MC3GX60V Cable Interface Line Card Faceplate



Downstream Sharing Between the Cisco uBR-MC3GX60V Line Card and Cisco Wideband SPA

Starting with Cisco IOS Release 12.2(33)SCG, MAC domains hosted on the Cisco uBR-MC3GX60V cable interface line card can include downstream channels from the Cisco Wideband SPAs. Each Cisco uBR-MC3GX60V line card, together with the Cisco Wideband SPA, can now support up to 96 downstream channels. With this increased downstream capacity, Cisco uBR10012 router supports more number of CMs.

The Cisco uBR-MC3GX60V line card and the Cisco Wideband SPA downstream sharing is supported on the Cisco CMTS through:

- The Cisco Wideband SPA downstreams that are included on the same fiber node as the Cisco uBR-MC3GX60V downstreams and upstreams.
- Any upstream channel of the Cisco uBR-MC3GX60V line card that is bonded with any wideband SPA downstream channel.

- A maximum of eight Cisco uBR-MC3GX60V line cards and six Cisco Wideband SPAs that are supported on a single chassis.
- The Cisco uBR-MC3GX60V line card that serves as the modular host for the Cisco Wideband SPA.
- The Hot-Standby Connection-to-Connection Protocol (HCCP) N+1 Redundancy that is supported for Cisco uBR-MC3GX60V line card with the Cisco Wideband SPA.

For more information on how to configure the Cisco uBR-MC3GX60V line card with the Cisco Wideband SPA, see "Configuring a Cable Interface on the Cisco uBR-MC3GX60V Cable Interface Line Card" section on page 11.

For more information on configuring the Cisco Wideband SPA, see the Cisco uBR10012 Universal Broadband Router SIP and SPA Software Configuration guide.

Onboard Failure Logging

The On-Board Failure Logging (OBFL) feature enables storage and collection of critical failure information in the non-volatile memory of a Field Replaceable Unit (FRU), like a route processor (RP) or line card. The Cisco uBR-MC3GX60V cable interface line card has 2 MB of non-volatile storage dedicated for OBFL use.

The OBFL stored data assists in understanding and debugging field failures on Return Material Authorization (RMA) of a RP or line card at repair and failure analysis sites.

OBFL records operating temperatures, voltages, hardware uptime, and any other important events that assist onboard diagnosis in case of hardware failures.

For more information about the feature, see the *Onboard Failure Logging* feature guide located at the following URL:

http://www.cisco.com/en/US/docs/ios/12_2sx/12_2sxh/feature/guide/sxhobfl.html#wp1053048.

Note The sample output documented in the *Onboard Failure Logging* feature guide might slightly vary for Cisco CMTS routers.

Bonding Across 3G60 Controllers Support

Downstream bonding group for a wideband cable interface on Cisco uBR-MC3GX60V includes only DS RF channels from one controller. This restricts the configuration of RF channels to bonding groups on other two controllers of the Cisco uBR-MC3GX60V cable interface line card.

Effective with Cisco IOS Release 12.2(33)SCH, the Bonding Across 3G60 Controllers Support feature allows the downstream bonding groups on one controller to include RF channels across all three downstream controllers. An RF channel can now belong to a maximum number of 96 bonding groups. The maximum number of RF channel members in a bonding group is 24.

For more information on how to configure the Bonding Across 3G60 Controllers Support feature, see Configuring Bonding Across 3G60 Controllers Support, page 20.

Adjacency Resolution

When Cisco uBR-MC5X20 line cards are replaced with Cisco uBR-MC3GX60V cable interface line card, the adjacency resolution (ADJ Resolve) process increases the CPU utilization.

The ADJ Resolve process uses ARP for resolution. If the ARP process is successful for an adjacency, then the adjacency is populated. However, if the ARP process is not successful, then the incomplete ARP request is added to the list of incomplete ARP requests and the number (of incomplete ARP requests) is incremented.

Every time an incomplete ARP request is re-sent and returned incomplete, the number is further incremented. As the number of incomplete ARP requests increases, the CPU utilization increases.

To resolve this high utilization of CPU:

- Increase the number of interface bundles
- Reduce the number of members per interface bundle
- Implement ACL or any other mechanism to block scanning
- Enable Divert Rate Limit (DRL) for fib_rp_glean diverts

DRL:

To configure token bucket for each source IP address of each WAN, use the **service divert-rate-limit ip divert-code rate** *rate* **limit** *limit*. This sends one packet to the Route Processor for ARP resolution per second with a burst size of 4 packets per second as minimum rate, instead of the default of 4,000 packets per second. This will reduce the ARP packet traffic to the CPU.

The DRL process is optimized with the following parameters:

- DRL rate - 1 (indicating 1 packet per second being the minimum permitted rate)
- DRL limit - 4 (indicating burst size of 4 packets per second being the minimum permitted burst size)

DHCP:

DHCP leasequery eliminates the broadcast of ARP requests to all bundle members and, thus, reduces CPU utilization for ADJ Resolve process.

Use the **cable source-verify dhcp** and **no cable arp** commands to send leasequeries to the DHCP server for unknown IP addresses within the bundle instead of ARP requests.

DHCP leasequery process is optimized with the following parameters:

- DHCP Leasequery filter packet burst size - 3 packets per second
- DHCP Leasequery filter interval - 60 seconds interval

How to Configure the Cisco uBR-MC3GX60V Cable Interface Line Card

This section describes the steps for configuring the Cisco uBR-MC3GX60V line card at startup. These procedures provide only the initial, basic configuration for the line card.

The Cisco uBR10012 universal broadband router should be operational before beginning the following procedures to configure the Cisco uBR-MC3GX60V cable interface line card:

- Configuring the Modular Cable Controller on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 7
- Configuring the GigE Interface for Downstream on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 10

- Configuring the Modular Cable Interface on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 16
- Configuring the Wideband Cable Interface on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 18
- Configuring Bonding Across 3G60 Controllers Support, page 20
- Configuring the RF Plant Topology on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 22

Note For Annex A and 256 QAM, each Cisco uBR-MC3GX60V supports up to 54 RF channels (18 channels on every controller) at full rate and up to 72 RF channels (24 channels on every controller) at less than full rate. For all other cases, the Cisco uBR-MC3GX60V supports up to 72 RF channels.

Configuring the Modular Cable Controller on the Cisco uBR-MC3GX60V Cable Interface Line Card

The downstream modular cable controller configuration defines Layer 1 and Layer 2 parameters for specific downstream RF channels, and certain configuration parameters for the GigE port.

Note Modular cable controllers can be configured in one of the two mutually exclusive modes—Manual DEPI or DEPI Control Plane. For information on configuring these modes, see Configuring the DEPI Control Plane on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 32 and Configuring Manual DEPI on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 37.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller modular-cable** *slot/subslot/controller*
4. (Optional step) **rf-channel** *rf-port* **cable downstream channel-id** *channel-id*
5. **rf-channel** *rf-port* **frequency** [*freq* | **none**] [**annex** {**A** | **B**} **modulation** {**64** | **256**} [**interleave-depth** {**8** | **12** | **16** | **32** | **64** | **128**}]]
6. **rf-channel** *rf-port* **ip-address** *ip-address* **mac-address** *mac-address* **depi-remote-id** *session-id*
7. **no rf-channel** *rf-port* **rf-shutdown**
8. **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	**controller modular-cable** *slot/subslot/controller* **Example:** `Router(config)# controller Modular-Cable 8/1/0`	Enters controller configuration mode to configure the Cisco uBR-MC3GX60V modular cable controller. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *controller*—Controller index for the modular cable.
Step 4	**rf-channel** *rf-port* **cable downstream channel-id** *channel-id* **Example:** `Router(config-controller)# rf-channel 0 cable downstream channel-id 1`	Assigns a downstream channel ID to an RF channel in the controller configuration mode. • *rf-port*— RF channel number on the physical port of the line card. The valid range is from 0 to 23. • *channel-id*—Unique channel ID. The valid range is from 1 to 255. **Note** We recommend that you retain the system-generated default channel IDs instead of configuring them.

	Command or Action	Purpose
Step 5	**rf-channel** *rf-port* **frequency** [*freq* | **none**] [**annex** {**A** | **B**} **modulation** {**64** | **256**} [**interleave-depth** {**8** | **12** | **16** | **32** | **64** | **128**}]] **Example:** `Router(config-controller)# rf-channel 0 frequency 453000000 annex B modulation 256 interleave-depth 32`	Configures the frequency of an RF channel in modular cable controller configuration mode. • *rf-port*—RF channel number on the physical port of the line card. The valid range is from 0 to 3. • *freq*—Center frequency of the RF channel. The valid range for each RF channel is different based on the Annex type. • **none**—Removes the specified frequency if the RF channel is shut down. **Note** **none** can be configured on the modular cable controller of the N+1 protect line card as no frequency is required to be configured on that controller. • **annex** {**A** | **B**}—Indicates the MPEG framing format for each RF channel. – **A**—Indicates that the downstream is compatible with the European MPEG framing format specified in ITU-TJ.83 Annex A. – **B**—Indicates that the downstream is compatible with the North American MPEG framing format specified in ITU-TJ.83 Annex B. • **modulation** {**64** | **256**}—Indicates the modulation rate (64 or 256 QAM) for each RF channel. • **interleave-depth value**—Indicates the downstream interleave depth. For annex A, the interleave value is 12. For annex B, the valid values are 8, 16, 32, 64, and 128.
Step 6	**rf-channel** *rf-port* **ip-address** *ip-address* **mac-address** *mac-address* **depi-remote-id** *session-id* **Example:** `Router(config-controller)# rf-channel 0 ip-address 192.168.100.20 mac-address 0090.f001.930c depi-remote-id 3001`	Sets the DEPI CMTS configuration. • *rf-port*—RF channel number on the physical port of the line card. The valid range is from 0 to 3. • *ip-address*—IP address of the Cisco RF Gateway. **Note** If the number of destination IP addresses, each corresponding to a DEPI tunnel, exceeds the limit of six, the command with the seventh IP address is rejected. • *mac-address*—MAC address of the Cisco RF Gateway. • *session-id*—DEPI remote session ID used for encapsulation of frames in DOCSIS-MPT mode. **Note** The User Datagram Protocol (UDP) port-based manual DEPI configuration is no longer supported. Therefore, this configuration solution is not supported with Cisco RF Gateways that do not support the Layer 2 Transmission Protocol version 3.

	Command or Action	Purpose
Step 7	**no rf-channel** *rf-port* **rf-shutdown** **Example:** `Router(config-controller)# no rf-channel 0 rf-shutdown`	Enables RF channel on the Cisco uBR10012 router. **Note** For manual DEPI, this command does not affect the EQAM. However, first verify that the RF channel of the upconverter is unshut.
Step 8	**end** **Example:** `Router(config-controller)# end`	Exits controller configuration mode and returns to privileged EXEC mode.

Examples

The following example shows how to configure the RF channel on a modular cable controller:

```
Router# enable
Router# configure terminal
Router(config)# controller Modular-Cable 6/1/0
Router(config-controller)# rf-channel 0 cable downstream channel-id 1
Router(config-controller)# rf-channel 0 frequency 567000000 annex B modulation 256qam
interleave 32
Router(config-controller)# rf-channel 0 ip-address 17.30.4.100 mac-address 0022.9084.4cbf
depi-remote-id 3000
Router(config-controller)# rf-channel 1 cable downstream channel-id 2
Router(config-controller)# rf-channel 1 frequency 573000000 annex B modulation 256qam
interleave 32
Router(config-controller)# rf-channel 1 ip-address 17.30.4.100 mac-address 0022.9084.4cbf
depi-remote-id 3001
Router(config-controller)# no rf-channel 0 rf-shutdown
```

Troubleshooting Tips

- Run the **show controllers modular-cable** *slot/subslot/controller* command to view the modular cable controller configuration details.

Note The **show controllers modular-cable** command for the Cisco uBR- MC3GX60V line card has a number of subcommands. Run the following command to view all the subcommands:

```
Router# show controllers modular-Cable slot/subslot/controller ?
```

- The following error may be displayed when you run the **no rf-channel 0 rf-shutdown** command:

  ```
  %ERROR: Cannot unshut channel 0, please upgrade linecard license and retry
  ```

  This error is displayed to indicate that there are insufficient licenses for the line card to unshut additional channels. You must either upgrade the license or shut down an unshut channel.

Configuring the GigE Interface for Downstream on the Cisco uBR-MC3GX60V Cable Interface Line Card

For complete information on this section, see Configuring the GigE Interface for Downstream on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 25.

Configuring a Cable Interface on the Cisco uBR-MC3GX60V Cable Interface Line Card

The cable interface is the MAC domain interface that hosts modular cable interfaces and associates upstream channels with the modular cable interfaces.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface cable** *slot/subslot/cable-interface-index*
4. **cable bundle** *bundle-number*
5. **downstream modular-cable** *slot/subslot/controller* **rf-channel** *grouplist* **upstream** *grouplist*
6. **cable upstream** *n* **frequency** *up-freq-hz*
7. **cable upstream max-ports** *n*
8. **cable upstream** *upstream-channel* **connector** *physical-port*
9. **cable upstream** *n* **docsis-mode** {**atdma** | **scdma** | **tdma** | **tdma-atdma**}
10. **cable upstream** *n* **channel-width** *first-choice-width* [*last-choice-width*]
11. **cable upstream** *n* **minislot-size** *size*
12. **cable upstream** *n* **range-backoff** {**automatic** | *start end*}
13. **cable upstream** *n* **modulation-profile** *primary-profile-number* [*secondary-profile-number*] [*tertiary-profile-number*]
14. **no cable upstream** *n* **shutdown**
15. **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** *slot/subslot/cable-interface-index* **Example:** `Router(config)# interface cable 7/0/0`	Enters the cable interface mode from the global configuration mode. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *cable interface index*—Downstream port number or MAC domain index of the cable interface line card.

