Cisco 3825 Mobile Wireless Edge Router Software Configuration Guide

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CONTENTS

Preface

This preface describes the objectives, audience, organization, and conventions of this *software configuration guide*.

This preface contains the following sections:

Document Revision History

The Document Revision History table below records technical changes to this document. The table shows the document revision number for the change, the date of the change, and a brief summary of the change. Note that not all Cisco documents use a Document Revision History table.

Revision	Date	Change Summary
OL-15667-03	August 14, 2008	Provided the following information for Cisco IOS 12.4(19)MR: Described use of the **ima group-id** command, which the user can employ to configure the IMA Group ID on an IMA interface.
OL-15667-02	April 1, 2008	Introduced the following features with Cisco IOS 12.4(16)MR2: Keyword **ignore-vpi-vci** added to the **xconnect** command for n:1 VCC cell mode PW
OL-15667-01	March 6, 2008	Initial release.

Objectives

This guide explains how to configure features that enable the Cisco 3825 Mobile Wireless Edge Router to be implemented in an IP Radio Access Network-Optimization (RAN-O) environment.

Audience

This publication is designed for the person who will be responsible for configuring the router. This guide is intended for the following audiences:

- Customers with technical networking background and experience
- System administrators who are familiar with the fundamentals of router-based internet working, but who may not be familiar with Cisco IOS software
- System administrators who are responsible for installing and configuring internetworking equipment, and who are familiar with Cisco IOS software

Organization

The major sections of this software configuration guide are listed in the following table:

Chapter	Title	Description
Chapter 1	Overview of the Cisco 3825 Mobile Wireless Edge Router	Describes the purpose of the Cisco 3825 router and its unique software features.
Chapter 2	Cisco IOS Software Basics	Describes what you need to know about the Cisco IOS software.
Chapter 3	First-Time Configuration	Describes how to use the setup command facility to configure basic attributes of your router.
Chapter 4	Configuring the Cisco 3825 Mobile Wireless Edge Router in a RAN-O Solution with the Command-Line Interface	Describes how to use the Cisco IOS software CLI to configure basic router functionality in a RAN-O environment.
Appendix A	Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference	Provides information about new and changed commands.
Appendix B	Configuration Examples	Provides examples of configurations.

Conventions

This publication uses the following conventions to convey instructions and information.

Convention	Description
boldface font	Commands and keywords.
italic font	Variables for which you supply values.
[ ]	Keywords or arguments that appear within square brackets are optional.
{x | y | z}	A choice of required keywords appears in braces separated by vertical bars. You must select one.
`screen font`	Examples of information displayed on the screen.
`boldface screen font`	Examples of information you must enter.

Convention	Description
< >	Nonprinting characters, for example passwords, appear in angle brackets.
[ ]	Default responses to system prompts appear in square brackets.

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

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

Tip Means *the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful information, similar to a Timesaver.

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

Related Documentation

The following list includes documentation related to your product by implementation.

Cisco Mobile Wireless RAN Optimization

- Cisco 3825 Mobile Wireless Edge Router Documents
  - *Cisco 3800 Series Hardware Installation*
- Cisco Interface Cards Installation Guides
  - *Quick Start Guide: Interface Cards*
  - *Cisco Interface Cards Installation Guide*
  - *Cisco 2-port T1/E1-RAN Installation Instructions*
- Cisco Network Modules Installation Guides
  - *Network Modules Quick Start Guide*
  - *Cisco Network Modules Hardware Installation Guide*
- Release Notes
  - *Release Notes for the Cisco 3825 Mobile Wireless Edge Router*

Note To obtain the latest information, access the online documentation.

Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

CHAPTER 1

Overview of the Cisco 3825 Mobile Wireless Edge Router

The Cisco 3825 Mobile Wireless Edge Router is a networking platform optimized for use in mobile wireless networks; specifically designed to be used at the cell site edge as a part of a 2G, 3G or 4G Radio Access Network (RAN). The Cisco 3825 Mobile Wireless Edge Router is a general purpose router platform specializing in 2/2.5G Global System for Mobile Communication (GSM) and 3G Universal Mobile Telecommunication System (UMTS) RAN backhaul transport and optimization.

The Cisco 3825 router offers high performance at a low cost while meeting the critical requirements for deployment in cell sites, including small size, high availability, and

DC input power flexibility.

This chapter includes the following sections:

Introduction

A typical RAN is composed of thousands of Base Transceiver Stations (BTSs)/Node Bs, hundreds of Base Station Controllers/Radio Network Controllers (BSCs/RNCs), and several Mobile Switching Centers (MSCs). The BTSs/Node Bs and BSCs/RNCs are often separated by large geographic distances, with the BTSs/Node Bs located in cell sites uniformly distributed throughout a region, and the BSCs, RNCs, and MSCs located at suitably chosen central offices (COs) and/or Mobile Telephone Switching Offices (MTSOs). The traffic generated by a BTS/Node B is transported to the corresponding BSC/RNC across a network, referred to as the backhaul network, which is often a hub-and-spoke topology with hundreds of BTSs/Node Bs connected to a given BSC/RNC by point-to-point time-division multiplexing (TDM) trunks. These TDM trunks may be leased line T1/E1s or their logical equivalents, such as microwave links or satellite channels. The interface between the BTS and BSC in GSM and Code

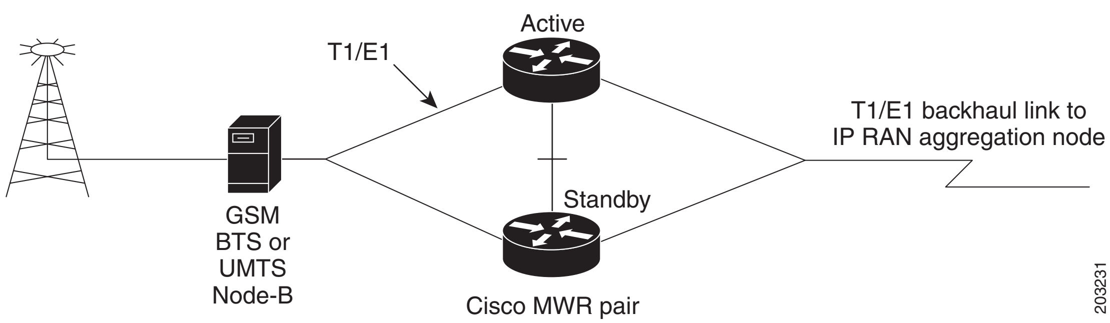
Division Multiple Access (CDMA) systems is called the Abis interface. The interface between the Node B and RNC in a UMTS system is called the Iub interface (see Appendix B, "Configuration Examples", for sample configurations.

RAN-Optimization Implementation

In RAN-Optimization (RAN-O), the Cisco 3825 router extends IP connectivity to the cell site and BTS. The router provides bandwidth-efficient IP transport of GSM and UMTS voice and data bearer traffic, as well as maintenance, control, and signaling traffic, over the leased line backhaul network between the BTS and leased line termination and aggregation node via compression (cRTP/cUDP) and packet multiplexing (Multilink PPP).

Figure 1-1 shows an example of the placement of and connections for the Cisco 3825 router in RAN-O.

Figure 1-1 Example of Cisco 3825 Router in a RAN-O



The BTS site consists of a pair of Cisco 3825 routers. The pair of routers provides an active router and a standby router for redundancy. A failure of the active router causes the standby router to take over as the active router for the BTS site.

Each pair of Cisco 3825 routers at the BTS site is identical in hardware configuration. The two routers connect to each other through the Gigabit Ethernet (GE) interfaces. The individual backhaul links to a Cisco 3825 router are cabled from a single T1/E1 termination block in the BTS, connecting to both the active and standby routers by means of a Y cable. The redundancy design to control the active/standby transitions of the router pair leverages Hot Standby Router Protocol (HSRP) to control the relays on the Cisco 2-port T1/E1-RAN interface card, Cisco product number VWIC-2T1/E1-RAN (for more information, see *Cisco 2-port T1/E1-RAN Installation Instructions*) in each router to ensure that the relays on the active router are closed while the relays on the standby router are open, thus avoiding double termination of the T1 (or E1).

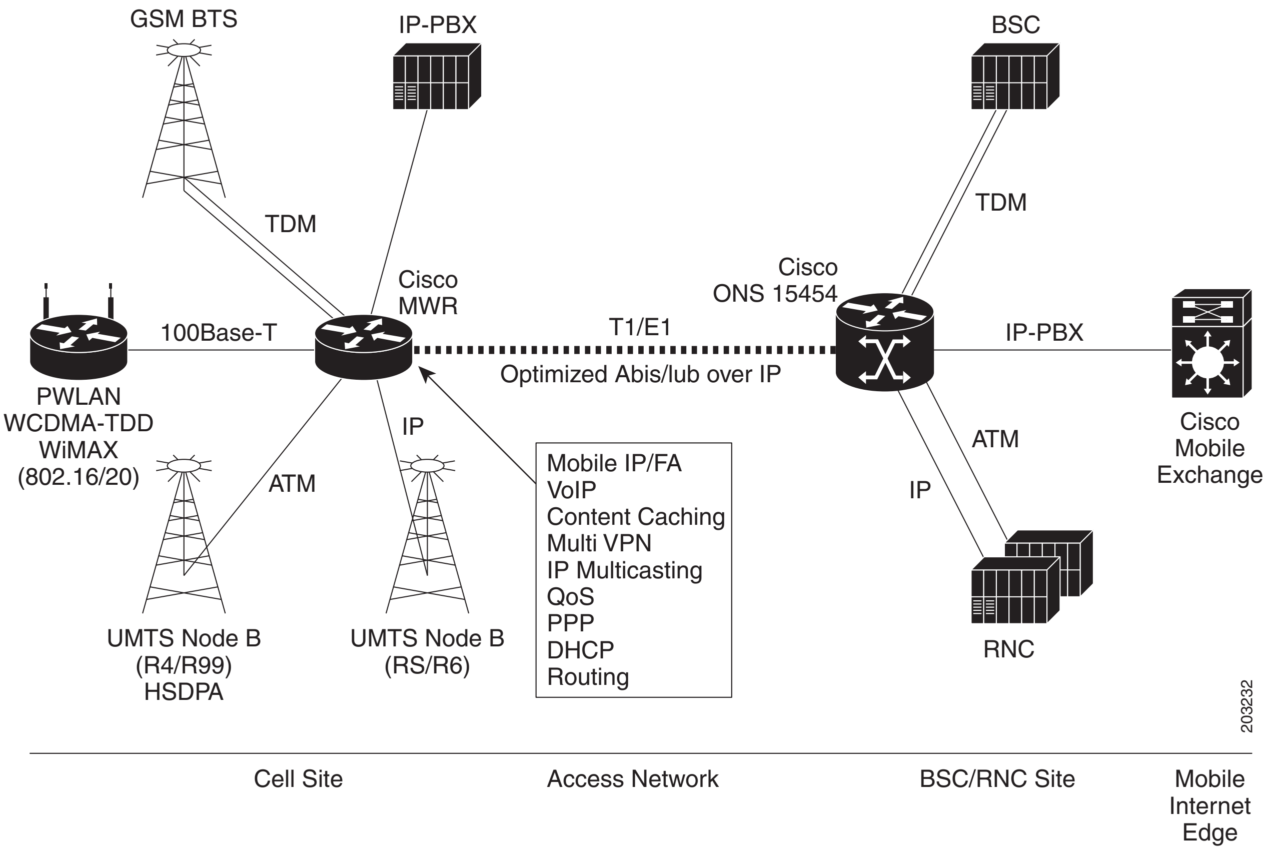
Cisco Abis and Iub Optimization over IP Implementation

One solution that mobile wireless operators find of value is Cisco's ability to optimize RAN backhaul efficiency (see Figure 1-2). For example, Cisco's GSM Abis Optimization solution increases the T1/E1 bandwidth efficiency by as much as 50%. This means the current traffic loads can be carried using half as many T1/E1 trunks as are presently used. This allows more voice and data calls to be carried over the existing RAN backhaul network, eliminating the need for the operator to add expensive new T1/E1 trunks as traffic demands grow. It will also allow a number of existing trunks to be decommissioned, putting an end to their recurring costs.

Another equally important benefit is that substantial excess capacity is now available in the existing RAN backhaul network. The operator can reallocate this recovered bandwidth to carry traffic from other radios, such as UMTS Node Bs, GPRS, EDGE, 1xEV-DO, PWLANs, and other data overlays. This capability reduces the deployment and operating costs for new technologies, since the operator avoids the up-front and recurring costs of supplementing backhaul capacity. It also accelerates time to revenue from deployments of new radio technologies since there is no need for the operator to wait for additional microwave licenses or leased lines to be supplied.

Compliance with 3GPP2 and 3GPP R5 and R6 transport standards is another appealing aspect of Cisco's RAN-O solution. Cisco converts today's CDMA transport networks into 3GPP2-compliant IP RAN transport networks, and GSM and R4/R99 UMTS transport networks into R5/R6 IP RAN transport networks now—and adds multi-radio backhaul compression as well. This means operators can enjoy the benefits of IP transport in their CDMA, GSM, and R4/R99 UMTS RANs today.

Figure 1-2 Example of Cisco 3825 Router in a GSM Abis and UMTS Iub Optimization over IP



Cisco GSM Abis Optimization over IP

The Cisco GSM Abis Optimization over IP technology improves T1/E1 bandwidth efficiency by 33% to 50%, corresponding to a GSM voice call capacity gain of 50-100% per T1/E1, depending on the nature of the traffic on the interface.

In a GSM RAN, the interface between the BTS and BSC is a 3GPP reference interface called the Abis interface. The physical trunk connecting a BTS and BSC is typically a T1 or E1 circuit, and carries 24 (T1) or 32 (E1) separate 64 kbps DS0 channels. One or two of these DS0 channels is used to carry control and signaling traffic, while the remainder are used to carry bearer traffic—voice and data from mobile users. Each DS0 bearer channel carries up to four sub-multiplexed 16 kbps channels, termed sub-rate DS0s. The voice and data bearer traffic is carried over the sub-rate DS0s in Transcoder and Rate Adaptor Unit (TRAU) frames in accordance with 3GPP TS 08.60 v8.2.1, “In-band control of transcoders and rate adaptors for Enhanced Full Rate (EFR) and full rate traffic channels.” There are several types of TRAU frames: full-rate (FR) or enhanced full-rate (EFR) GSM vocoder frames; Adaptive Multi-Rate (AMR) vocoder frames; silent speech frames; and OAM frames. When a sub-rate DS0 is assigned to a call, TRAU frames are generated in accordance with 3GPP TS 08.60 v8.2.1, “In-band control of transcoders and rate adaptors for EFR and full rate traffic channels.” When a sub-rate DS0 is idle, that is, not assigned to a call, a repeating idle pattern is transmitted in accordance with 3GPP TS 08.54 v8.0.1, “Base Station Controller-Base Transceiver Station (BSC-BTS) interface; Layer 1 structure of physical circuits.”

The transcoder and rate adaptation control function that specifies the TRAU frames provides several opportunities to optimize the Abis interface, and thus optimize the backhaul bandwidth efficiency. For example, when Discontinuous Transmission (DTX) is employed over the air interface, the TRAU frames that are transported on the Abis interface contain standardized redundant bit patterns, known as idle (silent) speech frames (FR and EFR) or “no data” frames (AMR), whenever a voice user is silent (typically 40-60% of the time). As another example, bearer channels that are not assigned to calls each carry known idle bit patterns on the Abis interface as mentioned previously. Thus, even though no radio transmissions are made during silent and idle periods, redundant information is nevertheless transported across the backhaul network thereby unnecessarily consuming precious bandwidth.

Cisco Pseudowire Emulation Edge-to-Edge (PWE3)

PWE3 is a mechanism that emulates the essential attributes of a service, such as ATM or EI/T1 (see Figure 1-3). The required functions of pseudowires (PWs) include encapsulating service-specific Packet Data Units (PDUs) arriving at an ingress port and carrying them across a path or tunnel, managing their timing and order, and any other operations required to emulate the behavior and characteristics of the service as efficiently as possible.

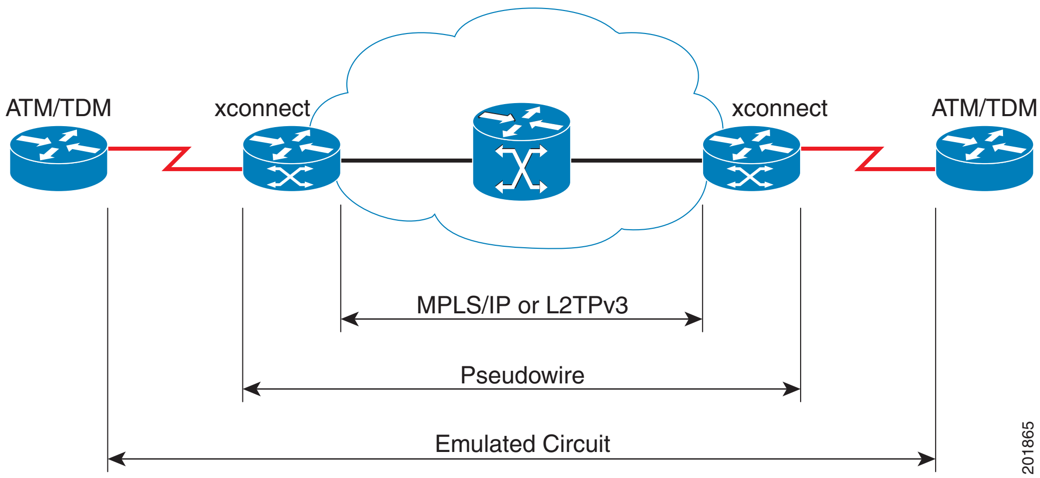
PW is perceived as an unshared link or circuit of the chosen service. However, there may be deficiencies that impede some applications from being carried on a PW. These limitations should be fully described in the appropriate service-specific documents and applicability statements.

Cisco supports standards-based PWE3 as defined by:

- Structure-agnostic TDM over Packet (SAToP), page 1-16
- Structure-aware TDM CESoPSN, page 1-16
- Transportation of ATM Service via MPLS/IP (PWE3/ATM), page 1-17
- Transportation of ATM Service via L2TPv3, page 1-20

A PW is a connection between two provider edge (PE) devices, which connects two attachment circuits (ACs). An AC can be an ATM virtual path identifier/virtual channel identifier (VPI/VCI) or an T1/E1 link.

Figure 1-3 Example of Cisco 3825 Router in a PWE3f



Cisco Iub Optimization over IP

The Cisco Iub Optimization over IP technology for R4/R99 (ATM) UMTS RANs improves bandwidth efficiency by as much as 15 to 40%, corresponding to a UMTS voice call capacity gain of 18 to 67%, depending on the type of Iub header and ATM Adaptation Layer traffic sub-cell multiplexing performance. For R5/R6 IP UMTS RANs, Cisco provides compression and low-overhead encryption.

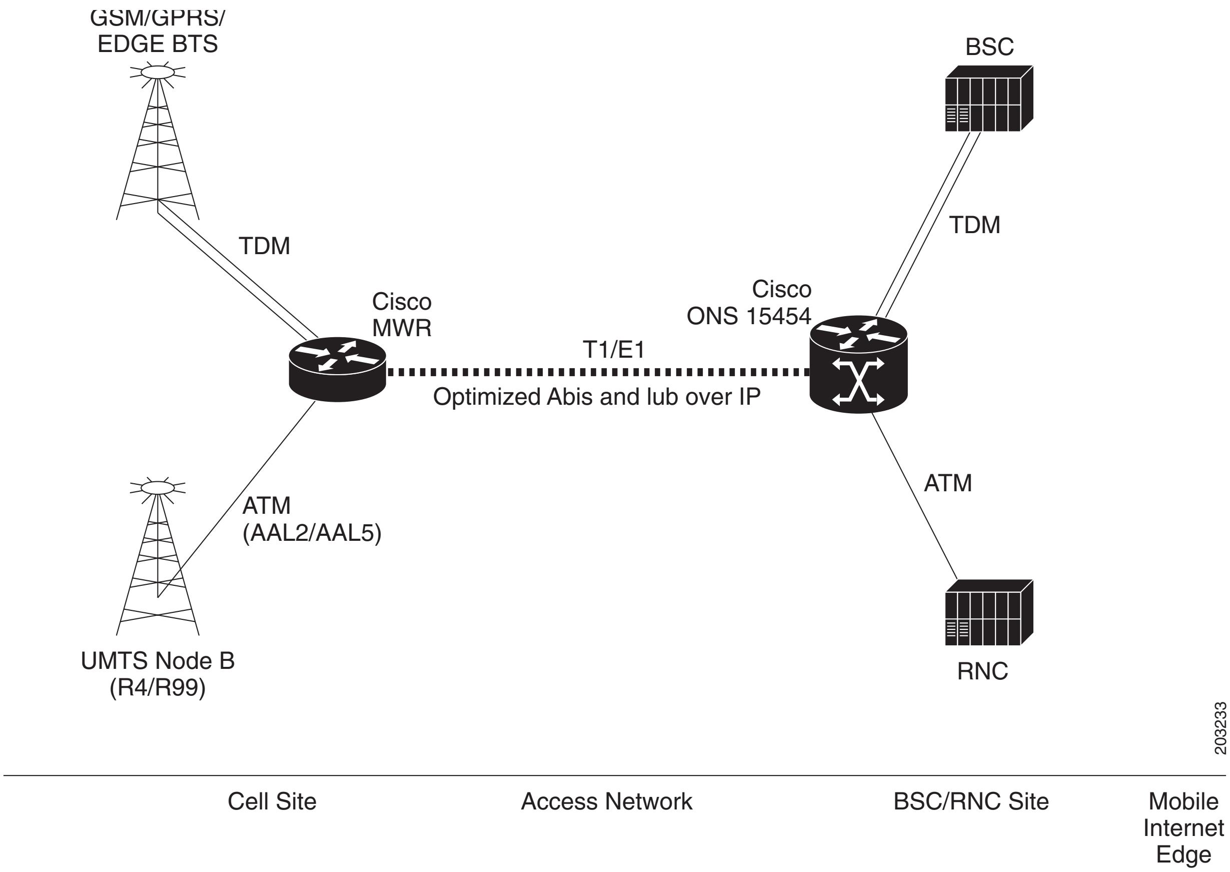
Intelligent Cell Site IP Services

Cisco's RAN-O solutions also open up the possibility to deliver new profit-enhancing services. This is achieved through the rich set of IP networking features supported in Cisco IOS Software that are now extended to the cell site (see Figure 1-4 on page 1-6).

Cell Site Points-of-Presence (POPs)

Since many cell sites are located in and around downtown areas, hotels, airports, and convention centers, they make attractive sites for co-locating public wireless LAN (PWLAN) access points and other wireless data overlays. Many of these wireless data radios are IP-based. IP networking features, like Mobile IP, VoIP, IP Multicast, Virtual Private Network (VPN), and content caching, enable delivery of new revenue-generating services over these radios. Cisco also provides a wide range of low-latency IP-based quality of service (QoS) and traffic shaping models to allow flexible mixing of multiple traffic types across the same backhaul network. Thus, the cell site becomes a physical point of presence or POP from which to offer hotspot services, or voice and wired Internet service provider (ISP) services to nearby enterprises and residences. The corresponding traffic "rides for free" on the spare backhaul bandwidth made available by Cisco's Abis and Iub Optimization solutions.

Figure 1-4 Example of Cisco 3825 Router in a Cell Site POP



Cisco IOS Software Features

There is one version of software available for the Cisco 3825 router. This version of the software is required for implementing the Cisco 3825 router in a Radio Access Network-Optimization (RAN-O) configuration.

Software features for the RAN-O Implementation

The software required for implementing the Cisco 3825 router consists the Cisco IOS software running on the MIPs-based portion of the Cisco 3825 router hardware.

Cisco IOS software functions added to the Cisco 3825 router for the RAN-O implementation include:

- Redundancy logic—For monitoring Hot Standby Router Protocol (HSRP) information to determine the active and standby router and control T1 termination.
- Failover logic—To force a switchover for hardware failures or an over-temperature condition.
- Relay control—To open and close the T1/E1 interfaces on the active and standby routers.
- Diagnostic functions—To monitor the “health” of the standby Cisco 3825 router.

Software Features

Standard Cisco IOS software features supported in the Cisco 3825 router for the RAN-O implementation include:

Simple Services

- DHCP
- PPP
- NAT
- OSPF
- RIP

Intelligent Services

- QoS
- VPN
- IP Multicast
- Mobile IP/FA
- content caching
- MPLS
- L2TPv3

Other Services

- ACFC and PFC Handling During PPP Negotiation
- HSRP
- NTP
- SNMP

Redundancy Support

In a RAN-O application, to ensure availability, the backhaul links to a Cisco 3825 router are redundantly cabled to the Cisco 2-port T1/E1-RAN card. This card, designed specifically for the Cisco MWR 1941-DC-A router and Cisco 3825 router includes relays that activate the T1/E1 ports. These relays allow "Y" cabling for router redundancy where the T1/E1 link is not redundant and default to open. The relays are controlled by HSRP/redundancy protocol between the two routers connected to the same T1/E1.

Note If you choose to use the Cisco 3825 router in a non-redundant configuration, you must close the relays on the card using the **standalone** subcommand. Also, redundancy parameters are processed when the router is booted up. These parameters cannot be changed "on the fly."

HSRP

Cisco's HSRP is used to control which router is active and which is standby. HSRP uses a priority scheme to determine which HSRP-configured router is to be the default active router. Priority is determined first by the configured priority value, then by the IP address. In each case, a higher value is of greater priority.

Configuration Statements for CISCO-IP-RAN-BACKHAUL-MIB

This section contains detailed information on how to enable notifications provided by the **CISCO-IP-RAN-BACKHAUL-MIB**.

With Cisco IOS Release 12.4(16)MR1, the Cisco 3825 router supports the following MIB:

CISCO-IP-RAN-BACKHAUL-MIB

This MIB is compatible with Cisco Mobile Wireless Transport Manager (MWTM) 5.0 or later. It provides information on the optimization on the optimization of the following traffic types:

- GSM—providing information between a BTS and the corresponding BSC
- UMTS—providing information on optimization between a Node Band the corresponding RNC.

NOTIFICATIONS

ciscoIpRanBackHaulGsmAlarm

Provides information alarms associated with Global System for Mobile Communications (GSM)-Abis interfaces. Only enables GSM Abis. See Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference" for more information.

```
conf t
    snmp-server enable traps ipran alarm-gsm
```

ciscoIpRanBackHaulUmtsAlarm

Provides information alarms associated with Universal Mobile Telecommunications System (UMTS)-Iub interfaces. Only enables UMTS Iub. See Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference" for more information.

```
conf t
    snmp-server enable traps ipran alarm-umts
```

ciscoIpRanBackHaulRcvdUtil + ciscoIpRanBackHaulSentUtil

Provides information on backhaul utilization. Only enables backhaul utilization. See Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference" for more information.

```
conf t
    snmp-server enable traps ipran util
```

Note The snmp-server enable traps ipran util command is obsolete. CLI accepts the command to maintain compatibility.

To specify all notifications, specify the component name. See Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference" for more information.

```
conf t
    snmp-server enable traps ipran
```

The following configuration statements are used to provide additional information about device and control generation of notifications:

ipran-mib ?

backhaul-notify-interval	Interval for backhaul utilization (Obsolete. Provided only to maintain compatibility.)
location	Location of device
snmp-access	Specify type snmp connectivity

ipran-mib ?

threshold-acceptable	Acceptable utilization threshold (Obsolete. Provided only to maintain compatibility.)
threshold-overloaded	Overloaded utilization threshold (Obsolete. Provided only to maintain compatibility.)
threshold-warning	Warning utilization threshold (Obsolete. Provided only to maintain compatibility.)

ipran-mib backhaul-notify-interval

For more information on these commands, see Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference".

MIB Support

The Cisco 3825 router supports the following MIBs:

• ADSL-DMT-LINE-MIB	• CISCO-IETF-ATM2-PVCTRAP-MIB-EXTN
• ADSL-LINE MIB	• CISCO-IETF-ATM2-PVCTRAP-MIB
• ATM-MIB	• CISCO-IETF-NAT-MIB
• BRIDGE-MIB	• CISCO-IETF-PW-MIB
• CISCO-AAA-SERVER-MIB	• CISCO-IETF-PW-MPLS-MIB
• CISCO-AAL5-MIB	• CISCO-IETF-PW-TC-MIB
• CISCO-ACCESS-ENVMON-MIB	• CISCO-IF-EXTENSION-MIB
• CISCO-ATM-EXT-MIB	• CISCO-IMAGE-MIB
• CISCO-ATM-PVCTRAP-EXTN-MIB	• CISCO-IP-RAN-BACKHAUL-MIB
• CISCO-BULK-FILE-MIB	• CISCO-IPMROUTE-MIB
• CISCO-CALL-APPLICATION-MIB	• CISCO-MEMORY-POOL-MIB
• CISCO-CALL-HISTORY-MIB	• CISCO-MVPN-MIB
• CISCO-CAR-MIB	• CISCO-NBAR-PROTOCOL-DISCOVERY-MIB
• CISCO-CAS-IF-MIB	• CISCO-NETFLOW-MIB
• CISCO-CCME-MIB	• CISCO-NTP-MIB
• CISCO-CDP-MIB	• CISCO-PIM-MIB
• CISCO-CIRECUIT-INTERFACE-MIB	• CISCO-PING-MIB
• CISCO-CLASS-BASED-QOS-MIB	• CISCO-POP-MGMT-MIB
• CISCO-CONFIG-MAN-MIB	• CISCO-PPPOE-MIB
• CISCO-DIAL-CONTROL-MIB	• CISCO-PROCESS-MIB
• CISCO-DSL-CPE-MIB	• CISCO-QUEUE-MIB
• CISCO-ENTITY-ASSET-MIB	• CISCO-RTTMON-MIB
• CISCO-ENTITY-EXT-MIB	• CISCO-SAA-APM-MIB
• CISCO-ENTITY-VENDORTYPE-OLD-MIB	• CISCO-SMI
• CISCO-ENVMON-MIB	• CISCO-SNAPSHOT-MIB
• CISCO-FLASH-MIB	• CISCO-SNMP--TARGET-EXT-MIB
• CISCO-FRAME-RELAY-MIB	• CISCO-SRST-MIB
• CISCO-FTP-CLIENT-MIB	• CISCO-STACKMAKER-MIB
• CISCO-HSRP-MIB	• CISCO-SYSLOG-MIB
• CISCO-ICSUDSU-MIB	• CISCO-TC

• CISCO-TCP-MIB • CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB • CISCO-VLAN-MEMBERSHIP-MIB • CISCO-VOICE-ANALOG-IF-MIB • CISCO-VOICE-ATM-DIAL-CONTROL-MIB • CISCO-VOICE-COMMON-DIAL-CONTROL-MIB • CISCO-VOICE-DIAL-CONTROL-MIB • CISCO-VOICE-DNIS-MIB • CISCO-VOICE-ENABLED-LINK-MIB • CISCO-VOICE-FR-DIAL-CONTROL-MIB • CISCO-VOICE-IF-MIB • CISCO-VOICE-NUMBER-EXPANSION-MIB • CISCO-VOICE-URI-CLASS-MIB • CISCO-VPDN-MGMT-EXT-MIB • CISCO-VPDN-MGMT-MIB • CISCO-VTP-MIB • DIAL-CONTROL-MIB • DS1-MIB • DS3-MIB • ETHERLIKE-MIB • EVENT-MIB • EXPRESSION-MIB • IF-MIB • IGMP-MIB • IMA-MIB • INT-SERV-GUARANTEED-MIB • INT-SERV-MIB	• IP-FORWARD-MIB • ISDN-MIB • MSDP-MIB • OLD-CISCO-CHASSIS-MIB • OLD-CISCO-FLASH-MIB • OLD-CISCO-INTERFACES-MIB • OLD-CISCO-IP-MIB • OLD-CISCO-SYS-MIB • OLD-CISCO-TCP-MIB • OLD-CISCO-TS-MIB • OSPF-MIB • OSPF-TRAP-MIB • PIM-MIB • RFC1213-MIB • RFC1231-MIB • RFC1315-MIB • RFC1406-MIB • RMON-MIB • RS-232-MIB • RSVP-MIB • SMON-MIB • SNMP-TARGET-MIB • SONET-MIB • TCP-MIB • UDP-MIB • VRRP-MIB • XGCP-MIB

Limitations and Restrictions

The following restrictions applies when using the Cisco 2-port T1/E1-RAN interface card in the Cisco 3825 router:

Caution The Cisco 3825 router does not support online insertion and removal (OIR) of the Cisco 2-port T1/E1-RAN interface card. Any attempt to perform OIR on a card in a powered up router might cause damage to the card.

