



Cisco uBR10012 Universal Broadband Router SIP and SPA Software Configuration Guide

First Published: 2007-01-01

Last Modified: 2015-02-18

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Audience

This guide is intended for system administrators and support engineers who configure and maintain the Cisco uBR10012 router. Many different delivery models exist for Cisco uBR10000 series equipment:

- In smaller networks, a single service provider manages all equipment and infrastructure.
- In larger networks, multiple service operators (MSOs) and ISPs share responsibility for provisioning and managing the cable plant and IP network.

How the MSO and ISP divide responsibilities depends on the service model. In some cases, the MSO maintains and operates the cable plant and attached CMs and set-top boxes (STBs), and the ISP owns, operates, and maintains the regional network and IP infrastructure beyond the cable distribution hub. In other cases, the Cable Modem Termination System (CMTS) and RF customer premises equipment (CPE) are viewed as part of the networking infrastructure, and the ISP maintains control for provisioning and managing DOCSIS functionality.



Note

This guide considers the MSO and ISP as a single service principle with responsibility to provision and manage DOCSIS-based cable modems and STBs. This guide assumes that administrators are familiar with Cisco uBR10000 series hardware, DOCSIS requirements, and networking.

Document Revision History

Release No.	Revision	Date	Change Summary
12.2(33)SCH	OL-10707-06	May 2013	Updated document to introduce the Cisco 3 Gbps Wideband Shared Port Adapter card.
12.2(33)SCF	OL-10707-05	June 2011	Updated document to include support for the DWDM-XFP-xx.xx modules.
12.2(33)SCB	OL-10707-04	December 2008	Added information related to the following: <ul style="list-style-type: none">• Cisco 10000 Series SPA Interface Processor-600• 1-Port 10-Gigabit Ethernet Shared Port Adapter• 5-Port Gigabit Ethernet Shared Port Adapter• Field-programmable devices

Release No.	Revision	Date	Change Summary
12.3(23)BC	OL-10707-03	December 2007	<p>Added configuration information for the following:</p> <ul style="list-style-type: none"> • Configuring SPA RF channels for narrowband modem support. • Configuring SPA RF channels for wideband modem support. • Configuring Channel Grouping Domain. • Selecting primary downstream channels.
12.3(21a)BC3	OL-10707-02	August 2007	Added information related to the Linksys WCM300-NA, WCM300-EURO, and WCM300-JP modems.
12.3(21)BC	OL-10707-01	February 2007	First release.

Document Organization

This document is organized into the following chapters:

Chapter	Description
SIP and SPA Product Overview	Provides an introduction to SPA interface processors (SIPs) and shared port adapters (SPAs).
Overview of Cisco uBR10012 Router SIPs	Provides an overview of the SIPs and Management Information Base (MIB) support for the Cisco Wideband SIP and Cisco 10000 Series SPA Interface Processor-600.
Configuring a SIP	Provides information about configuring the Cisco Wideband SIP or Cisco 10000 Series SPA Interface Processor-600 on the Cisco uBR10012 router.

Chapter	Description
Troubleshooting the SIPs	Describes techniques that you can use to troubleshoot the operation of the Cisco Wideband SIP or Cisco 10000 Series SPA Interface Processor-600.
Overview of the Cisco Wideband SPA	Provides an overview of the release history, and feature and Management Information Base (MIB) support for the Cisco Wideband SPA on the Cisco uBR10012 router.
Configuring the Cisco Wideband SPA	Provides information about configuring the Cisco Wideband SPA on the Cisco uBR10012 router.
Troubleshooting the Cisco Wideband SPA	Describes techniques that you can use to troubleshoot the operation of the Cisco Wideband SPA.
Overview of Gigabit Ethernet SPAs	Provides an overview of the release history, supported features, Management Information Base (MIB) support, and architecture for the Gigabit Ethernet SPAs on the Cisco uBR10012 router.
Configuring Gigabit Ethernet SPAs	Provides information about configuring Gigabit Ethernet SPAs on the Cisco uBR10012 router.
Troubleshooting Gigabit Ethernet SPAs	Describes techniques that you can use to troubleshoot the operation of Gigabit Ethernet SPAs.
Overview of the Cisco 3 Gbps Wideband Shared Port Adapter	Provides an overview of the release history, and feature and Management Information Base (MIB) support for the Cisco 3 Gbps Wideband Shared Port Adapter on the Cisco uBR10012 router.
Configuring the Cisco 3 Gbps Wideband Shared Port Adapter	Provides information about configuring the Cisco 3 Gbps Wideband Shared Port Adapter on the Cisco uBR10012 router.
Troubleshooting the Cisco 3 Gbps Wideband Shared Port Adapter	Describes techniques that you can use to troubleshoot the operation of the Cisco 3 Gbps Wideband Shared Port Adapter.
Field-Programmable Devices	Describes how to verify image versions and perform an upgrade for SPA or SIP FPD images when incompatibilities occur.

Document Conventions

This document uses the following conventions:

Convention	Description
<code>^</code> or Ctrl	Both the <code>^</code> symbol and Ctrl represent the Control (Ctrl) key on a keyboard. For example, the key combination <code>^D</code> or Ctrl-D means that you hold down the Control key while you press the D key. (Keys are indicated in capital letters but are not case sensitive.)
bold font	Commands and keywords and user-entered text appear in bold font .
<i>Italic font</i>	Document titles, new or emphasized terms, and arguments for which you supply values are in <i>italic font</i> .
<code>Courier font</code>	Terminal sessions and information the system displays appear in <code>courier font</code> .
Bold Courier font	Bold Courier font indicates text that the user must enter.
[x]	Elements in square brackets are optional.
...	An ellipsis (three consecutive nonbolded periods without spaces) after a syntax element indicates that the element can be repeated.
	A vertical line, called a pipe, indicates a choice within a set of keywords or arguments.
[x y]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
{x y}	Required alternative keywords are grouped in braces and separated by vertical bars.
[x {y z}]	Nested set of square brackets or braces indicate optional or required choices within optional or required elements. Braces and a vertical bar within square brackets indicate a required choice within an optional element.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
<>	Nonprinting characters such as passwords are in angle brackets.
[]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Reader Alert Conventions

This document uses the following conventions for reader alerts:

**Note**

Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.

**Tip**

Means *the following information will help you solve a problem*.

**Caution**

Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

**Timesaver**

Means *the described action saves time*. You can save time by performing the action described in the paragraph.

**Warning**

Means *reader be warned*. In this situation, you might perform an action that could result in bodily injury.

Related Documentation

The following is a list of documents and URLs for the Cisco uBR10012 router:

- [Cisco uBR10012 Universal Broadband Router SIP and SPA Hardware Installation Guide](#)
- [Cisco uBR10012 Universal Broadband Router Documentation Roadmap](#)
- [Cisco uBR10012 Universal Broadband Router Hardware Installation Guide](#)
- [Regulatory Compliance and Safety Information for the Cisco uBR10012 Universal Broadband Router](#)
- [Cisco Cable Wideband Solution Design and Implementation Guide, Release 1.0](#)
- [Release Notes for Cisco Universal Broadband Routers in Cisco IOS Release 12.2SC](#)
- [Cisco IOS CMTS Cable Command Reference](#)
- [Cisco IOS CMTS Cable System Messages Guide](#)
- [Cisco CMTS Universal Broadband Router MIB Specifications Guide](#)

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see [What's New in Cisco Product Documentation](#).

To receive new and revised Cisco technical content directly to your desktop, you can subscribe to the [What's New in Cisco Product Documentation RSS feed](#). RSS feeds are a free service.



SIP and SPA Product Overview

- [Overview, page 1](#)
- [SIP and SPA Compatibility, page 2](#)
- [Modular Optics Compatibility, page 3](#)

Overview

SPA Interface Processors (SIP) and Shared Port Adaptors (SPA) are a carrier card and port adapter architecture that increases modularity, flexibility, and density across Cisco routers for network connectivity.

SPA Interface Processors

The following list describes some of the general characteristics of a SIP:

- A SIP is a carrier card that inserts into a router slot like a line card. It provides no network connectivity on its own.
- A SIP contains one or more bays (subslots), which are used to house one or more SPAs. The SPA provides interface ports for network connectivity.
- During normal operation the SIP should reside in the router fully populated either with functional SPAs in all bays, or with a blank filler plate (SPA-BLANK=) inserted in all empty bays.
- SIPs support online insertion and removal (OIR) with SPAs inserted in their bays. SPAs also support OIR and can be inserted or removed independently from the SIP.
- The Cisco uBR10012 router supports the following SIPs:
 - Cisco Wideband SIP (PID—UBR10-2XDS-SIP)



Note Starting with Cisco IOS Release 12.2(33)SCH, support for Cisco Wideband SIP on the Cisco uBR10012 router is not available.

- Cisco 10000 Series SPA Interface Processor-600 (PID—10000-SIP-600)

Shared Port Adapters

The following list describes some of the general characteristics of a SPA:

- A SPA is a modular type of port adapter that inserts into a bay of a compatible SIP carrier card to provide network connectivity and increased interface port density. A SIP can hold one or more SPAs, depending on the SIP type.
- SPAs are available in various types.
 - Cisco 5-Port Gigabit Ethernet SPA (PID—SPA-5X1GE-V2)
 - Cisco 1-Port 10-Gigabit Ethernet SPA (PID—SPA-1X10GE-L-V2)
 - Cisco Wideband SPA (PID—UBR10-2XDS-SIP)
 - Cisco 3 Gbps Wideband Shared Port Adapter (PID—SPA-UBR10-DS-HD)
 - Cisco 6 Gbps Wideband Shared Port Adapter (Effective with Cisco IOS Release 12.2(33)SCI1, the PID is SPA-UBR10-DS-6G)



Note In the Cisco IOS Release 12.2(33)SCI, the Cisco 6 Gbps Wideband Shared Port Adapter uses the same hardware as the Cisco 3 Gbps Wideband Shared Port Adapter (PID—SPA-UBR10-DS-HD) with an upgraded field-programmable device (FPD) image. You must upgrade the FPD image on the Cisco 3 Gbps Wideband Shared Port Adapter to configure it as a Cisco 6 Gbps Wideband Shared Port Adapter.

- Each SPA provides a certain number of connectors, or ports, that are the interfaces to one or more networks.
- Either a blank filler plate or a functional SPA should reside in every bay of a SIP during normal operation to maintain cooling integrity. Blank filler plates are available in single-height form only.
- SPAs support online insertion and removal (OIR). They can be inserted or removed independently from the SIP. SIPs also support OIR with SPAs inserted in their bays.

SIP and SPA Compatibility

The table below lists the SIPs and SPAs supported on the Cisco uBR10012 router.

Table 1: SIP and SPA Compatibility Summary

SIP	Maximum Number of SIPs per CMTS	Maximum Number of SPAs per SIP				
		Cisco Wideband SPA	Cisco 5-Port Gigabit Ethernet SPA	Cisco 1-Port 10-Gigabit Ethernet SPA	Cisco 3 Gbps Wideband Shared Port Adapter	Cisco 6 Gbps Wideband Shared Port Adapter

SIP	Maximum Number of SIPs per CMTS	Maximum Number of SPAs per SIP				
Cisco Wideband SIP ¹	2 ²	2	NA	NA	NA	NA
Cisco 10000 Series SPA Interface Processor-600	1 with PRE2 2 with PRE4 2 with PRE5	4 ³	4	4 ⁴	4 ⁵	4 ⁶

¹ Not supported starting with Cisco IOS Release 12.2(33)SCH.

² Not compatible with PRE5.

³ With a PRE2 configuration, the Cisco uBR10012 router can support only one Cisco SIP-600 that can house a maximum of four Cisco Wideband SPAs. With a PRE4 configuration, the Cisco uBR10012 router can support two Cisco SIP-600s that can together house a maximum of six Cisco Wideband SPAs.

⁴ With PRE4 and PRE5.

⁵ Only with PRE5.

⁶ Only with PRE5.

**Note**

The values indicate the aggregate bandwidth supported by the SIP across all subslots—not per SPA subslot.

Modular Optics Compatibility

Some SPAs implement small form-factor pluggable (SFP or XFP/SFP+) optical transceivers to provide network connectivity. The SFP and XFP modules are fiber-optic transceiver devices that mount to the front panel to provide network connectivity.

**Note**

SFP modules are optics modules with speeds lower than 10 gigabits per second (Gb/s); XFP modules are optics modules with speeds equal to or greater than 10 Gb/s.

Cisco qualifies the SFP modules that can be used with SPAs.

**Note**

The SPAs accept only the optics modules listed as supported in this document. Each time an SFP or XFP module is inserted into a SPA, a check is run. Only SFP and XFP modules that pass this check are usable.

The table below lists the types of optics modules that are qualified for use with a SPA.

Table 2: SPA Optics Compatibility

SPA	Qualified Optics Modules—Cisco Part Numbers	Wavelength
Cisco 6 Gbps Wideband Shared Port Adapter	<ul style="list-style-type: none"> • For SFP+ <ul style="list-style-type: none"> ◦ SFP-10G-SR-X ◦ SFP-10G-LR-X 	<ul style="list-style-type: none"> • SFP-10G-SR-X: 840 to 860 nm • SFP-10G-LR-X: 1260 to 1355 nm
Cisco 3 Gbps Wideband Shared Port Adapter	<ul style="list-style-type: none"> • For SFP+ <ul style="list-style-type: none"> ◦ SFP-10G-SR-X ◦ SFP-10G-LR-X • For SFP <ul style="list-style-type: none"> ◦ GLC-SX-MMD ◦ GLC-LH-SMD ◦ GLC-ZX-SMD ◦ SFP-GE-T (1000Base-T) 	<ul style="list-style-type: none"> • SFP-10G-SR-X: 840 to 860 nm • SFP-10G-LR-X: 1260 to 1355 nm • GLC-SX-MMD: 850 nm • GLC-LH-SMD: 1310 nm • GLC-ZX-SMD: 1550 nm • SFP-GE-T (1000Base-T): N/A
Cisco Wideband SPA	<ul style="list-style-type: none"> • SFP-GE-T • GLC-SX-MM • GLC-LH-SM • GLC-ZX-SM GLC-T=(Class B-compliant) 	<ul style="list-style-type: none"> • SFP-GE-T: N/A • GLC-SX-MM: 850 nm • GLC-LH-SM: 1300 nm • GLC-ZX-SM GLC-T=(Class B-compliant): 1550 nm
Cisco 1-Port 10-Gigabit Ethernet SPA	<ul style="list-style-type: none"> • XFP-10GLR-OC192SR • XFP-10GER-OC192IR • XFP-10GZR LR-2 • XFP-10G-MM-SR • DWDM-XFP-xx.xx= 	<ul style="list-style-type: none"> • XFP-10GLR-OC192SR: 1310 nm • XFP-10GER-OC192IR: 1550 nm • XFP-10GZR LR-2: 1550 nm • XFP-10G-MM-SR: 850 nm • DWDM-XFP-xx.xx:

SPA	Qualified Optics Modules—Cisco Part Numbers	Wavelength
Cisco 5-Port Gigabit Ethernet SPA	<ul style="list-style-type: none">• SFP-GE-L• SFP-GE-S• SFP-GE-T• SFP-GE-Z	<ul style="list-style-type: none">• 1530.33 to 1550.12 nm• SFP-GE-L: 1270 to 1355 nm• SFP-GE-S: 770 to 860 nm• SFP-GE-T: N/A• SFP-GE-Z: 1500 to 1580 nm



CHAPTER 2

Overview of Cisco uBR10012 Router SIPs

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- [Cisco Wideband SIP Overview, page 7](#)
- [Cisco Wideband SIP Restrictions, page 8](#)
- [Cisco 10000 Series SPA Interface Processor-600 Overview, page 8](#)
- [On-Board Failure Logging, page 9](#)
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- [WAN Slot Restrictions, page 10](#)
- [Displaying the SIP Hardware Type, page 10](#)

SIP Summary

The table below lists the SIPs supported on the Cisco uBR10012 router.

Table 3: SIP Summary

SIP	Product Identifier	Minimum Cisco IOS Release
Cisco Wideband SIP	UBR10-2XDS-SIP	12.3(21)BC
Cisco 10000 Series SPA Interface Processor-600	10000-SIP-600	12.2(33)SB

Cisco Wideband SIP Overview

The Cisco Wideband SIP is a high-performance SPA interface processor that functions as a carrier card for shared port adapters (SPAs) on the Cisco uBR10012 router.

**Note**

Starting with Cisco IOS Release 12.2(33)SCH, support for Cisco Wideband SIP on the Cisco uBR10012 router is not available.

The Cisco Wideband SIP has the following features:

- Supports two single-wide, half-height Cisco Wideband SPAs
- Two 1/4-rate System Packet Interface Level 4 Phase 2 (SPI4.2) interfaces
- Up to nine SPI4.2 channels per SPA: eight active total channels to and from the PRE module and one active channel to and from the SIP main processor
- Channel counters for various SIP-related statistics: packets transmitted, bytes transmitted, error packets, dropped packets, and dropped bytes
- OIR support for the Cisco Wideband SIP and the Cisco Wideband SPAs located on the SIP
- MIB support (ENTITY-MIB)
- NEBS 3-compliant

Following topics provide more information about Cisco Wideband SIP:

Cisco Wideband SIP Restrictions

- On the Cisco uBR10012 router, the Cisco Wideband SIP requires the Cisco uBR10012 Performance Routing Engine 2 (PRE2). The Cisco Wideband SIP is not supported on PRE4 and PRE5.
- When the Cisco uBR10012 router is used as a wideband Cable Modem Termination System (CMTS), half-height Gigabit Ethernet (HHGE) line cards and the associated slot splitters must be installed in slot 3 or slot 4 of the router. Therefore, the Cisco Wideband SIP must be installed in slots 1/0 and 2/0 in the router.

**Note**

The Cisco Wideband SIP occupies two adjacent slots.

- The Cisco Wideband SIP cannot be installed in slots 2/0 and 3/0 in the router.

Cisco 10000 Series SPA Interface Processor-600 Overview

The Cisco 10000 Series SPA Interface Processor-600 is a high-performance, feature-rich SPA interface processor (SIP) that functions as a carrier card for shared port adapters (SPAs) on the Cisco uBR10012 router. The SIP is compatible with one or more platform-independent SPAs.

The Cisco 10000 Series SPA Interface Processor-600 has the following features:

- Support for two Cisco 10000 Series SPA Interface Processor-600 jacket cards on a Cisco uBR10012 router
- Support for the following SPAs:

- Cisco 5-Port Gigabit Ethernet SPA
- Cisco 1-Port 10-Gigabit Ethernet SPA (supported with PRE4 and PRE5 configurations)
- Cisco Wideband SPA
- Cisco 3 Gbps Wideband Shared Port Adapter (supported only with the PRE5 configuration)
- Cisco 6 Gbps Wideband Shared Port Adapter (supported only with the PRE5 configuration)
- Support for PRE2, PRE4, and PRE5 configurations
- Support for On-Board Failure Logging (OBFL) with the PRE4 and PRE5 configurations
- Support for Minimum Disruptive Restart (MDR) with the Cisco Wideband SPA, Gigabit Ethernet SPAs, Cisco 3 Gbps Wideband Shared Port Adapter, and Cisco 6 Gbps Wideband Shared Port Adapter

For more information about MDR, see the Cisco IOS In Service Software Upgrade Process feature guide at the following URL:

http://www.cisco.com/c/en/us/td/docs/cable/cmts/config_guide/b_cmts_high_availability_feature.html

Following topics provide more information about Cisco 10000 Series SPA Interface Processor-600:

On-Board Failure Logging

The On-Board Failure Logging (OBFL) feature enables storage and collection of critical failure information in the nonvolatile memory of a field replaceable unit, like a route processor (RP) or line card. The Cisco uBR10012 router supports OBFL only on the Cisco 10000 Series SPA Interface Processor-600 with the PRE4 and PRE5 configurations.

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

OBFL records operating temperatures, hardware up and down time, and any other important events that assist board diagnosis in case of hardware failures.

For more information about this feature, see the On-Board Failure Logging feature guide 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 On-Board Failure Logging feature guide might slightly vary for the Cisco uBR10012 router.

Cisco 10000 Series SPA Interface Processor-600 Restrictions

- The Cisco Wideband SIP and the Cisco 10000 Series SPA Interface Processor-600 cannot co-exist on a Cisco uBR10012 router.
- The Cisco 10000 Series SPA Interface Processor-600 can be configured in slots 1 and 3 only.
- For a PRE4 setup, all SPAs share a 11.2Gbps ironbus connection.

- A PRE2 setup allows the typical ironbus connection in which bays 0 and 2 share a 2.8Gbps ironbus connection and bays 1 and 3 also share a 2.8Gbps ironbus connection.

WAN Slot Restrictions

Slots 1, 2, 3, and 4 in the Cisco uBR10012 router are referred to as WAN slots. These slots are capable of accepting various combinations of the Cisco 10000 Series SPA Interface Processor-600, Cisco Wideband SIP, and Half-Height Gigabit Ethernet line cards (HHGE). In addition, the Cisco 10000 Series SPA Interface Processor-600 accepts various combinations of the Cisco Wideband SPA, Cisco 5-Port Gigabit Ethernet SPA, Cisco 1-Port 10-Gigabit Ethernet SPA, Cisco 3 Gbps Wideband Shared Port Adapter, and Cisco 6 Gbps Wideband Shared Port Adapter.

This section explains restrictions for the WAN slots and the supported SPA and line card combinations.

Following are the restrictions for the WAN slots:

- Limit of six Cisco Wideband SPA cards per chassis. To use six Cisco Wideband SPA cards, you must have a PRE4 configuration with two Cisco 10000 Series SPA Interface Processor-600s installed on the router.
- The Cisco Wideband SIP and Cisco 10000 Series SPA Interface Processor-600 cannot co-exist on a Cisco uBR10012 router.
- The Cisco 10000 Series SPA Interface Processor-600 supports only the following SPAs:
 - Cisco Wideband SPA
 - Cisco 5-Port Gigabit Ethernet SPA
 - Cisco 1-Port 10-Gigabit Ethernet SPA
 - Cisco 3 Gbps Wideband Shared Port Adapter
 - Cisco 6 Gbps Wideband Shared Port Adapter
- The Cisco Wideband SIP supports only the Cisco Wideband SPA.
- Half-Height Gigabit Ethernet line cards cannot be inserted in slot 1 or 2 because full reset capabilities are not available. HHGE is supported only with a PRE2 configuration.
- With a PRE2 setup, a Gigabit Ethernet SPA cannot be horizontally adjacent to a Cisco Wideband SPA.
- For a PRE2 configuration with the Cisco 5-Port Gigabit Ethernet SPA, total bandwidth of GE ports per SPA should be limited to 2Gbps. If more than two GE ports are enabled, total inbound or outbound aggregate bandwidth should be kept at 2Gbps. If the bandwidth exceeds 2Gbps, the support for Quality of Service (QoS) functionality cannot be guaranteed.

Displaying the SIP Hardware Type

To verify the SIP hardware type that is installed in your Cisco uBR10012 router, you can use the **show diag** command. There are other commands on the Cisco uBR10012 router that also provide SIP hardware information, such as the **show inventory** command.

Table 4: SIP Hardware Information

SIP	Description in show diag Command	Description in show inventory Command
Cisco Wideband SIP	2jacket-1 card	2 bay I/O slot SPA Interface Processor
Cisco 10000 Series SPA Interface Processor-600	4jacket-1 card	4 bay Cisco 10000 SPA Jacket Card

Example of the show diag Command

The following example shows output from the show diag command on the Cisco uBR10012 router with a Cisco Wideband SIP installed in slot 1/0. The output includes the SIP hardware type and SIP serial number.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```
Router# show diag 1/0

Slot/Subslot 1/0:
 2jacket-1 card, 0 ports
Card is full slot size
Card is analyzed
Card detected 12:16:52 ago
Card uptime 0 days, 12 hours, 16 minutes, 53 seconds
Card idle time 0 days, 11 hours, 3 minutes, 46 seconds
Voltage status: 3.3V Nominal 2.5V Nominal 1.5V Nominal 12V Nominal
EEPROM contents, slot 1/0:
Hardware Revision : 1.0
Top Assy. Part Number : 800-22843-04
Board Revision : 01
Deviation Number : 0-0
Fab Version : 04
PCB Serial Number : CSJ09030613
RMA Test History : 00
RMA Number : 0-0-0-0
RMA History : 00
CLEI Code :
LCMON version, slot 1/0
  LCDOS (Ferrari-BOOT : DEVELOPMENT BUILD xxxxxx-flot_spa_lc_2

/vob/lcdos/obj-cl0k-pq2-lcmon2 104)
  Built by xxxxxx at Mon Apr 17 13:49:38 2006.
  Reset reason 0x00000003/0x2 (PRE hard reset).
Operational Image version, slot 1/0
  LCDOS (C10000 2 Bay SPA Jacket (JACKET2) Image : DEVELOPMENT BUILD xxxxxx
/vob/lcdos/obj-cl0k-jacket 101) major version 1147325083.
  Built by xxxxxx at Wed May 10 22:24:44 2006.
```

The following example shows output from the **show diag** command on the Cisco uBR10012 router with a Cisco SIP-600 installed in slot 1/0 and having Cisco 3 Gbps Wideband Shared Port Adapter card in slot/bay 1/0.

```
Router# show diag 1/0

Slot 1:
 4jacket-1 card, 0 ports
Card is full slot size
Card is analyzed
Card detected 01:09:58 ago
```

Displaying the SIP Hardware Type

```

Card uptime 0 days, 1 hours, 9 minutes, 57 seconds
Card idle time 0 days, 1 hours, 1 minutes, 53 seconds
Voltage status:
EEPROM contents, slot 1/0:
  Controller Type : 1380
  Hardware Revision : 1.0
  PCB Part Number : 73-10771-02
  Board Revision : D0
  Deviation Number : 0-0
  Fab Version : 03
  PCB Serial Number : CAT1438F01K
  RMA Test History : 00
  RMA Number : 0-0-0-0
  RMA History : 00
  Top Assy. Part Number : 800-27953-03
  CLEI Code : IPUIA7TRAA
  Product Identifier (PID) : 10000-SIP-600
  Version Identifier (VID) : V01
LCMON version, slot 1/0
  LCDOS (LATEST-BOOT : DEVELOPMENT BUILD jkotelly-mayflower_lc_0628 /vob/1
cdos/obj-c10k-pq3-lcmon 114)
  Built by xxxxxx at Mon Jul 16 14:00:18 2007.
  Reset reason 0x00000008 (PRE hard reset).
Operational Image version, slot 1/0
  LCDOS (C10000 4 SPA Jacket Card Image (Spumoni) : DEVELOPMENT BUILD dasz
hang-license_lc /vob/lcdos/obj-c10k-spumoni 102) major version 1357881885.
  Built by xxxxxx at Thu Jan 10 21:26:42 2013.
  SW Version 1.1
  Code MD5 D266CF60F88DD7A0408C105F7BA8AB32
  FPGA MD5 89C8DD3DCD939BDD43DB19D514416137
  Expected Switchover Action: NO INFORMATION
  ECC 1 bit errors since last cleared (dd hh mm ss) = 0 (0 days, 0 hours, 0 minutes,
0 seconds)
  ECC 1 bit errors while up (total) = 0
  Number of crashdumps recorded = 1

SPA Information:
bay 1/0 SPA-UBR10-DS-HD ok
  SW Version 1.0
  SW Version 1.0
  Expected Switchover Action: NO INFORMATION
  Product Identifier (PID) : SPA-UBR10-DS-HD
  Version Identifier (VID) : V01
  PCB Serial Number : CAT1635E0W6
  Top Assy. Revision : 02
  Hardware Revision : 1.1
  CLEI Code :
  The Transceiver in slot 1 subslot 0 port 0 is ENABLED.
  No Transceiver in slot 1 subslot 0 port 1 .
  The Transceiver in slot 1 subslot 0 port 2 is ENABLED.

Wideband Information:
slot/bay 1/0:
  SPA-DOCSIS-HD-V1 card, 3 port + 0 redundant port
  Card is half slot size
  Card is analyzed
  Card detected 01:09:57 ago
  Card uptime: Not Supported
  Card idle time: Not Supported
  Voltage status:
  VP12V_SPA_MON          (+11.909)v          VP3P6_MON          (+3.595)v
  VP2P5_MON             (+2.502)v          VP1P25_MON         (+1.250)v
  SPA_AUX_MON           (+3.270)v          ADM1166_2_OK       (+2.048)v
  PWR_EN                (+2.048)v          VP1P0_MON          (+1.014)v
  VCCINT_MON            (+0.999)v          ADM1166_2_DOWN     (+2.048)v
  VP12V_SPA_MON          (+11.909)v          VP3P3_MON          (+3.303)v

```

```

        VF1P8_MON          (+1.802)v          VF1P5_MON          (+1.497)v
        MGTAVTT_MON        (+1.197)v          MGTAVCC_MON        (+0.997)v
        VTT_MON            (+0.735)v          PLL_STATUS         (+0.005)v
        PLL_LD             (+2.048)v          ADM1166_2_EN      (+2.048)v

License                : 0
Licensing Transaction ID : 59040
Ordered PID            : SWLIC-SPA-HD-DS-16115360
EEPROM contents, slot/bay 1/0:
Controller Type        : 2938
Hardware Revision      : 1.1
Boot Timeout           : 500 msec
PCB Serial Number      : CAT1635E0W6
PCB Part Number        : 73-15030-01
PCB Revision           : 06
Fab Version            : 01
RMA Test History       : 00
RMA Number             : 0-0-0-0
RMA History            : 00
Deviation Number       : 0
Product Identifier (PID) : SPA-UBR10-DS-HD
Version Identifier (VID) : V01
Top Assy. Part Number  : 800-38945-01
Top Assy. Revision     : 02
IDPROM Format Revision  : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
                        00 00 00 00 00 00 00 00
                        00 00 00 00 00 00

CLEI Code :
Base MAC Address      : 00 00 00 00 00 00
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data      : Minimum: 0 dBmV, Maximum: 0 dBmV
    Calibration values :
Power Consumption      : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 2E E0 46 32 09 C4
                        46 32 0C E4 46 32 03 E8
                        46 1E 03 E8 46 1E 2E E0
                        46 32 0C E4 46 32 07 08
                        46 32 05 DC 46 32 04 B0
                        46 19 03 E8 46 1E 02 EE
                        46 32 FE 02 EF 64
Processor Label        : 00 00 00 00 00 00 00
Platform features      : 00 00 00 00 00 00 00 00
                        00 00 00 00 00 00 00 00
                        00 00 00 00 00 00 00 00
                        00 00 00 00 00 00 00
Asset ID                : P1B-62B
Asset Alias             :
    
```

The following example shows output from the **show diag** command on the Cisco uBR10012 router, running Cisco IOS Release 12.2(33)SCI, with a Cisco SIP-600 installed in slot 1/0 and having Cisco 6 Gbps Wideband Shared Port Adapter card in slot/bay 1/2.

```

Router# show diag 1/0

Slot 1:
4jacket-1 card, 0 ports
Card is full slot size
Card is analyzed
Card detected 01:23:57 ago
Card uptime 0 days, 1 hours, 23 minutes, 55 seconds
Card idle time 0 days, 1 hours, 17 minutes, 48 seconds
Voltage status:
EEPROM contents, slot 1/0:
Controller Type        : 1380
    
```

Displaying the SIP Hardware Type

```

Hardware Revision      : 1.0
PCB Part Number       : 73-10771-03
Board Revision        : A0
Deviation Number      : 0-0
Fab Version           : 03
PCB Serial Number     : CAT1602F0FR
RMA Test History      : 00
RMA Number            : 0-0-0-0
RMA History           : 00
Top Assy. Part Number : 800-27953-04
CLEI Code             : IPUA7TRAB
Product Identifier (PID) : 10000-SIP-600
Version Identifier (VID) : V02
LCMON version, slot 1/0
  LCDOS (LATEST-BOOT : DEVELOPMENT BUILD jkotelly-mayflower_lc_0628
/vob/lcdos/obj-cl0k-pq3-lcmon 114)
  Built by xxxxxx at Mon Jul 16 14:00:18 2007.
  Reset reason 0x00000008 (PRE hard reset).
Operational Image version, slot 1/0
  LCDOS (C10000 4 SPA Jacket Card Image (Spumoni) : DEVELOPMENT BUILD
BLD-v122_33_sci_lc_throttle.lcdos-UNIQ-v122_33_sci_lc_throttle-V122_32_8_24_SCI-v122_33_sci_throttle-20140810_2207-21
/view/BLD-v122_33_sci_lc_throttle.lcdos-UNIQ-v122_33_sci_lc_throttle
  Built by xxxxxx at Sun Aug 10 22:28:10 2014.
  SW Version 1.1
  Code MD5 88F543721CF42BB65A34A5D0AC6D605E
  FPGA MD5 89C8DD3DCD939BDD43DB19D514416137
  Expected Switchover Action: NO INFORMATION
  ECC 1 bit errors since last cleared (dd hh mm ss) = 0 (0 days, 0 hours, 0 minutes,
0 seconds)
  ECC 1 bit errors while up (total) = 0
  Number of crashdumps recorded = 1

SPA Information:
bay 1/2      SPA-UBR10-DS-HD      ok

  SW Version 1.0
  Expected Switchover Action: NO INFORMATION
  Product Identifier (PID) : SPA-UBR10-DS-HD
  Version Identifier (VID) : V01
  PCB Serial Number       : CAT1635E0TW
  Top Assy. Revision      : 02
  Hardware Revision       : 1.1
  CLEI Code               :
  The Transceiver in slot 1 subslot 2 port 0 is ENABLED.
  No Transceiver in slot 1 subslot 2 port 1 .
  No Transceiver in slot 1 subslot 2 port 2 .

Wideband Information:
slot/bay 1/2:
  SPA-DOCSIS-HD-V1 card, 1 port + 1 redundant port
  Card is half slot size
  Card is analyzed
  Card detected 01:23:29 ago
  Card uptime: Not Supported
  Card idle time: Not Supported
  Voltage status:
VP12V_SPA_MON      (+11.856)v      VP3P6_MON          (+3.591)v
VP2P5_MON          (+2.496)v      VP1P25_MON         (+1.254)v
SPA_AUX_MON        (+3.272)v      ADM1166_2_OK       (+2.048)v
PWR_EN             (+2.048)v      VP1P0_MON          (+1.012)v
VCCINT_MON         (+0.997)v      ADM1166_2_DOWN     (+2.048)v
VP12V_SPA_MON      (+11.846)v      VP3P3_MON          (+3.296)v
VP1P8_MON          (+1.799)v      VP1P5_MON          (+1.492)v
MGTAVTT_MON        (+1.193)v      MGTAVCC_MON        (+0.996)v
VTT_MON            (+0.734)v      PLL_STATUS         (+0.006)v
PLL_LD             (+2.048)v      ADM1166_2_EN       (+2.048)v

License           : 48
EEPROM contents, slot/bay 1/2:
  Controller Type      : 2938
  Hardware Revision    : 1.1
  Boot Timeout         : 500 msecs
  PCB Serial Number    : CAT1635E0TW

```

```

PCB Part Number      : 73-15030-01
PCB Revision        : 06
Fab Version         : 01
RMA Test History    : 00
RMA Number         : 0-0-0-0
RMA History        : 00
Deviation Number    : 0
Product Identifier (PID) : SPA-UBR10-DS-HD
Version Identifier (VID) : V01
Top Assy. Part Number : 800-38945-01
Top Assy. Revision  : 02
IDPROM Format Revision : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00

CLEI Code           :
Base MAC Address    : 00 00 00 00 00 00
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data    : Minimum: 0 dBmV, Maximum: 0 dBmV
  Calibration values :
Power Consumption   : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 2E E0 46 32 09 C4
                    : 46 32 0C E4 46 32 03 E8
                    : 46 1E 03 E8 46 1E 2E E0
                    : 46 32 0C E4 46 32 07 08
                    : 46 32 05 DC 46 32 04 B0
                    : 46 19 03 E8 46 1E 02 EE
                    : 46 32 FE 02 EF 64

Processor Label     : 00 00 00 00 00 00 00
Platform features   : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00 00

Asset ID           : P1B-63B
Asset Alias        :
WBCMTS HD SPA capacity : 6G
DAUGHTER contents:
Controller Type    : 2939
Hardware Revision  : 1.0
Boot Timeout       : 500 msec
PCB Serial Number  : CAT1635E0YZ
PCB Part Number    : 73-15093-01
PCB Revision       : 04
Fab Version        : 01
RMA Test History   : 00
RMA Number         : 0-0-0-0
RMA History        : 00
Deviation Number   : 0
Product Identifier (PID) : SPA-UBR10-DS-HD
Version Identifier (VID) : V01
Top Assy. Part Number : 800-38945-01
Top Assy. Revision  : 02
IDPROM Format Revision : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00

CLEI Code           :
Base MAC Address    : 00 00 00 00 00 00
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data    : Minimum: 0 dBmV, Maximum: 0 dBmV
  Calibration values :
Power Consumption   : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 0C E4 46 32 09 C4
                    : 46 32 00 00 00 00 04 B0
                    : 46 32 00 00 00 00 07 08
                    : 46 32 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00 00
                    : 00 00 FE 02 FA 6D
    
```

```

Processor Label      : 00 00 00 00 00 00 00
Platform features   : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00 00
                    : 00 00 00 00 00 00 00
Asset ID            : P1B-63
Asset Alias         :

```

The following example shows output from the **show diag** command on the Cisco uBR10012 router, running Cisco IOS Release 12.2(33)SCI1, with a Cisco SIP-600 installed in slot 1/0 and having Cisco 6 Gbps Wideband Shared Port Adapter card in slot/bay 1/2.