	Command or Action	Purpose
Step 4	**cable bundle** *bundle-number* **Example:** `Router(config-if)# cable bundle 2`	Configures the cable interface to belong to an interface bundle. • *bundle-number*—Bundle identifier. The valid range is from 1 to 255.
Step 5	**downstream modular-cable** *slot/subslot/controller* **rf-channel** *grouplist* **upstream** *grouplist* **Example:** `Router(config-if)# downstream modular-cable 7/0/0 rf-channel 0`	Sets the RF channels from the Cisco uBR-MC3GX60V cable line card as primary channels in the MAC domain. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *controller*—Controller index for the modular cable. • *grouplist*—List of ranges for downstream RF channels. The valid range is from 0 to 23. • **upstream**—Indicates the logical identifier of upstreams that serve these downstream RF channels. **Note** The **upstream** keyword does not indicate an upstream logical channel that requires both, the upstream port number and the logical channel index (0 or 1). Here, it refers only to the upstream port. • *grouplist*—List of ranges for upstream RF channels. The valid range is from 0 to 7.

	Command or Action	Purpose
Step 6	**cable upstream** [*n* | **max-ports**] **frequency** *up-freq-hz* **Example:** `Router(config-if)# cable upstream 2 frequency 25000000`	Configures a fixed frequency of the upstream RF carrier for an upstream port. • *n*—Upstream channel number on the cable interface line card where you want to assign an upstream frequency. The valid values range from 0 to 3. • *up-freq-hz*—Upstream center frequency is configured to a fixed hertz (Hz) value. The valid upstream frequency ranges from 5 MHz (5000000 Hz) to 85 MHz (85000000 Hz). If you do not enter a frequency value, and spectrum management is configured, the Cisco CMTS dynamically specifies a center frequency for the given upstream interface. **Note** The **cable upstream freq-range** command is not supported on the Cisco uBR-MC3GX60V cable line card. All interfaces on the Cisco uBR-MC3GX60V cable line card support the extended frequency range of 5 MHz-85 MHz. **Note** The range of the upstream frequency is not restricted by the global frequency range value configured by the **cable freq-range** command in global configuration mode. **Note** If the frequency is set to the DOCSIS 3.0 extended frequency range (5 MHz-85 MHz), ensure that the cable plant is also set up to support the extended frequency range. In particular, the diplexers used by the upstream should support the extended frequency range. Also ensure that the center frequency of the upstream channel is less than 85MHz, so that [center frequency + 1/2 bandwidth] is less than or equal to 85MHz.
Step 7	**cable upstream max-ports** *n* **Example:** `Router(config-if)# cable upstream max-ports 4`	Configures the maximum number of upstreams on a cable interface (MAC domain) on the Cisco uBR-MC3GX60V cable interface line card. • *n*—Number of upstream ports. The valid range is from 0 to 8.
Step 8	**cable upstream** *upstream-channel* **connector** *physical-port* **Example:** `Router(config-if)# cable upstream 2 connector 0`	Maps an upstream port to a physical port on the Cisco uBR-MC3GX60V cable interface line card for use with a particular downstream. **Note** The 20 connectors are divided into 5 groups and each connector group can have up to 12 upstreams mapped to it. Therefore, if connector 0 has 12 upstreams mapped, then no upstreams can be mapped to connectors 1 to 3. • *upstream-channel*—Upstream channel number for the physical port assignment. • *physical-port*—Upstream port number for the actual physical port to be assigned. The valid range is from 0 to 19.

	Command or Action	Purpose
Step 9	**cable upstream** *n* **docsis-mode** {**atdma** |**scdma** | **tdma** | **tdma-atdma**} **Example:** `Router(config-if)# cable upstream 2 docsis-mode tdma`	Configures an upstream to use either DOCSIS 1.x or DOCSIS 2.0 modulation profiles. • *n*—Upstream channel number. The valid values start with 0 for the first upstream port on the cable interface line card. • **atdma**—Indicates the upstream only for DOCSIS 2.0 Advanced Time Division Multiple Access (A-TDMA) modulation profiles. • **scdma**—Indicates the upstream only for DOCSIS 2.0 Synchronous Code Division Multiple Access (S-CDMA) modulation profiles. • **tdma**—Indicates the upstream only for DOCSIS 1.0 and DOCSIS 1.1 Time Division Multiple Access (TDMA) modulation profiles (default). • **tdma-atdma**—Indicates the upstream for both A-TDMA and TDMA operation (mixed mode).
Step 10	**cable upstream** *n* **channel-width** *first-choice-width* [*last-choice-width*] **Example:** `Router(config-if)# cable upstream 2 channel-width 1600000 1600000`	Specifies an upstream channel width for an upstream port. • *n*—Upstream channel number. The valid values start with 0 for the first upstream port on the cable interface line card. • *first-choice-width*—Upstream channel width in Hz. The valid values for all cards are: – 200,000 (160,000 symbols/sec)—Not valid when using Unsolicited Grant Service (UGS) or UGS with Activity Detection (UGS-AD) service flows (such as PacketCable voice calls) – 400,000 (320,000 symbols/sec) – 800,000 (640,000 symbols/sec) – 1,600,000 (1,280,000 symbols/sec) – 3,200,000 (2,560,000 symbols/sec) • *last-choice-width*—Upstream channel width in hertz (Hz). The valid values are the same as those for the *first-choice-width* parameter, but for proper operation, the *last-choice-width* should be equal to or less than the first-choice-width value. Use this parameter with supported cards to enable symbol rate management algorithms. The symbol rate automatically steps up from the first-choice-width value to the highest value until a stable channel is established.
Step 11	**cable upstream** *n* **minislot-size** *size* **Example:** `Router(config-if)# cable upstream 2 minislot-size 4`	Specifies the minislot size (in ticks) for a specific upstream interface. • *n*—Upstream channel number. The valid values start with 0 for the first upstream port on the cable interface line card. • *size*—Minislot size in time ticks. The valid minislot sizes are 2, 4, 8, 16, 32, 64, and 128.

	Command or Action	Purpose
Step 12	**cable upstream** *n* **range-backoff** {**automatic** | *start end*} **Example:** `Router(config-if)# cable upstream 0 range-backoff 3 6`	Specifies automatic or configured initial ranging backoff calculation. • *n*—Upstream channel number. The valid values start with 0 for the first upstream port on the cable interface line card. • **automatic**—Indicates the fixed data backoff start and end values. • *start*—Binary exponential algorithm. Sets the start value for the initial ranging backoff. The valid values range from 0 to 15. • *end*—Binary exponential algorithm. Sets the end value for the initial ranging backoff. The valid values range from *start* to 15.
Step 13	**cable upstream** *n* **modulation-profile** *primary-profile-number* [*secondary-profile-number*] [*tertiary-profile-number*] **Example:** `Router(config-if)# cable upstream 0 modulation-profile 21`	Assigns one or two modulation profiles to an upstream port. • *n*—Upstream channel number. The valid values start with 0 for the first upstream port on the cable interface line card. • *primary-profile-number*—Number identifying the primary modulation profile for the upstream port. The valid values range from 21 to 30. • *secondary-profile-number*—Secondary modulation profile for the upstream port, which is used when noise on the upstream increases to the point that the primary modulation profile can no longer be used. The valid values are the same ranges as for the primary modulation profile. • *tertiary-profile-number*—Tertiary modulation profile for the upstream port.
Step 14	**no cable upstream** *n* **shutdown** **Example:** `Router(config-if)# no cable upstream 0 shutdown`	Enables a single upstream port. • *n*—Upstream channel number. The valid values start with 0 for the first upstream port on the cable interface line card.
Step 15	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.

Examples

The following example shows how to configure a cable interface:

```
Router> enable
Router# configure terminal
Router(config)# interface cable 7/0/0
Router(config-if)# cable bundle 2
Router(config-if)# downstream modular-cable 7/0/0 rf-channel 0
Router(config-if)# cable upstream 2 frequency 25000000
Router(config-if)# cable upstream max-ports 4
Router(config-if)# cable upstream 2 connector 0
Router(config-if)# cable upstream 2 docsis-mode tdma
Router(config-if)# cable upstream 2 channel-width 1600000 1600000e
Router(config-if)# cable upstream 2 minislot-size 4
Router(config-if)# cable upstream 2 range-backoff 3 6
```

```
Router(config-if)# cable upstream 2 modulation-profile 21
Router(config-if)# no cable upstream 0 shutdown
```

Troubleshooting Tips

Run the **show cable mac-domain cable** *slot/subslot/port* **cgd-associations** command to view a summary of the Channel Grouping Domain (CGD) associations for all cable MAC domains.

The following error may be displayed when you run the **no cable upstream** *n* **shutdown**:

```
Router(config-if)# no cable upstream 3 shutdown
%ERROR: Cannot unshut channel 3 on Cable7/0/0, please upgrade linecard license and retry
```

This error is displayed to indicate that there are insufficient licenses for the line card to unshut additional channels. You must either upgrade the license or shut down an unshut channel.

Note For information on logical channels, see *S-CDMA and Logical Channel Support on the Cisco CMTS Routers* feature guide on Cisco.com.

Configuring the Modular Cable Interface on the Cisco uBR-MC3GX60V Cable Interface Line Card

A modular cable interface forwards non-bonded traffic in the downstream direction. By default, this interface is allocated the bandwidth from the RF channel where it is configured.

The modular cable interfaces on slots 1 and 3 are only for SPAs. The modular cable interface for the Cisco uBR-MC3GX60V line card is restricted to slots 5 through 8.

Note The SPA and Cisco uBR-MC3GX60V line card modular cable interfaces are created independently of each other.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface modular-cable** *slot/subslot/controller:rf-channel*
4. **cable rf-bandwidth-percent** *percent-value* [**remaining ratio** *excess-value*]
5. **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 modular-cable** *slot/subslot/controller:rf-channel* **Example:** `Router(config)# interface Modular-Cable 8/1/0`	Enters the configuration mode to configure the Cisco uBR-MC3GX60V modular cable interface. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *controller*—Controller index for the modular cable. • *rf-channel*—RF channel. The valid range is from 0 to 23.
Step 4	***cable rf-bandwidth-percent*** *percent-value* [**remaining ratio** *excess-value*] **Example:** `Router(config-if)# cable rf-bandwidth-percent 96`	Enables either static or dynamic bandwidth percentage sharing for a modular cable interface in interface configuration mode. • *percent-value*—Static bandwidth allocation of a downstream RF channel. The range is from 1 to 100 percent. • **remaining ratio**—(Optional) Indicates the ratio of the remaining or excess bandwidth that can be allocated to the modular cable channel. **Note** If dynamic bandwidth sharing (DBS) is disabled (DBS is enabled by default) to use static bandwidth sharing, the **remaining ratio** option will not be available. • *excess-value*—Value of excess bandwidth that can be allocated to the modular cable channel. The valid range is from 1 to 100. The default value is 1.
Step 5	**end** **Example:** `Router(config-if)# end`	Exits controller configuration mode and returns to privileged EXEC mode.

Examples

The following example shows how to configure a modular cable interface on the Cisco uBR-MC3GX60V line card:

```
Router> enable
Router# configure terminal
Router(config)# interface modular-cable 7/0/0:0
Router(config-if)# cable rf-bandwidth-percent 96
Router(config-if)# cable bundle 1
```

Troubleshooting Tips

Run the **show interfaces modular-cable** *slot/subslot/controller:rf-channel* command to view the modular cable configuration details.

Configuring the Wideband Cable Interface on the Cisco uBR-MC3GX60V Cable Interface Line Card

A wideband (WB) cable interface forwards bonded traffic in the downstream direction. A set of RF channels is configured under the wideband cable interface. The Cisco uBR-MC3GX60V has 3 downstream controllers and 32 bonded channels per controller with a maximum of 24 RF channels in a bonding group. The 24 RF channels must be on the same controller.