Caution The Cisco 3825 router does not support OIR of network modules. Any attempt to perform OIR on a card in a powered up router might cause damage to the card.

Note The Cisco NM-2W network interface module only is only supported on the Cisco 3825 router on shorthaul with or without Inverse Multiplexing over ATM (IMA). It is not supported on the Cisco 3825 router on shorthaul with GSM.

RAN-O Implementation Limitations and Restrictions

The following list of restrictions applies when implementing the Cisco 3825 router in a Radio Access Network-Optimization (RAN-O) configuration.

Hardware not Supported on the Cisco 3825 Router

Use of additional voice/WAN interface card (VWIC) cards. The only supported VWIC is the Cisco 2-port T1/E1-RAN.

UMTS Iub and GSM Abis Implementation Limitations and Restrictions

The following list of restrictions applies when implementing the UMTS Iub or GSM Abis application in a RAN-O configuration.

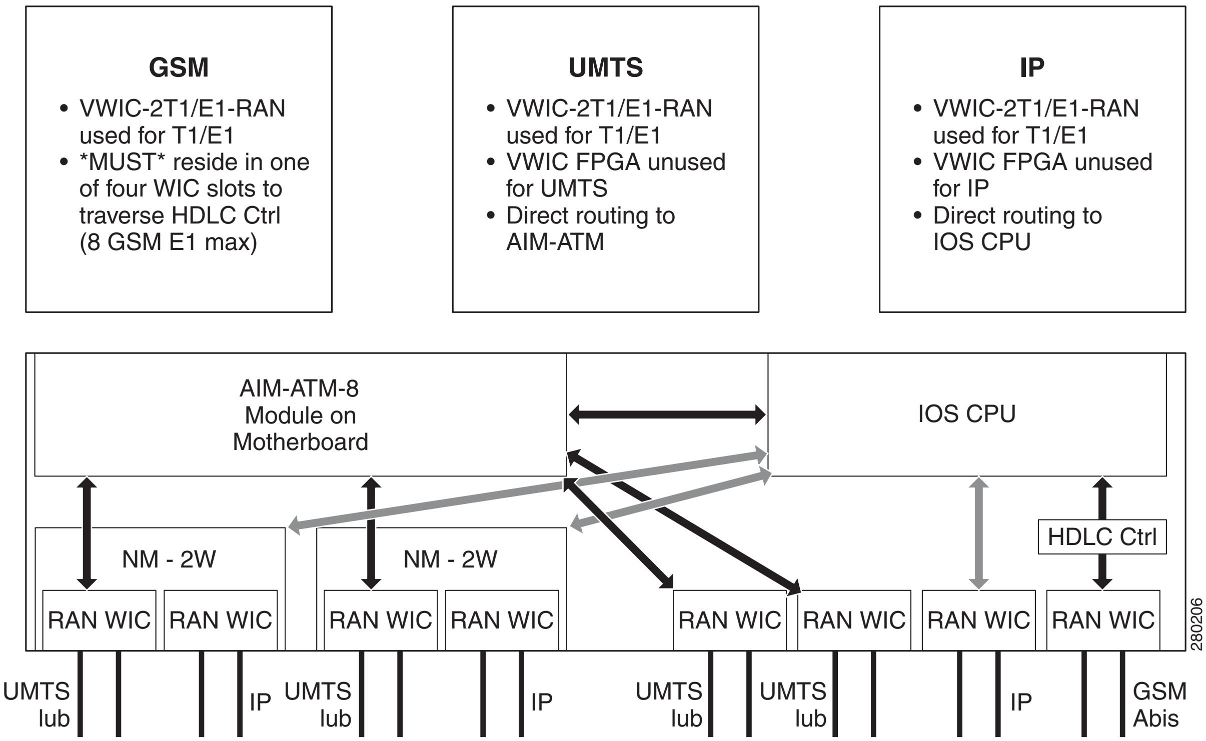
Hardware not Supported for UMTS Iub

The Cisco MWR 1941-DC router does not support UMTS Iub as it does not include the Advanced Integration Module (AIM) slot connector on the motherboard. Only the Cisco MWR 1941-DC-A router and Cisco 3825 router are supported for UMTS Iub.

Hardware not Supported for GSM Abis

The Network Interface Module (NM-2W) does not support GSM Abis as the HDLC Controller channel does not interface with the NM-2W. GSM Abis is only supported through the Cisco 2-port T1/E1-RAN card through the four voice/WAN interface card (VWIC) ports on the Cisco 3825 router (see Figure 1-5 on page 1-13).

Figure 1-5 Example of Cisco 3825 Router VWIC and NM-2W Configuration Options Block Diagram



New Features in Cisco IOS Release 12.4(16)MR2

With Cisco IOS Release 12.4(16)MR2, the Cisco MWR 1941-DC-A router supports the following feature:

- Keyword ignore-vpi-vci Added to xconnect Command, page 1-13

Keyword ignore-vpi-vci Added to xconnect Command

With the **ignore-vpi-vci** keyword configured, the MWR ignores the VPI/VCI value in the PW packet and does a blind rewrite with the local configured AC-side PVC's VPI/VCI value. This applies only when the **xconnect** command is configured under the PVC, which is the N:1 with N=1 special case. It does not apply when the **xconnect** command is configured under the subinterface, which supports N>1.

The **xconnect** command with keyword **ignore-vpi-vci** results in the PVC mapping being done in a cooperative way if the MWR works the same way as the receiving router. Without this command, the MWR checks the VPI/VCI value inside PW packet for matches against the local configured PVC or PVC-mapping. With the **ignore-vpi-vci** keyword configured, the MWR ignores the VPI/VCI header inside the received PW packet and does a blind rewrite with the local configured AC-side PVC's VPI/VCI value.

New Features in Cisco IOS Release 12.4(16)MR1

With Cisco IOS Release 12.4(16)MR1, the Cisco 3825 router supports the following:

Emulation of TDM Circuit via MPLS/IP (PWE3/TDM)

PWE3 is a mechanism that emulates the essential attributes of a T1/E1 line over a packet-switched network (PSN). This evolutionary technology allows you to migrate all packet networks from legacy TDM networks, yet provides transport for legacy applications. PWE3/TDM emulates T1/E1 unstructured and structured lines, including NxDS0 circuits over a Multiprotocol Label Switching (MPLS) infrastructure.

Configuration for provisioning and creating the PW is done through the existing xconnect interface.

A new command **cem-group** has been added to this feature to create a circuit emulation (CEM) channel from one or more time slots of T1/E1.

The *group-number* keyword identifies the group number used for this channel.

- For T1 controller, the range is 0-23. (24 cem-groups id)
- For E1 controller, the range is 0-30. (30 cem-groups id)

Use the unframed keyword to specify that a single CEM channel is being created, including all time slots with no framing structure defined. If time slots are defined, the PWE3 circuit is circuit emulation service over packet-switched network (CESoPSN).

Use the time slots keyword and the *timeslot-range* argument to specify the time slots to be included in the CEM channel. The list of time slots may include commas and hyphens with no spaces between the numbers, commas, and hyphens.

The following example illustrates the use of the **cem-group** command:

SATOP

```
controller e1 0/0/0
 cem-group 0 unframed

int cem 0/0/0
 cem 0
  xconnect 10.10.10.10 200 encap mpls
```

CESoPSN

```
controller e1 0/0/1
 cem-group 0 timeslots 1-31

int cem 0/0/1
 cem 0
  xconnect 10.10.10.10 200 encap mpls
```

A new command **sample-rate** has been added to this feature to specify in milliseconds the rate that hardware samples data on the attached circuit.

The default is 1 ms. The **sample-rate** command translates into the *payload-size* that is sent over the circuit.

- 32-time slots at 1 ms = 256-bytes (32-time slots * 8-bytes/timeslot/ms)
- 24-time slots at 2 ms = 384-bytes (24-time slots * 16-bytes/timeslot/ms)
- 10-time slots at 1 ms = 80-bytes (10-time slots * 8-bytes/timeslot/ms)

The following example illustrates the use of the **sample-rate** command:

```
interface CEM0/0/0
no ip address
cem 0
 sample-rate 2
 xconnect 10.10.10.10 200 encapsulation mpls
```

A new command **dejitter-buffer** has been added to this feature to specify the size of the **dejitter-buffer** used to compensate for the network jitter.

- Use the *size* argument to specify the size of the buffer in milliseconds.
- *Size* can vary from 4 - 500 ms; default is 4 ms.

The following example illustrates the use of the **dejitter-buffer** command:

```
interface CEM0/0/0
no ip address
cem 0
 dejitter-buffer 10
 xconnect 10.10.10.10 200 encapsulation mpls
```

A new command **idle-pattern** has been added to this feature to specify the data pattern transmitted on the T1/E1 when missing packets are detected on the PWE3 circuit.

The default **idle-pattern** command is 0xFF.

The following example illustrates the use of the **idle-pattern** command:

```
interface CEM0/0/0
no ip address
cem 0
 idle-pattern 0x55
 xconnect 10.10.10.10 200 encapsulation mpls
```

A new command **shutdown** has been added to this feature to administratively shut down the CEM channel.

Default: cem channel is created in a "no shut" state.

The following example illustrates the use of the **shutdown** command:

```
interface CEM0/0/0
no ip address
cem 0
 shutdown
 xconnect 10.10.10.10 200 encapsulation mpls
```

A new command **class cem** has been added to this feature to allow CEM interface parameters to be configured in a class and applied to CEM interfaces together. This command works in the same manner for CEM interfaces as the pseudowire-class command does for xconnect.

The following example illustrates the use of the **class cem** command:

```
class cem mycemclass
dejitter-buffer 10
sample-rate 2

interface CEM0/0/0
no ip address
cem 0
 xconnect 10.10.10.10 200 encapsulation mpls
 cem class mycemclass
```

Structure-agnostic TDM over Packet (SAToP)

SAToP encapsulates TDM bit-streams (T1, E1, T3, E3) as PWs over PSNs. It disregards any structure that may be imposed on streams, in particular the structure imposed by the standard TDM framing.

The protocol used for emulation of these services does not depend on the method in which attachment circuits are delivered to the PEs. For example, a T1 attachment circuit is treated in the same way regardless of whether it is delivered to the PE on copper, multiplexed in a T3 circuit, mapped into a virtual tributary of a SONET/SDH circuit, or carried over an ATM network using unstructured ATM circuit emulation service (CES) [ATM-CES]. Termination of any specific "carrier layers" used between the PE and CEM is performed by an appropriate network service provider (NSP).

Structure-aware TDM CESoPSN

CESoPSN encapsulates structured (NxDS0) TDM signals as PWs over PSNs. It complements similar work for structure-agnostic emulation of TDM bit-streams, such as PWE3-SAToP.

Emulation of NxDS0 circuits saves PSN bandwidth and supports DS0-level grooming and distributed cross-connect applications. It also enhances resilience of CE devices to the effects of loss of packets in the PSN.

Transportation of ATM Service via MPLS/IP (PWE3/ATM)

An ATM PW is used to carry ATM cells over an MPLS network. It is an evolutionary technology that allows you to migrate all packet networks from legacy ATM networks, yet provides transport for legacy applications.

Configuration for provisioning and creating the PW is done through the existing **xconnect** command.

The following PW modes are supported in this release:

- Transparent Cell Transport Service/ATM Port Mode, page 1-17
- ATM N-to-One VCC Cell Mode, page 1-17
- ATM AAL5 CPCS-SDU Mode, page 1-18
- ATM VCC Cell Relay Service, page 1-20

The following examples illustrates how different modes of PWs are configured.

Transparent Cell Transport Service/ATM Port Mode

ATM port mode maps the entire ATM interface to a PW. Use the **xconnnect** command under the interface mode to configure a port mode PW.

A sample configuration is written as follows:

```
interface ATM0/0/0
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 100 encapsulation mpls sequencing both
 pvc 1/35 l2transport
  encapsulation aal0
!
 pvc 1/36 l2transport
  encapsulation aal0
!
 pvc 1/37 l2transport
  encapsulation aal0
!
```

ATM N-to-One VCC Cell Mode

ATM N:1 VCC cell relay mode maps one or more permanent virtual circuits (PVCs) to one PW. There are two ways to configure N:1 VCC in cell relay mode:

1. When only one PVC needs to be mapped to a PW, configure the **xconnect** command under the PVC mode to configure a N:1 VCC cell relay mode PW.

A sample configuration is written as follows:

```
interface ATM0/0/1
 no ip address
 load-interval 30
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 pvc 0/101 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
```

```
  xconnect 99.99.99.99 1101 encapsulation mpls sequencing both
!
```

2. When more than one PVC needs to be mapped to a PW, configure the **xconnect** command under the subinterface mode to configure N:1 VCC cell in relay mode PW. All PVCs configured under this subinterface are mapped to the PW.

A sample configuration is written as follows:

```
interface ATM0/0/1.1 multipoint
 no snmp trap link-status
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 1200 encapsulation mpls sequencing both
 pvc 1/35 l2transport
  encapsulation aal0
!
 pvc 1/36 l2transport
  encapsulation aal0
!
 pvc 1/37 l2transport
  encapsulation aal0
```

ATM AAL5 CPCS-SDU Mode

ATM adaptation layer 5 (AAL5) SDU mode maps one AAL5 type PVC to a PW. Use the **xconnect** command under an AAL5 encapsulation type PVC to configure AAL5 SDU mode PW.

A sample configuration is written as follows:

```
interface ATM0/0/1
 no ip address
 load-interval 30
 scrambling-payload
 no atm ilmi-keepalive
 pvc 0/100 l2transport
  encapsulation aal5
  xconnect 99.99.99.99 1100 encapsulation mpls sequencing both
!
```

ATM One-to-One VCC Cell Mode

ATM 1:1 VCC cell relay mode maps one PVC to a PW. Use a **one-to-one** keyword in the **xconnect** command mode to specify a 1:1 VCC relay mode PW.

A sample configuration is written as follows:

```
interface ATM0/0/1
 no ip address
 load-interval 30
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 pvc 0/102 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 99.99.99.99 1102 encapsulation mpls sequencing both one-to-one
 !
```

Cell Packing

Cell packing or concatenation supports Port, N:1 VCC cell, or 1:1 VCC cell mode. Cell packing can be configured with a parameter of a maximum number of cells and a parameter of cell packing timer.

"atm mcpt-timers [timer1] [timer2] [timer3]" can be used under the interface mode to configure three cell packing timer values. Timer values are in microseconds, and the granularity is 1,000 microseconds, namely 1 millisecond. The timer value is referenced by the "**atm cell-packing** …" and "**cell-packing** …" commands.

The sample below configures cell packing for ATM port modes. It specifies a maximum number of cells as 28 and a cell packing timer as 3,000 microseconds.

```
interface ATM0/0/0
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 100 encapsulation mpls sequencing both
 pvc 1/35 l2transport
  encapsulation aal0
 !
 pvc 1/36 l2transport
  encapsulation aal0
 !
 pvc 1/37 l2transport
  encapsulation aal0
 !
```

The sample below configures cell packing for the N:1 VCC cell relay mode PW. It specifies a maximum number of cells as 20 and a cell packing timer as 4,000 microseconds.

```
interface ATM0/0/1
 no ip address
 load-interval 30
 scrambling-payload
 atm mcpt-timers 2000 3000 4000
 no atm ilmi-keepalive
 pvc 0/101 l2transport
  encapsulation aal0
  cell-packing 20 mcpt-timer 3
  xconnect 99.99.99.99 1101 encapsulation mpls sequencing both
```

PVC Mapping

The **pw-pvc** command configures PVC mapping or rewrites for PW-configured PVCs. It specifies the PW-side vpi/vci value used in sending and receiving PW packets for specified PVCs.

The following example illustrates the use of the **pw-pvc** command:

```
pvc 0/40 l2transport
 encapsulation aal0
 pw-pvc 1/40
 xconnect 1.1.1.1 40 encapsulation mpls
```

Transportation of ATM Service via L2TPv3

This service transports ATM services over IP networks. It allows you to migrate all PSNs from ATM legacy networks while still providing ATM legacy services.

The following PW modes are supported in this release:

- ATM Port Cell Relay Service, page 1-20
- ATM VCC Cell Relay Service, page 1-20
- ATM AAL5-SDU Mode, page 1-21

Configuring Layer 2 Tunnel Protocol version 3 (L2TPv3)-based PWs is very similar to configuring MPLS-based PWs, except that a **pseudowire-class** command is required to be configured for L2TPv3-based PWs.

A sample configuration of the L2TPv3 **pseudowire-clas**s command is written as follows:

```
pseudowire-class l2tp
 encapsulation l2tpv3
 sequencing both
 ip local interface Loopback0
```

ATM Port Cell Relay Service

ATM port mode maps the entire ATM interface to a PW. Use the **xconnnect** command under the interface mode to configure a port mode PW. The ATM interface maps to the PW.

A sample configuration is written as follows:

```
interface ATM0/0/0
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 100 pw-class l2tp
 pvc 1/35 l2transport
  encapsulation aal0
 !
 pvc 1/36 l2transport
  encapsulation aal0
 !
 pvc 1/37 l2transport
  encapsulation aal0
 !
!
```

ATM VCC Cell Relay Service

ATM N:1 VCC cell relay mode maps one or more PVCs to one PW. There are two ways to configure N:1 VCC in cell relay mode:

1. When only one PVC needs to be mapped to the PW, configure the **xconnect** command under the PVC mode to configure a N:1 VCC cell relay mode PW.

A sample configuration is written as follows:

```
interface ATM0/0/1
 no ip address
 load-interval 30
 scrambling-payload
```

```
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 pvc 0/101 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 99.99.99.99 1101 pw-class l2tp
 !
```

2. When more than one PVC needs to be mapped to a PW, configure the **xconnect** command under the subinterface mode to configure a N:1 VCC cell relay mode PW. All PVCs configured under this subinterface are mapped to the PW.

A sample configuration is written as follows:

```
interface ATM0/0/1.1 multipoint
 no snmp trap link-status
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 1200 pw-class l2tp
 pvc 1/35 l2transport
  encapsulation aal0
  pw-pvc 2/135
 !
 pvc 1/36 l2transport
  encapsulation aal0
  pw-pvc 2/136
 !
 pvc 1/37 l2transport
  encapsulation aal0
  pw-pvc 2/137
 !
!
```

ATM AAL5-SDU Mode

ATM AAL5-SDU mode maps one AAL5 type PVC to a PW. Use the **xconnect** command under an AAL5 encapsulation type PVC to configure a AAL5-SDU mode PW.

A sample configuration is written as follows:

```
interface ATM0/0/1
 no ip address
 load-interval 30
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 pvc 0/100 l2transport
  encapsulation aal5
  xconnect 99.99.99.99 1100 pw-class l2tp
 !
```

Cell Packing

Cell packing or concatenation supports Port, N:1 VCC cell, or 1:1 VCC cell mode. Cell packing can be configured with a parameter of a maximum number of cells and a parameter of cell packing timer.

"atm mcpt-timers [timer1] [timer2] [timer3]" can be used under the interface mode to configure three cell packing timer values. Timer values are in microseconds, and the granularity is 1,000 microseconds, namely 1 millisecond. The timer value is referenced by the "**atm cell-packing** …" and "**cell-packing** …" commands.

The sample below configures cell packing for ATM port modes. It specifies a max number of cells as 28 and a cell packing timer as 3,000 microseconds.

```
interface ATM0/0/0
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 100 pw-class l2tp
 pvc 1/35 l2transport
  encapsulation aal0
 !
 pvc 1/36 l2transport
  encapsulation aal0
 !
 pvc 1/37 l2transport
  encapsulation aal0
 !
```

The sample below configures cell packing for the N:1 VCC cell relay mode. It specifies a maximum number of cells as 20 and a cell packing timer as 4,000 microseconds.

```
interface ATM0/0/1
 no ip address
 load-interval 30
 scrambling-payload
 atm mcpt-timers 2000 3000 4000
 no atm ilmi-keepalive
 pvc 0/101 l2transport
  encapsulation aal0
  cell-packing 20 mcpt-timer 3
  xconnect 99.99.99.99 1101 pw-class l2tp
```

PVC Mapping

The **pw-pvc** command configures PVC mapping or rewrites for PW-configured PVCs. It specifies the PW-side vpi/vci value used in sending and receiving specific PVCs.

The following example illustrates the use of PW packets for the **pw-pvc** command:

```
pvc 0/40 l2transport
 encapsulation aal0
 pw-pvc 1/40
 xconnect 1.1.1.1 40 pw-class l2tp
```

Asymmetric PWE3

This feature uses two different MPLS enabled IP routes in uplink and downlink directions for creating an asymmetric backhaul path between two Mobile Wireless Routers (MWRs) acting as provider edge (PE) routers.

For ATM over L2TPV3, this feature uses two different IP routes in uplink and downlink directions for creating an asymmetric backhaul path between two MWRs acting as end points for an L2TPV3 tunnel.

No special configuration is needed for this feature apart from configuring the IP routes and having multiple backhaul paths available between two MWRs.

For a configuration example, see the "Asymmetric PWE3 Configuration" section on page B-2 in Appendix B.

Ethernet over MPLS

The Ethernet over MPLS feature allows you to transport Ethernet traffic over MPLS networks. This feature can be configured in the following two ways:

VLAN Mode

A VLAN is a switched network that is logically segmented by functions, project teams, or applications regardless of the physical location of users.

To connect two VLAN networks in different locations, configure the PE routers at each end of the MPLS backbone and add a point-to-point virtual connection (VC). Only two PE routers at the ingress and egress points of the MPLS backbone have dedicated VCs to transport Layer 2 VLAN traffic.

Ethernet over MPLS in VLAN mode transports Ethernet traffic from a source 802.1Q VLAN to a destination 802.1Q VLAN over a core MPLS network.

The following example configures Ethernet in VLAN mode:

```
Router> enable
Router# configure terminal
Router(config)# interface gigabitethernet 0/0.1
Router(config-subif)# encapsulation dot1q 100
Router(config-subif)# xconnect 10.0.0.1 123 encapsulation mpls
```

Note Ethernet over MPLS in VLAN mode must be configured on subinterfaces.

Port Mode

Port mode allows a frame coming into an interface to be packed into an MPLS packet and transported over the MPLS backbone to an egress interface. The entire Ethernet frame without the preamble or a frame check sequence (FCS) is transported as a single packet.

To configure in port mode, use the **xconnect** command in the interface configuration mode and specify the destination address and the VC ID. The syntax of the **xconnect** command is the same for all other transport types. Each interface is associated with one unique PW VC label.

When configuring Ethernet over MPLS in port mode, use the following guidelines:

- The pseudowire (PW) VC type is set to Ethernet.
- Port mode and Ethernet VLAN mode are mutually exclusive. If you enable a main interface for port-to-port transport, you cannot also enter commands on a subinterface.

The command output in the following example shows two VCs for Ethernet over MPLS:

```
Router# show mpls l2transport vc
Local intf     Local circuit        Dest address    VC ID      Status
-------------  -------------------- --------------- ---------- ----------
Fa0/0.1        Eth VLAN 2           10.1.1.1        2          UP
Fa0/1          Ethernet           10.1.1.1        8          UP
```

VC 2 is in Ethernet VLAN mode. VC 8 is in Ethernet port mode.

If you issue the **show mpls l2transport vc** detail command, the output is similar to the following:

```
Router# show mpls l2transport vc detail
Local interface: Fa0/0.1 up, line protocol up, Eth VLAN 2 up
Destination address: 10.1.1.1, VC ID: 2, VC status: up
.
.
.
Local interface: Fa0/1 up, line protocol up, Ethernet up
  Destination address: 10.1.1.1, VC ID: 8, VC status: up
```

PWE3 over MLPPP

PWE3 over MLPPP (Multi-Link Point-to-Point Protocol) enables PWE3 establishment over multilink backhaul. With this feature it is possible to use multilink as an MPLS or L2TPV3 (for ATM over L2TPv3) enabled backhaul between two MWRs acting as PE routers. This feature does not need any special configuration apart from enabling MPLS on MLPPP and using an MLPPP ip address for ip routing between two MWRs acting as PE routers.

Existing command **MPLS IP** has been added to this feature to enable MPLS forwarding of IPv4 packets along normally routed paths for a designated interface.

The following example illustrates that label switching is enabled on a designated Ethernet interface:

```
Router# configure terminal
Router(config)# interface multilink1
Router(config-if)# mpls ip
```

PWE3 Redundancy

The PWE3 Redundancy feature enables you to configure your network to detect a failure in the network and reroute the Layer 2 (L2) service to another endpoint that can continue to provide service. This feature provides the ability to recover from a failure of the PE router or the link between the PE and the CE router.

Existing command **backup peer** has been added to this feature to specify a redundant peer for a PW VC.

Existing command **backup delay** has been added to this feature to specify how long a backup PW VC should wait before resuming operation after the primary PW VC goes down.

Existing command **xconnect logging redundancy** has been added to this feature to enable system message log (syslog) reporting of the status of the xconnect redundancy group.

The following example enables syslog reporting of the status of the xconnect redundancy group and shows the messages that are generated during switchover events:

```
Router(config)# xconnect logging redundancy
```

Activating the Primary Member

```
00:01:07: %XCONNECT-5-REDUNDANCY: Activating primary member 10.55.55.2:1000
```

Activating the Backup Member:

```
00:01:05: %XCONNECT-5-REDUNDANCY: Activating secondary member 10.55.55.3:1001
```

TDM PWE3 Redundancy

The following examples illustrate the use of the **backup peer** command:

PW Redundancy Without PW Class

```
interface CEM0/0/0
 no ip address
 cem 0
  xconnect 2.2.2.2 100 encapsulation mpls
   backup peer 2.2.2.2 200
   backup delay 20 20
```

PW Redundancy With PW Class

```
pseudowire-class pw_redundancy
 encapsulation mpls

interface CEM0/0/0
 no ip address
 cem 0
  xconnect 2.2.2.2 100 encapsulation mpls
   backup peer 2.2.2.2 200 pw-class pw_redundancy
   backup delay 20 20
```

ATM PWE3 Redundancy

The following examples illustrate the use of the **backup delay** command:

PW Redundancy Without PW Class

```
interface ATM0/0/0
 no ip address
 xconnect 2.2.2.2 300 encapsulation mpls
  backup peer 2.2.2.2 400
  backup delay 20 20
```

PW Redundancy With PW Class

```
pseudowire-class pw_redundancy
 encapsulation mpls

interface ATM0/0/0
 no ip address
  xconnect 2.2.2.2 300 encapsulation mpls
   backup peer 2.2.2.2 400 pw-class pw_redundancy
   backup delay 20 20
```

Ethernet PWE3 Redundancy

The following examples illustrate the use of the **xconnect logging redundancy** command:

PW Redundancy Without PW Class

```
interface GigabitEthernet 0/0
 xconnect 2.2.2.2 500 encapsulation mpls
  backup peer 2.2.2.2 600
  backup delay 20 20
```

PW Redundancy With PW Class

```
pseudowire-class pw_redundancy
 encapsulation mpls

interface GigabitEthernet 0/0
  xconnect 2.2.2.2 500 encapsulation mpls
  backup peer 2.2.2.2 600 pw-class pw_redundancy
  backup delay 20 20
```

Maximum Number of Supported ATM Ports

This enhancement increases the maximum number of supported ATM ports on the Cisco 3825 router.

The maximum number of ATM ports supported on the AIM-ATM-8 depends on the slot in which the AIM-ATM-8 is installed:

- AIM-ATM-8 installed in slot 0—maximum of 12 ATM ports supported
- AIM-ATM-8 installed in slot 1—maximum of 8 ATM ports supported

The ATM-AIM module still supports a maximum of 4 ATM ports.

ATM Cell Switching

This feature provides PVC-to-PVC cell switching on the Cisco 3825 router.

The feature includes PVC remapping within either an AIM-ATM module or AIM-ATM-8 module. Also, the feature is available for PVC-to-PVC switching between ATM interfaces and/or ATM IMA groups. Note that PVC values must be above the well-known virtual path identifier/virtual channel identifier (VPI/VCI) range (0/32).

The following configuration snippet shows a connection from ATM0/0/0 to ATM0/0/1. The PVC is mapped from 0/32 to 0/33 and vice versa.

```
controller E1 0/0/0
 mode atm aim 1
!
controller E1 0/0/1
 mode atm aim 1
!
interface ATM0/0/0
 pvc 0/32 12transport
!
interface ATM0/0/1
 pvc 0/33 12transport
!
connection NAME a0/0 0/32 a0/1 0/33
```

Privileged EXEC commands of interest include:

```
Router# show connection ?
```

`all`	All Connections
`elements`	Show Connection Elements
`id`	ID Number
`name`	Connection Name
`port`	Port Number

New Features in Cisco IOS Release 12.4(16)MR

With Cisco IOS Release 12.4(16)MR, the Cisco 3825 router supports the following:

GSMmux—Global System for Mobile Communication (GSM) Abis Optimization over IP

The Cisco GSM Abis Optimization and Iub Optimization solutions can optimize the excess capacity that exists in the current RAN backhaul network. This eliminates the need to add new T1/E1 trunks to meet growing demand and can even allow a number of existing trunks to be decommissioned.