```
Router# show diag 1/0
```

```
Slot 1:
```

```

4jacket-1 card, 0 ports
Card is full slot size
Card is analyzed
Card detected 01:23:57 ago
Card uptime 0 days, 1 hours, 23 minutes, 55 seconds
Card idle time 0 days, 1 hours, 17 minutes, 48 seconds
Voltage status:

```

```
EEPROM contents, slot 1/0:
```

```

Controller Type      : 1380
Hardware Revision    : 1.0
PCB Part Number      : 73-10771-03
Board Revision       : A0
Deviation Number     : 0-0
Fab Version          : 03
PCB Serial Number    : CAT1602F0FR
RMA Test History     : 00
RMA Number           : 0-0-0-0
RMA History          : 00
Top Assy. Part Number : 800-27953-04
CLEI Code            : IPUA7TRAB
Product Identifier (PID) : 10000-SIP-600
Version Identifier (VID) : V02

```

```
LCMON version, slot 1/0
```

```

LCDOS (LATEST-BOOT : DEVELOPMENT BUILD jkotelly-mayflower_lc_0628
/vob/lcdos/obj-c10k-pq3-lcmon 114)
Built by xxxxxx at Mon Jul 16 14:00:18 2007.
Reset reason 0x00000008 (PRE hard reset).

```

```
Operational Image version, slot 1/0
```

```

LCDOS (C10000 4 SPA Jacket Card Image (Spumoni) : DEVELOPMENT BUILD
BLD-v122_33_sci_lc_throttle.lcdos-UNIQ-v122_33_sci_lc_throttle-v122_32_8_24_SCI-v122_33_sci_throttle-20140810_2207-21
/view/BLD-v122_33_sci_lc_throttle.lcdos-UNIQ-v122_33_sci_lc_throttle
Built by xxxxxx at Sun Aug 10 22:28:10 2014.
SW Version 1.1
Code MD5 88F543721CF42BB65A34A5D0AC6D605E
FPGA MD5 89C8DD3DCD939BDD43DB19D514416137
Expected Switchover Action: NO INFORMATION
ECC 1 bit errors since last cleared (dd hh mm ss) = 0 (0 days, 0 hours, 0 minutes,
0 seconds)
ECC 1 bit errors while up (total) = 0
Number of crashdumps recorded = 1

```

```
SPA Information:
```

```

bay 1/0 SPA-UBR10-DS-6G ok
SW Version 1.0
SW Version 1.0
Expected Switchover Action: NO INFORMATION
Product Identifier (PID) : SPA-UBR10-DS-6G
Version Identifier (VID) : V01
PCB Serial Number : CAT1635E0W6
Top Assy. Revision : 02
Hardware Revision : 1.1
CLEI Code :

```

```
The Transceiver in slot 1 subslot 2 port 0 is ENABLED.
```

```

No Transceiver in slot 1 subslot 2 port 1 .
No Transceiver in slot 1 subslot 2 port 2 .

```

```
Wideband Information:
```

```
slot/bay 1/2:
```

```

SPA-DOCSIS-HD-V1 card, 1 port + 1 redundant port
Card is half slot size
Card is analyzed
Card detected 01:23:29 ago
Card uptime: Not Supported
Card idle time: Not Supported
Voltage status:
VP12V SPA_MON      (+11.856)v          VP3P6_MON           (+3.591)v
  VP2P5_MON        (+2.496)v          VP1P25_MON          (+1.254)v
  SPA_AUX_MON      (+3.272)v          ADM1166_2_OK        (+2.048)v
    PWR_EN         (+2.048)v          VP1P0_MON           (+1.012)v
    VCCINT_MON     (+0.997)v          ADM1166_2_DOWN      (+2.048)v
VP12V SPA_MON      (+11.846)v          VP3P3_MON           (+3.296)v
  VP1P8_MON        (+1.799)v          VP1P5_MON           (+1.492)v
  MGTAVTT_MON      (+1.193)v          MGTAVCC_MON         (+0.996)v
    VTT_MON        (+0.734)v          PLL_STATUS           (+0.006)v
    PLL_LD         (+2.048)v          ADM1166_2_EN        (+2.048)v

License : 48
EEPROM contents, slot/bay 1/2:
Controller Type : 2938
Hardware Revision : 1.1
Boot Timeout : 500 msecs
PCB Serial Number : CAT1635E0TW
PCB Part Number : 73-15030-01
PCB Revision : 06
Fab Version : 01
RMA Test History : 00
RMA Number : 0-0-0-0
RMA History : 00
Deviation Number : 0
Product Identifier (PID) : SPA-UBR10-DS-6G
Version Identifier (VID) : V01
Top Assy. Part Number : 800-38945-01
Top Assy. Revision : 02
IDPROM Format Revision : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
                        00 00 00 00 00 00 00 00
                        00 00 00 00 00 00

CLEI Code :
Base MAC Address : 00 00 00 00 00 00
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data : Minimum: 0 dBmV, Maximum: 0 dBmV
  Calibration values :
Power Consumption : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 2E E0 46 32 09 C4
                          46 32 0C E4 46 32 03 E8
                          46 1E 03 E8 46 1E 2E E0
                          46 32 0C E4 46 32 07 08
                          46 32 05 DC 46 32 04 B0
                          46 19 03 E8 46 1E 02 EE
                          46 32 FE 02 EF 64

Processor Label : 00 00 00 00 00 00 00
Platform features : 00 00 00 00 00 00 00 00
                  00 00 00 00 00 00 00 00
                  00 00 00 00 00 00 00 00
                  00 00 00 00 00 00 00

Asset ID : P1B-63B
Asset Alias :
WBCMTS HD SPA capacity : 6G
DAUGHTER contents:
Controller Type : 2939
Hardware Revision : 1.0
Boot Timeout : 500 msecs
PCB Serial Number : CAT1635E0YZ
PCB Part Number : 73-15093-01
PCB Revision : 04
Fab Version : 01
RMA Test History : 00
RMA Number : 0-0-0-0
RMA History : 00
    
```

Displaying the SIP Hardware Type

```

Deviation Number          : 0
Product Identifier (PID)  : SPA-UBR10-DS-6G
Version Identifier (VID)  : V01
Top Assy. Part Number     : 800-38945-01
Top Assy. Revision        : 02
IDPROM Format Revision     : 36
System Clock Frequency    : 00 00 00 00 00 00 00 00 00
                          : 00 00 00 00 00 00 00 00 00
                          : 00 00 00 00 00 00
CLEI Code                 :
Base MAC Address          : 00 00 00 00 00 00
MAC Address block size    : 1
Manufacturing Test Data   : 00 00 00 00 00 00 00 00 00
Field Diagnostics Data    : 00 00 00 00 00 00 00 00 00
Calibration Data         : Minimum: 0 dBmV, Maximum: 0 dBmV
      Calibration values :
Power Consumption         : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 0C E4 46 32 09 C4
                          : 46 32 00 00 00 00 04 B0
                          : 46 32 00 00 00 00 07 08
                          : 46 32 00 00 00 00 00 00
                          : 00 00 00 00 00 00 00 00
                          : 00 00 00 00 00 00 00 00
                          : 00 00 FE 02 FA 6D
Processor Label           : 00 00 00 00 00 00 00 00
Platform features         : 00 00 00 00 00 00 00 00
                          : 00 00 00 00 00 00 00 00
                          : 00 00 00 00 00 00 00 00
                          : 00 00 00 00 00 00 00 00
Asset ID                  : P1B-63
Asset Alias               :

```




Configuring a SIP

- [SIP and SPA Slot Numbering Format](#), page 19
- [Identifying the Location of the Cisco Wideband SIP and Cisco Wideband SPA](#), page 20
- [Identifying the Location of a Cisco 10000 Series SPA Interface Processor-600](#), page 22
- [Required Configuration Tasks](#), page 22
- [Optional Configuration Tasks](#), page 23
- [Resetting a SIP](#), page 28

SIP and SPA Slot Numbering Format

Cisco IOS Release 12.2(33)SCB introduces a new slot numbering format to specify locations of SIPs and SPAs on a Cisco uBR10012 router. This format is different from the slot numbering format used in Cisco IOS Releases 12.2(33)SCA and 12.3BC. This change applies to the CLIs that use a modular cable interface, a wideband cable interface, or a controller modular cable as an argument.

The table below lists the SIP and SPA slot numbering format used in different Cisco IOS releases.

Table 5: SIP and SPA Slot Numbering Format

Cisco IOS Release	Syntax	Description
12.2(33)SCB and later releases	<i>slot</i> or <i>slot/subslot</i> for SIPs and <i>slot/bay/port</i> for SPAs	The SIP and SPA CLI uses this format to specify SIPs or any SPA resources on a SIP. For example, the channel 8 of a SPA in bay 1 of a SIP in slot 1 is specified as interface modular-cable 1/1/0:8.

Cisco IOS Release	Syntax	Description
12.2(33)SCA and 12.3BC	<i>slot/subslot</i> for SIPs and <i>slot/subslot/bay</i> for SPAs	The SIP and SPA CLI uses this format to specify SIPs or any SPA resources on a SIP. For example, the channel 8 of a SPA in bay 1 of a SIP in slot 1 is specified as interface modular-cable 1/0/1:8.

**Note**

Due to the change in the slot numbering format, the SIP and SPA configurations are lost while downgrading from Cisco IOS Release 12.2(33)SCB or later to Cisco IOS Release 12.3(23)BC. Reconfigure SIP and SPA after the image downgrade is complete.

Identifying the Location of the Cisco Wideband SIP and Cisco Wideband SPA

This section describes how to specify the physical locations of the Cisco Wideband SIP and Cisco Wideband SPA on the Cisco uBR10012 router within the Cisco IOS command-line interface (CLI) to configure or monitor those devices.

To see slot numbering used in Cisco uBR10012 router, see [Cisco uBR10012 Universal Broadband Router Hardware Installation Guide](#).

Specifying the Location for the Cisco Wideband SIP

In Cisco IOS commands, the Cisco Wideband SIP is designated by its location on a Cisco uBR10012 router. The location is specified in the form:

- *slot/subslot* (for Cisco IOS Releases 12.2(33)SCA and 12.3BC)
- *slot* or *slot/subslot* (for Cisco IOS Release 12.2(33)SCB and later)

On the Cisco uBR10012 router, the Cisco Wideband SIP occupies two adjacent full-height line card slots: either slots 1/0 and 2/0, or slots 3/0 and 4/0. On the Cisco IOS CLI, the location of the Cisco Wideband SIP is specified as follows:

- If the Cisco Wideband SIP occupies slots 1/0 and 2/0, the location for the Cisco IOS CLI is specified as *slot/subslot 1/0*.
- If the Cisco Wideband SIP occupies slots 3/0 and 4/0, the location for the Cisco IOS CLI is specified as *slot/subslot 3/0*.

**Note**

If the Cisco Wideband SIP is moved from slots 1/0 and 2/0 to slots 3/0 and 4/0, the OIR is unsuccessful. To prevent this failure, the **card** commands for the Cisco Wideband SIP in *slot/subslot* 1/0 and Cisco Wideband SPAs in *slot/subslot* 1/0 must be removed.

If the Cisco Wideband SIP is moved from slots 3/0 and 4/0 to slots 1/0 and 2/0, the OIR is unsuccessful. To prevent this failure, the card commands for Cisco Wideband SIP in *slot/subslot* 3/0 and Cisco Wideband SPAs in *slot/subslot* 3/0 must be removed.

For information about **card** commands, see [Optional Configuration Tasks](#).

**Note**

When the Cisco uBR10012 router is used as a wideband CMTS, Half-Height Gigabit Ethernet (HHGE) line cards and the associated slot splitters must be installed in slot 3 or slot 4 in the router. Therefore, the Cisco Wideband SIP is installed in slots 1/0 and 2/0.

Some Cisco IOS commands, such as `show diag`, allow you to display information about a Cisco Wideband SIP. These commands require you to specify the chassis location for the SIP that you want information about. For example, to display status and information about the Cisco Wideband SIP installed in *slot/subslot* 1/0, enter the following command:

```
Router# show diag 1/0
```

Specifying the Location for the Cisco Wideband SPA

In Cisco IOS commands, the Cisco Wideband SPA is designated by its location in a SIP on a Cisco uBR10012 router. The location is specified in the form:

- *slot/subslot/bay* (for Cisco IOS Releases 12.2(33)SCA and 12.3BC)
- *slot/bay/port* (for Cisco IOS Release 12.2(33)SCB and later)

A bay number identifies the location of each Cisco Wideband SPA in the Cisco Wideband SIP. The Cisco Wideband SPA can be installed in bay 0 or bay 1. Therefore, on the Cisco uBR10012 router when the Cisco Wideband SIP is installed in *slot/subslot* 1/0, the *slot/bay/port* locations for the two Cisco Wideband SPAs are 1/0/0 and 1/0/1.

Each Cisco Wideband SPA has two Gigabit Ethernet ports: one active and one redundant. The active port is used to send downstream traffic to one or more edge QAM devices. The individual Gigabit Ethernet ports on the Cisco Wideband SPA are not specified on the Cisco IOS CLI.

Some Cisco IOS commands, such as `show diag`, allow you to display information about a Cisco Wideband SPA. These commands require you to specify the chassis location for the SPA that you want information about. For example, to display status and information about the Cisco Wideband SPA installed in *slot/bay/port* 1/0/1, enter the following command:

```
Router# show diag 1/0/1
```

Identifying the Location of a Cisco 10000 Series SPA Interface Processor-600

This section describes how to specify the physical locations for a Cisco 10000 Series SPA Interface Processor-600 and its SPAs on the Cisco uBR10012 router within the command-line interface (CLI) to configure or monitor these devices.

Specifying the Slot Location for a Cisco 10000 Series SPA Interface Processor-600

The Cisco 10000 Series SPA Interface Processor-600 is a full-height line card that occupies two physical slots in a Cisco uBR10012 router. Each chassis supports a maximum of two SIPs that can be inserted in the following slots:

- SIP slot 1
- SIP slot 3

Some commands allow you to display information about a SIP and its SPAs, such as the **show inventory** and **show diag** commands. For example, to display information about the SIP installed in chassis slot 1 and its SPAs, use the **show diag** command.

Specifying the SPA Location in a Cisco 10000 Series SPA Interface Processor-600

A Cisco 10000 Series SPA Interface Processor-600 supports four bays (subslots) for the installation of SPAs and the SPA bays are numbered from 0 to 3. The number for each SPA bay is indicated by a small numeric label on the SIP faceplate.

A Cisco uBR10012 router uses *slot/bay/port* slot numbering format to specify the physical location of the SIP, SPA, and interface, where:

- *slot*—Specifies the chassis slot number where the SIP is installed.
- *bay*—Specifies the secondary slot of the SIP where the SPA is installed.
- *port*—Specifies the interface number that you want to select on the SPA.

To display information about a SPA, use the **show diag**, **show hw-module subslot**, and **show inventory** commands.

Required Configuration Tasks

There are no required configuration tasks for the Cisco Wideband SIP and Cisco 10000 Series SPA Interface Processor-600.

Optional Configuration Tasks

Optional Configuration Task for the Cisco Wideband SIP and Cisco Wideband SPA

Preprovisioning is an optional configuration task for the Cisco Wideband SIP and Cisco 10000 Series SPA Interface Processor-600. Preprovisioning on the Cisco uBR10012 router allows you to configure SIPs and SPAs without their physical presence.

Use the following command to preprovision a Cisco Wideband SIP:

Command	Purpose
Cisco IOS Releases 12.2(33)SCA and 12.3BC <code>Router(config)#card slot/subslot card-type</code> Cisco IOS Release 12.2(33)SCB and later <code>Router(config)#card slot card-type</code>	<ul style="list-style-type: none"> • <i>slot</i>—Identifies the chassis slot for the Cisco Wideband SIP. Valid values are 1 to 3. • <i>subslot</i>—Identifies the secondary slot for the Cisco Wideband SIP. Valid values are 0 or 1 (0 is always specified). • <i>card-type</i>—Specifies the type of card for which to preprovision the slot. 2jacket-1 is the card type for Cisco Wideband SIP.

Use the following command to preprovision a Cisco Wideband SPA on a Cisco Wideband SIP:

Command	Purpose
Cisco IOS Releases 12.2(33)SCA and 12.3BC <code>Router(config)#card slot/subslot/bay card-type</code> Cisco IOS Release 12.2(33)SCB and later <code>Router(config)#card slot/bay card-type</code>	<ul style="list-style-type: none"> • <i>slot</i>—Identifies the chassis slot for the Cisco Wideband SIP. Valid values are 1 to 3. • <i>subslot</i>—Identifies the secondary slot for the Cisco Wideband SIP. Valid values are 0 or 1 (0 is always specified). • <i>bay</i>—Identifies the bay number in the SIP where the Cisco Wideband SPA is located. Valid values are 0 (upper bay) or 1 (lower bay). • <i>card-type</i>—Specifies the type of card for which to preprovision the slot. 24rfchannel-spa-1 is the card type for Cisco Wideband SPA.

Optional Configuration Task for the Cisco 10000 Series SPA Interface Processor-600 and the SPAs

Use the following command to preprovision a Cisco 10000 Series SPA Interface Processor-600:

Command	Purpose
Router (config) # card slot card-type	<ul style="list-style-type: none"> • <i>slot</i>—Identifies the chassis slot for the Cisco 10000 Series SPA Interface Processor-600. Valid value is 1 or 3. • <i>card-type</i>—Specifies the type of card for which to preprovision the slot. 4jacket-1 is the card type for Cisco 10000 Series SPA Interface Processor-600.

Use the following command to preprovision a Cisco 6 Gbps Wideband Shared Port Adapter on a Cisco 10000 Series SPA Interface Processor-600:

Command	Purpose
Router (config) # card slot/subslot SPA-DOCSIS-HD-V1 1x10GE 6G-capacity license [ds_lic_count none]	<ul style="list-style-type: none"> • <i>slot</i>—Identifies the chassis slot for the Cisco 10000 Series SPA Interface Processor-600. Valid value is 1 or 3. • <i>subslot</i>—Identifies the secondary slot for the Cisco 10000 Series SPA Interface Processor-600 where the SPA resides. Valid values are from 0 to 3. • SPA-DOCSIS-HD-V1—Identifies the SPA card as a high density DOCSIS SPA card. • 6G-capacity—Configures the 6 Gbps capacity for the SPA card. • license—Creates a license for the SPA card. • <i>ds_lic_count</i>—Specifies the downstream license count. The valid value is from 0 to 144. • none—Specifies there is no downstream license.

Use the following command to preprovision a Cisco 3 Gbps Wideband Shared Port Adapter on a Cisco 10000 Series SPA Interface Processor-600:

Command	Purpose
<pre>Router(config)#card slot/subslot SPA-DOCSIS-HD-V1 {1x10GE 3x1GE} license [ds_lic_count none]</pre>	<ul style="list-style-type: none"> • <i>slot</i>—Identifies the chassis slot for the Cisco 10000 Series SPA Interface Processor-600. Valid value is 1 or 3. • <i>subslot</i>—Identifies the secondary slot for the Cisco 10000 Series SPA Interface Processor-600 where the SPA resides. Valid values are from 0 to 3. • SPA-DOCSIS-HD-V1—Identifies the SPA card as a high density DOCSIS SPA card. • license—Creates a license for the SPA card. • <i>ds_lic_count</i>—Specifies the downstream license count. The valid value is from 0 to 72. • none—Specifies there is no downstream license.

Use the following command to preprovision a Cisco Wideband SPA on a Cisco 10000 Series SPA Interface Processor-600:

Command	Purpose
<pre>Router(config)#card slot/bay card-type</pre>	<ul style="list-style-type: none"> • <i>slot</i>—Identifies the chassis slot for the Cisco 10000 Series SPA Interface Processor-600. Valid value is 1 or 3. • <i>bay</i>—Identifies the bay number in the Cisco 10000 Series SPA Interface Processor-600 where the Cisco Wideband SPA resides. Valid values are 0 (upper bay) or 1 (lower bay). • <i>card-type</i>—24rfchannel-spa-1 is the card type for the Cisco Wideband SPA.

Use the following command to preprovision a Gigabit Ethernet SPA on a Cisco 10000 Series SPA Interface Processor-600:

Command	Purpose
<pre>Router(config)#card slot/bay card-type</pre>	<ul style="list-style-type: none"> • <i>slot</i>—Identifies the chassis slot for the Cisco 10000 Series SPA Interface Processor-600. Valid value is 1 or 3. • <i>bay</i>—Identifies the bay number in the Cisco 10000 Series SPA Interface Processor-600 where the SPA resides. Valid values are from 0 to 3. • <i>card-type</i>—Specifies the type of card for which to preprovision the slot. Following are the card types for the Gigabit Ethernet SPAs: is the card type for the Cisco Wideband SPA. <ul style="list-style-type: none"> ◦ SPA-1XTENGE-XFP-V2—card type for the Cisco 1-Port 10-Gigabit Ethernet SPA. ◦ SPA-5X1GE-V2—card type for the Cisco 5-Port Gigabit Ethernet SPA.

Configuring the SIP Throughput Monitoring

Effective with Cisco IOS Release 12.2(33)SCI, use the following command to configure the throughput monitoring on the SIP:

Command	Purpose
<pre>Router(config)# cable sip slot ib-stats bandwidth-usage percent message-throttle minutes</pre>	<ul style="list-style-type: none"> • bandwidth-usage—Specifies the warning message threshold for the bandwidth usage, in percentage. • <i>percent</i>—Bandwidth usage percent. The valid range is from 50 to 100. The default value is 90%. • message-throttle—Specifies the warning message interval, in minutes. • <i>minutes</i>—Warning message interval. The valid range is from 0 to 60. The default value is 2 minutes. <p>Note If the warning message interval is set to 0, then the warning message is not displayed.</p>

Configuring CIR Scaling

Effective with Cisco IOS Release 12.2(33)SCI, use the following command to configure the committed information rate (CIR) scaling ratio for scaling the admission control (AC) bandwidth for all modular cable and wideband interfaces on a SIP:

Command	Purpose
Router(config)# cable sip slot cir-scale percent	<ul style="list-style-type: none"> <i>slot</i>—Slot number of the SIP on the Cisco uBR10012 router. The valid values are 1 and 3. <i>percent</i>—Percentage for scaling the AC bandwidth on the SIP. The valid range is from 10 to 100.

When CIR scaling is configured, the maximum reserved bandwidth is scaled based on the specified *percent*.



Note

Do not change the CIR scaling value frequently as it can increase the system load.

The table below provides the recommended values for the CIR scaling:

Table 6: Recommended Values for the CIR Scaling

Shared Port Adapters	Recommended CIR Scaling
4 x Cisco 3 Gbps Wideband Shared Port Adapters	100%
4 x Cisco 6 Gbps Wideband Shared Port Adapters	50%
2 x Cisco 6 Gbps Wideband Shared Port Adapters	100%
1 x Cisco 6 Gbps Wideband Shared Port Adapter and 3 x Cisco 3 Gbps Wideband Shared Port Adapters	80%

Resetting a SIP

To reset a SIP, use the following command in privileged EXEC configuration mode:

Command	Purpose
<pre>Router# hw-module subslot slot/subslot reset [hold release]</pre>	<p>Turns power off and on to the SIP in the specified <i>slot</i> and <i>subslot</i>, where:</p> <p><i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slot 1 and slot 3 can be used for the Cisco Wideband SIP and slot 0 and slot 3 can be used for the Cisco 10000 Series SPA Interface Processor-600.</p> <p><i>subslot</i>—Specifies the subslot where the SIP resides. On the Cisco uBR10012 router, subslot 0 is always specified.</p>

Resetting a SIP is not usually done but may sometimes be useful when troubleshooting a failed SIP.



Troubleshooting the SIPs

- [Interpreting Console Error Messages, page 29](#)
- [Using debug Commands, page 29](#)
- [Using show Commands to Troubleshoot SIPs, page 30](#)
- [Preparing for Online Removal of a SIP, page 30](#)
- [Preparing for Online Removal of a SPA, page 33](#)

Interpreting Console Error Messages

To view the explanations and recommended actions for Cisco uBR10012 router system messages, including messages related to SIPs, refer to the Cisco IOS CMTS Cable System Messages Guide.

System messages are organized in the documentation according to the particular system facility that produces the messages. The Cisco Wideband SIP error messages use the facility name **C10KJACKET**, and the Cisco 10000 Series SPA Interface Processor-600 error messages use the facility name **C10K_JACKET4SPA**.

Using debug Commands

The **debug** command is primarily used by Cisco technical support personnel.



Caution

Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff. Moreover, it is best to use **debug** commands during periods of lower network traffic and fewer users.

Following are some **debug** commands for debugging SIPs and SPAs on the Cisco uBR10012 router:

- **debug c10k-jacket2spa**—Enables debug information for the Cisco Wideband SIP card.
- **debug c10k-jacket4spa**—Enables debug information for the Cisco SIP-600 card.
- **debug hw-module bay**—Enables debugging information for a SPA.

- **debug cable fn**—Enables debugging information for cable fiber nodes.
- **debug cable wbcmts**—Enables debug information for the wideband CMTS.
- **debug hw-module subslot**—Enables debug information for a SPA and all of its interfaces.

For information about other **debug** commands supported on the Cisco uBR10012 router, see the [Cisco IOS CMTS Cable Command Reference](#).

To view the explanation and recommended action for the Cisco uBR10012 router system messages, including messages related to Cisco uBR10012 SIPs and SPAs, see the [Cisco IOS CMTS Cable System Messages Guide](#).

Using show Commands to Troubleshoot SIPs

The **show diag** and **show controllers jacket** commands allow you to monitor and troubleshoot the SIPs on the Cisco uBR10012 router.

- The **show diag** command shows the revision-level information on a SIP and on any SPAs installed in the SIP.
- The **show controllers jacket** command shows the register values of a SIP.

Effective with Cisco IOS Release 12.2(33)SCI, the **show ib statistic** command allows you to monitor the SIP throughput. It shows the Iron bus statistics information on a SIP.

Preparing for Online Removal of a SIP

The Cisco uBR10012 router supports OIR of the SIP. To do this, you can power down a SIP (which automatically deactivates any installed SPAs) and remove the SIP with the SPAs still intact.

Although graceful deactivation of a SIP is preferred using the **hw-module shutdown** command, the Cisco uBR10012 router does support removal of the SIP without deactivating it first.

If you plan to remove a SIP, you can deactivate the SIP first, using the **hw-module shutdown** global configuration command. When you deactivate a SIP using this command, it automatically deactivates each of the SPAs that are installed in that SIP. Therefore, it is not necessary to deactivate each of the SPAs prior to deactivating the SIP.

Either a blank filler plate or a functional SPA should reside in every bay (subslot) of a SIP during normal operation.

For more information about the recommended procedures for physical removal of the SIP, see the [Cisco uBR10012 Universal Broadband Router SIP and SPA Hardware Installation Guide](#).

Deactivating a SIP

To deactivate a SIP and its installed SPAs prior to removal of the SIP, use the following command in global configuration mode:

DETAILED STEPS

	Command or Action	Purpose
Step 1	hw-module subslot slot/subslot shutdown	<p>Deactivates the SIP in the specified slot, where:</p> <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 can be used for the SIPs. • <i>subslot</i>—Specifies the subslot where the SIP resides. On the Cisco uBR10012 router, subslot 0 is always specified. <p>For more information about chassis slot numbering, see the Identifying the Location of the Cisco Wideband SIP and Cisco Wideband SPA section.</p>

What to Do Next

- To reactivate a SIP, follow the steps in [Reactivating a SIP](#) section.
- To verify deactivation of a SIP, see [Verifying Deactivation and Activation of a SIP](#) section.
- To reactivate a SPA, follow the steps in [Reactivating a SPA](#) section.

Reactivating a SIP

After you deactivate a SIP, whether or not you have performed an OIR, you must use the **no hw-module shutdown** global configuration command to reactivate the SIP.

If you did not execute a command to deactivate the SPAs installed in a SIP, but you did deactivate the SIP using the **hw-module subslot shutdown** command, then you do not need to reactivate the SPAs after an OIR of the SIP. The installed SPAs automatically reactivate upon reactivation of the SIP in the router.

For example, consider the case where you remove a SIP from the router to replace it with another SIP. You reinstall the same SPAs into the new SIP. When you enter the **no hw-module subslot shutdown** command on the router, the SPAs will automatically reactivate with the new SIP.

To activate a SIP and its installed SPAs after the SIP has been deactivated, use the following command in global configuration mode:

DETAILED STEPS

	Command or Action	Purpose
Step 1	no hw-module subslot slot/subslot shutdown	<p>Activates the SIP in the specified slot and its installed SPAs, where:</p> <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 can be used for the SIPs. • <i>subslot</i>—Specifies the subslot where the SIP resides. On the Cisco uBR10012 router, subslot 0 is always specified.

	Command or Action	Purpose
		For more information about chassis slot numbering, see Identifying the Location of the Cisco Wideband SIP and Cisco Wideband SPA section.

What to Do Next

- To deactivate a SIP, follow the steps in [Deactivating a SIP](#) section.
- To verify deactivation of a SIP, see [Verifying Deactivation and Activation of a SIP](#) section.

Verifying Deactivation and Activation of a SIP

To verify the deactivation of a SIP, enter the **show diag** command in privileged EXEC mode. When a SIP is powered down, the SIP no longer appears in the output of the **show diag** command or any other Cisco IOS command.

The following example shows how to deactivate and verify deactivation for the Cisco Wideband SIP located in slot 1, subslot 0. Notice that there is no output for the **show diag** command after the SIP is deactivated.

```
Router# configure terminal
Router(config)# hw-module subslot 1/0 shutdown
Router(config)#
00:44:02: %IPCOIR-3-TIMEOUT: Timeout waiting for a response from slot 1/0.
00:44:02: %IPCOIR-2-CARD_UP_DOWN: Card in slot 1/0 is down. Notifying 2jacket-1 driver.
00:44:04: %LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:0, changed state to down
00:44:04: %LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:1, changed state to down
...
Router# show diag 1/0 // Displays no output
```

The following example shows how to activate and verify activation for the Cisco Wideband SIP located in slot 1, subslot 0. If there is output for the **show diag** command, the SIP has been powered on.

```
Router(config)# no hw-module subslot 1/0 shutdown
Router(config)#
00:44:28: %IPCOIR-5-CARD_DETECTED: Card type 2jacket-1 (0x415) in slot 1/0
00:44:28: %IPCOIR-5-CARD_LOADING: Loading card in slot 1/0
00:44:38: %C10K-5-LC_NOTICE: Slot[1/0] Line-card Image Downloaded...Booting...
00:45:11: %IPCOIR-5-CARD_DETECTED: Card type 2jacket-1 (0x415) in slot 1/0
00:45:11: %IPCOIR-2-CARD_UP_DOWN: Card in slot 1/0 is up. Notifying 2jacket-1 driver.
00:45:21: %C10K-5-LC_NOTICE: Slot[1/0] Line-card WB Chan 1/0/0:0 Disabled
00:45:21: %SPAWCMTS-4-SFP_OK: Wideband-Cable 1/0/0, 1000BASE-SX SFP inserted in port 0
...
Router# show diag 1/0
Slot/Subslot 1/0:
2jacket-1 card, 0 ports
Card is full slot size
Card is analyzed
Card detected 0:3:16 ago
Card uptime 0 days, 0 hours, 3 minutes, 17 seconds
...
```

What to do Next

- To deactivate a SIP, see [Deactivating a SIP](#) section.
- To reactivate a SIP, see [Reactivating a SIP](#) section.

Preparing for Online Removal of a SPA

The Cisco uBR10012 router supports OIR of a SPA independently of removing the SIP. This means that a SIP can remain installed in the router with one SPA remaining active, while you remove another SPA from one of the SIP bays. If you are not planning to immediately replace a SPA into the SIP, then be sure to install a blank filler plate in the bay. The SIP should always be fully installed with either functional SPAs or blank filler plates.

The interface configuration is retained (recalled) if a SIP or SPA is removed and then replaced with one of the same type.

If you are planning to remove a SIP along with its SPAs, then you do not need to follow the instructions in this section. To remove a SIP along with its SPAs, see the [Preparing for Online Removal of a SIP](#) section.

Deactivating a SPA

Although graceful deactivation of a SPA is preferred using the **hw-module bay shutdown** command, the Cisco uBR10012 router does support removal of the SPA without deactivating it first. Before deactivating a SPA, ensure that the SIP is seated securely into the slot before pulling out the SPA itself.



Note

If you are preparing for an OIR of a SPA, there are no standard interfaces to be shut down prior to deactivation of the SPA. The **hw-module bay shutdown** command automatically stops traffic on the Gigabit Ethernet interfaces and deactivates them along with the SPA in preparation for OIR. In similar fashion, you do not need to independently restart any Gigabit Ethernet interfaces on a SPA after OIR of a SPA or SIP.

To deactivate a SPA and all of its interfaces prior to removal of the SPA, use the following command in global configuration mode:

DETAILED STEPS

	Command or Action	Purpose
Step 1	hw-module bay {slot/subslot/bay slot/bay} shutdown unpowered	In Cisco IOS Releases 12.2(33)SCA and 12.3BC hw-module bay slot/subslot/bay shutdown unpowered Starting with Cisco IOS Release 12.2(33)SCB release hw-module bay slot/bay shutdown unpowered Deactivates the specified SPA, where: <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i> —Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay).

	Command or Action	Purpose
		<ul style="list-style-type: none"> • unpowered—Shuts down the SPA and all of its interfaces, and leaves them in an administratively down state without power. <p>For more information about chassis slot and SIP bay numbering, see the Identifying the Location of the Cisco Wideband SIP and Cisco Wideband SPA section.</p>

What to Do Next

- To reactivate a SPA, see the [Reactivating a SPA](#) section.
- To verify deactivation and reactivation of the SPA, see the [Verifying Deactivation and Activation of a SPA](#) section.

Reactivating a SPA



Note

You do not need to reactivate a SPA after an OIR of either the SIP or a SPA if you did not deactivate the SPA prior to removal. If the router is running, then the SPAs automatically start upon insertion into the SIP or with insertion of a SIP into the router.

If you deactivate a SPA using the **hw-module bay shutdown** global configuration command and need to reactivate it without performing an OIR, you must use the **no hw-module bay shutdown** global configuration command to reactivate the SPA and its interfaces.

To activate a SPA and its interfaces after the SPA has been deactivated, use the following command in global configuration mode:

DETAILED STEPS

	Command or Action	Purpose
Step 1	no hw-module bay <i>{slot/subslot/bay slot/bay}</i> shutdown	<p>In Cisco IOS Releases 12.2(33)SCA and 12.3BC</p> <p>no hw-module bay slot/subslot/bay shutdown</p> <p>Starting with Cisco IOS Release 12.2(33)SCB release</p> <p>no hw-module bay slot/bay shutdown</p> <p>Activates the SPA and its interfaces in the specified slot and subslot of the SIP, where:</p> <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified.

	Command or Action	Purpose
		<ul style="list-style-type: none"> • <i>bay</i> —Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). <p>For more information about chassis slot and SIP bay numbering, see the Identifying the Location of the Cisco Wideband SIP and Cisco Wideband SPA section.</p>

What to Do Next

- To deactivate a SPA, see the [Deactivating a SPA](#) section.
- To verify deactivation and reactivation of the SPA, see the [Verifying Deactivation and Activation of a SPA](#) section.

Verifying Deactivation and Activation of a SPA

To verify the deactivation of a SPA, enter the **show hw-module bay oir** command in privileged EXEC configuration mode, and look at the Operational Status of the SPA.

The example below shows how to deactivate and verify deactivation for the Cisco Wideband SPA located in slot 1, subslot 0, bay 0. In the output of the **show hw-module bay oir** command, notice **admin down** in the Operational Status field.



Note

The example below shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```

Router# configure terminal
Router(config)# hw-module bay 1/0/0 shutdown unpowered
%SPAWBCMTS-4-SFP MISSING: Wideband-Cable 1/0/0, 1000BASE-SX SFP missing from port 0
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:1, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:2, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:3, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:4, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:5, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:6, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:7, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:8, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:9, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:10, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:11, changed state to down
...
    
```

```

Router# show hw-module bay 1/0/0 oir
Module      Model              Operational Status
-----
bay 1/0/0   SPA-24XDS-SFP      admin down
    
```

The example below shows how to activate and verify activation for the Cisco Wideband SPA located in slot 1, subslot 0, bay 0. In the output of the **show hw-module bay oir** command, notice **ok** in the Operational Status field.

```

Router# configure terminal
    
```

```

Router(config)# no hw-module bay 1/0/0 shutdown
%SPAWBCMTS-4-SFP_OK: Wideband-Cable 1/0/0, 1000BASE-SX SFP inserted in port 0
%SPAWBCMTS-4-SFP_LINK_OK: Wideband-Cable 1/0/0, port 0 link changed state to up
%SNMP-5-LINK_UP: LinkUp:Interface Wideband-Cable1/0/0:0 changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:0, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:1, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:2, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:3, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:4, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:5, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:6, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:7, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:8, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:9, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:10, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:11, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Wideband-Cable1/0/0, changed state to up
...

```

```

Router# show hw-module bay 1/0/0 oir
Module      Model              Operational Status
-----
bay 1/0/0  SPA-24XDS-SFP      ok

```

The example below shows how to deactivate, activate, and verify the Cisco 3 Gbps Wideband Shared Port Adapter located in slot 1, bay 0.

```

Router# configure terminal
Router(config)# hw-module bay 1/0 shutdown unpowered
%SPAWBCMTS-2-CARD_UP_DOWN: Card SPA-DOCSIS-HD-V1 in bay 1/0/0 is down.
%SPA_OIR-6-OFFLINECARD: SPA (DOCSIS HD SPA ) offline in bay 1/0
%LINK-3-UPDOWN: Interface GigabitEthernet1/0/0, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:0, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:1, changed state to down
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:20, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/0, changed state to
down
%SPAWBCMTS-4-SFP_MISSING: Modular-Cable 1/0/0, 1000BASE-T SFP missing from port 0
%SPAWBCMTS-4-SFP_MISSING: Modular-Cable 1/0/2, 1000BASE-LX SFP missing from port 2
SPA TSM Error: bay:1/0 fail_code:0x9080(SPA shutdown)
%SPA_OIR-6-OFFLINECARD: SPA (DOCSIS HD SPA ) offline in bay 1/0
Router(config)# no hw-module bay 1/0 shutdown
%SPAWBCMTS-2-CARD_UP_DOWN: Card SPA-DOCSIS-HD-V1 in bay 1/0/0 is up.
%SPAWBCMTS-4-SFP_MISSING: Modular-Cable 1/0/0, 1000BASE-T SFP missing from port 0
%SPAWBCMTS-4-SFP_OK: Modular-Cable 1/0/0, 1000BASE-T SFP inserted in port 0
%SPAWBCMTS-4-SFP_MISSING: Modular-Cable 1/0/2, 1000BASE-LX SFP missing from port 2
%SPAWBCMTS-4-SFP_OK: Modular-Cable 1/0/2, 1000BASE-LX SFP inserted in port 2
%SPAWBCMTS-4-SFP_OK: Modular-Cable 1/0/0, 1000BASE-T SFP inserted in port 0
%SPAWBCMTS-4-SFP_OK: Modular-Cable 1/0/2, 1000BASE-LX SFP inserted in port 2
%SPA_OIR-6-ONLINECARD: SPA (DOCSIS HD SPA ) online in bay 1/0
%LINEPROTO-5-UPDOWN: Line protocol on Interface Wideband CMTS Base1/0/0, changed state to
down
%SPAWBCMTS-4-SFP_LINK_OK: Modular-Cable 1/0/0, port 0 link changed state to up
%LINK-3-UPDOWN: Interface GigabitEthernet1/0/0, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:0, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:1, changed state to up
%LINK-3-UPDOWN: Interface Wideband-Cable1/0/0:20, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Wideband CMTS Base1/0/0, changed state to
up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/0, changed state to up

Router# show hw-module bay 1/0/0 oir
Module      Model              Operational Status
-----
bay 1/0     SPA-UBR10-DS-HD   ok

```



CHAPTER 5

Overview of the Cisco Wideband SPA

- [Cisco Wideband SPA Release History](#), page 37
- [Cisco Wideband SPA Overview](#), page 38
- [Features Supported by Cisco Wideband SPA](#), page 38
- [Restrictions for Cisco Wideband SPA](#), page 39
- [MIBs Supported on Cisco Wideband SPA](#), page 39
- [Cisco Wideband SPA Architecture](#), page 40
- [Displaying Cisco Wideband SPA Information](#), page 47

Cisco Wideband SPA Release History

Table 7: Cisco Wideband SPA Release History

Cisco IOS Release	Modification
12.3(23)BC	Added support for primary-capable SPA downstream channels.
12.3(21)BC	Support for the Cisco Wideband SPA on the Cisco Wideband SIP was introduced.
12.2(33)SCB	Support for the Cisco Wideband SPA on the Cisco 10000 Series SPA Interface Processor-600 was introduced.
12.2(33)SCF	Updated the document to include support for the DWDM-XFP-xx.xx.

Cisco Wideband SPA Overview

The Cisco Wideband SPA is a single-wide, half-height shared port adapter that provides Cisco Wideband Protocol for a DOCSIS network formatting to the downstream data packets. It is used for downstream data traffic only. The Cisco Wideband SPA is a key component for the Cisco IOS features, DOCSIS 3.0 Downstream Channel Bonding and DOCSIS M-CMTS network architecture.

Each Cisco Wideband SPA is installed into a bay of the Cisco Wideband SIP or Cisco 10000 Series SPA Interface Processor-600 on a Cisco uBR10012 universal broadband router. See the [Identifying the Location of the Cisco Wideband SIP and Cisco Wideband SPA](#) for information on slot restrictions. The Cisco Wideband SPA has one active and one redundant Gigabit Ethernet port that is used to send traffic to the external edge QAM device. If the link states of both Gigabit Ethernet ports are up, port 0 comes up as the active port and port 1 becomes the redundant port. If the link state of port 0 is not up, port 1 comes up as the active port.

The Cisco uBR10012 router can support up to six Cisco Wideband SPAs. Depending on how it is configured, each Cisco Wideband SPA supports up to 24 RF channels. Each Cisco Wideband SPA can support up to 32 logical wideband channels (bonding groups).



Note

For annex A and 256 QAM, each Cisco Wideband SPA supports up to 18 RF channels at full rate and up to 24 RF channels at less than full rate. For all other cases, the Cisco Wideband SPA supports up to 24 RF channels.

The Cisco Wideband SPA contains field-programmable devices: the Cisco Wideband SPA FPGAs and Complex Programmable Logic Device (CPLDs). The FPGA and CPLD upgrade information is part of the Cisco IOS release rather than a separate file to be downloaded by users.

Features Supported by Cisco Wideband SPA

- Up to 32 channel-bonded wideband channels per Cisco Wideband SPA
- Up to 24 radio frequency (RF) channels (Annex B) or 18 RF channels (Annex A) per Cisco Wideband SPA
- Cisco Wideband Cable for DOCSIS Network support
- Two Gigabit Ethernet ports (one of which is redundant) for link to edge QAM devices
- Traditional DOCSIS 1.x/2.0 upstream channels
- Primary-capable SPA downstream channels
- DOCSIS 1.x/2.0 modem support on primary-capable SPA downstream channels
- DOCSIS 1.x/2.0 modem support and legacy feature support on primary-capable SPA downstream channels
- Extensible MAC domain support via Channel Grouping Domain
- 64 QAM and 256 QAM support
- 6 MHz and 8 MHz support
- Euro-DOCSIS and J-DOCSIS support [Not sure]

- Baseline Privacy Interface(BPI)/BPI+ encryption
- Single-wide, half-height SPA form factor
- Small form-factor pluggable (SFP) modules that plug into the Gigabit Ethernet ports
- SFP module support for SX, LX/LH, and ZX optical fiber (1000BASE-SX, 1000BASE-LX/LH, 1000BASE-ZX)
 - Standard Category 5 copper and RJ45 connections (1000BASE-T)
- Cisco IOS command set for wideband-channel configuration, provisioning, and maintenance
- Cisco IOS command set for wideband channel hardware monitoring, troubleshooting, and debugging
- MIB support
- Online insertion and removal (OIR)
- Multipoint Bridging

Restrictions for Cisco Wideband SPA

The following restrictions apply to the Cisco Wideband SPA for Cisco IOS Release 12.3(23)BC, Cisco IOS Release 12.2(33)SCA, and Cisco IOS Release 12.2(33)SCB:

- Voice call service flows are configurable only on wideband interfaces.
- Full DOCSIS QoS, including CIR support and downstream low latency service flows for voice, are configurable only on wideband interfaces.
- Dynamic services are configurable only on wideband interfaces.
- A wideband interface can only use RF channels from the same SPA.
- Scientific Atlanta DPC2505 and EPC2505 wideband cable modems support multicast traffic on the primary downstream channel only. These modems do not support multicast traffic on wideband downstream channels.
- Currently only data services are supported.
- The **rf-channel rf shutdown** command cannot be executed on the Cisco 1 Gbps Wideband Shared Port Adapter (SPA) configured with manual DEPI.