Restrictions

Wideband channels can be formed only from the downstream RF channels belonging to a single controller.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface wideband-cable** *slot/subslot/controller:bonded-channel*
4. **cable bundle** *bundle-id*
5. **cable rf-channel** *rf-channel* **bandwidth-percent** *bw-percent*
6. **cable bonding-group-secondary**
7. **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 wideband-cable** *slot/subslot/controller:bonded-channel* **Example:** `Router(config)# interface Wideband-Cable 8/1/2:31`	Enters the wideband cable interface configuration mode. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *controller*—Controller index for the modular cable. • *bonded channel*—The valid range is from 0 to 31. **Note** An RF channel from a specific controller in a modular and multiple wideband group cannot exceed 96 percent.
Step 4	**cable bundle** *bundle-id* **Example:** `Router(config-if)# cable bundle 1`	Configures the wideband cable interface to belong to an interface bundle. • *bundle-id*—Bundle identifier. The valid range is from 1 to 255.
Step 5	**cable rf-channel** *rf-channel* **bandwidth-percent** *bw-percent* **Example:** `Router(config-if)# cable rf-channel 0 bandwidth-percent 25`	Configures the bandwidth of the RF channel that would be allocated to a specified wideband channel or bonding group. • *rf-channel*—RF channel on the physical port on the field-programmable gate array (FPGA). • **bandwidth-percent** *bw-percent*—(Optional) Indicates the percentage of bandwidth from this RF channel that is used for the wideband interface. The valid range is from 0 to 100 percent. If the **bandwidth-percent** is not used, the default bandwidth value is 100 percent.
Step 6	**cable bonding-group-secondary** **Example:** `Router(config-if)# cable bonding-group-secondary`	Configures the bonding group for VDOC multicast.
Step 7	**end** **Example:** `Router(config-if)# end`	Exits interface configuration mode and returns to privileged EXEC mode.

Examples

The following example shows how to configure the wideband cable interface on the Cisco uBR-MC3GX60V line card:

```
Router> enable
Router# configure terminal
Router(config)# interface wideband-cable 7/1/0:0
Router(config-if)# cable bundle 1
Router(config-if)# cable rf-channel 0 bandwidth-percent 25
Router(config-if)# cable rf-channel 1 bandwidth-percent 25
Router(config-if)# cable rf-channel 2 bandwidth-percent 25
Router(config-if)# cable rf-channel 3 bandwidth-percent 25
```

Troubleshooting Tips

- Run the **show interfaces wideband-cable** *slot/subslot/controller:bonded-channel* command to view the entire configuration of the bandwidth allocation between WB channels and RF channels.
- Run the **show controllers modular-cable** [**association** | **config** | **mapping**] command to verify whether a wideband channel is configured correctly.

Configuring Bonding Across 3G60 Controllers Support

Configuring the Bonding Across 3G60 Controller Support feature is similar to Configuring the Wideband Cable Interface on the Cisco uBR-MC3GX60V Cable Interface Line Card. A set of RF channels can be configured under any downstream bonding group or wideband cable interface configured on any of the three controllers on the Cisco uBR-MC3GX60V cable interface line card.

Restrictions

- The maximum number of RF channel members in a bonding group is 24.
- If a downstream bonding group includes RF channels with frequencies separated by a wide range, some wideband modems may not come online correctly. This happens because most modems do not support a wide range of frequencies. It is necessary to check the modems' frequency ranges while configuring the range of frequencies for controllers and configuring the Bonding Across 3G60 Controllers Support feature.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface wideband-cable** *slot/subslot/controller:bonded-channel*
4. **cable bundle** *bundle-id*
5. **cable rf-channel {controller** *controller* **channel** *rf-channel*} [**bandwidth-percent** *bw-percent*]
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 wideband-cable** *slot/subslot/controller:bonded-channel* **Example:** `Router(config)# interface Wideband-Cable 8/1/2:31`	Enters the wideband cable interface configuration mode. For details, see the Cisco IOS CMTS Cable Command Reference. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *controller*—Controller index for the modular cable. • *bonded channel*—The valid range is from 0 to 31. **Note** An RF channel from a specific controller in a modular and multiple wideband group cannot exceed 96 percent.
Step 4	**cable bundle** *bundle-id* **Example:** `Router(config-if)# cable bundle 1`	Configures the wideband cable interface to belong to an interface bundle. • *bundle-id*—Bundle identifier. The valid range is from 1 to 255.
Step 5	**cable rf-channel {controller** *controller* **channel** *rf-channel***}** [**bandwidth-percent** *bw-percent*] **Example:** `Router(config-if)# cable rf-channel controller 0 channel 12 bandwidth-percent 25`	Configures the bandwidth of the RF channel that would be allocated to a specified wideband channel or bonding group. • **controller** *controller*—Controller index for the modular cable. • **channel** *rf-channel*—RF channel on the physical port on the field-programmable gate array (FPGA). • **bandwidth-percent** *bw-percent*—(Optional) Indicates the percentage of bandwidth from this RF channel that is used for the wideband interface. The valid range is from 0 to 100 percent. If the **bandwidth-percent** is not used, the default bandwidth value is 100 percent.
Step 6	**end** **Example:** `Router(config-if)# end`	Exits interface configuration mode and returns to privileged EXEC mode.

Examples

The following example shows how to configure the Bonding Across 3G60 Controllers Support feature on the Cisco uBR-MC3GX60V line card:

```
Router>enable
Router#configuration terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface wideband-cable 7/0/1:30
Router(config)#cable bundle 1
Router(config-if)#cable rf-channel 23 bandwidth-percent 10
Router(config-if)#cable rf-channel 22 bandwidth-percent 10
Router(config-if)#cable rf-channel 21 bandwidth-percent 10
Router(config-if)#cable rf-channel controller 0 channel 21 bandwidth-percent 10
Router(config-if)#cable rf-channel controller 0 channel 22 bandwidth-percent 10
Router(config-if)#cable rf-channel controller 0 channel 23 bandwidth-percent 10
Router(config-if)#end
```

When the **controller** *controller* option is not used the default controller as specified in the interface wideband-cable command is used. To configure a RF-channel from a different controller, the **controller** *controller* option is used. In the example, RF channels number 21, 22 and 23 from the default controller are configured and then using the **controller** option, RF channels from controller 0 are configured.

Troubleshooting Tips

Run the **show controllers modular-cable** command to verify the configuration of the Bonding Across 3G60 Controller Support feature.

Configuring the RF Plant Topology on the Cisco uBR-MC3GX60V Cable Interface Line Card

You must configure the Hybrid Fiber-Coaxial (HFC) plant topology on the Cisco uBR-MC3GX60V cable interface line card to enable DOCSIS 3.0 operation and effective upstream spectrum management. The HCF plant topology configuration is achieved by associating upstream connectors and downstream channels with HFC service group units called fiber nodes.

Prerequisites

To ensure validity of the fiber-node configuration:

- All downstream channels in a fiber node should have a unique frequency and a downstream channel ID.
- All downstream channels in a fiber node should belong to the same bundle.
- All upstream channels in a fiber node must have a distinct frequency.

For details about the fiber-node configuration, see the *Cable Best Practices for the uBR10012* document at Cisco.com.

Restrictions

- The Cisco uBR-MC3GX60V line card supports 60 upstream channels mapped to 20 upstream connectors. Therefore, any connector has multiple upstream channels mapped to it.
- The Cisco uBR-MC3GX60V line card does not create a corresponding DOCSIS 3.0 general load balancing group (GLBG) on a fiber-node configuration that includes any channel from any other line card.

  In a fiber-node configuration, you can either add a restricted load balancing group (RLBG) or a DOCSIS 2.0 GLBG to contain the channels of the Cisco uBR-MC3GX60V line card for load balancing features.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **cable fiber-node** *fiber-node-id*
4. **downstream modular-cable** *downstream slot/downstream subslot/controller* **rf-channel** *grouplist*
5. **upstream cable** *slot/subslot* **connector** *physical-port*
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	**cable fiber-node** *fiber-node-id* **Example:** `Router(config)# cable fiber-node 1`	Enters the cable fiber-node configuration mode to configure a fiber node. • *fiber-node-id*—Unique numerical ID for the fiber node. The valid values range from 1 to 256.
Step 4	**downstream modular-cable** *downstream slot/downstream subslot/controller* **rf-channel** *grouplist* **Example:** `Router(config-fiber-node)# downstream modular-cable 6/1/0 rf-channel 3`	Configures the downstream on the fiber node of the Cisco uBR-MC3GX60V cable interface line card. • *downstream slot*—Cable interface line card slot. The valid range is from 1 to 3 for Cisco Wideband SPA, and 5 to 8 for Cisco uBR-MC3GX60V cable line card. • *downstream subslot*—Cable interface line card subslot. The valid values are 0 and 1. • *controller*—Cable interface number. The valid range is from 0 to 2. • *grouplist*—Group of RF channel number, and number ranges. The valid range is from 0 to 23.
Step 5	**upstream cable** *slot/subslot* **connector** *physical-port* **Example:** `Router(config-fiber-node)# upstream Cable 6/1 connector 3`	Specifies the upstream channel ports for a fiber node. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *physical-port*—Upstream channel port. The valid range is from 0 to 19.
Step 6	**end** **Example:** `Router(config-fiber-node)# end`	Exits controller configuration mode and returns to privileged EXEC mode.

Examples

The following example shows how to configure the fiber node on the Cisco uBR-MC3GX60V line card:

```
Router> enable
Router# configure terminal
Router(config-if)# cable fiber-node 1
Router(config-if)# downstream modular-cable 6/1/0 rf-channel 3
Router(config-if)# upstream Cable 6/1 connector 3
```

Troubleshooting Tips

Run the **show cable fiber-node** command to list all channels associated with the fiber node and to indicate if the fiber node is valid.

Configuring Redundancy on the Cisco uBR-MC3GX60V Cable Interface Line Card

There are two levels of redundancy for the Cisco uBR-MC3GX60V line card:

- Port-level redundancy—This redundancy is provided by the Gigabit Ethernet (GigE) ports on the Cisco uBR-MC3GX60V line card. For more information, see Configuring the GigE Interface for Downstream on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 25.
- Line-card redundancy—The line-card redundancy provides the following kinds of redundancy:
  - The upstream traffic redundancy is provided by the Global HCCP N+1 Redundancy. For more information, see Configuring Global HCCP N+1 Line Card Redundancy on the Cisco uBR10012 Router, page 28.
  - The downstream traffic redundancy is provided by manual DEPI and control plane DEPI. For more information, see Configuring the DEPI Control Plane on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 32 and Configuring Manual DEPI on the Cisco uBR-MC3GX60V Cable Interface Line Card, page 37.

Configuring the GigE Interface for Downstream on the Cisco uBR-MC3GX60V Cable Interface Line Card

The Cisco uBR-MC3GX60V line card supports six (3 + 3) GigE links that connect to the Cisco RF Gateway. The links are arranged in three sets of redundant pairs.

The links in the pair are modeled as an active-passive GigE pair and traffic can be quickly switched from the working GigE link to the standby GigE link in the pair.

The three active GigE links are numbered as *slot/subslot/0, 2, 4* and are mapped to the modular controllers *slot/subslot/0, 1, 2* respectively. You are not required to configure the passive GigE links.

During the initialization of the Cisco uBR-MC3GX60V line card, the following are created:

- Three GigE interfaces
- Three modular cable controllers
- 24 x 3 modular cable interfaces

Each GigE pair is assigned as:

- Gige {0, 1} – GigE interface 0 = Modular cable controller {0}; 0 to 23 channels; 0 to 31 bonding groups
- Gige {2, 3} – GigE interface 2 = Modular cable controller {1}; 24 to 47 channels; 32 to 63 bonding groups
- Gige {4, 5} – GigE interface 4 = Modular cable controller {2}; 48 to 71 channels; 64 to 95 bonding groups

Prerequisites

The Cisco uBR-MC3GX60V cable interface line card supports the following types of SFPs transceivers:

Table 2 SFP Modules for the Cisco uBR-MC3GX60V Cable Interface Line Card

SFP Module Product Number	SFP Module	Description
SFP-GE-T	1000BASE-T-SFP pluggable transceiver	Cisco 1000BASE-T-SF Pluggable transceiver module, 100-m on Category 5 (Cat 5), Category 5e (Cat 5e), and Category 6 (Cat 6) cable
GLC-SX-MM	Short wavelength (1000BASE-SX)	Cisco 1000BASE-SX SFP transceiver module for multimode fiber (MMF), 850-nm wavelength
GLC-LH-SM	Long wavelength/long haul (1000BASE-LX/LH)	Cisco 1000BASE-LX/LH SFP transceiver module for single-mode fiber (SMF), 130-nm wavelength
GLC-ZX-SM	Extended distance (1000BASE-ZX)	Cisco 1000BASE-ZX SFP transceiver module for SMF, 1550-nm wavelength

Restrictions

Due to slow link loss detection, we do not recommend using the SFP-GE-T transceivers for primary interfaces.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface gigabitEthernet** *slot/subslot/port*
4. **ip address** [*ip* | *dhcp* | *pool*] *IP subnet mask*
5. **negotiation auto**
6. **output-rate** *output-rate*
7. **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 gigabitEthernet** *slot/subslot/port* **Example:** `Router(config)# interface gigabitEthernet 8/1/0`	Enters GigE interface configuration mode. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *port*—Downstream port number.
Step 4	**ip address** [*ip address* | *dhcp* | *pool*] *IP subnet mask* **Example:** `Router(config-if)# ip address 10.30.4.1 255.255.0.0`	Sets the IP address of the GigE interface. • *ip address*—IP address of the GigE interface. • *dhcp*—IP address negotiated through the DHCP server. • *pool*—IP address autoconfigured from a local DHCP pool. • *IP subnet mask*—Subnet mask for the network.
Step 5	**negotiation auto** **Example:** `Router(config-if)# negotiation auto`	Selects the autonegotiation mode.
Step 6	**output-rate** *output-rate* **Example:** `Router(config-if)# output-rate 100`	Specifies the output link rate for DEPI packets on the GigE interface. • *output-rate*—The valid values range from 1 to 1000000 kbps. The recommended value is 1000 kbps.
Step 7	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.