The Cisco GSM Abis Optimization over IP technology improves T1/E1 bandwidth efficiency by 33% to 50%, corresponding to a GSM voice call capacity gain of 50-100% per T1/E1, depending on the nature of the traffic on the interface.

UMTSmux—Universal Mobile Telecommunication System (UMTS) Iub Optimization over IP

The Cisco Iub Optimization over IP technology for R4/R99 (ATM) UMTS RANs improves bandwidth efficiency by as much as 15 to 40%, corresponding to a UMTS voice call capacity gain of 18 to 67%, depending on the type of Iub header and ATM Adaptation Layer traffic sub-cell multiplexing performance. For R5/R6 IP UMTS RANs, Cisco provides compression and low-overhead encryption.

UMTS Congestion Management Control

The purpose of Congestion management control is to protect the most important traffic when congestion happens. Typically signaling and voice traffic are configured as the highest priority in QoS, and usually you do not expect these two types of combined traffic to congest the backhaul. But, if it does happen, some traffic will be dropped. The QoS on the Cisco 3825 router does not differentiate between signaling and voice traffic, which means the packets will drop randomly. Dropping signaling traffic could have much more severe results than voice traffic. If the RNC and Node B lose signaling communication, the Node B device could be reset. Signaling traffic needs to be passed through during this time. Congestion management control throttles any other traffic but the signaling traffic, thus leaving the backhaul resource for signaling traffic.

Typically, UMTS Congestion Management Control protects the most important PVC traffic (usually signalling pvc) during backhaul congestion. Each PVC can be configured with a congestion priority. There are nine congestion control priority levels, *protected* and priority 2- 9. The *protected* priority has the highest priority and priority 9 has the lowest priority.

When congestion happens, all other PVC traffic except *protected* PVC(s) traffic will be throttled to save the backhaul resource for the *protected* PVC traffic. If after a certain period (200 ms) and there is no congestion reported, a recovery mechanism is triggered. Recovery gradually includes back throttled PVC traffic in the order of their congestion control priority level (priority 2 being first and 9 being last). Recovery will unthrottle the traffic gradually every until all traffic is recovered or congestion happens again.

It is recommended that you configure UMTS QoS as your first line of defense when congestion happens so that the low priority/best effort traffic be dropped by the QoS during congestion. Congestion control will be triggered when combining priority traffic (signalling and voice) congested backhaul, and it will throttle relatively less important traffic (voice) to protect most important traffic (signaling) based on the congestion control priority configuration.

With UMTS Congestion Management Control, you can configure the UMTS congestion based on priority. Two new commands (**umts-iub congestion priority** and **umts-iub congestion-control)** are added using the PVC Configuration mode and Interface Configuration mode, respectively (see Appendix A, “Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference”).

```
interface ATM0/IMA0
 no ip address
 atm bandwidth dynamic
 atm umts-iub
 no atm ilmi-keepalive
 pvc 2/1 qsaal
  umts-iub congestion priority protected
 !
 pvc 2/2
  encapsulation aal0
  umts-iub congestion priority protected
 !
 pvc 3/1
  encapsulation aal0
  umts-iub congestion priority 4
 !
 pvc 3/2
  encapsulation aal0
  umts-iub congestion priority 5
 !
 pvc 3/100
  encapsulation aal2
 !
 umts-iub congestion-control
 umts-iub set dscp 8
```

```
 umts-iub set peering dscp 8
 umts-iub local 20.20.20.21 6666
 umts-iub remote 20.20.20.20 6666
```

One new CLI Show command **show umts congestion atm** *slot/port* has been added to this feature and a new field has been added to the **show umts-iub peering** command (see Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference").

The following example illustrates the use of **show umts congestion atm**.

```
Router# show umts congestion atm 0/ima0
UMTS-Iub(ATM0/IMA0):
   Congestion: ON
   Throttled ATM cells: 415801
   Last congestion time: Mar 13 18:09:49.858   duration: 0h 0m 53s
```

The following example illustrates the use of **show atm umts-iub peering** command with the new Congestion Control status field. In this example, it shows it On.

```
Router# show umts-iub peering atm 0/ima0
UMTS-Iub(ATM0/IMA0): Peering Information
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):       Local (20.20.20.21:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Connect State: OPEN
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Congestion Control: ON
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Alarm State:
UMTS-Iub(ATM0/0 - ATM0/2):                    RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/1 - ATM0/3):                    RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):       Remote (20.20.20.20:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Alarm State:
UMTS-Iub(ATM0/0 - ATM0/2):                    RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/1 - ATM0/3):                    RX(NO ALARM)       TX(NO ALARM)
```

Inverse Multiplexing over ATM (IMA)

Inverse Multiplexing over ATM (IMA) interface as a shorthaul enables you to configure existing UMTS commands on IMA interfaces. No new commands are added for this new feature. Only previously existing Cisco IOS commands have been added for this feature (see the "Configuring Inverse Multiplexing over ATM (IMA)" section on page 4-37 and Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference").

When operating in the IMA environment, a sample ATM configuration is written as follows:

```
interface ATM0/0/0
    no ip address
    no atm ilmi-keepalive
    ima-group 0
    scrambling-payload

interface ATM0/0/1
    no ip address
    no atm ilmi-keepalive
    ima-group 0
    scrambling-payload
```

```
interface ATM0/IMA0
    no ip address
    atm bandwidth dynamic
    atm umts-iub
    no atm ilmi-keepalive
    pvc 2/1
        encapsulation aal0
    !
    pvc 2/2
        encapsulation aal0
    !
umts-iub local 20.20.20.21 6666
umts-iub remote 20.20.20.20 6666
```

Note The above sample configuration has one IMA shorthaul with two member links (`atm0/0/0 and atm 0/0/1`).

The output for the **show umts-iub peering** command has also changed and will look like the following:

```
Router#show umts peer
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0): Peering Information
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):      Local (20.20.20.21:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Connect State: OPEN
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/0/0): RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/0/1): RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):      Remote (20.20.20.20:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/0/0):       RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/0/1):       RX(NO ALARM)       TX(NO ALARM)
```

Note In the previous output, the local shorthaul/interface name appears before the dash (–), and the remote shorthaul/interface name appears after the dash (–).

Permanent Virtual Circuit (PVC) Routing

PVC Routing allows you to offload PVC traffic from a physical ATM shorthaul to an alternate backhaul. For each alternate backhaul, you will need to create a logical shorthaul by creating an ATM sub-interface. Traffic from the PVCs configured under this logical shorthaul will go through the corresponding alternate backhaul. Three new commands are added using the Sub-interface Configuration mode for this new feature: **atm umts**, **umts local**, and **umts remote** (see the "Configuring PVC Routing (HSDPA Offload)" section on page 4-41 and Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference").

A sample configuration is written as follows:

```
interface ATM0/IMA0
 no ip address
 atm umts-iub
 no atm ilmi-keepalive
 pvc 2/1
  encapsulation aal0
 !
 pvc 2/2
```

```
  encapsulation aal0
 !
 umts-iub local 20.20.20.21 6666
 umts-iub remote 20.20.20.20 6666


interface ATM0/IMA0.1 multipoint
 atm umts-iub
 pvc 1/200
  encapsulation aal0
 !
 umts-iub local 192.168.10.2
 umts-iub remote 192.168.10.1
```

In the above sample, traffic for PVC 1/200 will be off-loaded to the alternate backhaul (192.168.10.2 -- 192.168.10.1). The new output of a **show umts peer** command will look like the following:

```
Router#show umts peer
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0): Peering Information
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):      Local (20.20.20.21:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Connect State: OPEN
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/0/0): RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/0/1): RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):      Remote (20.20.20.20:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/0/0):        RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/0/1):        RX(NO ALARM)       TX(NO ALARM)

UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1): Peering Information
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):      Local (192.168.10.2:6666) States:
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):           Connect State: OPEN
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):           Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):           Version: 4
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):      Remote (192.168.10.1:6666) States:
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):           Version: 4
```

Note In the previous output, the local shorthaul/interface name appears before the dash (–), and the remote shorthaul/interface name appears after the dash (–).

```
Router#show umts pvc
UMTS-Iub(ATM0/IMA0): PVC matching
   Peering state: OPEN
   Local PVCs:
     PVC(2/1): has    MATCHING remote PVC.
     PVC(2/2): has    MATCHING remote PVC.

   Remote PVCs:
     PVC(2/1): has    MATCHING local PVC.
     PVC(2/2): has    MATCHING local PVC.
```

```
UMTS-Iub(ATM0/IMA0.1): PVC matching
   Peering state: OPEN
   Local PVCs:
     PVC(1/200): has    MATCHING remote PVC.

   Remote PVCs:
     PVC(1/200): has    MATCHING local PVC.


Lisa#show umts packet
UMTS-Iub(ATM0/IMA0): packets:
  rxUMTS_count ================ 468845
  txUMTS_count ================ 276847
  rxUMTS_bytes ================ 22504560
  txUMTS_bytes ================ 13288656
  rxBackhaul_packets ========== 58216
  txBackhaul_packets ========== 88884
  rxBackhaul_bytes ============ 14687104
  txBackhaul_bytes ============ 24824360
  Last cleared 00:50:39
UMTS-Iub(ATM0/IMA0.1): packets:
  rxUMTS_count ================ 126173
  txUMTS_count ================ 126173
  rxUMTS_bytes ================ 6056304
  txUMTS_bytes ================ 6056304
  rxBackhaul_packets ========== 28405
  txBackhaul_packets ========== 28777
  rxBackhaul_bytes ============ 6532571
  txBackhaul_bytes ============ 7596968
  Last cleared 00:08:08
```

Behavior Changes

The following behavior changes will be apparent when using this PVC Routing feature.

1. When the **no atm umts** command is applied to a base ATM interface, the command will un-configure the ATM UMTS mode for all the sub-interfaces under that ATM interface.
2. When the **no atm umts** command is applied to an ATM sub-interface, the command will un-configure the ATM UMTS mode only for that sub-interface.
3. Alarms are carried over the primary backhaul only, while the primary peering will have the alarm information. The following is a sample output:

```
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0): Peering Information
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):      Local (20.20.20.21:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Connect State: OPEN
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/0/0): RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/0/1): RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):      Remote (20.20.20.20:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/0/0):        RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/0/1):        RX(NO ALARM)       TX(NO ALARM)
```

```
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1): Peering Information
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):      Local (192.168.10.2:6666) States:
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):           Connect State: OPEN
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):           Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):           Version: 4
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):      Remote (192.168.10.1:6666) States:
UMTS-Iub(ATM0/IMA0.1 - ATM0/IMA.1):           Version: 4
```

Note In the previous output, the local shorthaul/interface name appears before the dash (–), and the remote shorthaul/interface name appears after the dash (–).

4. An **admin shutdown** of the base ATM interface will shut down all the peering instances, including the primary peering and all the sub-interface peering(s). (In other words, they will move to the CLOSED state).
5. An **admin shutdown** of an ATM sub-interface will shut down only the peering for that sub-interface. (In other words, the **admin shutdown** of the ATM sub-interface will make the PVCs on that sub-interface inactive, but it won't change the status of the PVCs on the other end of the shorthaul, Node B or RNC.)
6. When the primary backhaul goes down and the primary peering goes down, the primary peering will start sending Alarm Indication Signals (AISs) on the shorthaul, and; therefore, bring down the shorthaul like before. So all shorthaul traffic will stop, including the PVC traffic off-loaded to the alternate backhaul(s). (In this situation, the sub-interface peering connection state will stay OPEN as long as the alternate backhaul doesn't go down).
7. When an alternate or sub-interface backhaul goes down, the sub-interface peering will go down, but it won't bring down the shorthaul or start any alarms on the T1/E1 link. So primary backhaul traffic won't be affected. (In this case, the sub-interface's state will not be changed since the sub-interface is only the logical interface and changing its state will not generate any notification to the Node B or RNC at the ATM level. If the Node B/RNC wants to be able to detect an alternate backhaul down situation, configure the OAM-CC on the PVCs that are off-loaded to the alternate/sub-interface backhaul).
8. Cannot configure the **qsaal** type PVC under the ATM sub-interface, which means the AAL5 type traffic cannot be off-loaded to the alternate backhaul unless they are configured as the AAL0 type on the Cisco 3825 router.

UMTS QoS

Three new commands are added using the Interface Configuration mode for this new feature: **umts-iub set dscp**, **umts-iub set peering dscp**, and **gsm-abis set dscp** and one new ATM-VC Interface Configuration command: **umts-iub set dscp** (see the "Configuring UMTS QoS" section on page 4-46 and Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference"). These new commands allow you to perform the following:

- UMTS Shorthaul Interface
  - Set the default description value to tag the backhaul packet including peering and data generated from the shorthaul in a UMTS Iub configuration.
  - Set the description value in the UMTS Iub configuration such that it overwrites the default value defined previously. It is also used to tag the peering backhaul packet.

- PVC of a UMTS Shorthaul Interface
  - Set the description value in the UMTS Iub configuration such that it overwrites the default value defined previously. It is also used to tag the backhaul packet generated from traffic from the PVC.
- GSM Shorthaul Interface
  - Set the description value in such a way as to tag all the backhaul packets generated from the shorthaul in the GSM Abis interface.

A sample configuration is written as follows:

```
class-map match-any llq-class
 match ip dscp cs2
 !
policy-map llq-policy
 class llq-class
  priority percent 99
 class class-default
  bandwidth remaining percent 1
  queue-limit 45
!

interface ATM0/0/0
 no ip address
 atm umts-iub
 no atm ilmi-keepalive
 pvc 2/1
  encapsulation aal0
  umts-iub set dscp 16
 !
 pvc 2/2
  encapsulation aal0
 !
 umts-iub set dscp 8
 umts-iub set peering dscp 16
 umts-iub local 20.20.20.21 6666
 umts-iub remote 20.20.20.20 6666
!

interface ATM0/0/1
 no ip address
 atm umts-iub
 no atm ilmi-keepalive
 pvc 2/1
  encapsulation aal0
  umts-iub set dscp 16
 !
 pvc 2/2
  encapsulation aal0
 !
 umts-iub set dscp 8
 umts-iub set peering dscp 16
 umts-iub local 20.20.20.21 8888
 umts-iub remote 20.20.20.20 8888

interface Multilink2
 ip address 20.20.20.21 255.255.255.0
 ip tcp header-compression ietf-format
 load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
```

```
ppp acfc local request
ppp acfc remote apply
ppp multilink
ppp multilink interleave
ppp multilink group 2
ppp multilink fragment delay 0 1
ppp multilink multiclass
max-reserved-bandwidth 100
service-policy output llq-policy
hold-queue 50 out
ip rtp header-compression ietf-format
```

In the above sample, PVC 2/1 of ATM0/0/0 and ATM0/0/1 will go to the priority queue and PVC 2/2 of ATM0/0/0 and ATM0/0/1 will be considered the best effort traffic and will go to the Weighted Fair Queue.

Note Defining the **dscp** value under the PVC affects the way the ATM cells are bundled together as a backhaul. The more **dscp** values that are defined, the more limitations on how the ATM cells can be bundled. This, as a result, could affect backhaul efficiency. We recommend that you define at most two different **dscp** values for each shorthaul. One for llq traffic, and the other for best effort traffic.

CHAPTER 2

Cisco IOS Software Basics

This chapter describes what you need to know about the Cisco IOS software before you configure the router by using the CLI. This chapter includes the following topics:

- Getting Help, this page
- Understanding Command Modes, page 2-2
- Undoing a Command or Feature, page 2-3
- Saving Configuration Changes, page 2-3
- Where to Go Next, page 2-3

Understanding this information will save you time as you begin to use the CLI. If you have never used the Cisco IOS software or if you need a refresher, read this chapter before you proceed to Chapter 3, "First-Time Configuration."

If you are already familiar with the Cisco IOS software, proceed to Chapter 3, "First-Time Configuration".

Getting Help

Use the question mark (?) and arrow keys to help you enter commands:

- For a list of available commands, enter a question mark:

  ```
  Router> ?
  ```

- To complete a command, enter a few known characters followed by a question mark (with no space):

  ```
  Router> s?
  ```

- For a list of command variables, enter the command followed by a space and a question mark:

  ```
  Router> show ?
  ```

- To redisplay a command that you previously entered, press the **Up Arrow** key. Continue to press the **Up Arrow** key to see more commands.

Understanding Command Modes

The Cisco IOS user interface is used in various command modes. Each command mode permits you to configure different components on your router. The commands available at any given time depend on which command mode you are in. Entering a question mark (**?**) at a prompt displays a list of commands available for that command mode. Table 2-1 lists the most common command modes.

Table 2-1 Common Command Modes

Command Mode	Access Method	Router Prompt Displayed	Exit Method
User EXEC	Log in.	`Router>`	Use the **logout** command.
Privileged EXEC	From user EXEC mode, enter the **enable** command.	`Router#`	To exit to user EXEC mode, use the **disable**, **exit**, or **logout** command.
Global configuration	From the privileged EXEC mode, enter the **configure terminal** command.	`Router (config)#`	To exit to privileged EXEC mode, use the **exit** or **end** command, or press **Ctrl-Z**.
Interface configuration	From the global configuration mode, enter the **interface** *type number* command, such as **interface serial 0/0/0**.	`Router (config-if)#`	To exit to global configuration mode, use the **exit** command. To exit directly to privileged EXEC mode, press **Ctrl-Z**.

Timesaver Each command mode restricts you to a subset of commands. If you have trouble entering a command, check the prompt and enter the question mark (**?**) to see a list of available commands. You might be in the wrong command mode or be using an incorrect syntax.

In the following example, notice how the prompt changes after each command to indicate a new command mode:

```
Router> enable
Password: <enable password>
Router# configure terminal
Router (config)# interface serial 0/0/0
Router (config-if)# line 0
Router (config-line)# controller t1 0
Router (config-controller)# exit
Router (config)# exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

The last message is normal and does not indicate an error. Press **Return** to get the `Router#` prompt.

Note You can press **Ctrl-Z** in any mode to immediately return to enable mode (`Router#`), instead of entering **exit**, which returns you to the previous mode.

Undoing a Command or Feature

If you want to undo a command that you entered or if you want to disable a feature, enter the keyword **no** before most commands; for example, **no ip routing**.

Saving Configuration Changes

You must enter the **copy running-config startup-config** command to save your configuration changes to NVRAM, so that the changes are not lost if there is a system reload or power outage. For example:

```
Router# copy running-config startup-config
Building configuration...
```

It might take a few minutes to save the configuration to nonvolatile random-access memory (NVRAM). After the configuration has been saved, the following message appears:

```
[OK]
Router#
```

Where to Go Next

Now that you know some Cisco IOS software basics, you can begin to configure the router by using the CLI.

Remember the following:

- You can use the question mark (?) and arrow keys to help you enter commands.
- Each command mode restricts you to a set of commands. If you have difficulty entering a command, check the prompt and then enter the question mark (**?**) to see a list of available commands. You might be in the wrong command mode or be using the incorrect syntax.
- To disable a feature, enter the keyword **no** before the command; for example, **no ip routing**.
- You need to save your configuration changes to NVRAM so that the changes are not lost if there is a system reload or power outage.

Proceed to Chapter 3, "First-Time Configuration," for first time configuration. Otherwise, proceed to Chapter 4, "Configuring the Cisco 3825 Mobile Wireless Edge Router in a RAN-O Solution with the Command-Line Interface," to begin configuring the router.

CHAPTER 3

First-Time Configuration

This chapter contains information with which you should be familiar before you begin to configure your router for the first time, including information about understanding boot images, interface numbering, and what you should do before you turn on your router. This chapter also describes how to use the **setup** command facility to configure your Cisco 3825 Mobile Wireless Edge Router.

This chapter includes the following sections:

Understanding Boot Images

The first file on the compact flash device in slot0: *must* be the Cisco IOS software image that you want to use. If it is not, the Cisco 3825 router will not be able to boot.

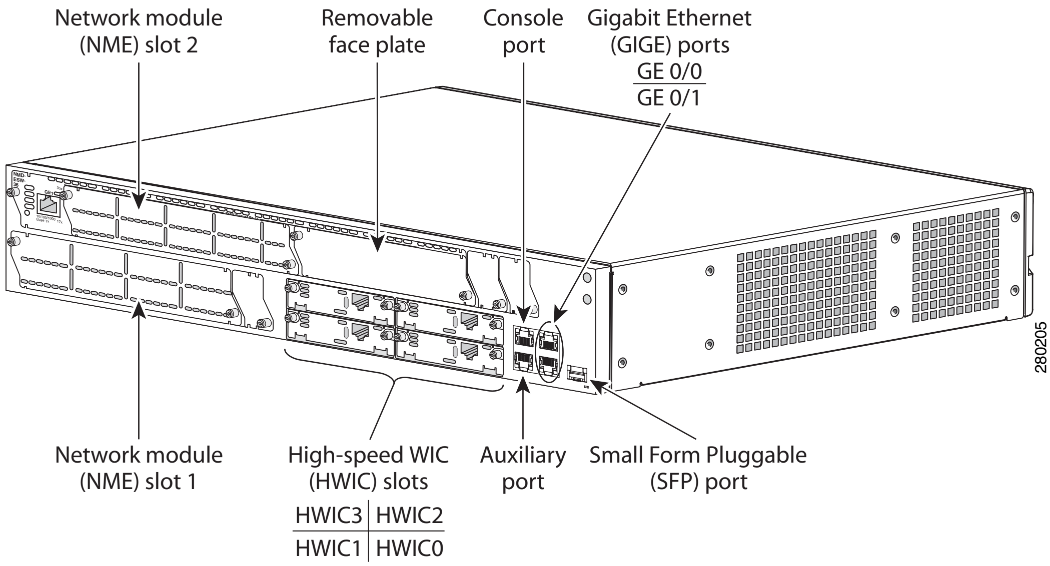
Understanding the Cisco 3825 Router Interface Numbering

Each network interface on a Cisco 3825 router is identified by a slot number, subslot number, and a port number.

Figure 3-1 on page 3-2 shows an example of interface numbering on a Cisco 3825 router:

- A Cisco 2-port T1/E1-RAN interface card in each of the four Cisco 2-port T1/E1-RAN slots (labeled HWIC0, HWIC1, HWIC2, and HWIC3) [high-speed WIC]
- Two built-in Gigabit Ethernet (GE) interfaces (labeled GE 0/0 and GE 0/1)

Figure 3-1 Cisco 3825 Router Slot and Port Numbers



Slot and Port Numbering

The Cisco 3825 router chassis contains the following LAN and WAN interface types:

- One Small Form Pulggable (SFP) port—industry standard Gigabit interface convertor
- Two built-in Gigabit Ethernet LAN interfaces (labeled GE 0/0 and GE 0/1)
- Four slots for installing Cisco 2-port T1/E1-RAN interface cards (labeled HWIC0, HWIC1, HWIC2, and HWIC3)
- Two slots for installing NM-2W network modules (supports up to four additional Cisco 2-port T1/E1-RAN interface cards)

Note A removable face plate allows for installation of a double-wide NMD network module into NME slot 2.

The logical slot numbers are as follows:

- 0 for all built-in Cisco 2-port T1/E1-RAN interface card slots
- 1 for the lower network module slot
- 2 for the upper network module slot

The numbering format is:

<Interface type> <Slot number> / <Subslot number> / <Port number>

For example:

```
Serial 0/0/0 (HWIC slot 0)

Serial 1/0/0 (NM slot 1)
```

Interface (port) numbers begin at logical 0 for each interface type; ports are numbered from right to left.

- The two built-in Gigabit Ethernet 10/100/1000 logical interfaces are GE 0/0 and GE 0/1.
- The logical slot number for all Cisco 2-port T1/E1-RAN interfaces in the built-in Cisco 2-port T1/E1-RAN interface card slot is always 0. (The HWIC0, HWIC1, HWIC2, and HWIC3 slot designations are for physical slot identification only.) Interfaces in the Cisco 2-port T1/E1-RAN interface cards are numbered from right to left, starting with logical 0/0/0 for each interface type, regardless of the physical slot in which the Cisco 2-port T1/E1-RAN interface cards are installed.

  For example, if you have a Cisco 2-port T1/E1-RAN interface card in two of the 2-port T1/E1-RAN interface card slots (physical slots HWIC0 and HWIC1), then the logical interfaces are:

  – Serial 0/0/0 and Serial 0/0/1 in physical slot HWIC0

  – Serial 0/1/0 and Serial 0/1/1 in physical slot HWIC1

  However, if you install a Cisco 2-port T1/E1-RAN interface card in physical slot HWIC1 (leaving slot HWIC0 empty), the logical interfaces in slot HWIC1 are Serial 0/0/0 and Serial 0/0/1. If you later add a Cisco 2-port T1/E1-RAN interface card to slot HWIC0, the interface numbering will shift. The configuration that you created for logical interfaces Serial 0/0/0 and Serial 0/0/1 will now be applied to the Cisco 2-port T1/E1-RAN interface card in slot HWIC0, and you will need to create a new configuration for the interfaces that you previously configured on HWIC1 (which will now be Serial 0/1/0 and Serial 0/1/1).
- The slot number of the Cisco 2-port T1/E1-RAN interfaces installed in slot 1 using an NM-2W network module is always logical 1, and the interfaces are always numbered from the right to left.

Setup Command Facility

The **setup** command facility prompts you for information that is needed to start a router functioning quickly. The facility steps you through a basic configuration, including LAN interfaces.

If you prefer to configure the router manually or if you wish to configure a module or interface that is not included in the **setup** command facility, proceed to "Chapter 2, "Cisco IOS Software Basics" to familiarize yourself with the command-line interface (CLI) and then proceed to Chapter 4, "Configuring the Cisco 3825 Mobile Wireless Edge Router in a RAN-O Solution with the Command-Line Interface" for instructions on configuring your Cisco 3825 router.

Before Starting Your Router

Before you power on your router and begin using the **setup** command facility, follow these steps:

Step 1 Set up the hardware and connect the console and network cables as described in the "Connecting Cables to Cisco 3800 Series Routers" section of the *Cisco 3800 Series Hardware Installation* guide.

Step 2 Configure your PC terminal emulation program for 9600 baud, 8 data bits, no parity, and 1 stop bit.

Using the Setup Command Facility

The **setup** command facility is displayed in your PC terminal emulation program window.

To create a basic configuration for your router, do the following:

- Complete the steps in the "Configuring Global Parameters" section on page 3-4.
- Complete the steps in the "Completing the Configuration" section on page 3-7.

Note If you make a mistake while using the setup command facility, you can exit the facility and run it again. Press **Ctrl-C**, and type **setup** at the enable mode prompt (`1900#`).

Configuring Global Parameters

Step 1 Power on the router.

Messages will begin to appear in your terminal emulation program window.

Caution *Do not press any keys on the keyboard until the messages stop*. Any keys that you press during this time will be interpreted as the first command entered after the messages stop, which might cause the router to power off and start over. Wait a few minutes. The messages will stop automatically.

The messages look similar to the following:

Note The messages vary, depending on the Cisco IOS software image and interface modules in your router. The screen displays in this section are for reference only and might not match the messages on your console.

```
rommon 1 >boot
program load complete, entry point: 0x8000f000, size: 0xc0c0

Initializing ATA monitor library.......

program load complete, entry point: 0x80010000, size: 0x2888ab0
Self decompressing the image :
############################################################################
[OK]

Smart Init is enabled
smart init is sizing iomem
 ID     MEMORY_REQ            TYPE
00042A      0X010D78F3 C3825 motherboard
0000D6      0X000D8A10 FE Port Module, 2 WAN
0000D6      0X000D8A10 FE Port Module, 2 WAN
       0X00288860 Onboard PVDM2 SIMM
       0X000021B8 OnboardUSB
000587      0X0030FEF2 ATM AIM-8 with SAR only, no DSPs
000587      0X0030FEF2 ATM AIM-8 with SAR only, no DSPs
       0X00660670 public buffer pools
       0X0078F000 public particle pools
TOTAL:      0X02922B7F
```

```
If any of the above Memory requirements
are "UNKNOWN", you may be using an unsupported
configuration or there is a software problem and
system operation may be compromised.
Rounded IOMEM up to: 42Mb.
Using 8 percent iomem. [42Mb/512Mb]

              Restricted Rights Legend

Use, duplication, or disclosure by the Government is
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(c) of the Commercial Computer Software - Restricted
Rights clause at FAR sec. 52.227-19 and subparagraph
(c) (1) (ii) of the Rights in Technical Data and Computer
Software clause at DFARS sec. 252.227-7013.

           cisco Systems, Inc.
           170 West Tasman Drive
           San Jose, California 95134-1706

Cisco IOS Software, 3800 Software (C3825-IPRANK9-M), Version 12.4(16)MR1, RELEASE SOFTWARE
(fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2008 by Cisco Systems, Inc.
Compiled Thu 10-Jan-08 14:09 by prod_rel_team
Image text-base: 0x600010930, data-base: 0x62C1F030

This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptograhpic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco 3825 (revision 1.0) with 481280K/43008K bytes of memory.
Processor board ID FHK0902F51G
2 Gigabit Ethernet interfaces
16 Channelized (E1 or T1)/PRI ports
2 ATM/Voice AIMs
DRAM configuration is 64 bits wide with parity disabled.
479K bytes of NVRAM.
125440K bytes of ATA System CompactFlash (Read/Write)
```

Step 2 When the following message appears, enter **yes** to begin the initial configuration dialog:

```
Basic management setup configures only enough connectivity
for management of the system, extended setup will ask you
to configure each interface on the system

Would you like to enter basic management setup? [yes/no]:yes
Configuring global parameters:
```

Step 3 Enter a hostname for the router (this example uses 3825-1):

```
Configuring global parameters:

 Enter host name [Router]: 3825-1
```

Step 4 Enter an enable secret password. This password is encrypted (more secure) and cannot be seen when viewing the configuration:

```
The enable secret is a password used to protect access to
privileged EXEC and configuration modes. This password, after
entered, becomes encrypted in the configuration.
Enter enable secret: ciscoenable
```

Note When you enter the enable secret password, it will be seen while you type the password. After entering it, it becomes encrypted in the configuration.

Step 5 Enter an enable password that is different from the enable secret password. This password is *not* encrypted (less secure) and can be seen when viewing the configuration:

```
The enable password is used when you do not specify an
enable secret password, with some older software versions, and
some boot images.
Enter enable password: ciscoenable
```

Step 6 Enter the virtual terminal password, which prevents unauthenticated access to the router through ports other than the console port:

```
The virtual terminal password is used to protect
access to the router over a network interface.
Enter virtual terminal password: ciscoterminal
```

Step 7 Respond to the following prompts as appropriate for your network:

```
Configure SNMP Network Management? [yes]:
    Community string [public]: public
```

Step 8 The summary of interfaces is displayed. This list varies, depending on what network modules, if any, are installed in your router.