MIBs Supported on Cisco Wideband SPA

The following MIBs are supported in Cisco IOS Release 12.3(23)BC and later for the Cisco uBR10012 router and the Cisco Wideband SIP and Cisco Wideband SPA:

The following MIBs have been introduced in Cisco IOS Release 12.3(23)BC:

- DOCS-DSG-IF-MIB
- DTI-MIB

The following MIBs have been modified for Cisco IOS Release 12.3(23)BC:

- CISCO-CABLE-SPECTRUM-MIB
- CISCO-DOCS-EXT-MIB
- DOCS-IF-MIB
- DOCS-BPI-PLUS-MIB
- ENTITY-MIB
- IF-MIB

The following MIBs continue to be supported in Cisco IOS Release 12.3(23)BC:

- CISCO-CABLE-WIDEBAND-MIB
- CISCO-VENDORTYPE-OID-MIB

For more information about MIB support on a Cisco uBR10012 router, see the Cisco CMTS Universal Broadband Router MIB Specifications Guide at the following URL:

http://www.cisco.com/en/US/docs/cable/cmts/mib/12_2sc/reference/guide/ubrmibv5.html

For information about MIBs associated with edge QAM devices or wideband cable modems, see the vendor documentation.

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<https://tools.cisco.com/RPF/register/register.do>

Cisco Wideband SPA Architecture

This section provides an overview of the architecture of the Cisco Wideband SPA and describes the path of a packet in the ingress and egress directions. Some of these areas of the architecture are referenced in the SPA software and can be helpful to understand when troubleshooting or interpreting some of the SPA CLI and show command output.

Every incoming and outgoing packet on the Gigabit Ethernet SPAs goes through the physical (PHY) SFP optics, Media Access Control (MAC), and ASIC devices.

Path of a Packet in the Ingress Direction

The steps below describe the path of an ingress packet through the Gigabit Ethernet SPAs:

- 1 The PHY SFP optics device receives incoming frames on a per-port basis from one of the laser-optic interface connectors.
- 2 The PHY laser optics device processes the frame and sends it over the XAUI path to the MAC device.
- 3 The MAC device receives the frame, strips the CRCs, and sends the packet via the SPI 4.2 bus to the ASIC.
- 4 The ASIC takes the packet from the MAC devices and classifies the Ethernet information. CAM lookups based on etype, port, VLAN, and source and destination address information determine whether the packet is dropped or forwarded to the SPA interface.

Path of a Packet in the Egress Direction

The steps below describe the path of an egress packet from the SIP through the Gigabit Ethernet SPA:

- 1 The packet is sent to the ASIC using the SPI 4.2 bus. The packets are received with Layer 2 and Layer 3 headers in addition to the packet data.
- 2 The ASIC uses port number, destination MAC address, destination address type, and VLAN ID to perform parallel CAM lookups. If the packet is forwarded, it is forwarded via the SPI 4.2 bus to the MAC device.
- 3 The MAC device forwards the packets to the PHY laser-optic interface, which transmits the packet.

Information on Configuring SPAs

This section describes terminologies used while configuring SPAs:

Wideband Channel or Bonding Group

A wideband channel or bonding group is a logical grouping of one or more physical radio frequency (RF) channels over which wideband MPEG-TS packets are carried. By aggregating or “channel bonding” multiple RF channels, the wideband channel is capable of greater bandwidth capacity for downstream data traffic than a single narrowband channel. During Cisco Wideband SPA configuration, each wideband channel is associated with one or more RF channels. Each Cisco Wideband SPA supports 32 wideband channels.

Narrowband Channel

A narrowband channel is a logical representation of a non-bonded channel that is a standard DOCSIS 1.x/2.0 protocol downstream channel that contains one RF channel.

Wideband-Cable Interface

A wideband-cable interface is a logical representation of the channels in the bonding group and is configured using the interface wideband-cable command.

Modular-Cable Interface

A modular-cable interface is a logical representation of the downstream channel’s capability to carry non-bonded data traffic on the SPA downstream channels and is configured using the interface modular-cable command.

The Cisco DOCSIS 3.0 Downstream Channel Bonding feature can be deployed in parallel with DOCSIS 1.x/2.0 technology. The CMTS supports DOCSIS 1.x/2.0 modems on non-wideband interfaces while wideband cable modems deliver higher-speed throughput on the wideband ports.

Virtual Bundle

For a fiber node to be in valid state, all wideband and modular cable interfaces that use the RF channels in the fiber node must belong to the same virtual bundle interface. You must assign virtual bundle numbers for wideband interfaces using CLI configuration. The bundle membership of the MAC domain, namely the line card host interface, is inherited by the modular-cable interface via the CGD configuration.

Wideband-Cable Interfaces Belonging to the Same Virtual Bundle

The example below shows wideband-cable interfaces that belong to the same virtual bundle. Fiber node 1 includes RF channels 0 to 3 of Cisco Wideband SPA 1/0/0 and these RF channels are used by two wideband interfaces.

The fiber node is in valid state because the two wideband channels share the same RF channel and the wideband interfaces are in the same virtual bundle.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```
interface Wideband-Cable1/0/0:12
no ip address
cable bundle 1
cable bonding-group-id 36
cable rf-channel 0 bandwidth-percent 90
cable rf-channel 1 bandwidth-percent 50
cable rf-channel 2
end
```

```
interface Wideband-Cable1/0/0:13
no ip address
cable bundle 1
cable bonding-group-id 37
cable rf-channel 1 bandwidth-percent 50
cable rf-channel 2
cable rf-channel 3
end
```

Modular-Cable Interfaces Belonging to the Same Virtual Bundle

In the example shown above, if RF channel 0 of the Cisco Wideband SPA 1/0/0 is configured as a primary-capable channel and is associated with the line card host interface 6/0/1, then the modular-cable interface 1/0/0:0 inherits the bundle membership of this host interface. This bundle number must be the same as the two wideband interfaces, interface Wideband-Cable 1/0/0:12 and interface Wideband-Cable 1/0/0:13. Otherwise, fiber node 1 that includes the RF channels 0 to 3 will be in invalid state.

The virtual bundle number of the wideband or modular-cable interfaces cannot be changed after the RF channels that belong to these interfaces are added to the fiber node. To change the virtual bundle number, you must remove the RF channel from the fiber node before making the change.

All wideband channels on a fiber node and all associated primary downstream channels must belong to the same virtual bundle interface. The tasks involved in configuring wideband channels and primary downstream channels as members of the same virtual bundle are as follows:

- 1 Define a virtual bundle interface.
- 2 Use the cable bundle command to add wideband channels as virtual bundle members.

**Note**

For recent releases of Cisco IOS, a virtual bundle interface with virtual bundle members has replaced the master-slave model that was previously used for cable bundles. The virtual bundle model is used in Cisco IOS Release 12.3(21)BC and subsequent releases.

Primary-Capable Downstream Channel

A SPA downstream channel is made primary-capable via Channel Grouping Domain (CGD) configuration. A primary-capable downstream channel can carry narrowband traffic as well as wideband traffic. An RF channel is considered primary-capable when it has been associated with one or more upstream channels from a Cisco uBR10-MC5X20 cable interface and this RF channel can carry DOCSIS MAC management messages (MMM) including SYNC messages, Mini-slot Allocation Packet (MAP) messages, and Upstream Channel Descriptors (UCDs). Such an RF channel downstream is referred to as a primary-capable downstream channel. A DOCSIS Timing Interface (DTI) server that interfaces with the EQAM device and the Cisco DTCC card is used to synchronize DOCSIS MAC-layer messages. The interface represented by a single primary-capable downstream represents the narrowband portion of the RF channel.

A SPA downstream channel, whether primary-capable or not, can always be part of a bonded channel that carries bonded data traffic.

An RF channel can be shared by the associated modular-cable interface and by the wideband interfaces. The bandwidth of each RF channel can be configured to be statically divided between the modular-cable and wideband interfaces. Each RF channel's bandwidth can be used for wideband channels or narrowband channels or for a combination of the two.

A primary downstream channel is a primary-capable channel that is being used as a narrowband channel or as part of a wideband channel. A SPA DS channel may only be a primary-capable downstream channel for a single MAC domain. However, the same SPA DS channel may be part of one or more bonded channels (wideband interface) that serve multiple MAC domains. A primary downstream channel of one MAC domain can serve as non-primary downstream channel of another MAC domain. The total available bandwidth of a primary downstream channel, which is 96 percent, is split between the primary-capable downstream and non-primary-capable downstream channels. The remaining 4 percent is reserved for DOCSIS MAP and SYNC bandwidth.

Extensible MAC Domain Support via Channel Grouping Domain

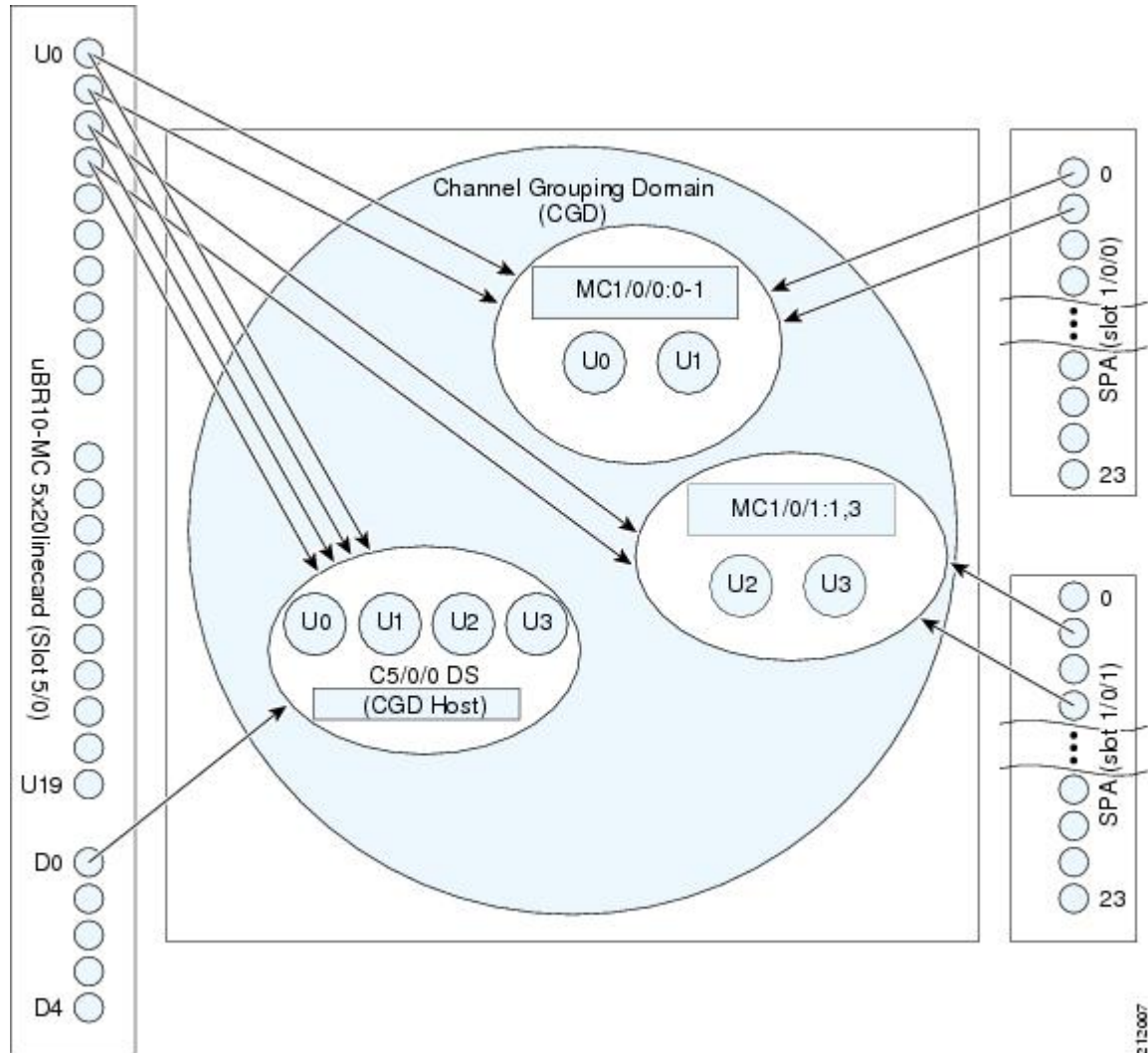
A Channel Grouping Domain (CGD) is a collection of primary-capable downstream channels that are associated with a common set of upstream channels under a cable interface, where the downstream channels can be shared by one or more upstreams. A CGD is always specified within the context of a MAC domain to which all the downstream and upstream channels belong. The downstream channel local to the MAC domain on the line card is always primary-capable, but a SPA DS channel has to be made primary-capable by explicit CGD configuration. A CGD provides the additional flexibility of associating a subset of the upstream channels within a MAC domain to any of the primary-capable downstream channels, including the local downstream channels. When an upstream channel is associated with a downstream channel, its information is included in the MAP and UCD messages sent through that downstream channel. Multiple CGD configurations may be included in the same MAC domain, allowing the flexibility of the MAC domain to include various primary-capable downstream channels associated with common or different sets of upstream channels.

A CGD is created using the following:

- Upstream channels 1 to 8 from a single line card
- A single downstream from the line card (This downstream can optionally be disabled.)

- Downstream channels 0 to 24 from one or more SPAs

Figure 1: MAC Domain Support via Channel Grouping Domain Configurations



In this example:

- The Interface Cable 5/0/0 serves as the Channel Grouping Domain host downstream channel.
- Upstream channels 0 to 3 from the line card are associated, by default, with the CGD host downstream channel.
- Downstream RF channels 0 and 1 from the SPA residing in slot 1, subslot 0, and bay 0 are associated with the line card upstream channels 0 and 1.
- Downstream RF channels 1 and 3 from the SPA residing in slot 1, subslot 0, and bay 0 are associated with the line card upstream channels 2 and 3.

**Note**

The downstream channel from the line card can serve either as a MAC domain or as a primary downstream channel.

The CGD allows load balancing groups to be created across one or more CGDs and enables the load balancing groups by default within the CGDs.

Fiber Node Configuration

In a cable network, a fiber node is a point of interface between a fiber trunk and the coaxial portion of the cable plant. A cable modem is physically connected to only one fiber node. Fiber node software configuration mirrors the physical topology of the cable network and is needed to optimize the DOCSIS MAC-layer messages for channel bonding. When configuring fiber nodes with Cisco IOS CLI commands, a fiber node is a software mechanism to define the following:

- The set of downstream RF channels that will flow into the fiber node
- At least one primary downstream channel for the fiber node
- The set of upstream channel ports on the cable interface line card that are connected to the fiber node and available as upstream channels

A fiber node will be associated with at least one primary downstream channel. A fiber node can be associated with more than one primary downstream channel though only one primary downstream channel is used at any given point in time. Each primary-capable downstream channel can be associated with up to 8 fiber nodes. All channels that belong to a fiber node are configured with different non-overlapping frequencies.

Fiber Nodes for Wideband

In a cable network, a fiber node is a point of interface between a fiber trunk and the coaxial distribution. A cable modem is physically connected to only one fiber node. Fiber node software configuration mirrors the physical topology of the cable network. When configuring wideband channels, a fiber node is a software mechanism to define a set of downstream and upstream channels that will flow into the physical fiber node.

Configuring cable fiber nodes with the **cable fiber-node** command is required for fiber nodes that are used for wideband channels. Cable fiber node configuration does not allow downstream interfaces to be combined into the same fiber node unless they are members of the same virtual bundle interface.

For a wideband channel to work correctly, each fiber node must be configured as follows:

- 1 Use the **cable fiber-node** command to create the fiber node and to enter cable fiber-node configuration mode.
- 2 Use the **downstream cable** command to associate the fiber node with one or more line card downstream channels. Each fiber node should have at least one primary downstream. This command is optional if the primary downstream channel for this fiber node is assigned from a SPA downstream.
- 3 Use the **upstream** command to specify the upstream channel ports that are connected to a fiber node.
- 4 Use the **downstream modular-cable rf-channel** command to associate one or more SPA RF channels or primary-capable RF channels from the SPA with the fiber node.
- 5 Optionally, use the **description** command to specify a description for the fiber node.

For each fiber node, a primary downstream channel is used to carry SYNCs, MAPs, and other MAC-layer management messages, and the associated upstream channel is used to carry MAC management messages.

A DTI server that interfaces with the EQAM device and the Cisco DTCC card is used to synchronize DOCSIS MAC-layer messages.

In Cisco IOS Release 12.3(21)BC, the primary downstream channel, which is a traditional DOCSIS downstream channel on the cable interface line card, is used to carry MAC management and signaling messages, and the associated traditional DOCSIS upstream channel is used for return data traffic and signaling.

Beginning in Cisco IOS Releases 12.3(23)BC and 12.2(33)SCB, either an RF channel from the SPA or a line card downstream channel can serve as a primary channel in a fiber node. If the fiber node does not have a line card downstream channel, then make sure that at least one of the RF channels specified in the **downstream modular-cable rf-channel** command is a primary-capable downstream channel.

The maximum number of cable fiber nodes that can be configured is limited to 256 for each CMTS.

Load Balancing Groups

A Load Balancing Group (LBG) is an operator-configured managed object that controls how the CMTS assigns the service flows of registered cable modems among an identified set of upstream and downstream channels of the CMTS.

An operator configures a Load Balancing Group with the following attributes:

- A Load Balancing Group Index unique within the CMTS
- A set of downstream and upstream channels in the same MAC Domain cable modem Service Group (MD-CM-SG)
- A boolean optionally configuring the LBG as a “Restricted” LBG
- A policy that governs if and when the cable modem or its individual service flows can be moved
- A priority value that can be used by the CMTS in order to select which cable modems and service flows to move

For more information on load balancing, see the [Cisco DOCSIS 3.0 Downstream Solution Design and Implementation Guide](#).

Primary Downstream Channel Selection in a Fiber Node Configured with Downstreams from the Cable Interface Line Card and SPA Downstreams

If a fiber node is configured with a primary downstream from a cable interface line card as well as a primary downstream from the SPA that is part of a wideband channel, then the primary downstream channel selection depends on the downstream channel selection policies (that govern when the cable modem can be moved) implemented and enforced by the configuration. The fiber node can be configured to force a Scientific Atlanta DPC2505 (EPC2505 for EuroDOCSIS) to perform 3-channel bonding. But this will also depend on the implemented downstream channel selection policies that govern when the cable modem can be moved.

Wideband Cable Modems

The number of RF channels that can be aggregated into a wideband channel is determined by the capability of the wideband cable modem. The Cisco Cable Wideband Solution, Release 2.0 supports DOCSIS 3.0-compliant multichannel modems, including the following Linksys and Scientific Atlanta modems:

Linksys WCM300-NA, WCM300-EURO, and WCM300-JP Modems

For wideband channels, the Linksys WCM300-NA (WCM300-EURO for EuroDOCSIS and WCM300-JP for Japanese DOCSIS) wideband cable modem supports the receiving of a 50-MHz capture window of up to

eight different downstream RF channels at 6 MHz per channel, or six different downstream RF channels at 8 MHz per channel. In addition to these eight RF channels, the Linksys WCM300 modem supports reception of one primary downstream channel (traditional DOCSIS channel).

The Linksys WCM300 wideband cable modem software supports the acquisition of up to eight wideband (bonded) downstream channels:

- One primary bonded channel is the wideband channel on which the wideband cable modem receives all of its unicast data and some multicast data.
- Up to two secondary bonded channels are the wideband channels on which the wideband cable modem receives common multicast data streams. Secondary bonded channels are intended to receive multicast data such as broadcast video that is not available on the primary bonded channel.

The DOCSIS configuration file and the `cable bonding-group-id` command define the primary and secondary bonded channels for the modem to select and acquire. The cable modem identifies the primary bonded channel and any secondary bonded channels to the CMTS at cable modem registration time.

For information on how the Linksys WCM300 modem selects primary and secondary bonded channels, see the Cisco DOCSIS 3.0 Downstream Solution Design and Implementation Guide, Release 2.0.

Scientific Atlanta DPC2505 and EPC2505 Modems

When used with the Cisco uBR10012 CMTS, the Scientific Atlanta DPC2505 and EPC2505 (for EuroDOCSIS) wideband cable modems support the receiving of one wideband channel, which consists of up to three bonded downstream RF channels from the SPA at 6 MHz per channel or at 8 MHz per channel. One of the RF channels from the Cisco Wideband SPA serves as the primary downstream channel.

The Scientific Atlanta DPC2505 is DOCSIS 3.0-compliant and can be used in this mode (for example, if the modem is connected to a non-wideband Cisco CMTS or to a non-Cisco CMTS). The modem is also backward compatible with existing DOCSIS 1.x networks.

Displaying Cisco Wideband SPA Information

To verify the SPA type that is installed in your Cisco uBR10012 router, you can use the **show diag** command.



Note

With Cisco IOS commands, the Cisco Wideband SPA Gigabit Ethernet ports are not standard user-configurable interfaces and do not appear in the output of the **show interfaces** command. You can get information on the Cisco Wideband SPA Gigabit Ethernet ports using the **show controllers modular-cable** command with the **ge_phy** keyword.

The table below shows the card type that appears in the **show diag** command output for the Cisco Wideband SPA.

Table 8: Cisco Wideband SPA Card Descriptions in show Commands

SPA	Description in show diag command
Cisco Wideband SPA	24rfchannel-spa-1

The 12 wideband channels on each Cisco Wideband SPA are similar to cable interfaces and appear in the output of commands such as the **show interfaces** command.

The **show hw-module bay** command displays a variety of information about the RF channels and wideband channels on a Cisco Wideband SPA.

Examples of the show diag and show interface wideband-cable Commands

The following example shows output from the **show diag** command on a Cisco uBR10012 router with a Cisco Wideband SPA installed in slot 1, subslot 0, bay 0.

```
Router# show diag 1/0/0

Slot/Subslot/Port 1/0/0:
 24rfchannel-spa-1 card, 1 port + 1 redundant port
Card is half slot size
Card is analyzed
Card detected 16:47:55 ago
Card uptime: Not Supported
Card idle time: Not Supported
Voltage status: 3.3V (+3.291) NOMINAL 2.5V (+2.495) NOMINAL
                 1.2V (+1.201) NOMINAL 1.8V (+1.811) FIXED
EEPROM contents, slot 1/0/0:
Hardware Revision      : 1.0
Boot Timeout          : 500
PCB Serial Number     : CSJ09379726
Part Number           : 73-9597-03
Part Number Revision  : 05
Fab Version           : 03
RMA Test History      : 00
RMA Number            : 0-0-0-0
RMA History           : 00
Deviation Number      : 0
Product (FRU) Number  : SPA-24XDS-SFP
Version Identifier (VID) : V01
Top Assy. Part Number : 68-2562-03
Board Revision        : 05
CLEI Code             :
MAC Address           : 0019.06a5.d9b2
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data : Minimum: 0 dBmV, Maximum: 0 dBmV
  Calibration values :
Platform features     : 00 00 00 00 00 00 00 00
                      : 00 00 00 00 00 00 00 00
                      : 00 00 00 00 00 00 00 00
                      : 00 00 00 00 00 00 00 00
```

The following example shows output from the **show interface wideband-cable** command. It shows information about the cable interface for wideband channel 1 on the Cisco Wideband SPA located in slot 1, subslot 0, bay 0.



Note

The example below shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```
Router# show interface wideband-cable 1/0/0:1

Wideband-Cable1/0/0:1 is up, line protocol is up
Hardware is Wideband CMTS Cable interface, address is 0012.001a.8897 (bia0012.001a.8897)
MTU 1500 bytes, BW 74730 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 00:00:09, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
30 second input rate 0 bits/sec, 0 packets/sec
30 second output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
24224 packets output, 1222002 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
```




Configuring the Cisco Wideband SPA

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- [Specifying Narrowband Channels, page 52](#)
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Specifying the Location for the Cisco Wideband SPA

For information on specifying the location of a Cisco Wideband SPA, see the [Identifying the Location of the Cisco Wideband SIP and Cisco Wideband SPA](#) section.

Specifying Narrowband Channels

A modular-cable interface is a narrowband interface associated with one downstream RF channel of the SPA. The same RF channel may be associated with an entirely independent bonding group, and the RF channel could be sharing RF bandwidth with this bonding group.

At the Cisco IOS command line, the **interface modular-cable** command is used to specify a narrowband channel.

Modular cable interfaces are similar to the downstream portion of cable interfaces and are displayed in the output of commands such as **show ip interface**, **show interfaces**, **show interface modular-cable**, and **show running-config**.

The following is sample output for the **show interface** command for a modular-cable interface:

```
Router# show interfaces
Modular-Cable 1/0/0:1 is up, line protocol is up
  Hardware is CMTS MC interface, address is 0011.9221.84be (bia 0011.9221.84be)
  MTU 1500 bytes, BW 539 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 1w3d, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  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 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    40 packets output, 9968 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
  ...
```



Note

When a SPA is inserted, 24 modular-cable interfaces are created for that SPA. These interfaces are hidden until they are configured and will not be displayed in the output of commands such as **show ip interface**, **show interfaces**, **show interface modular-cable**, and **show running-config**. See the [Hardware Status and Line Protocol Status for a Wideband-Channel and Modular-Cable Interface](#) section for information on the conditions when the line protocol is up for modular-cable interfaces.

Specifying Wideband Channels

At the Cisco IOS command line, the **interface wideband-cable** command is used to specify a wideband channel.

Wideband channels are similar to cable interfaces and are displayed in the output of commands such as **show ip interface**, **show interfaces**, and **show interface wideband-cable**. For example:

```
Router# show interfaces
...
Wideband-Cable1/0/0:0 is up, line protocol is up
  Hardware is Wideband CMTS Cable interface, address is 0012.001a.8896 (bia
0012.001a.8896)
  MTU 1500 bytes, BW 74730 Kbit, def 74730 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 00:00:09, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    17033 packets output, 1765690 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
...
```

Hardware Status and Line Protocol Status for a Wideband-Channel and Modular-Cable Interface

When Cisco IOS commands that display the hardware status and line protocol status for a cable interface such as the **show interface wideband-cable** command displays a wideband-channel cable interface or the **show interface modular-cable** command displays a modular cable interface, the following applies:

- The hardware status for the cable interfaces will be up if a SPA is installed in a SIP and both the SIP and SPA are powered on.
- The line protocol for wideband-channel cable interfaces will be up under the following conditions:
 - The interface must be administratively up.
 - The interface must be associated with at least one RF channel.
 - The Gigabit Ethernet port of the SPA must be connected.
 - The RF channel frequency must be set for the RF channel.
 - MAC address of the next-hop interface or edge QAM device must be set for the RF channel.
 - IP address of the edge QAM device must be set for the RF channel.
 - UDP port number or DEPI remote session ID for the QAM device that is used for the RF channel must be set.

If the line protocol for a wideband-channel cable interface is up, all wideband-channel configuration information needed to successfully send data is present. However, additional configuration information may be needed to complete the Cisco Wideband SPA configuration process. See the [Configuring the Cisco Wideband SPA](#) chapter for configuration procedures.

The line protocol for modular-cable interfaces will be up under the following conditions:

- The interface must be administratively up.
- The upstream channels from the Cisco uBR10-MC5X20 cable interface line card must be associated with the modular-cable interface downstream channels in a given cable MAC domain.
- The total bandwidth allocated for the interface must be greater than or equal to 1 percent.
- The modular host must be configured on the modular cable controller for the corresponding SPA.
- If the modular-cable interface is a primary-capable channel, the DEPI remote ID must be configured for this channel. The UDP port number must not be configured in this case.



Note RF channels that are non-primary-capable and used in a wideband interface can use either a DEPI remote ID or a UDP port number and the line protocol and status of this interface is always down.

- The following parameters must be set for the RF channel:
 - RF channel frequency
 - MAC address of the next-hop interface or edge QAM device
 - IP address of the edge QAM device
 - UDP port number or DEPI remote ID for the QAM device that is used for the RF channel
 - The Gigabit Ethernet port of the SPA must be connected.

Preprovisioning of the Cisco Wideband SPA and a SIP

Preprovisioning is an optional configuration task for the Cisco Wideband SPA on a SIP. Preprovisioning on the Cisco uBR10012 router allows you to configure the SIP and Cisco Wideband SPA without their physical presence.

For information on preprovisioning the Cisco Wideband SPA and a SIP, see the [Optional Configuration Tasks](#) section.

Entering Controller Configuration Mode for the Cisco Wideband SPA

The Cisco Wideband SPA is represented in the Cisco IOS software as a controller. You enable controller configuration by preprovisioning the Cisco Wideband SPA using the **card** command or by physically inserting the Cisco Wideband SPA in the SIP.

Following is an example of the **card** command:

```
card 1/0 2jacket-1
card 1/0/0 24rfchannel-spa-1
```



Note This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

To enter controller configuration mode for the Cisco Wideband SPA, use the **controller modular-cable** command. Most Cisco Wideband SPA configuration tasks are performed in controller configuration mode.

Setting General Configuration Values for the Cisco Wideband SPA

Some Cisco Wideband SPA configuration items affect all RF channels on the SPA. These general Cisco Wideband SPA configuration values are set in controller configuration mode as follows:



Note In Cisco IOS Release 12.3(21)BC, annex and modulation parameters were set globally for each SPA. For Cisco IOS Releases 12.3(23)BC and 12.2(33)SCB, annex and modulation parameters are set for each RF channel.

- Use the **ip-address** command to set the IP address of the Cisco Wideband SPA FPGA. The IP address that is assigned to the Cisco Wideband SPA controller with the **ip-address** command is used as the source IP address for packets that are transmitted by the SPA.
- Use the **modular-host** command to specify the modular-host Cisco uBR10-MC5X20 line card that will be used for DOCSIS 3.0 Downstream Channel Bonding. The Cisco Wideband SPA itself does not support DOCSIS 3.0 Downstream Channel Bonding operations.



Note A maximum of three SPA controllers can be hosted on a single cable interface line card. For more information on the **modular-host** command, see the [Cisco IOS CMTS Cable Command Reference](#).

To set these general Cisco Wideband SPA configuration values, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.

	Command or Action	Purpose
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—controller modular-cable slot/subslot/bay • Cisco IOS Release 12.2(33)SCB—controller modular-cable slot/bay/port Example: Router(config)# controller modular-cable 1/0/1	Enters controller configuration mode to configure the SPA controller. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	ip-address ip-address Example: Router(config-controller)# ip-address 192.168.200.31	Sets the IP address of the Cisco Wideband SPA FPGA.
Step 5	modular-host subslot slot/subslot Example: Router(config-controller)# modular-host subslot 7/0	Specifies the modular-host line card that will be used for DOCSIS 3.0 Downstream Channel Bonding. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the line card resides. The valid values are 5 to 8. • <i>subslot</i>—Specifies the subslot for the line card. The valid values are 0 and 1.
Step 6	end Example: Router# end	Returns to privileged EXEC mode.

What to Do Next

Troubleshooting Tips

**Note**

Any line card in the chassis can be used as a guardian card, even if the line card is not configured. Do not remove the guardian card from the chassis when the active line card's cable interfaces is configured.

It is recommended to use the line card that is associated with the SPA where its cable interfaces are configured

The following example shows the line card can be used as a guardian card:

```
Router# interface Cable6/0/0
Router# downstream Modular-Cable 1/0/0 rf-channel 6-13
Router# controller Modular-Cable 1/0/0
Router(config-controller)# ip-address 192.168.200.31
Router(config-controller)# modular-host subslot 5/0
```

The following example shows the recommended configuration:

```
Router# interface Cable6/0/0
Router# downstream Modular-Cable 1/0/0 rf-channel 6-13
Router# controller Modular-Cable 1/0/0
Router(config-controller)# ip-address 192.168.200.31
Router(config-controller)# modular-host subslot 6/0
```

Configuring RF Channels for Narrowband

This section describes how to configure the RF channels for narrowband capability. Use the RF channel commands to configure the RF channel characteristics . For each RF channel, you must specify these configuration items:

- Narrowband channel that is associated with the RF channel
- Frequency
- Annex
- Modulation
- Interleave-depth
- IP address
- MAC address
- UDP port or DEPI remote ID

In addition to these required configuration items, each RF channel can have a description, though it is optional.

**Note**

Be certain to verify that the RF channel values set with `rf-channel` match the values configured on the edge QAM device. Frequency, IP address, MAC address, and UDP port and DEPI remote ID must match what is configured on the edge QAM device. If any of these values are incorrect, the Cisco Wideband SPA will not successfully communicate with the edge QAM device.

By default, Cisco IOS software assigns a unique downstream channel ID to the RF channel. Use the **rf-channel cable downstream channel-id** command if you need to change the assigned RF channel ID.

**Note**

Each RF channel on the Cisco Wideband SPA can be mapped to a specific QAM port on an edge QAM device. Traffic from different Cisco Wideband SPAs cannot be mixed on the same QAM port.

To configure an RF channel for narrowband, complete the following steps:

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example: Router> enable</p>	<p>Enables privileged EXEC mode.</p> <p>Enter your password if prompted.</p>
Step 2	<p>configure terminal</p> <p>Example: Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p>Use the appropriate command based on the Cisco IOS Release in use:</p> <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—controller modular-cable slot/subslot/bay • Cisco IOS Release 12.2(33)SCB—controller modular-cable slot/bay/port <p>Example: Router(config)# controller modular-cable 1/0/1</p>	<p>Enters controller configuration mode to configure the SPA controller.</p> <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	<p>rf-channel rf-port frequency freq [annex {A B} modulation {64 256} [interleave-depth {8 12 16 32 64 128}]]</p> <p>Example: Router(config-controller)# rf-channel 1 frequency 699000000</p>	<p>Sets the frequency, annex, modulation, and interleave-depth of the RF channel.</p> <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. Allowed range is 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>freq</i>—Sets the center frequency for the RF channel. Allowed range is 55000000 to 1050000000 MHz. • annex {A B} (Optional)—Specifies the MPEG framing format for each RF channel: <ul style="list-style-type: none"> ◦ A—Annex A. The downstream is compatible with the European MPEG framing format specified in ITU-TJ.83 Annex A.

	Command or Action	Purpose
		<ul style="list-style-type: none"> ◦ B—Annex B. The downstream is compatible with the North American MPEG framing format specified in ITU-TJ.83 Annex B. • modulation {64 256}(Optional)—Specifies the modulation rate for each RF channel: • interleave-depth {8 12 16 32 64 128}(Optional)—Indicates the downstream interleave depth. The default value is 32.
Step 5	<p>rf-channel <i>rf-port</i> ip-address <i>ip-address</i> mac-address <i>mac-address</i> {udp-port <i>portnum</i> depi-remote-id <i>session-id</i>}</p> <p>Example: Router(config-controller)# rf-channel 1 ip-address 192.168.200.30 mac-address 0011.920e.a9ff udp-port 49152</p>	<p>Specifies the following:</p> <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. Allowed range is 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>ip-address</i>—Specifies the IP address of the Gigabit Ethernet interface on the edge QAM device for this RF channel. • <i>mac-address</i>—Specifies the MAC address of the next-hop interface or of the edge QAM device for this RF channel. • <i>portnum</i>—(Optional) Specifies the UDP port number for the edge QAM device that will be used for this RF channel. Allowed range is 0 to 65535. • <i>session-id</i>—(Optional) Specifies the DEPI remote session ID to be used for encapsulation of frames in DOCSIS-MPT mode. <p>Note Primary-capable modular cable interfaces must use the DEPI remote ID. Non-primary-capable modular cable interfaces can use either a UDP port number or a DEPI remote ID.</p>
Step 6	<p>rf-channel <i>rf-port</i> description <i>description</i></p> <p>Example: Router(config-controller)# rf-channel 1 description Used for WB channel 0</p>	<p>Specifies the following:</p> <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. The valid range is from 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>description</i>—(Optional) Specifies a description for the RF channel.
Step 7	<p>rf-channel <i>rf-port</i> cable downstream channel-id <i>channel-id</i></p> <p>Example: Router(config-controller)# rf-channel 1 cable downstream channel-id 121</p>	<p>(Optional) Assigns a downstream channel ID to the RF channel. Cisco IOS software automatically assigns a unique downstream channel ID to the RF channel.</p>

	Command or Action	Purpose
Step 8	exit Example: Router# exit	Returns to global configuration mode.
Step 9	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface modular-cable slot/subslot/bay:nb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:nb-channel Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a narrowband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 10	cable rf-bandwidth-percent percent_value Example: Router(config-if)# cable rf-bandwidth-percent 50	Specifies the bandwidth percent allocated for this interface.
Step 11	exit Example: Router# exit	Returns to global configuration mode.

RF Channel Bandwidth Allocation for Modular-Cable and Wideband-Cable Interfaces

During RF channel configuration, the bandwidth from each RF channel is statically partitioned between the modular-cable and wideband-cable interfaces.

Bandwidth Allocation for Modular-Cable Interfaces

Use the **cable rf-bandwidth-percent** command to allocate RF channel bandwidth to a modular-cable interface. If the RF channel is primary-capable, the total allocated percentage of the RF channel, including both, modular-cable interface and the wideband interfaces must not exceed 96 percent. The extra 4 percent of RF channel bandwidth is reserved for MAP and other MAC management messages traffic using this RF channel as its primary-capable downstream channel.

The default bandwidth percentage for a modular cable interface is set to zero. If the bandwidth is not allocated, then the RF channel cannot be used as a primary-capable channel and 100 percent of this RF channel bandwidth can be used for wideband interfaces.

Bandwidth Allocation for Wideband-Cable Interfaces

The total bandwidth allocation can be 100 percent if the RF channel is configured only for wideband interfaces.

The table below is an example to show that a single RF channel can be associated with multiple wideband channels as long as the total allocated bandwidth for the RF channel does not exceed 100 percent.

Table 9: Bandwidth Allocation for a Non-Primary-Capable RF Channel

RF Channel	Wideband Channel	Bandwidth Allocated
10	0	30 percent
10	1	30 percent
10	2	40 percent
Total Bandwidth Percent: 100 percent		

The table below is an example to show that a primary-capable RF channel can be associated with multiple narrowband and multiple wideband channels as long as the total allocated bandwidth for the RF channel does not exceed 96 percent. The extra 4 percent is used for MAP and MAC management traffic.

Table 10: Bandwidth Allocation for a Primary-Capable RF Channel

Narrowband Channel 10	Wideband Channel 0	Wideband Channel 1	Wideband Channel 2	Total Bandwidth Percent
35 percent	20 percent	25 percent	16 percent (4 percent is reserved for MMM)	96 percent

Configuring Modular-Cable Interfaces

Use the **interface modular-cable** command to enter the interface configuration mode for narrowband channels. From this mode, you can allocate bandwidth percentage to the narrowband interface.

Use the **cable rf-bandwidth-percent** command to assign bandwidth percentage to a modular-cable interface.

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable	Enables privileged EXEC mode.

	Command or Action	Purpose
	Example: Router> enable	Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface modular-cable slot/subslot/bay:nb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:nb-channel Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a narrowband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	cable rf-bandwidth-percent percent_value Example: Router(config-if)# cable rf-bandwidth-percent 50	Specifies the bandwidth percent allocated for this interface.
Step 5	exit Example: Router# exit	Returns to global configuration mode.

Configuring Fiber Nodes for Narrowband

Fiber node configuration is used mainly to configure a wideband channel. Configuring fiber nodes for narrowband is optional. Use the **cable fiber-node** command to configure the fiber nodes.

Configuring RF Channels for Wideband

A wideband channel is a logical grouping of one or more physical RF channels. By aggregating or “channel bonding” multiple RF channels, the wideband channel is capable of greater bandwidth capacity for downstream traffic than a single RF channel.

The number of RF channels that can be aggregated into a wideband channel is determined by the capability of the wideband cable modem.