Examples

The following example shows how to configure the GigE interface on the Cisco uBR-MC3GX60V line card:

```
Router> enable
Router(config)# interface gigabitEthernet 8/1/0
Router(config-if)# ip address 10.30.4.1 255.255.0.0
Router(config-if)# negotiation auto
Router(config-if)# output-rate 100
Router(config-if)# end
```

Troubleshooting Tips

- Run the **show interfaces gigabitEthernet** *slot/subslot/port* command to view the GigE interface configuration details.
- Run the **show controller** command to display link status of the primary and secondary ports and other information.

Configuring Global HCCP N+1 Line Card Redundancy on the Cisco uBR10012 Router

Note Starting with Cisco IOS Release 12.2(33)SCE1, N+1 redundancy feature including DEPI redundancy is supported on the Cisco uBR-MC3GX60V cable interface line card.

N+1 redundancy refers to (N) cable interface line cards, referred to as working line cards that are protected by an additional line card (+1), referred to as the protect line card.

Note In the Cisco uBR10012 routers, the value of N can be between one and seven Cisco uBR-MC3GX60V line cards. An additional Cisco uBR-MC3GX60V protect line card can provide the redundant backup for the other Cisco uBR-MC3GX60V working cards in the HCCP group.

N+1 redundancy provides synchronization between the HCCP working interface configurations and those configurations that are inherited during the switchover to the HCCP protect interfaces. This makes the configuration of the HCCP working and protect interfaces easier and the switchover times faster.

For more information, see the *N+1 Redundancy for the Cisco Cable Modem Termination System* feature guide.

Prerequisites

- Configure the RF switch name, using the **rf-switch name line card redundancy configuration** command, and the RF switch IP addresses before configuring the line card redundancy.
- Configure the downstream physical connectivity using the Ethernet switch with VLANs to ensure that the Cisco RF Gateway receives downstream traffic through the protect line card Ethernet ports.

- Ensure that the HCCP group configuration specifies the working and protect line cards, preconfiguration source line card, and the RF switch slot numbers.
- When using the DEPI control plane, ensure that the DEPI backup sessions (secondary sessions) are established. When using the manual DEPI, ensure that the GigE link is functioning on the protect line card.

Restrictions

- HCCP N+1 redundancy is not supported between different generations of line cards. That is, an HCCP group can consist of either M-CMTS based line cards (Cisco uBR-MC3GX60V line cards) or I-CMTS based line cards (Cisco uBR10-MC5X20 line cards or Cisco UBR-MC20X20V) to work in a redundant mode. The Cisco uBR10-MC5X20, Cisco UBR-MC20X20V, and Cisco uBR-MC3GX60V cards can coexist in the same chassis but only one group of line cards is allowed to have the redundancy configuration; that is, either integrated line cards or modular line cards.
- For a DEPI control plane connecting to a Cisco RF Gateway that does not support DEPI path redundancy (DPR), the modems go offline during the line card switchover. Because no valid backup sessions are available, new sessions are not re-established.

Note If your Cisco RF Gateway does not support DEPI control plane DPR, use the manual DEPI N+1 redundancy.

- The license on the protect line card should be a superset of the license on all working line cards.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip host rf-sw1** *ip_addr*
4. **ip host rf-sw2** *ip_addr*
5. **redundancy**
6. **linecard-group** *linecard-group identifier* **y-cable**
7. **member subslot** *slot/subslot* **working** [*rfsw-slot*]
8. **member subslot** *slot/subslot* **protect** [*slot/subslot* | **rf-power**]
9. **end**
10. **write memory**

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	**ip host rf-sw1** *ip_addr* **Example:** `Router(config)# ip host rf-sw1 10.4.4.1`	Assigns the Domain Name System (DNS) entry to the first or only Cisco RF switch in the redundancy scheme. • *ip_addr*—IP address of the RF switch.
Step 4	**ip host rf-sw2** *ip_addr* **Example:** `Router(config)# ip host rf-sw2 10.4.4.2`	(Required when using two Cisco RF Switches) Assigns the DNS entry to the second Cisco RF switch in the redundancy scheme.
Step 5	**redundancy** **Example:** `Router(config)# redundancy`	Enters redundancy configuration mode.
Step 6	**linecard-group** *linecard-group identifier* **y-cable** **Example:** `Router(config-red)# linecard-group 1 y-cable`	Enters line card redundancy mode. This command assigns the HCCP group to all interfaces on the cable interface line card or the Cisco Broadband Processing Engine (BPE). • *linecard-group identifier*—The valid value is 1. • **y-cable**—The link protection type for the line card group.
Step 7	**member subslot** *slot/subslot* **working** [*rfsw-slot*] **Example:** `Router(config-red-lc)# member subslot 8/0 working`	Configures all the interfaces on the specified line card to function as HCCP working interfaces in the redundancy scheme. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • **working** *rfsw-slot*—(Optional) Indicates the working RF switch slots for the line card. Repeat this step for each working line card in the Cisco router.

	Command or Action	Purpose

Step 8	**member subslot** *slot/subslot* **protect** [*slot/subslot* | **rf-power**]
	
	Example:
	`Router(config-red-lc)# member subslot 8/1 protect`
	
	member subslot *slot/subslot* **protect** [**config** *slot/subslot* | **rf-power**]
	
	Example:
	`Router(config-red-lc)# member subslot 8/1 protect config 8/0`
		Configures all the interfaces on the specified line card to function as HCCP protect interfaces in the redundancy scheme.
		
		or
		
		For faster switchover results, configures the protect interface for the most appropriate working interface configuration.
		
		rf-power—Sets the RF power.

Step 9	**end**
	
	Example:
	`Router(config-red-lc)# end`
	`Router#`
		Exits global and redundancy configuration modes and returns to privileged EXEC mode.

Step 10	**write memory**
	
	Example:
	`Router# copy running-config startup-config`
	`or`
	`Router# write memory`
		After configuring all domains, save your settings to the nonvolatile random access memory (NVRAM) to ensure that the system retains the settings after a power cycle.

Examples

The following is the sample output from the **show running configuration** command that displays the N+1 redundancy scheme configured on the Cisco uBR10012 universal broadband router with two Cisco RF switches:

```
Router# show running-config
...

ip host rfsw-1 10.4.4.1
ip host rfsw-2 10.4.4.2

redundancy
 main-cpu
  auto-sync standard
 linecard-group 1 cable
  rf-switch name 1 rf-switch-1
  rf-switch name 2 rf-switch-2
rf-switch snmp-community private123
  member subslot 6/1 working
  member subslot 5/1 protect
member subslot 8/0 working
...
```

Configuring the DEPI Control Plane on the Cisco uBR-MC3GX60V Cable Interface Line Card

The Cisco CMTS supports an N+1 DEPI redundancy to protect against the Cisco uBR-MC3GX60V cable line card failures and switchovers. In the redundancy mode, the protect line card establishes a backup DEPI session. The primary DEPI control connection and session is established on the GigE ports of the working line card. The two DEPI sessions are paired through the common transport stream identifier (TSID).

Note The network connectivity must be set up to reach the Cisco RF Gateway through the protect Cisco uBR-MC3GX60V line card.

In an N+1 line card redundancy, the protect line card initiates a DEPI control session to the RF Gateway channels during bootup. When the protect line card detects a line card failure, it enables all sessions of the failed line card. If there are multiple line cards with sessions to the same RF Gateway, the protect line card has a control connection and multiple corresponding secondary data sessions within it. The Cisco CMTS associates the primary and secondary sessions using the TSID, which has matching values for the corresponding primary and secondary sessions.

For more information, see the *M-CMTS DEPI Control Plane* feature guide at Cisco.com.

Prerequisites

- The GigE interfaces corresponding to modular controllers should have their source IP addresses configured.
- The PHY parameters (frequency, annex, modulation, and interleave) for the RF channel should be configured through the **rf-channel** *x* **frequency** *yyy000000* **annex B modulation** *xxx* **interleave** *xx* command.

Restrictions

- Only six DEPI-tunnel classes are allowed per controller.
- Common Layer 2 Transmission Protocol (L2TP) class configuration for all working controllers are associated with one protect controller.
- Modems will fall offline during the cable line card switchover, if the Cisco RF Gateway does not support DPR.
- UDP port option is not supported on the Cisco uBR-MC3GX60V cable line card.
- Failure detection time through the control plane is limited by the HELLO interval in L2TP class. To achieve fast failure detection, set the L2TP hello timeout to 1. The default L2TP hello timeout is 60 seconds. The recommended L2TP hello timeout is 30 seconds.

Note If the standby line card DEPI sessions are the superset of the active line card, Control Plane DEPI can detect downstream failure through the hello timeout and trigger a line card switchover.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **l2tp-class** *l2tp-class-name*
4. **hello** *seconds*
5. **retransmit retries** *max retransmissions*
6. **retransmit timeout** [**max** | **min**] *retransmit timeout*
7. **depi-class** *depi-classname*
8. **mode mpt**
9. **depi-tunnel** *protect-tunnel-name*
10. **dest-ip** *ip address*
11. **depi-tunnel** *working-tunnel-name*
12. **dest-ip** *ip address*
13. **protect-tunnel** *protect-tunnel-name*
14. **l2tp-class** *l2tp-class-name*
15. **depi-class** *depi-class-name*
16. **controller Modular-Cable** *slot/subslot/port*
17. **rf-channel** *rf-channel-num* **depi-tunnel** *working-tunnel-name* **tsid** *tsid*
18. **no rf-channel** *rf-port* **rf-shutdown**
19. **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`
	`Router(config)#`
		Enters global configuration mode.

Step 3	**l2tp-class** *l2tp-class-name* **Example:** `Router(config)# l2tp-class depi_l2tp_class`	Enters the L2TP class configuration mode where you can define an L2TP signalling template. • *l2tp-class-name*—L2TP class name.

	Command or Action	Purpose
Step 4	**hello** *seconds* **Example:** `Router(config-l2tp-class)# hello 1`	Configures the interval used to exchange hello keepalive packets in a Layer 2 control channel. • *seconds*—Number of seconds that a router at one end of a Layer 2 control channel waits before sending hello keepalive packets to its peer router. The valid values range from 0 to 1000 seconds. The default value is 60 seconds. **Note** If you want the DEPI tunnels to be less sensitive to network disturbances, increase the value of the hello time.
Step 5	**retransmit retries** *max retransmissions* **Example:** `Router(config-l2tp-class)# retransmit retries 5`	Configures the retransmission retry settings of the control packets. • *retries*—Number of retransmission cycles that occur before determining that the peer provider edge (PE) router does not respond. The valid values for retries range from 5 to 1000. The default value is 15. Specify a smaller value for faster failure detection.
Step 6	**retransmit timeout** [**max** | **min**] *retransmit timeout* **Example:** `Router(config-l2tp-class)# retransmit timeout max 1`	Specifies the maximum and minimum retransmission intervals (in seconds) for resending the control packets. • {**max** | **min**} *retransmit timeout*—The valid values for the *retransmit timeout* range is from 1 to 8. The default maximum interval is 8; the default minimum interval is 1.
Step 7	**depi-class** *depi-classname* **Example:** `Router(config)# depi-class depi_mpt_class`	Enters the DEPI class configuration mode. • *depi-classname*—Name of the DEPI class. The depi-classname must be specified to configure multiple sets of DEPI control parameters.
Step 8	**mode mpt** **Example:** `Router(config-depi-class)# mode mpt`	Enters the MPEG-Transport Stream (MPT) mode of the DEPI.
Step 9	**depi-tunnel** *protect-tunnel-name* **Example:** `Router(config-depi-class)# depi-tunnel depi_protect_tunnel_5_1_0`	Enters the DEPI data session configuration mode. • *protect-tunnel-name*—Name of the protect DEPI tunnel.
Step 10	**dest-ip** *ip-address* **Example:** `Router(config-depi-tunnel)# dest-ip 1.30.9.100`	Assigns a destination IP address belonging to the EQAM, which is the termination point of the DEPI tunnel. • *ip address*—IP address of the protect DEPI tunnel.
Step 11	**depi-tunnel** *working-tunnel-name* **Example:** `Router(config-depi-class)# depi-tunnel depi_working_tunnel_8_0_0`	Enters the DEPI data session configuration mode. • *working-tunnel-name*—Name of the working DEPI tunnel.