```
Current interface summary

Any interface listed with OK? value “NO” does not have a valid configuration

Interface               IP-Address      OK? Method Status        Protocol
GigabitEthernet0/0     unassigned      NO unset up up
GigabitEthernet0/1     unassigned      NO unset up up
```

Step 9 Specify the interface to be used to connect to the network management system.

```
Enter interface name used to connect to the
management network from the above interface summary: GigabitEthernet0/0
```

Step 10 Configure the specified interface as prompted.

```
Configuring interface GigabitEthernet0/0:
    Use the 100 Base-TX (RJ-45) connector? [yes]: yes
    Operate in full-duplex mode? [no]: yes
    Configure IP on this interface? [yes]:yes
    IP address for this interface: 178.18.44.233
    Subnet mask for this interface [255.255.0.0] : 255.255.255.128
    Class B network ia 178.18.0.0, 25 subnet bits; mask is /25
```

Completing the Configuration

When you have provided all the information prompted for by the setup command facility, the configuration appears. Messages will be displayed that are similar to the following:

```
The following configuration command script was created:

!
hostname 3825-1
enable secret 5 $1$5fH0$Z6Pr5EgtR5iNJ2nBg3i6y1 enable password ciscoenable line vty 0 4
password ciscoenablesnmp-server community public !
no ip routing

!
interface GigabitEthernet0/0
no shutdown
media-type 100BaseX
full-duplex
ip address 178.18.44.233 255.255.255.128
!
interface GigabitEthernet0/1
shutdown
no ip address
!
end
```

To complete your router configuration, do the following:

Step 1 A setup command facility prompt asks whether you want to save this configuration.

```
[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.

Enter your selection [2]: 2
Building configuration...
[OK]

Use the enabled mode 'configure' command to modify this configuration.


Press RETURN to get started!
```

If you answer **no**, the configuration information that you entered is *not* saved, and you return to the router enable prompt. Type **setup** to return to the System Configuration Dialog.

If you answer **yes**, the configuration is saved, and you return to the EXEC prompt.

Step 2 When the messages stop displaying on your screen, press **Return** to get the command line prompt.

The `3825-1>` prompt indicates that you are now at the CLI and you have just completed a basic router configuration. However, this is *not* a complete configuration. You must configure additional parameters by using the Cisco IOS software CLI as described in Chapter 4, "Configuring the Cisco 3825 Mobile Wireless Edge Router in a RAN-O Solution with the Command-Line Interface."

CHAPTER 4

Configuring the Cisco 3825 Mobile Wireless Edge Router in a RAN-O Solution with the Command-Line Interface

This chapter describes how to use the Cisco IOS software CLI to configure the Cisco 3825 Mobile Wireless Edge Router in a Radio Access Network-Optimization (RAN-O) solution and includes the following sections:

For sample configurations, see Appendix B, "Configuration Examples".

For additional configuration topics, see the Cisco IOS configuration guide and command reference publications. These publications are available on the Documentation DVD that came with your router, available online at Cisco.com, or as printed copies that you can order separately.

Note If you skipped Chapter 2, "Cisco IOS Software Basics," and you have never configured a Cisco router, return to Chapter 2 and read it now. The chapter contains important information that you need to successfully configure your router.

Before You Begin

Before you configure the Cisco 3825 router in a RAN-O solution, you should be aware of the following caveats:

- A Cisco IOS Release 12.4(16)MR1 or later, "c3825-iprank9-mz" image must be installed on the Cisco 3825 router.
- If you are using the Cisco 3825 in a redundant configuration and are attaching the router to a device that uses spanning tree, configure port first on the device to avoid problems with Hot Standby Router Protocol (HSRP) at start up.
- In case of competing equal priorities, HSRP uses the IP address to determine the active router. Therefore, you should ensure that the order of the IP addresses of the T1/E1 interfaces on the active router corresponds to the order of the IP addresses of the T1/E1 interfaces on the standby router.

Verifying the Version of Cisco IOS Software

To implement the Cisco 3825 router in a RAN-O solution, Cisco IOS Release 12.4(16)MR or later must be installed on the router. To verify the version of Cisco IOS software, use the **show version** command.

The **show version** command displays the configuration of the system hardware, the software version, the names and sources of the configuration files, and the boot images.

Clocking Requirements for Cisco 3825 Router

Network clocking is the means by which a clock signal is generated or derived and distributed through a network and its individual nodes for the purpose of ensuring synchronized network operation.

Network clocking is an important consideration in the RAN-O networks. A solid network clocking design is essential to the successful deployment of any RAN-O network. The purpose of this section is to describe the use of network clocking for RAN-O networks using the Cisco 3825 router (see Figure 4-1 for an example of clocking using the Cisco 3825 router).

Figure 4-1 Clocking Example

```
Clocking ------------------------------------------->

 BSC---z___MWR_A---z___MWR_B---z____BTS          92853
```

The Base Station Controller (BSC) is responsible for providing the clock source into the network to which the connected devices must synchronize its transmit clocks.

The BSC provides the clock source to the Cisco 3825 router, which is distributed to the participating serial/ATM ports.

Clock-Related Commands

The following sections describe the uses of the clock-related commands:

- Network-Clock-Participate Command
- Network-Clock-Select Command
- Clock Source Command

Network-Clock-Participate Command

The **network-clock-participate** command allows the ports on a specified network module or voice/WAN interface card (VWIC) or high-speed WAN interface card to use the network clock for timing. For example:

```
mwr2(config)#network-clock-participate ?

  aim   AIM  Module
  slot  Network Module Slot
  wic   WIC  Module

Use "aim" keyword to identify Advanced Integration Module
Use "wic" keyword to specify the voice/WAN interface card
```

Network-Clock-Select Command

The **network-clock-select** command names a source to provide timing for the network clock and to specify the selection priority for this clock source.

To ensure that the router uses the correct interface as the primary (highest priority) clock source, this command must be present to configure the clocking priority for the system. To establish the clocking hierarchy (in case the primary source goes down), the same command needs to be repeated with a different priority for each interface:

```
network-clock-select 1 e1 0/0/0

network-clock-select 2 e1 0/0/1
```

Clock Source Command

The **clock source** command configures the source for synchronization of the interface transmit clock.

Configure *clock source line* if the router is deriving its clock externally from the connected device.

Configure *clock source internal* if the router provides the master clock (for example, either the internal clock or the network clock).

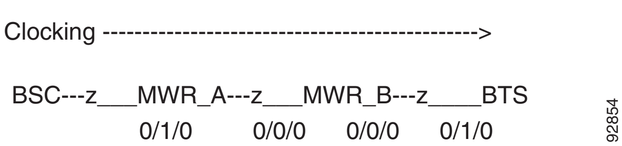
The **show network-clocks** command allows verification of the clocking configuration.

```
mwr2#sh network-clocks
  Network Clock Configuration
  ---------------------------
  Priority      Clock Source    Clock State     Clock Type

     1          E1 0/0/0      GOOD            E1
    10          Backplane       GOOD            PLL

  Current Primary Clock Source
  ---------------------------
  Priority      Clock Source    Clock State     Clock Type

     1          E1 0/0/0      GOOD            E1
```

The previous output of **show network-clocks** corresponds to the following configuration (see Figure 4-2 for description of how the clocking is done):

```
no network-clock-participate slot 1
  network-clock-participate wic 0
  network-clock-participate wic 1
  network-clock-participate wic 2
  no network-clock-participate aim 0
  no network-clock-participate aim 1
  network-clock-select 1 E1 0/0/0

  controller E1 0/0/0
   clock source line
   channel-group 0 timeslots 1-31 speed 64
```

Figure 4-2 Clocking Example



1. The BSC provides clock synchronization to the *MWR_A* router.
2. The *MWR_A* router receives clock from the BSC via port 0/1/0 and distributes to port 0/0/0.
3. The *MWR_B* router receives clock from the *MWR_A* router via port 0/0/0 and distributes to port 0/1/0.
4. The Base Transceiver STATION (BTS) receives clock synchronization from the *MWR_B* router.
5. The clock synchronization from the BSC is propagated through the network to the BTS.

Example Configurations

The following examples show two sample configurations:

Configuration Sample #1

```
  network-clock-participate wic 0
  network-clock-participate wic 1
  network-clock-select 1 E1 0/1/0

  controller E1 0/0/0
   clock source internal
   channel-group 0 timeslots 1-31 speed 64

controller E1 0/1/0
   clock source line
   channel-group 0 timeslots 1-31 speed 64
```

Configuration Sample #2

```
  network-clock-participate wic 0
  network-clock-participate wic 1
  network-clock-select 1 E1 0/0/0

  controller E1 0/0/0
   clock source line
   channel-group 0 timeslots 1-31 speed 64

controller E1 0/1/0
   clock source internal
   channel-group 0 timeslots 1-31 speed 64
```

Show Controller Command

Use the **show controller** command to detect any clocking issues. For example, *Slip Secs* may indicate a clocking issue (see following example).

```
mwr1#sh contr e1 0/1/0
E1 0/2 is up.
  Applique type is Channelized E1 - balanced
  No alarms detected.
  alarm-trigger is not set
  Version info Firmware: 20050421, FPGA: 13, spm_count = 0
  Daughter card FPGA version: 0x16, source: Bundled
  Framing is NO-CRC4, Line Code is HDB3, Clock Source is Line.
  CRC Threshold is 320. Reported from firmware  is 320.
  VWIC relays are closed
  Link noise monitor disabled
  Data in current interval (330 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     243 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
```

Note The last line of the previous example shows 243 Slip Secs indicating a possible clocking issue.

Configuration Sequence

The Summary of Steps section provides the recommended primary configuration sequence for the Cisco 3825 router in a RAN-O solution. These steps have configuration sub-steps or tasks within the primary steps or tasks.

Note The installation of the Cisco 3825 router and the Cisco 2-port T1/E1-RAN interface card should be completed before attempting the configuration (see the "Related Documentation" section on page ix for more information).

The configuration sequence of the Cisco 3825 router for the RAN-O solution assumes that you will have already had some familiarity with the configuration of Cisco routers. It is also assumed that you are familiar with your own network configurations and that you are familiar with the CLI used in configuring Cisco routers.

Note For correct CLI syntax and format, see the "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference" section on page A-1.

Summary of Steps

Perform the following tasks to configure the Cisco 3825 router in a RAN-O solution.

1. Configuring the Hostname and Password
2. Verifying the Hostname and Password, page 4-7
3. Configuring Gigabit Ethernet Interfaces, page 4-8
4. Enabling the GE Interface, page 4-9
5. Configuring the Backhaul Links, page 4-9
6. Configuring the PPP Backhaul Interfaces, page 4-19
7. Configuring GSM-Abis Links, page 4-20
8. Configuring UMTS Links, page 4-24
9. Configuring Redundancy, page 4-28
10. Configuring for SNMP Support, page 4-33
11. Saving Configuration Changes, page 4-61

Configuring the Hostname and Password

Two important configuration tasks that you might want to perform first are to configure the hostname and to set an encrypted password. Configuring a host name allows you to distinguish multiple Cisco routers from each other. Setting an encrypted password allows you to prevent unauthorized configuration changes.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure a hostname and to set an encrypted password, follow these steps:

Step 1 Enter enable mode.

```
Router> enable
```

The Password prompt appears. Enter your password.

```
Password: password
```

You have entered the enable mode when the prompt changes to `Router#`.

Step 2 Enter global configuration mode.

```
Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.
```

You have entered global configuration mode when the prompt changes to `Router(config)#`.

```
Router(config)#
```

Step 3 Change the name of the router to a meaningful name. Substitute your hostname for `Router`.

```
Router(config)# hostname Router

Router(config)#
```

Enter an enable secret password. This password provides access to the privileged EXEC mode. When you type **enable** at the EXEC prompt (`Router>`), you must enter the enable secret password to access the configuration mode. Enter your secret password.

```
Router(config)# enable secret secret password
```

Step 4 Exit back to global configuration mode.

```
Router(config)# exit
```

Verifying the Hostname and Password

To verify that you have correctly configured the hostname and password, follow these steps

---

Step 1 Enter the **show config** command:

```
Router# show config
Using 1888 out of 126968 bytes
!
version XX.X
.
.
.
!
hostname Router
!
enable secret 5 $1$60L4$X2JYOwoDc0.kqa1loO/w8/
.
.
.
```

Check the hostname and encrypted password, which are displayed near the top of the command output.

Step 2 Exit global configuration mode and attempt to reenter it, using the new enable password:

```
Router# exit
.
.
.
Router con0 is now available
Press RETURN to get started.
Router> enable
Password: password
Router#
```

Configuring Gigabit Ethernet Interfaces

To configure the Gigabit Ethernet (GE) interface on the Cisco 3825 router, complete the following tasks:

- Configuring the GE Interface IP Address
- Setting the Speed and Duplex Mode, page 4-8
- Enabling the GE Interface, page 4-9

Configuring the GE Interface IP Address

Use the following instructions to perform a basic GE IP Address configuration: specifying the port adapter and aligning an IP address and subnet mask of the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure the GE interface, follow these steps, while in the global configuration mode:

Step 1 Specify the port adapter type and the location of the interface to be configured.

```
Router(config)# interface gigabitethernet slot/port
```

The *slot* represents the main fixed slots and is always 0 and the *port* is the number of the port (0 or 1).

Step 2 Assign an IP address and subnet mask to the interface.

```
Router(config-if)# ip address ip_address subnet_mask
```

Setting the Speed and Duplex Mode

The GE ports of the Cisco 3825 router can run in full- or half- duplex mode and at 1000 Mbps, 100 Mbps, or 10 Mbps. The Cisco 3825 router has an auto-negotiation feature that allows the router to negotiate the speed and duplex mode with the corresponding interface at the other end of the connection.

Auto-negotiation is the default setting for the speed and transmission mode.

When configuring an interface speed and duplex mode, follow these guidelines:

- If both ends of the line support auto-negotiation, we highly recommend the default auto negotiation settings.
- When auto-negotiation is turned on for either speed or duplex mode, it auto- negotiates both speed and the duplex mode.
- If one interface supports auto-negotiation, and the interface at the other end does not, configure the duplex mode and speed on both interfaces. If you use the auto-negotiation setting on the supported side, the duplex mode setting will be set at half-duplex.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure speed and duplex operation, follow these steps, while in the interface configuration mode:

Step 1 Specify the duplex operation.

```
Router(config-if)# duplex [auto | half | full]
```

Step 2 Specify the speed.

```
Router(config-if)# speed [auto | 1000 | 100 | 10]
```

Enabling the GE Interface

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

Once you have configured the GE interface, enable it, by following this step, while in the interface configuration mode:

Step 1 Enable the interface.

```
Router(config-if)# no shutdown
```

Configuring the Backhaul Links

To configure the backhaul links, complete the following tasks:

- Configuring the Card Type for the Cisco 2-port T1/E1-RAN, this page
- Configuring E1 Controllers, page 4-11
- Configuring T1 Controllers, page 4-12

- Configuring Network Clocking Support, page 4-14
- Configuring Multilink Backhaul Interface, page 4-15
- Configuring the PPP Backhaul Interfaces, page 4-19

Configuring the Card Type for the Cisco 2-port T1/E1-RAN

Use the following instructions to perform a basic Card Type configuration: enabling the router, enabling an interface, and specifying the card type. You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To select and configure a card type for the Cisco 2-port T1/E1-RAN card, follow these steps:

Step 1 Enter the enable mode.

```
Router> enable
```

Step 2 Enter the password.

```
Password: password
```

You have entered the enable mode when the prompt changes to `Router#`.

Step 3 Enter the global configuration mode.

```
Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#
```

You have entered the global configuration mode when the prompt changes to `Router(config)#`.

Note To see a list of the configuration commands available to you, enter **?** at the prompt or press the **Help** key while in the configuration mode.

Step 4 Set the card type for the Cisco 2-port T1/E1-RAN card.

```
Router(config-if)# card type {e1 | t1} slot subslot
```

Where:

- *slot*—Slot number of the interface.
- *subslot*—Specifies the VWIC/HWIC slot number.

For example, the following command configures the Cisco 2-port T1/E1-RAN card in the Cisco 3825 router slot 0, VWIC/HWIC slot 0 as an E1:

```
Router(config)# card type e1 0 0
```

When the command is used for the first time, the configuration takes effect immediately. A subsequent change in the card type will not take effect unless you enter the **reload** command or reboot the router.

Note When you are using the **card type** command to change the configuration of an installed card, you must enter the **no card type** {**e1** | **t1**} slot subslot command first. Then enter the **card type** {**e1** | **t1**} *slot subslot* command for the new configuration information.

Configuring E1 Controllers

Use the following instructions to perform a basic E1 controller configuration: specifying the E1 controller, entering the clock source, specifying the channel-group, configuring the serial interface, configuring PPP encapsulation, and enabling keepalive packets. You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure the E1 controllers, follow these steps, while in the global configuration mode:

Step 1 Specify the controller that you want to configure. Controller E1 0/0/0 maps to the first port of the Cisco 2-port T1/E1-RAN interface card in slot 0. Controller E1 0/0/1 maps to the second port of the Cisco 2-port T1/E1-RAN interface card in slot 0.

```
Router(config)# controller e1 slot/subslot/port
```

For example, the following command specifies the E1 controller as the first port of the Cisco 2-port T1/E1-RAN interface card in slot 0:

```
Router(config)# controller e1 0/0/0
```

You have entered the controller configuration mode when the prompt changes to `Router(config-controller)#`.

Step 2 Enter the clocking source.

```
Router(config-controller)# clock source {line [primary] | internal}
```

Where:

- **line**—Specifies the E1 line from which the clocking is taken.
- **internal**—Specifies internal clocking.
- **primary**—Primary clock source.

For example, the following command configures the clock source for the E1 controller:

```
Router(config-controller)# clock source line
```

Note When you are using the **clock source {line [primary] | internal}** command to change the configuration of an installed card, you must enter the **no clock source** {**line [primary]** |**internal**} command first. Then enter the **clock source {line {primary] | internal}** command for the new configuration information.

Step 3 Specify the channel-group and time slots to be mapped. Once you configure a channel-group, the serial interface is automatically created.

```
Router(config-controller)# channel-group channel-no timeslots timeslot-list speed {64}
```

Where:

- *channel-no*—ID number to identify the channel group. The valid range is 0 to 30.
- *timeslot-list*—Timeslots (DS0s) to include in this channel group. The valid timeslots are 1 to 31.
- **speed {64}**—The speed of the DS0: 64 kbps.

For example, the following command configures the channel-group and time slots for the E1 controller:

```
Router(config-controller)# channel-group 0 timeslots 1-31 speed 64
```

Note When you are using the **channel-group** *channel-no* **timeslots** *timeslot-list* **{64}** command to change the configuration of an installed card, you must enter the **no channel-group** *channel-no* **timeslots** *timeslot-list* **speed {64}** command first. Then enter the **channel-group***channel-no* **timeslots** *timeslot-list* **{64}** command for the new configuration information.

Step 4 Exit the controller configuration mode.

```
Router(config-controller)# exit
```

Step 5 Configure the serial interface. Specify the E1 slot, subslot, port number, and channel-group.

```
Router(config)# interface serial slot/subslot/port:channel
Router(config-if)#
```

Note To see a list of the configuration commands available to you, enter **?** at the prompt or press the **Help** key while in the configuration mode.

Step 6 To configure PPP encapsulation, enter the following command:

```
Router(config-if)# encapsulation ppp
```

Step 7 Enable keepalive packets on the interface and specify the number of times keepalive packets will be sent without a response before bringing down the interface:

```
Router(config-if)# keepalive [period [retries]]
```

Step 8 Return to Step 1 to configure the second port on the Cisco 2-port T1/E1-RAN interface card and the ports on any additional Cisco 2-port T1/E1-RAN interface cards.

Step 9 Exit the interface configuration mode.

```
Router(config-if)# exit
```

Configuring T1 Controllers

Use the following instructions to perform a basic T1 controller configuration: specifying the T1 controller, specifying the framing type, specifying the line code form, specifying the channel-group and time slots to be mapped, configuring the cable length, configuring the serial interface, configuring PPP encapsulation, and enabling keepalive packets. You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure the T1 interfaces, follow these steps, while in the global configuration mode:

Step 1 Specify the controller that you want to configure. Controller T1 0/0/0 maps to the first port of the Cisco 2-port T1/E1-RAN interface card in slot 0. Controller T1 0/0/1 maps to the second port of the Cisco 2-port T1/E1-RAN interface card in slot 0.

```
Router(config)# controller t1 slot/subslot/port
```

Step 2 Specify the framing type.

```
Router(config-controller)# framing esf
```

Step 3 Specify the line code format.

```
Router(config-controller)# linecode b8zs
```

Step 4 Specify the channel-group and time slots to be mapped. Once you configure a channel-group, the serial interface is automatically created.

Note The default speed of the channel-group is 56.

```
Router(config-controller)# channel-group 0 timeslots 1-24 speed 56
```

Step 5 Configure the cable length.

```
Router(config-controller)# cablelength feet
```

Note Although you can specify a cable length from 0 to 450 feet, the hardware recognizes only two ranges: 0 to 49 feet and 50 to 450 feet. For example, entering 35 feet uses the 0 to 49 range. If you later change the cable length to 40 feet, there is no need for reconfiguration because 40 is within the 0 to 49 range. However, if you change the cable length to 50, the 50 to 450 range must be used. The actual number that you enter is stored in the configuration file.

Step 6 Exit controller configuration mode.

```
Router(config-controller)# exit
```

Step 7 Configure the serial interface. Specify the T1 slot (always 0), subslot, port number, and channel-group.

```
Router(config)# interface serial slot/subslot/port:channel
```

Step 8 Enter the following command to configure PPP encapsulation.

```
Router(config-if)# encapsulation ppp
```

Step 9 Enable keepalive packets on the interface and specify the number of times that keepalive packets will be sent without a response the interface is brought down:

```
Router(config-if)# keepalive [period [retries]]
```

Step 10 Return to Step 1 to configure the second port on the Cisco 2-port T1/E1-RAN interface card and the ports on any additional Cisco 2-port T1/E1-RAN interface cards.

Step 11 Exit to the global configuration mode.

```
Router(config-if)# exit
```

Configuring Network Clocking Support

To allow the ports on the Cisco 2-port T1/E1-RAN interface card to use the network clock for timing, use the **network-clock-participate** command in the global configuration mode. To restrict the device to use only its own clock signals, use the **no** form of this command.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure the Cisco 2-port T1/E1-RAN interface card, follow these steps, while in the global configuration mode:

Step 1 Continuing with configuration of the E1, configure the network clock timing by entering:

```
Router(config)# network-clock-participate [wic | aim | slot wic-slot]
```

Where:

- **wic** *wic-slot*—Configures the Cisco 2-port T1/E1-RAN interface card slot number on the Cisco 3825 router. Valid values are 0 or 1.
- **aim**—Configures the Advanced Integration Module (AIM) for Asynchronous Transfer Mode (ATM) (AIM-ATM or AIM-ATM-8) daughter card built-in on the motherboard of the Cisco 3825 router.
- **slot**—Configures the NM-2W network interface module in the network module slot located on the Cisco 3825 router.

For example, the following command configures the Cisco 2-port T1/E1-RAN interface card to use the network clock on the 2-port T1/E1-RAN in the router chassis in slot 0:

```
Router(config)# network-clock-participate wic 0
```

Step 2 To name a source to provide timing for the network clock and to specify the selection priority for this clock source, use the **network-clock-select** command in global configuration mode. To cancel the network clock selection, use the no form of this command.

Step 3 To specify the selection priority for the clock source, enter:

```
Router(config)# network-clock-select priority {e1} slot/subslot/port
```

Where:

- *priority*—Selection priority for the clock source (1 is the highest priority). The clock with the highest priority is selected to drive the system time-division multiplexing (TDM) clocks. When the higher-priority clock source fails, the next-higher-priority clock source is selected.
- **e1**—Specifies that the slot is configured as E1.
- *slot*—Slot number identifying the controller that is the clock source.

- *subslot*—Subslot number identifying the controller that is the clock source.
- *port*—Port number identifying the controller that is the clock source.

For example, the following command specifies the clock source for E1, slot 0, subslot 0, port 0:

```
Router(config)# network-clock-select 1 e1 0/0/0
```

Configuring Multilink Backhaul Interface

A multilink interface is a special virtual interface that represents a multilink PPP bundle. The multilink interface coordinates the configuration of the bundled link, and presents a single object for the aggregate links. However, the individual PPP links that are aggregated must also be configured. Therefore, to enable multilink PPP on multiple serial interfaces, you first need to set up the multilink interface, and then configure each of the serial interfaces and add them to the same multilink interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

The Cisco 3825 router can support up to 16 E1 or T1 interfaces through the multilink interface.

Complete the following configuration tasks for a multilink backhaul interface.

- Creating a Multilink Bundle, this page
- Configuring PFC, page 4-16
- Configuring ACFC, page 4-17
- Enable Multilink and Identify the Multilink Interface, page 4-17
- Enable Real-Time Transport Protocol (RTP) Header-Compression, page 4-18

Creating a Multilink Bundle

To create a multilink bundle, follow these steps, while in the global configuration mode:

Step 1 Create a multilink bundle and enter the interface configuration mode:

```
Router(config)# interface multilink group-number
```

Where *group-number* is the number of the multilink bundle.

For example, the following command creates a multilink bundle 5:

```
Router(config)# interface multilink5
Router(config-if)#
```

To remove a multilink bundle, use the **no** form of this command.

Note To see a list of the configuration commands available to you, enter **?** at the prompt or press the **Help** key while in the configuration mode.

Step 2 Assign an IP address to the multilink interface.

```
Router(config-if)# ip address address [subnet mask]
```

Where:

- *address*—The IP address.
- *subnet mask*—Network mask of IP address.

For example, the following command creates an IP address and subnet mask:

```
Router(config-if)# ip address 10.10.10.2 255.255.255.0
```

Handling PFC and ACFC

Use the following instructions to perform Protocol Field Compression (PFC) and Address and Control Field Compression (ACFC) handling during PPP negotiation to be configured. By default, PFC/ACFC handling is not enabled.

Note The recommended PFC and ACFC handling in the Cisco 3825 router is: **acfc local request, acfc remote apply, pfc local request, and pfc remote apply**.

Configuring PFC

To configure PFC handling during PPP negotiation, follow these steps, while in the interface configuration mode:

Step 1 To configure how the router handles PFC in its outbound configuration requests, enter the following command:

```
Router(config-if)# ppp pfc local {request | forbid}
```

Where:

- **request**—The PFC option is included in outbound configuration requests.
- **forbid**—The PFC option is not sent in outbound configuration requests, and requests from a remote peer to add the PFC option are not accepted.

For example, the following command creates how the router handles PFC:

```
Router(config-if)# ppp pfc local request
```

Step 2 To configure how the router handles the PFC option in configuration requests received from a remote peer, enter the following command:

```
Router(config-if)# ppp pfc remote {apply | reject | ignore}
```

Where:

- **apply**—PFC options are accepted and ACFC may be performed on frames sent to the remote peer.
- **reject**—PFC options are explicitly ignored.
- **ignore**—PFC options are accepted, but ACFC is not performed on frames sent to the remote peer.

For example, the following command allows PFC options to be accepted:

```
Router(config)# ppp pfc remote apply
```

Configuring ACFC

To configure ACFC handling during PPP negotiation, follow these steps, while in the interface configuration mode:

Step 1 To configure how the router handles ACFC in its outbound configuration requests, enter the following command:

```
Router(config-if)# ppp acfc local {request | forbid}
```

Where:

- **request**—The ACFC option is included in outbound configuration requests.
- **forbid**—The ACFC option is not sent in outbound configuration requests, and requests from a remote peer to add the ACFC option are not accepted.

For example, the following command creates how the router handles ACFC:

```
Router(config-if)# ppp acfc local request
```

Step 2 To configure how the router handles the ACFC option in configuration requests received from a remote peer, enter the following command:

```
Router(config-if)# ppp acfc remote {apply | reject | ignore}
```

Where:

- **apply**—ACFC options are accepted and ACFC may be performed on frames sent to the remote peer.
- **reject**—ACFC options are explicitly ignored.
- **ignore**—ACFC options are accepted, but ACFC is not performed on frames sent to the remote peer.

For example, the following command allows ACFC options to be accepted:

```
Router(config-if)# ppp acfc remote apply
```

Enable Multilink and Identify the Multilink Interface

To enable multilink and identify the multilink interface, follow these steps, while in the interface configuration mode:

Step 1 Enable multilink PPP operation.

```
Router(config-if)# ppp multilink
```

Step 2 Specify an identification number for the multilink interface.

```
Router(config-if)# ppp multilink group group-number
```

Where ***group-number*** is the multilink group number.

For example, the following command restricts (identifies) the multilink interface, 5, that can be negotiated:

```
Router(config-if)# ppp multilink group 5
```

Step 3 Enable keepalive packets on the interface and specify the number of times the keepalive packets will be sent without a response before bringing down the interface.

```
Router(config-if)# keepalive [period [retries]]
```

Where:

- *period*—(Optional) Integer value in seconds greater than 0. The default is 10.
- *retries*—(Optional) Specifies the number of times that the device will continue to send keepalive packets without response before bringing the interface down. Integer value greater than 1 and less than 255. If omitted, the value that was previously set is used; if no value was specified previously, the default of 5 is used.

For example, the following command restricts (identifies) the multilink interface, 5, that can be negotiated:

```
Router(config-if)# keepalive 1 5
```

Enable Real-Time Transport Protocol (RTP) Header-Compression

To enable RTP Header Compression, follow these steps, while in the interface configuration mode:

Step 1 Enable RTP header-compression.

```
Router(config-if)# ip rtp header-compression [passive | iphc-format | ietf-format] 
[periodic-refresh]
```

Where:

- **passive**—(Optional) Compresses outgoing RTP packets only if incoming RTP packets on the same interface are compressed. If you do not specify the passive keyword, all RTP packets are compressed. This option is not applicable on PPP links.
- **iphc-format**—(Optional) Indicates that the IP Header Compression (IPHC) format of header compression will be used.
- **ietf-format**—(Optional) Indicates that the Internet Engineering Task Force (IETF) format of header compression will be used.
- **periodic-refresh**—(Optional) Indicates that the compressed IP header will be refreshed periodically.

For example, the following command enables RTP header-compression in the Internet IETF format by suppressing the IP ID in the RTP/UDP header compression:

```
Router(config-if)# ip rtp header-compression ietf-format ignore-id
```

Configuring the PPP Backhaul Interfaces

Use the following instructions to perform a basic backhaul interface configuration: enabling an interface, configuring PPP encapsulation, enabling multilink PPP operation, and specifying an ID number for the multilink interface. You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To continue the configuration of the backhaul links for the E1 controllers, follow these steps, while in the global configuration mode:

Step 1 Configure the serial interface. Specify the E1 slot, subslot, port number, and channel-group.