- The Linksys WCM300-NA (WCM300-EURO for EuroDOCSIS and WCM300-JP for Japanese DOCSIS) wideband cable modem can receive a wideband channel consisting of up to eight downstream RF channels at 6 MHz per channel, or up to six downstream RF channels at 8 MHz per channel. The modem requires that the channels be received in a 50-MHz capture window.
- The Scientific Atlanta DPC2505 (EPC2505 for EuroDOCSIS) wideband cable modem can receive a wideband channel consisting of up to three downstream RF channels at either 6 MHz per channel or 8 MHz per channel.

- 1 Use the RF channel commands to configure RF channel characteristics. See the [Configuring RF Channels for Narrowband](#) section for information on RF channel configuration.
- 2 Use the `cable rf-channel` command to associate an RF channel with a wideband channel.

Optionally, you can use the command to assign a percent of the RF channel's bandwidth to the wideband channel. You can allocate some or all of an RF channel's bandwidth to a wideband channel. As long as an RF channel's total allocated bandwidth does not exceed 100 percent, an RF channel can be associated with multiple wideband channels on the same Cisco Wideband SPA.

To configure an RF channel for wideband, complete the following steps:

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	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—controller modular-cable slot/subslot/bay • Cisco IOS Release 12.2(33)SCB—controller modular-cable slot/bay/port Example: Router (config)# controller modular-cable 1/0/1	Enters controller configuration mode to configure the SPA controller. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.

	Command or Action	Purpose
Step 4	<p>rf-channel <i>rf-port</i> frequency <i>freq</i> [annex {A B} modulation {64 256} [interleave-depth {8 12 16 32 64 128}]]</p> <p>Example: Router(config-controller)# rf-channel 1 frequency 699000000</p>	<p>Sets the frequency, annex, modulation, and interleave-depth of the RF channel.</p> <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. Allowed range is 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>freq</i>—Sets the center frequency for the RF channel. Allowed range is 55000000 to 1050000000 MHz. • annex {A B} (Optional)—Specifies the MPEG framing format for each RF channel: <ul style="list-style-type: none"> ◦ A—Annex A. The downstream is compatible with the European MPEG framing format specified in ITU-TJ.83 Annex A. ◦ B—Annex B. The downstream is compatible with the North American MPEG framing format specified in ITU-TJ.83 Annex B. • modulation {64 256} (Optional)—Specifies the modulation rate for each RF channel: • interleave-depth {8 12 16 32 64 128} (Optional)—Indicates the downstream interleave depth. The default value is 32.
Step 5	<p>rf-channel <i>rf-port</i> ip-address <i>ip-address</i> mac-address <i>mac-address</i> {udp-port <i>portnum</i> depi-remote-id <i>session-id</i>}</p> <p>Example: Router(config-controller)# rf-channel 1 ip-address 192.168.200.30 mac-address 0011.920e.a9ff udp-port 49152</p>	<p>Specifies the following:</p> <ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. Allowed range is 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>ip-address</i>—Specifies the IP address of the Gigabit Ethernet interface on the edge QAM device for this RF channel. • <i>mac-address</i>—Specifies the MAC address of the next-hop interface or of the edge QAM device for this RF channel. • <i>portnum</i>—(Optional) Specifies the UDP port number for the edge QAM device that will be used for this RF channel. Allowed range is 0 to 65535. • <i>session-id</i>—(Optional) Specifies the DEPI remote session ID to be used for encapsulation of frames in DOCSIS-MPT mode. <p>Note Primary-capable modular cable interfaces must use the DEPI remote ID. Non-primary-capable modular cable interfaces can use either a UDP port number or a DEPI remote ID.</p>
Step 6	<p>rf-channel <i>rf-port</i> description <i>description</i></p>	<p>Specifies the following:</p>

	Command or Action	Purpose
	<p>Example: Router(config-controller)# rf-channel 1 description Used for WB channel 0</p>	<ul style="list-style-type: none"> • <i>rf-port</i>—Specifies the RF channel physical port on the Wideband SPA FPGA. The valid range is from 0 to 23. Valid values for <i>rf-port</i> depend on the configuration set with the annex modulation command. • <i>description</i>—(Optional) Specifies a description for the RF channel.
Step 7	<p>rf-channel <i>rf-port</i> cable downstream channel-id <i>channel-id</i></p> <p>Example: Router(config-controller)# rf-channel 1 cable downstream channel-id 121</p>	(Optional) Assigns a downstream channel ID to the RF channel. Cisco IOS software automatically assigns a unique downstream channel ID to the RF channel.
Step 8	<p>exit</p> <p>Example: Router# exit</p>	Returns to global configuration mode.
Step 9	<p>Use the appropriate command based on the Cisco IOS Release in use:</p> <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface modular-cable <i>slot/subslot/bay:nb-channel</i> • Cisco IOS Release 12.2(33)SCB—interface modular-cable <i>slot/bay/port:nb-channel</i> <p>Example: Router(config)# interface modular-cable 1/0/1:5</p>	<p>Enters interface configuration mode for a narrowband channel on the SPA.</p> <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 10	<p>cable rf-bandwidth-percent <i>percent_value</i></p> <p>Example: Router(config-if)# cable rf-bandwidth-percent 50</p>	Specifies the bandwidth percent allocated for this interface.
Step 11	<p>exit</p> <p>Example: Router# exit</p>	Returns to global configuration mode.

Configuring Wideband-Channel Cable Interfaces

Use the **interface wideband-cable** command to enter the interface configuration mode for wideband channel.

From this mode, you can specify bandwidth percent for each cable RF channel that is added to the wideband interface. Each wideband-cable interface is a representation of a bonding group and allows you to create up to 32 bonding group IDs for each SPA. The Cisco IOS software automatically assigns a bonding group ID to each wideband-channel cable interface by default.

- Use the **cable bonding-group-id** command to configure bonding group IDs for wideband-cable interfaces.
- Use the **cable bundle** command to add the modular-cable interface to the cable bundle.
- Use the **cable rf-channel bandwidth-percent** command to associate RF channels with a wideband channel and to assign a percent of the RF channel's bandwidth to the wideband channel.

To configure a wideband-cable interface, complete the following steps:

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	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface wideband-cable slot/subslot/bay:wb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:wb-channel Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a wideband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	cable bundle n Example: Router(config-if)# cable bundle 1	Adds the modular cable interface to the cable bundle.
Step 5	cable rf-channel n bandwidth-percent percent_value Example: Router(config-if)# cable rf-channel 0 bandwidth-percent 50	Adds the RF channel to this wideband interface and specifies the RF channel bandwidth allocated for this channel. Note If you do not specify a bandwidth percent value, 100 percent of the RF channel bandwidth is allocated to the RF channel.

	Command or Action	Purpose
Step 6	cable bonding-group-id <i>n</i> Example: Router(config-if)# cable bonding-group-id 1	Assigns a bonding group ID to this wideband cable interface.
Step 7	exit Example: Router# exit	Returns to global configuration mode.

Configuring a Virtual Bundle

To configure two wideband cable interfaces and a CGD host interface as members of a the same virtual bundle, complete the following steps:

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 bundle <i>n</i> Example: Router(config)# interface bundle 1	Enters interface configuration mode so that a virtual bundle can be defined.
Step 4	ip address <i>address mask</i> Example: Router(config-if)# ip address 172.25.1.1 255.255.255.0	Configures an IP address and subnet mask for the virtual bundle.
Step 5	ip pim sparse-mode Example: Router(config-if)# ip pim sparse-mode	(Optional) For multicast, enables sparse mode protocol-independent multicast (PIM) for the virtual bundle.

	Command or Action	Purpose
Step 6	cable helper-address <i>address</i> Example: Router(config-if)# cable helper-address 10.0.0.0	(Optional) For the virtual bundle, specifies an IP address for an external Dynamic Host Configuration Protocol (DHCP) server.
Step 7	exit Example: Router# exit	Returns to global configuration mode.
Step 8	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface wideband-cable slot/subslot/bay:wb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:wb-channel Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a wideband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 9	cable bundle <i>n</i> Example: Router(config-if)# cable bundle 1	Adds the modular cable interface to the cable bundle.
Step 10	cable rf-channel <i>n</i> bandwidth-percent <i>percent_value</i> Example: Router(config-if)# cable rf-channel 0 bandwidth-percent 50	Adds the RF channel to this wideband interface and specifies the RF channel bandwidth allocated for this channel. Note If you do not specify a bandwidth percent value, 100 percent of the RF channel bandwidth is allocated to the RF channel.
Step 11	cable bonding-group-id <i>n</i> Example: Router(config-if)# cable bonding-group-id 1	Assigns a bonding group ID to this wideband cable interface.
Step 12	exit Example: Router# exit	Returns to global configuration mode.
Step 13	interface cable <i>slot/subslot/port</i> Example: Router(config)# interface cable 6/0/1	Enters interface configuration mode for the Channel Grouping Domain host line card. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the chassis slot number of the cable interface line card.

	Command or Action	Purpose
		<ul style="list-style-type: none"> • <i>subslot</i>—(Cisco uBR10012 only) Specifies the secondary slot number of the cable interface line card. Valid subslots are 0 or 1. • <i>port</i>—Specifies the downstream port number. Valid values for these arguments are dependent on your CMTS router and cable interface line card. See the hardware documentation for your router chassis and cable interface line card for supported slot and port numbering.
Step 14	cable bundle <i>n</i> Example: Router(config-if)# cable bundle 1	Adds the modular cable interface to the cable bundle.
Step 15	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—downstream modular-cable slot/subslot/bay rf-channel rf channels [upstream grouplist] • Cisco IOS Release 12.2(33)SCB—downstream modular-cable slot/bay/port rf-channel rf channels [upstream grouplist] Example: Router(config-if)# downstream modular-cable 1/0/0 rf-channel 0 upstream 1	Specifies primary-capable channels from the SPA that are associated with the upstream channels from the host line card. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA. • rf-channel rf channels—Range of RF channel physical ports on the SPA FPGA. • upstream grouplist—Specifies the number of upstreams with the modular cable downstream channel.
Step 16	exit Example: Router# exit	Returns to global configuration mode.

Following is an example that shows the basic configuration steps used for configuring wideband channels on a fiber node and all associated primary downstream channels as virtual bundle members.

```

Router> enable
Router# configure terminal
Router(config)# interface bundle 1
Router(config-if)# ip address 172.25.1.1 255.255.255.0
Router(config-if)# ip pim sparse-mode
Router(config-if)# cable helper-address 10.0.0.0
Router(config-if)# exit
Router(config)# interface wideband-cable slot/subslot/bay:wb-channel

```

```

Router(config)# interface wideband-cable 1/0/0:12
Router(config)# cable bundle 1
Router(config-if)# cable rf-channel 0 bandwidth-percent 90
Router(config-if)# cable rf-channel 1 bandwidth-percent 50
Router(config-if)# cable rf-channel 2
Router(config-if)# cable bonding-group-id 36
Router(config-if)# exit
Router(config)#
Router(config)# interface wideband-cable 1/0/0:13
Router(config)# cable bundle 1
Router(config-if)# cable rf-channel 1 bandwidth-percent 50
Router(config-if)# cable rf-channel 2
Router(config-if)# cable rf-channel 3
Router(config-if)# cable bonding-group-id 36
Router(config-if)# exit
Router(config)# interface cable 6/0/1
Router(config-if)# cable bundle 1
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 0 upstream 1
Router(config-if)# exit
Router(config)#

```

What to Do Next

In a real deployment, additional commands may be used for virtual interface bundling. For detailed information on virtual interface bundling, see the [Cisco IOS CMTS Cable Software Configuration Guide, Release 12.2SC](#).

Configuring Fiber Nodes for Wideband

To configure a fiber node, complete the following steps:

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 <i>fiber-node-id</i> Example: Router(config)# cable fiber-node 1	Enters cable fiber-node configuration mode for the specified fiber node.
Step 4	downstream cable <i>slot/subslot/port</i> Example: Router(config-fiber-node)# downstream cable 6/0/0	(Optional) Assigns a primary downstream channel from the line card for the fiber node. If the primary downstream channel for this fiber node is assigned from a SPA downstream, then this command is not required. <ul style="list-style-type: none"> <i>slot</i>—Specifies the chassis slot number of the cable interface line card. <i>subslot</i>—(Cisco uBR10012 only) Specifies the secondary slot number of the cable interface line card. Valid subslots are 0 or 1.

	Command or Action	Purpose
		<ul style="list-style-type: none"> <i>port</i>—Specifies the downstream port number.
Step 5	<p>upstream cable <i>slot/subslot connector list-of-ports</i></p> <p>Example: Router(config-fiber-node) # upstream cable 6/0 connector 0-3</p>	<p>Specifies the upstream ports that are connected to the fiber node.</p> <ul style="list-style-type: none"> <i>slot/subslot</i>—The location of the cable interface line card containing the upstream port. <i>list-of-ports</i>—A range of physical port numbers on the cable interface line card. The <i>list-of-ports</i> can be one or more port numbers or a range of port numbers separated by a hyphen or combinations of both. The valid range is from 0 to 19.
Step 6	<p>Use the appropriate command based on the Cisco IOS Release in use:</p> <ul style="list-style-type: none"> Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—downstream modular-cable slot/subslot/bay rf-channel rf channels Cisco IOS Release 12.2(33)SCB—downstream modular-cable slot/bay/port rf-channel rf channels <p>Example: Router(config-fiber-node) # downstream modular-cable 1/0/0 rf-channel 0-1</p>	<p>Specifies indicates the RF channels that are available for wideband channels on the fiber node or channels that will be used as primary-capable channels.</p> <ul style="list-style-type: none"> <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). <i>port</i>—Specifies the interface number on the SPA. rf-channel rf channels—Range of RF channel physical ports on the SPA FPGA.
Step 7	<p>description <i>description</i></p> <p>Example: Router(config-fiber-node) # description Branch Office 105</p>	<p>(Optional) Specifies a comment providing information about the fiber node.</p>
Step 8	<p>exit</p> <p>Example: Router# exit</p>	<p>Returns to global configuration mode.</p>

Following example shows how to configure one fiber node so that it has all 24 RF channels from a Cisco Wideband SPA available for a wideband channel. In a real deployment, the number of RF channels that are used for a fiber node will vary depending on how many wideband channels are provisioned for the fiber node and how much bandwidth (number of RF channels) is required for the wideband channels.

```
Router> enable
Router# configure terminal
Router(config)# cable fiber-node 1
```

```

Router(config-fiber-node) # downstream cable 6/0/0
Router(config-fiber-node) # upstream cable 6/0 connector 0-3
Router(config-fiber-node) # downstream modular-cable 1/0/0 rf-channel 0-1
Router(config-fiber-node) # description Branch Office 105
Router(config-fiber-node) # exit
Router(config) #

```

Configuring Channel Grouping Domains

To configure channel group domains, do the following:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface cable slot/subslot/port Example: Router(config) # interface cable 6/0/1	Enters interface configuration mode for the Channel Grouping Domain host line card. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the chassis slot number of the cable interface line card. • <i>subslot</i>—(Cisco uBR10012 only) Specifies the secondary slot number of the cable interface line card. Valid subslots are 0 or 1. • <i>port</i>—Specifies the downstream port number. Valid values for these arguments are dependent on your CMTS router and cable interface line card. See the hardware documentation for your router chassis and cable interface line card for supported slot and port numbering.
Step 4	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—downstream modular-cable slot/subslot/bay rf-channel rf channels [upstream grouplist] • Cisco IOS Release 12.2(33)SCB—downstream modular-cable slot/bay/port rf-channel rf channels [upstream grouplist] 	Specifies primary-capable channels from the SPA that are associated with the upstream channels from the host line card. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA. • rf-channel rf channels—Range of RF channel physical ports on the SPA FPGA.

	Command or Action	Purpose
	<p>Example: Router(config-if)# downstream modular-cable 1/0/0 rf-channel 1 3 upstream 2-3</p>	<ul style="list-style-type: none"> • upstream grouplist—Specifies the number of upstreams with the modular cable downstream channel. <p>Note The Cisco IOS software automatically assigns a cable bundle to the modular cable interface when the downstream modular-cable rf-channel command is given in the MAC domain configuration.</p>
Step 5	<p>exit</p> <p>Example: Router# exit</p>	Returns to global configuration mode.

The example below shows how to associate downstream RF channels 0 and 1 from the SPA slot 1, subslot 0, and bay 0 with upstream channels 0 and 1 from the host line card and downstream RF channels 1 and 3 from the SPA slot 1, subslot 0, and bay 0 with upstream channels 2 and 3 from the host line card.

```
Router> enable
Router# configure terminal
Router(config)# interface cable 5/0/0
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 0-1 upstream 0-1
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 1 3 upstream 2-3
Router(config-if)# exit
Router(config)#
```

Configuring Primary Downstream Channel Selection in a Fiber Node

To configure a fiber node configured with a primary downstream from the cable interface line card as well as a primary downstream from the SPA, do the following:

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example: Router> enable</p>	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	<p>configure terminal</p> <p>Example: Router# configure terminal</p>	Enters global configuration mode.

	Command or Action	Purpose
Step 3	<p>cable fiber-node <i>fiber-node-id</i></p> <p>Example: Router(config)# cable fiber-node 1</p>	Enters cable fiber-node configuration mode for the specified fiber node.
Step 4	<p>downstream cable <i>slot/subslot/port</i></p> <p>Example: Router(config-fiber-node)# downstream cable 6/0/0</p>	<p>(Optional) Assigns a primary downstream channel from the line card for the fiber node. If the primary downstream channel for this fiber node is assigned from a SPA downstream, then this command is not required.</p> <ul style="list-style-type: none"> • <i>slot</i>—Specifies the chassis slot number of the cable interface line card. • <i>subslot</i>—(Cisco uBR10012 only) Specifies the secondary slot number of the cable interface line card. Valid subslots are 0 or 1. • <i>port</i>—Specifies the downstream port number.
Step 5	<p>Use the appropriate command based on the Cisco IOS Release in use:</p> <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—downstream modular-cable <i>slot/subslot/bay rf-channel rf channels</i> • Cisco IOS Release 12.2(33)SCB—downstream modular-cable <i>slot/bay/port rf-channel rf channels</i> <p>Example: Router(config-fiber-node)# downstream modular-cable 1/0/0 rf-channel 0-1</p>	<p>Specifies indicates the RF channels that are available for wideband channels on the fiber node or channels that will be used as primary-capable channels.</p> <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA. • rf-channel <i>rf channels</i>—Range of RF channel physical ports on the SPA FPGA.
Step 6	<p>upstream cable <i>slot/subslot connector list-of-ports</i></p> <p>Example: Router(config-fiber-node)# upstream cable 6/0 connector 0-3</p>	<p>Specifies the upstream ports that are connected to the fiber node.</p> <ul style="list-style-type: none"> • <i>slot/subslot</i>—The location of the cable interface line card containing the upstream port. • <i>list-of-ports</i>—A range of physical port numbers on the cable interface line card. The <i>list-of-ports</i> can be one or more port numbers or a range of port numbers separated by a hyphen or combinations of both. The valid range is from 0 to 19.
Step 7	<p>exit</p> <p>Example: Router# exit</p>	Returns to global configuration mode.


```

Router> enable
Router# configure terminal
Router(config)# cable fiber-node 1
Router(config-fiber-node)# downstream cable 6/0/0
Router(config-fiber-node)# downstream modular-cable 1/0/0 rf-channel 0-3
Router(config-fiber-node)# downstream cable 6/0/1
Router(config-fiber-node)# downstream modular-cable 1/0/0 rf-channel 4-7
Router(config-fiber-node)# upstream cable 6/0 connector 0-7
Router(config-fiber-node)# exit
Router(config)#

```

Enabling Auto-Reset Mode on the CMTS

Use the **cable wideband auto-reset** command to enable wideband auto-reset mode on the CMTS. If wideband auto-reset mode is enabled, wideband cable modems registered on a cable interface as traditional DOCSIS modems are auto-reset when the cable interface becomes wideband-capable. When a wideband cable modem auto-resets, it deregisters on the CMTS as a traditional DOCSIS cable modem and immediately attempts to re-register as a wideband cable modem.

For a fully configured wideband CMTS, wideband cable modems can register as traditional DOCSIS modems for a variety of reasons, such as cable interface line card boot order or line card online insertion and removal (OIR). Rather than defer wideband cable modem registration, wideband cable modems are permitted to register as traditional DOCSIS modems. When and if a cable interface becomes wideband-capable, wideband cable modems that have registered as traditional DOCSIS modems are reset for CMTS routers with auto-reset mode enabled. These modems are only reset when the interface first becomes wideband-capable and are not reset again if they subsequently fail to register as wideband cable modems.

A wideband deployment typically enables wideband auto-reset mode. To enable wideband auto-reset mode, complete the following steps:

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 wideband auto-reset Example: Router(config)# cable wideband auto-reset	Enables wideband auto-reset mode on the CMTS.

	Command or Action	Purpose
Step 4	end Example: Router# end	Returns to privileged EXEC mode.

Configuring Primary and Secondary Bonded Channels

Configuration of primary and secondary bonded (wideband) channels with the **cable bonding-group-id** command applies only to channels that will be received by the Linksys WCM300-NA, WCM300-EURO and WCM300-JP cable modems.



Note

The **cable bonding-group-id** command is not used for wideband channels that will be received by the Scientific Atlanta DPC2505 (EPC2505 for EuroDOCSIS) wideband cable modem.

For wideband channels used by the Linksys WCM300 wideband cable modem, a wideband channel is configured either as a primary bonded channel or a secondary bonded channel. The **cable bonding-group-id** command defines whether a wideband channel is a primary bonded channel or secondary bonded channel.

- A primary bonding group is a primary bonded channel. When the **cable bonding-group-id** command is issued, the absence of the **secondary** keyword indicates a primary bonding group. For example: cable bonding-group-id 105
- A secondary bonding group is a secondary bonded channel. When the **cable bonding-group-id** command is issued, the use of the **secondary** keyword indicates a secondary bonding group. For example: cable bonding-group-id 105 secondary

The primary bonded channel is the wideband channel that a Linksys WCM300 cable modem first successfully registers on and is the channel on which it receives its unicast data. In addition to joining a primary bonded channel, a Linksys WCM300 cable modem may join up to two secondary bonded channels simultaneously in order to receive multicast data streams. The wideband cable modem selects secondary bonded channels to acquire using type, length, value (TLV) encodings from the DOCSIS configuration file.

If a wideband channel is specified as a primary or secondary bonded channel in the DOCSIS configuration file, the channel must be identically specified as a primary or secondary bonded channel in the CMTS active, running configuration file.

- If a wideband channel is configured to be a primary bonded channel or by default is a primary bonded channel, the wideband cable modem will not register using it as one of its secondary bonded channels.
- If a wideband channel is configured to be a secondary bonded channel, the wideband cable modem will not register using it as its primary bonded channel.

For detailed information on how the Linksys WCM300 wideband cable modem selects primary and secondary bonded channels, see the [Cisco DOCSIS 3.0 Downstream Solution Design and Implementation Guide](#).

**Tip**

When a wideband channel is defined on the Cisco Wideband SPA, Cisco IOS software configures the wideband channel as a primary bonding group (primary bonded channel) and assigns a default ID to the bonding group. If a wideband channel is to be used as a secondary bonded channel, use the **cable bonding-group-id** command with the **secondary** keyword to specify that the channel is a secondary bonded channel.

To specify that a wideband channel is a primary or secondary bonded channel, complete the following steps:

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	Use the appropriate command based on the Cisco IOS Release in use: <ul style="list-style-type: none"> • Cisco IOS Releases 12.3(23)BC and 12.2(33)SCA—interface wideband-cable slot/subslot/bay:wb-channel • Cisco IOS Release 12.2(33)SCB—interface modular-cable slot/bay/port:wb-channel Example: Router(config)# interface modular-cable 1/0/1:5	Enters interface configuration mode for a wideband channel on the SPA. <ul style="list-style-type: none"> • <i>slot</i>—Specifies the slot where the SIP resides. On the Cisco uBR10012 router, slots 1 and 3 are used for a SIP. • <i>subslot</i>—Specifies the subslot where the Cisco Wideband SIP resides (Cisco IOS Releases 12.2(33)SCA and 12.3BC). On the Cisco uBR10012 router, subslot 0 is always specified. • <i>bay</i>—Specifies the SIP subslot where a SPA resides. Valid values are 0 (upper bay) and 1 (lower bay). • <i>port</i>—Specifies the interface number on the SPA.
Step 4	cable bonding-group-id id-num [secondary] Example: Router(config-if)# cable bonding-group-id 105	Specifies a bonding-group ID and whether the wideband channel is a primary bonding group or secondary bonding group. If you omit the secondary keyword, the group is a primary bonding group.
Step 5	end Example: Router# end	Returns to privileged EXEC mode.

Selecting Primary Downstream Channels by Narrowband and Wideband Cable Modems

Each primary downstream channel from the SPA can be configured to carry narrowband as well as wideband traffic. Each SPA RF channel can be shared by the associated modular-cable interface as well as the wideband interfaces. Depending on the type of wideband-capable modems used, this allows support for bonding of two to eight RF channels from the same SPA to deliver higher-speed throughput data. This section describes how a modem selects the primary downstream channel that is used for MAC management traffic.

Primary Downstream Channel Selection for Wideband Cable Modems

The wideband-capable cable modems or modems that have bonded services are forced to register on the primary-capable channel that is part of a wideband channel's set of RF channels (downstream bonding group) using the **cable service attribute ds-bonded downstream-type bonding-enabled [enforce]** command. This command forces a downstream bonding-capable modem to initialize on a bonded primary-capable downstream channel.

**Note**

Enabling primary channel selection for wideband cable modems will not affect existing modems in the system.

Primary Downstream Channel Selection for Narrowband Modems

Primary downstream channel selection for narrowband modems provides the flexibility to restrict narrowband modems on specific types of downstream channels.

The primary downstream channel selection for narrowband modems can be done in one of two ways:

- Potential non-bonding-capable modems that access the CMTS with INIT-RNG-REQ at initialization can be redirected to a specified downstream frequency using the **cable service attribute non-ds-bonded legacy-ranging downstream-type frequency** command.
- The non-bonding-capable modems can be forced to register only on DOCSIS 1.0 /2.0 (non-bonded) downstream channel on the CMTS using the **cable service attribute non-ds-bonded downstream-type bonding-disabled** command.

Both these options can be configured simultaneously. If the cable modem is a narrowband modem and accesses the CMTS with legacy initial ranging, then the option of registering the modem based on a specific downstream channel frequency will override the option where the modem is allowed to register only on narrowband channels.

**Note**

Enabling primary downstream channel selection for wideband modems will not affect existing modems in the system.

**Note**

If the **frequency** keyword option is used and if the frequency is modified, then the new frequency setting will only impact new modems trying to initialize after the frequency is modified. To enforce the downstream channel selection policy on existing modems, each modem has to be manually reset either globally or at the individual primary downstream channel level using the **clear cable modem** command.

Primary Downstream Channel Selection for Voice-Enabled Services

By default, all primary-capable narrowband downstream channels on the SPA and on the cable interface line card are voice-enabled.

To restrict voice services only to downstream channels on the cable interface line card, use the **cable service attribute voice-enabled downstream-type HA-capable** command.

To provide higher system availability for voice services, the voice-enabled services can be restricted only to downstreams from the cable interface line card by configuring only the cable interface line card downstream channels as voice-capable. The CMTS attempts to register or move voice modems to the hosting cable interface line card downstream channel in the same load balancing group.

For more information on primary downstream channel selection, see the [Cisco DOCSIS 3.0 Downstream Solution Design and Implementation Guide](#).

Cisco Wideband SPA Configuration Examples

Controller Configuration Example

The following example shows the configuration for the controller of the Cisco Wideband SPA located in slot 1, subslot 0, bay 0. Only RF channels 0 to 17 have been configured and associated with wideband channels.

**Note**

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```

controller Modular-Cable 1/0/0
annex B modulation 256qam 0 23
modular-host subslot 5/0
rf-channel 0 cable downstream channel-id 24
rf-channel 0 frequency 699000000
rf-channel 0 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49192
rf-channel 1 cable downstream channel-id 25
rf-channel 1 frequency 705000000
rf-channel 1 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49193
rf-channel 2 cable downstream channel-id 26
rf-channel 2 frequency 711000000
rf-channel 2 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49194
rf-channel 3 cable downstream channel-id 27
rf-channel 3 frequency 717000000
rf-channel 3 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49195
rf-channel 4 cable downstream channel-id 28
rf-channel 4 frequency 723000000
rf-channel 4 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49196
rf-channel 5 cable downstream channel-id 29
rf-channel 5 frequency 729000000
rf-channel 5 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49197
rf-channel 6 cable downstream channel-id 30
rf-channel 6 frequency 735000000
rf-channel 6 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49198

```

```

rf-channel 7 cable downstream channel-id 31
rf-channel 7 frequency 741000000
rf-channel 7 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49199
rf-channel 8 cable downstream channel-id 32
rf-channel 8 frequency 747000000
rf-channel 8 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49200
rf-channel 9 cable downstream channel-id 33
rf-channel 9 frequency 753000000
rf-channel 9 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49201
rf-channel 10 cable downstream channel-id 34
rf-channel 10 frequency 759000000
rf-channel 10 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49202
rf-channel 11 cable downstream channel-id 35
rf-channel 11 frequency 765000000
rf-channel 11 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49203
rf-channel 12 cable downstream channel-id 36
rf-channel 12 frequency 771000000
rf-channel 12 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49204
rf-channel 13 cable downstream channel-id 37
rf-channel 13 frequency 777000000
rf-channel 13 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49205
rf-channel 14 cable downstream channel-id 38
rf-channel 14 frequency 783000000
rf-channel 14 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49206
rf-channel 15 cable downstream channel-id 39
rf-channel 15 frequency 789000000
rf-channel 15 ip-address 10.30.4.110 mac-address 0090.f001.06ec udp-port 49207
rf-channel 16 cable downstream channel-id 40
rf-channel 16 frequency 795000000
rf-channel 16 ip-address 10.30.4.100 mac-address 0090.f00b.0037 udp-port 49172
rf-channel 17 cable downstream channel-id 41
rf-channel 17 frequency 801000000
rf-channel 17 ip-address 10.30.4.100 mac-address 0090.f00b.0037 udp-port 49173
rf-channel 18 cable downstream channel-id 42
rf-channel 19 cable downstream channel-id 43
rf-channel 20 cable downstream channel-id 44
rf-channel 21 cable downstream channel-id 45
rf-channel 22 cable downstream channel-id 46
rf-channel 23 cable downstream channel-id 47

```

Wideband Channel Configuration Example

The following example shows how a wideband channel is configured. In this example, wideband channel Wideband-Cable1/0/0:0 is a member of virtual bundle interface 1.



Note This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.



Note The assignment of a bonding group ID is only needed for the Linksys WCM300 cable modem.

```

interface Wideband-Cable1/0/0:0
no ip address
load-interval 30
cable bundle 1
cable bonding-group-id 24
cable rf-channel 0
cable rf-channel 1

```

Virtual Bundle Configuration Example

The wideband channel and its associated primary channels on the fiber node must belong to the same virtual bundle interface. The following example shows how virtual bundle interface 1 is configured.

```
interface Bundle1
 ip address 10.11.68.200 255.255.0.0
 ip pim sparse-mode
 cable match address 102 downstream Wideband-Cable1/0/0:1 bpi-enable
 cable arp filter request-send 3 2
 cable arp filter reply-accept 3 2
```

Cable Fiber Node Configuration Example

The following example shows how cable fiber node 1 is configured.

```
cable fiber-node 1
 downstream Cable5/0/1
 downstream Modular-Cable 1/0/0 rf-channel 0 - 3
 upstream cable 5/0 connector 4
 upstream cable 5/0 connector 5
```

Channel Grouping Domain Configuration Example

The following example shows how the primary downstream channel located at slot/subslot/port 5/0/1 is configured. In this example, the primary downstream channel is a member of virtual bundle interface (cable bundle) 1 (as are the wideband channels on the fiber node, such as the wideband channel Wideband-Cable1/0/0:0).



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```
interface Cable5/0/1
 no ip address
 load-interval 30
 downstream Modular-Cable 1/0/0 rf-channel 0 - 3 upstream 0-2
 no cable packet-cache
 cable bundle 1
 cable downstream channel-id 120
 cable downstream annex B
 cable downstream modulation 256qam
 cable downstream interleave-depth 32
 cable downstream frequency 561000000
 no cable downstream rf-shutdown
 cable downstream rf-power 50
 cable upstream max-ports 4
 cable upstream 0 connector 4
 cable upstream 0 frequency 11400000
 cable upstream 0 docsis-mode tdma
 cable upstream 0 channel-width 1600000 1600000
 cable upstream 0 minislots-size 4
 cable upstream 0 power-level 0
 cable upstream 0 range-backoff 3 6
 cable upstream 0 modulation-profile 21
 no cable upstream 0 shutdown
 cable upstream 1 connector 5
 cable upstream 1 frequency 13000000
 cable upstream 1 docsis-mode tdma
 cable upstream 1 channel-width 1600000 1600000
 cable upstream 1 minislots-size 4
 cable upstream 1 power-level 0
 cable upstream 1 range-backoff 3 6
 cable upstream 1 modulation-profile 21
 no cable upstream 1 shutdown
```

```

cable upstream 2 connector 6
cable upstream 2 frequency 14600000
cable upstream 2 docsis-mode tdma
cable upstream 2 channel-width 1600000 1600000
cable upstream 2 minislot-size 4
cable upstream 2 power-level 0
cable upstream 2 range-backoff 3 6
cable upstream 2 modulation-profile 21
no cable upstream 2 shutdown
cable upstream 3 connector 7
cable upstream 3 frequency 16200000
cable upstream 3 docsis-mode tdma
cable upstream 3 channel-width 1600000 1600000
cable upstream 3 minislot-size 4
cable upstream 3 power-level 0
cable upstream 3 range-backoff 3 6
cable upstream 3 modulation-profile 21
no cable upstream 3 shutdown

```

Modular Cable Interface Configuration Example

The following example shows how a modular cable interface is configured. In this example, the modular cable interface slot/subslot/bay:narrowband channel 1/0/0:2 is configured. The cable rf-bandwidth-percent command specifies that 40 percent of the bandwidth is reserved for this interface.



Note This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```

interface Modular-Cable 1/0/0:2
no ip address
cable bundle 1
cable rf-bandwidth-percent 40

```

Wideband Cable Interface Configuration Examples

The example below shows a three-channel wideband cable interface using Cisco uBR10-MC5X20 local downstream as the primary downstream. In this example, cable rf-channel 2, cable rf-channel 3, and cable rf-channel 4 are added to the wideband cable interface slot/subslot/bay: wideband channel 1/0/0:0. This wideband interface is capable of 3-channel bonding as well a 2-channel bonding.



Note The following examples show the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```

interface Wideband-Cable 1/0/0:0
no ip address
load-interval 30
cable bundle 1
cable bonding-group-id 25
cable rf-channel 2 bandwidth-percent 20
cable rf-channel 3 bandwidth-percent 30
cable rf-channel 4

```

The example below shows the **downstream cable** command used in the fiber node configuration assigning the Cisco uBR10-MC5X20 downstream as the primary-capable downstream channel.

```

Router# configure terminal
Router(config)# cable fiber-node 5
Router(config-fiber-node)# downstream cable 6/0/0
downstream modular-cable 1/0/0 rf-channel 2
upstream cable 5/0 connector 0

```


The example below shows a wideband interface with a SPA RF channel 0 as a primary-capable channel. This interface is capable of 3-channel bonding.

```
Router# configure terminal
Router (config)# interface cable 5/1/0
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 0 upstream 0-1 4-5
interface Wideband-Cable 1/0/0:1
no ip address
load-interval 30
cable bundle 1
cable bonding-group-id 25
cable rf-channel 0
cable rf-channel 1
cable rf-channel 2
```

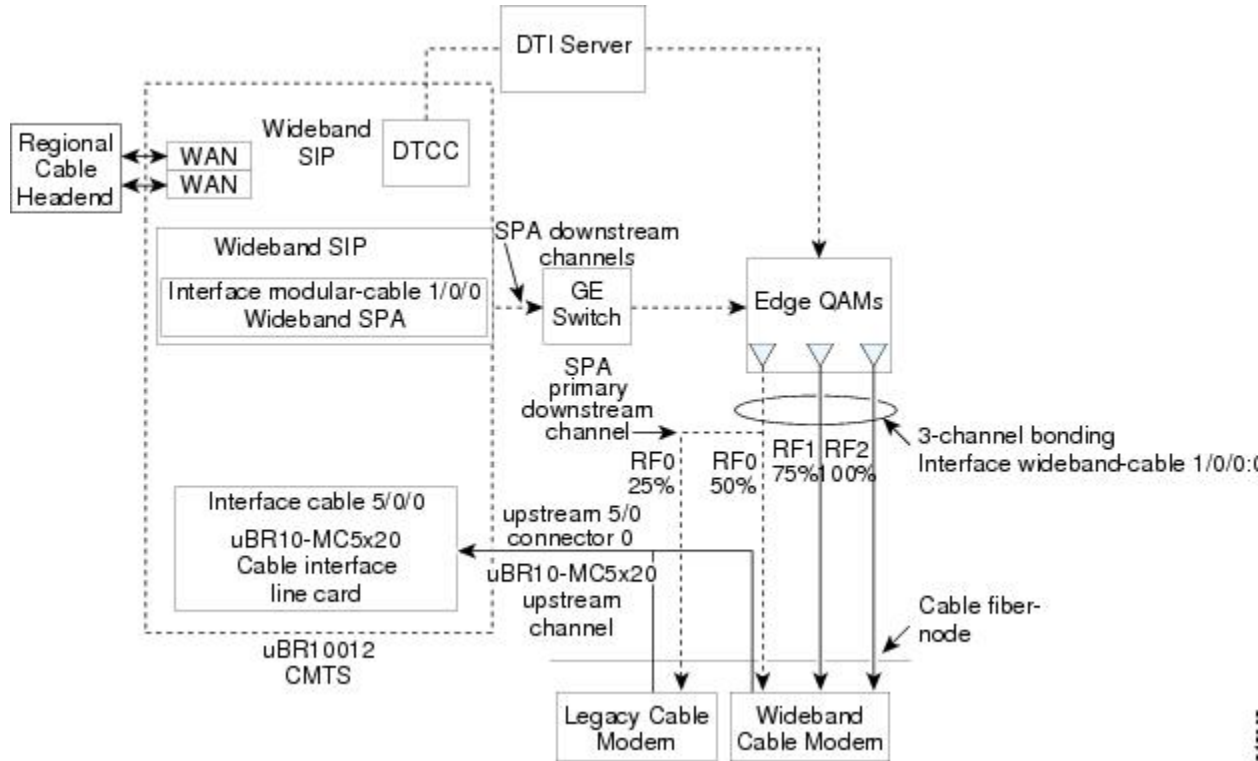
The example below shows a modular-cable interface capable of registering narrowband modems on a SPA RF channel.

```
Router# configure terminal
Router (config)# interface cable 5/1/0
Router(config-if)# downstream modular-cable 1/0/0 rf-channel 2 upstream 0-1 4-5

interface Modular-Cable 1/0/0:2
no ip address
cable bundle 1
cable rf-bandwidth-percent 40
```

Sample Wideband and Modular-Cable Interface Configuration

Figure 2: Sample Wideband and Modular-Cable Interface Configuration



Wideband Cable Interface Configuration

Channel Bonding: Three RF channels, RF0, RF1 and RF2 from the SPA residing in slot 1, subslot 0, and bay 0 are bonded to form the wideband cable interface 1/0/0:0.

- 50 percent of the total bandwidth of RF channel 0 is reserved for this wideband interface.
- 75 percent of the total bandwidth of RF channel 1 is reserved for this wideband interface.
- 100 percent of the bandwidth of RF channel 2 is reserved for this wideband interface.

Primary Downstream Channel: RF channel 0, which is associated with upstream 0, connector 0 from the Cisco uBR10-MC5X20 line card, serves as the primary downstream channel that is used for SYNCs, MAPs, and MAC management traffic.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

The wideband interface is configured as follows:

```
Router(config)# interface wideband-cable 1/0/0:0
Router(config-if)# cable bundle 1
Router(config-if)# cable rf-channel 0 bandwidth-percent 50
Router(config-if)# cable rf-channel 1 bandwidth-percent 75
Router(config-if)# cable rf-channel 2
Router(config-if)# cable bonding-group-id 1
Router(config-if)# exit
```

Modular-Cable Interface Configuration

RF channel 0, which is the narrowband channel, is associated with upstream 0, connector 0 from the Cisco uBR10-MC5X20 line card.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

The modular-cable interface is configured as follows:

```
Router(config)# interface modular-cable 1/0/0:0
Router(config-if)# cable rf-bandwidth-percent 50
Router(config-if)# exit
```



Troubleshooting the Cisco Wideband SPA

- [Interpreting Console Error Messages](#), page 85
- [Using show Commands to Troubleshoot the SPA](#), page 85
- [Troubleshooting SPA-to-EQAM Communication Problems](#), page 86
- [Verifying the Cisco Wideband SPA Configuration](#), page 86
- [Verifying RF Channel Configuration](#), page 88
- [Verifying Fiber Node Configuration](#), page 89

Interpreting Console Error Messages

To view the explanations and recommended actions for Cisco uBR10012 router error messages, including messages related to SPAs, see the [Cisco IOS CMTS Cable System Messages Guide](#).