	Command or Action	Purpose
Step 12	**dest-ip** *ip-address* **Example:** `Router(config-depi-tunnel)# dest-ip 1.30.3.100`	Assigns a destination IP address belonging to the EQAM, which is the termination point of this DEPI tunnel. • *ip address*—IP address of the working DEPI tunnel.
Step 13	**protect-tunnel** *protect-tunnel-name* **Example:** `Router(config-depi-tunnel)# protect-tunnel depi_protect_tunnel_5_1_0`	Assigns a name to the protect tunnel.
Step 14	**l2tp-class** *l2tp-class-name* **Example:** `Router(config-depi-tunnel)# l2tp-class depi_l2tp_class`	Enters the L2TP class configuration mode where you can define an L2TP signalling template. • *l2tp-class-name*—L2TP class name.
Step 15	**depi-class** *depi-classname* **Example:** `Router(config-depi-tunnel)# depi-class depi_mpt_class`	Enters the DEPI class configuration mode. • *depi-classname*—Name of the DEPI class. The depi-classname must be specified to configure multiple sets of DEPI control parameters.
Step 16	**controller Modular-Cable** *slot/subslot/port* **Example:** `Router(config-depi-tunnel)# controller modular-cable 8/0/0`	Enters controller configuration mode. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *port*—Downstream port number.
Step 17	**rf-channel** *rf-channel-num* **depi-tunnel** *working-tunnel-name* **tsid** *tsid* **Example:** `Router(config-if)# rf-channel 0 depi-tunnel depi_working_tunnel_8_0_0 tsid 148`	Binds the DEPI tunnel to an RF channel. • *rf-channel-num*—RF channel on the physical port of the wideband SPA. The valid range is from 0 to 3. • *working-tunnel-name*—Name of the DEPI tunnel. • *tsid*—TSID value.
Step 18	**no rf-channel** *rf-port* **rf-shutdown** **Example:** `Router(config-if)# no rf-channel 0 rf-shutdown`	Enables the RF output. • *rf-port*—RF channel on the physical port. The valid range is 0 to 3. The valid values for rf-port depend on the configuration set with the annex modulation command.
Step 19	**end** **Example:** `Router(config-if)# end`	Exits controller configuration mode and returns to privileged EXEC mode.

Examples

The following example shows how to configure the GigE interface DEPI control plane on the Cisco uBR-MC3GX60V line card:

Note Before you begin the GigE interface configuration, ensure that the GigE interfaces are configured with an IP address by running these commands:

```
Router(config)# interface GigabitEthernet 8/0/0
Router(config-if)# ip address 1.30.3.1 255.255.255.0
Router(config)# interface GigabitEthernet 5/1/0
Router(config-if)# ip address 1.30.9.1 255.255.255.0
```

```
Router> enable
Router# configure terminal
Router(config)# l2tp-class depi_l2tp_class
Router(config-l2tp-class)# hello 1
Router(config-l2tp-class)# retransmit retries 5
Router(config-l2tp-class)# retransmit timeout max 1
Router(config-l2tp-class)# exit
Router(config)# depi-class depi_mpt_class
Router(config-depi-class)# mode mpt
Router(config-depi-class)# depi-tunnel depi_protect_tunnel_5_1_0
Router(config-depi-class)# dest-ip 1.30.9.100
Router(config-depi-class)# depi-tunnel depi_working_tunnel_8_0_0
Router(config-depi-tunnel)# dest-ip 1.30.3.100
Router(config-depi-tunnel)# protect-tunnel depi_protect_tunnel_5_1_0
Router(config-depi-tunnel)# l2tp-class depi_l2tp_class
Router(config-depi-tunnel)# depi-class depi_mpt_class
Router(config-depi-tunnel)# controller modular-cable 8/0/0
Router(config-controller)# rf-channel 0 depi-tunnel depi_working_tunnel_8_0_0 tsid 148
Router(config-controller)# no rf-channel 0 rf-shutdown
Router(config-controller)# end
```

Troubleshooting Tips

Run the **show depi**, **show depi session endpoints** (for the DEPI session status), and **show depi tunnel endpoints** (for the DEPI tunnel status) commands to view the DEPI session details.

Each of the four QAMs on an RF Gateway port must have the same RF power level and a contiguous frequency range. A configuration that does not meet these conditions is rejected by the RF Gateway.

On the Cisco CMTS side, this rejection results in intermittent connectivity problems or flapping of the DEPI sessions. The mismatch in RF power level or frequency mismatch are displayed in the **Reason** field in the **show depi session configured** output

```
Router# show depi session configured

Session Name                 State  Reason                       Time
Modular-Cable8/0/0:0         IDLE   QC RF Power mismatch         Sep 19 18:49:42
```

To resolve this issue, align the RF power for the QAMs to be the same value or align the frequency for the QAMs so they have a contiguous range, or do both.

You can run the following commands:

- **rf-channel** *rf-port* **rf-power** *power-level*
- **rf-channel** *x* **frequency** *yyy000000* **annex A | B modulation** *xxx qam* **interleave** *xx*

Configuring Manual DEPI on the Cisco uBR-MC3GX60V Cable Interface Line Card

The manual DEPI configuration also supports N+1 DEPI redundancy and port-level redundancy on the Cisco uBR-MC3GX60V line card. In manual DEPI configuration, you do not have to configure the protect tunnel. The working card configuration is automatically applied to the protect card through IPC messages.

The DEPI connection between the M-CMTS router and the EQAM is static in manual DEPI configuration. Data sessions are not established dynamically in manual DEPI configuration.

For more information, see the *M-CMTS DEPI Control Plane* feature guide at Cisco.com.

Prerequisites

- EQAM IP address and the MAC address must be specified.
- The EQAM must support L2TPv3.

Restrictions

Manual DEPI or control plane DEPI must be used for an entire Cisco uBR-MC3GX60V cable line card. That is, you must not configure manual DEPI for one controller and control plane DEPI for another controller on the same Cisco uBR-MC3GX60V cable line card; they must all be either one or the other on the same Cisco uBR-MC3GX60V cable line card.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **redundancy**
4. **linecard-group** *linecard-groupId* **y-cable**
5. **member subslot** *slot/subslot* **working**
6. **member subslot** *slot/subslot* **protect**
7. **controller Modular-Cable** *slot/subslot/port*
8. **rf-channel** *rf-port* **cable downstream channel-id** *channel-id*
9. **rf-channel** *rf-port* **frequency** [*freq* | **none**] [**annex** {**A** | **B**} **modulation** {**64** | **256**} [**interleave-depth** {**8** | **12** | **16** | **32** | **64** | **128**}]]
10. **rf-channel** *rf-port* **ip-address** *ip-address* **mac-address** *mac-address* **depi-remote-id** *session-id*
11. **end**

Note Steps 3 to 6 are applicable only if line card redundancy is supported.

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`
	`Router(config)#`
		Enters global configuration mode.

Step 3	**redundancy** **Example:** `Router(config)# redundancy`	Enters redundancy configuration mode
Step 4	**linecard-group** *linecard-groupId* **y-cable** **Example:** `Router(config-red)# linecard-group 1 y-cable`	Creates a line card group for one-to-one line card redundancy. • *linecard-groupId*—Unsigned integer in the range 0 to (maximum number of chassis line card subslots/2) -1.
Step 5	**member subslot** *slot/subslot* **working** **Example:** `Router(config-red-lc)# member subslot 5/0 working`	Configures the redundancy role of a line card. • *slot*—Working RF Switch slots for the line card. • *subslot*—Working RF Switch subslots for the line card. • **working**—Specifies the working slot in the line card group. Repeat this step for each working line card in the Cisco router.
Step 6	**member subslot** *slot/subslot* **protect** **Example:** `Router(config-red-lc)# member subslot 6/0 protect`	Configures the redundancy role of a line card. • *slot*—Protect RF Switch slots for the line card. • *subslot*—Protect RF Switch subslots for the line card. • **protect**—Specifies the protect slot in the line card group.
Step 7	**controller Modular-Cable** *slot/subslot/controller* **Example:** `Router(config-red-lc)# controller modular-cable 8/0/0`	Enters controller configuration mode. • *slot*—Slot where the cable interface line card resides. • *subslot*—(Cisco uBR10012 only) Secondary slot number of the cable interface line card. • *controller*—Modular cable controller. The valid range is from 0 to 2.
Step 8	**rf-channel** *rf-port* **cable downstream channel-id** *channel-id* **Example:** `Router(config-controller)# rf-channel 0 cable downstream channel-id 1`	Assigns a downstream channel ID to an RF channel in controller configuration mode. • *rf-port*— RF channel number on the physical port of the line card. The valid range is from 0 to 23. • *channel-id*—Unique channel ID. The valid range is from 1 to 255. **Note** We recommend that you retain the system-generated default channel IDs instead of configuring them.

	Command or Action	Purpose
Step 9	**rf-channel** *rf-port* **frequency** [*freq* | **none**] [**annex** {**A** | **B**} **modulation** {**64** | **256**} [**interleave-depth** {**8** | **12** | **16** | **32** | **64** | **128**}]] **Example:** `Router(config-controller)# rf-channel 0 frequency 453000000 annex B modulation 256qam interleave-depth 32`	Configures the frequency of an RF channel in modular cable controller configuration mode. • *rf-port*—RF channel number on the physical port of the line card. The valid range is from 0 to 3. • *freq*—Center frequency of the RF channel. The valid range for each RF channel is different based on the Annex type. • **none**—Removes the specified frequency if the RF channel is shut down. • **annex** {**A** | **B**}—Indicates the MPEG framing format for each RF channel. – **A**—Annex A. Indicates that the downstream is compatible with the European MPEG framing format specified in ITU-TJ.83 Annex A. – **B**—Annex B. Indicates that the downstream is compatible with the North American MPEG framing format specified in ITU-TJ.83 Annex B. • **modulation** {**64** | **256**}—Indicates the modulation rate (64 or 256 QAM) for each RF channel. • **interleave-depth value**—Indicates the downstream interleave depth. For annex A, the interleave value is 12. For annex B, the valid values are 8, 16, 32, 64, and 128.
Step 10	**rf-channel** *rf-port* **ip-address** *ip-address* **mac-address** *mac-address* **depi-remote-id** *session-id* **Example:** `Router(config-controller)# rf-channel 0 ip-address 192.168.100.20 mac-address 0090.f001.930c depi-remote-id 3001`	Sets the DEPI CMTS configuration. • *rf-port*—RF channel number on the physical port of the line card. The valid range is from 0 to 3. • *ip-address*—IP address of the Cisco RF Gateway. **Note** If the number of destination IP addresses, each corresponding to a DEPI tunnel, exceeds the limit of six, the command with the seventh IP address is rejected. • *mac-address*—MAC address of the Cisco RF Gateway. • *session-id*—DEPI remote session ID used for encapsulation of frames in DOCSIS-MPT mode. **Note** The User Datagram Protocol (UDP) port-based manual DEPI configuration is no longer supported. Therefore, this configuration solution is not supported with older Cisco RF Gateways that do not support the Layer 2 Transmission Protocol version 3.
Step 11	**end** **Example:** `Router(config-if)# end`	Exits controller configuration mode and returns to privileged EXEC mode.

Example

The following example shows how to configure Manual DEPI on the Cisco uBR-MC3GX60V line card:

```
Router> enable
Router# configure terminal
Router(config)# redundancy
Router(config-red)# linecard-group 1 y-cable
Router(config-red-lc)# member subslot 5/0 working
Router(config-red-lc)# member subslot 6/0 protect
Router(config-red-lc)# controller modular-cable 8/0/0
Router(config-controller)# rf-channel 0 cable downstream channel-id 1
Router(config-controller)# rf-channel 0 frequency 453000000 annex B modulation 256qam
interleave-depth 32
Router(config-controller)# rf-channel 0 ip-address 192.168.100.20 mac-address
0090.f001.930c depi-remote-id 3001
Router(config-if)# end
```

Troubleshooting Tips

Run **show controllers modular-cable rf-channel** to display the manual DEPI settings for the given controller.

Monitoring and Maintaining the Cisco uBR-MC3GX60V Cable Interface Line Card

The following sections describe the **show** commands that provide more information about the Cisco uBR-MC3GX60V cable interface line card:

- Viewing the Cisco uBR-MC3GX60V Cable Interface Line Card Statistics, page 40
- Viewing Information About the Cisco uBR-MC3GX60V Line Card and Cisco Wideband SPA Downstream Sharing, page 42
- Viewing Information About the Interface Controllers, page 48
- Viewing Information About the Cable Modems, page 49

Viewing the Cisco uBR-MC3GX60V Cable Interface Line Card Statistics

To view information about the Cisco uBR-MC3GX60V line card statistics, use the **show controller modular-cable** command in privileged EXEC mode.