```
Router(config)# interface serial slot/subslot/port:channel-group
```

Where:

- *slot*—Slot number of the interface.
- *subslot*—Subslot number of the interface.
- *port*—Port number of the interface.
- **channel-group**—ID number to identify the channel group.

For example, the following command identifies the serial interface located in slot 0, subslot 0, port 0, channel-group 0:

```
Router(config)# interface serial0/0/0:0
Router(config-if)#
```

Note To see a list of the configuration commands available to you, enter **?** at the prompt or press the **Help** key while in the configuration mode.

Step 2 Do not assign an IP address and subnet mask to the interface.

```
Router(config-if)# no ip address ip_address subnet_mask
```

Step 3 To configure PPP encapsulation, enter the following command:

```
Router(config-if)# encapsulation ppp
```

Step 4 Enable multilink PPP operation.

```
Router(config-if)# ppp multilink
```

Step 5 Specify an identification number for the multilink interface.

```
Router(config-if)# ppp multilink group group-number
```

Where *group-number* is the multilink group number.

For example, the following command restricts (identifies) the multilink interface, 5, that can be negotiated:

```
Router(config-if)# ppp multilink group 5
```

Step 6 Enable keepalive packets on the interface and specify the number of times the keepalive packets will be sent without a response before bringing down the interface.

```
Router(config-if)# keepalive [period]
```

Where *period* is an optional integer value in seconds greater than 0. The default is 10.

For example, the following command indicates the number of times the keepalive packets will be sent as 1:

```
Router(config-if)# keepalive 1
```

Extended Availability Drop and Insert (EADI)

EADI capabilities must be disabled on the Cisco 3825 router (using the **disable-eadi** global configuration command) to avoid a double-termination situation upon router reboot when the Cisco 3825 router is being used in a redundant configuration.

To disable EADI, follow these steps, while in the global configuration mode:

Step 1 Disable EADI.

```
Router(config)# disable eadi
```

Configuring GSM-Abis Links

Note The following is an example of configuring an E1 on the Cisco 2-port T1/E1-RAN interface card in a Cisco 3825 router.

Use the following instructions to perform a basic Global System for Mobile Communications (GSM)-Abis configuration on the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router, by entering the following Cisco IOS commands at the router prompt (see the "Understanding the Cisco 3825 Router Interface Numbering" section on page 3-1 for information about slot and port numbering on the Cisco 3825 router). You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure the GSM-Abis attributes, follow these steps while in the global configuration mode:

Step 1 Set the card type for the Cisco 2-port T1/E1-RAN interface card.

> **Note** This configuration assumes that the Cisco 2-port T1/E1-RAN interface card is installed in all three Cisco 2-port T1/E1-RAN interface card slots (physical slots HWIC0, HWIC1, HWIC2, and HWIC3) of the Cisco 3825 router.

```
Router(config)# card type {e1 | t1} slot subslot
```

Where:

- **e1**—*Card type E1.*
- **t1**—*Cart type T1.*
- *slot*—Slot number of the interface.
- *subslot*—Specifies the Cisco 2-port T1/E1-RAN interface card (serial slot) port number.

For example, there is no Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router serial slot 0 (physical slot HWIC0). So, the interface card is located in physical slot HWIC1. As a result, the following command configures the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router serial slot 0 (physical slot HWIC1), first port of the Cisco 2-port T1/E1-RAN interface card as a E1:

```
Router(config)# card type e1 0 1
```

When the command is used for the first time, the configuration takes effect immediately. A subsequent change in the card type will not take effect unless you enter the **reload** command or reboot the router

Step 2 Specify the controller that you want to configure by entering the controller configuration mode. Controller E1 0/0/0 maps to the first port of the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router serial slot 0 (physical slot HWIC0). Controller E1 0/0/1 maps to the second port of the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router serial slot 0 (physical slot HWIC0).

> **Note** If you install a Cisco 2-port T1/E1-RAN interface card in the Cisco 3825 router in physical slot HWIC1 (leaving physical slot HWIC0 empty), the logical interfaces in physical slot HWIC1 become Serial 0/0/0 and Serial 0/0/1. If you later add a Cisco 2-port T1/E1-RAN interface card to physical slot HWIC0, the interface numbering shifts. The configuration that you created for logical interfaces Serial 0/0/0 and Serial 0/0/1 will now be applied to the Cisco 2-port T1/E1-RAN interface card in physical slot HWIC0, and you will need to create a new configuration for the logical interfaces that you previously configured on HWIC1 (which will now be Serial 0/1/0 and Serial 0/1/1). For more information about interface numbering, see Understanding the Cisco 3825 Router Interface Numbering, page 3-1.

```
Router(config)# controller e1 slot/subslot/port
```

Where:

- *slot*—Number of the serial slot the 2-port T1/E1-RAN card is located in the Cisco 3825 router.
- *subslot*—Number of the serial subslot the 2-port T1/E1-RAN card is located in the Cisco 3825 router.
- *port*—Number of the serial port the 2-Port T1/E1-RAN card is using.

With a Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router slot 0 (physical slot HWIC0), for example, the following command specifies the E1 controller as the first port of the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router slot 0 (physical slot HWIC0):

```
Router(config)# controller e1 0/1/0
Router(config-controller)#
```

Step 3 Enter the clocking source (see Clocking Requirements for Cisco 3825 Router, page 4-2 for more information).

```
Router(config-controller)# clock source {line [primary] | internal}
```

Where:

- **line**—Specifies the E1 line from which the clocking is taken.
- **internal**—Specifies internal clocking.
- **primary**—Primary clock source.

For example, the following command configures the clock source for the E1 controller:

```
Router(config-controller)# clock source internal
```

Note When you are using the **clock source {line [primary] | internal}** command to change the configuration of an installed card, you must enter the **no clock source** {**line [primary] |internal**} command first. Then enter the **clock source {line {primary] | internal}** command for the new configuration information.

Step 4 Specify the channel-group and time slots to be mapped. Once you configure a channel-group, the serial interface is automatically created.

```
Router(config-controller)# channel-group channel-no timeslots timeslot-list speed {64}
```

Where:

- *channel-no*—ID number to identify the channel group. The valid range is 0 to 30.
- *timeslot-list*—Timeslots (DS0s) to include in this channel group. The valid timeslots are 1 to 31.
- **speed {64}**—The speed of the DS0: 64 kbps.

For example, the following command configures the channel-group and time slots for the E1 controller:

```
Router(config-controller)# channel-group 0 timeslots 1-31 speed 64
```

Note When you are using the **channel-group** *channel-no* **timeslots** *timeslot-list* **{64}** command to change the configuration of an installed card, you must enter the **no channel-group** *channel-no* **timeslots** *timeslot-list* **speed {64}** command first. Then enter the **channel-group** *channel-no* **timeslots** *timeslot-list* **{64}** command for the new configuration information.

Step 5 Exit back to global configuration mode.

```
Router(config-controller)# exit
```

Step 6 To Configure the GSM-Abis interface, first specify the serial interface that you want to configure by entering the interface configuration mode.

```
Router(config)# interface serial slot/subslot/port:channel-group
```

Where:

- *slot*—Number of the slot being configured.
- *subslot*—Number of the subslot being configured.

- *port*—Number of the port being configured.
- *channel-group*—Specifies the E1 channel group number defined with the channel-group controller configuration command.

For example, the following command enables the serial interface on VWIC-2/HWIC-2, port 0:

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

Note To see a list of the configuration commands available to you, enter **?** at the prompt or press the **Help** key while in the configuration mode.

Step 7 Enter the following command to configure GSM-Abis interface encapsulation in the interface configuration mode.

```
Router(config-if)# encapsulation gsm-abis
```

Where **gsm-abis** is the type of interface layer.

For example, the following command enables encapsulation on the GSM-ABIS interface layer:

```
Router(config-if)# encapsulation gsm-abis
```

Step 8 To configure the local parameters required to establish an Internet Protocol/User Datagram Protocol (IP/UDP) backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from in the interface configuration mode.

```
Router(config-if)# gsm-abis local ip-address port
```

Where:

- *ip-address*—The IP address for the entry you wish to establish.
- *port*—The port you want to use for the entry you wish to establish.

For example, the following command configures the gsm-abis local parameters to an IP address of 10.10.10.2 located on port 5502:

```
Router(config-if)# gsm-abis local 10.10.10.2 5502
```

Step 9 To configure the remote parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection to in the interface configuration mode.

```
Router(config-if)# gsm-abis remote ip-address port
```

Where:

- *ip-address*—The IP address for the entry you wish to establish.
- *port*—The port you want to use for the entry you wish to establish.

For example, the following command configures the **gsm-abis remote** parameters to an IP address of 10.10.10.1 located on port 5502:

```
Router(config-if)# gsm-abis remote 10.10.10.1 5502
```

Step 10 Return to Step 1 to configure the next port of the Cisco 2-port T1/E1-RAN interface card and any other ports on additional Cisco 2-port T1/E1-RAN interface cards.

Step 11 Exit the interface configuration mode.

```
Router(config-if)# exit
```

Configuring UMTS Links

Note The following is an example of configuring an E1 on the Cisco 2-port T1/E1-RAN interface card in a Cisco 3825 router.

Use the following instructions to perform a basic Universal Mobile Telecommunications System (UMTS)-Iub configurational on the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router, enter the following Cisco IOS commands at the router prompt (see the "Understanding the Cisco 3825 Router Interface Numbering" section on page 3-1 for information about slot and port numbering on the Cisco 3825 router). You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure the UMTS-Iub attributes, follow these steps beginning in the global configuration mode:

Step 1 Set the card type for the Cisco 2-port T1/E1-RAN interface card.

Note This configuration assumes that the Cisco 2-port T1/E1-RAN interface card is installed in all three Cisco 2-port T1/E1-RAN interface card slots (physical slots HWIC0, HWIC1, HWIC2, and HWIC3) of the Cisco 3825 router.

- ***e1****—Card type E1.*
- ***t1****—Cart type T1.*
- *slot*—Slot number of the interface.
- *subslot*—Specifies the Cisco 2-port T1/E1-RAN interface card (serial slot) port number.

```
Router(config)# card type {e1 | t1} slot subslot
```

For example, there is no Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router serial slot 0 (physical slot HWIC0). So, the interface card is located in physical slot HWIC1. As a result, the following command configures the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router serial slot 0 (physical slot HWIC1), the first port of the Cisco 2-port T1/E1-RAN interface card as a E1:

```
Router(config)# card type e1 0 1
```

When the command is used for the first time, the configuration takes effect immediately. A subsequent change in the card type will not take effect unless you enter the **reload** command or reboot the router

Step 2 Specify the controller that you want to configure by entering the controller configuration mode. Controller E1 0/0/0 maps to the first port of the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router serial slot 0 (physical slot HWIC0). Controller E1 0/0/1 maps to the second port of the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router serial slot 0 (physical slot HWIC0).

Note If you install a Cisco 2-port T1/E1-RAN interface card in the Cisco 3825 router in physical slot HWIC1 (leaving physical slot HWIC0 empty), the logical interfaces in physical slot HWIC1 become Serial 0/0/0 and Serial 0/0/1. If you later add a Cisco 2-port T1/E1-RAN interface card to physical slot HWIC0, the logical interface numbering shifts. The configuration that you created for interfaces Serial 0/0/0 and Serial 0/0/1 will now be applied to the Cisco 2-port T1/E1-RAN interface card in physical slot HWIC0, and you will need to create a new configuration for the logical interfaces that you previously configured on HWIC1 (which will now be Serial 0/1/0 and Serial 0/1/1). For more information about interface numbering, see Understanding the Cisco 3825 Router Interface Numbering, page 3-1.

```
Router(config)# controller e1 slot/subslot/port
```

Where:

- *slot*—Number of serial slot the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router.
- *subslot*—Number of serial subslot the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router.
- *port*—Number of the serial port the Cisco 2-Port T1/E1-RAN interface card is using.

With a Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router slot 0 (physical slot HWIC0), for example, the following command specifies the E1 controller as the first port of the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router serial slot 0 (physical slot HWIC0):

```
Router(config)# controller e1 0/2/0
Router(config-controller)#
```

Step 3 Configure the AIM for ATM card to be used for ATM traffic on the previously specified E1 controller.

```
Router(config-controller)# mode atm aim aim-slot
```

Where *aim-slot* sets the mode of the E1 controller in the AIM slot.

For example, the following command sets the mode of the E1 controller in AIM slot 1:

```
Router(config-controller)# mode atm aim 1
```

Step 4 Enter the clocking source.

```
Router(config-controller)# clock source {line [primary] | internal}
```

Where:

- **line**—Specifies the E1 line from which the clocking is taken.
- **internal**—Specifies internal clocking.
- **primary**—Primary clock source.

For example, the following command configures the clock source for the E1 controller:

```
Router(config-controller)# clock source internal
```

Note When you are using the **clock source {line [primary] | internal}** command to change the configuration of an installed card, you must enter the **no clock source** {**line [primary] |internal**} command first. Then enter the **clock source {line {primary] | internal}** command for the new configuration information.

Step 5 Exit the controller configuration mode.

```
Router(config-controller)# exit
```

Step 6 Configure the network clock support for the Cisco 2-port T1/E1-RAN interface card.

```
Router(config)# network-clock-participate wic number
```

Where *number* is the slot number of the Cisco 2-port T1/E1-RAN interface card which is installed on the Cisco 3825 router.

For example, the following command enables the Cisco 2-port T1/E1-RAN interface card in logical slot 2 (physical slot HWIC1) of the Cisco 3825 router to use the network clock for its timing:

```
Router(config)# network-clock-participate wic 1
```

Step 7 Configure the network clock support for the AIM for ATM card interface.

```
Router(config)# network-clock-participate aim number
```

Where *number* is the slot number of the AIM for ATM card interface installed in the Cisco 3825 router.

For example, the following command enables the AIM for ATM card interface in physical slot 1 of the Cisco 3825 router to use the network clock for its timing:

```
Router(config)# network-clock-participate aim 1
```

Step 8 To configure the UMTS-Iub interface, first specify the ATM interface by entering the interface configuration mode.

```
Router(config)# interface ATMslot/subslot/port
```

Where:

- *slot*—Specifies the slot number of the VWIC/HWIC previously assigned to the AIM for ATM card.
- *subslot*—Specifies the subslot number of the VWIC/HWIC previously assigned to the AIM for ATM card.
- ***port***—Specifies the port on the VWIC/HWIC previously assigned to the AIM for ATM card.

For example, the following command configures the VWIC/HWIC in logical slot 0 (physical slot 0), subslot 0, port 1 located on the motherboard of the Cisco 3825 router to be used for ATM traffic:

```
Router(config)# interface ATM0/2/0
Router(config-if)#
```

Note To see a list of the configuration commands available to you, enter **?** at the prompt or press the **Help** key while in the configuration mode.

Step 9 To create an ATM path on the UMTS Iub interface, enter the following command:

```
Router(config-if)# atm umts-iub
```

Step 10 To configure the local parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub local ip-address port
```

Step 11 To configure the remote parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub remote ip-address port
```

Step 12 Create an ATM permanent virtual circuit (PVC):

```
Router(config-if)# pvc [name] vpi/vci [qsaal]
```

Where:

- *name—(Optional) specifies the name of the ATM PVC interface you create.*
- *vpi*—Specifies the ATM network virtual path identifier (VPI) of this PVC.
- *vci*—Specifies the ATM network virtual channel identifier (VCI) of this PVC.
- **qsaal**—(Optional) specifies the Q.2931 signaling ATM adaptation layer (QSAAL) encapsulation type.

Note Typically AAL5 PVCs are defined using qsaal encapsulation. However, if the traffic profile is such that the AAL5 packets exceed normal signaling (272 bytes) payload size, it is recommended that the PVC be defined using AAL0.

This is commonly true for OAM PVCs and synchronization PVCs. NodeB Application Part (NBAP) and Access Link Control Application Part (ALCAP) PVCs can be defined using qsaal encapsulation.

For example, the following command specifies the ATM PVC interface with a VPI of 0 and a VCI of 100:

```
Router(config-if)# pvc 0/100
```

Note PVC definitions should match those on the NodeB and use the following definitions:

NBAP signaling–use qsaal
ALCAP signaling–use qsaal
AAL2 bearer–use encapsulation aal0
All other PVCs should use encapsulation aal0

Class of service should be defined to match the NodeB PVC class of service definitions. For instance, if the NodeB has defined a PVC with CBR, the PVC on the Cisco 3825 router should use the same CBR definitions.

OAM can be defined on the PVCs as well. If the NodeB has OAM enabled on its PVC, OAM should be defined on the PVCs of the Cisco 3825 router as well.

Step 13 Configure the ATM adaptation layer (AAL) and encapsulation type to AAL0 encapsulation.

```
Router(config-if)# encapsulation aal-encap
```

Where ***aal-encap*** specifies the ATM adaptation layer (AAL) and encapsulation type.

For example, the following command specifies the AAL as AAL0:

```
Router(config-if)# encapsulation aal0
```

Step 14 Create another ATM permanent virtual circuit (PVC):

```
Router(config-if)# pvc [name] vpi/vci [qsaal]
```

Where:

- *name—(Optional) specifies the name of the ATM PVC interface you create.*
- *vpi*—Specifies the ATM network virtual path identifier (VPI) of this PVC.
- *vci*—Specifies the ATM network virtual channel identifier (VCI) of this PVC.
- **qsaal**—(Optional) specifies theQ.2931 signaling ATM adaptation layer (QSAAL) encapsulation type.

For example, the following command specifies the ATM PVC interface with a VPI of 0, a VCI of 100, and a QSAAL:

```
Router(config-if)# pvc 0/200 qsaal
```

Step 15 Return to Step 1 to configure the second port of the Cisco 2-port T1/E1-RAN interface card and the ports on additional Cisco 2-port T1/E1-RAN interface cards.

Step 16 Exit the interface configuration mode.

```
Router(config-if)# exit
```

Configuring Redundancy

The Cisco 3825 router can be used either in a redundant configuration (preferable) or as a standalone device.

Note Before implementing redundancy, you must disable extended availability drop-and-insert (EADI) capabilities on the router using the **diable-eadi** command in the global configuration mode.

Redundant Cisco 3825 Routers

Use the following instructions to configure the Cisco 3825 router for redundancy. For redundancy, the Cisco 3825 router makes use of the existing HSRP feature. However, additional controls are needed for the Cisco 3825 router. In a redundant configuration, the router must track the status of the health and revertive loopback interfaces as well as the backhaul and shorthaul interfaces. You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure a Cisco 3825 router for use in a redundant configuration, follow these steps while in the global configuration mode:

Step 1 First configure the shorthaul loopback interfaces (loopback 103).

> **Note** The loopback interface is software-only, virtual interface that emulates an interface that is always up. The interface number is the number of the loopback interface that you want to create or configure.

```
Router(config)# interface loopback interface
```

For example, the following command specifies the loopback interface for shorthaul as 103:

```
Router(config)# interface loopback Loopback103
```

Step 2 Enter the ip address and subnet mask for the shorthall loopback interface:

```
Router (config-if)# ip address ip_address subnet_mask
```

Step 3 Exit the interface configuration mode.

```
Router (config-if)# exit
```

Step 4 To go to the redundancy mode, enter the **redundancy** command:

```
Router(config)# redundancy
```

Step 5 In the redundancy mode, enter the y-cable mode:

```
Router(config-r)# mode y-cable
```

Step 6 To enable the GSM redundancy, enter the **standby gsm-redundancy** command:

```
Router(config-r)# standby gsm-redundancy
```

Step 7 Specify the interface to be used for backhauling.

```
Router(config-r-y)# standby use-interface interface backhaul
```

> **Note** The interface that you specify for the backhaul must be a Multi-Link Point-to-Point Protocol (MLPPP) interface. If you want to use a serial interface as the backhaul, you must first configure that interface to be part of an MLPPP bundle. The interface that you specify for the backhaul interface should match one of those that you configured and tracked in the "Configuring Multilink Backhaul Interface" section on page 4-15.

For example, the following command specifies the multilink interface for backhaul:

```
Router(config-r-y)# standby use-interface Multilink5 backhaul
```

Step 8 Specify the interface to be used for shorthaul.

```
Router(config-r-y)# standby use-interface interface shorthaul
```

> **Note** The interface that you specify for the shorthaul interface should match the one that you configured in the Step 1.

For example, the following command specifies the loopback interface for shorthaul:

```
Router(config-r-y)# standby use-interface Loopback103 shorthaul
```

Step 9 Exit the y-cable configuration mode.

```
Router(config-r-y)# exit
```

Step 10 Exit the redundancy configuration mode.

```
Router(config-r)# exit
```

Step 11 Specify the Gigabit Ethernet interface to be configured (see "Configuring Gigabit Ethernet Interfaces" section on page 4-8 for more details).

```
Router(config)# interface gigabitethernet slot/port
```

The *slot* represents the main fixed slot and is always 0 and the *port* is the number of the port (0 or 1).

For example, the following command specifies the Gigabit Ethernet interface in slot 0 on port 1:

```
Router(config)# interface gigabitethernet 0/1
Router(config-if)#
```

Step 12 Enable HSRP, and assign an IP address to the virtual router. This address is the same for both the active and standby routers.

Note In redundant configurations, the Cisco 3825 router uses HSRP to control the active and standby routers. To use HSRP, you must configure the standby priority attributes and the IP address of the virtual router. Priority is determined first by the configured priority value, and the IP address. In each case, a higher value has greater priority.

```
Router(config-if)# standby [group-number] ip-address [secondary]
```

Where:

- *group-number*—(Optional) Group number on the interface to which the timers apply. The default is 0.
- *ip-address*—(Optional) IP address of the Hot Standby router interface.
- **secondary**—(Optional) Indicates the IP address is a secondary Hot Standby router interface. Useful on interfaces with primary and secondary addresses; you can configure primary and secondary HSRP addresses.

For example, the following command specifies the hot standby group 1 with the IP address as 55.0.0.10:

```
Router(config-if)# standby 1 ip 55.0.0.10
```

Step 13 To configure the time between "hello packets" and the time before other routers declare the active Hot Standby or standby router to be down, use the **standby timers** command in interface configuration mode. To restore the timers to their default values, use the **no** form of this command. Indicate the hot standby group and timers to be configured.

```
Router(config-if)# standby [group-number] timers [msec] hellotime [msec] holdtime
```

Where:

- *group-number*—(Optional) Group number on the interface to which the timers apply. The default is 0.
- **msec**—(Optional) Interval in milliseconds. Millisecond timers allow for faster failover.

- *hellotime*—Hello interval (in seconds). This is an integer from 1 to 254. The default is 3 seconds. If the msec option is specified, hello interval is in milliseconds. This is an integer from 15 to 999.
- *holdtime*—Time (in seconds) before the active or standby router is declared to be down. This is an integer from x to 255. The default is 10 seconds. If the msec option is specified, holdtime is in milliseconds. This is an integer from y to 3000.

  Where:
  - x is the hellotime + 50 milliseconds, then rounded up to the nearest 1 second
  - y is greater than or equal to 3 times the hellotime and is not less than 50 milliseconds.

For example, the following command specifies the hot standby group 1 with the timers set between 1 and 3 seconds:

```
Router(config-if)# standby 1 timers 1 3
```

Step 14 To configure HSRP preemption and preemption delay, use the **standby preempt** command in interface configuration mode. To restore the default values, use the **no** form of this command.

Note Without preemption, a standby router will transition to the active state only if HSPR “hello packets” cease. In a RAN-O solution, you may sometimes want a switchover to occur in the absence of a router GE failure; therefore, you need to configure preemption.

```
Router(config-if)# standby [group-number] preempt [delay{minimum delay|reload delay|sync delay}]
```

Where:

- *group-number*—(Optional) Group number on the interface to which the other arguments in this command apply.
- *delay*—(Optional) Required if either the **minimum**, **reload**, or **sync** keywords are specified.
- **minimum** *delay*—(Optional) Specifies the minimum delay period in delay seconds. The delay argument causes the local router to postpone taking over the active role for delay (minimum) seconds since that router was last restarted. The range is from 0 to 3600 seconds (1 hour). The default is 0 seconds (no delay).
- **reload** *delay*—(Optional) Specifies the preemption delay period after a reload only. This delay period applies only to the first interface-up event after the router has reloaded.
- **sync** *delay*—(Optional) Specifies the maximum synchronization period for IP redundancy clients in delay seconds.

For example, the following command specifies the hot standby group 1 with preempt:

```
Router(config-if)# standby 1 preempt
```

Note The default group number is 0. The default delay is 0 seconds; if the router wants to preempt, it will do so immediately. By default, the router that comes up later becomes the standby.

Step 15 To configure the name of the standby group, use the **standby name** command in interface configuration mode. To disable the name, use the **no** form of this command.

```
Router(config-if)# standby [group-number] name [group-name]
```

Where:

- *group-number*—Specifies the standby group number.
- *group-name*—Specifies the name of the standby group.

For example, the following command specifies the hot standby group name as *one*:

```
Router(config-if)# standby 1 name_one
```

Note Typically, only one GE is used in a RAN-O solution. So, the command must be **standby 1 name_one**.

Caution If you omit the *group-name* or if you enter a group name that does not begin with one or two, the configuration will fail and there will be a mismatch in the information displayed by the **show redundancy** and **show standby** commands.

Step 16 To configure HSRP to track an object and change the Hot Standby priority based on the state of the object, use the **standby track** command in interface configuration mode. To remove the tracking, use the **no** form of this command.

Note When you use the Cisco 3825 router in a RAN-O solution, you must configure the GE interface to track the multilink interface and the loopback interface.

```
Router(config-if)# standby [group-number] track interface-type interface-number
[interface-priority]
```

Where:

- *group-number*—(Optional) Group number to which the tracking applies.
- *interface-type*—Interface type (combined with interface number) that will be tracked.
- *interface-number*—Interface number (combined with interface type) that will be tracked.
- ***interface-priority***—(Optional) Amount by which the Hot Standby priority for the router is decremented (or incremented) when the interface goes down (or comes back up). The default value is 10.

For example, the following command specifies the hot standby group 1 to track Loopback 103 interface:

```
Router(config-if)# standby 1 track Loopback103
```

Note In redundant configurations, you should issue **standby track** commands for both the health interface (loopback101), the revertive interface (loopback102), the backhaul interface (multilink1), and shorthaul interface (loopback 103). The decrement values *must* be as follows: 10 for the multilink, GE, and health interfaces; 5 for the revertive interface.

Step 17 Continue to configure HSRP to track Multilink1 and Loopback103 if needed.

Step 18 Specify a priority of 100.

```
Router(config-if)# standby group priority 100
```

Note If you are using the Cisco 3825 in a redundant configuration, you must also set the keepalives under the GE interface to 1.

```
Router(config-if)# keepalive 1
```

Standalone Cisco 3825 Router

The Cisco 3825 router has relays that work with a special y-cable for redundancy and that are controlled by HSRP. You can, however, use the Cisco 3825 as a standalone device. If you choose not to use the Cisco 3825 in a redundant configuration, you should *not* configure HSRP and you must manually control the relays of the Cisco 2-port T1/E1-RAN card.

To manually set the relays to open or closed, follow these steps, while in the global configuration mode:

Step 1 To go to the redundancy mode, enter redundancy mode:

```
Router(config)# redundancy
```

Step 2 In the redundancy mode, enter the y-cable mode:

```
Router(config-r)# mode y-cable
```

Step 3 Specify that the router is to be used as a standalone device. This command closes the relays.

```
Router(config-r-y)# standalone
```

Step 4 Exit y-cable configuration mode.

```
Router(config-r-y)# exit
```

To verify the status of the relays on an Cisco 3825 router, use the **show controllers** command.

Configuring for SNMP Support

Use the following instructions to configure for Simple Network Management Protocol (SNMP) support: setting up the community access, establishing a message queue for each trap host, enabling the router to send SNMP traps, enabling SNMP traps for alarms, and enabling SNMP traps for a specific environment. You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure a Cisco 3825 for SNMP, follow these steps while in the global configuration mode:

Step 1 To set up the community access string to permit access to the SNMP, use the **snmp-server community** command. The **no** form of this command removes the specified community string.

```
Router(config)# snmp-server community string [view view-name] [ro | rw] [number]
```

Where:

- *string*—Community string that acts like a password and permits access to the SNMP protocol.
- **view** *view-name*—(Optional) Name of a previously defined view. The view defines the objects available to the community.
- **ro**—(Optional) Specifies read-only access. Authorized management stations are only able to retrieve MIB objects.
- **rw**—(Optional) Specifies read-write access. Authorized management stations are able to both retrieve and modify MIB objects.
- *number*—(Optional) Integer from 1 to 99 that specifies an access list of IP addresses that are allowed to use the community string to gain access to the SNMP agent.

For example, the following command sets up the community access string as xxxxx with read-only access:

```
Router(config)# snmp-server community xxxxx RO
```

Step 2 To establish the message queue length for each trap host, use the **snmp-server queue-length** command.

```
Router(config)# snmp-server queue-length length
```

Where *length* is the integer that specifies the number of trap events that can be held before the queue must be emptied.

For example, the following command establishes the number of trap events to 100:

```
Router(config)# snmp-server queue-length 100
```

Step 3 To enable the router to send SNMP traps or informs (SNMP notifications), use the **snmp-server enable traps** command. Use the **no** form of this command to disable SNMP notifications.