System error messages are organized in the documentation according to the particular system facility that produces the messages. The Cisco Wideband SPA error messages use the facility name SPAWBCMTS.

Using show Commands to Troubleshoot the SPA

Following are the **show** commands used to verify and monitor the SPA:

- **show cable mac-domain downstream-service-group**
- **show controllers modular-cable**
- **show hw-module bay**
- **show hw-module bay oir**
- **show interface wideband-cable**

Troubleshooting SPA-to-EQAM Communication Problems

If a Cisco Wideband SPA is unable to communicate with an edge QAM device, check that the RF channels set with the **rf-channel** command match the values required by the edge QAM device. The following example shows how to use the **show hw-module bay** command to see the values that have been configured for an RF channel.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```
Router# show hw-module bay 1/0/0 config rf-channel 0 verbose
SPA                               : Wideband-Cable 1/0/0
RF channel number                 : 0
Frequency                         : 699000000 Hz
Modulation                        : 64qam
Annex                             : B
IP address                        : 192.168.200.30
MAC address of EQAM              : 000c.3033.2cbf
UDP port number                   : 49152
EQAM headroom                     : 0
```

Check that the following values are correct and match what is configured on the edge QAM device:

- Frequency—The center frequency for this RF channel.
- IP address —The IP address of the edge QAM device for this RF channel.
- MAC address —The MAC address of a next-hop router or edge QAM device for this RF channel.
- UDP port—The UDP port number for the QAM output port for this RF channel.

In the **rf-channel** command, the value used for *mac-address* in the *mac-address* argument is as follows:

- If a Gigabit Ethernet router or Layer-3 switch is used between the Cisco Wideband SPA and the edge QAM device, the value specified for *mac-address* is the MAC address for the next-hop interface on the router or Layer-3 switch.
- If a Gigabit Ethernet router or Layer-3 switch is not used, the value specified for *mac-address* is the MAC address for Gigabit Ethernet interface on the edge QAM device.

The UDP port number set for the RF channel allows mapping an input UDP session to a specific QAM output port. Wideband traffic from different Cisco Wideband SPAs cannot be mixed on the same QAM output ports.

Verifying the Cisco Wideband SPA Configuration

In addition to using the **show running-configuration** command to display your router configuration settings, you can use a variety of commands to display information about the Cisco Wideband SPA including:

- Cisco Wideband SPA configuration
- Wideband channels and RF channels
- Wideband-channel cable interfaces

For an example of the **show interface wideband-cable** command output for a wideband-channel cable interface, see the [Displaying Cisco Wideband SPA Information](#) topic. With Cisco IOS commands, the

Cisco Wideband SPA and its Gigabit Ethernet ports are not considered standard user-configurable interfaces and do not appear in the output of the show interfaces command. The Cisco Wideband SPA is a controller and the **show controller modular-cable** command displays information about the SPA, its Gigabit Ethernet ports, installed SFP modules, and so on.

The following is a sample output of the **show controller modular-cable** command for the Cisco Wideband SPA located in slot 1, subslot 0, bay 0 of a Cisco uBR10012 router. In the output, the **Gigabit Ethernet Port Selected** field indicates that Port 1 is the active port on the Cisco Wideband SPA.



Note

This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```

Router# show controller modular-cable 1/0/0 brief
SPA 0 is present
status LED: [green]
Host 12V is enabled and is okay.
Power has been enabled to the SPA.
SPA reports power enabled and okay.
SPA reports it is okay and is NOT held in reset.

Gigabit Ethernet Port Selected : Port 1
Receive Interface                : In Reset
Receive Interface                : Disabled
Transmit Interface               : Out of Reset
Transmit Interface               : Enabled
Primary Receive Clock            : Disabled
Backup Receive Clock            : Disabled
SFP [Port 0] : 1000BASE-SX Present
Tx Enabled , LOS Detected , TxFault Not Detected
Link Status [Port 0] : DOWN
SFP [Port 1] : 1000BASE-T Present
Tx Enabled , LOS Not Detected , TxFault Not Detected
Link Status [Port 1] : UP

Wideband Channel information
Channel  RF bitmap  Police Info: Bytes  Interval
0         0x3      0           0          0 ms
1         0xC      0           0          0 ms
2         0x30     0           0          0 ms
3         0xC0     0           0          0 ms
4         0x300   0           0          0 ms
5         0xC00   0           0          0 ms
6         0x3000  0           0          0 ms
7         0xC000  0           0          0 ms
8         0x30000 0           0          0 ms
9         0x0      0           0          0 ms
10        0x0      0           0          0 ms
11        0x0      0           0          0 ms
12        0x0      0           0          0 ms
13        0x0      0           0          0 ms
14        0x0      0           0          0 ms
15        0x0      0           0          0 ms
16        0x0      0           0          0 ms
17        0x0      0           0          0 ms
18        0x0      0           0          0 ms
19        0x0      0           0          0 ms
20        0x0      0           0          0 ms
21        0x0      0           0          0 ms
22        0x0      0           0          0 ms
23        0x0      0           0          0 ms
24        0x0      0           0          0 ms
25        0x0      0           0          0 ms
26        0x0      0           0          0 ms
27        0x0      0           0          0 ms
28        0x0      0           0          0 ms
29        0x0      0           0          0 ms
30        0x0      0           0          0 ms
31        0x0      0           0          0 ms
    
```

```

RF Channel information
Modulation corresponds to : QAM 256
Annex corresponds to : Annex B
Modulation Data :GE Interframe Gap = 12 , MPEG-TS Frames per pkt = 4
SPA IP address = 0.0.0.0 SPA MAC Addr = 0012.001A.888B
QAM   Channel Rate   Rate adjust   State
0     0               1             Enabled
1     0               1             Enabled
2     0               1             Enabled
3     0               1             Enabled
4     0               1             Enabled
5     0               1             Enabled
6     0               1             Enabled
7     0               1             Enabled
8     0               1             Enabled
9     0               1             Enabled
10    0               1             Enabled
11    0               1             Enabled
12    0               1             Enabled
13    0               1             Enabled
14    0               1             Enabled
15    0               1             Enabled
16    0               1             Enabled
17    0               1             Enabled
18    0               1             Enabled
19    0               1             Enabled
20    0               1             Enabled
21    0               1             Enabled
22    0               1             Enabled
23    0               1             Enabled

```

```

Interrupt Counts
Idx  Interrupt Register      Interrupt Bit   Total Count   Masked:
69  blz_sp_int_stat_reg_0    spi_train_vld  24            YES
84  spa_brd_int_stat_reg     sp_int_0       24            NO
85  spa_brd_int_stat_reg     scc_int        2             NO
86  spa_brd_int_stat_reg     phy1_int       1             NO
87  spa_brd_int_stat_reg     phy0_int       1             NO
92  spa_brd_int_stat_reg     temp1_int      2             NO
93  spa_brd_int_stat_reg     temp0_int      2             NO
97  bm_int_stat_reg          bm_spa_brd     26            NO

```

Verifying RF Channel Configuration

The following is a sample output of the **show hw-module bay** command for RF channel 0 in the Cisco Wideband SPA located in slot 1, subslot 0, bay 0 of a Cisco uBR10012 router.



Note This example shows the syntax supported prior to Cisco IOS Release 12.2(33)SCB.

```

Router# show hw-module bay 1/0/0 config rf-channel 0 verbose
SPA                               : Modular-Cable 1/0/0
RF channel number                  : 0
Frequency                          : 6990000000 Hz
Modulation                         : 256qam
Annex                              : B
IP address of next hop              : 10.30.4.110
MAC address of EQAM                : 0090.f001.06ec
UDP port number                    : 49192
EQAM headroom                      : 0

```

Verifying Fiber Node Configuration

The following is a sample output of the **show cable fiber-node** command for cable fiber node 1:

```
Router# show cable fiber-node 1
Fiber-Node 1 (prim_rfch = 0x400, bg_rfch = 0x3, status = 0x1)
  MDD Status: Valid
```




CHAPTER 8

Overview of Gigabit Ethernet SPAs

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- [Features Supported on the Gigabit Ethernet SPAs](#), page 91
- [Restrictions for Gigabit Ethernet SPA](#), page 92
- [MIBs Supported on the Gigabit Ethernet SPAs](#), page 93
- [Packet Flow Through the Gigabit Ethernet SPAs](#), page 94
- [Displaying Gigabit Ethernet SPA Information](#), page 94

Gigabit Ethernet SPAs Release History

Release	Modification
12.2(33)SCB	Support for the following SPAs was introduced on the Cisco 10000 Series SPA Interface Processor-600 on the Cisco uBR10012 router: <ul style="list-style-type: none">• Cisco 1-Port 10-Gigabit Ethernet SPA, Version 2• Cisco 5-Port Gigabit Ethernet SPA, Version 2

Features Supported on the Gigabit Ethernet SPAs

- Autonegotiation (supported only on the Cisco 5-Port Gigabit Ethernet SPA)
- Speed negotiation
- Duplex negotiation
- Full-duplex operation
- EtherChannel bundles
- IEEE 802.1Q VLAN termination

- Up to 4000 VLANs per port and 8000 VLANs per SPA
- Jumbo frames support (9000 bytes)
- Support for command-line interface (CLI)-controlled OIR
- 802.3x flow control
- 802.3ad link bundling
- 802.1Q and QinQ for SIP oversubscription
- QinQ push/pop/swap functions
- QinQ configuration supports 448 outer VLAN tags
- 802.1p for SIP oversubscription
- Maximum transmission unit (MTU) up to 9180 bytes
- Up to 5000 MAC Accounting Entries for a SPA (source MAC Accounting on the ingress and Destination MAC Accounting on the egress)
- Power monitoring and diagnostics of SFP and XFP modules
- Ingress traffic classification based on IP Differentiated Services Code Point (DSCP) or IP precedence values, MPLS experimental (EXP) bits, VLAN 802.1Q priority bits, and IPv6 traffic-class bits
- Ingress IPv6 traffic classification based on IPv6 traffic-class bits
- Per-port byte and packet counters for policy drops, oversubscription drops, CRC error drops, packet sizes, unicast, multicast, and broadcast packets
- Per-VLAN byte and packet counters for policy drops, oversubscription drops, unicast, multicast, and broadcast packets

Restrictions for Gigabit Ethernet SPA

Starting with Cisco IOS Release 12.2(33)SCB, the Gigabit Ethernet SPAs have the following restrictions:

- When used as an uplink interface, the Cisco 1-Port 10-Gigabit Ethernet SPA supports from 1 to 10 VLANs with priority queues and class based weighted-fair queues, based on QoS configuration and test scenarios. When QoS is applied at multiple VLAN 10-Gigabit Ethernet interfaces other than the main 10-Gigabit Ethernet interface, unexpected drops with nonpriority class queues may occur.
- As an access interface, the Cisco 1-Port 10-Gigabit Ethernet SPA does not support oversubscription at the VLAN level when using QoS Model F.
- You cannot configure more than two active ports for sending and receiving packets on the Cisco 5-Port Gigabit Ethernet SPA.
- The following features are not supported:
 - IEEE 802.1 Q-in-Q VLAN tag switching
 - Bridge protocol data units (BPDU) filtering

MIBs Supported on the Gigabit Ethernet SPAs

The following MIBs are supported by the Gigabit Ethernet SPAs on the Cisco uBR10012 router:

- ENTITY-MIB (RFC 2737)
- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- CISCO-ENTITY-ALARM-MIB
- CISCO-ENTITY-EXT-MIB
- CISCO-ENTITY-SENSOR-MIB
- IF-MIB
- ETHERLIKE-MIB (RFC 2665)
- Remote Monitoring (RMON)-MIB (RFC 1757)
- CISCO-CLASS-BASED-QOS-MIB
- CISCO-ENTITY-BITS-CLOCK
- Ethernet MIB/RMON

For more information about MIB support on a Cisco uBR10012 router, see the Cisco CMTS Universal Broadband Router MIB Specifications Guide at the following URL:

http://www.cisco.com/en/US/docs/cable/cmts/mib/12_2sc/reference/guide/ubrmibv5.html

For information about MIBs associated with edge QAM devices or wideband cable modems, see the vendor documentation.

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<https://tools.cisco.com/RPF/register/register.do>

Packet Flow Through the Gigabit Ethernet SPAs

This section describes the path of a packet in the ingress and egress directions through the Gigabit Ethernet SPAs. Each incoming and outgoing packet on the Gigabit Ethernet SPAs goes through the physical port (PHY) SFP optics, Media Access Controller (MAC), and ASIC devices.

Path of a Packet in the Ingress Direction

- 1 The PHY SFP optics device receives incoming frames on a per-port basis from one of the laser optic interface connectors.
- 2 The PHY laser optics device processes the frame and sends it over the XAUI path to the MAC device.
- 3 The MAC device receives the frame, strips the CRCs, and sends the packet through the SPI 4.2 bus to the ASIC.
- 4 The ASIC takes the packet from the MAC devices and classifies the Ethernet information. CAM lookup based on etype, port, VLAN, and source and destination address information determine whether the packet is dropped or forwarded to the SPA interface. If the packet is forwarded to the SPA interface, an 8-byte SHIM header that is used for additional downstream packet processing is appended at the beginning of the packet.

Packet Path in the Egress Direction

- 1 The packet is sent to the ASIC using the SPI 4.2 bus. The packets are received with Layer 2 and Layer 3 headers in addition to the packet data.
- 2 The ASIC uses port number, destination MAC address, destination address type, and VLAN ID to perform parallel CAM lookups. If the packet is forwarded, it is forwarded through the SPI 4.2 bus to the MAC device.
- 3 The MAC device forwards the packet to the PHY laser-optic interface, which transmits the packet.

Displaying Gigabit Ethernet SPA Information

To verify the SPA hardware type that is installed in your Cisco uBR10012 router, you can use the **show interfaces** command.

The table below shows the hardware description that appears in the **show** command output for each type of Gigabit Ethernet SPA that is supported on the Cisco uBR10012 router.

SPA	Description in show interfaces Command
Cisco 1-Port 10-Gigabit Ethernet SPA	Hardware is TenGigEther SPA
Cisco 5-Port Gigabit Ethernet SPA	Hardware is GigEther SPA

Example of the show interfaces Command

The following example shows output from the **show interfaces tengigabitethernet** command on a Cisco 1-Port 10-Gigabit Ethernet SPA in slot 1, SPA subslot 3. The second line of the output identifies the type of SPA and its MAC address.

```
Router# show interfaces tenGigabitEthernet 1/3/0

GigabitEthernet1/3/0 is up, line protocol is up
  Hardware is TenGigEther SPA, address is 0005.00e7.2548 (bia 0005.00e7.2548)

  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not set
  Full Duplex, 1000Mbps, link type is auto, media type is SX
  output flow-control is unsupported, input flow-control is XON
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:00, 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 GigabitEthernet1/3/0 queueing strategy: PXF Class-based
  5 minute input rate 19000 bits/sec, 23 packets/sec
  5 minute output rate 17000 bits/sec, 23 packets/sec
    61860 packets input, 9470324 bytes, 0 no buffer
    Received 3151 broadcasts (0 IP multicasts)
    0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 3151 multicast, 0 pause input
    62413 packets output, 5726961 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier, 0 pause output
    0 output buffer failures, 0 output buffers swapped out
```




CHAPTER 9

Configuring Gigabit Ethernet SPAs

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- [Specifying the Interface Address on a SPA, page 98](#)
- [Configuring Gigabit Ethernet SPAs, page 98](#)
- [Modifying the MAC Address on the Interface, page 99](#)
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- [Preprovisioning the SIPs and Gigabit Ethernet SPAs, page 110](#)
- [Gigabit Ethernet SPAs Configuration Examples, page 111](#)

Default Configuration Values

The table below lists the default configuration parameters when an interface is enabled on a Gigabit Ethernet SPA.

Table 11: Gigabit Ethernet SPA Default Configuration Values

Parameter	Default Value
Autonegotiation	Enabled (supported only on Cisco 5-Port Gigabit Ethernet SPA)

Parameter	Default Value
Flow control	Enabled
Hold queue	Disabled
IEEE 802.1Q encapsulation	Disabled
MAC accounting	Disabled
MAC address	Hardware burned in address (BIA)
MTU	1514 for normal interfaces, 1518 for 802.1Q VLAN

Specifying the Interface Address on a SPA

Gigabit Ethernet SPAs on the Cisco uBR10012 router use an addressing format that specifies the physical location of the SIP, SPA, and interface. The interface address format is *slot/subslot/port*, where:

- *slot*—Specifies the slot number in the Cisco uBR10012 router where the SIP is installed.
- *subslot*—Specifies the secondary slot of the SIP where the SPA is installed.
- *port*—Specifies the number of the individual interface port on a SPA.

The following example shows how to specify the second interface (1) on a Gigabit Ethernet SPA installed in the first subslot of a SIP (0) installed in chassis slot 3:

```
Router(config)# interface gigabitethernet 3/0/1
```

Configuring Gigabit Ethernet SPAs

To configure a Gigabit Ethernet SPA, follow this procedure:



Note

Perform either

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example: Router> enable</p>	<p>Enables privileged EXEC mode.</p> <p>Enter your password if prompted.</p>

	Command or Action	Purpose
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	Use the appropriate command based on the Gigabit Ethernet SPA in use: <ul style="list-style-type: none"> • interface gigabitethernet <i>slot/subslot/port[.subinterface-number]</i> • interface tengigabitethernet <i>slot/subslot/port[.subinterface-number]</i> Example: Router(config)# interface gigabitethernet 5/0/0	Specifies the Gigabit Ethernet or the 10-Gigabit Ethernet interface to enter interface configuration mode. <ul style="list-style-type: none"> • <i>slot/subslot/port</i>—Specifies the location of the interface. • <i>subinterface-number</i>—(Optional) Specifies a secondary interface (subinterface) number.
Step 4	Use the appropriate command: <ul style="list-style-type: none"> • ip address <i>ip-address mask</i> • ipv6 address <i>ipv6-prefix/prefix-length</i> Example: Router(config-if)# ip address 172.18.189.38 255.255.255.224 or Router(config-if)# ipv6 address 3000:1116::1:3:300:1/112	Assigns an IP address to the interface. <ul style="list-style-type: none"> • <i>ip-address mask</i>—Specifies an IP address and subnet mask. • <i>ipv6-prefix/prefix-length</i>—Specifies an IPv6 network address and prefix length.
Step 5	no shutdown Example: Router(config-if)# no shutdown	Removes the shutdown configuration, which forces an interface administratively down.
Step 6	end Example: Router# end	Returns to privileged EXEC mode.

Modifying the MAC Address on the Interface

The Gigabit Ethernet SPAs use a default MAC address for each port that is derived from the base address that is stored in the electrically erasable programmable read-only memory (EEPROM) on the backplane of the Cisco uBR10012 router.

To modify the default MAC address of an interface to some user-defined address, do the following:

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	mac-address <i>ieee-address</i> Example: Router(config-if) # mac-address <i>ieee-address</i>	Modifies the default MAC address of an interface to a user-defined address. <i>ieee-address</i> —Specifies the 48-bit Institute of Electrical and Electronics Engineers (IEEE) MAC address written as a dotted triple of four-digit hexadecimal numbers (<i>xxxx.yyyy.zzzz</i>). To return to the default MAC address on the interface, use the no form of the command.
Step 4	end Example: Router# end	Returns to privileged EXEC mode.

Gathering MAC Address Accounting Statistics

MAC address accounting provides accounting information for IP traffic based on the source and destination MAC addresses of the LAN interfaces. MAC address accounting calculates the total packet and byte counts for a LAN interface that receives or sends IP packets to or from a unique MAC address. It also records a time stamp for the last packet received or sent. With MAC address accounting, you can determine how much traffic is being sent to or received from various peers.

To enable MAC address accounting on an interface, do the following:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. Enter your password if prompted.

	Command or Action	Purpose
Step 2	configure terminal Example: Router# <code>configure terminal</code>	Enters global configuration mode.
Step 3	ip accounting mac-address [input output] Example: Router(config-if)# <code>ip accounting mac-address input</code>	Enables MAC address accounting on an interface. <ul style="list-style-type: none"> • input—Performs accounting based on the source MAC address on received packets. • output—Performs accounting based on the destination MAC address on transmitted packets.
Step 4	end Example: Router# <code>end</code>	Returns to privileged EXEC mode.

Configuring Autonegotiation on an Interface

Autonegotiation is enabled by default and can be disabled on the 5-Port Gigabit Ethernet SPA. During autonegotiation, advertisement for flow control, speed, and duplex occurs. If autonegotiation is disabled on one end of a link, it must be disabled on the other end of the link. If one end of a link has autonegotiation disabled while the other end of the link does not, the link does not come up properly on both ends. Flow control is always negotiated when autonegotiation is enabled.



Note

Autonegotiation is not supported on the 1-Port 10-Gigabit Ethernet SPA.

To disable autonegotiation on the 5-Port Gigabit Ethernet SPA, use the **no negotiation auto** command in interface configuration mode.

```
Router(config-if)# no negotiation auto
```

No advertisement of flow control occurs.

To re-enable autonegotiation on a Gigabit Ethernet interface, use the **negotiation auto** command in interface configuration mode.

```
Router(config-if)# negotiation auto
```

Advertisement of flow control occurs.

Configuring Ethernet Flow Control

The Ethernet flow control feature is a mechanism for temporarily stopping the transmission of data between two peers to prevent packet drops in the event of data overflow. The overwhelmed network element will send a PAUSE frame, which halts transmission from the sending node for a specified period of time. Flow control is enabled by default on the 1-Port 10-Gigabit Ethernet SPA.

**Note**

Flow control is always negotiated when autonegotiation is enabled.

To disable flow control on the 1-Port 10-Gigabit Ethernet SPA, use the **flowcontrol receive off** command in interface configuration mode.

```
Router(config-if)# flowcontrol receive off
```

When the flow control is disabled, the PAUSE frames received from its peer are ignored and transmission continues.

To re-enable flow control on a Gigabit Ethernet interface, use the **no flowcontrol receive off** command in interface configuration mode.

```
Router(config-if)# no flowcontrol receive off
```

Modifying the Interface MTU Size

The Cisco IOS software supports three different types of configurable maximum transmission unit (MTU) options at different levels of the protocol stack:

- **Interface MTU**—Checked by the SPA on traffic coming in from the network. Different interface types support different interface MTU sizes and defaults. The interface MTU defines the maximum packet size allowable (in bytes) for an interface before drops occur. If the frame is smaller than the interface MTU size, but is not smaller than the minimum frame size for the interface type (such as 64 bytes for Ethernet), then the frame continues to process.
- **IP MTU**—Can be configured on an interface or a subinterface and is used by the Cisco IOS software to determine whether fragmentation of a packet takes place. If an IP packet exceeds the IP MTU size, then the packet is fragmented.
- **Tag or Multiprotocol Label Switching (MPLS) MTU**—Can be configured on an interface or a subinterface and allows up to six different labels, or tag headers, to be attached to a packet. The maximum number of labels is dependent on your Cisco IOS software release.

**Note**

For the Gigabit Ethernet SPAs on the Cisco uBR10012 router, the default MTU size is 1500 bytes. When the interface is being used as a Layer 2 port, the maximum configurable MTU is 9000 bytes. The SPA automatically adds an additional 22 bytes to the configured MTU size to accommodate some of the additional overhead. However, when the Gigabit Ethernet SPAs are configured in the interface tunnel, the configurable MTU is 9180 bytes; but it is highly recommended to use a maximum packet size of 9132 bytes.

Interface MTU Configuration Guidelines

When configuring the interface MTU size on a Gigabit Ethernet SPA on a Cisco uBR10012 router, consider the following guidelines:

- The default interface MTU size accommodates a 1500-byte packet, plus 22 additional bytes to cover the following additional overhead:
 - Layer 2 header—14 bytes

- Dot1Q header—4 bytes
- CRC—4 bytes

**Note**

Depending on your Cisco IOS software release, a certain maximum number of MPLS labels are supported. If you need to support more than two MPLS labels, then you must increase the default interface MTU size.

- If you are using MPLS, be sure that the **mpls mtu** command is configured for a value less than or equal to the interface MTU.
- If you are using MPLS labels, then you should increase the default interface MTU size to accommodate the number of MPLS labels. Each MPLS label adds 4 bytes of overhead to a packet.

Interface MTU Configuration Task

To modify the MTU size on an interface, use the **mtu bytes** command in interface configuration mode.

```
Router(config-if)# mtu 9128
```

The default is 1500 bytes. The maximum configurable MTU is 9129 bytes.

bytes—Specifies the maximum number of bytes for a packet.

To return to the default MTU size, use the **no** form of the command.

Configuring the Encapsulation Type and VLANs

By default, the interfaces on the Gigabit Ethernet SPAs support Advanced Research Projects Agency (ARPA) encapsulation. They do not support configuration of service access point or SNAP encapsulation for transmission of frames; however, the interfaces will properly receive frames that use service access point and SNAP encapsulation.

The Cisco uBR10012 router supports virtual local area networks (VLANs) to separate a service provider's subscriber traffic. Each Gigabit Ethernet SPA supports up to 8000 VLANs.

The other encapsulation supported by the SPA interfaces is IEEE 802.1Q encapsulation for VLANs. To create a subinterface on a SPA interface port and configure the subinterface on a VLAN using IEEE 802.1Q encapsulation, use the **encapsulation dot1q vlan-id** command in subinterface configuration mode.

Configuring the Hold Queue

You can limit the size of the input queue on a Gigabit Ethernet SPA in units of packets. The input hold queue prevents a single interface from flooding the network server with too many input packets. Further input packets are discarded if the interface has too many input packets outstanding in the system. The default input hold queue limit is 75 packets.

To modify the input hold queue on a Gigabit Ethernet SPA, use the **hold-queue length in** command in interface configuration mode.

The *length* specifies the maximum number of packets in the queue. The valid values are from 0 to 4096.

Configuring EtherChannels

An EtherChannel bundles individual Gigabit Ethernet links into a single logical link that provides the aggregate bandwidth of up to four physical links. This feature helps improve the cost effectiveness of a device by increasing cumulative bandwidth without requiring hardware upgrades. In addition, IEEE 802.3ad link bundling provides a capability to dynamically provision, manage, and monitor various aggregated links and enables interoperability between various Cisco devices and the devices of third-party vendors.



Note Gigabit Ethernet SPAs on the Cisco uBR10012 routers do not support Link Aggregation Control Protocol (LACP).

Configuring a Priority Queue on Gigabit Ethernet SPAs

The Gigabit Ethernet SPAs provide the ability to separate high-priority traffic from low-priority traffic and places the traffic in the appropriate interface queue. Priority and nonpriority traffic are separated at the SIP to prevent the dropping of high-priority traffic in an oversubscription case.



Note Each SPA supports one priority queue.

The following classification types are available to prioritize ingress traffic on the Gigabit Ethernet SPAs:

- VLAN 802.1Q priority bits
- IP DSCP bits
- IP precedence bits
- IPv6 traffic-class bits
- MPLS EXP bits

Classifying Ingress VLAN Traffic

To classify ingress VLAN traffic based on the 802.1Q priority bits, use the following commands in interface and subinterface configuration mode:

Command	Purpose
<code>plim qos input map cos enable</code>	Enables classification of ingress VLAN traffic according to the 802.1Q priority bits. Note This command can only be applied to VLAN interfaces.

Command	Purpose
plim qos input map cos <i>cos-value</i> queue low-latency	<p>(Optional) Classifies incoming VLAN traffic on a subinterface according to the 802.1Q priority bits and places the traffic into the appropriate queue.</p> <ul style="list-style-type: none"> • <i>cos-value</i>—Specifies an IEEE 802.1Q/ISL CoS value from 0 to 7. <p>Note When you configure a class of service (CoS) value on a QinQ subinterface, the CoS value applies to all QinQ subinterfaces with the same outer VLAN ID.</p> <ul style="list-style-type: none"> • low-latency—Specifies the high-priority queue.

Classifying Ingress IP Traffic According to DSCP Bits

To classify ingress IP traffic based on the value of the DSCP bits, use the following commands in interface configuration mode:

Command	Purpose
plim qos input map ip dscp-based	<p>Enables the classification of incoming IP traffic according to the value of the DSCP bits.</p> <p>Note This command only applies to physical interfaces.</p>

Command	Purpose
<p>plim qos input map ip dscp <i>dscp-value</i> queue low-latency</p>	<p>Classifies incoming IP traffic according to the value of the DSCP bits and places the traffic into the appropriate queue. By default, IP traffic with the DSCP bits will use the low-latency queue, and traffic with any other DSCP value will use the low-priority queue.</p> <ul style="list-style-type: none"> • <i>dscp-value</i>—Value of the DSCP bits. Values can be one of the following: <ul style="list-style-type: none"> 0 to 63—Differentiated services code point value af11—001010 af12—001100 af13—001110 af21—010010 af22—010100 af23—010110 af31—011010 af32—011100 af33—011110 af41—100010 af42—100100 af43—100110 cs1—Precedence 1 (001000) cs2—Precedence 2 (010000) cs3—Precedence 3 (011000) cs4—Precedence 4 (100000) cs5—Precedence 5 (101000) cs6—Precedence 6 (110000) cs7—Precedence 7 (111000) default—000000 ef—101110 <p>A range of values can be specified separated by a dash (-), or a list of values can be specified.</p> <ul style="list-style-type: none"> • low-latency—Specifies the high-priority queue.

Classifying Ingress IP Traffic According to IP Precedence Bits

To classify ingress IP traffic based on the value of the IP precedence bits, use the following commands in interface configuration mode:

Command	Purpose
plim qos input map ip precedence-based	Enables the classification of incoming IP traffic according to the IP precedence value. Note This command only applies to physical interfaces.
plim qos input map ip precedence <i>precedence-value</i> queue low-latency	Classifies incoming IP traffic according to the value of the IP precedence bits and places the traffic into the appropriate queue. <i>precedence-value</i> —Value of the IP precedence bits (0 to 7). A range of values can be specified separated by a dash (-), or a list of values can be specified. low-latency —Specifies the high-priority queue.

Classifying Ingress IPv6 Traffic According to Traffic-Class Bits

To classify ingress IPv6 traffic based on the value of the traffic-class bits, use the following command in interface configuration mode:

Command	Purpose
plim qos input map ipv6 tc <i>tc-value</i> queue low-latency	

Command	Purpose
	<p>Classifies ingress IPv6 traffic based on the value of the traffic-class bits and places the traffic into the appropriate queue.</p> <p>By default, IPv6 traffic with a traffic-class value uses the high-priority queue, and all other traffic will use the low-priority queue. Only the most significant six bits of the traffic-class octet is used for the classification.</p> <p>Note This command only applies to physical interfaces.</p> <ul style="list-style-type: none"> • tc-value—Value of the traffic-class bits. Values can be one of the following: <ul style="list-style-type: none"> 0 to 63—Differentiated services code point value af11—001010 af12—001100 af13—001110 af21—010010 af22—010100 af23—010110 af31—011010 af32—011100 af33—011110 af41—100010 af42—100100 af43—100110 cs1—Precedence 1 (001000) cs2—Precedence 2 (010000) cs3—Precedence 3 (011000) cs4—Precedence 4 (100000) cs5—Precedence 5 (101000) cs6—Precedence 6 (110000) cs7—Precedence 7 (111000) default—000000 ef—101110 <p>A range of values can be specified separated by a dash (-), or a list of values can be specified.</p>

Command	Purpose
	<ul style="list-style-type: none"> • low-latency—Specifies the high-priority queue.

Classifying Ingress MPLS Traffic According to EXP Bits

To classify ingress MPLS traffic based on the value of the EXP bits, use the following commands in interface configuration mode:

Command	Purpose
plim qos input map mpls exp <i>exp-value</i> queue low-latency	<p>Classifies incoming MPLS traffic according to the value of the EXP bits and places the traffic into the appropriate queue.</p> <p>Note This command only applies to physical interfaces.</p> <ul style="list-style-type: none"> • <i>exp-value</i>—Value of the EXP bits (0 to 7). A range of values can be specified separated by a dash (-), or a list of values can be specified. • low-latency—Specifies the high-priority queue.

Configuring the Interface for Internal Loopback

Loopback support is useful for testing the interface without connectivity to the network, or for diagnosing equipment malfunctions between the interface and a device. The Gigabit Ethernet SPAs support internal loopback mode.

To enable internal loopback at the MAC device on a Gigabit Ethernet SPA, use the **loopback mac** command in interface configuration mode.

Preprovisioning the SIPs and Gigabit Ethernet SPAs

Preprovisioning is an optional configuration task for the Cisco 10000 Series SPA Interface Processor-600 and the Gigabit Ethernet SPAs. It allows you to preprovision a line card slot in the Cisco uBR10012 router to accept a particular SIP, and to preconfigure the SPA interfaces without the SIP being physically present in the chassis. This feature allows planning for future configurations.

For information on preprovisioning the Gigabit Ethernet SPAs and Cisco 10000 Series SPA Interface Processor-600, see the [Optional Configuration Tasks](#) section.

For preprovisioning a SPA, the subslot must be physically empty or gracefully deactivated. For information on gracefully deactivating a SPA, see the [Deactivating a SPA](#) section.

**Tip**

To display the slots, if any, that are preprovisioned for a card type, use the **show running-config | include card** command.

Removing Preprovisioning on a SIP and SPA

To remove a preprovisioning configuration from a line card slot, use the **no card** command. This removes all configuration information for that subslot, as well as any information in the SNMP MIB database about the card and its card slot.

To remove preprovisioning configuration information, the SIP slot or SPA subslot must be physically empty or gracefully deactivated. For information on deactivating SIPs and SPAs, see the [Preparing for Online Removal of a SIP](#) and [Preparing for Online Removal of a SPA](#) sections.

Gigabit Ethernet SPAs Configuration Examples

Basic Interface Configuration Example

The following example shows how to specify the interface that you want to configure, configure an IP address for the interface, and save the configuration. This example configures interface port 0 on the SPA that is located in subslot 3 of the SIP, which is installed in slot 1 of the Cisco uBR10012 router.

```
! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Specify the interface address.
!
Router(config)# interface gigabitethernet 1/3/0
!
! Configure an IP address.
!
Router(config-if)# ip address 192.168.50.1 255.255.255.0
!
! Start the interface.
!
Router(config-if)# no shut
!
! Save the configuration to NVRAM.
!
Router(config-if)# exit
Router# copy running-config startup-config
```

MAC Address Configuration Example

The following example changes the default MAC address on the interface to 1111.2222.3333:

```
! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Specify the interface address
!
Router(config)# interface gigabitethernet 1/3/0
!
! Modify the MAC address.
```

```
!
Router(config-if)# mac-address 1111.2222.3333
```

MAC Address Accounting Configuration Example

The following example enables MAC Address Accounting:

```
! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Enable MAC address accounting
Router(config)# ip accounting mac-address {input | output}
Router(config-if)# ip accounting ?
access-violations Account for IP packets violating access lists on this interface
mac-address Account for MAC addresses seen on this interface
output-packets Account for IP packets output on this interface
precedence Count packets by IP precedence on this interface
Router(config-if)# ip accounting mac
Router(config-if)# ip accounting mac-address ?
input Source MAC address on received packets
output Destination MAC address on transmitted packets
Router(config-if)# ip accounting mac-address ip
Router(config-if)# ip accounting mac-address input ?
! Specify MAC address accounting for traffic entering the interface.
!
Router(config-if)# ip accounting mac-address input
! Specify MAC address accounting for traffic leaving the interface.
!
Router(config-if)# ip accounting mac-address output
Router(config-if)# end
! Verify the MAC Address on the interface.
!
Router# show interfaces GigabitEthernet 1/3/0 mac-accounting
GigabitEthernet1/3/0
Input (511 free)
000f.f7b0.5200(26 ): 124174 packets, 7450440 bytes, last: 1884ms ago
Total: 124174 packets, 7450440 bytes
Output (511 free)
000f.f7b0.5200(26 ): 135157 packets, 8109420 bytes, last: 1884ms ago
Total: 135157 packets, 8109420 bytes
```

MTU Configuration Example

The following example sets the interface MTU to 9180 bytes:

```
! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Specify the interface address
!
Router(config)# interface gigabitethernet 1/3/0
!
! Configure the interface MTU.
!
Router(config-if)# mtu 9180
```

VLAN Configuration Example

The following example creates subinterface number 268 on the SPA interface port, and configures the subinterface on the VLAN with ID number 268 using IEEE 802.1Q encapsulation:

```
! Enter global configuration mode.
!
```

```

Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Specify the interface address
!
Router(config)# interface gigabitethernet 1/3/0.268
!
! Configure dot1q encapsulation and specify the VLAN ID.
!
Router(config-subif)# encapsulation dot1q 268

```

Priority Queue Classification Configuration Example

The following example enables DSCP-based classification on the SPA that is located in subslot 3 of the SIP in slot 1 of the Cisco uBR10012 router:

```

! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Specify the interface address
!
Router(config)# interface gigabitethernet 1/3/0
!
! Configure the priority queue classification type.
Router(config-if)# plim qos input map ip dscp-based

```

Configuring any Keyword on Subinterfaces for PPPoE-QinQ Support

The following example configures seven subinterfaces with various outer and inner VLAN IDs:

```

! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
Router# interface GigabitEthernet3/0/0.1
Router(config-if)# encapsulation dot1q 100 second-dot1q 100
Router(config-if)# exit
Router# interface GigabitEthernet3/0/0.2
Router(config-if)# encapsulation dot1q 100 second-dot1q 200
Router(config-if)# exit
Router# interface GigabitEthernet3/0/0.3
Router(config-if)# encapsulation dot1q 100 second-dot1q 300-400,500-600
Router(config-if)# exit
Router# interface GigabitEthernet3/0/0.4
Router(config-if)# encapsulation dot1q 100 second-dot1q any
Router(config-if)# exit
Router# interface GigabitEthernet3/0/0.5
Router(config-if)# encapsulation dot1q 200 second-dot1q 50
Router(config-if)# exit
Router# interface GigabitEthernet3/0/0.6
Router(config-if)# encapsulation dot1q 200 second-dot1q 1000-2000,3000-4000
Router(config-if)# exit
Router# interface GigabitEthernet3/0/0.7
Router(config-if)# encapsulation dot1q 200 second-dot1q any

```




Troubleshooting Gigabit Ethernet SPAs

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- [Verifying the Interface](#), page 116
- [Verifying the MAC Address](#), page 117
- [Verifying MTU Size](#), page 118
- [Verifying Per-Port Interface Status](#), page 118
- [Verifying Loopback Status](#), page 119
- [Troubleshooting Gigabit Ethernet SPAs Using Show Commands](#), page 119
- [Using the Cisco IOS Event Tracer to Troubleshoot Problems](#), page 121

Performing Basic Interface Troubleshooting

You can perform most of the basic interface troubleshooting using the **show interfaces gigabitethernet** or **show interfaces tengigabitethernet** command and examining several areas of the output to determine how the interface is operating.

The following example shows output from the **show interfaces gigabitethernet** and **show interfaces tengigabitethernet** commands:

```
Router# show interfaces gigabitethernet 3/0/0

GigabitEthernet3/0/0 is down, line protocol is down
  Hardware is GigEther SPA, address is 000a.f330.2e40 (bia 000a.f330.2e40)
  Internet address is 2.2.2.1/24
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  Full-duplex, 1000Mb/s, link type is force-up, media type is SX
  output flow-control is on, input flow-control is on
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 03:18:49, output 03:18:44, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    1703 packets input, 638959 bytes, 0 no buffer
```

```

Received 23 broadcasts (0 IP multicasts)
0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 watchdog, 1670 multicast, 0 pause input
1715 packets output, 656528 bytes, 0 underruns
0 output errors, 0 collisions, 4 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier, 0 pause output
0 output buffer failures, 0 output buffers swapped out

```

```
Router# show interfaces tenGigabitEthernet 3/0/0
```

```

TenGigabitEthernet3/0/0 is up, line protocol is up (connected)
Hardware is TenGigEther SPA, address is 0000.0c00.0102 (bia 000f.342f.c340)
Internet address is 15.1.1.2/24
MTU 1500 bytes, BW 10000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive not supported
Full-duplex, 10Gb/s
input flow-control is on, output flow-control is on
ARP type: ARPA, ARP Timeout 04:00:00
Last input never, output 00:00:10, output hang never
Last clearing of "show interface" counters 20:24:30
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
L2 Switched: ucast: 0 pkt, 0 bytes - mcast: 0 pkt, 0 bytes
L3 in Switched: ucast: 0 pkt, 0 bytes - mcast: 0 pkt, 0 bytes mcast
L3 out Switched: ucast: 0 pkt, 0 bytes mcast: 0 pkt, 0 bytes
237450882 packets input, 15340005588 bytes, 0 no buffer
Received 25 broadcasts (0 IP multicasts)
0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 watchdog, 0 multicast, 0 pause input
0 input packets with dribble condition detected
1676 packets output, 198290 bytes, 0 underruns
0 output errors, 0 collisions, 4 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier, 0 PAUSE output
0 output buffer failures, 0 output buffers swapped out

```

Verifying the Interface

To verify that your interface is operating properly, complete the following steps:

- 1 From global configuration mode, enter the **show interfaces gigabitethernet** or **show interfaces tengigabitethernet** command.

```

Router# show interfaces gigabitethernet 1/3/0
Router# show interfaces tengigabitethernet 3/0/0

```

- 2 Verify that the interface is up.

```

Router# show interfaces gigabitethernet 1/3/0
GigabitEthernet1/3/0 is up, line protocol is up

Router# show interfaces tengigabitethernet 3/0/0
TenGigabitEthernet3/0/0 is up, line protocol is up
(connection)

```

- 3 Verify that the line protocol is up.

```

Router# show interfaces gigabitethernet 1/3/0
GigabitEthernet1/3/0 is up, line protocol is up

```

```
Router# show interfaces tengigabitethernet 3/0/0
TenGigabitEthernet3/0/0 is up, line protocol is up
(connection)
```

- 4 Verify that the interface duplex mode matches the remote interface configuration.