This command allows the user to view the following line card statistics:

- Interface association
- JIB hardware downstream configuration
- Channel counters

- Errors
- Mapping of wideband and RF channels
- JIB hardware downstream registers
- JIB hardware downstream status

The following example shows a typical display for the **show controllers modular-cable** command:

```
Router# show controllers modular-cable 5/1/0 all

Modular Cable Controller 5/1/0:
-----------------------------------
  Channel 1  Annex = B  Modulation = 64 QAM
  Channel 2  Annex = B  Modulation = 64 QAM

Sync Configuration:
-------------------

Jib3-DS Device Information:
---------------------------
   Jib3-DS Version = 2.2.1.11
   SW Rev ID = 0x00020002 HW Rev ID = 0x0001000B
   Device Type: Unknown
   Driver State: 3
   Device Object Address: 0x20112190
   Ironbus Base Channel: 0xC02

Channel Resources:
------------------
   Total Non-bonded Channels..........= 72
   Per-Controller Non-bonded Channels = 24
   Total Bonded Channels..............= 96
   Per-Controller Bonded Channels.....= 32

Slot-Wide Resources:
--------------------
   Number of PHS Rules...........= 12K (0x3000)
   Number of BPI Table Entries...= 24K (0x6000)
   Number of Service Flows.......= 64K (0x10000)

Jib3-DS Status:
---------------
   Rx SPI..............: OK
   Tx SPI..............: OK
   DCM Status..........: OK
   ERP Status..........: OK
   DOCSIS RLDRAM Status: OK
   QM RLDRAM Status....: OK

BPI Error Counters:
-------------------
Bad Input Pkts  = 0  Single-bit ECC Errors = 0
Bad Output Pkts = 0

PLL events:  PLL 1 LD: 0000 PLL 2 LD: 0000 PLL 3 LD: 0000

Low Fa/Fl/Cp/Sa               0001 0000 0000 0000
Low Misc                      0000

The following example shows a typical display for the show controllers modular-cable
command with counters keyword:
router# show controllers Modular-Cable 6/0/0 counters rf-channel 2

Contr RF Pkts Bytes Pkts DMPT DMPT* Sync MAP/UCD Med Pri
```

```
Chan Tx Tx Dropped Mbps pps Pkts Pkts Pkts
Tx Tx Tx
6/0/0 2 78689590 14818993216 0 0.895732 594 13273653 65283559 135133

Total: 78689590 14818993216 0 0.895732 594 13273653 65283559 135133
* Does not include DEPI control plane or DLM packets.
router#
```

Viewing Information About the Cisco uBR-MC3GX60V Line Card and Cisco Wideband SPA Downstream Sharing

To view information about the Cisco uBR-MC3GX60V line card and the Cisco Wideband SPA downstream sharing, use the following commands in privileged EXEC mode:

- **show cable cgd-associations**
- **show cable mac-domain cable cgd-associations**
- **show cable mac-domain cable downstream-service-group**
- **show controllers cable downstream**
- **show controllers cable upstream**
- **show pxf cpu queue WB-SPA**
- **show pxf cpu statistics queue [OCQ | high Flowoff | low Flowoff]**

For a complete description of the above show commands, see the *Cisco IOS CMTSCable Command Reference Guide* on Cisco.com.

Examples

The following example is a sample output of the **show cable cgd-associations** command:

```
Router# show cable cgd-associations

CGD Host  Resource  DS Channels            Upstreams (AllUS)   Active Remote DS
Ca7/1/0   7/1/0     4                      0-3       Yes
                                                         4
```

Note In the AllUS field, *Yes* indicates all upstream channels are associated with downstream channels in the MAC domain. If the AllUS field is blank, all upstream channels are not associated with downstream channels.

The following example is a sample output of the **show cable mac-domain cable cgd-associations** command:

```
Router# show cable mac-domain cable 8/0/0 cgd-associations

CGD Host  Resource  DS Channels            Upstreams (AllUS)   Active Remote DS
Ca8/0/0   1/1/0     0                      0-3       Yes
```

The following example is a sample output of the **show cable mac-domain cable downstream-service-group** command:

```
Router# show cable mac-domain cable 8/0/0 downstream-service-group

Cable    MD-DS-SG              RF
IF       Id        Resource    Chan     Primary Chan
C8/0/0   1         1/1/0       00-03    0
                   1/3/0       00-03
                   7/0/0       00-03
                   8/0/2       00-03
```

The following example is a sample output of the **show controllers cable downstream** command:

```
Router# show controllers cable 8/0/0 downstream

  Dynamic Services Stats (All Downstreams):
  DSA: 0  REQs  0 RSPs  0 ACKs
  0 Successful DSAs  0 DSA Failures
  DSC: 0  REQs  0 RSPs  0 ACKs
  0 Successful DSCs  0 DSC Failures
  DSD:  0 REQs  29 RSPs
  0 Successful DSDs  0 DSD Failures
  DBC:  0 REQs  96 RSPs(Rcvd)  0 ACKs
  0 Successful DBCs  0 DBC Failures  0 DBC Partial
  96 DBC Protocol Violations
  0 Total DBC Pending Q-Size
  DCC: 0  REQs  0 RSPs  0 ACKs
  0 Successful DCCs  0 DCC Failures
  0 DCC Departs 0 DCC Arrives
  DCC end of transaction counts:
  DCC unknown cause(0) offline(0) if down(0) no cm(0)
  DCC no resource(0) no retries(0) reject(0) unknown state (0)
  DCC rebuild err (0) T15 timeout(0) wrong channel(0) reinit MAC (0)
  DCC dcc succeeds(0)
  DCC wcm(0)
  CM STATUS Stats:
  0 invalid_event  4 tlv_error
  0 disabled_event  598985 invalid_state
  0 invalid_chid  0 prim_chid
 Local total modems 0, modems active 0, total DS flows 3
  NB DS Mo1/1/0:0, STATE: UP
   Frequency 699.0000 MHz 256-QAM,  ANNEX B, R/S Interleave I=32, J=4
   Network Delay 550 (usec)
   Bandwidth (Kbps): 6000,  Load Percent: 0
   Channel ID: 5, US MAP: 0x000F
   Total modems: 51, modems active : 37, total DS flows: 158

  DS_chan_id  RFID  Interface
  --------------------------------------
    5         24    Mo1/1/0:0
  --------------------------------------

  MDDs           Primary          Non-Primary
  ----------------------------------------------
  1/1/0:0        1148012          0
  1/1/0:1        0                1148011
  1/1/0:2        0                1148011
  1/1/0:3        0                1148011
  1/3/0:0        0                1148011
  1/3/0:1        0                1148011
  1/3/0:2        0                1148011
  1/3/0:3        0                1148011
  7/0/0:0        0                1148011
  7/0/0:1        0                1148011
  7/0/0:2        0                1148011
  7/0/0:3        0                1148011
```

```
 8/0/2:0        0                1148011
 8/0/2:1        0                1148011
 8/0/2:2        0                1148011
 8/0/2:3        0                1148011
 ----------------------------------------------
```

The following example is a sample output of the **show controllers cable upstream** command:

```
Router# show controllers cable 8/0/0 upstream

 Cable8/0/0 Upstream 0 is up
  Frequency 15.000 MHz, Channel Width 0.800 MHz, Symbol Rate 0.640 Msps
  Modulations (16-QAM) - Short 16-QAM, Long 16-QAM
  Mapped to shared connector 0 and receiver 0
  Spectrum Group is overridden
  US phy MER(SNR)_estimate for good packets - 36.1280 dB
  Nominal Input Power Level -4 dBmV, Tx Timing Offset 5734
  Ranging Backoff Start 3, Ranging Backoff End 6
  US timing offset adjustment type 0, value 0
  Ranging Insertion Interval automatic (60 ms)
  US throttling off
  Tx Backoff Start 3, Tx Backoff End 5
  Modulation Profile Group 21
  Concatenation is enabled
  Fragmentation is enabled
  part_id=0x3142, rev_id=0xB1, rev2_id=0x00
  nb_agc_thr=0x0000, nb_agc_nom=0x0000
  Range Load Reg Size=0x58
  Request Load Reg Size=0x0E
  Minislot Size in number of Timebase Ticks is = 8
  Minislot Size in Symbols = 32
  Bandwidth Requests = 0xC7957
  Piggyback Requests = 0x19899
  Invalid BW Requests= 0x4BF
  Minislots Requested= 0xF2E365
  Minislots Granted  = 0xE240A
  Minislot Size in Bytes = 16
  Map Advance (Dynamic) : 3389 usecs
  Map Count Internal = 1134448325
  No MAP buffer= 0x0   No Remote MAP buffer= 0x0
  Map Counts: Controller 1/1/0 = 1134446105
  UCD Counts:
    Controller 1/1/0:0 = 1150386

  UCD procedures on lch 0
  UCD ucd-succeeds(2) ucd-shut(0) init-state-err(0)
  UCD init-tss-err(0) init-timeout(0) init-start-err(0)
  UCD ucd-ccc-time(0) ucd-timeout(0) ucd-tss-err(0)
  UCD ucd-state-err(0) ucd-process(0) ucd-retries(0)
  UCD stale-tss(0)
  PHY: us errors 0  us recoveries 0 (enp 0)
  MAC PHY TSS: tss error start 0  tss error end 0
  MAC PHY Status: bcm3140 status 0  lookout status 0
  PHY: TSS late 0  discontinuous 0
  PHY: TSS mis-match 0  not-aligned 0
  PHY: TSS missed snapshots from phy 0
  MAP/UCD Replication Instructions:
    Controller 1/1/0 index = 361, bitmap = 0x0001
 Cable8/0/0 Upstream 1 is up
  Frequency 16.000 MHz, Channel Width 0.800 MHz, Symbol Rate 0.640 Msps
  Modulations (16-QAM) - Short 16-QAM, Long 16-QAM
  Mapped to shared connector 0 and receiver 1
  Spectrum Group is overridden
```

```
  US phy MER(SNR)_estimate for good packets - 36.1280 dB
  Nominal Input Power Level -4 dBmV, Tx Timing Offset 2330
  Ranging Backoff Start 3, Ranging Backoff End 6
  US timing offset adjustment type 0, value 0
  Ranging Insertion Interval automatic (60 ms)
  US throttling off
  Tx Backoff Start 3, Tx Backoff End 5
  Modulation Profile Group 21
  Concatenation is enabled
  Fragmentation is enabled
  part_id=0x3142, rev_id=0xB1, rev2_id=0x00
  nb_agc_thr=0x0000, nb_agc_nom=0x0000
  Range Load Reg Size=0x58
  Request Load Reg Size=0x0E
  Minislot Size in number of Timebase Ticks is = 8
  Minislot Size in Symbols = 32
  Bandwidth Requests = 0xC0BFF
  Piggyback Requests = 0x18BFB
  Invalid BW Requests= 0x1B248
  Minislots Requested= 0xE50E2A
  Minislots Granted  = 0xDA909
  Minislot Size in Bytes = 16
  Map Advance (Dynamic) : 3057 usecs
  Map Count Internal = 1134268243
  No MAP buffer= 0x0   No Remote MAP buffer= 0x0
  Map Counts: Controller 1/1/0 = 1134266034
  UCD Counts:
    Controller 1/1/0:0 = 1150386

  UCD procedures on lch 0
  UCD ucd-succeeds(2) ucd-shut(0) init-state-err(0)
  UCD init-tss-err(0) init-timeout(0) init-start-err(0)
  UCD ucd-ccc-time(0) ucd-timeout(0) ucd-tss-err(0)
  UCD ucd-state-err(0) ucd-process(0) ucd-retries(0)
  UCD stale-tss(0)
  PHY: us errors 0  us recoveries 0 (enp 0)
  MAC PHY TSS: tss error start 0  tss error end 0
  MAC PHY Status: bcm3140 status 0  lookout status 0
  PHY: TSS late 0  discontinuous 0
  PHY: TSS mis-match 0  not-aligned 0
  PHY: TSS missed snapshots from phy 0
  MAP/UCD Replication Instructions:
    Controller 1/1/0 index = 362, bitmap = 0x0001
Cable8/0/0 Upstream 2 is up
  Frequency 17.000 MHz, Channel Width 0.800 MHz, Symbol Rate 0.640 Msps
  Modulations (16-QAM) - Short 16-QAM, Long 16-QAM
  Mapped to shared connector 0 and receiver 2
  Spectrum Group is overridden
  US phy MER(SNR)_estimate for good packets - 36.1280 dB
  Nominal Input Power Level -4 dBmV, Tx Timing Offset 5733
  Ranging Backoff Start 3, Ranging Backoff End 6
  US timing offset adjustment type 0, value 0
  Ranging Insertion Interval automatic (60 ms)
  US throttling off
  Tx Backoff Start 3, Tx Backoff End 5
  Modulation Profile Group 21
  Concatenation is enabled
  Fragmentation is enabled
  part_id=0x3142, rev_id=0xB1, rev2_id=0x00
  nb_agc_thr=0x0000, nb_agc_nom=0x0000
  Range Load Reg Size=0x58
  Request Load Reg Size=0x0E
  Minislot Size in number of Timebase Ticks is = 8
  Minislot Size in Symbols = 32
```

```
  Bandwidth Requests = 0xAB0B1
  Piggyback Requests = 0x163A0
  Invalid BW Requests= 0x696
  Minislots Requested= 0xE32885
  Minislots Granted  = 0xC260C
  Minislot Size in Bytes = 16
  Map Advance (Dynamic) : 3389 usecs
  Map Count Internal = 1134411867
  No MAP buffer= 0x0   No Remote MAP buffer= 0x0
  Map Counts: Controller 1/1/0 = 1134409666
  UCD Counts:
    Controller 1/1/0:0 = 1150386

  UCD procedures on lch 0
  UCD ucd-succeeds(2) ucd-shut(0) init-state-err(0)
  UCD init-tss-err(0) init-timeout(0) init-start-err(0)
  UCD ucd-ccc-time(0) ucd-timeout(0) ucd-tss-err(0)
  UCD ucd-state-err(0) ucd-process(0) ucd-retries(0)
  UCD stale-tss(0)
  PHY: us errors 0  us recoveries 0 (enp 0)
  MAC PHY TSS: tss error start 0  tss error end 0
  MAC PHY Status: bcm3140 status 0  lookout status 0
  PHY: TSS late 0  discontinuous 0
  PHY: TSS mis-match 0  not-aligned 0
  PHY: TSS missed snapshots from phy 0
  MAP/UCD Replication Instructions:
    Controller 1/1/0 index = 363, bitmap = 0x0001
......
```