```
Router(config)# snmp-server enable traps [notification-type] [notification-option]
```

Where:

- ***notification-type***—**snmp [authentication]**—Enables RFC 1157 SNMP notifications. Note that use of the **authentication** keyword produces the same effect as not using the **authentication** keyword. Both the **snmp-server enable traps snmp** and **snmp-server enable traps snmp authentication** forms of this command will globally enable (or, if using the **no** form, disable) the following SNMP traps:
  - authentication failure
  - linkup
  - linkdown
  - coldstart
  - warmstart

- ***notification-option***—(Optional) **atm pvc** [**interval** *seconds*] [**fail-interval** *seconds*]—The optional interval seconds keyword/argument combination specifies the minimum period between successive traps, in the range from 1 to 3600. Generation of PVC traps is dampened by the notification interval in order to prevent trap storms. No traps are sent until the interval lapses. The default interval is 30.

  The optional fail-interval seconds keyword/argument combination specifies the minimum period for storing the failed time stamp, in the range from 0 to 3600. The default fail-interval is 0.

  envmon [**voltage** | **shutdown** | **supply** | **fan** | **temperature**]—When the **envmon** keyword is used, you can enable a specific environmental notification type, or accept all notification types from the environmental monitor system. If no option is specified, all environmental notifications are enabled. The option can be one or more of the following keywords: **voltage**, **shutdown**, **supply**, **fan**, and **temperature**.

  isdn [**call-information** | **isdn u-interface**]—When the **isdn** keyword is used, you can specify the **call-information** keyword to enable an SNMP ISDN call information notification for the ISDN MIB subsystem, or you can specify the **isdnu-interface** keyword to enable an SNMP ISDN U interface notification for the ISDN U interface MIB subsystem.

  repeater [**health** | **reset**]—When the repeater keyword is used, you can specify the repeater option. If no option is specified, all repeater notifications are enabled. The option can be one or more of the following keywords:

  - **health**—Enables IETF Repeater Hub MIB (RFC 1516) health notification.
  - **reset**—Enables IETF Repeater Hub MIB (RFC 1516) reset notification.

For example, the following command enables traps for SNMP link down, link up, coldstart and warmstart:

```
Router(config)# snmp-server enable traps snmp linkdown linkup coldstart warmstart
```

Step 4 To enable SNMP traps for all IP-RAN notifications, enter:

```
Router(config)# snmp-server enable traps ipran
```

Note Besides enabling SNMP traps for all IP-RAN notifications, you can also enable traps for IP-RAN GSM alarms, UMTS alarms, and general information about the backhaul utilization (see Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference" for descriptions on how to use these SNMP commands.

Step 5 To enable SNMP traps for a specific environment, enter:

```
Router(config)# snmp-server enable traps envmon
```

Step 6 To specify the recipient of an SNMP notification operation, use the **snmp-server host** command. To remove the specified host, use the **no** form of this command.

```
Router(config)# snmp-server host host-addr [traps | informs] [version {1 | 2c | 3 [auth |
noauth | priv]}] community-string [udp-port port] [notification-type]
```

Where:

- *host-addr*—Name or Internet address of the host (the targeted recipient).
- **traps**—(Optional) Send SNMP traps to this host. This is the default.
- **informs**—(Optional) Send SNMP informs to this host.

- **version**—(Optional) Version of the SNMP used to send the traps. Version 3 is the most secure model, as it allows packet encryption with the **priv** keyword. If you use the version keyword, one of the following must be specified:
  - **1**—SNMPv1. This option is not available with informs.
  - **2c**—SNMPv2C.
  - **3**—SNMPv3. The following three optional keywords can follow the version 3 keyword:

    –**auth** (Optional). Enables Message Digest 5 (MD5) and Secure Hash Algorithm (SHA) packet authentication

    –**noauth** (Default). The noAuthNoPriv security level. This is the default if the [auth | noauth | priv] keyword choice is not specified.

    –**priv** (Optional). Enables Data Encryption Standard (DES) packet encryption (also called "privacy").
- ***community-string***—Password-like community string sent with the notification operation. Though you can set this string using the **snmp-server host** command by itself, we recommend you define this string using the **snmp-server community** command before using the **snmp-server host** command.
- **udp-port port**—UDP port of the host to use. The default is 162.
- ***notification-type***—(Optional) Type of notification to be sent to the host. If no type is specified, all notifications are sent. The notification type can be one or more of the following keywords:
  - **aaa_server**—Enable SNMP AAA Server traps.
  - **atm**—Enable SNMP atm Server traps.
  - **ccme**—Enable SNMP ccme traps.
  - **cnpd**—Enable NBAR Protocol Discovery traps.
  - **config**—Enable SNMP config traps.
  - **config-copy**—Enable SNMP config-copy traps.
  - **cpu**—Allow cpu related traps.
  - **dial**—Enable SNMP dial control traps.
  - **dnis**—Enable SNMP DNIS traps.
  - **ds0-busyout**—Enable ds0-busyout traps.
  - **ds1**—Enable SNMP DS1 traps.
  - **ds1-loopback**—Enable ds1-loopback traps.
  - **ds3**—Enable SNMP DS3 traps.
  - **dsp**—Enable SNMP dsp traps.
  - **eigrp**—Enable SNMP EIGRP traps.
  - **entity**—Enable SNMP entity traps.
  - **envmon**—Enable SNMP environmental monitor traps.
  - **flash**—Enable SNMP FLASH notifications.
  - **frame-relay**—Enable SNMP frame-relay traps.
  - **hsrp**—Enable SNMP HSRP traps.
  - **icsudsu**—Enable SNMP ICSUDSU traps.

- **ipmulticast**—Enable SNMP ipmulticast traps.
- **ipran**—Enable IP-RAN Backhaul traps.
- **ipsla**—Enable SNMP IP SLA traps.
- **isdn**—Enable SNMP isdn traps.
- **12tun**—Enable SNMP L2 tunnel protocol traps.
- **mpls**—Enable SNMP MPLS traps.
- **msdp**—Enable SNMP MSDP traps.
- **mvpn**—Enable Multicast Virtual Private Networks traps.
- **ospf**—Enable OSPF traps.
- **pim**—Enable SNMP PIM traps.
- **pppoe**—Enable SNMP pppoe traps.
- **pw**—Enable SNMP PW traps.
- **rsvp**—Enable RSVP flow change traps.
- **snmp**—Enable SNMP traps.
- **srst**—Enable SNMP srst traps.
- **syslog**—Enable SNMP syslog traps.
- **tty**—Enable TCP connection traps.
- **voice**—Enable SNMP voice traps.
- **vrrp**—Enable SNMP vrrp traps.
- **vtp**—Enable SNMP VTP traps.
- **xgcp**—Enable XGCP protocol traps.

For example, the following command specifies a recipient of the SNMP operation with a host-address of 10.20.30.40 with a version SNMP of SNMPv2C:

```
Router(config)# snmp-server host 10.20.30.40 version 2c
```

Step 7 Exit the global configuration mode.

```
Router(config)# exit
```

Configuring Inverse Multiplexing over ATM (IMA)

A new feature, Inverse Multiplexing over ATM (IMA) interface as a shorthaul has been implemented in Cisco IOS Release 12.4(4)MR. With this feature, you can now configure existing UMTS commands on IMA interfaces. No new commands are added for this new feature. Only previously existing Cisco IOS commands have been added for this feature (see Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference" for detailed command information).

Inverse multiplexing provides the capability to transmit and receive a single high-speed data stream over multiple slower-speed physical links. In inverse multiplexing over ATM (IMA), the originating stream of ATM cells is divided so that complete ATM cells are transmitted in round-robin order across the set of ATM links. IMA is supported on the Cisco 2-port T1/E1-RAN card on the Cisco 3825 router.

Note With Cisco IOS Release 12.4(16)MR1 and later, the Cisco 3825 router supports the AIM-ATM-8 card. The Cisco 3825 router supports up to 12 ATM ports with the AIM-ATM-8 card installed in slot 0 and up to 8 ATM ports for AIM with the AIM-ATM-8 card installed in slot 1.

The AIM for ATM card (AIM-ATM) supports up to four independent ATM links.

To determine which AIM for ATM card is installed in your router, use the **show diagnostics** command in privileged EXEC mode.

To configure a Cisco 3825 router for IMA, follow these steps while in the global configuration mode:

Step 1 Enter interface configuration mode and specify the location of the interface.

```
Router(config)# interface atmslot/subslot/port
```

Where:

- *slot*—Specifies the slot number of the VWIC/HWIC previously assigned to the AIM for ATM (Step 2 of the "Configuring UMTS Links" procedure on page 4-24).
- *subslot*—Specifies the subslot number of the VWIC/HWIC previously assigned to the AIM for ATM card (Step 2 of the "Configuring UMTS Links" procedure on page 4-24).
- *port*—Specifies the port on the VWIC/HWIC previously assigned to the AIM for ATM card (Step 3 of the "Configuring UMTS Links" procedure on page 4-24).

For example, the following command configures the VWIC/HWIC in logical slot 0 (physical slot 0), subslot 0, port 1 located on the motherboard of the Cisco 3825 router to be used for ATM traffic:

```
Router(config)# interface ATM0/2/0
Router(config-if)#
```

Note To see a list of the configuration commands available to you, enter **?** at the prompt or press the **Help** key while in the configuration mode.

Step 2 Disable the IP address configuration for the physical layer interface. This and other protocol parameters should be configured on the IMA interface.

```
Router(config-if)# no ip address
```

Step 3 Disable the Interim Local Management Interface (ILMI) keepalive parameters.

```
Router(config-if)# no atm ilmi-keepalive
```

Step 4 Specify the link that is included in an IMA group.

```
Router(config-if)# ima-group group-number
```

Where *group-number* specifies the group number of the IMA group.

For example, the following command specifies the group number of the IMA group as 0:

```
Router(config-if)# ima-group 0
```

Step 5 Randomize the ATM cell payload frames.

```
Router(config-if)# scrambling-payload
```

Step 6 Perform Steps 1 to 5 to add another member link.

Step 7 Specify the slot location and port of IMA interface group.

```
Router(config-if)# interface ATMslot/IMA<group-number>
```

Where:

- *slot*—Specifies the slot location of the ATM IMA port adapter.
- *group-number*—Specifies the group number of the IMA group.

For example, the following command specifies the slot number as 0 and the group number as 0:

```
Router(config-if)# interface ATM0/IMA0
```

Note Should you desire, the optional **ima group-id** command can be used to explicitly configure the IMA Group ID for the IMA interface. You cannot configure the same IMA Group ID on two different IMA interfaces; therefore, if you configure an IMA Group ID with the system-selected default ID already configured on an IMA interface, the system toggles the IMA interface to make the user-configured IMA Group ID the effective IMA Group ID. At the same, the system toggles the original IMA interface to select a different IMA Group ID.

Step 8 Disable the IP address configuration for the physical layer interface.

```
Router(config-if)# no ip address
```

Step 9 Specify the ATM bandwith as dynamic.

```
Router(config-if)# atm bandwith dynamic
```

Step 10 Create an ATM path on the UMTS Iub interface, enter the following command:

```
Router(config-if)# atm umts-iub
```

Step 11 Disable the Interim Local Management Interface (ILMI) keepalive parameters.

```
Router(config-if)# no atm ilmi-keepalive
```

Step 12 Create an ATM PVC:

```
Router(config-if)# pvc [name] vpi/vci [qsaal]
```

Where:

- *name—(Optional) specifies the name of the ATM PVC interface you create.*
- *vpi*—Specifies the ATM network virtual path identifier (VPI) of this PVC.
- *vci*—Specifies the ATM network virtual channel identifier (VCI) of this PVC.
- **qsaal**—(Optional) specifies theQ.2931 signaling ATM adaptation layer (QSAAL) encapsulation type.

Note Typically AAL5 PVCs are defined using qsaal encapsulation. However, if the traffic profile is such that the AAL5 packets exceed normal signaling (272 bytes) payload size, it is recommended that the PVC be defined using AAL0.

This is commonly true for OAM PVCs and synchronization PVCs. NodeB Application Part (NBAP) and Access Link Control Application Part (ALCAP) PVCs can be defined using qsaal encapsulation.

For example, the following command specifies the ATM PVC interface with a VPI of 2and a VCI of 1:

```
Router(config-if)# pvc 2/1
```

Note PVC definitions should match those on the NodeB and use the following definitions:

NBAP signaling–use qsaal
ALCAP signaling–use qsaal
AAL2 bearer–use encapsulation aal0
All other PVCs should use encapsulation aal0

Class of service should be defined to match the NodeB PVC class of service definitions. For instance, if the NodeB has defined a PVC with CBR, the PVC on the Cisco 3825 router should use the same CBR definitions.

OAM can be defined on the PVCs as well. If the NodeB has OAM enabled on its PVC, OAM should be defined on the PVCs of the Cisco 3825 router as well.

Step 13 Configure the AAL and encapsulation type to AAL0 encapsulation.

```
Router(config-if)# encapsulation aal-encap
```

Where ***aal-encap*** specifies the AAL and encapsulation type.

For example, the following command specifies the AAL as AAL0:

```
Router(config-if)# encapsulation aal0
```

Step 14 Perform Steps 12 and 13 to add another ATM PVC.

Step 15 To configure the local parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub local ip-address port
```

For example, the following command configures the **umts-iub local** interface with an IP address and port of 20.20.20.21 6666:

```
Router(config-if)# umts-iub local 20.20.20.21 6666
```

Step 16 To configure the remote parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub remote ip-address port
```

For example, the following command configures the **umts-iub remote** interface with an IP address and port of 20.20.20.20 6666:

```
Router(config-if)# umts-iub remote 20.20.20.20 6666
```

Step 17 Exit the interface configuration mode.

```
Router(config-if)# exit
```

Configuring PVC Routing (HSDPA Offload)

A new feature, PVC Routing has been implemented in Cisco IOS Release 12.4(4)MR. With this feature, you can now off load PVC traffic from a physical ATM shorthaul to an alternate backhaul. For each alternate backhaul, you will need to create a logical shorthaul by creating an ATM sub-interface. Traffic from the PVCs configured under this logical shorthaul will go through the corresponding alternate backhaul. Three new commands are added using the Sub-interface Configuration mode for this new feature: **atm umts**, **umts local**, and **umts remote** (see Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference" for detailed command information).

To configure a Cisco 3825 router for PVC Routing, follow these steps while in the global configuration mode:

Step 1 First, add the Gigabit Ethernet interfaces by specifying the port adapter type and the location of the interface to be configured.

```
Router(config)# interface gigabitethernet slot/port
```

The *slot* represents the main fixed slot and is always 0 and the *port* is the number of the port (0 or 1).

For example, the following command specifies the slot number as 0 and the port number as 0:

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

Step 2 Assign an IP address and subnet mask to the interface.

```
Router(config-if)# ip address ip_address subnet_mask
```

For example, the following command specifies the IP address 192.168.1.1 and subnet mask 255.255.255.0:

```
Router(config-if)# interface ip address 192.168.1.1 255.255.255.0
```

Step 3 Specify the duplex operation.

```
Router(config-if)# duplex [auto | half | full]
```

For example, the following command specifies the duplex operation as auto:

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

Step 4 Specify the speed.

```
Router(config-if)# speed [auto | 1000 | 100 | 10]
```

For example, the following command specifies the speed as auto:

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

Step 5 Exit the interface configuration mode.

```
Router(config-if)# exit
```

Step 6 Enter interface configuration mode and specify the location of the interface.

```
Router(config)# interface atmslot/subslot/port
```

Where:

- *slot*—Specifies the slot number of the VWIC/HWIC previously assigned to the AIM for ATM (Step 2 of the "Configuring UMTS Links" procedure on page 4-24).
- *subslot*—Specifies the subslot number of the VWIC/HWIC previously assigned to the AIM for ATM card (Step 2 of the "Configuring UMTS Links" procedure on page 4-24).

- *port*—Specifies the port on the VWIC/HWIC previously assigned to the AIM for ATM card (Step 3 of the "Configuring UMTS Links" procedure on page 4-24).

For example, the following command configures the VWIC/HWIC in logical slot 0 (physical slot 0) port 1 located on the motherboard of the Cisco 3825 router to be used for ATM traffic:

```
Router(config)# interface ATM0/2/0
Router(config-if)#
```

Step 7 Disable the IP address configuration for the physical layer interface. This and other protocol parameters should be configured on the IMA interface.

```
Router(config-if)# no ip address
```

Step 8 Disable the Interim Local Management Interface (ILMI) keepalive parameters.

```
Router(config-if)# no atm ilmi-keepalive
```

Step 9 Specify the link that is included in an IMA group.

```
Router(config-if)# ima-group group-number
```

Where *group-number* specifies the group number of the IMA group.

For example, the following command specifies the group number of the IMA group as 0:

```
Router(config-if)# ima-group 0
```

Step 10 Randomize the ATM cell payload frames.

```
Router(config-if)# scrambling-payload
```

Step 11 Specify the slot location and port of IMA interface group.

```
Router(config-if)# interface ATMslot/IMA<group-number>
```

Where:

- *slot*—Specifies the slot location of the ATM IMA port adapter.
- *group-number*—Specifies the group number of the IMA group.

For example, the following command specifies the slot number as 0 and the group number as 0:

```
Router(config-if)# interface ATM0/IMA0
```

Note Should you desire, the optional **ima group-id** command can be used to explicitly configure the IMA Group ID for the IMA interface. You cannot configure the same IMA Group ID on two different IMA interfaces; therefore, if you configure an IMA Group ID with the system-selected default ID already configured on an IMA interface, the system toggles the IMA interface to make the user-configured IMA Group ID the effective IMA Group ID. At the same, the system toggles the original IMA interface to select a different IMA Group ID.

Step 12 Create an ATM path on the UMTS Iub interface, enter the following command:

```
Router(config-if)# atm umts-iub
```

Step 13 Disable the ILMI keepalive parameters.

```
Router(config-if)# no atm ilmi-keepalive
```

Step 14 Create an ATM PVC:

```
Router(config-if)# pvc [name] vpi/vci [qsaal]
```

Where:

- *name—(Optional) specifies the name of the ATM PVC interface you create.*
- *vpi*—Specifies the ATM network virtual path identifier (VPI) of this PVC.
- *vci*—Specifies the ATM network virtual channel identifier (VCI) of this PVC.
- **qsaal**—(Optional) specifies theQ.2931 signaling ATM adaptation layer (QSAAL) encapsulation type.

Note Typically AAL5 PVCs are defined using qsaal encapsulation. However, if the traffic profile is such that the AAL5 packets exceed normal signaling (272 bytes) payload size, it is recommended that the PVC be defined using AAL0.

This is commonly true for OAM PVCs and synchronization PVCs. NodeB Application Part (NBAP) and Access Link Control Application Part (ALCAP) PVCs can be defined using qsaal encapsulation.

For example, the following command specifies the ATM PVC interface with a VPI of 2and a VCI of 1:

```
Router(config-if)# pvc 2/1
```

Note PVC definitions should match those on the NodeB and use the following definitions:

NBAP signaling–use qsaal
ALCAP signaling–use qsaal
AAL2 bearer–use encapsulation aal0
All other PVCs should use encapsulation aal0

Class of service should be defined to match the NodeB PVC class of service definitions. For instance, if the NodeB has defined a PVC with CBR, the PVC on the Cisco 3825 router should use the same CBR definitions.

OAM can be defined on the PVCs as well. If the NodeB has OAM enabled on its PVC, OAM should be defined on the PVCs of the Cisco 3825 router as well.

Step 15 Configure the AAL and encapsulation type to AAL0 encapsulation.

```
Router(config-if)# encapsulation aal-encap
```

Where ***aal-encap*** specifies the AAL and encapsulation type.

For example, the following command specifies the AAL as AAL0:

```
Router(config-if)# encapsulation aal0
```

Step 16 To configure the local parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub local ip-address port
```

For example, the following command configures the **umts-iub local** interface with an IP address and port of 20.20.20.21 6666:

```
Router(config-if)# umts-iub local 20.20.20.21 6666
```

Step 17 To configure the remote parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub remote ip-address port
```

For example, the following command configures the **umts-iub remote** interface with an IP address and port of 20.20.20.20 6666:

```
Router(config-if)# umts-iub local 20.20.20.20 6666
```

Step 18 Exit the interface configuration mode.

```
Router(config-if)# exit
Router(config)#
```

Step 19 Specify the ATM/IMA interface that the PVCs will be assigned to and enter the sub-interface mode.

```
Router(config)# interface ATMslot/IMA<group-number>[.<subinterface-number> {multipoint
point-to-point}]
```

Where:

- *slot*—Specifies the slot location of the ATM IMA port adapter.
- *group-number*—Specifies the group number of the IMA group.
- *subinterface-number*—Specifies the sub-interface number.

For example, the following command specifies the slot number as 0 and the group number as 0.1 for multipoint:

```
Router(config)# interface ATM0/IMA0.1 multipoint
```

Step 20 Create an ATM path on the UMTS Iub interface, enter the following command:

```
Router(config-subif)# atm umts-iub
```

Step 21 Create an ATM PVC:

```
Router(config-subif)# pvc [name] vpi/vci [qsaal]
```

Where:

- *name—(Optional) specifies the name of the ATM PVC interface you create.*
- *vpi*—Specifies the ATM network virtual path identifier (VPI) of this PVC.
- *vci*—Specifies the ATM network virtual channel identifier (VCI) of this PVC.
- **qsaal**—(Optional) specifies theQ.2931 signaling ATM adaptation layer (QSAAL) encapsulation type.

Note Typically AAL5 PVCs are defined using qsaal encapsulation. However, if the traffic profile is such that the AAL5 packets exceed normal signaling (272 bytes) payload size, it is recommended that the PVC be defined using AAL0.

This is commonly true for OAM PVCs and synchronization PVCs. NodeB Application Part (NBAP) and Access Link Control Application Part (ALCAP) PVCs can be defined using qsaal encapsulation.

For example, the following command specifies the ATM PVC interface with a VPI of 1and a VCI of 200:

```
Router(config-subif)# pvc 1/200
```

Note PVC definitions should match those on the NodeB and use the following definitions:

NBAP signaling–use qsaal
ALCAP signaling–use qsaal
AAL2 bearer–use encapsulation aal0
All other PVCs should use encapsulation aal0

Class of service should be defined to match the NodeB PVC class of service definitions. For instance, if the NodeB has defined a PVC with CBR, the PVC on the Cisco 3825 router should use the same CBR definitions.

OAM can be defined on the PVCs as well. If the NodeB has OAM enabled on its PVC, OAM should be defined on the PVCs of the Cisco 3825 router as well.

Step 22 Configure the AAL and encapsulation type to AAL0 encapsulation.

```
Router(config-if-atm)# encapsulation aal-encap
```

Where ***aal-encap*** specifies the AAL and encapsulation type.

For example, the following command specifies the AAL as AAL0:

```
Router(config-if-atm)# encapsulation aal0
```

Step 23 Exit the interface atm configuration mode.

```
Router(config-if-atm)# exit
```

Step 24 To configure the local parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-subif)# umts-iub local ip-address port
```

For example, the following command configures the **umts-iub local** interface with an IP address of 192.168.10.2 and a port of 6000:

```
Router(config-subif)# umts-iub local 192.168.10.2 6000
```

Step 25 To configure the remote parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-subif)# umts-iub remote ip-address port
```

For example, the following command configures the **umts-iub remote** interface with an IP address of 192.168.10.1 and a port of 6000:

```
Router(config-subif)# umts-iub remote 192.168.10.1
```

Note In the above procedure, traffic for PVC 1/200 will be off-loaded to the alternate backhaul (192.168.10.2 — 192.168.10.1).

Step 26 Exit the sub-interface configuration mode.

```
Router(config-subif)# exit
```

Note For more information about PVC Routing, see the "Permanent Virtual Circuit (PVC) Routing" section on page 1-30. Example output from the show umts peer command as well as specific behavior changes are described.

Configuring UMTS QoS

Three new commands are added using the Interface Configuration mode for this new feature: **umts-iub set dscp**, **umts-iub set peering dscp**, and **gsm-abis set dscp** and one new ATM-VC Interface Configuration command: **umts-iub set dscp** (see Appendix A, "Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference" for detailed command information). These new commands allow you to perform the following:

- UMTS Shorthaul Interface
  - Set the default description value to tag the backhaul packet including peering and data generated from the shorthaul in a UMTS Iub configuration.
  - Set the description value in the UMTS Iub configuration such that it overwrites the default value defined previously. It is also used to tag the peering backhaul packet.
- PVC of a UMTS Shorthaul Interface
  - Set the description value in the UMTS Iub configuration such that it overwrites the default value defined previously. It is also used to tag the backhaul packet generated from traffic from the PVC.
- GSM Shorthaul Interface
  - Set the description value in such a way as to tag all the backhaul packets generated from the shorthaul in the GSM Abis interface.

In the following procedures, PVC 2/1 of ATM0/0/0 and ATM0/0/1 will go to the priority queue and PVC 2/2 of ATM0/0/0 and ATM0/0/1 will be considered the best effort traffic and will go to the Weighted Fair Queue.

Note Defining the **dscp** value under the PVC affects the way the ATM cells are bundled together as a backhaul. The more **dscp** values that are defined, the more limitations on how the ATM cells can be bundled. This, as a result, could affect backhaul efficiency. We recommend that you define at most two different **dscp** values for each shorthaul. One for llq traffic, and the other for best effort traffic.

Creating a Class Map

For each class map that you want to create, follow these steps, while in global configuration mode:

Step 1 Assign a name to your class map.

```
Router(config)# class-map [match-all | match-any] class_name
```

Where **match-any** means that a single match rule is sufficient for class membership and **match-all** means that only packets that have all the specified attributes are part of the class.

For example, the following command specifies the class map as an llq-class:

```
Router(config)# class-map match-any llq-class
```

When you enter the **class-map** command, you are in the class map configuration mode.

Step 2 To identify a specific IP differentiated service code point (DSCP) value as a match criterion, use the following command:

```
Router(config-cmap)# match ip dscp value
```

Where **match ip dscp** *value* specifies the exact value from 0 to 63 used to identify an IP DSCP value.

For example, the following command specifies cs2 to be used as a match criterion:

```
Router(config-cmap)# match ip dscp cs2
```

For more information about this command, see the *Cisco IOS Quality of Service Solutions Command Reference* for your Cisco IOS Release.

Step 3 Exit the class map configuration mode.

```
Router(config-cmap)# exit
```

Creating a Policy Map

To create a policy map, follow these steps, while in the global configuration mode:

Step 1 Assign a name to your policy map.

```
Router(config)# policy-map policy_name
```

Where *policy_name* specifies the name of the traffic policy. The traffic policy may contain one or more traffic classes.

For example, the following command specifies the policy map of low latency queueing (LLQ).

```
Router(config)# policy-map llq-policy
```

When you enter the **policy-map** command, you are in the policy map configuration mode.

Step 2 Associate the llq-policy with a class map.

```
Router(config-pmap)# class class_name
```

Where *class_name* specifies the name of a traffic class you want to modify.

Specify the same *class_name* as you did in Step 1in the "Creating a Class Map" section on page 4-47.

For example, the following command specifies the class as the llq-class.

```
Router(config-pmap)# class llq-class
```

When you enter the **class** command, you are in the class submode of the policy-map configuration mode.

Step 3 Allocate a percentage of bandwidth to be used for the prority queue.

```
Router(config-pmap-c)# priority percent number
```

For example, the following command specifies a **priority percent** number of 99.

```
Router(config-pmap-c)# priority percent 99
```

Step 4 Associate the llq-policy with a default class map. The default class is used for non-priority traffic.

```
Router(config-pmap-c)# class class-default
```

Step 5 Allocate the remaining bandwidth to the default class.

```
Router(config-pmap-c)# bandwitdh remaining percent number
```

For example, the following command specifies the remaining bandwidth as 1 percent.

```
Router(config-pmap-c)# bandwidth remaining percent 1
```

Step 6 Limit the queue depth of the default queue.

```
Router(config-pmap-c)# queue-limit number
```

For example, the following command limits the queue depth to 45.

```
Router(config-pmap-c)# queue-limit 45
```

Note The queue limit on the default class should be less than the hold-queue specified on the multilink interface.

Step 7 Exit the class map and policy map configuration modes.

```
Router(config-pmap-c)# exit
Router(config-pmap)# exit
```

For more information about these commands, see the *Cisco IOS Quality of Service Solutions Command Reference* for your Cisco IOS Release.

Specify the Location of the Interface

Step 1 Enter interface configuration mode and specify the location of the interface.

```
Router(config)# interface atmslot/subslot/port
```

For example, the following command specifies the location of the interface as ATM0/0.

```
Router(config# interface atm0/0/0
```

Step 2 Disable the IP address configuration for the physical layer interface.

```
Router(config-if)# no ip address
```

Step 3 Create an ATM path on the UMTS Iub interface, enter the following command:

```
Router(config-if)# atm umts-iub
```

Step 4 Disable the Interim Local Management Interface (ILMI) keepalive parameters.

```
Router(config-if)# no atm ilmi-keepalive
```

Step 5 Create an ATM PVC:

```
Router(config-if)# pvc [name] vpi/vci [qsaal]
```

Where:

- *name—(Optional) specifies the name of the ATM PVC interface you create.*
- *vpi*—Specifies the ATM network virtual path identifier (VPI) of this PVC.
- *vci*—Specifies the ATM network virtual channel identifier (VCI) of this PVC.
- **qsaal**—(Optional) specifies theQ.2931 signaling ATM adaptation layer (QSAAL) encapsulation type.

Note Typically AAL5 PVCs are defined using qsaal encapsulation. However, if the traffic profile is such that the AAL5 packets exceed normal signaling (272 bytes) payload size, it is recommended that the PVC be defined using AAL0.

This is commonly true for OAM PVCs and synchronization PVCs. NodeB Application Part (NBAP) and Access Link Control Application Part (ALCAP) PVCs can be defined using qsaal encapsulation.

For example, the following command specifies the ATM PVC interface with a VPI of 2and a VCI of 1:

```
Router(config-if)# pvc 2/1
```

Note PVC definitions should match those on the NodeB and use the following definitions:

NBAP signaling–use qsaal
ALCAP signaling–use qsaal
AAL2 bearer–use encapsulation aal0
All other PVCs should use encapsulation aal0

Class of service should be defined to match the NodeB PVC class of service definitions. For instance, if the NodeB has defined a PVC with CBR, the PVC on the Cisco 3825 router should use the same CBR definitions.

OAM can be defined on the PVCs as well. If the NodeB has OAM enabled on its PVC, OAM should be defined on the PVCs of the Cisco 3825 router as well.

Step 6 Configure the ATM adaptation layer (AAL) and encapsulation type to AAL0 encapsulation.

```
Router(config-if)# encapsulation aal-encap
```

Where ***aal-encap*** specifies the AAL and encapsulation type.

For example, the following command specifies the AAL as AAL0:

```
Router(config-if)# encapsulation aal0
```

Step 7 To set the DSCP value used as the interface default DSCP value to tag the backhaul packet, use the following command:

```
Router(config-if)# umts-iub set dscp value
```

Where ***value*** is a number chosen to represent that packet of traffic.

For example, the following command specifies the number 16 for the packet of traffic for the umts-iub interface:

```
Router(config-if)# umts-iub set dscp 16
```

Step 8 Perform Steps 5 through 7 to set another PVC 2/2 with a umts-iub interface DSCP of 8.

Step 9 To overwrite the previous PVC 2/1 with a umts-iub interface DSCP of 16, use the following command:

```
Router(config-if)# umts-iub set dscp value
```

Where ***value*** is a number chosen to represent that packet of traffic.

For example, the following command overwrites the number 16 for the packet of traffic for the umts-iub interface:

```
Router(config-if)# umts-iub set dscp 16
```

Step 10 To configure the local parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub local ip-address port
```

For example, the following command configures the **umts-iub local** interface with an IP address and port of 20.20.20.21 6666:

```
Router(config-if)# umts-iub local 20.20.20.21 6666
```

Step 11 To configure the remote parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub remote ip-address port
```

For example, the following command configures the **umts-iub remote** interface with an IP address and port of 20.20.20.20 6666:

```
Router(config-if)# umts-iub remote 20.20.20.20 6666
```

Step 12 Perform Steps 1 to 7 for ATM0/0/1 with a UMTS DSCP of 8.

Step 13 To overwrite the previous PVC 2/1 with a umts-iub interface DSCP of 16, use the following command:

```
Router(config-if)# umts-iub set dscp value
```

Where ***value*** is a number chosen to represent that packet of traffic.

For example, the following command overwrites the number 16 for the packet of traffic for the umts-iub interface:

```
Router(config-if)# umts-iub set dscp 16
```

Step 14 To configure the local parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub local ip-address port
```

For example, the following command configures the **umts-iub local** interface with an IP address and port of 20.20.20.21 8888:

```
Router(config-if)# umts-iub local 20.20.20.21 8888
```

Step 15 To configure the remote parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub remote ip-address port
```

For example, the following command configures the **umts-iub remote** interface with an IP address and port of 20.20.20.20 8888:

```
Router(config-if)# umts-iub remote 20.20.20.20 8888
```

Step 16 Exit the interface configuration mode.