The following example shows that the local interface is currently operating in full-duplex mode:

```
Router# show interfaces gigabitethernet 1/3/0
[text omitted]
Keepalive not supported
Full-duplex, 1000Mb/s, link type is force-up, media type
is SX
```

```
Router# show interfaces tengigabitethernet 3/0/0
[text omitted]
Keepalive not supported
Full-duplex, 10Gb/s
```

- 5 Verify that the interface speed matches the speed on the remote interface.

The following example shows that the local interface is currently operating at 100 Mbps (Gigabit Ethernet) or 10Gbps (10-Gigabit Ethernet):

```
Router# show interfaces gigabitethernet 1/3/0
[text omitted]
Keepalive not supported
Full-duplex, 1000Mb/s, link type is force-up, media type
is SX
```

```
Router# show interfaces tengigabitethernet 3/0/0
[text omitted]
Full-duplex, 10Gb/s
```

- 6 Observe the output hang status on the interface.

```
ARP type: ARPA, ARP Timeout 04:00:00
Last input 03:18:49, output 03:18:44, output hang never
```

- 7 Observe the CRC counter.

```
0 input errors, 0 CRC, 0 frame, 130043940 overrun, 0
ignored
```

- 8 Observe the late collision counter.

```
0 output errors, 0 collisions, 4 interface resets
0 babbles, 0 late collision, 0 deferred
```

- 9 Observe the carrier signal counters.

```
0 lost carrier, 0 no carrier, 0 pause output
0 output buffer failures, 0 output buffers swapped out
```

Verifying the MAC Address

To verify the MAC address of an interface, use the **show interfaces gigabitethernet** privileged EXEC command and observe the value shown in the **address** field.

The following example shows output from the **show interfaces tengigabitethernet** command on a Cisco 1-Port 10-Gigabit Ethernet SPA in slot 1, SPA subslot 3. The second line of the output identifies the type of SPA and its MAC address.

```
Router# show interfaces tengigabitethernet 1/3/0
GigabitEthernet1/3/0 is up, line protocol is up
```

```

Hardware is TenGigEther SPA, address is 0005.00e7.2548 (bia 0005.00e7.2548)

MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
  reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive not set
Full Duplex, 1000Mbps, link type is auto, media type is SX
output flow-control is unsupported, input flow-control is XON
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:00:00, output 00:00:00, 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 GigabitEthernet1/3/0 queuing strategy: PXF Class-based
5 minute input rate 19000 bits/sec, 23 packets/sec
5 minute output rate 17000 bits/sec, 23 packets/sec
  61860 packets input, 9470324 bytes, 0 no buffer
  Received 3151 broadcasts (0 IP multicasts)
  0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
  0 watchdog, 3151 multicast, 0 pause input
  62413 packets output, 5726961 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 babbles, 0 late collision, 0 deferred
  0 lost carrier, 0 no carrier, 0 pause output
  0 output buffer failures, 0 output buffers swapped out

```

Verifying MTU Size

To verify the MTU size for an interface, use the **show interfaces** command in privileged EXEC command and observe the value shown in the **MTU** field.

The following example shows an MTU size of 1500 bytes for the Gigabit Ethernet SPA installed in the SIP that is located in slot 1 of the Cisco uBR10012 router:

```

Router# show interfaces GigabitEthernet 1/3/0

GigabitEthernet1/3/0 is up, line protocol is up
  Hardware is GigEther SPA, address is 0005.00e7.2548 (bia 0005.00e7.2548)

  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not set

```

Verifying Per-Port Interface Status

To find detailed interface information on a per-port basis for the Gigabit Ethernet SPAs, use the **show interfaces gigabitethernet** command.

The following example provides sample output on a Cisco 1-Port 10-Gigabit Ethernet SPA in slot 1, subslot 3, port 0:

```

Router# show interfaces tenGigabitEthernet 1/3/0

GigabitEthernet1/3/0 is up, line protocol is up
  Hardware is GigEther SPA, address is 0005.00e7.2548 (bia 0005.00e7.2548)

  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not set
  Full Duplex, 1000Mbps, link type is auto, media type is SX
  output flow-control is unsupported, input flow-control is XON
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:00, 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 GigabitEthernet1/3/0 queueing strategy: PXF Class-based
5 minute input rate 19000 bits/sec, 23 packets/sec
5 minute output rate 17000 bits/sec, 23 packets/sec
 61860 packets input, 9470324 bytes, 0 no buffer
  Received 3151 broadcasts (0 IP multicasts)
   0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
   0 watchdog, 3151 multicast, 0 pause input
 62413 packets output, 5726961 bytes, 0 underruns
   0 output errors, 0 collisions, 0 interface resets
   0 babbles, 0 late collision, 0 deferred
   0 lost carrier, 0 no carrier, 0 pause output
   0 output buffer failures, 0 output buffers swapped out

```

Verifying Loopback Status

To verify whether loopback is enabled on an interface port on a SPA, use the **show interfaces gigabitethernet** or **show interfaces tengigabitethernet** command in privileged EXEC mode and observe the value shown in the **loopback** field.

The following example shows that loopback is disabled for interface port 0 (the first port) on the Gigabit Ethernet SPA installed in the top (0) subslot of the SIP that is located in slot 1 of the Cisco uBR10012 router:

```

Router# show interfaces gigabitethernet 1/0/0

GigabitEthernet1/0/0 is up, line protocol is up
  Hardware is GigMac 1 Port 10 GigabitEthernet, address is 0008.7db3.8dfe (bia)
  Internet address is 10.0.0.2/24
  MTU 1500 bytes, BW 10000000 Kbit, DLY 10 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set

```

The following example shows that loopback is disabled for interface port 0 (the first port) on the Cisco 1-Port 10-Gigabit Ethernet SPA installed in the top (0) subslot of the SIP that is located in slot 3 of the Cisco uBR10012 router:

```

Router# show interfaces tengigabitethernet 3/0/0

TenGigabitEthernet3/0/0 is up, line protocol is up (connected)
  Hardware is TenGigEther SPA, address is 0000.0c00.0102 (bia 000f.342f.c340)
  Internet address is 15.1.1.2/24
  MTU 1500 bytes, BW 10000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set

```

Troubleshooting Gigabit Ethernet SPAs Using Show Commands

Problem Interface is down.

- **Solution** If the interface is **administratively down**, use the **no shutdown interface** configuration command to enable the interface.
- **Solution** Be sure that the cable is fully connected.
- **Solution** Verify that the cable is not bent or damaged. If the cable is bent or damaged, the signal will be degraded.

- **Solution** Verify that a hardware failure has not occurred. Observe the LEDs to confirm the failure. If the hardware has failed, replace the SPA as necessary.

Problem The line protocol is down or the line protocol software processes have determined that the line is unusable.

- **Solution** Replace the cable.
- **Solution** Check the local and remote interface for incorrect configuration.
- **Solution** Verify that a hardware failure has not occurred. Observe the LEDs to confirm the failure. If the hardware has failed, replace the SPA as necessary.

Problem Interpreting the value in the **hang** field.

Solution The output hang provides the number of hours, minutes, and seconds since the last reset caused by a lengthy transmission. When the number of hours in the field exceeds 24 hours, the number of days and hours is shown. If the field overflows, asterisks are printed. The field shows a value of **never** if no output hangs have occurred.

Problem High CRC errors accompanied by a low number of collisions.

Possible Cause Excessive noise.

- **Solution** Check the cables for damage.
- **Solution** Verify that the correct cables are being used for the SPA interface.

Problem Late collisions on the interface.

- **Solution** Verify that the duplex mode on the local and remote interface match. Late collisions occur when there is a duplex-mode mismatch.
- **Solution** Verify the length of the Ethernet cables. Late collisions result from cables that are too long.

Problem Incrementing carrier signal counters.

Possible Cause The lost carrier counter shows the number of times that the carrier was lost during transmission. The no carrier counter shows the number of times that the carrier was not present during transmission. Carrier signal resets can occur when an interface is in loopback mode or shut down.

- **Solution** Check the interface for a malfunction.
- **Solution** Check for a cable problem.

Using the Cisco IOS Event Tracer to Troubleshoot Problems

**Note**

This feature is intended for use as a software diagnostic tool and should be configured only under the direction of a Cisco Technical Assistance Center (TAC) representative.

The Event Tracer feature provides a binary trace facility for troubleshooting Cisco IOS software. This feature gives Cisco service representatives additional insight into the operation of the Cisco IOS software and can be useful in helping to diagnose problems in the unlikely event of an operating system malfunction or, in the case of redundant systems, Route Processor (RP) switch over.

Event tracing works by reading informational messages from specific Cisco IOS software subsystem components that have been preprogrammed to work with event tracing, and by logging messages from those components into system memory. Trace messages stored in memory can be displayed on the screen or saved to a file for later analysis.

The SPAs currently support the “spa” component to trace SPA OIR-related events.

For more information about using the Event Tracer feature, see the [Event Tracer](#) document.



Overview of the Cisco 3 Gbps Wideband Shared Port Adapter

- [Cisco 3 Gbps Wideband Shared Port Adapter Release History](#), page 123
- [Cisco 3 Gbps Wideband Shared Port Adapter Overview](#), page 123
- [Cisco 3 Gbps Wideband Shared Port Adapter Features](#), page 124
- [Restrictions for Cisco 3 Gbps Wideband Shared Port Adapter](#), page 126
- [MIBs Supported on Cisco 3 Gbps Wideband Shared Port Adapter](#), page 126
- [Displaying Cisco 3 Gbps Wideband Shared Port Adapter Information](#), page 127

Cisco 3 Gbps Wideband Shared Port Adapter Release History

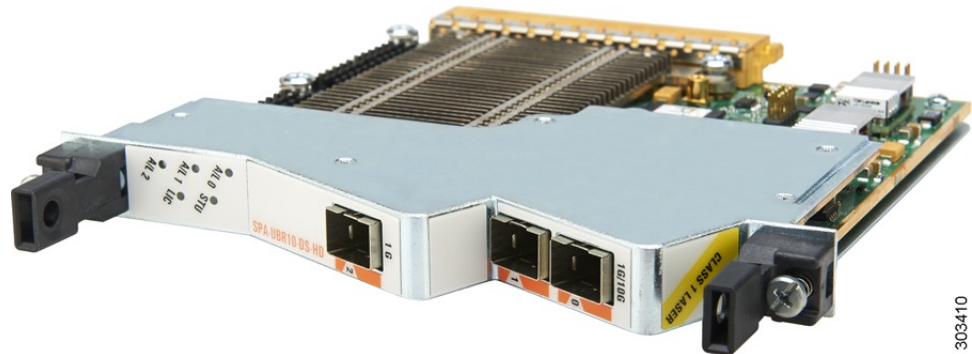
Cisco IOS Release	Modification
12.2(33)SCH	Support for the Cisco 3 Gbps Wideband Shared Port Adapter card was introduced.

Cisco 3 Gbps Wideband Shared Port Adapter Overview

The Cisco 3 Gbps Wideband Shared Port Adapter is a single-wide, half-height shared port adapter that provides DOCSIS network formatting to downstream data packets. It is used for only downstream data traffic. The Cisco 3 Gbps Wideband Shared Port Adapter is a key component for the Cisco IOS features, DOCSIS 3.0 Downstream Channel Bonding and DOCSIS M-CMTS network architecture. The base hostboard is the Cisco 10000 Series SPA Interface Processor-600. Each Cisco 10000 Series SPA Interface Processor-600 jacket can host four Cisco 3 Gbps Wideband Shared Port Adapter cards.

Each Cisco 3 Gbps Wideband Shared Port Adapter has three 1 Gigabit Ethernet ports (no redundant port). The first two Gigabit Ethernet ports on the SPA can be used as a 10 Gigabit Ethernet port (one active and one redundant). The Gigabit Ethernet ports are used to send traffic to one or more external edge QAM devices.

Figure 3: Cisco 3 Gbps Wideband Shared Port Adapter Faceplate



The Cisco uBR10012 router can support up to two Cisco 10000 Series SPA Interface Processor-600 jackets and eight Cisco 3 Gbps Wideband Shared Port Adapters. In both the three 1G mode and one 10G mode, each Cisco 3 Gbps Wideband Shared Port Adapter card supports up to 72 RF channels and hence a total of 576 RF channels are supported with eight Cisco 3 Gbps Wideband Shared Port Adapters.



Note For annex A and 256 QAM, each Cisco 3 Gbps Wideband Shared Port Adapter in the three 1G mode support up to 18 RF channels with fully loaded traffic per Gigabit Ethernet port and hence a total of 54 RF channels per Cisco 3 Gbps Wideband Shared Port Adapter card. In the one 10G mode, 54 RF channels are supported. If the RF channels do not run with fully loaded traffic, 24 RF channels can be configured per Gigabit Ethernet port in the three 1G mode or 72 RF channels can be configured on the 10G port.



Note For license information, see the [Software License Activation on Cisco CMTS Routers](#) document.



Note Effective with Cisco IOS Release 12.2(33)SCI, the Cisco 3 Gbps Wideband Shared Port Adapter FPD image can be upgraded to configure it as a Cisco 6 Gbps Wideband Shared Port Adapter. For more information, see [Cisco uBR10012 Universal Broadband Router SIP and SPA Software Configuration Guide](#).

Cisco 3 Gbps Wideband Shared Port Adapter Features

- Single-wide, half-height SPA form factor.
- The base hostboard is Cisco 10000 Series SPA Interface Processor-600.
- Each Cisco 10000 Series SPA Interface Processor-600 jacket can host four Cisco 3 Gbps Wideband Shared Port Adapter cards.

- Works in two physical modes; three 1G or one 10G (with a second redundant 10G port).



Note In the Cisco IOS Release 12.2(33)SCH, the one 10G port on the Cisco 3 Gbps Wideband Shared Port Adapter card is used for SFP+.

- In three 1G mode, the Cisco 3 Gbps Wideband Shared Port Adapter card provides DOCSIS 3.0 Channel Bonding for up to 96 Wideband interfaces spread across up to 72 RF channels in external QAM upconverter(s).



Note For license information, refer to [Software License Activation on Cisco CMTS Routers](#) document.

- Oversubscribing the GigE is supported such that you can connect more than 18 Annex A channels per GigE if required. For annex A and 256 QAM, each Cisco 3 Gbps Wideband Shared Port Adapter in the three 1G mode support up to 18 RF channels per Gigabit Ethernet port and hence a total of 54 RF channels per Cisco 3 Gbps Wideband Shared Port Adapter card. In the one 10G mode, 54 RF channels are supported.
- Works with PRE5.
- Interoperates with Cisco uBR-MC20X20V, Cisco uBR-MC3GX60V, Cisco RF Gateway 10 DS-384, Cisco RF Gateway DS-48 line cards or any Cisco qualified EQAM device.
- The Cisco 3 Gbps Wideband Shared Port Adapter card, Cisco Wideband SPA card, and Gigabit Ethernet SPA cards can coexist in a single Cisco 10000 Series SPA Interface Processor-600 jacket.
- Supports:
 - Cisco Wideband Cable for DOCSIS Network.
 - Traditional DOCSIS 1.x/2.0 upstream channels.
 - Primary-capable SPA downstream channels.
 - DOCSIS 1.x/2.0 modem support on primary-capable SPA downstream channels.
 - DOCSIS 1.x/2.0 modem support and legacy features on primary-capable SPA downstream channels.
 - Extensible MAC domain support via Channel Grouping Domain.
 - 64 QAM and 256 QAM downstream modulation formats.
 - 6 MHz and 8 MHz.
 - Euro-DOCSIS and J-DOCSIS.
 - Baseline Privacy Interface(BPI)/BPI+ encryption.
 - Triple Data Encryption Standard (3DES) and Advanced Encryption Standard (AES) encryptions.
 - MIBs.
 - Online insertion and removal (OIR).
 - Multipoint Bridging.

- Cisco IOS command set for wideband-channel configuration, provisioning, and maintenance.
 - Cisco IOS command set for wideband channel hardware monitoring, troubleshooting, and debugging.
 - Two small form-factor pluggable plus (SFP+) ports and one small form-factor pluggable (SFP) port are available on the front panel. The SFP+ ports can function as an SFP port.
- SFP modules supported include:
 - GLC-SX-MMD
 - GLC-LH-SMD
 - GLC-ZX-SMD
 - SFP-GE-T (1000Base-T)
 - SFP+ modules supported include:
 - SFP-10G-SR-X
 - SFP-10G-LR-X

For more information on the SFP and SFP+ modules, see the [Cisco uBR10012 Universal Broadband Router SIP and SPA Hardware Installation Guide](#).

Restrictions for Cisco 3 Gbps Wideband Shared Port Adapter

- Not compatible with PRE2 and PRE4.
- The three 1G ports do not have redundant ports.
- The general WAN interface supported features cannot be configured on DEPI interface.
- The three 1G mode of the SPA does not support VLAN.
- Only three source IP addresses can be configured and hence in the one 10G mode, the maximum number of subinterface that can be configured is three.
- DEPI interface does not support MQC or ACL related features.
- In the three 1G mode, only one DEPI mode can be configured on the RF channels on one controller; either static or dynamic.
- Only six DEPI tunnels can be configured per controller.
- Port Channel configuration is not supported on Gigabit Ethernet interface of Cisco 3 Gbps Wideband Shared Port Adapter

MIBs Supported on Cisco 3 Gbps Wideband Shared Port Adapter

The following MIBs have been modified for Cisco IOS Release 12.2(33)SCH:

- CISCO-ENTITY-VENDORTYPE-OID-MIB

- CISCO-ENVMON-MIB
- ENTITY-MIB
- IF-MIB

For more information about MIB support on a Cisco uBR10012 router, see the Cisco CMTS Universal Broadband Router MIB Specifications Guide at the following URL:

http://www.cisco.com/en/US/docs/cable/cmts/mib/12_2sc/reference/guide/ubrmibv5.html

For information about MIBs associated with edge QAM devices or wideband cable modems, see the vendor documentation.

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<https://tools.cisco.com/RPF/register/register.do>

Displaying Cisco 3 Gbps Wideband Shared Port Adapter Information

To verify the SPA type installed on your Cisco uBR10012 router, use the **show diag** command.



Note

With Cisco IOS commands, the Cisco 3 Gbps Wideband Shared Port Adapter Gigabit Ethernet ports are not standard user-configurable interfaces and do not appear in the output of the **show interfaces** command.

Use the **show controllers modular-cable** command with the **ge_phy** keyword to get information on the Cisco 3 Gbps Wideband Shared Port Adapter Gigabit Ethernet ports.

SPA	Description in show diag command
Cisco 3 Gbps Wideband Shared Port Adapter	SPA-DOCSIS-HD-V1

The 96 wideband channels on each Cisco 3 Gbps Wideband Shared Port Adapter are similar to cable interfaces and appear in the output of the **show interfaces** command.

The **show hw-module bay** command displays information about the RF channels and wideband channels on a Cisco 3 Gbps Wideband Shared Port Adapter.

Examples of the show diag and show interface wideband-cable Commands

The following example shows output from the **show diag** command on a Cisco uBR10012 router with a Cisco 3 Gbps Wideband Shared Port Adapter installed in slot 1, subslot 0.

Router# **show diag 1/0**

```
Slot 1:
 4jacket-1 card, 0 ports
 Card is full slot size
 Card is analyzed
 Card detected 01:09:58 ago
 Card uptime 0 days, 1 hours, 9 minutes, 57 seconds
 Card idle time 0 days, 1 hours, 1 minutes, 53 seconds
 Voltage status:
 EEPROM contents, slot 1/0:
   Controller Type       : 1380
   Hardware Revision    : 1.0
   PCB Part Number      : 73-10771-02
   Board Revision       : D0
   Deviation Number     : 0-0
   Fab Version          : 03
   PCB Serial Number    : CAT1438F01K
   RMA Test History     : 00
   RMA Number           : 0-0-0-0
   RMA History          : 00
   Top Assy. Part Number : 800-27953-03
   CLEI Code            : IPUA7TRAA
   Product Identifier (PID) : 10000-SIP-600
   Version Identifier (VID) : V01
 LCMON version, slot 1/0
   LCDOS (LATEST-BOOT : DEVELOPMENT BUILD jkotelly-mayflower_lc_0628 /vob/1
   cdos/obj-cl0k-pq3-lcmon 114)
   Built by jkotelly at Mon Jul 16 14:00:18 2007.
   Reset reason 0x00000008 (PRE hard reset).
 Operational Image version, slot 1/0
   LCDOS (C10000 4 SPA Jacket Card Image (Spumoni) : DEVELOPMENT BUILD dasz
   hang-license_lc /vob/lcdos/obj-cl0k-spumoni 102) major version 1357881885.
   Built by daszhang at Thu Jan 10 21:26:42 2013.
   SW Version 1.1
   Code MD5 D266CF60F88DD7A0408C105F7BA8AB32
   FPGA MD5 89C8DD3DCD939BDD43DB19D514416137
   Expected Switchover Action: NO INFORMATION
   ECC 1 bit errors since last cleared (dd hh mm ss) = 0 (0 days, 0 hours, 0 minutes,
   0 seconds)
   ECC 1 bit errors while up (total) = 0
   Number of crashdumps recorded = 1

 SPA Information:
 bay 1/0      SPA-UBR10-DS-HD      ok

 SW Version 1.0
 SW Version 1.0
 Expected Switchover Action: NO INFORMATION
 Product Identifier (PID) : SPA-UBR10-DS-HD
 Version Identifier (VID) : V01
 PCB Serial Number       : CAT1635E0W6
 Top Assy. Revision      : 02
 Hardware Revision       : 1.1
 CLEI Code               :
 The Transceiver in slot 1 subslot 0 port 0 is ENABLED.
 No Transceiver in slot 1 subslot 0 port 1 .
 The Transceiver in slot 1 subslot 0 port 2 is ENABLED.
 Wideband Information:
 slot/bay 1/0:
 SPA-DOCSIS-HD-V1 card, 3 port + 0 redundant port
 Card is half slot size
 Card is analyzed
 Card detected 01:09:57 ago
 Card uptime: Not Supported
 Card idle time: Not Supported
```

```

Voltage status:
VP12V_SPA_MON      (+11.909)v          VP3P6_MON      (+3.595)v
                   VP2P5_MON      (+2.502)v          VF1P25_MON     (+1.250)v
                   SPA_AUX_MON     (+3.270)v          ADM1166_2_OK   (+2.048)v
                   PWR_EN          (+2.048)v          VP1P0_MON      (+1.014)v
                   VCCINT_MON     (+0.999)v          ADM1166_2_DOWN (+2.048)v
VP12V_SPA_MON      (+11.909)v          VP3P3_MON      (+3.303)v
                   VP1P8_MON      (+1.802)v          VP1P5_MON      (+1.497)v
                   MGTAVTT_MON     (+1.197)v          MGTAVCC_MON    (+0.997)v
                   VTT_MON          (+0.735)v          PLL_STATUS     (+0.005)v
                   PLL_LD          (+2.048)v          ADM1166_2_EN   (+2.048)v

License              : 0
Licensing Transaction ID : 59040
Ordered PID          : SWLIC-SPA-HD-DS-16115360
EEPROM contents, slot/bay 1/0 :
Controller Type      : 2938
Hardware Revision    : 1.1
Boot Timeout         : 500 msec
PCB Serial Number    : CAT1635E0W6
PCB Part Number      : 73-15030-01
PCB Revision         : 06
Fab Version          : 01
RMA Test History     : 00
RMA Number           : 0-0-0-0
RMA History          : 00
Deviation Number     : 0
Product Identifier (PID) : SPA-UBR10-DS-HD
Version Identifier (VID) : V01
Top Assy. Part Number : 800-38945-01
Top Assy. Revision    : 02
IDPRM Format Revision : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
                      : 00 00 00 00 00 00 00 00
                      : 00 00 00 00 00 00

CLEI Code            :
Base MAC Address     : 00 00 00 00 00 00
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data     : Minimum: 0 dBmV, Maximum: 0 dBmV
Calibration values   :
Power Consumption    : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 2E E0 46 32 09 C4
                      : 46 32 0C E4 46 32 03 E8
                      : 46 1E 03 E8 46 1E 2E E0
                      : 46 32 0C E4 46 32 07 08
                      : 46 32 05 DC 46 32 04 B0
                      : 46 19 03 E8 46 1E 02 EE
                      : 46 32 FE 02 EF 64
Processor Label      : 00 00 00 00 00 00 00 00
Platform features    : 00 00 00 00 00 00 00 00
                      : 00 00 00 00 00 00 00 00
                      : 00 00 00 00 00 00 00 00
                      : 00 00 00 00 00 00 00 00
Asset ID             : P1B-62B
Asset Alias          :
    
```

The following **show interface wideband-cable** command displays information about the cable interface for wideband channel 1 on the Cisco 3 Gbps Wideband Shared Port Adapter located in slot 1, subslot 0.

Router# **show interface wideband-cable 1/0/0:1**

```
Wideband-Cable1/0/0:1 is up, line protocol is up
  Hardware is Wideband CMTS Cable interface, address is 001a.2f8a.df10 (bia 001a
.2f8a.df10)
  MTU 1500 bytes, BW 75000 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 Wideband-Cable1/0/0:1 queueing strategy: PXF Class-based
  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
  ...
```




Configuring the Cisco 3 Gbps Wideband Shared Port Adapter

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- [Specifying Narrowband Channels](#), page 131
- [Specifying Wideband Channels](#), page 132
- [Preprovisioning of the Cisco 3 Gbps Wideband Shared Port Adapter and a SIP](#), page 133
- [Entering Controller Configuration Mode for the Cisco 3 Gbps Wideband Shared Port Adapter](#), page 133
- [Completing Required and Optional Wideband-Related Configuration Tasks](#), page 133
- [Cisco 3 Gbps Wideband Shared Port Adapter Configuration Examples](#), page 133

Specifying the Location for the Cisco 3 Gbps Wideband Shared Port Adapter

For information on specifying the location of a Cisco 3 Gbps Wideband Shared Port Adapter, see the [Identifying the Location of a Cisco 10000 Series SPA Interface Processor-600](#) section.

Specifying Narrowband Channels

A modular-cable interface is a narrowband interface associated with one downstream RF channel of the SPA. The same RF channel may be associated with an entirely independent bonding group, and the RF channel could be sharing RF bandwidth with this bonding group.

At the Cisco IOS command line, use the **interface modular-cable** command to specify a narrowband channel.

Modular cable interfaces are similar to the downstream portion of cable interfaces and are displayed in the output of commands such as **show ip interface**, **show interfaces**, **show interface modular-cable**, and **show running-config**.

The following is sample output for the **show interface** command for a modular-cable interface:

```
Router# show interfaces modular-Cable 1/0/0:0

Modular-Cable1/0/0:0 is up, line protocol is up
  Hardware is CMTS MC interface, address is 001a.2f8a.df10 (bia 001a.2f8a.df10)
  MTU 1464 bytes, BW 37500 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 00:00:09, 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 Modular-Cable1/0/0:0 queueing strategy: PXF Class-based
  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
    95 packets output, 10434 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
```

Specifying Wideband Channels

At the Cisco IOS command line, the **interface wideband-cable** command is used to specify a wideband channel.

Wideband channels are similar to cable interfaces and are displayed in the output of commands such as **show ip interface**, **show interfaces**, and **show interface wideband-cable**. For example:

```
Router# show interface wideband-cable 1/0/0:1

Wideband-Cable1/0/0:1 is up, line protocol is up
  Hardware is Wideband CMTS Cable interface, address is 001a.2f8a.df10 (bia 001a
.2f8a.df10)
  MTU 1500 bytes, BW 75000 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 Wideband-Cable1/0/0:1 queueing strategy: PXF Class-based
  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
...

```

Preprovisioning of the Cisco 3 Gbps Wideband Shared Port Adapter and a SIP

Preprovisioning is an optional configuration task for the Cisco 3 Gbps Wideband Shared Port Adapter on a SIP. Preprovisioning on the Cisco uBR10012 router allows you to configure the SIP and Cisco 3 Gbps Wideband Shared Port Adapter without their physical presence.

For information on preprovisioning the Cisco 3 Gbps Wideband Shared Port Adapter and a SIP, see the [Optional Configuration Task for the Cisco 10000 Series SPA Interface Processor-600 and the SPAs](#) section.

Entering Controller Configuration Mode for the Cisco 3 Gbps Wideband Shared Port Adapter

The Cisco 3 Gbps Wideband Shared Port Adapter is represented in the Cisco IOS software as a controller. Enable controller configuration by preprovisioning the Cisco 3 Gbps Wideband Shared Port Adapter using the **card** command or by physically inserting the Cisco 3 Gbps Wideband Shared Port Adapter in the SIP.

The following is an example of the **card** command:

- **card 1/0 SPA-DOCSIS-HD-V1 1x10GE license 1**
- **card 1/0 SPA-DOCSIS-HD-V1 3x1GE license 71**

To enter controller configuration mode for the Cisco 3 Gbps Wideband Shared Port Adapter, use the **controller modular-cable** command. Most Cisco 3 Gbps Wideband Shared Port Adapter configuration tasks are performed in controller configuration mode.

Completing Required and Optional Wideband-Related Configuration Tasks

For information on the required and optional wideband-related configuration tasks, see the [Configuring the Cisco Wideband SPA](#) chapter.

Cisco 3 Gbps Wideband Shared Port Adapter Configuration Examples

Controller Configuration

The following example shows the configuration for the controller of the Cisco 3 Gbps Wideband Shared Port Adapter located in slot 1, subslot 0, bay 0.

```
controller Modular-Cable 1/0/0
modular-host subslot 7/0
rf-channel 0 cable downstream channel-id 193
```

```

rf-channel 0 frequency 555000000 annex B modulation 256qam interleave 32
rf-channel 0 depi-tunnel RFGW10-LC3-13 tsid 10000
no rf-channel 0 rf-shutdown
rf-channel 1 cable downstream channel-id 194
rf-channel 1 frequency 561000000 annex B modulation 256qam interleave 32
rf-channel 1 depi-tunnel RFGW10-LC3-13 tsid 10001
no rf-channel 1 rf-shutdown
rf-channel 2 cable downstream channel-id 195
rf-channel 2 frequency 567000000 annex B modulation 256qam interleave 32
rf-channel 2 depi-tunnel RFGW10-LC3-13 tsid 10002
no rf-channel 2 rf-shutdown
rf-channel 3 cable downstream channel-id 196
rf-channel 3 frequency 573000000 annex B modulation 256qam interleave 32
rf-channel 3 depi-tunnel RFGW10-LC3-13 tsid 10003
no rf-channel 3 rf-shutdown
rf-channel 4 cable downstream channel-id 197
rf-channel 4 frequency 579000000 annex B modulation 256qam interleave 32
rf-channel 4 depi-tunnel RFGW10-LC3-13 tsid 10004
no rf-channel 4 rf-shutdown
rf-channel 5 cable downstream channel-id 198
rf-channel 5 frequency 585000000 annex B modulation 256qam interleave 32
rf-channel 5 depi-tunnel RFGW10-LC3-13 tsid 10005
no rf-channel 5 rf-shutdown
rf-channel 6 cable downstream channel-id 199
rf-channel 6 frequency 591000000 annex B modulation 256qam interleave 32
rf-channel 6 depi-tunnel RFGW10-LC3-13 tsid 10006
no rf-channel 6 rf-shutdown
rf-channel 7 cable downstream channel-id 200
rf-channel 7 frequency 597000000 annex B modulation 256qam interleave 32
rf-channel 7 depi-tunnel RFGW10-LC3-13 tsid 10007
no rf-channel 7 rf-shutdown
rf-channel 8 cable downstream channel-id 201
rf-channel 8 frequency 603000000 annex B modulation 256qam interleave 32
rf-channel 8 depi-tunnel RFGW10-LC3-13 tsid 10008
no rf-channel 8 rf-shutdown
rf-channel 9 cable downstream channel-id 202
rf-channel 9 frequency 609000000 annex B modulation 256qam interleave 32
rf-channel 9 depi-tunnel RFGW10-LC3-13 tsid 10009
no rf-channel 9 rf-shutdown
rf-channel 10 cable downstream channel-id 203
rf-channel 10 frequency 615000000 annex B modulation 256qam interleave 32
rf-channel 10 depi-tunnel RFGW10-LC3-13 tsid 10010
no rf-channel 10 rf-shutdown
rf-channel 11 cable downstream channel-id 204
rf-channel 11 frequency 621000000 annex B modulation 256qam interleave 32
rf-channel 11 depi-tunnel RFGW10-LC3-13 tsid 10011
no rf-channel 11 rf-shutdown
rf-channel 12 cable downstream channel-id 205
rf-channel 12 frequency 627000000 annex B modulation 256qam interleave 32
rf-channel 12 depi-tunnel RFGW10-LC3-13 tsid 10012
no rf-channel 12 rf-shutdown
rf-channel 13 cable downstream channel-id 206
rf-channel 13 frequency 633000000 annex B modulation 256qam interleave 32
rf-channel 13 depi-tunnel RFGW10-LC3-13 tsid 10013
no rf-channel 13 rf-shutdown
rf-channel 14 cable downstream channel-id 207
rf-channel 14 frequency 639000000 annex B modulation 256qam interleave 32
rf-channel 14 depi-tunnel RFGW10-LC3-13 tsid 10014
no rf-channel 14 rf-shutdown
rf-channel 15 cable downstream channel-id 208
rf-channel 15 frequency 645000000 annex B modulation 256qam interleave 32
rf-channel 15 depi-tunnel RFGW10-LC3-13 tsid 10015
no rf-channel 15 rf-shutdown
rf-channel 16 cable downstream channel-id 209
rf-channel 16 frequency 651000000 annex B modulation 256qam interleave 32
rf-channel 16 depi-tunnel RFGW10-LC3-13 tsid 10016
rf-channel 17 cable downstream channel-id 210
rf-channel 17 frequency 657000000 annex B modulation 256qam interleave 32
rf-channel 17 depi-tunnel RFGW10-LC3-13 tsid 10017
no rf-channel 17 rf-shutdown
rf-channel 18 cable downstream channel-id 211
rf-channel 18 frequency 663000000 annex B modulation 256qam interleave 32
rf-channel 18 depi-tunnel RFGW10-LC3-13 tsid 10018

```

```

no rf-channel 18 rf-shutdown
rf-channel 19 cable downstream channel-id 212
rf-channel 19 frequency 669000000 annex B modulation 256qam interleave 32
rf-channel 19 depi-tunnel RFGW10-LC3-13 tsid 10019
no rf-channel 19 rf-shutdown
rf-channel 20 cable downstream channel-id 213
rf-channel 20 frequency 675000000 annex B modulation 256qam interleave 32
rf-channel 20 depi-tunnel RFGW10-LC3-13 tsid 10020
no rf-channel 20 rf-shutdown
rf-channel 21 cable downstream channel-id 214
rf-channel 21 frequency 681000000 annex B modulation 256qam interleave 32
rf-channel 21 depi-tunnel RFGW10-LC3-13 tsid 10021
no rf-channel 21 rf-shutdown
rf-channel 22 cable downstream channel-id 215
rf-channel 22 frequency 687000000 annex B modulation 256qam interleave 32
rf-channel 22 depi-tunnel RFGW10-LC3-13 tsid 10022
no rf-channel 22 rf-shutdown
rf-channel 23 cable downstream channel-id 216
rf-channel 23 frequency 693000000 annex B modulation 256qam interleave 32
rf-channel 23 depi-tunnel RFGW10-LC3-13 tsid 10023
no rf-channel 23 rf-shutdown
!

```

Wideband Channel Configuration

The following example shows how a wideband channel is configured. In this example, the wideband channel Wideband-Cable1/0/1:1 is a member of virtual bundle interface 1.

```

interface Wideband-Cable1/0/1:1
 cable bundle 1
 cable rf-channel 0 bandwidth-percent 20
 cable rf-channel 1 bandwidth-percent 20
 cable rf-channel 2 bandwidth-percent 20
 cable rf-channel 3 bandwidth-percent 20
 cable downstream attribute-mask 80000001
!

```

Virtual Bundle Configuration

The wideband channel and its associated primary channels on the fiber node must belong to the same virtual bundle interface. The following example shows how virtual bundle interface 1 is configured.

```

interface Bundle1
 ip address 40.87.0.1 255.255.0.0 secondary
 ip address 40.86.0.1 255.255.0.0
 ip pim sparse-dense-mode
 ip igmp static-group 225.0.0.1
 cable arp filter request-send 3 2
 cable arp filter reply-accept 3 2
 cable ipv6 source-verify
 cable dhcp-giaddr policy
 cable helper-address 20.1.0.3
 ipv6 address 2001:40:0:80::1/64
 ipv6 enable
 ipv6 nd managed-config-flag
 ipv6 nd other-config-flag
 ipv6 dhcp relay destination 2001:20:1:1:FA66:F2FF:FE22:FC27
!

```

Cable Fiber Node Configuration

The following example shows how cable fiber node 1 is configured.

```

cable fiber-node 1
 downstream Integrated-Cable 1/0/0 rf-channel 0-3
 downstream Integrated-Cable 1/0/1 rf-channel 0-3
 upstream Cable 5/0 connector 0-3

```

Channel Grouping Domain Configuration

The following example shows how the primary downstream channel located at slot/subslot/port 5/0/0 is configured. In this example, the primary downstream channel is a member of virtual bundle interface (cable bundle) 1 (as are the wideband channels on the fiber node, such as the wideband channel Wideband-Cable1/0/0:0).

```
interface Cable5/0/0
  no cable packet-cache
  cable upstream max-ports 4
  cable upstream 0 connector 0
  cable upstream 0 channel-width 1600000 1600000
  cable upstream 0 docsis-mode atdma
  cable upstream 0 minislot-size 4
  cable upstream 0 range-backoff 3 6
  cable upstream 0 modulation-profile 221
  cable upstream 0 shutdown
  cable upstream 1 connector 1
  cable upstream 1 channel-width 1600000 1600000
  cable upstream 1 docsis-mode atdma
  cable upstream 1 minislot-size 4
  cable upstream 1 range-backoff 3 6
  cable upstream 1 modulation-profile 221
  cable upstream 1 shutdown
  cable upstream 2 connector 2
  cable upstream 2 channel-width 1600000 1600000
  cable upstream 2 docsis-mode atdma
  cable upstream 2 minislot-size 4
  cable upstream 2 range-backoff 3 6
  cable upstream 2 modulation-profile 221
  cable upstream 2 shutdown
  cable upstream 3 connector 3
```

Modular Cable Interface Configuration

The following example shows how a modular cable interface is configured. In this example, the modular cable interface slot/subslot/bay:narrowband channel 1/0/0:2 is configured. The **cable rf-bandwidth-percent** command specifies that 40 percent of the bandwidth is reserved for this interface.

```
interface Modular-Cable1/0/0:3
  cable bundle 1
  cable rf-bandwidth-percent 10
  !
```

Wideband Cable Interface Configuration

The example below shows a three-channel wideband cable interface using Cisco uBR-MC3GX60V local downstream as the primary downstream. In this example, cable rf-channel 0, cable rf-channel 1, and cable rf-channel 2 are added to the wideband cable interface slot/subslot/bay: wideband channel 1/0/0:0. This wideband interface is capable of 3-channel bonding as well a 2-channel bonding.

```
interface Wideband-Cable1/0/0:0
  cable bundle 1
  cable rf-channel 0 bandwidth-percent 20
  cable rf-channel 1 bandwidth-percent 20
  cable rf-channel 2 bandwidth-percent 50
  cable downstream attribute-mask 80000002
```

The example below shows a modular-cable interface capable of registering narrowband modems on a SPA RF channel.

```
interface Cable5/0/0
  downstream Modular-Cable 1/0/1 rf-channel 2 upstream 0-1 4-5
  no cable packet-cache
  cable upstream max-ports 4
```

```
cable upstream 0 connector 0
cable upstream 0 channel-width 1600000 1600000
cable upstream 0 docsis-mode atdma
cable upstream 0 minislots-size 4
cable upstream 0 range-backoff 3 6
cable upstream 0 modulation-profile 221
cable upstream 0 shutdown
cable upstream 1 connector 1
cable upstream 1 docsis-mode atdma
cable upstream 1 minislots-size 4
cable upstream 1 range-backoff 3 6
cable upstream 1 modulation-profile 221
cable upstream 1 shutdown
cable upstream 2 connector 2
cable upstream 2 channel-width 1600000 1600000
cable upstream 2 docsis-mode atdma
cable upstream 2 minislots-size 4
cable upstream 2 range-backoff 3 6
cable upstream 2 modulation-profile 221
cable upstream 2 shutdown
cable upstream 3 connector 3
cable upstream 3 channel-width 1600000 1600000
cable upstream 3 docsis-mode atdma
cable upstream 3 minislots-size 4
cable upstream 3 range-backoff 3 6
cable upstream 3 modulation-profile 221
cable upstream 3 shutdown
```




Troubleshooting the Cisco 3 Gbps Wideband Shared Port Adapter

- [Interpreting Console Error Messages](#), page 139
- [Using show Commands to Troubleshoot the SPA](#), page 139
- [Troubleshooting SPA-to-EQAM Communication Problems](#), page 142
- [Troubleshooting the Cisco 3 Gbps Wideband Shared Port Adapter Problems After RMA](#), page 143

Interpreting Console Error Messages

To view the explanations and recommended actions for Cisco uBR10012 router error messages, including messages related to SPAs, see the [Cisco IOS CMTS Cable System Messages Guide](#).