The following example is a sample output of the **show pxf cpu queue wb-spa** command:

```
Router# show pxf cpu queue wb-spa

SPA 1/1/0
MAP/UCD and LP-MMM Flow (IronBus Channel: 0xC020):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
8         0/255  251121646  0           0         1/10000  0       32771  hi-pri
131100    0/255  9634685    0           0         1/10000  0       32770  lo-pri

SPA 1/3/0
MAP/UCD and LP-MMM Flow (IronBus Channel: 0xC030):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
66        0/255  0          0           0         1/10000  0       32775  hi-pri
131216    0/255  4596528    0           0         1/10000  0       32774  lo-pri

Fauna6/0
Statistics and Cable Monitor Flow (IronBus Channel: 0x1FFF):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
131441    0/255  0          0           0         1/240    0       205   def

CableInternal6/0
Statistics and Cable Monitor Flow (IronBus Channel: 0x7000):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
178       0/255  0          0           0         1/10000  0       32789  hi-pri
131440    0/255  2303963    0           0         1/10000  0       32788  lo-pri
131439    0/255  0          0           0         1/240    0       20     def

CableInternal6/1
Statistics and Cable Monitor Flow (IronBus Channel: 0x0500):
```

```
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
185       0/255  0          0           0         1/10000  0       32791  hi-pri
131454    0/255  2394164    0           0         1/10000  0       32790  lo-pri
131453    0/255  0          0           0         1/240    0       21     def

Fauna7/0
Statistics and Cable Monitor Flow (IronBus Channel: 0x1FFF):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
131557    0/255  0          0           0         1/240    0       266   def

CableInternal7/0
Statistics and Cable Monitor Flow (IronBus Channel: 0x7000):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
236       0/255  4596556    0           0         1/10000  0       32793  hi-pri
131556    0/255  2377280    0           0         1/10000  0       32792  lo-pri
131555    0/255  0          0           0         1/240    0       22     def

Fauna8/0
Statistics and Cable Monitor Flow (IronBus Channel: 0x1FFF):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
131903    0/255  0          0           0         1/240    0       453   def

CableInternal8/0
Statistics and Cable Monitor Flow (IronBus Channel: 0x7000):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
409       0/255  0          0           0         1/10000  0       32797  hi-pri
131902    0/255  3350878    0           0         1/10000  0       32796  lo-pri
131901    0/255  0          0           0         1/240    0       24     def

Fauna8/1
Statistics and Cable Monitor Flow (IronBus Channel: 0x1FFF):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
132261    0/255  0          0           0         1/240    0       697   def

CableInternal8/1
Statistics and Cable Monitor Flow (IronBus Channel: 0x7000):
QID     Len/Max  Dequeues   TailDrops   MinRt  Wt/Quantum  ShapeRt FlowId
                                        (Kbps)             (Kbps)
582       0/255  0          0           0         1/10000  0       32799  hi-pri
132260    0/255  0          0           0         1/10000  0       32798  lo-pri
132259    0/255  0          0           0         1/240    0       25     def
```

The following example is a sample output of the **show pxf cpu statistics queue ocq** command:

```
Router# show pxf cpu statistics queue ocq

 OCQ counter per resource

 resource  flowResource    slot    counter

   00        00                     0x0 (0)
   01        01            to RP    0x0 (0)
   02        09             5/0     0x0 (0)
   03        08             5/1     0x0 (0)
   04        07             6/0     0x0 (0)
   05        06             6/1     0x0 (0)
   06        05             7/0     0x0 (0)
```

```
   07        04             7/1     0x0 (0)
   08        03             8/0     0x0 (0)
   09        02             8/1     0x0 (0)
   10        17             1/0     0x0 (0)
   11        16             1/1     0x0 (0)
   12        15             2/0     0x0 (0)
   13        14             2/1     0x0 (0)
   14        13             3/0     0x0 (0)
   15        12             3/1     0x0 (0)
   16        11             4/0     0x0 (0)
   17        10             4/1     0x0 (0)
   18        18                     0x0 (0)
   19        19                     0x0 (0)
   20        20                     0x0 (0)
   21        21                     0x0 (0)
   22        22                     0x0 (0)
   23        23                     0x0 (0)
   24        24                     0x0 (0)
   25        25                     0x0 (0)
   26        26                     0x0 (0)
   27        27                     0x0 (0)
   28        28                     0x0 (0)
   29        29                     0x0 (0)
   30        30                     0x0 (0)
   31        31                     0x0 (0)

* slot to resource mapping may not accurate for none PRE4
```

Viewing Information About the Interface Controllers

To view information about the interface controllers, use the following commands in privileged EXEC mode:

- **show controller cable** *slot/subslot/port*
- **show interface cable** *slot/subslot/cable-interface-index*

For a complete description of the above show commands, see the *Cisco Broadband Cable Command Reference Guide* on Cisco.com.

Examples

The following example shows a typical display for the **show controller cable** command:

```
Router# show controller cable 5/1/0

Interface Cable5/1/0
Hardware is MC3GX60V

Upstream MAC Processor Powered by Jib3 Upstream FPGA Complex
Jib3 Upstream FPGA is Initialized
  Jib3US Initialization Error Code: 0
  Jib3US Initialization Status    : No error at Startup Init
Jib3 Upstream FPGA Information
  Fluorine FPGA Rev ID    = 0x00000001
  Fluorine FPGA HW Rev ID = 0x00000006
  Fauna FPGA Rev ID    = 0x00000008
  Fauna FPGA HW Rev ID = 0x00000002

  Jib3US Hardware Flow State Info - Segment 0
    Bonded HwFlows Free    = 32768
```

```
    Bonded HwFlows Used    = 0
    Bonded HwFlows Wait    = 0
    NonBonded HwFlows Free = 98304
    NonBonded HwFlows Used = 0
    NonBonded HwFlows Wait = 0
    ------------------------------
    Total Jib3US HwFlows   = 131072

  Jib3US State = Active, Active Seg = 0, Clr Rldram Done = True, CCF Done=True

HCCP HA FLAGS:
  linestate: TRUE hccp_if_inited: FALSE hccphopready: TRUE
  hccp_keepalive: FALSE hccp_critical: FALSE ha_critical: FALSE
  drop_mac_msgs: FALSE current_active_segment: 0


Cable5/1/0 JIB hardware status:

  JIB Upstream port 1 Enabled  Bound to local = 0
  JIB Upstream port 2 Enabled  Bound to local = 0
  JIB Upstream port 3 Enabled  Bound to local = 0
  JIB Upstream port 4 Enabled  Bound to local = 0
```

The following example shows a typical display for the **show interface cable** command.

```
Router# show interface cable 5/1/0

Cable5/1/0 is up, line protocol is up
  Hardware is UBR10000 CLC, address is 0013.5f05.134c (bia 0013.5f05.134c)
  MTU 1500 bytes, BW 26000 Kbit, 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: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Interface Cable5/1/0 queueing strategy: fifo
  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, 1 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

Viewing Information About the Cable Modems

To view information about the registered and unregistered cable modems, use the **show cable modem** command in privileged EXEC mode. For a complete description of this command, see the *Cisco Broadband Cable Command Reference Guide* on Cisco.com.

Examples

The following example shows a typical display for the **show cable modem** command:

```
Router# show cable modem
```

```
MAC Address    IP Address     I/F           MAC           Prim RxPwr  Timing Num I
                                            State         Sid  (dBmV) Offset CPE P
0018.f826.337e 80.14.0.2      C5/0/0/U0     online(pt)    1    0.00   1992   0 N
0018.6852.82f8 80.14.0.5      C5/0/0/U0     w-online(pt)  2    0.50   1998   0 N
0013.10c6.c43d 80.14.0.3      C6/1/0/U0     online(pt)    1    0.00   1997   0 N
0019.474a.e162 80.14.0.4      C6/1/0/U0     w-online(pt)  2    -0.75  1999   0
```

The following example shows a typical display for the **show cable modem primary** command:

```
Router# show cable modem primary

MAC Address    IP Address     Host          MAC           Prim  Num Primary    DS
                              Interface     State         Sid   CPE Downstream RfId
0018.f826.337e 80.14.0.2      C5/0/0/U0     online(pt)    1     0   Mo5/0/0:1 24
0018.6852.82f8 80.14.0.5      C5/0/0/U0     w-online(pt)  2     0   Mo5/0/0:1 24
0013.10c6.c43d 80.14.0.3      C6/1/0/U0     online(pt)    1     0   Mo6/1/0:0 2
0019.474a.e162 80.14.0.4      C6/1/0/U0     w-online(pt)  2     0   Mo6/1/0:0 2
```

Troubleshooting the Cisco uBR-MC3GX60V Cable Interface Line Card

The following MAC domain commands are useful for troubleshooting bonding operations:

- **show cable mac-domain cable cgd-associations**
- **show cable mac-domain cable downstream-service-group**
- **show cable mac-domain cable forwarding**
- **show cable mac-domain cable rcc**
- **show cable mac-domain cable upstream-service-group**

To troubleshoot software license issues, use the following commands:

- **show cable license**
- **show license detail**

For the M-CMTS network architecture, DOCSIS Timing Interface (DTI) based timing must be enabled with the following global configuration command:

- **cable clock dti**

  If DTI timing does not function correctly, modems are not be seen even in an init() state.

To determine the active DOCSIS Timing and Control Card (DTCC) and its current status, run the following command:

- **show cable clock**

```
Router# show cable clock

Number of TCC Cards in the Chassis: 1
Active TCC Card is in slot: 1 subslot: 1,(DTCC Eightbells card) Clock reference used
by the active card is DTI

Active TCC card in slot 1/1
TCC Card 1/1 DTI status:
------------------------------------------ Active Client port: 2
Active Client status: normal Active Client Server status: freerun Active Client frame
error rate : < 2% Active Client CRC error count : 0xFC Standby Client Signal detected
: no
```

Some other commands that you can use to troubleshoot the Cisco uBR-MC3GX60 line card:

- **show diag**

  To verify that the Cisco uBR-MC3GX60 line card is powered on, use the **show diag** command. If the output of the **show diag** command displays any output, the Cisco uBR-MC3GX60 line card is powered on.

  If the Cisco uBR-MC3GX60 line card is powered on, verify that:

  – The line card has been inserted correctly and is screwed in

  – There are no extraneous subslot **shutdown** commands in the configuration that are preventing the line card from booting. Run the **show running | include hw-module shutdown** command for more information.

  If **show diag** command does not display any output and the card is powered on by configuration, physically examine the line card face plate and check the Fail LED status. If the LED is on, then the line card is not booting correctly.

Note When using a Cisco uBR-MC3GX60 line card, the empty slots in the Cisco uBR10012 router must be filled with blank filler cards to maximize air flow and keep the line cards functioning within proper thermal boundaries.

- **show controllers modular-cable sfp**

  The Cisco uBR-MC3GX60 line card can have up to six Small Form-Factor Pluggable (SFPs) for its three controllers. To check the presence and link status of the SFP, use the **show controllers modular-cable sfp** command. If the SFP is not present, the output will display:

  ```
  SFP in Port1 is NOT PRESENT
  ```

  If the SFP is present, verify that the "Phy Port" status is "Up"

- **show ip interface brief**

  To verify bidirectional communication between the Cisco CMTS and the RF Gateway, run the **show ip interfaces brief** command.

  The Cisco uBR-MC3GX60 line card has three Gigabit Ethernet interfaces. When an IP address is configured on the GigE interface in a subnet that includes the RF Gateway, the IP address of the RF Gateway becomes pingable.

For more information on troubleshooting, see the *Cisco DOCSIS 3.0 Downstream Solution Design and Implementation Guide*.

For complete descriptions of the above configuration commands, see the *Cisco IOS CMTS Cable Command Reference* on Cisco.com.

Upgrading Cisco uBR10-MC5X20S/U/H or Cisco UBR-MC20X20V Line Cards to Cisco uBR-MC3GX60V Cable Interface Line Card

The Cisco IOS Release 12.2(33)SCE does not support online insertion and removal (OIR) compatibility for the Cisco uBR-MC3GX60V line card. To upgrade to the Cisco uBR-MC3GX60V line card from the Cisco uBR10-MC5X20S/U/H or Cisco UBR-MC20X20V line cards, you must remove the existing configuration of the line card using the **no card** command and create a new configuration for the Cisco uBR-MC3GX60V line card.

Configuration Examples for the Cisco uBR-MC3GX60V Cable Interface Line Card

The following example shows how to configure the Cisco uBR-MC3GX60V cable interface line card:

```
!
! Configure DEPI tunnel to EQAM. DEPI tunnel requires L2TP class and
! DEPI class configuration that be applied to multiple tunnels.
!
l2tp-class class1
 hello 1
 retransmit retries 5
 retransmit timeout max 1
!
depi-class rfgw10-1
```