```
Router(config-if)# exit
```

Assigning a QoS Boilerplate to an Interface

Use the following instructions to assign a quality of service (QoS) boilerplate to an interface: enabling a multilink interface, enable real-time packet interleaving, specifying an ID number for the multilink interface, configuring a maximum fragment size, enabling multiclass multilink PPP (MCMP), specifying the percent of the interface bandwidth, and assigning the Qos boilerplate. You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To assign a QoS boilerplate to a multilink interface, follow these steps, while in the global configuration mode.

Step 1 Enter the interface configuration mode.

```
Router(config)# interface multilink group-number
```

Where *group-number* is the number of the multilink bundle.

For example, the following command creates a multilink bundle 2:

```
Router(config)# interface multilink2
Router(config-if)#
```

Step 2 Assign an IP address and subnet mask to the interface.

```
Router(config-if)# ip address ip_address subnet_mask
```

For example, the following command creates a an IP address of 20.20.20.21 and a subnet mask of 255.255.255.0:

```
Router(config-if)# ip address 20.20.20.21 255.255.255.0
```

Step 3 Enable Transmission Control Protocol (TCP) header compression.

```
Router(config-if)# ip tcp header-compression keyword
```

For example, the following command enables IETF-Format as the header compression:

```
Router(config-if)# ip tcp header-compression ietf-format
```

Step 4 Change the length of time for which data is used, enter the following command:

```
Router(config-if)# load-interval seconds
```

Where *seconds* is the length of time for which data is used to compute load statistics. A value that is a multiple of 30, from 30 to 600 (30, 60, 90, 120, and so forth).

For example, the following command has the length of time set at 30 seconds:

```
Router(config-if)# load-interval 30
```

Step 5 Disable the keepalive parameters.

```
Router(config-if)# no keepalive
```

Step 6 Disable the Cisco Discovery Protocol (CDP) on the interface.

```
Router(config-if)# no cdp enable
```

Step 7 To configure PFC on the router, enter the following command:

```
Router(config-if)# ppp pfc local {request | forbid}
```

Where:

- **request—**The PFC option is included in outbound configuration requests.
- **forbid**—The PFC option is not sent in outbound configuration requests, and requests from a remote peer to add the PFC option are not accepted.

For example, the following command creates how the router handles PFC:

```
Router(config-if)# ppp pfc local request
```

Step 8 To configure how the router handles the PFC option in configuration requests received from a remote peer, enter the following command:

```
Router(config-if)# ppp pfc remote {apply | reject | ignore}
```

Where:

- **apply**—PFC options are accepted and ACFC may be performed on frames sent to the remote peer.
- **reject**—PFC options are explicitly ignored.
- **ignore**—PFC options are accepted, but ACFC is not performed on frames sent to the remote peer.

For example, the following command allows PFC options to be accepted:

```
Router(config)# ppp pfc remote apply
```

Step 9 To configure how the router handles ACFC in its outbound configuration requests, enter the following command:

```
Router(config-if)# ppp acfc local {request | forbid}
```

Where:

- **request**—The ACFC option is included in outbound configuration requests.
- **forbid**—The ACFC option is not sent in outbound configuration requests, and requests from a remote peer to add the ACFC option are not accepted.

For example, the following command creates how the router handles ACFC:

```
Router(config-if)# ppp acfc local request
```

Step 10 To configure how the router handles the ACFC option in configuration requests received from a remote peer, enter the following command:

```
Router(config-if)# ppp acfc remote {apply | reject | ignore}
```

Where:

- **apply**—ACFC options are accepted and ACFC may be performed on frames sent to the remote peer.
- **reject**—ACFC options are explicitly ignored.
- **ignore**—ACFC options are accepted, but ACFC is not performed on frames sent to the remote peer.

For example, the following command allows ACFC options to be accepted:

```
Router(config-if)# ppp acfc remote apply
```

Step 11 Enable multilink PPP operation.

```
Router(config-if)# ppp multilink
```

Step 12 Enable real-time packet interleaving.

```
Router(config-if)# ppp multilink interleave
```

Step 13 Specify an identification number for the multilink interface.

```
Router(config-if)# ppp multilink group group-number
```

Where *group-number* is the multilink group number.

For example, the following command restricts (identifies) the multilink interface, 2, that can be negotiated:

```
Router(config-if)# ppp multilink group 2
```

Step 14 Configure a fragment delay.

```
Router(config-if)# ppp multilink fragment delay
```

Where *delay* is optional and configures a maximum fragment delay. If, for example, you want a voice stream to have a maximum bound on delay of 20 milliseconds (ms) and you specify 20 ms using this command, MLPPP will choose a fragment size based on the configured value.

For example, the following command configures the delay from 0 to 1 millisecond:

```
Router(config-if)# ppp multilink delay 0 1
```

Step 15 Enable MCMP.

```
Router(config-if)# ppp multilink multiclass
```

Step 16 Specify the percent of the interface bandwidth allocated for LLQ.

```
Router(config-if)# max-reserved-bandwith percent
```

Where *percent* is the percent of interface bandwidth allocated for LLQ.

For example, the following command specifies the interface bandwidth allocated for LLQ as 100%:

```
Router(config-if)# max-reserved-bandwidth 100
```

Step 17 Assign the QoS boilerplate to the multilink interface.

```
Router(config-if)# service-policy output policy_name
```

Where *policy_name* is LLQ.

For example, the following command assigns the QoS boilerplate to the multilink interface policy name LLQ:

```
Router(config-if)# service-policy output llq-policy
```

Step 18 Set the size of the output queue.

```
Router(config-if)# hold-queue size in | out
```

Where:

- *size*— Number of packets held in the queue.
- *in* | *out*—Direction of packets being held, either input or output.

For example, the following command sets the size of the queue for the outbound packets at 50:

```
Router(config-if)# hold-queue 50 out
```

Note Specify a **hold-queue** limit. The limit needs to be greater than the **hold-queue** depth that is defined on the default class (see the "Creating a Class Map" section on page 4-47 for more information).

Step 19 Enable TCP header compression.

```
Router(config-if)# ip tcp header-compression keyword
```

For example, the following command enables IETF-Format as the header compression:

```
Router(config-if)# ip tcp header-compression ietf-format
```

Note In the previous procedure, PVC 2/1 of ATM0/0/0 and ATM0/0/1 will go to the priority queue and PVC 2/2 of ATM0/0/0 and ATM0/0/1 will be considered the best effort traffic and will go to the Weighted Fair Queue.

Configuring UMTS Congestion Management Control

A new feature for Cisco IOS Release 12.4(4)MR1, UMTS Congestion Management Control has been implemented. With this feature, you can now configure the UMTS congestion based on priority.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure a Cisco 3825 router for UMTS Congestion Control for IMA, follow these steps while in the Privileged EXEC mode:

Step 1 Enter global configuration mode from the terminal.

```
Router# configure terminal
```

Step 2 Enter interface configuration mode and specify the location of the interface.

- *slot*—Specifies the slot number of the VWIC/HWIC previously assigned to the AIM for ATM (Step 2 of the "Configuring UMTS Links" procedure on page 4-24).
- *subslot*—Specifies the subslot number of the VWIC/HWIC previously assigned to the AIM for ATM card (Step 2 of the "Configuring UMTS Links" procedure on page 4-24).
- *port*—Specifies the port on the VWIC/HWIC previously assigned to the AIM for ATM card (Step 3 of the "Configuring UMTS Links" procedure on page 4-24).

For example, the following command configures the VWIC/HWIC in logical slot 0 (physical slot 0) port 1 located on the motherboard of the Cisco 3825 router to be used for ATM traffic:

```
Router(config)# interface ATM0/2/0
Router(config-if)#
```

Note To see a list of the configuration commands available to you, enter **?** at the prompt or press the **Help** key while in the configuration mode.

Step 3 Disable the IP address configuration for the physical layer interface. This and other protocol parameters should be configured on the IMA interface.

```
Router(config-if)# no ip address
```

Step 4 Disable the Interim Local Management Interface (ILMI) keepalive parameters.

```
Router(config-if)# no atm ilmi-keepalive
```

Step 5 Specify the link that is included in an IMA group.

```
Router(config-if)# ima-group group-number
```

Where *group-number* specifies the group number of the IMA group.

For example, the following command specifies the group number of the IMA group as 0:

```
Router(config-if)# ima-group 0
```

Step 6 Randomize the ATM cell payload frames.

```
Router(config-if)# scrambling-payload
```

Step 7 Perform Steps 1 to 5 to add another member link.

Step 8 Specify the slot location and port of IMA interface group.

```
Router(config-if)# interface ATMslot/IMA<group-number>
```

Where:

- *slot*—Specifies the slot location of the ATM IMA port adapter.
- *group-number*—Specifies the group number of the IMA group.

For example, the following command specifies the slot number as 0 and the group number as 0:

```
Router(config-if)# interface ATM0/IMA0
```

Note Should you desire, the optional **ima group-id** command can be used to explicitly configure the IMA Group ID for the IMA interface. You cannot configure the same IMA Group ID on two different IMA interfaces; therefore, if you configure an IMA Group ID with the system-selected default ID already configured on an IMA interface, the system toggles the IMA interface to make the user-configured IMA Group ID the effective IMA Group ID. At the same, the system toggles the original IMA interface to select a different IMA Group ID.

Step 9 Disable the IP address configuration for the physical layer interface.

```
Router(config-if)# no ip address
```

Step 10 Specify the ATM bandwidth as dynamic.

```
Router(config-if)# atm bandwidth dynamic
```

Step 11 Create an ATM path on the UMTS Iub interface, enter the following command:

```
Router(config-if)# atm umts-iub
```

Step 12 Disable the ILMI keepalive parameters.

```
Router(config-if)# no atm ilmi-keepalive
```

Step 13 Create an ATM PVC:

```
Router(config-if)# pvc [name] vpi/vci [qsaal]
```

Where:

- *name—(Optional) specifies the name of the ATM PVC interface you create.*
- *vpi*—Specifies the ATM network virtual path identifier (VPI) of this PVC.
- *vci*—Specifies the ATM network virtual channel identifier (VCI) of this PVC.
- **qsaal**—See Note.

Note Typically AAL5 PVCs are defined using qsaal encapsulation. However, if the traffic profile is such that the AAL5 packets exceed normal signaling (272 bytes) payload size, it is recommended that the PVC be defined using AAL0.

This is commonly true for OAM PVCs and synchronization PVCs. NodeB Application Part (NBAP) and Access Link Control Application Part (ALCAP) PVCs can be defined using qsaal encapsulation.

For example, the following command specifies the ATM PVC interface with a VPI of 2and a VCI of 1:

```
Router(config-if)# pvc 2/1
```

Note PVC definitions should match those on the NodeB and use the following definitions:

NBAP signaling–use qsaal
ALCAP signaling–use qsaal
AAL2 bearer–use encapsulation aal0
All other PVCs should use encapsulation aal0

Class of service should be defined to match the NodeB PVC class of service definitions. For instance, if the NodeB has defined a PVC with CBR, the PVC on the Cisco 3825 router should use the same CBR definitions.

OAM can be defined on the PVCs as well. If the NodeB has OAM enabled on its PVC, OAM should be defined on the PVCs of the Cisco 3825 router as well.

Step 14 Configure the AAL and encapsulation type to AAL0 encapsulation.

```
Router(config-if)# encapsulation aal-encap
```

Where ***aal-encap*** specifies the AAL and encapsulation type.

For example, the following command specifies the AAL as AAL0:

```
Router(config-if)# encapsulation aal0
```

Step 15 To set the UMTS Congestion priority for protected, enter the following command.

```
Router(config-if-atm-vc)# umts-iub congestion priority protected
```

Step 16 To set the UMTS Congestion priority to level 4, enter the following command.

```
Router(config-if-atm-vc)# umts-iub congestion priority 4
```

Step 17 To enable the UMTS Congestion Control under UMTS shorthaul interface, enter the following command.

```
Router(config-if)# umts-iub congestion-control
```

Step 18 To set the DSCP value used as the interface default DSCP value to tag the backhaul packet, use the following command:

```
Router(config-if)# umts-iub set dscp value
```

Where ***value*** is a number chosen to represent that packet of traffic.

For example, the following command specifies the number 8 for the packet of traffic for the umts-iub interface:

```
Router(config-if)# umts-iub set dscp 8
```

Step 19 To overwrite the previous PVC 2/1 with a umts-iub interface DSCP of 16, use the following command:

```
Router(config-if)# umts-iub set peering dscp value
```

Where ***value*** is a number chosen to represent that packet of traffic.

For example, the following command overwrites the number 16 for the packet of traffic for the umts-iub interface:

```
Router(config-if)# umts-iub set peering dscp 16
```

Step 20 To configure the local parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub local ip-address port
```

For example, the following command configures the **umts-iub local** interface with an IP address and port of 20.20.20.21 6666:

```
Router(config-if)# umts-iub local 20.20.20.21 6666
```

Step 21 To configure the remote parameters required to establish an IP/UDP backhaul connection, enter the following command including the IP address and port you want to establish the IP/UDP backhaul connection from.

```
Router(config-if)# umts-iub remote ip-address port
```

For example, the following command configures the **umts-iub remote** interface with an IP address and port of 20.20.20.20 6666:

```
Router(config-if)# umts-iub local 20.20.20.20 6666
```

Step 22 Exit the interface configuration mode.

```
Router(config-if)# exit
```

Configuring Satellite Support

To support the configuration of a network when satellites are employed, you must implement a configurable jitter buffer and a tunable retransmission timer of repetitive sub-rates to overcome the network latency and satellite signal fade.

Use the following instructions to perform a GSM-Abis configuration with satellite support on the Cisco 2-port T1/E1-RAN interface card located in the Cisco 3825 router by entering the following Cisco IOS commands at the router prompt.

You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure the GSM-Abis attributes with satellite support, follow these steps while in the global configuration mode:

Step 1 Perform Steps 1 through 10 as described in the previous procedure (see the "Configuring GSM-Abis Links" procedure on page 4-20).

Step 2 To configure the jitter buffer, enter the following command including the value of the jitter buffer.

```
Router(config-if)# gsm-abis jitter value ms
```

Where ***ms*** is the value range in milliseconds of the jitter buffer. The default is 4 ms.

For example, the following command configures the **gsm-abis jitter** buffer to 10 ms:

```
Router(config-if)# gsm-abis jitter 10
```

Step 3 To configure the tunable retransmission timer, enter the following command including the value in milliseconds to retransmit.

```
Router(config-if)# gsm-abis retransmit value
```

Where ***value*** is the sample delay which is a value range of the retransmission of 100 ms to 5100 ms in 20 ms intervals. For example, if the value is 5, then the amount of time in ms would be calculated as 5 times 20 ms or a total of 100 ms as the retransmit time.

For example, the following command configures the **gsm-abis retransmit** timer to a value of 5 or 100 ms:

```
Router(config-if)# gsm-abis retransmit 5
```

Configuring Graceful Degradation

A local Cisco 3825 router detects congestion on the backhaul by measuring its transmit jitter buffer level. If the transmit jitter buffer shrinks, it means that the backhaul packets are not arriving fast enough to fill the transmit jitter buffer indicating congestion. You should set the congestion abatement detection level at which a remote router will stop suppressing these timeslots.

Use the following instructions to configure graceful degradation on the Cisco 3825 router by entering the following Cisco IOS commands at the router prompt.

You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

Note In the following procedure, press the **Return** key after each step unless otherwise noted. At any time, you can exit the privileged level and return to the user level by entering **disable** at the `Router#` prompt.

To configure graceful degradation, follow these steps while in the global configuration mode:

Step 1 Perform Steps 1 through 10 as described in the previous procedure (see the "Configuring GSM-Abis Links" procedure on page 4-20).

Step 2 To set the congestion detection algorithm to monitor the transmit jitter buffer so as to send the congestion indicator signals to the remote when the congestion is detected, enter the following command.

```
Router(config-if)# gsm-abis congestion enable
```

Step 3 To set the congestion abate detection level, enter the following command.

```
Router(config-if)# gsm-abis congestion abate ms
```

Where ***ms*** is the value of the congestion abate in milliseconds.

For example, the following command configures the **gsm-abis congestion abate** detection level to a value 250 ms:

```
Router(config-if)# gsm-abis congestion abate 250
```

Note The abate detection level is defined as x milliseconds of continuous congestion abatement (that is, no congestion indications).

Step 4 To set the congestion onset detection level at which the remote router will start suppressing all timeslots that are not defined as critical in an effort to alleviate the congestion, enter the following command.

```
Router(config-if)# gsm-abis congestion onset ms
```

Where ***ms*** is the value of the congestion onset in milliseconds.

For example, the following command configures the **gsm-abis congestion onset** detection level to a value 100 ms:

```
Router(config-if)# gsm-abis congestion onset 100
```

Note The onset detection level is defined as x milliseconds of continuous congestion detected.

Step 5 To define the critical timeslots that are exempt from suppression during congestion onset, enter the following command.

```
Router(config-if)# gsm-abis congestion critical timeslot-range
```

Where ***timeslot-range*** specifies a value or range of values for time slots that are exempt from suppression during congestion onset. Use a hyphen to indicate a range.

For example, the following command configures the **gsm-abis congestion critical** timeslot range as 1-10:

```
Router(config-if)# gsm-abis congestion critical 1-10
```

Note These are the timeslots that contain signalling and control information exchanged between the BSC and BTS.

Saving Configuration Changes

After you have completed configuring your Cisco 3825 router, to prevent the loss of the router configuration, you must store the configuration changes by saving it to nonvolatile random-access memory (NVRAM) so that the router boots with the configuration you entered.

Step 1 Exit the global configuration mode.

```
Router(config)# exit
```

Tip You can press **Ctrl-Z** in any mode to return immediately to enable mode (`Router#`), instead of entering **exit**, which returns you to whatever mode you were in previously.

Step 2 Save the configuration changes to NVRAM so that they are not lost during resets, power cycles, or power outages.

```
Router# copy running-config startup-config
```

Example Configurations

The following examples show sample configurations for the:

- BTS/Node-B side of the Cisco 3825 Mobile Wireless Edge Router
- Base Station Controller/Radio Network Controller (BSC/RNC) side of the Cisco 3825 Mobile Wireless Edge Router

BTS/Node-B Configuration

```
!
version 12.4
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
hostname hostname !--- Enter <hostname> here
!
boot-start-marker
boot system flash slot0: !--- Image Name
boot-end-marker
!
card type e1 0 0
card type e1 0 1
card type e1 0 2
logging buffered 1000000 debugging
enable password !--- Set the ENABLE password here
!
no aaa new-model
!
resource manager
!
clock timezone EST -5 !--- Example of setting time zone
!
```

```
redundancy
     mode y-cable
         standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/1/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip subnet-zero
no ip dhcp use vrf connected
!
!
no ip domain lookup
!
!
!
!
!--- The use of CRC4 or NO-CRC4 is dependent on the configuration of the end user
equipment.
!
!
!
controller E1 0/0/0
     framing NO-CRC4
     clock source internal
     channel-group 0 timeslots 1-31
     description Short Haul Abis E1 NO-CRC4 framing
!
controller E1 0/0/1
     clock source internal
     channel-group 0 timeslots 1-31
     description Short Haul Abis E1 CRC4 framing (default)
!
controller E1 0/1/0
     channel-group 0 timeslots 1-31
     description Backhaul IP E1
!
controller E1 0/1/1
     mode atm aim 1
     description Short Haul Iub E1
!
controller E1 0/2/0
     mode atm aim 1
     description Short Haul Iub E1
     clock source internal
!
class-map match-any abis
     match ip dscp 15!
!
policy-map llq-policy
     class abis
         priority percent 99
     class class-default
         bandwidth remaining percent 1
         queue-lmit 45
!
!
interface Loopback0
     description O&M IP Globally Routable
```

```
     ip address 10.10.10.2 255.255.255.255
!
interface Loopback1
     description Loopback IP for Unnumbered
     ip address 172.168.1.2 255.255.255.252
!
interface Multilink1
     description MLPPP IP interface for IP backhaul bundle
     ip unnumbered Loopback1
     ip tcp header-compression ietf-format
     load-interval 30
     no keepalive
     no cdp enable
     ppp pfc local request
     ppp pfc remote apply
     ppp acfc local request
     ppp acfc remote apply
     ppp multilink
     ppp multilink interleave
     ppp multilink group 1
     ppp multilink fragment delay 0 1
     ppp multilink multiclass
     hold-queue 50 out
     max-reserved-bandwidth 100
     service-policy output llq-policy
     ip rtp header-compression ietf-format
!
interface GigabitEthernet0/0
     no ip address
     shutdown
     duplex auto
     speed auto
!
interface Serial0/0/0:0
     no ip address
     no keepalive
     description GSM Abis interface
     encapsulation gsm-abis
     gsm-abis local 172.168.1.2 3334 !--- Port numbers must be even
     gsm-abis remote 172.168.1.1 3334 !--- Port numbers must be even
!
interface GigabitEthernet0/1
     no ip address
     shutdown
     duplex auto
     speed auto
!
interface Serial0/0/1:0
     no ip address
     no keepalive
     description GSM Abis interface
     encapsulation gsm-abis
     gsm-abis local 172.168.1.2 3336
     gsm-abis remote 172.168.1.1 3336
!
interface Serial0/1/0:0
     no ip address
     description IP backhaul MLPPP member interface
     encapsulation ppp
     ppp multilink group 1
     max-reserved-bandwidth 100
!
interface ATM0/1/1
     no ip address
```

```
     description Default E1 Iub interface configuration
     scrambling-payload
     no atm ilmi-keepalive
     atm umts-iub
     umts-iub local 172.168.1.2 6000
     umts-iub remote 172.168.1.1 6000
     pvc 1/32 !--- PVCs needed will vary
     encapsulation aal0
     !
     pvc 1/33
     encapsulation aal0
     !
     pvc 1/34
     encapsulation aal0
     !
     pvc 1/35
     encapsulation aal0
     !
     pvc 1/36 qsaal
     !
     pvc 1/37 qsaal
     !
     pvc 1/38 qsaal
     !
     pvc 1/39
     encapsulation aal0
     !
     pvc 1/43 qsaal
     !
     pvc 1/44 qsaal
     !
     pvc 1/45 qsaal
     !
!
interface ATM0/2/0
     no ip address
     description Default Motorola Iub interface configuration
     scrambling-payload
     no atm ilmi-keepalive
     atm umts-iub
     umts-iub local 172.168.1.2 6002
     umts-iub remote 172.168.1.1 6002
     pvc 1/32 !--- PVCs needed will vary
     encapsulation aal0
     !
     pvc 1/36 qsaal
     !
     pvc 1/37 qsaal
     !
     pvc 1/39
     encapsulation aal0
     !
!
snmp-server community public RO
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran alarm
snmp-server trap link ietf
snmp-server host 10.10.10.10 version 2c v2c
!--- Public and 10.10.10.10 need to be replaced with customer specified values
!
ip classless
!
no ip http server
!
```

```
disable-eadi
!
!
control-plane
!
line con 0
     logging synchronous
line aux 0
line vty 04
     login
     password !--- Set VTY password
!
ntp server W.X.Y.Z !--- Set W.X.Y.Z to the NTP server on the network. This is important so
!that all the MWTM reports sync with the correct time. MWTM should sync to the same NTP
!server.
```

BSC/RNC Configuration

```
!
version 12.4
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
hostname hostname !--- Enter <hostname> here
!
boot-start-marker
boot system flash slot0: !--- Image Name
boot-end-marker
!
card type e1 0 0
card type e1 0 1
card type e1 0 2
logging buffered 1000000 debugging
enable password !--- Set the ENABLE password here
!
no aaa new-model
!
resource manager
!
clock timezone EST -5 !--- Example of setting time zone
!
redundancy
     mode y-cable
         standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
network-clock-select 2 E1 0/0/1
network-clock-select 3 E1 0/1/1
network-clock-select 4 E1 0/2/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip subnet-zero
no ip dhcp use vrf connected
!
!
```

```
no ip domain lookup
!
!
!
!
!--- The use of CRC4 or NO-CRC4 is dependent on the configuration of the end user
equipment.
!
!
!
controller E1 0/0/0
     framing NO-CRC4
     clock source internal
     channel-group 0 timeslots 1-31
     description Short Haul Abis E1 NO-CRC4 framing
!
controller E1 0/0/1
     clock source internal
     channel-group 0 timeslots 1-31
     description Short Haul Abis E1 CRC4 framing (default)
!
controller E1 0/1/0
     channel-group 0 timeslots 1-31
     description Backhaul IP E1
!
controller E1 0/1/1
     mode atm aim 1
     description Short Haul Iub E1
!
controller E1 0/2/0
     mode atm aim 1
     description Short Haul Iub E1
!
class-map match-any abis
     match ip dscp 15
!
!
policy-map llq-policy
     class abis
         priority percent 99
     class class-default
         bandwidth remaining percent 1
         queue-lmit 45
!
!
interface Loopback0
     description O&M IP Globally Routable
     ip address 10.10.10.1 255.255.255.255
!
interface Loopback1
     description Loopback IP for Unnumbered
     ip address 172.168.1.1 255.255.255.252
!
interface Multilink1
     description MLPPP IP interface for IP backhaul bundle
     ip unnumbered Loopback1
     ip tcp header-compression ietf-format
     load-interval 30
     no keepalive
     no cdp enable
     ppp pfc local request
     ppp pfc remote apply
     ppp acfc local request
     ppp acfc remote apply
```

```
     ppp multilink
     ppp multilink interleave
     ppp multilink group 1
     ppp multilink fragment delay 0 1
     ppp multilink multiclass
     hold-queue 50 out
     max-reserved-bandwidth 100
     service-policy output llq-policy
     ip rtp header-compression ietf-format
!
interface GigabitEthernet0/0
     description GE interface providing IP connectivity to MWTM server
     ip address W.X.Y.Z A.B.C.D
     speed 1000
     full-duplex
!
interface Serial0/0/0:0
     no ip address
     no keepalive
     description GSM Abis interface
     encapsulation gsm-abis
     gsm-abis local 172.168.1.1 3334 !--- Port numbers must be even
     gsm-abis remote 172.168.1.2 3334 !--- Port numbers must be even
!
interface GigabitEthernet0/1
     no ip address
     shutdown
     duplex auto
     speed auto
!
interface Serial0/0/1:0
     no ip address
     no keepalive
     description GSM Abis interface
     encapsulation gsm-abis
     gsm-abis local 172.168.1.1 3336
     gsm-abis remote 172.168.1.2 3336
!
interface Serial0/1/0:0
     no ip address
     description IP backhaul MLPPP member interface
     encapsulation ppp
     ppp multilink group 1
     max-reserved-bandwidth 100
!
interface ATM0/1/1
     no ip address
     description Default E1 Iub interface configuration
     scrambling-payload
     no atm ilmi-keepalive
     atm umts-iub
     umts-iub local 172.168.1.1 6000
     umts-iub remote 172.168.1.2 6000
     pvc 1/32 !--- PVCs needed will vary
     encapsulation aal0
     !
     pvc 1/33
     encapsulation aal0
     !
     pvc 1/34
     encapsulation aal0
     !
     pvc 1/35
     encapsulation aal0
```

```
     !
     pvc 1/36 qsaal
     !
     pvc 1/37 qsaal
     !
     pvc 1/38 qsaal
     !
     pvc 1/39
     encapsulation aal0
     !
     pvc 1/43 qsaal
     !
     pvc 1/44 qsaal
     !
     pvc 1/45 qsaal
     !
!
interface ATM0/2/0
     no ip address
     description Default Motorola Iub interface configuration
     scrambling-payload
     no atm ilmi-keepalive
     atm umts-iub
     umts-iub local 172.168.1.1 6002
     umts-iub remote 172.168.1.2 6002
     pvc 1/32 !--- PVCs needed will vary
     encapsulation aal0
     !
     pvc 1/36 qsaal
     !
     pvc 1/37 qsaal
     !
     pvc 1/39
     encapsulation aal0
     !
!
snmp-server community public RO
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran alarm
snmp-server trap link ietf
snmp-server host 10.10.10.10 version 2c v2c
!--- Public and 10.10.10.10 need to be replaced with customer specified values
!
ip classless
!
no ip http server
!
disable-eadi
!
!
control-plane
!
line con 0
     logging synchronous
line aux 0
line vty 04
     login
     password !--- Set VTY password
!
ntp server W.X.Y.Z !--- Set W.X.Y.Z to the NTP server on the network. This is important so
!that all the MWTM reports sync with the correct time. MWTM should sync to the same NTP
!server.
```

Monitoring and Managing the Cisco 3825 Router

You can use Cisco's network management applications, such as Cisco Mobile Wireless Transport Manager (MWTM), to monitor and manage the Cisco 3825 router. This Network Management tool provides monitoring and management capabilities to the RAN-O solution. The Cisco MWTM addresses the element-management requirements of mobile operators and provides fault, configuration, and troubleshooting capability.

The Cisco MWTM provides the following key features:

- Event Monitoring
- Web-Based Reporting
- Auto Discovery and Topology
- Inventory
- OSS Integration
- Security
- Client/Server Architecture
- Multiple OS Support

The Cisco MWTM integrates with any SNMP-based monitoring system, such as Cisco Info Center products. In addition, the Cisco MWTM collects a large amount of performance data that can be exported or directly accessed from the database. This data can then be used by performance reporting applications.