System error messages are organized in the documentation according to the particular system facility that produces the messages. The Cisco 3 Gbps Wideband Shared Port Adapter error messages use the facility name SPAWBCMTS.

Using show Commands to Troubleshoot the SPA

Following are the **show** commands used to verify and monitor the SPA:

- **show cable mac-domain downstream-service-group**
- **show controllers modular-cable**
- **show hw-module bay**
- **show hw-module bay oir**
- **show interface wideband-cable**

Verifying the Cisco 3 Gbps Wideband Shared Port Adapter Configuration

In addition to using the show running-configuration command to display your router configuration settings, you can use a variety of commands to display information about the Cisco 3 Gbps Wideband Shared Port Adapter including:

- Cisco 3 Gbps Wideband Shared Port Adapter configuration
- Wideband channels and RF channels
- Wideband-channel cable interfaces

Router# **show controllers modular-cable 1/0/0 brief**

```
SPA 0 is present
status LED: [green]
Host 12V is enabled and is okay.
Power has been enabled to the SPA.
SPA reports power enabled and okay.
SPA reports it is okay and is NOT held in reset.

SFP [Port 0] : 1000BASE-T Present
Tx Enabled , LOS Not Detected , TxFault Not Detected
Link Status [Port 0] : UP

SFP [Port 1] : Not Present
Tx Not Enabled , LOS Not Detected , TxFault Not Detected
Link Status [Port 1] : DOWN

SFP [Port 2] : 1000BASE-LX Present
Tx Enabled , LOS Detected , TxFault Not Detected
Link Status [Port 2] : DOWN
```

```
Wideband Channel information
Channel RF bitmap Police Info: Bytes Interval
0          0x0          0x0    0x0    0 0 ms
1          0x0          0x0    0x0    0 0 ms
2          0x0          0x0    0x0    0 0 ms
3          0x0          0x0    0x0    0 0 ms
4          0x0          0x0    0x0    0 0 ms
...
...
94         0x0          0x0    0x0    0 0 ms
95         0x0          0x0    0x0    0 0 ms
```

```
RF Channel information
Modulation Data :GE Interframe Gap = 12
SPA IP address = 11.1.1.1          SPA MAC Addr = 001A.2F8A.DF10
QAM  MOD   ANNEX  TKB Interval  Rate adjust  State
0    QAM 256 Annex B 145          27           Enabled
1    QAM 256 Annex B 145          27           Enabled
2    QAM 256 Annex B 145          27           Enabled
3    QAM 256 Annex B 145          27           Enabled
4    QAM 256 Annex B 145          27           Enabled
5    QAM 256 Annex B 145          27           Enabled
6    QAM 256 Annex B 145          27           Enabled
7    QAM 256 Annex B 145          27           Enabled
8    QAM 256 Annex B 145          27           Enabled
9    QAM 256 Annex B 145          27           Enabled
10   QAM 256 Annex B 145          27           Enabled
11   QAM 256 Annex B 145          27           Enabled
12   QAM 256 Annex B 145          27           Enabled
13   QAM 256 Annex B 145          27           Enabled
14   QAM 256 Annex B 145          27           Enabled
15   QAM 256 Annex B 145          27           Enabled
16   QAM 256 Annex B 145          27           Enabled
17   QAM 256 Annex B 145          27           Enabled
```

```

18      QAM 256 Annex B 145      27      Enabled
19      QAM 256 Annex B 145      27      Enabled
20      QAM 256 Annex B 145      27      Enabled
21      QAM 256 Annex B 145      27      Enabled
22      QAM 256 Annex B 145      27      Enabled
23      QAM 256 Annex B 145      27      Enabled
Modulation Data :GE Interframe Gap = 12
SPA IP address = 0.0.0.0          SPA MAC Addr = 001A.2F8A.DF11
QAM   MOD   ANNEX   TKB Interval  Rate adjust  State
24    QAM 64  Annex B 209      51      Enabled
25    QAM 64  Annex B 209      51      Enabled
26    QAM 64  Annex B 209      51      Enabled
27    QAM 64  Annex B 209      51      Enabled
28    QAM 64  Annex B 209      51      Enabled
29    QAM 64  Annex B 209      51      Enabled
30    QAM 64  Annex B 209      51      Enabled
31    QAM 64  Annex B 209      51      Enabled
32    QAM 64  Annex B 209      51      Enabled
33    QAM 64  Annex B 209      51      Enabled
34    QAM 64  Annex B 209      51      Enabled
35    QAM 64  Annex B 209      51      Enabled
36    QAM 64  Annex B 209      51      Enabled
37    QAM 64  Annex B 209      51      Enabled
38    QAM 64  Annex B 209      51      Enabled
39    QAM 64  Annex B 209      51      Enabled
40    QAM 64  Annex B 209      51      Enabled
41    QAM 64  Annex B 209      51      Enabled
42    QAM 64  Annex B 209      51      Enabled
43    QAM 64  Annex B 209      51      Enabled
44    QAM 64  Annex B 209      51      Enabled
45    QAM 64  Annex B 209      51      Enabled
46    QAM 64  Annex B 209      51      Enabled
47    QAM 64  Annex B 209      51      Enabled
Modulation Data :GE Interframe Gap = 12
SPA IP address = 0.0.0.0          SPA MAC Addr = 001A.2F8A.DF12
QAM   MOD   ANNEX   TKB Interval  Rate adjust  State
48    QAM 64  Annex B 209      51      Enabled
49    QAM 64  Annex B 209      51      Enabled
50    QAM 64  Annex B 209      51      Enabled
51    QAM 64  Annex B 209      51      Enabled
52    QAM 64  Annex B 209      51      Enabled
53    QAM 64  Annex B 209      51      Enabled
54    QAM 64  Annex B 209      51      Enabled
55    QAM 64  Annex B 209      51      Enabled
56    QAM 64  Annex B 209      51      Enabled
57    QAM 64  Annex B 209      51      Enabled
58    QAM 64  Annex B 209      51      Enabled
59    QAM 64  Annex B 209      51      Enabled
60    QAM 64  Annex B 209      51      Enabled
61    QAM 64  Annex B 209      51      Enabled
62    QAM 64  Annex B 209      51      Enabled
63    QAM 64  Annex B 209      51      Enabled
64    QAM 64  Annex B 209      51      Enabled
65    QAM 64  Annex B 209      51      Enabled
66    QAM 64  Annex B 209      51      Enabled
67    QAM 64  Annex B 209      51      Enabled
68    QAM 64  Annex B 209      51      Enabled
69    QAM 64  Annex B 209      51      Enabled
70    QAM 64  Annex B 209      51      Enabled
71    QAM 64  Annex B 209      51      Enabled

```

```

Interrupt Counts
WESTLAKE SEU Interrupt:-----
WESTLAKE SEU Interrupt Count = 0
Last SEU Interrupt Data = 0x00000000

```

```

Westlake Subslot 1/0 interrupt events counters:
Current Total Bursts Event name
1      1      0 Tx SPI: In Frame
2      2      0 SAN EGRESS NF: Switch Change - Port 1
49    349    0 SAN INGRESS NF: rx_gmac1_err

```

Verifying RF Channel Configuration

The following is a sample output of the **show hw-module bay** command for RF channel 0 in the Cisco 3 Gbps Wideband Shared Port Adapter located in slot 1, subslot 0, and bay 0 of a Cisco uBR10012 router.

```
Router# show hw-module bay 1/0/0 config rf-channel 0 verbose
```

```
SPA                               : Modular-Cable 1/0/0
RF channel number                  : 0
Frequency                          : 555000000 Hz
Modulation                         : 256qam
Annex                              : B
IP address of next hop             : 11.1.1.2
MAC address of EQAM                : 30e4.db05.2b7f
UDP port number                    : 0
EQAM headroom                      : 0

SPA                               : Modular-Cable 1/0/1
RF channel number                  : 0
Frequency                          : 0 Hz
Modulation                         : 256qam
Annex                              : B
IP address of next hop             : 0.0.0.0
MAC address of EQAM                : 0000.0000.0000
UDP port number                    : 0
EQAM headroom                      : 0

SPA                               : Modular-Cable 1/0/2
RF channel number                  : 0
Frequency                          : 0 Hz
Modulation                         : 256qam
Annex                              : B
IP address of next hop             : 0.0.0.0
MAC address of EQAM                : 0000.0000.0000
UDP port number                    : 0
EQAM headroom                      : 0
```

Verifying Fiber Node Configuration

The following example provides sample **show cable fiber-node** output for cable fiber node 1:

```
Router# show cable fiber-node 1
```

```
Fiber-Node 1
Channel(s)   : downstream Integrated-Cable 1/0/0: 0-3
Channel ID(s): 97, 98, 99, 100
Channel(s)   : downstream Integrated-Cable 1/0/1: 0-3
Channel ID(s): 101, 102, 103, 104
upstream Cable 1/0: 0-3
  FN Config Status: Configured (status flags = 0x01)
  MDD Status: Valid
```

Troubleshooting SPA-to-EQAM Communication Problems

If a Cisco 3 Gbps Wideband Shared Port Adapter is unable to communicate with an edge QAM device, use the **rf-channel** command to check whether the RF channels set match the values required by the edge QAM device. The following example shows how to use the **show hw-module bay** command to see the values that have been configured for an RF channel.

```
Router# show hw-module bay 1/0/0 config rf-channel 0 verbose
```

```
SPA                               : Wideband-Cable 1/0/0
RF channel number                 : 0
Frequency                         : 699000000 Hz
Modulation                       : 64qam
Annex                             : B
IP address                       : 192.168.200.30
MAC address of EQAM              : 000c.3033.2cbf
UDP port number                   : 49152
EQAM headroom                    : 0
```

Check that the following values are correct and match what is configured on the edge QAM device:

- Frequency—The center frequency for this RF channel.
- IP address —The IP address of the edge QAM device for this RF channel.
- MAC address —The MAC address of a next-hop router or edge QAM device for this RF channel.
- UDP port—The UDP port number for the QAM output port for this RF channel.

RF channels are configured using the **rf-channel** command. The following values are used for *mac-address* in the *mac-address* argument:

- If a Gigabit Ethernet router or Layer-3 switch is used between the Cisco Wideband SPA and the edge QAM device, the value specified for *mac-address* is the MAC address for the next-hop interface on the router or Layer-3 switch.
- If a Gigabit Ethernet router or Layer-3 switch is not used, the value specified for *mac-address* is the MAC address for Gigabit Ethernet interface on the edge QAM device.

The UDP port number set for the RF channel allows mapping an input UDP session to a specific QAM output port. Wideband traffic from different Cisco Wideband SPAs cannot be mixed on the same QAM output ports.

Troubleshooting the Cisco 3 Gbps Wideband Shared Port Adapter Problems After RMA

Problem The Cisco 3 Gbps Wideband Shared Port Adapter card does not boot up after the RMA and you cannot upgrade the FPD image to configure it as a Cisco 6 Gbps Wideband Shared Port Adapter.

Possible Cause The running configuration contains the Cisco 6 Gbps Wideband Shared Port Adapter card configurations and a Cisco 3 Gbps Wideband Shared Port Adapter card is installed after the RMA.

Solution Use the **upgrade hw-module subslot slot/subslot rma** command to force the upgrade of the SPA FPD image after the RMA. This command forces the upgrade of the SPA FPD image to ensure that the configured capacity is consistent.



CHAPTER 14

Overview of the Cisco 6 Gbps Wideband Shared Port Adapter

- [Cisco 6 Gbps Wideband Shared Port Adapter Release History](#), page 145
- [Cisco 6 Gbps Wideband Shared Port Adapter Overview](#), page 146
- [Cisco 6 Gbps Wideband Shared Port Adapter Features](#), page 147
- [Restrictions for Cisco 6 Gbps Wideband Shared Port Adapter](#), page 148
- [MIBs Supported on Cisco 6 Gbps Wideband Shared Port Adapter](#), page 149
- [Displaying Cisco 6 Gbps Wideband Shared Port Adapter Information](#), page 149

Cisco 6 Gbps Wideband Shared Port Adapter Release History

Cisco IOS Release	Modification
12.2(33)SCI	<p>Support for the Cisco 6 Gbps Wideband Shared Port Adapter card was introduced.</p> <p>Note In the Cisco IOS Release 12.2(33)SCI, the Cisco 6 Gbps Wideband Shared Port Adapter uses the same hardware as the Cisco 3 Gbps Wideband Shared Port Adapter. Upgrade the software on the field-programmable device (FPD) to the Cisco 3 Gbps Wideband Shared Port Adapter to configure it as a Cisco 6 Gbps Wideband Shared Port Adapter.</p>
12.2(33)SCI1	<p>The Cisco 6 Gbps Wideband Shared Port Adapter card with the new PID SPA-UBR10-DS-6G was introduced.</p>

Cisco 6 Gbps Wideband Shared Port Adapter Overview

The Cisco 6 Gbps Wideband Shared Port Adapter is a single-wide, half-height shared port adapter that provides DOCSIS network formatting to downstream data packets. It is used for only downstream data traffic. The Cisco 6 Gbps Wideband Shared Port Adapter is a key component for the Cisco IOS features, DOCSIS 3.0 Downstream Channel Bonding and DOCSIS M-CMTS network architecture. The base hostboard is the Cisco 10000 Series SPA Interface Processor-600. Each Cisco 10000 Series SPA Interface Processor-600 jacket can host four Cisco 6 Gbps Wideband Shared Port Adapter cards. The Cisco 6 Gbps Wideband Shared Port Adapter has six controllers. The Cisco 6 Gbps Wideband Shared Port Adapter supports only the 10G mode.



Note

In the Cisco IOS Release 12.2(33)SCI, the Cisco 6 Gbps Wideband Shared Port Adapter uses the same hardware as the Cisco 3 Gbps Wideband Shared Port Adapter. Upgrade the software on the field-programmable device (FPD) to the Cisco 3 Gbps Wideband Shared Port Adapter to configure it as a Cisco 6 Gbps Wideband Shared Port Adapter.

Each Cisco 6 Gbps Wideband Shared Port Adapter has three Gigabit Ethernet ports (no redundant port). The first two Gigabit Ethernet ports on the SPA can be used as a 10 Gigabit Ethernet port (one active and one redundant). The Gigabit Ethernet ports are used to send traffic to one or more external edge QAM devices.



Note

The last Gigabit Ethernet port (1G port) cannot be used on the Cisco 6 Gbps Wideband Shared Port Adapter as it does not support the 10G mode.

Figure 4: Cisco 6 Gbps Wideband Shared Port Adapter Faceplate



The Cisco uBR10012 router can support up to two Cisco 10000 Series SPA Interface Processor-600 jackets and eight Cisco 6 Gbps Wideband Shared Port Adapters. Each Cisco 6 Gbps Wideband Shared Port Adapter card supports up to 144 RF channels and hence a total of 1152 RF channels are supported with eight Cisco 6 Gbps Wideband Shared Port Adapters with some level of oversubscription.



Note For annex A and 256 QAM, each Cisco 6 Gbps Wideband Shared Port Adapter in the 10G mode supports up to 20 RF channels with fully loaded traffic per Gigabit Ethernet port and hence a total of 120 RF channels per Cisco 6 Gbps Wideband Shared Port Adapter card. If the RF channels do not run with fully loaded traffic, 144 RF channels can be configured on the 10G port.



Note For license information, see the [Software License Activation on Cisco CMTS Routers](#) document.

Cisco 6 Gbps Wideband Shared Port Adapter Features

- Single-wide, half-height SPA form factor.
- The base hostboard is Cisco 10000 Series SPA Interface Processor-600.
- Each Cisco 10000 Series SPA Interface Processor-600 jacket can host four Cisco 6 Gbps Wideband Shared Port Adapter cards.
- Works in the one 10G mode with a second redundant 10G port.



Note The third 1G port on the Cisco 6 Gbps Wideband Shared Port Adapter is not used.

- Each Cisco 6 Gbps Wideband Shared Port Adapter card supports up to six controllers.
- Oversubscribing the Gigabit Ethernet is supported such that you can connect more than 20 Annex A channels per Gigabit Ethernet if required. For annex A and 256 QAM, each Cisco 6 Gbps Wideband Shared Port Adapter in the one 10G mode, supports 120 RF channels.
- Works with PRE5.
- Interoperates with Cisco uBR-MC20X20V, Cisco uBR-MC3GX60V, Cisco RF Gateway 10 DS-384, Cisco RF Gateway DS-48 line cards or any Cisco qualified EQAM device.
- The Cisco 6 Gbps Wideband Shared Port Adapter, Cisco 3 Gbps Wideband Shared Port Adapter card, Cisco Wideband SPA card, and Gigabit Ethernet SPA cards can coexist in a single Cisco 10000 Series SPA Interface Processor-600 jacket.
- Supports:
 - Cisco Wideband Cable for DOCSIS Network.
 - Traditional DOCSIS 1.x/2.0 upstream channels.
 - Primary-capable SPA downstream channels.
 - DOCSIS 1.x/2.0 modem support on primary-capable SPA downstream channels.
 - DOCSIS 1.x/2.0 modem support and legacy features on primary-capable SPA downstream channels.
 - Extensible MAC domain support via Channel Grouping Domain.
 - 64 QAM and 256 QAM downstream modulation formats.

- 6 MHz and 8 MHz.
 - Euro-DOCSIS and J-DOCSIS.
 - Baseline Privacy Interface(BPI)/BPI+ encryption.
 - Triple Data Encryption Standard (3DES) and Advanced Encryption Standard (AES) encryptions.
 - MIBs.
 - Online insertion and removal (OIR).
 - Multipoint Bridging.
 - Cisco IOS command set for wideband-channel configuration, provisioning, and maintenance.
 - Cisco IOS command set for wideband channel hardware monitoring, troubleshooting, and debugging.
 - Two small form-factor pluggable plus (SFP+) ports are available on the front panel.
- SFP+ modules supported include:
 - SFP-10G-SR-X
 - SFP-10G-LR-X

For more information on the SFP+ modules, see the [Cisco uBR10012 Universal Broadband Router SIP and SPA Hardware Installation Guide](#).

Restrictions for Cisco 6 Gbps Wideband Shared Port Adapter

- Not compatible with PRE2 and PRE4.
- The 1G port on the Cisco 6 Gbps Wideband Shared Port Adapter cannot be used.
- SFP modules are not supported on the Cisco 6 Gbps Wideband Shared Port Adapter.



Note Only SFP+ modules are supported.

- The general WAN interface supported features cannot be configured on DEPI interface.
- Only three source IP addresses can be configured and hence in the one 10G mode, the maximum number of subinterface that can be configured is three.
- DEPI interface does not support MQC or ACL related features.
- Only six DEPI tunnels can be configured per controller.
- Port Channel configuration is not supported on Gigabit Ethernet interface of the Cisco 6 Gbps Wideband Shared Port Adapter.
- The six controllers (or 144 rf channels) on the Cisco 6 Gbps Wideband Shared Port Adapter are divided into two groups with 3 controllers each (0 to 2 and 3 to 5). Wideband interfaces on controllers 0 to 2 can only include the RF channels on the controllers 0 to 2, and vice versa. Bonding across the two groups is not supported.

MIBs Supported on Cisco 6 Gbps Wideband Shared Port Adapter

The following MIBs are supported by the Cisco 6 Gbps Wideband Shared Port Adapter on the Cisco uBR10012 router:

- CISCO-ENTITY-VENDORTYPE-OID-MIB
- CISCO-ENVMON-MIB
- ENTITY-MIB
- IF-MIB

For more information about MIB support on a Cisco uBR10012 router, see the Cisco CMTS Universal Broadband Router MIB Specifications Guide at the following URL:

http://www.cisco.com/en/US/docs/cable/cmts/mib/12_2sc/reference/guide/ubrmibv5.html

For information about MIBs associated with edge QAM devices or wideband cable modems, see the vendor documentation.

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<https://tools.cisco.com/RPF/register/register.do>

Displaying Cisco 6 Gbps Wideband Shared Port Adapter Information

To verify the SPA type installed on the Cisco uBR10012 router, use the following commands:

- **show diag**
- **show hw-module subslotslot/subslot fpd | include HD**
- **show running-config | include card**

**Note**

With Cisco IOS commands, the Cisco 6 Gbps Wideband Shared Port Adapter Gigabit Ethernet ports are not standard user-configurable interfaces and do not appear in the output of the **show interfaces** command.

Use the **show controllers modular-cable** command with the **ge_phy** keyword to get information on the Cisco 6 Gbps Wideband Shared Port Adapter Gigabit Ethernet ports.

SPA	Description in show diag command
Cisco 6 Gbps Wideband Shared Port Adapter	SPA-DOCSIS-HD-V1

The 192 wideband channels on each Cisco 6 Gbps Wideband Shared Port Adapter are similar to the cable interfaces and appear in the output of the **show interfaces** command.

The **show hw-module bay** command displays information about the RF channels and wideband channels on a Cisco 6 Gbps Wideband Shared Port Adapter.

The **show interface wideband-cable** command displays information about the cable interfaces for the wideband channels

Examples of the show diag Command

The following example shows output from the **show diag** command on a Cisco uBR10012 router, running Cisco IOS Release 12.2(33)SCI, with a Cisco 6 Gbps Wideband Shared Port Adapter installed in slot 1, subslot 2.

```
Router# show diag 1/0

Slot 1:
 4jacket-1 card, 0 ports
 Card is full slot size
 Card is analyzed
 Card detected 01:23:57 ago
 Card uptime 0 days, 1 hours, 23 minutes, 55 seconds
 Card idle time 0 days, 1 hours, 17 minutes, 48 seconds
 Voltage status:
 EEPROM contents, slot 1/0:
 Controller Type           : 1380
 Hardware Revision        : 1.0
 PCB Part Number          : 73-10771-03
 Board Revision           : A0
 Deviation Number         : 0-0
 Fab Version              : 03
 PCB Serial Number        : CAT1602F0FR
 RMA Test History         : 00
 RMA Number               : 0-0-0-0
 RMA History              : 00
 Top Assy. Part Number    : 800-27953-04
 CLEI Code                : IPUA7TRAB
 Product Identifier (PID) : 10000-SIP-600
 Version Identifier (VID) : V02
 LCMON version, slot 1/0
 LCDOS (LATEST-BOOT : DEVELOPMENT BUILD xxxxxx-mayflower_lc_0628
 /vob/lcdos/obj-c10k-pq3-lcmon 114)
 Built by xxxxxx at Mon Jul 16 14:00:18 2007.
 Reset reason 0x00000008 (PRE hard reset).
 Operational Image version, slot 1/0
 LCDOS (C10000 4 SPA Jacket Card Image (Spumoni) : DEVELOPMENT BUILD
 BLD-v122_33_sci_lc_throttle.lcdos-UNIQ-v122_33_sci_lc_throttle-v122_32_8_24_SCI-v122_33_sci_throttle-20140810_2207-21
 /view/BLD-v122_33_sci_lc_throttle.lcdos-UNIQ-v122_33_sci_lc_throttle
 Built by xxxxxx at Sun Aug 10 22:28:10 2014.
 SW Version 1.1
```

```
Code MD5 88F543721CF42BB65A34A5D0AC6D605E
FPGA MD5 89C8DD3DCD939BDD43DB19D514416137
Expected Switchover Action: NO INFORMATION
ECC 1 bit errors since last cleared (dd hh mm ss) = 0 (0 days, 0 hours, 0 minutes,
0 seconds)
ECC 1 bit errors while up (total) = 0
Number of crashdumps recorded = 1
```

```
SPA Information:
bay 1/2 SPA-UBR10-DS-HD ok
```

```
SW Version 1.0
Expected Switchover Action: NO INFORMATION
Product Identifier (PID) : SPA-UBR10-DS-HD
Version Identifier (VID) : V01
PCB Serial Number : CAT1635E0TW
Top Assy. Revision : 02
Hardware Revision : 1.1
CLEI Code :
The Transceiver in slot 1 subslot 2 port 0 is ENABLED.
No Transceiver in slot 1 subslot 2 port 1 .
No Transceiver in slot 1 subslot 2 port 2 .
```

```
Wideband Information:
slot/bay 1/2:
SPA-DOCSIS-HD-V1 card, 1 port + 1 redundant port
Card is half slot size
Card is analyzed
Card detected 01:23:29 ago
Card uptime: Not Supported
Card idle time: Not Supported
```

```
Voltage status:
VP12V_SPA_MON (+11.856)v VP3P6_MON (+3.591)v
VP2P5_MON (+2.496)v VP1P25_MON (+1.254)v
SPA_AUX_MON (+3.272)v ADM1166_2_OK (+2.048)v
PWR_EN (+2.048)v VP1P0_MON (+1.012)v
VCCINT_MON (+0.997)v ADM1166_2_DOWN (+2.048)v
VP12V_SPA_MON (+11.846)v VP3P3_MON (+3.296)v
VP1P8_MON (+1.799)v VP1P5_MON (+1.492)v
MGTAVTT_MON (+1.193)v MGTAVCC_MON (+0.996)v
VTT_MON (+0.734)v PLL_STATUS (+0.006)v
PLL_LD (+2.048)v ADM1166_2_EN (+2.048)v
```

```
License : 48
EEPROM contents, slot/bay 1/2:
Controller Type : 2938
Hardware Revision : 1.1
Boot Timeout : 500 msec
PCB Serial Number : CAT1635E0TW
PCB Part Number : 73-15030-01
PCB Revision : 06
Fab Version : 01
RMA Test History : 00
RMA Number : 0-0-0-0
RMA History : 00
Deviation Number : 0
Product Identifier (PID) : SPA-UBR10-DS-HD
Version Identifier (VID) : V01
Top Assy. Part Number : 800-38945-01
Top Assy. Revision : 02
IDPROM Format Revision : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
                          00 00 00 00 00 00 00 00
                          00 00 00 00 00 00
CLEI Code :
Base MAC Address : 00 00 00 00 00 00
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data : Minimum: 0 dBmV, Maximum: 0 dBmV
Calibration values :
Power Consumption : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 2E E0 46 32 09 C4
```

```

46 32 0C E4 46 32 03 E8
46 1E 03 E8 46 1E 2E E0
46 32 0C E4 46 32 07 08
46 32 05 DC 46 32 04 B0
46 19 03 E8 46 1E 02 EE
46 32 FE 02 EF 64
Processor Label      : 00 00 00 00 00 00 00
Platform features    : 00 00 00 00 00 00 00 00
                     : 00 00 00 00 00 00 00 00
                     : 00 00 00 00 00 00 00 00
                     : 00 00 00 00 00 00 00 00
Asset ID             : P1B-63B
Asset Alias          :
WBCMTS HD SPA capacity : 6G
DAUGHTER contents:
Controller Type      : 2939
Hardware Revision    : 1.0
Boot Timeout         : 500 msec
PCB Serial Number    : CAT1635E0YZ
PCB Part Number      : 73-15093-01
PCB Revision         : 04
Fab Version          : 01
RMA Test History     : 00
RMA Number           : 0-0-0-0
RMA History          : 00
Deviation Number     : 0
Product Identifier (PID) : SPA-UBR10-DS-HD
Version Identifier (VID) : V01
Top Assy. Part Number : 800-38945-01
Top Assy. Revision   : 02
IDPROM Format Revision : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
                     : 00 00 00 00 00 00 00 00
                     : 00 00 00 00 00 00
CLEI Code            :
Base MAC Address     : 00 00 00 00 00 00
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data     : Minimum: 0 dBmV, Maximum: 0 dBmV
  Calibration values :
Power Consumption    : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 0C E4 46 32 09 C4
                     : 46 32 00 00 00 00 04 B0
                     : 46 32 00 00 00 00 07 08
                     : 46 32 00 00 00 00 00 00
                     : 00 00 00 00 00 00 00 00
                     : 00 00 00 00 00 00 00 00
                     : 00 00 FE 02 FA 6D
Processor Label      : 00 00 00 00 00 00 00
Platform features    : 00 00 00 00 00 00 00 00
                     : 00 00 00 00 00 00 00 00
                     : 00 00 00 00 00 00 00 00
                     : 00 00 00 00 00 00 00 00
Asset ID             : P1B-63
Asset Alias          :

```

The following example shows output from the **show diag** command on a Cisco uBR10012 router, running Cisco IOS Release 12.2(33)SC11, with a Cisco 6 Gbps Wideband Shared Port Adapter installed in slot 1, subslot 2.

```
Router# show diag 1/0
```

```
Slot 1:
```

```

4jacket-1 card, 0 ports
Card is full slot size
Card is analyzed
Card detected 01:23:57 ago
Card uptime 0 days, 1 hours, 23 minutes, 55 seconds
Card idle time 0 days, 1 hours, 17 minutes, 48 seconds
Voltage status:
EEPROM contents, slot 1/0:

```

```

Controller Type           : 1380
Hardware Revision        : 1.0
PCB Part Number          : 73-10771-03
Board Revision           : A0
Deviation Number         : 0-0
Fab Version              : 03
PCB Serial Number        : CAT1602F0FR
RMA Test History         : 00
RMA Number               : 0-0-0-0
RMA History              : 00
Top Assy. Part Number    : 800-27953-04
CLEI Code                : IPUA7TRAB
Product Identifier (PID) : 10000-SIP-600
Version Identifier (VID) : V02
LCMON version, slot 1/0
  LCDOS (LATEST-BOOT : DEVELOPMENT BUILD xxxxxx-mayflower_lc_0628
/vob/lcdos/obj-cl0k-pq3-lcmon 114)
  Built by xxxxxx at Mon Jul 16 14:00:18 2007.
  Reset reason 0x00000008 (PRE hard reset).
Operational Image version, slot 1/0
  LCDOS (C10000 4 SPA Jacket Card Image (Spumoni) : DEVELOPMENT BUILD
BLD-v122_33_sci_lc_throttle.lcdos-UNIQ-v122_33_sci_lc_throttle-v122_32_8_24_SCI-v122_33_sci_throttle-20140810_2207-21
/view/BLD-v122_33_sci_lc_throttle.lcdos-UNIQ-v122_33_sci_lc_throttle
  Built by xxxxxx at Sun Aug 10 22:28:10 2014.
  SW Version 1.1
  Code MD5 88F543721CF42BB65A34A5D0AC6D605E
  FPGA MD5 89C8DD3DCD939BDD43DB19D514416137
  Expected Switchover Action: NO INFORMATION
  ECC 1 bit errors since last cleared (dd hh mm ss) = 0 (0 days, 0 hours, 0 minutes,
0 seconds)
  ECC 1 bit errors while up (total) = 0
  Number of crashdumps recorded = 1

SPA Information:
bay 1/2      SPA-UBR10-DS-6G      ok

SW Version 1.0
Expected Switchover Action: NO INFORMATION
Product Identifier (PID) : SPA-UBR10-DS-6G
Version Identifier (VID) : V01
PCB Serial Number       : CAT1635E0TW
Top Assy. Revision      : 02
Hardware Revision       : 1.1
CLEI Code               :
The Transceiver in slot 1 subslot 2 port 0 is ENABLED.
No Transceiver in slot 1 subslot 2 port 1 .
No Transceiver in slot 1 subslot 2 port 2 .

Wideband Information:
slot/bay 1/2:
SPA-DOCSIS-HD-V1 card, 1 port + 1 redundant port
Card is half slot size
Card is analyzed
Card detected 01:23:29 ago
Card uptime: Not Supported
Card idle time: Not Supported
Voltage status:
VP12V SPA_MON      (+11.856)v      VP3P6_MON      (+3.591)v
VP2P5_MON          (+2.496)v      VP1P25_MON     (+1.254)v
SPA_AUX_MON        (+3.272)v      ADM1166_2_OK   (+2.048)v
PWR_EN             (+2.048)v      VP1P0_MON      (+1.012)v
VCCINT_MON         (+0.997)v      ADM1166_2_DOWN (+2.048)v
VP12V SPA_MON      (+11.846)v      VP3P3_MON      (+3.296)v
VF1P8_MON          (+1.799)v      VP1P5_MON      (+1.492)v
MGTAVTT_MON        (+1.193)v      MGTAVCC_MON    (+0.996)v
VTT_MON            (+0.734)v      PLL_STATUS     (+0.006)v
PLL_LD             (+2.048)v      ADM1166_2_EN   (+2.048)v

License           : 48
EEPROM contents, slot/bay 1/2:
Controller Type   : 2938
Hardware Revision : 1.1
Boot Timeout      : 500 msec

```

Displaying Cisco 6 Gbps Wideband Shared Port Adapter Information

```

PCB Serial Number      : CAT1635E0TW
PCB Part Number       : 73-15030-01
PCB Revision          : 06
Fab Version           : 01
RMA Test History      : 00
RMA Number            : 0-0-0-0
RMA History           : 00
Deviation Number      : 0
Product Identifier (PID) : SPA-UBR10-DS-6G
Version Identifier (VID) : V01
Top Assy. Part Number  : 800-38945-01
Top Assy. Revision    : 02
IDPROM Format Revision : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00

CLEI Code              :
Base MAC Address       : 00 00 00 00 00 00
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data       : Minimum: 0 dBmV, Maximum: 0 dBmV
    Calibration values :
Power Consumption      : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 2E E0 46 32 09 C4
                       : 46 32 0C E4 46 32 03 E8
                       : 46 1E 03 E8 46 1E 2E E0
                       : 46 32 0C E4 46 32 07 08
                       : 46 32 05 DC 46 32 04 B0
                       : 46 19 03 E8 46 1E 02 EE
                       : 46 32 FE 02 EF 64

Processor Label        : 00 00 00 00 00 00 00
Platform features     : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00

Asset ID               : P1B-63B
Asset Alias            :
WBCMTS HD SPA capacity : 6G

DAUGHTER contents:
Controller Type        : 2939
Hardware Revision      : 1.0
Boot Timeout           : 500 msecs
PCB Serial Number      : CAT1635E0YZ
PCB Part Number       : 73-15093-01
PCB Revision          : 04
Fab Version           : 01
RMA Test History      : 00
RMA Number            : 0-0-0-0
RMA History           : 00
Deviation Number      : 0
Product Identifier (PID) : SPA-UBR10-DS-6G
Version Identifier (VID) : V01
Top Assy. Part Number  : 800-38945-01
Top Assy. Revision    : 02
IDPROM Format Revision : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00

CLEI Code              :
Base MAC Address       : 00 00 00 00 00 00
MAC Address block size : 1
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data       : Minimum: 0 dBmV, Maximum: 0 dBmV
    Calibration values :
Power Consumption      : 300000 mWatts (Maximum)
Environment Monitor Data : 03 30 0C E4 46 32 09 C4
                       : 46 32 00 00 00 00 04 B0
                       : 46 32 00 00 00 00 07 08
                       : 46 32 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00

```



```

Processor Label          : 00 00 FE 02 FA 6D
Platform features       : 00 00 00 00 00 00 00 00
                        : 00 00 00 00 00 00 00 00
                        : 00 00 00 00 00 00 00 00
                        : 00 00 00 00 00 00 00 00
                        : 00 00 00 00 00 00 00 00
Asset ID                 : PlB-63
Asset Alias              :

```

The following example shows the output from the **show diag** command that displays the capacity information on a Cisco uBR10012 router with a Cisco 6 Gbps Wideband Shared Port Adapter installed in slot 1, subslot 2:

```

Router# show diag 1/0 | include capacity

WBCMTS HD SPA capacity : 6G

```

Examples of the show hw-module subslot fpd Command

The following example shows the output from the **show hw-module subslot fpd** command that displays the FPGA version information for the Cisco 6 Gbps Wideband Shared Port Adapter located in slot 1, subslot 2:

```

Router# show hw-module subslot 1/2 fpd | include HD

1/2 SPA-UBR10-DS-HD      1.1  2-EASTLAKE FPGA    4096.56    4096.0

```

The following example shows the output from the **show hw-module subslot fpd** command, for Cisco IOS Release 12.2(33)SCI1, that displays the FPGA version information for the Cisco 6 Gbps Wideband Shared Port Adapter located in slot 1, subslot 2:

```

Router# show hw-module subslot 1/2 fpd | include HD

1/2 SPA-UBR10-DS-6G     1.1  2-EASTLAKE FPGA    4096.56    4096.56

```

Examples of the show running-config Command

The following examples shows the output from the **show running-config** command that displays the information for all the configured cards:

```

Router# show running-config | include card

card 1 4jacket-1
card 1/0 24rfchannel-spa-1
card 1/2 SPA-DOCSIS-HD-V1 1x10GE 6G-capacity license 48
card 1/1 2cable-dtcc
card 2/1 2cable-dtcc
card 3 4jacket-1
card 3/1 SPA-5X1GE-V2
card 5/1 ubr10k-clc-3g60 license 72X60
card 7/1 ubr10k-clc-mc2020v license 20X20
card 8/0 ubr10k-clc-3g60 license 72X60

```




Configuring the Cisco 6 Gbps Wideband Shared Port Adapter

- [Specifying the Location for the Cisco 6 Gbps Wideband Shared Port Adapter, page 157](#)
- [Specifying Narrowband Channels, page 157](#)
- [Specifying Wideband Channels, page 158](#)
- [Preprovisioning of the Cisco 6 Gbps Wideband Shared Port Adapter and a SIP, page 159](#)
- [Entering Controller Configuration Mode for the Cisco 6 Gbps Wideband Shared Port Adapter, page 159](#)
- [Completing Required and Optional Wideband-Related Configuration Tasks, page 159](#)
- [Cisco 6 Gbps Wideband Shared Port Adapter Configuration Examples, page 159](#)

Specifying the Location for the Cisco 6 Gbps Wideband Shared Port Adapter

For information on specifying the location of a Cisco 6 Gbps Wideband Shared Port Adapter, see the [Identifying the Location of a Cisco 10000 Series SPA Interface Processor-600, on page 22](#) section.

Specifying Narrowband Channels

A modular-cable interface is a narrowband interface associated with one downstream RF channel of the SPA. The same RF channel may be associated with an entirely independent bonding group, and the RF channel could be sharing RF bandwidth with this bonding group.

At the Cisco IOS command line, use the **interface modular-cable** command to specify a narrowband channel.

Modular cable interfaces are similar to the downstream portion of cable interfaces and are displayed in the output of commands such as **show ip interface**, **show interfaces**, **show interface modular-cable**, and **show running-config**.

The following is sample output for the **show interface** command for a modular-cable interface:

```
Router# show interfaces modular-Cable 1/0/0:0

Modular-Cable1/0/0:0 is up, line protocol is up
  Hardware is CMTS MC interface, address is 001a.2f8a.df10 (bia 001a.2f8a.df10)
  MTU 1464 bytes, BW 37500 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 00:00:09, 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 Modular-Cable1/0/0:0 queueing strategy: PXF Class-based
  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
    95 packets output, 10434 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
```

Specifying Wideband Channels

At the Cisco IOS command line, the **interface wideband-cable** command is used to specify a wideband channel.

Wideband channels are similar to cable interfaces and are displayed in the output of commands such as **show ip interface**, **show interfaces**, and **show interface wideband-cable**. For example:

```
Router# show interface wideband-cable 1/0/0:1

Wideband-Cable1/0/0:1 is up, line protocol is up
  Hardware is Wideband CMTS Cable interface, address is 001a.2f8a.df10 (bia 001a
.2f8a.df10)
  MTU 1500 bytes, BW 75000 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 Wideband-Cable1/0/0:1 queueing strategy: PXF Class-based
  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
...