```
 mode mpt
!
depi-tunnel rfgw10-1_81_0_w
 dest-ip 192.168.18.200
 l2tp-class class1
 depi-class rfgw10-1
!
! Configure RF channel parameters and DEPI tunnel.
!
controller Modular-Cable 8/1/0
 rf-channel 0 cable downstream channel-id 169
 rf-channel 0 frequency 453000000 annex B modulation 256qam interleave 32
 rf-channel 0 depi-tunnel rfgw10-1_81_0_w tsid 1231
 no rf-channel 0 rf-shutdown
 rf-channel 1 cable downstream channel-id 170
 rf-channel 1 frequency 459000000 annex B modulation 256qam interleave 32
 rf-channel 1 depi-tunnel rfgw10-1_81_0_w tsid 1232
 no rf-channel 1 rf-shutdown
 rf-channel 2 cable downstream channel-id 171
 rf-channel 2 frequency 465000000 annex B modulation 256qam interleave 32
 rf-channel 2 depi-tunnel rfgw10-1_81_0_w tsid 1233
 no rf-channel 2 rf-shutdown
 rf-channel 3 cable downstream channel-id 172
 rf-channel 3 frequency 471000000 annex B modulation 256qam interleave 32
 rf-channel 3 depi-tunnel rfgw10-1_81_0_w tsid 1234
 no rf-channel 3 rf-shutdown
 rf-channel 4 cable downstream channel-id 173
 rf-channel 4 frequency 477000000 annex B modulation 256qam interleave 32
 rf-channel 4 depi-tunnel rfgw10-1_81_0_w tsid 1241
 no rf-channel 4 rf-shutdown
 rf-channel 5 cable downstream channel-id 174
 rf-channel 5 frequency 483000000 annex B modulation 256qam interleave 32
 rf-channel 5 depi-tunnel rfgw10-1_81_0_w tsid 1242
 no rf-channel 5 rf-shutdown
 rf-channel 6 cable downstream channel-id 175
 rf-channel 6 frequency 489000000 annex B modulation 256qam interleave 32
 rf-channel 6 depi-tunnel rfgw10-1_81_0_w tsid 1243
 no rf-channel 6 rf-shutdown
 rf-channel 7 cable downstream channel-id 176
 rf-channel 7 frequency 495000000 annex B modulation 256qam interleave 32
 rf-channel 7 depi-tunnel rfgw10-1_81_0_w tsid 1244
 no rf-channel 7 rf-shutdown
 rf-channel 8 cable downstream channel-id 177
 rf-channel 9 cable downstream channel-id 178
 rf-channel 10 cable downstream channel-id 179
 rf-channel 11 cable downstream channel-id 180
 rf-channel 12 cable downstream channel-id 181
 rf-channel 13 cable downstream channel-id 182
 rf-channel 14 cable downstream channel-id 183
 rf-channel 15 cable downstream channel-id 184
 rf-channel 16 cable downstream channel-id 185
 rf-channel 17 cable downstream channel-id 186
 rf-channel 18 cable downstream channel-id 187
 rf-channel 19 cable downstream channel-id 188
 rf-channel 20 cable downstream channel-id 189
 rf-channel 21 cable downstream channel-id 190
 rf-channel 22 cable downstream channel-id 191
 rf-channel 23 cable downstream channel-id 192
!
! Configure MAC domain with primary capable downstream channels, and
! upstream channels.
!
interface Cable8/1/14
 downstream Modular-Cable 8/1/0 rf-channel 0
```

```
 cable mtc-mode
 no cable packet-cache
 cable bundle 1
 cable upstream max-ports 4
 cable upstream bonding-group 81
  upstream 0
  upstream 1
  upstream 2
  upstream 3
  attributes 80000000
 cable upstream 0 connector 0
 cable upstream 0 frequency 15000000
 cable upstream 0 channel-width 1600000 1600000
 cable upstream 0 docsis-mode tdma
 cable upstream 0 minislot-size 4
 cable upstream 0 range-backoff 3 6
 cable upstream 0 modulation-profile 21
 no cable upstream 0 shutdown
 cable upstream 1 connector 0
 cable upstream 1 frequency 25000000
 cable upstream 1 channel-width 1600000 1600000
 cable upstream 1 docsis-mode tdma
 cable upstream 1 minislot-size 4
 cable upstream 1 range-backoff 3 6
 cable upstream 1 modulation-profile 21
 no cable upstream 1 shutdown
 cable upstream 2 connector 0
 cable upstream 2 frequency 30000000
 cable upstream 2 channel-width 1600000 1600000
 cable upstream 2 docsis-mode tdma
 cable upstream 2 minislot-size 4
 cable upstream 2 range-backoff 3 6
 cable upstream 2 modulation-profile 21
 no cable upstream 2 shutdown
 cable upstream 3 connector 0
 cable upstream 3 frequency 35000000
 cable upstream 3 channel-width 1600000 1600000
 cable upstream 3 docsis-mode tdma
 cable upstream 3 minislot-size 4
 cable upstream 3 range-backoff 3 6
 cable upstream 3 modulation-profile 21
 no cable upstream 3 shutdown
!
! Configure GE interface for controller 8/1/0 with DEPI tunnel source
! IP address.
!
interface GigabitEthernet8/1/0
 ip address 192.168.18.100 255.255.255.0
 negotiation auto
 output-rate 100
!
! Configure Modular-Cable interface for primary cable downstream channel

interface Modular-Cable8/1/0:0
 cable bundle 1
 cable rf-bandwidth-percent 46
!
! Configure Wideband-Cable interface with primary and non-primary
! downstream channels
!
interface Wideband-Cable8/1/0:31
 cable bundle 1
 cable rf-channel 0 bandwidth-percent 20
 cable rf-channel 1 bandwidth-percent 20
```

```
 cable rf-channel 2 bandwidth-percent 20
!
! Configure Bundle interface referenced by MAC domain, Modular-Cable, and
! Wideband-Cable interfaces.
!
interface Bundle1
 ip address 80.14.0.1 255.255.255.0
 cable arp filter request-send 3 2
 cable arp filter reply-accept 3 2
!
! Configure  fiber node with downstream and upstream channels
!
cable fiber-node 1
  downstream Modular-Cable 8/1/0 rf-channel 0-7
 upstream Cable 8/1 connector 0
!
```

Note For more configuration examples, see the Cisco documentation wiki (DocWiki) at http://docwiki.cisco.com/wiki/Cisco_uBR-MC3GX60V_Cable_Line_Card_Configuration_Example.

Configuration Examples for the Cisco uBR-MC3GX60V Cable Interface Line Card along with Wideband SPA

The following example shows how to configure the Cisco uBR-MC3GX60V line card along with the Cisco Wideband SPA:

Note The example displayed in this section contains configuration specific to the Cisco uBR-MC3GX60V and Cisco Wideband SPA downstream sharing. The steps to configure the Cisco uBR-MC3GX60V line card and Cisco Wideband SPA remain the same. For more information on how to configure the Cisco Wideband SPA, see the *Cisco uBR10012 Universal Broadband Router SIP and SPA Software Configuration Guide*.

```
!Configure the Cisco uBR-MC3GX60V line card as modular host of Cisco Wideband SPA

controller Modular-Cable 1/1/0
modular-host subslot 8/0

!Configure the rf-channel for Cisco Wideband SPA

rf-channel 0 cable downstream channel-id 5
rf-channel 0 frequency 699000000 annex B modulation 256qam interleave 32
rf-channel 0 ip-address 192.168.100.60 mac-address 0090.f001.8f48 depi-remote-id 460000
rf-channel 1 cable downstream channel-id 1
rf-channel 1 frequency 705000000 annex B modulation 256qam interleave 32
rf-channel 1 ip-address 192.168.100.60 mac-address 0090.f001.8f48 depi-remote-id 480000
rf-channel 2 cable downstream channel-id 2
rf-channel 2 frequency 711000000 annex B modulation 256qam interleave 32
rf-channel 2 ip-address 192.168.100.60 mac-address 0090.f001.8f48 depi-remote-id 500000
rf-channel 3 cable downstream channel-id 3
rf-channel 3 frequency 717000000 annex B modulation 256qam interleave 32
end

!Configure the Cisco uBR-MC3GX60V line card to include DS from Cisco Wideband SPA
```

```
interface Cable8/0/0
downstream Modular-Cable 1/1/0 rf-channel 0
end

!Configure the fiber node to include DSs from Cisco Wideband SPA and Cisco uBR-MC3GX60V
line card

cable fiber-node 1
downstream Modular-Cable 1/1/0 rf-channel 0-3
downstream Modular-Cable 8/0/2 rf-channel 0-3
upstream Cable 8/0 connector 0-4
end
```

Configuration Restrictions

- The Cisco uBR-MC3GX60V cable interface line card supports 72 downstream channels with up to 24 downstream channels per controller (GigE port). There are no restrictions when operating in Annex B framing mode.
- The Cisco uBR-MC3GX60V cable interface line card supports up to 54 downstream channels in Annex A framing mode. The command line interface does not enforce restrictions on the number of enabled channels in Annex A mode. However, when the number of enabled channels in Annex A framing mode exceeds the limit (18), a warning message is displayed.

  We recommend that no more than 54 downstream channels in Annex A mode should be enabled with up to 18 downstream channels per controller to minimize oversubscription of the GigE ports.

Configuration Restrictions for Cisco uBR-MC3GX60V Line Card and Cisco Wideband SPA Downstream Sharing

- Every Cisco uBR-MC3GX60V MAC-Domain should contain downstream channels from not more than one SPA.

Note Starting with Cisco IOS Release 12.2(33)SCG, the Cisco uBR-MC3GX60V MAC-Domain can contain downstream channels from more than one SPA.

- Configure Cisco CMTS WAN Egress Quality of Service (QoS) using Modular Quality of Service Command-Line Interface (MQC) with bandwidth rate-limits on the Ten-Gigabit-Ethernet interface. For more information on how to configure MQC QoS, see MQC QoS on the Cisco CMTS Routers guide.
- Configure the WAN QoS rate-limiting on the uplink WAN routers link to the Cisco CMTS so that the Cisco CMTS WAN Ingress bandwidth is limited.
- Configure the cable interface line card upstream bandwidth parameters. Ensure that the total line card ingress bandwidth along with WAN ingress bandwidth, on the Cisco CMTS, does not exceed the Parallel eXpress Forwarding (PXF) memory bandwidth of 17 Gbps.

Additional References

Related Documents

Document Title	URL
Cisco uBR-MC3GX60V Cable Interface Line Card Hardware Installation Guide	http://www.cisco.com/en/US/docs/interfaces_modules/cable/broadband_processing_engines/ubr_mc3gx60v/installation/guides/b_3g60_lchig.html
Installing Cisco uBR-MC3GX60V Cable Interface Line Cards - Quick Start Guide	http://www.cisco.com/en/US/docs/interfaces_modules/cable/broadband_processing_engines/ubr_mc3gx60v/quick/start/b_LC_QSG.html
Cisco uBR10012 Universal Broadband Router Hardware Installation Guide	http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/installation/guide/hig.html
Cisco uBR10012 Universal Broadband Router Software Configuration Guide	http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/configuration/guide/scg.html
Cisco IOS Commands for the Cisco CMTS Routers	http://www.cisco.com/en/US/docs/ios/cable/command/reference/cbl_book.html
Cisco IOS CMTS Cable Software Configuration Guide, Release 12.2SC	http://www.cisco.com/web/techdoc/cable/Config/Sw_conf.html
Cisco uBR10000 Series Universal Broadband Router Release Notes	http://www.cisco.com/en/US/products/hw/cable/ps2209/prod_release_notes_list.html
Software Activation on Cisco CMTS Routers	http://www.cisco.com/en/US/docs/cable/cmts/license/cmts_swact.html
Cisco DOCSIS 3.0 Downstream Solution Design and Implementation Guide	http://www.cisco.com/en/US/docs/cable/cmts/wideband/solution/guide/release_2.0/ds_solu.html

Standards

Standard	Title
CableLabs™ DOCSIS 1.1 specifications	http://www.cablelabs.com/cablemodem/
CableLabs™ PacketCable specifications	http://www.cablelabs.com/packetcable/
CableLabs™ PacketCable MultiMedia specifications	http://www.cablelabs.com/packetcable/specifications/multimedia.html

MIBs

MIB	MIBs Link
MIBs for the Cisco Cable Modem Termination System	*Cisco CMTS Universal Broadband Series Router MIB Specifications Guide 12.2 SC* http://www.cisco.com/en/US/docs/cable/cmts/mib/12_2sc/reference/guide/ubrmibv5.html
MIBs Supporting Cisco IOS	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

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 the Cisco uBR-MC3GX60V Cable Interface Line Card

Table 3 lists the release history for this feature.

Use the 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 Table 3 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 3 Feature Information for the Cisco uBR-MC3GX60V Cable Interface Line Card

Feature Name	Releases	Feature Information
Configuring the Cisco uBR-MC3GX60V Cable Interface Line Card	12.2(33)SCE	The Cisco uBR-MC3GX60V cable interface line card was introduced on the Cisco uBR10012 universal broadband router.
Cisco uBR-MC3GX60V cable interface line card and Cisco Wideband SPA DS Sharing	12.2(33)SCG	The Cisco uBR-MC3GX60V cable interface line card and Cisco Wideband SPA can now coexist on a single chassis, and share the downstream channels.
Bonding Across 3G60 Controllers Support	12.2(33)SCH	The Bonding Across 3G60 Controllers Support feature allows the downstream bonding groups on one controller to include RF channels across all three downstream controllers. The following commands were modified: **cable rf-channel**, **show controllers modular-cable**