```

Preprovisioning of the Cisco 6 Gbps Wideband Shared Port Adapter and a SIP

Preprovisioning is an optional configuration task for the Cisco 6 Gbps Wideband Shared Port Adapter on a SIP. Preprovisioning on the Cisco uBR10012 router allows you to configure the SIP and Cisco 6 Gbps Wideband Shared Port Adapter without their physical presence.

For information on preprovisioning the Cisco 6 Gbps Wideband Shared Port Adapter and a SIP, see the [Optional Configuration Task for the Cisco 10000 Series SPA Interface Processor-600 and the SPAs](#), on page 24 section.

Entering Controller Configuration Mode for the Cisco 6 Gbps Wideband Shared Port Adapter

The Cisco 6 Gbps Wideband Shared Port Adapter is represented in the Cisco IOS software as a controller. Enable controller configuration by preprovisioning the Cisco 6 Gbps Wideband Shared Port Adapter using the **card** command or by physically inserting the Cisco 6 Gbps Wideband Shared Port Adapter in the SIP.

The following is an example of the **card** command:

```
Router# configure terminal  
Router(config)# card 1/1 SPA-DOCSIS-HD-V1 1x10GE 6G-capacity
```

To enter controller configuration mode for the Cisco 6 Gbps Wideband Shared Port Adapter, use the **controller modular-cable** command. Most Cisco 6 Gbps Wideband Shared Port Adapter configuration tasks are performed in controller configuration mode.

Completing Required and Optional Wideband-Related Configuration Tasks

For information on the required and optional wideband-related configuration tasks, see the [Configuring the Cisco Wideband SPA](#) chapter.

Cisco 6 Gbps Wideband Shared Port Adapter Configuration Examples

Controller Configuration

The following example shows the configuration for the controller of the Cisco 6 Gbps Wideband Shared Port Adapter located in slot 1, subslot 0, bay 0.

```
controller Modular-Cable 1/0/0  
modular-host subslot 8/0  
rf-channel 0 cable downstream channel-id 193  
rf-channel 0 frequency 603000000 annex B modulation 256qam interleave 32  
rf-channel 0 depi-tunnel qam8_1-4 tsid 811
```

```

rf-channel 0 rf-power 52.0
no rf-channel 0 rf-shutdown
rf-channel 1 cable downstream channel-id 194
rf-channel 1 frequency 609000000 annex B modulation 256qam interleave 32
rf-channel 1 depi-tunnel qam8_1-4 tsid 812
rf-channel 1 rf-power 52.0
no rf-channel 1 rf-shutdown
rf-channel 2 cable downstream channel-id 195
rf-channel 2 frequency 615000000 annex B modulation 256qam interleave 32
rf-channel 2 depi-tunnel qam8_1-4 tsid 813
rf-channel 2 rf-power 52.0
no rf-channel 2 rf-shutdown
rf-channel 3 cable downstream channel-id 196
rf-channel 3 frequency 621000000 annex B modulation 256qam interleave 32
rf-channel 3 depi-tunnel qam8_1-4 tsid 814
rf-channel 3 rf-power 52.0
no rf-channel 3 rf-shutdown
rf-channel 4 cable downstream channel-id 197
rf-channel 5 cable downstream channel-id 198
rf-channel 6 cable downstream channel-id 199
rf-channel 7 cable downstream channel-id 200
rf-channel 8 cable downstream channel-id 201
rf-channel 9 cable downstream channel-id 202
rf-channel 10 cable downstream channel-id 203
rf-channel 11 cable downstream channel-id 204
rf-channel 12 cable downstream channel-id 205
rf-channel 13 cable downstream channel-id 206
rf-channel 14 cable downstream channel-id 207
rf-channel 15 cable downstream channel-id 208
rf-channel 16 cable downstream channel-id 209
rf-channel 17 cable downstream channel-id 210
rf-channel 18 cable downstream channel-id 211
rf-channel 19 cable downstream channel-id 212
rf-channel 20 cable downstream channel-id 213
rf-channel 21 cable downstream channel-id 214
rf-channel 22 cable downstream channel-id 215
rf-channel 23 cable downstream channel-id 216
!

```

Wideband Channel Configuration

The following example shows how a wideband channel is configured. In this example, the wideband channel Wideband-Cable1/2/2:20 is a member of virtual bundle interface 1.

```

interface Wideband-Cable1/2/2:20
 cable bundle 1
 cable rf-channel 20 bandwidth-percent 20
 cable rf-channel 21 bandwidth-percent 20
 cable rf-channel 22 bandwidth-percent 20
 cable rf-channel 23 bandwidth-percent 20
!

```

Virtual Bundle Configuration

The wideband channel and its associated primary channels on the fiber node must belong to the same virtual bundle interface. The following example shows how virtual bundle interface 1 is configured.

```

interface Bundle1
 ip address 192.0.0.1 255.255.0.0
 load-interval 30
 cable arp filter request-send 3 2
 cable arp filter reply-accept 3 2
!

```

Cable Fiber Node Configuration

The following example shows how cable fiber node 2 is configured.

```
cable fiber-node 2
  downstream Modular-Cable 8/0/0 rf-channel 4-7
  upstream Cable 8/0 connector 1
!
```

Channel Grouping Domain Configuration

The following example shows how the primary downstream channel located at slot/subslot/port 5/1/1 is configured.

```
interface Cable5/1/2
  no cable packet-cache
  cable upstream max-ports 4
  cable upstream 0 connector 2
  cable upstream 0 frequency 10000000
  cable upstream 0 channel-width 3200000 3200000
  cable upstream 0 docsis-mode atdma
  cable upstream 0 minislots-size 2
  cable upstream 0 range-backoff 3 6
  cable upstream 0 modulation-profile 221
  no cable upstream 0 shutdown
  cable upstream 1 connector 2
  cable upstream 1 frequency 15000000
  cable upstream 1 channel-width 3200000 3200000
  cable upstream 1 docsis-mode atdma
  cable upstream 1 minislots-size 2
  cable upstream 1 range-backoff 3 6
  cable upstream 1 modulation-profile 221
  no cable upstream 1 shutdown
  cable upstream 2 connector 2
  cable upstream 2 frequency 20000000
  cable upstream 2 channel-width 3200000 3200000
  cable upstream 2 docsis-mode atdma
  cable upstream 2 minislots-size 2
  cable upstream 2 range-backoff 3 6
  cable upstream 2 modulation-profile 221
  no cable upstream 2 shutdown
  cable upstream 3 connector 2
  cable upstream 3 frequency 25000000
  cable upstream 3 channel-width 3200000 3200000
  cable upstream 3 docsis-mode atdma
  cable upstream 3 minislots-size 2
  cable upstream 3 range-backoff 3 6
  cable upstream 3 modulation-profile 221
  no cable upstream 3 shutdown
!
```

Modular Cable Interface Configuration

The following example shows how a modular cable interface is configured. In this example, the modular cable interface slot/subslot/bay:narrowband channel 1/0/0:3 is configured. The **cable rf-bandwidth-percent** command specifies that 20 percent of the bandwidth is reserved for this interface.

```
interface Modular-Cable1/0/0:3
  cable bundle 1
  cable rf-bandwidth-percent 20
!
```




Troubleshooting the Cisco 6 Gbps Wideband Shared Port Adapter

- [Interpreting Console Error Messages, page 163](#)
- [Using show Commands to Troubleshoot the SPA, page 163](#)
- [Troubleshooting SPA-to-EQAM Communication Problems, page 164](#)

Interpreting Console Error Messages

To view the explanations and recommended actions for Cisco uBR10012 router error messages, including messages related to SPAs, see the [Cisco IOS CMTS Cable System Messages Guide](#).

System error messages are organized in the documentation according to the particular system facility that produces the messages. The Cisco 6 Gbps Wideband Shared Port Adapter error messages use the facility name SPAWBCMTS.

Using show Commands to Troubleshoot the SPA

Following are the **show** commands used to verify and monitor the SPA:

- **show cable mac-domain downstream-service-group**
- **show controllers modular-cable**
- **show hw-module bay**
- **show hw-module bay oir**
- **show interface wideband-cable**

Verifying the Cisco 6 Gbps Wideband Shared Port Adapter Configuration

In addition to using the `show running-configuration` command to display your router configuration settings, you can use a variety of commands to display information about the Cisco 6 Gbps Wideband Shared Port Adapter including:

- Cisco 6 Gbps Wideband Shared Port Adapter configuration
- Wideband channels and RF channels
- Wideband-channel cable interfaces

```
Router# show controllers modular-cable 1/0/0 brief
```

Verifying RF Channel Configuration

The following is a sample output of the `show hw-module bay` command for RF channel 0 in the Cisco 6 Gbps Wideband Shared Port Adapter located in slot 1, subslot 0, and bay 0 of a Cisco uBR10012 router.

```
Router# show hw-module bay 1/0/0 config rf-channel 0 verbose
```

Verifying Fiber Node Configuration

The following example provides sample `show cable fiber-node` output for cable fiber node 1:

```
Router# show cable fiber-node 1
```

Troubleshooting SPA-to-EQAM Communication Problems

If a Cisco 6 Gbps Wideband Shared Port Adapter is unable to communicate with an edge QAM device, use the `rf-channel` command to check whether the RF channels set match the values required by the edge QAM device. The following example shows how to use the `show hw-module bay` command to see the values that have been configured for an RF channel.

```
Router# show hw-module bay 1/0/0 config rf-channel 0 verbose
```

Check that the following values are correct and match what is configured on the edge QAM device:

- Frequency—The center frequency for this RF channel.
- IP address —The IP address of the edge QAM device for this RF channel.
- MAC address —The MAC address of a next-hop router or edge QAM device for this RF channel.
- UDP port—The UDP port number for the QAM output port for this RF channel.

RF channels are configured using the `rf-channel` command. The following values are used for `mac-address` in the `mac-address` argument:

- If a Gigabit Ethernet router or Layer-3 switch is used between the Cisco Wideband SPA and the edge QAM device, the value specified for `mac-address` is the MAC address for the next-hop interface on the router or Layer-3 switch.

- If a Gigabit Ethernet router or Layer-3 switch is not used, the value specified for mac-address is the MAC address for Gigabit Ethernet interface on the edge QAM device.

The UDP port number set for the RF channel allows mapping an input UDP session to a specific QAM output port. Wideband traffic from different Cisco Wideband SPAs cannot be mixed on the same QAM output ports.



Field-Programmable Devices

- [Upgrading Field-Programmable Devices, page 167](#)
- [SPA FPD Image Upgrade Support, page 167](#)
- [Automatic FPD Image Upgrades, page 168](#)
- [Upgrading SPA FPD Images, page 168](#)
- [Optional FPD Procedures, page 170](#)
- [Troubleshooting FPD Image Upgrade, page 177](#)

Upgrading Field-Programmable Devices

Field-programmable devices (FPDs) are hardware devices implemented on router cards that support separate software upgrades. A field-programmable gate array (FPGA) is a type of programmable memory device that exists on most hardware components of a Cisco uBR10012 router. The term FPD was introduced to collectively and generically describe any type of programmable hardware device on SIPs and SPAs, including FPGAs.



Note

In Cisco IOS Release 12.2(33)SCB, the FPD image upgrade is supported only for the SPAs inserted in the Cisco 10000 Series SPA Interface Processor-600 on a Cisco uBR10012 router.

This chapter describes how to verify image versions and perform an upgrade for SPA or SIP FPD images when incompatibilities occur and includes the following sections:

SPA FPD Image Upgrade Support

An FPD image package is used to upgrade FPD images. Each time a Cisco IOS software image is released that supports SPAs, a companion SPA FPD image package may also be released for that Cisco IOS software release. The FPD image package is available from Cisco.com and is accessible from the Cisco Software Center page where you also go to download your Cisco IOS software image.

If you are running SPAs on your router and are upgrading your Cisco IOS image, you should download the FPD image package file before booting the router using the new Cisco IOS release. If the SPA requires an FPD upgrade and the Cisco IOS image is unable to locate an FPD image package, the system messages indicate

that the FPD image is incompatible. You will need to go to the Cisco Software Center on Cisco.com to download the FPD image package for your Cisco IOS software release. An FPD incompatibility on a SPA disables all interfaces on that SPA until the incompatibility is addressed.

Automatic FPD Image Upgrades

By default, the Cisco uBR10012 router automatically upgrades the FPD images when it detects a version incompatibility between the FPD image on the SPA and the FPD image required to run the SPA. The FPD automatic upgrade feature only searches for the FPD image package file with the same version number as the running Cisco IOS release.

Upgrading SPA FPD Images



Note

Upgrading the FPD image on a SPA places the SPA offline while the upgrade is taking place. The time required to complete an FPD image upgrade can be lengthy.

This section provides the procedures to perform the following SPA FPD image upgrades:

Upgrading SPA FPD Images Before Booting the New Cisco IOS Release

If you are running your old Cisco IOS release but are preparing to load a newer version of Cisco IOS, you can place the FPD image package for the new version of Cisco IOS onto one of your router's flash file systems. For example, if you are running Cisco IOS Release 12.2(33)SCA and are upgrading to Cisco IOS Release 12.2(33)SCB, place the FPD image package for Cisco IOS release 12.2(33)SCB onto a flash file system while still running Cisco IOS Release 12.2(33)SCA.

To place an FPD image package on a flash disk before upgrading IOS, perform the following steps:

-
- Step 1** While still running the Cisco IOS release that will be upgraded, place the FPD image package for the new version of Cisco IOS onto one of your router's flash file systems. The FPD image package for a specific Cisco IOS release can be located on Cisco.com from the same area where you downloaded that Cisco IOS software image. Your router and SPAs should continue to operate normally, because this action has no impact on the current FPDs.
- Caution** Do not change the filename of the FPD image package file. The Cisco IOS software searches for the FPD image package file by filename, so the FPD image package file cannot be found if it is renamed.
- Step 2** Reboot your router using the new upgraded Cisco IOS image.
- Step 3** When the router has booted, verify the upgrade was successful by entering the **show hw-module all fpd** command.
-

Upgrading SPA FPD Images After Booting the New Cisco IOS Release

The following procedure explains how to upgrade FPD images if you have already upgraded your Cisco IOS release but still need to upgrade your FPD images.



Note If multiple SPAs require upgrades, you must update the different pieces of hardware individually.

To perform an FPD upgrade after the new Cisco IOS release boots, perform the following steps:

-
- Step 1** If you are unsure if the FPD images for your SPAs are compatible, enter the **show hw-module all fpd** command to verify compatibility of all SPAs. If all of your SPAs are compatible, you do not need to perform this upgrade.
- Step 2** If an FPD upgrade is necessary, place the FPD image package for the new version of Cisco IOS onto the router's flash disk or on an accessible FTP or TFTP server. The FPD image package can be located on Cisco.com from the same area where you downloaded your Cisco IOS software image.
- Step 3** Enter the **upgrade hw-module subslot slot/subslot fpd file file-url** command in privileged EXEC mode. The *file-url* argument specifies the location of the FPD image package file. For example, if you are upgrading the FPD image in SPA subslot 0 on the SIP installed in chassis slot 1, and the FPD image package for Cisco IOS Release 12.2(33)SCB is on the TFTP server mytftpserver/myname/fpdpkg, you would enter:
- ```
Router# upgrade hw-module subslot 1/0 fpd file tftp://mytftpserver/myname/fpdpkg/ubr10k-fpd-pkg.122-122_33_SCB_20081123.pkg
```
- Step 4** Verify the upgrade was successful by entering the **show hw-module all fpd** command.
- 

## Manually Upgrading the Cisco 3 Gbps Wideband Shared Port Adapter FPD to Cisco 6 Gbps Wideband Shared Port Adapter

You can upgrade the FPD on the Cisco 3 Gbps Wideband Shared Port Adapter card to configure it as a Cisco 6 Gbps Wideband Shared Port Adapter card. You can upgrade the Cisco 3 Gbps Wideband Shared Port Adapter cards simultaneously on two SIPs. However, within a SIP, you cannot upgrade the Cisco 3 Gbps Wideband Shared Port Adapter cards simultaneously.

### Before You Begin

- The Cisco uBR10012 router must be running the Cisco IOS Release 12.2(33)SCI or a later release.
- The Cisco 3 Gbps Wideband Shared Port Adapter must be in the 10G mode.
- The Cisco 3 Gbps Wideband Shared Port Adapter must be online.

### Restrictions

- If you manually upgrade the FPD when the Cisco 3 Gbps Wideband Shared Port Adapter is in 1G mode, the Cisco 3 Gbps Wideband Shared Port Adapter resets continuously. Then, you must configure the 6 Gbps capacity and 10G mode for the SPA manually using the **card** command.
- If you are running Cisco IOS Release 12.2(33)SCI, we recommend that you upgrade to Cisco IOS Release 12.2(33)SCI1 or later release. For more information, see field notice [FN-63952](#).
- If you want to use the Cisco IOS Release 12.2(33)SCI, you must use the Cisco IOS Release 12.2(33)SCI1 FPD image for the SPA upgrade. Perform the following:
  - 1 Download the Cisco IOS Release 12.2(33)SCI1 FPD image package from Cisco.com and place it on the disk0 of the Cisco uBR10012 router.
  - 2 Rename FPD image package from **ubr10k-fpd-pkg.122-33.SCI1** to **ubr10k-fpd-pkg.122-33.SCI**.
  - 3 Use the renamed FPD image package for the SPA upgrade.

- 
- Step 1** Place the FPD image package on the disk0 of the Cisco uBR10012 router. The FPD image package can be located on Cisco.com from the same area where you downloaded your Cisco IOS software image.
- Important** Do not change the filename of the FPD image package file. The Cisco IOS software searches for the FPD image package file by file name, and the FPD image package file cannot be located if it is renamed.
- Step 2** Upgrade the FPD image on the card using the **upgrade hw-module subslot slot/bay idprom 6g** command in privileged EXEC mode.
- Note** The service interruption time is up to 1 minute during the upgrade. The upgrade can take up to 10 minutes. Do not interrupt while the upgrade is in progress. To verify the progress of the upgrade, use the **show upgrade fpd progress** command.
- Step 3** Wait for up to 8 minutes for the upgrade to complete (6 minutes for the upgrade and 2 minutes for the SPA to come online).
- Step 4** Ensure that the running configuration is automatically changed to Cisco 6 Gbps Wideband Shared Port Adapter using the **show running-config | include card** command and verify that the **6G-capacity** keyword is added in the **card** command.
- Step 5** Reload the SPA using the **hw-module bay slot/bay reload** command.
- Step 6** Wait for up to 2 minutes for the SPA to come online.
- Step 7** Verify if the upgrade is successful using the **show hw-module subslot slot/subslot fpd** command. The Eastlake FPGA version number must be 4096.56 or more.
- 

### What to Do Next

The controller configurations for controllers 0 to 2 are inherited from Cisco 3 Gbps Wideband Shared Port Adapter card. Configure controllers 3 to 5 on the Cisco 6 Gbps Wideband Shared Port Adapter. See [Entering Controller Configuration Mode for the Cisco 6 Gbps Wideband Shared Port Adapter](#), on page 159.

## Optional FPD Procedures

This section provides information for optional FPD-related functions. None of the topics discussed in this section are necessary for completing FPD upgrades, but may be useful in some FPD-related scenarios. This section includes the following topics:



## Manually Upgrading SPA FPD Images

The FPD manual upgrade feature provides the ability to manually upgrade the FPD image on a SPA. To manually upgrade the current FPD version on a SPA, enter the following command in privileged EXEC mode:

```
Router# upgrade hw-module subslot slot/subslot fpd file file-url [reload]
```

In the command, *slot* is the slot where the SIP is installed, *subslot* is the subslot number where the SPA is located, *file-url* is the location and name of the FPD image package file, and **reload** is an option that forces the SPA to perform an FPD upgrade even if the FPD is compatible. The **reload** option is almost never necessary and should be entered only if requested by a technical support representative. The SPA will be reloaded automatically to complete the FPD upgrade.

**Note**

Upgrading the FPD image on a SPA places the SPA offline while the upgrade is taking place. The time required to complete an FPD image upgrade can be lengthy.

## Upgrading FPD from an FTP or TFTP Server

The recommended method to perform an FPD image upgrade is to download the FPD image package to a flash file system and use the FPD automatic upgrade. By default, the system searches the flash file systems for the FPD image package file when an FPD incompatibility is detected.

This default behavior of loading an FPD image from a flash file system can be changed using the **upgrade fpd path** global configuration command, which sets the path to search for the FPD image package file to a location other than the router's flash file systems.

For large deployments where all the systems are being upgraded to a specific Cisco IOS software release, we recommend that the FPD image package file be placed on an FTP or TFTP server that is accessible to all the affected systems, and enter the **upgrade fpd path** global configuration command to configure the routers to look for the FPD image package file from the FTP or TFTP server prior to the reloading of the system with the new Cisco IOS release.

**Note**

This approach can also be used if there is not enough disk space on the system flash card to hold the FPD image package file.

To download an FPD image package file to an FTP or TFTP server, use the following procedure:

**Step 1** Copy the FPD image package file to the FTP or TFTP server.

**Step 2** Access the router from a connection that does not use the SPA interface for access, if possible. We recommend not using the SPA interface as your connection to the router because an FPD incompatibility disables all interfaces on the SPA, making a manual FPD upgrade impossible through a SPA interface. If access through one of the SPA ports is the only access to the router you have, do not use the TFTP or FTP upgrade method. Instead, copy the FPD image package to your router's default flash card before upgrading your Cisco IOS release. This method allows the router to find the FPD image package during the first Cisco IOS boot and upgrade FPD automatically.

**Step 3** From global configuration mode, enter the upgrade fpd path command to instruct the router to locate the FPD image package file from the FTP or TFTP server location. For example, enter one of the following global configuration commands from the target system's console:

```
Router(config)# upgrade fpd path tftp://my_tftpserver/fpd_pkg_dir/
```

or

```
Router(config)# upgrade fpd path ftp://login:password@my_ftpserver/fpd_pkg_dir/
```

**Note** The slash (/) at the end of each example is required. If the path is specified without the trailing slash, the command does not work properly.

In these examples, *my\_tftpserver* or *my\_ftpserver* is the path to the server, *fpd\_pkg\_dir* is the directory on the TFTP server where the FPD image package is located, and *login:password* is your FTP login name and password.

**Step 4** Make sure that the FPD automatic upgrade feature is enabled by examining the output of the **show running-config** command (look for the *upgrade fpd auto configuration* line in the output). If there are no upgrade commands in the output, the FPD automatic upgrade feature is enabled. If automatic upgrades are disabled, use the **upgrade fpd auto** global configuration command to enable automatic FPD upgrades.

**Step 5** Enter the **show upgrade fpd file** command to ensure your router is connecting properly to the default FPD image package. If you are able to generate output related to the FPD image package using this command, the upgrade should work properly.

**Step 6** Save the configuration and reload the system with the new Cisco IOS release.

During the system startup after the reload, the necessary FPD image version check for all the SPAs will be performed and any upgrade operation will occur automatically if an upgrade is required. In each upgrade operation, the system extracts the necessary FPD images to the SPA from the FPD image package file located on the FTP or TFTP server.

## Modifying the Default Path for the FPD Image Package File Location

By default, the Cisco IOS software looks for the FPD image package file on a flash file system when performing an automatic FPD image upgrade.



**Note** Be sure there is enough space on one of your flash file systems to accommodate the FPD image package file.

Alternatively, you can store an FPD image package file elsewhere. However, because the system looks on the flash file systems by default, you need to change the FPD image package file location so that the system is directed to search an alternate location (such as an FTP or TFTP server) that is accessible by the Cisco IOS software. Enter the **upgrade fpd path fpd-pkg-dir-url** global configuration command, where *fpd-pkg-dir-url* is the alternate location, to instruct the router to search for the FPD image package elsewhere.

When specifying *fpd-pkg-dir-url*, be aware of the following:

*fpd-pkg-dir-url* is the path to the FPD image package, but the FPD image package should not be specified as part of *fpd-pkg-dir-url*. For instance, if the *ubr10k-fpd-pkg.122-122\_33\_SCB\_20081123.pkg* file can be found on the TFTP server using the path *mytftpserver/myname/myfpdpkg* and you want the router to utilize this FPD image package for FPD upgrades, the **upgrade fpd path tftp://mytftpserver/myname/myfpdpkg/** command should be entered so the router knows where to find the file. The actual filename should not be specified.

The slash (/) at the end of *fpd-pkg-dir-url* is required.

If the **upgrade fpd path** global configuration command has not been entered to direct the router to locate an FPD image package file in an alternate location, the system searches the flash file systems on the Cisco uBR10012 router for the FPD image package file.

Failure to locate an FPD image package file when an upgrade is required disables the SPA. If the automatic upgrade feature is disabled, the SPA is also disabled if it requires an FPD upgrade.

## Upgrading Multiple FPD Images

A single piece of hardware can contain multiple FPD images. The Cisco uBR10012 router can upgrade up to four FPD images simultaneously. However, only one FPD upgrade per router slot can occur at a time. All FPD images on all SPAs in a single slot wait for the previous FPD upgrade to finish before their specific FPD upgrade begins.

During manual upgrades, you specify an upgrade for a single piece of hardware each time you enter the **upgrade hw-module [slot slot | subslot slot/subslot]** command. If you individually specify multiple manual FPD upgrades, only four FPDs can be upgraded simultaneously; the upgrades can occur only when the hardware is in different router slots. The FPD upgrade process stops when all FPDs for the specified hardware are upgraded.

## Disabling Automatic FPD Upgrades

To disable automatic FPD image upgrades, enter the **no upgrade fpd auto** command in global configuration mode. If the automatic FPD image upgrade feature is disabled but an FPD image is required for a SPA, the **upgrade hw-module subslot** command can be used to manually upgrade the SPA FPD image.

**Note**

Disabling the automatic upgrade feature does not disable the version checking mechanism. This prevents SPAs with incompatible FPD images from becoming active.

## Manually Downgrading the Cisco 6 Gbps Wideband Shared Port Adapter FPD to Cisco 3 Gbps Wideband Shared Port Adapter

You can downgrade the FPD on the Cisco 6 Gbps Wideband Shared Port Adapter card to configure it as a Cisco 3 Gbps Wideband Shared Port Adapter card.

### Before You Begin

- The Cisco uBR10012 router must be running the Cisco IOS Release 12.2(33)SCI or a later release.
- The Cisco 3 Gbps Wideband Shared Port Adapter card must be up.

### Restrictions

- If you are running Cisco IOS Release 12.2(33)SCI, we recommend that you upgrade to Cisco IOS Release 12.2(33)SCI1 or later release. For more information, see field notice [FN-63952](#).

- If you want to use the Cisco IOS Release 12.2(33)SCI, you must use the Cisco IOS Release 12.2(33)SCI1 FPD image for the SPA downgrade. Perform the following:
  - 1 Download the Cisco IOS Release 12.2(33)SCI1 FPD image package from Cisco.com and place it on the disk0 of the Cisco uBR10012 router.
  - 2 Rename FPD image package from **ubr10k-fpd-pkg.122-33.SCI1** to **ubr10k-fpd-pkg.122-33.SCI**.
  - 3 Use the renamed FPD image package for the SPA downgrade.

- 
- Step 1** Place the FPD image package on the disk0 of the Cisco uBR10012 router. The FPD image package can be located on Cisco.com from the same area where you downloaded your Cisco IOS software image.
- Note** Do not change the filename of the FPD image package file. The Cisco IOS software searches for the FPD image package file by filename, so the FPD image package file cannot be found if it is renamed.
- Step 2** Downgrade the FPD image on the card using the **upgrade hw-module subslot *slot/bay* idprom 3g** command in privileged EXEC mode.
- Step 3** Remove the preprovisioning for the card using the **no card** command in global configuration mode.
- Step 4** Enable the card using the **no hw-module bay *slot/bay* shutdown** command.
- 

### What to Do Next

Configure the Cisco 3 Gbps Wideband Shared Port Adapter card. See [Configuring the Cisco 3 Gbps Wideband Shared Port Adapter](#), on page 131.

## Configuring Automatic Upgrade and Downgrade of FPD Images

Effective with Cisco IOS Release 12.2(33)SCI1, you can configure the automatic upgrade and downgrade of the FPD images on the Cisco 3 Gbps Wideband Shared Port Adapter and Cisco 6 Gbps Wideband Shared Port Adapter based on the preprovisioned configuration for the slot. Once enabled, regardless of the type of the inserted SPA, automatic downgrade or upgrade is performed to ensure that the inserted SPA is consistent with the preprovisioned configuration for the slot.

**Table 12: Automatic Upgrade/Downgrade Information When Cisco 3 Gbps Wideband Shared Port Adapter is Inserted Into the Slot**

| Preprovisioned Configuration                               | FPD Upgrade/Downgrade | Post-insertion Configuration                               |
|------------------------------------------------------------|-----------------------|------------------------------------------------------------|
| Cisco 3 Gbps Wideband Shared Port Adapter in three 1G mode | N/A                   | Cisco 3 Gbps Wideband Shared Port Adapter in three 1G mode |
| Cisco 3 Gbps Wideband Shared Port Adapter in one 10G mode  | N/A                   | Cisco 3 Gbps Wideband Shared Port Adapter in one 10G mode  |
| Cisco 6 Gbps Wideband Shared Port Adapter in one 10G mode  | Upgrade               | Cisco 6 Gbps Wideband Shared Port Adapter in one 10G mode  |

| Preprovisioned Configuration | FPD Upgrade/Downgrade | Post-insertion Configuration                               |
|------------------------------|-----------------------|------------------------------------------------------------|
| None                         | N/A                   | Cisco 3 Gbps Wideband Shared Port Adapter in three 1G mode |

**Table 13: Automatic Upgrade/Downgrade Information When Cisco 6 Gbps Wideband Shared Port Adapter is Inserted Into the Slot**

| Preprovisioned Configuration                               | FPD Upgrade/Downgrade | Post-insertion Configuration                               |
|------------------------------------------------------------|-----------------------|------------------------------------------------------------|
| Cisco 3 Gbps Wideband Shared Port Adapter in three 1G mode | Downgrade             | Cisco 3 Gbps Wideband Shared Port Adapter in three 1G mode |
| Cisco 3 Gbps Wideband Shared Port Adapter in one 10G mode  | Downgrade             | Cisco 3 Gbps Wideband Shared Port Adapter in one 10G mode  |
| Cisco 6 Gbps Wideband Shared Port Adapter in one 10G mode  | N/A                   | Cisco 6 Gbps Wideband Shared Port Adapter in one 10G mode  |
| None                                                       | N/A                   | Cisco 6 Gbps Wideband Shared Port Adapter in one 10G mode  |

**Before You Begin**

- Download and place the FPD image package on the disk0 of the Cisco uBR10012 router. The FPD image package can be located on Cisco.com from the same area where you downloaded your Cisco IOS software image.



**Note** Do not change the filename of the FPD image package file. The Cisco IOS software searches for the FPD image package file by file name, and the FPD image package file cannot be located if it is renamed.

- To enable automatic upgrade or downgrade of the FPD image on the SPA, you must configure the **cable sip slot fpd-auto** command before inserting the SPA.

**DETAILED STEPS**

|               | Command or Action                                                        | Purpose                                                                      |
|---------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <b>Step 1</b> | <p><b>enable</b></p> <p><b>Example:</b><br/>Router&gt; <b>enable</b></p> | <p>Enables privileged EXEC mode.</p> <p>Enter your password if prompted.</p> |

|        | Command or Action                                                                                    | Purpose                                                                                                                                                                                                                                                                  |
|--------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 2 | <b>configure terminal</b><br><br><b>Example:</b><br>Router# <b>configure terminal</b>                | Enters global configuration mode.                                                                                                                                                                                                                                        |
| Step 3 | <b>cable sip slot fpd-auto</b><br><br><b>Example:</b><br>Router(config)# <b>cable sip 1 fpd-auto</b> | Enables the automatic upgrade and downgrade of the FPD images based on the preprovisioned configuration for the slot. <ul style="list-style-type: none"> <li>• <i>slot</i>—Slot number of the SIP on the Cisco uBR10012 router. The valid values are 1 and 3.</li> </ul> |
| Step 4 | <b>end</b><br><br><b>Example:</b><br>Router(config)# <b>end</b>                                      | Returns to privileged EXEC mode.                                                                                                                                                                                                                                         |

## Displaying Current and Minimum Required FPD Image Versions

To display the current version of FPD images on the SPAs installed on your router, use the **show hw-module [slot/subslot | all] fpd** command, where *slot* is the slot number where the SIP is installed and *subslot* is the number of the SIP subslot where a target SPA is located. Entering the **all** keyword shows information for hardware in all router slots.

The following example shows the FPD versions on SPAs that meet the minimum requirements:

```
Router# show hw-module all fpd
=====
H/W Field Programmable Current Min. Required
Slot Card Type Ver. Device: "ID-Name" Version Version
=====
1/0 SPA-24XDS-SFP 1.0 1-Modena BLAZE FPG 1285.1444 1285.1444

1/1 SPA-24XDS-SFP 1.0 1-Modena BLAZE FPG 1285.1444 1285.1444

1/2 SPA-24XDS-SFP 1.0 1-Modena BLAZE FPG 1285.1444 1285.1444

1/3 SPA-5X1GE-V2 1.2 1-5xGE V2 I/O FPGA 1.10 1.10

3/0 SPA-24XDS-SFP 1.0 1-Modena BLAZE FPG 1285.1444 1285.1444

3/1 SPA-24XDS-SFP 1.0 1-Modena BLAZE FPG 1285.1444 1285.1444

3/2 SPA-24XDS-SFP 1.0 1-Modena BLAZE FPG 1285.1444 1285.1444

3/3 SPA-1X10GE-L-V2 1.2 1-10GE V2 I/O FPGA 1.9 1.9
=====
```

The following example shows the output when using the *slot/subslot* argument to identify a particular SPA:

```
Router# show hw-module subslot 1/0 fpd
=====
H/W Field Programmable Current Min. Required
Slot Card Type Ver. Device: "ID-Name" Version Version
=====
1/0 5xGE SPA[1/0] 1.1 1-5xGE V2 I/O FPGA 1.10 1.10
=====
```

## Displaying Information About the Default FPD Image Package

You can use the **show upgrade fpd package default** command to find out which SPAs are supported with your current Cisco IOS release and which FPD image package you need for an upgrade.

```
Router# show upgrade fpd package default

This Cisco IOS software image requires the following default FPD Image
Package for the automatic upgrade of FPD images (the package is available
from Cisco.com and is accessible from the Cisco Software Center page where
this IOS software image can be downloaded):

Version: Version: 12.2(20080919:205903)
Package Filename: ubr10k-fpd-pkg.122-test.pkg
```

List of card type supported in this package:

| No. | Card Type           | Minimal<br>HW Ver. |
|-----|---------------------|--------------------|
| 1)  | 5xGE SPA            | 0.0                |
| 2)  | 1x10GE XFP SPA      | 0.0                |
| 3)  | WIDEBAND DOCSIS SPA | 0.0                |

## Verifying the FPD Image Upgrade Progress

You can use the **show upgrade fpd progress** command to view a snapshot of the upgrade process while an FPD image upgrade is taking place. The following example shows a sample output of this command:

```
Router# show upgrade fpd progress

FPD Image Upgrade Progress Table:
=====
Slot Card Description Field Programmable Time
Device : "ID-Name" Needed Time Left State
=====
1/0 SPA-1XTENGE-XFP 1-10GE I/O FPGA 00:06:00 00:05:17 Updating...

1/0 SPA-10X1GE 1-GE I/O FPGA --:--:-- --:--:-- Waiting...
=====
```

## Troubleshooting FPD Image Upgrade

**Problem** Corrupt FPD image. The SPA is unusable by the router. The system displays the following message when it stops trying to power up the SPA:

**Problem** *02:10:10: %SPA\_OIR-3-SPA\_POWERED\_OFF: subslot 1/0: SPA 1x10GE XFP SPA powered off after 5 failures within 600 seconds*

**Possible Cause** FPD upgrade operation is interrupted by a power failure or the removal of the SPA.

**Solution** The **show hw-module subslot slot/subslot fpd** command can be used to verify that the SPA is using a corrupted FPD image.

**Solution** To find more information about FPD-related messages, see *Cisco IOS CMTS Cable System Messages Guide* at the following URL:

**Solution** [http://www.cisco.com/en/US/products/hw/cable/ps2209/products\\_system\\_message\\_guides\\_list.html](http://www.cisco.com/en/US/products/hw/cable/ps2209/products_system_message_guides_list.html)

**Problem** SPA powered off by the system.

**Possible Cause** Failed retries to initialize the SPA.

**Solution** The following example shows the output of an attempt to perform a recovery upgrade before all of the initialization retries have been attempted for the SPA in subslot 1/0.

```
02:04:08: %FPD_MGMT-4-UPGRADE_EXIT: Unexpected exit of FPD image upgrade operation for
SPA-1XTENGE-XFP card in subslot 1/0.
02:04:15: %FPD_MGMT-5-CARD_DISABLED: SPA-1XTENGE-XFP card in subslot 1/0 is being disabled
because of an incompatible FPD image version. Note that the ubr10k-fpd-pkg.122-test.pkg
package will be required if you want to perform the upgrade operation.
```

```
Router# upgrade hw-module subslot 1/0 file disk0:ubr10k-fpd-pkg.122-test.pkg
```

```
% Cannot get FPD version information for version checking. If a previous upgrade attempt
has failed for the target card, then a recovery upgrade would be required to fix the
failure.
% The following FPD(s) will be upgraded for SPA-1XTENGE-XFP (H/W ver = 2.1) in subslot 1/0:
```

```
=====
Field Programmable Current Upgrade Estimated
Device: "ID-Name" Version Version Upgrade Time
=====
1-10GE I/O FPGA ?.? 1.6 00:00:20
=====
```

```
% Do you want to perform the recovery upgrade operation? [no]: y
% Cannot perform recovery upgrade operation because the target card is not in a failed
state. Please try again later.
```

**Solution** After the following error message appears, you can perform the recovery upgrade:



**Note** **Solution** You must wait to see this error message before you attempt the upgrade.

```
%SPA_OIR-3-SPA_POWERED_OFF: subslot 1/0: SPA 1x10GE XFP SPA powered off after 5 failures
within 600 seconds
```

**Solution** Perform the manual FPD image upgrade method using the **upgrade hw-module subslot** command to recover from a corrupted image after the SPA has been powered off by the system.



**Note** **Solution** Before proceeding with this operation, make sure that the correct version of the FPD image package file has been obtained for the corresponding Cisco IOS release that the system is using.

**Solution** The following example shows the console output of a recovery upgrade operation:

```
Router# upgrade hw-module subslot 1/0 file disk0:ubr10k-fpd-pkg.122-test.pkg
```

```
% Cannot get FPD version information for version checking. If a previous upgrade attempt
has failed for the target card, then a recovery upgrade would be required to fix the
failure.
% The following FPD(s) will be upgraded for SPA-1XTENGE-XFP (H/W ver = 2.1) in subslot 1/0:
```



```

=====
Field Programmable Current Upgrade Estimated
Device: "ID-Name" Version Version Upgrade Time
=====
1-10GE I/O FPGA ?.? 1.6 00:00:20
=====

```

```

% Do you want to perform the recovery upgrade operation? [no]: y
% Proceeding with recovery upgrade operation ...

```

```

Router#
02:14:47: %FPD_MGMT-6-UPGRADE_TIME: Estimated total FPD image upgrade time for SPA-1XTENGE-XFP
card in subslot 1/0 = 00:00:20.
02:14:47: %FPD_MGMT-6-UPGRADE_START: Unknown FPD (FPD ID=1) image upgrade in progress for
SPA-1XTENGE-XFP card in subslot 1/0. Updating to version 1.6. PLEASE DO NOT INTERRUPT
DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:00:20) ...
02:15:10: %FPD_MGMT-6-UPGRADE_PASSED: Unknown FPD (FPD ID=1) image in the SPA-1XTENGE-XFP
card in subslot 2/0 has been successfully updated from version ?.? to version 1.6.
Upgrading time = 00:00:23.540
02:15:10: %FPD_MGMT-6-OVERALL_UPGRADE: All the attempts to upgrade the required FPD images
have been completed for SPA-1XTENGE-XFP card in subslot 1/0. Number of successful/failure
upgrade(s): 1/0.
02:15:10: %FPD_MGMT-5-CARD_POWER_CYCLE: SPA-1XTENGE-XFP card in subslot 1/0 is being power
cycled for the FPD image upgrade to take effect.

```

**Solution** After the upgrade process is complete, you can use the **show hw-module subslot *slot/subslot* fpd** command to verify that the FPD image is successfully upgraded. For example:

```
Router# show hw-module subslot 1/0 fpd
```

```

=====
Slot Card Type H/W Field Programmable Current Min. Required
Ver. Device: "ID-Name" Version Version
=====
1/0 5xGE SPA[1/0] 1.1 1-5xGE V2 I/O FPGA 1.10 1.10
=====

```