Additional information can be found in the following publications of the Cisco MWTM documentation set:

- Cisco Mobile Wireless Transport Manager User Guide
- Cisco Mobile Wireless Transport Manager Release Notes
- Cisco Mobile Wireless Transport Manager Online Help System

Enabling the Cisco 3825 Router for Remote Network Management

To enable remote network management of the Cisco 3825 router, do the following:

Step 1 At the privileged EXEC prompt, enter the following command to access the configuration mode:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

Step 2 At the configuration prompt, enter the following command to assign a host name to each of the network management workstations:

```
Router(config)# ip host hostname ip_address
```

Where *hostname* is the name assigned to the Operations and Maintenance (O&M) workstation and *ip_address* is the address of the network management workstation.

Step 3 Enter the following commands to create a loopback interface for O&M (see the "Configuring Gigabit Ethernet Interfaces" section on page 4-8 for more information):

```
Router(config)# interface loopback number
Router(config-if)# ip address ip_address subnet_mask
```

Step 4 Exit interface configuration mode:

```
Router(config-if)# exit
```

Step 5 At the configuration prompt, enter the following command to specify the recipient of a Simple Network Management Protocol (SNMP) notification operation:

```
Router(config)# snmp-server host hostname [traps | informs] [version {1 | 2c | 3 [auth |
noauth | priv]}] community-string [udp-port port] [notification-type]
```

Where *hostname* is the name assigned to the Cisco Info Center workstation with the **ip host** command in Step 2.

Note See the "Configuring for SNMP Support" section on page 4-33 for more information about configuring Steps 5 through 8 in this procedure.

Step 6 Enter the following commands to specify the public and private SNMP community names:

```
Router(config)# snmp-server community public RO
Router(config)# snmp-server community private RW
```

Step 7 Enter the following command to enable the sending of SNMP traps:

```
Router(config)# snmp-server enable traps
```

Step 8 Enter the following command to specify the loopback interface from which SNMP traps should originate:

```
Router(config)# snmp-server trap-source loopback number
```

Where *number* is the number of the loopback interface you configured for the O&M in Step 3.

Step 9 At the configuration prompt, press Ctrl-Z to exit configuration mode.

Step 10 Write the new configuration to nonvolatile memory as follows:

```
Router# copy running-config startup-config
```

Show Commands for Monitoring the Cisco 3825 Router

To monitor and maintain the Cisco 3825 router, use the following commands:

Command	Purpose
show atm cell-packing	Displays information about Layer 2 transport ATM cell-packing.
show cem circuit	Displays summary information about the CEM circuit state, including controller, interface and AC. Displays specific CEM circuit state, circuit parameters and statistics/counters in detail.
show cem platform	Displays CEM errors and information.
show controllers	Displays all network modules and their interfaces. Displays the status of the VWIC/HWIC relays when a VWIC or HWIC is installed.
show controllers e1	Displays information about the controller status specific to the controller hardware. It also displays statistics about the E1 link. If you specify a slot and a port number, statistics for each 15 minute period will be displayed.
show controllers fastethernet slot/port	Displays information about initialization block, transmit ring, receive ring and errors for the Fast Ethernet controller chip.
show controllers gigabitethernet slot/subslot/port	Displays information about initialization block, transmit ring, receive ring, and errors for Gigabit Ethernet interface controllers.
show controllers t1	Displays information about the cable length, framing, firmware, and errors associated with the T1. With the Cisco 3825 router, this command also displays the status of the relays on the VWIC/HWIC.
show gsm traffic	Displays traffic rates, in bits per second, at 1 second, 5 seconds, 1 minute, 5 minutes, and 1 hour intervals for GSM data transmitted and received over the backhaul.
show gsm-abis efficiency [history]	Displays the history of the GSM efficiency averages for compression/decompression at 1-second, 5-second, 1-minute, 5-minute, and 1-hour intervals.
show gsm-abis errors	Displays error statistics counters of the GSM for compression/decompression.
show gsm-abis packets	Displays packet statistics counters of the GSM for compression/decompression.
show gsm-abis peering [details]	Displays peering status, statistics, and history of the GSM compression/decompression.

Command	Purpose
show interface *type slot/port*	Displays the configuration and status of the specified interface.
show interfaces fastethernet slot/port	Displays the status of the FE interface.
show interfaces gigabitethernet slot/port	Displays the status and configuration settings of the GE interface.
show ip rtp header-compression	Displays RTP header compression statistics.
show l2tp session	Displays session information about active Layer 2 sessions.
show l2tp tunnel	Displays information about active Layer 2 tunnels.
show mpls l2transport vc	Displays information about Any Transport over MPLS (AToM) virtual circuits (VCs) that have been enabled to route Layer 2 packets on a router.
show network-clocks	Displays the network clocking configuration.
show ppp multilink	Displays MLP and multilink bundle information.
show ppp multilink interface *number*	Displays multilink information for the specified interface.
show protocols	Displays the protocols configured for the router and the individual interfaces.
show redundancy	Displays current redundant setting and recent changes in state.
show standby	Displays HSRP configuration information.
show umts traffic	Displays traffic rates, in bits per second, at 1 second, 5 seconds, 1 minute, 5 minutes, and 1 hour intervals for UMTS data transmitted and received over the backhaul.
show umts congestion atm	Displays the UMTS Congestion state.
show umts-iub efficiency	Displays the history of the UMTS Iub interface efficiency averages for compression/decompression at 1-second, 5-second, 1-minute, 5-minute, and 1-hour intervals.
show umts-iub errors	Displays error statistics UMTS-Iub interface.
show umts-iub packets	Displays packet statistics of the UMTS-Iub interface.
show umts-iub peering	Displays peering status, statistics, and history of the UMTS Iub interface.
show umts-iub pvc	Displays the pvc mapping of the UMTS Iub interface
show xconnect all	Displays xconnect information.

Where to Go Next

At this point you can proceed to the following:

- The Cisco IOS software configuration guide and command reference publications for more advanced configuration topics. These publications are available on the Documentation DVD that came with your router, available online at Cisco.com, or you can order printed copies.
- The *System Error Messages* and *Debug Command Reference* publications for troubleshooting information available online at Cisco.com.

APPENDIX A

Cisco 3825 Mobile Wireless Edge Router RAN-O Command Reference

This appendix contains an alphabetical listing of new and revised commands specific to the Cisco 3825 router in a Radio-Access Network-Optimization (RAN-O) solution.

The following commands have been introduced:

- atm umts
- atm umts-iub
- cem-group
- class cem
- clear gsm-abis
- clear umts-iub
- dejitter-buffer
- gsm-abis congestion abate
- gsm-abis congestion critical
- gsm-abis congestion enable
- gsm-abis congestion onset
- gsm-abis jitter
- gsm-abis local
- gsm-abis remote
- gsm-abis retransmit
- gsm-abis set dscp
- idle-pattern
- pw-pvc
- sample-rate
- show cem circuit
- show cem platform
- show gsm-abis efficiency
- show gsm-abis errors
- show gsm-abis packets

- show gsm-abis peering
- show gsm-abis traffic
- show umts-iub congestion
- show umts-iub efficiency
- show umts-iub errors
- show umts-iub packets
- show umts-iub peering
- show umts-iub pvc
- show umts-iub traffic
- snmp-server enable traps ipran
- snmp-server enable traps ipran alarm-gsm
- snmp-server enable traps ipran alarm-umts
- snmp-server enable traps ipran util
- umts-iub backhaul-oam
- umts-iub backhaul-timer
- umts-iub congestion-control
- umts-iub congestion priority
- umts-iub local
- umts-iub remote
- umts-iub set dscp (interface configuration mode)
- umts-iub set dscp (PVC configuration mode)
- umts-iub set peering dscp
- umts local
- umts remote

The following commands were not changed but are included for your convenience:

- backup delay
- backup peer
- cdp enable
- clear ip rtp header-compression
- encapsulation l2tpv3
- ima-group
- interface atm ima
- ip local interface
- ip protocol
- ip rtp header-compression
- ip tcp header-compression
- ip tos (l2tp)
- ipran-mib backhaul-notify-interval

- ipran-mib location
- ipran-mib snmp-access
- ipran-mib threshold-acceptable
- ipran-mib threshold-overloaded
- ipran-mib threshold-warning
- keepalive
- load-interval
- match ip dscp
- mode y-cable
- mpls ip
- pseudowire-class
- redundancy
- scrambling-payload
- sequencing
- show atm cell-packing
- show connection
- show mpls l2transport vc
- show l2tp session
- show l2tp tunnel
- show ip rtp header-compression
- show redundancy
- show xconnect all
- standalone
- standby use-interface
- xconnect
- xconnect logging redundancy

atm umts

To select an ATM interface for Universal Mobile Telecommunications System (UMTS) Iub traffic for the atm subinterfaces, use the **atm umts** Sub-Interface configuration command. This command is used when you want to off load one or more permanent virtual circuit (PVC) traffic packets from a physical ATM shorthaul so as to go over an alternate backhaul. For each alternate backhaul, you need to create a logical shorthaul by creating an atm subinterface. Traffic for the PVCs configured under this logical shorthaul will go through the corresponding alternate backhaul.

atm umts

Syntax Description

This command has no arguments or keywords.

Command Modes

Sub-Interface configuration

Command History

Release	Modification
12.4(4)MR	This command is introduced.

Examples

The following example illustrates the use of **atm umts** command.

```
Router(config)# interface ATM0/2/0
Router(config-if)# atm umts-iub
Router(config-subif)# atm umts
```

Note You can use this command only when the base atm interface is already enabled as **atm umts**.

Related Commands

Command	Description
umts local [ip-address]	This command configures the local IP address for alternate backhaul.
umts remote [ip-address]	This command configures the remote IP address for alternate backhaul.

atm umts-iub

To select an ATM interface for UMTS Iub traffic, use the **atm umts-iub** Interface configuration command.

atm umts-iub

Syntax Description

This command has no arguments or keywords.

Command Modes

Sub-Interface configuration

Command History

Release	Modification
12.4(4)MR	This command is introduced.

Examples

The following example illustrates the use of **atm umts** command.

```
Router(config)# interface ATM0/2/0
Router(config-if)# atm umts-iub
```

backup delay

To specify how long a backup pseudowire (PW) virtual circuit (VC) should wait before resuming operation after the primary PW VC goes down, use the **backup delay** command in the interface configuration mode or xconnect configuration mode.

backup delay *enable-delay* {*disable-delay* | **never**}

Syntax Description

enable-delay	Number of seconds that elapse after the primary PW VC goes down before the Cisco IOS software activates the secondary PW VC. The range is 0 to 180. The default is 0.
disable-delay	Number of seconds that elapse after the primary PW VC comes up before the Cisco IOS software deactivates the secondary PW VC. The range is 0 to 180. The default is 0.
never	The secondary PW VC does not fall back to the primary PW VC if the primary PW VC becomes available again, unless the secondary PW VC fails.

Defaults

If a failover occurs, the xconnect redundancy algorithm immediately switches over or falls back to the backup or primary member in the redundancy group.

Command Modes

Interface configuration

Xconnect configuration

Command History

Release	Modification
12.0(31)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.4(11)T	This command was integrated into Cisco IOS Release 12.4(11)T.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
12.4(16)MR	This command was integrated into Cisco IOS Release 12.4(16)MR.

Examples

The following example shows a Multiprotocol Label Switching (MPLS) xconnect with one redundant peer. Once a switchover to the secondary VC occurs, there is no fallback to the primary VC unless the secondary VC fails.

```
Router# config t
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls
Router(config-pw-class)# exit
Router(config)# interface atm1/0/0
Router(config-if)# xconnect 10.0.0.1 50 pw-class mpls
Router(config-if-xconn)# backup peer 10.0.0.2 50
Router(config-if-xconn)# backup delay 0 never
Router(config-if-xconn)# exit
Router(config-if)# exit
Router(config)# exit
```

The following example shows an MPLS xconnect with one redundant peer. The switchover does not begin unless the Layer 2 Tunnel Protocol (L2TP) PW has been down for three seconds. After a switchover to the secondary VC occurs, there is no fallback to the primary until the primary VC has been reestablished and is up for ten seconds.

```
Router# config t
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls
Router(config-pw-class)# exit
Router(config)# interface atm1/0/0
Router(config-if)# xconnect 10.0.0.1 50 pw-class mpls
Router(config-if-xconn)# backup peer 10.0.0.2 50
Router(config-if-xconn)# backup delay 3 10
Router(config-if-xconn)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
backup peer	Configures a redundant peer for a PW VC.

backup peer

To specify a redundant peer for a PW VC, use the **backup peer** command in the interface configuration mode or xconnect configuration mode. To remove the redundant peer, use the **no** form of this command.

backup peer *peer-router-ip-addr vcid* [**pw-class** *pw-class-name*]

no backup peer *peer-router-ip-addr vcid*

Syntax Description

peer-router-ip-addr	IP address of the remote peer.
vcid	The 32-bit identifier of the VC between the routers at each end of the layer control channel.
pw-class	(Optional) PW type. If not specified, the PW type is inherited from the parent xconnect.
pw-class-name	(Optional) Name of the PW you created when you established the PW class.

Defaults

No redundant peer is established.

Command Modes

Interface configuration

Xconnect configuration

Command History

Release	Modification
12.0(31)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.4(11)T	This command was integrated into Cisco IOS Release 12.4(11)T.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
12.4(16)MR	This command was integrated into Cisco IOS Release 12.4(16)MR.

Usage Guidelines

The combination of the *peer-router-ip-addr* and *vcid* arguments must be unique on the router.

Examples

The following example shows an MPLS xconnect with one redundant peer:

```
Router# config t
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls
Router(config-pw-class)# exit
Router(config)# interface atm1/0/0
Router(config-if)# xconnect 10.0.0.1 100 pw-class mpls
Router(config-if-xconn)# backup peer 10.0.0.2 200
Router(config-if-xconn)# exit
Router(config-if)# exit
Router(config)# exit
```

The following example shows a backup peer configuration for an ATM interface:

```
Router# config t
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls
Router(config-pw-class)# exit
Router(config)# interface atm0/0/1
Router(config-if)# xconnect 10.0.0.2 1 pw-class mpls
Router(config-if-xconn)# backup peer 10.0.0.2 100 pw-class mpls
Router(config-if-xconn)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
backup delay	Specifies how long the backup PW VC should wait before resuming operation after the primary PW VC goes down.

cdp enable

To enable Cisco Discovery Protocol (CDP) on an interface, use the **cdp enable** command in interface configuration mode. To disable CDP on an interface, use the no form of this command.

cdp enable

Syntax Description

This command has no arguments or keywords.

Command Modes

Interface configuration

Command History

Release	Modification
10.3	This command was introduced.
12.4(4)MR	This command was incorporated.

Usage Guidelines

CDP is enabled by default at the global level and on each supported interface in order to send or receive CDP information. However, some interfaces, such as ATM interfaces, do not support CDP.

Note The **cdp enable**, **cdp timer**, and **cdp run** commands affect the operation of the IP on demand routing feature (that is, the **router odr** Global configuration command). For more information on the **router odr** command, see the "On-Demand Routing Commands" chapter in the *Cisco IOS Command Reference, Volume 2 of 3: Routing Protocols* document.

Examples

In the following example, CDP is disabled on the Ethernet 0 interface only.

```
Router# show cdp
Global CDP information
    Sending CDP packets every 60 seconds
    Sending a holdtime value of 180 seconds
    Sending CDPv2 advertisements is enabled
Router# config terminal
Router(config)# interface ethernet 0
Router(config-if)# no cdp enable
```

Related Commands

Command	Description
cdp run	Re-enables CDP on a Cisco device.
cdp timer	Specifies how often the Cisco IOS software sends CDP updates.
router odr	Enables on-demand routing on a hub router

cem-group

To create a circuit emulation (CEM) channel from one or more time slots of a T1 or E1 line, use the **cem-group** command in controller configuration mode. To remove a CEM group and release the associated time slots, use the **no** form of this command.

cem-group *group-number* {**unframed** | **timeslots** *time-slot-range*}

no cem-group *group-number*

Syntax Description

group-number	CEM identifier to be used for this group of time slots: • For T1 ports, the range is from 0 to 23. • For E1 ports, the range is from 0 to 30.
unframed	Specifies that a single CEM channel is being created, including all time slots, without specifying the framing structure of the line.
timeslots	Specifies that a list of time slots is to be used as specified by the time-slot-range argument. *time-slot-range*—Specifies the time slots to be included in the CEM channel. The list of time slots may include commas and hyphens with no spaces between the numbers.

Defaults

No CEM groups are defined.

Command Modes

Controller configuration

Command History

Release	Modification
12.4(12)MR2	This command was introduced.

Usage Guidelines

Use this command to create CEM channels on the T1 or E1 port.

Examples

The following example illustrates the use of the **cem group** command:

SATOP

```
Router# config t
Router(config)# controller el 0/0/0
Router(config-controller)# cem-group 0 unframed
Router(config-controller)# exit
Router(config)# interface cem 0/0/0
Router(config-if)# cem 0
Router(config-if-cem)# xconnect 10.10.10.10 200 encapsulation mpls
Router(config-if-cem-xconn)# exit
Router(config-if-cem)# exit
Router(config-if)# exit
```

```
Router(config)# exit
```

CESoPSN

```
Router# config t
Router(config)# controller el 0/0/1
Router(config-controller)# cem-group 0 timeslots 1-31
Router(config-controller)# exit
Router(config)# interface cem 0/0/1
Router(config-if)# cem 0
Router(config-if-cem)# xconnect 10.10.10.10 200 encapsulation mpls
Router(config-if-cem-xconn)# exit
Router(config-if-cem)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
cem	Enters circuit emulation configuration mode.

class cem

Use the **class cem** command in the global configuration mode to configure CEM interface parameters in a class that's applied to CEM interfaces together. This command works in the same manner for CEM interfaces as pseudowire-class does for xconnect.

class cem *class-name*

Syntax Description

class-name	(Required) The name of a CEM interface parameters class.

Command Modes

Global configuration

Command History

Release	Modification
12.4(12)MR2	This command was introduced.

Usage Guidelines

The **class cem** command allows you to configure CEM interface parameters in a class that's applied to CEM interfaces together. A **class cem** command includes the following configuration settings:

- dejitter-buffer *dejitter in ms*
- idle-pattern *Set 8 bit idle pattern*
- sample-rate *Sample rate (in ms)*

Examples

The following example illustrates the use of the **class cem** command:

```
Router# config t
Router(config)# class cem mycemclass
Router(config-cem-class)# dejitter-buffer 10
Router(config-cem-class)# sample-rate 2
Router(config-cem-class)# exit
Router(config)# interface cem 0/0/0
Router(config-if)# no ip address
Router(config-if)# cem 0
Router(config-if-cem)# xconnect 10.10.10.10 200 encapsulation mpls
Router(config-if-cem-xconn)# cem class mycemclass
Router(config-if-cem)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
dejitter-buffer	Specifies the size of the dejitter-buffer used for the network jitter in the CEM configuration mode.
idle-pattern	Specifies the data pattern to transmit on the T1/E1 when missing packets are detected on the PWE3 circuit in the CEM configuration mode.

Command	Description
sample-rate	Specifies in milliseconds the rate hardware samples the data on the attached circuit in the CEM circuit configuration mode.
cem	Enters circuit emulation configuration mode.

clear gsm-abis

To clear the statistics displayed by the **show gsm-abis** commands, use the **clear gsm-abis** command in privileged EXEC mode.

clear gsm-abis [**serial** *serial-number interface-number*]

Syntax Description

serial	
serial-number	(Optional) The serial number range is from 0 to6.
interface number	(Optional) The serial number range is from 0 to6.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.
12.4(9)MR	This command was modified to include serial option.

Examples

The following example illustrates the use of the **clear gsm-abis** command.

```
Router# clear gsm-abis serial 0/0/0:0
```

Related Commands

Command	Description
show gsm-abis efficiency	Displays the history of Global System for Mobile Communications (GSM) compression/decompression efficiency averages at 1 second, 5 seconds, 1 minute, 5 minutes, and 1 hour intervals.
show gsm-abis errors	Displays error statistics counters.
show gsm-abis packets	Displays packet statistics counters.
show gsm-abis peering [details]	Displays peering status, statistics, and history.

clear ip rtp header-compression

To clear Real-Time Transport Protocol (RTP) header compression structures and statistics, use the **clear ip rtp header-compression** privileged EXEC command.

clear ip rtp header-compression [*type number*]

Syntax Description

type number	(Optional) Interface type and number.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3	This command was introduced.
12.2(8)MC2	This command was incorporated.
12.2(15)MC1	This command was incorporated.
12.3(11)T	This command was incorporated.
12.4(2)MR	This command was incorporated.

Usage Guidelines

If this command is used without an interface type and number, the command clears all RTP header compression structures and statistics.

Examples

The following example clears the RTP header compression structures and statistics for multilink interface 1:

```
Router# clear ip rtp header-compression multilink1
```

Related Commands

Command	Description
ip rtp header-compression	Enables RTP header compression.

clear umts-iub

To clear the statistics displayed by the **show umts-iub** commands, use the **clear umts-iub** command in privileged EXEC mode.

clear umts-iub [**atm** *atm interface interface number*]

Syntax Description

atm	
atm interface	(Optional) The interface number range is from 0 to 1.
interface number	(Optional) The serial number range is from 0/0/0 to 1/0/1.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.
12.4(9)MR	This command was modified to include atm option.

Examples

The following example illustrates the use of the **clear umts-iub** command.

```
Router# clear umts-iub atm 0/0/1
```

Related Commands

Command	Description
show umts-iub efficiency	Displays the history of UMTS efficiency averages at 1 second, 5 seconds, 1 minute, 5 minutes, and 1 hour intervals.
show umts-iub peer	Displays peering status, statistics, and history.

dejitter-buffer

To specify the size of the dejitter-buffer used to compensate for the network jitter, use the **dejitter-buffer** command in the CEM configuration mode. To restore the dejitter-buffer to its default size, use the **no** form of this command.

dejitter-buffer *size*

no dejitter-buffer

Syntax Description

size	Use the *size* argument to specify the size of the buffer in milliseconds. *Size* can vary from 4 to 500 ms; default is 4 ms.

Defaults

The dejitter buffer defaults to 4 milliseconds.

Command Modes

CEM circuit configuration

Command History

Release	Modification
12.4(12)MR2	This command was introduced.

Examples

The following example illustrates the use of the **dejitter-buffer** command:

```
Router# config t
Router(config)# interface cem 0/0/0
Router(config-if)# no ip address
Router(config-if)# cem 0
Router(config-if-cem)# dejitter-buffer 10
Router(config-if-cem)# xconnect 10.10.10.10 200 encapsulation mpls
Router(config-if-cem-xconn)# exit
Router(config-if-cem)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
cem	Enters circuit emulation configuration mode.
cem class	Applies the CEM interface parameters defined in the given <cem-class-name> to the circuit.
class cem	Configure's CEM interface parameters in a class that's applied to CEM interfaces together in the global configuration mode.

encapsulation l2tpv3

To specify that Layer 2 Tunnel Protocol version 3 (L2TPv3) is used as the data encapsulation method for tunneling IP traffic over the PW, use the **encapsulation l2tpv3** command in pseudowire-class configuration mode. To remove L2TPv3 as the encapsulation method, use the **no pseudowire-class** command (see the Usage Guidelines for more information).

encapsulation l2tpv3

no pseudowire-class

Syntax Description

This command has no arguments or keywords.

Defaults

No encapsulation method is specified.

Command Modes

Pseudowire-class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(27)SBC	Support for this command was integrated into Cisco IOS Release 12.2(27)SBC.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Usage Guidelines

This command must be configured if the pseudowire-class is referenced from an xconnect configured to forward L2TPv3 traffic.

Once you specify the **encapsulation l2tpv3** command, you cannot remove it using the **no encapsulation l2tpv3** command. Nor can you change the command's setting using the **encapsulation mpls** command. Those methods result in the following error message:

```
Encapsulation changes are not allowed on an existing pw-class.
```

To remove the **l2tpv3** command, you must delete the PW with the **no pseudowire-class** command. To change the type of encapsulation, remove the PW with the **no pseudowire-class comm**and to re-establish the PW and to specify the new encapsulation type.

Examples

The following example illustrates the use of the **encapsulation l2tpv3** command:

```
Router# config t
Router(config)# pseudowire-class l2tp
Router(config-pw-class)# encapsulation l2tpv3
Router(config-pw-class)# exit
Router(config)# exit
```

The following example configures ATM AAL5 over L2TPv3 PW:

```
Router# config t
Router(config)# interface atm 0/0/1
Router(config-if)# pvc 0/10 l2transport
Router(config-if-atm-l2trans-pvc)# encapsulation aal5
Router(config-if-atm-l2trans-pvc)# xconnect 1.1.1.1 10 pw-class l2tp
Router(config-if-atm-l2trans-pvc-xconn)# exit
Router(config-if-atm-l2trans-pvc)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
encapsulation mpls	Configures MPLS as the data encapsulation method over AToM-enabled IP/MPLS networks.
pseudowire-class	Specifies the name of an L2TP pseudowire-class and enters pseudowire-class configuration mode.

gsm-abis congestion abate

Sets the congestion abatement detection level at which the remote router will stop suppressing timeslots because congestion has been alleviated.

The abate detection level is defined as x milliseconds of continuous congestion abatement (that is, no congestion indications). To set the abate detection, use the **gsm-abis congestion abate** Interface configuration command.

gsm-abis congestion abate [**ms**]

Syntax Description

ms	Sets the number of milliseconds for the abate detection level.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to the gsm-abis abate command is set at 250 ms:

```
Router(config)# interface Serial10/1/0:0
Router(config-if)# no ip address
Router(config-if)# encapsulation gsm-abis
Router(config-if)# load-interval 30
Router(config-if)# gsm-abis local 10.10.10.2 6661
Router(config-if)# gsm-abis remote 10.10.10.1 5553
Router(config-if)# gsm-abis congestion enable
Router(config-if)# gsm-abis congestion abate 250
Router(config-if)# no keepalive
```

Related Commands

Command	Description
gsm-abis congestion critical	Defines the critical timeslots that are exempt from suppression during congestion onset.
gsm-abis congestion enable	Sets the congestion detection algorithm to monitor the transmit jitter buffer and to send congestion indicator signals to the remote when congestion is detected.
gsm-abis congestion onset	Sets the congestion onset detection level at which the remote router will start suppressing all timeslots that are not defined as critical in an effort to alleviate the congestion.
gsm-abis jitter	Sets the amount of transmit jitter delay for the GSM-Abis interface.

Command	Description
gsm-abis local	Configures the local parameters for an Internet Protocol/User Datagram Protocol (IP/UDP) backhaul connection.
gsm-abis remote	Configures the remote parameters for an IP/UDP backhaul connection.

gsm-abis congestion critical

Defines the critical timeslots that are exempt from suppression during congestion onset.

These are the timeslots that contain signalling and control information exchanged between the BSC and Base Transceiver Station (BTS). To define the critical timeslots that are exempt from suppression during congestion onset, use the **gsm-abis congestion critical** Interface configuration command.

gsm-abis congestion critical [**timeslot-range**]

Syntax Description

timeslot-range	Specifies a value or range of values for time slots that are exempt from suppression during congestion onset. Use a hyphen to indicate a range.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to set the timeslots range:

```
Router(config)# interface Serial10/1/0:0
Router(config-if)# no ip address
Router(config-if)# encapsulation gsm-abis
Router(config-if)# load-interval 30
Router(config-if)# gsm-abis local 10.10.10.2 6661
Router(config-if)# gsm-abis remote 10.10.10.1 5553
Router(config-if)# gsm-abis congestion enable
Router(config-if)# gsm-abis congestion critical 2-3
Router(config-if)# no keepalive
```

Related Commands

Command	Description
gsm-abis congestion abate	Sets the congestion abatement detection level at which the remote router will stop suppressing timeslots because congestion has been alleviated.
gsm-abis congestion enable	Sets the congestion detection algorithm to monitor the transmit jitter buffer and to send congestion indicator signals to the remote when congestion is detected.
gsm-abis congestion onset	Sets the congestion onset detection level at which the remote router will start suppressing all timeslots that are not defined as critical in an effort to alleviate the congestion.
gsm-abis jitter	Sets the amount of transmit jitter delay for the GSM-Abis interface.

Command	Description
gsm-abis local	Configures the local parameters for an IP/UDP backhaul connection.
gsm-abis remote	Configures the remote parameters for an IP/UDP backhaul connection.

gsm-abis congestion enable

The congestion detection algorithm monitors the transmit jitter buffer and sends congestion indicator signals to the remote when congestion is detected. The remote will suppress all timeslots that are not defined as critical in an effort to alleviate the congestion. The goal of the congestion detection algorithm is to save the *critical* timeslots from loss of data. To enable the congestion detection algorithm, use the **gsm-abis congestion enable** Interface configuration command.

gsm-abis congestion enable

Syntax Description

This command has no arguments or keywords.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to enable the gsm-abis congestion:

```
Router(config)# interface Serial10/1/0:0
Router(config-if)# no ip address
Router(config-if)# encapsulation gsm-abis
Router(config-if)# load-interval 30
Router(config-if)# gsm-abis local 10.10.10.2 6661
Router(config-if)# gsm-abis remote 10.10.10.1 5553
Router(config-if)# gsm-abis congestion enable
Router(config-if)# no keepalive
```

Related Commands

Command	Description
gsm-abis congestion abate	Sets the congestion abatement detection level at which the remote router will stop suppressing timeslots because congestion has been alleviated.
gsm-abis congestion critical	Defines the critical timeslots that are exempt from suppression during congestion onset.
gsm-abis congestion onset	Sets the congestion onset detection level at which the remote router will start suppressing all timeslots that are not defined as critical in an effort to alleviate the congestion.
gsm-abis jitter	Sets the amount of transmit jitter delay for the GSM-Abis interface.

Command	Description
gsm-abis local	Configures the local parameters for an IP/UDP backhaul connection.
gsm-abis remote	Configures the remote parameters for an IP/UDP backhaul connection.

gsm-abis congestion onset

Sets the congestion onset detection level at which the remote router will start suppressing all timeslots that are not defined as critical in an effort to alleviate the congestion.

The onset detection level is defined as x milliseconds of continuous congestion detected. To set the congestion onset, use the **gsm-abis congestion onset** Interface configuration command.

gsm-abis congestion onset [**ms**]

Syntax Description

ms	Sets the number of milliseconds for the onset detection level.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to set the onset detection level at 50 ms:

```
Router(config)# interface Serial10/1/0:0
Router(config-if)# no ip address
Router(config-if)# encapsulation gsm-abis
Router(config-if)# load-interval 30
Router(config-if)# gsm-abis local 10.10.10.2 6661
Router(config-if)# gsm-abis remote 10.10.10.1 5553
Router(config-if)# gsm-abis congestion enable
Router(config-if)# gsm-abis congestion onset 100
Router(config-if)# no keepalive
```

Related Commands

Command	Description
gsm-abis congestion abate	Sets the congestion abatement detection level at which the remote router will stop suppressing timeslots because congestion has been alleviated.
gsm-abis congestion critical	Defines the critical timeslots that are exempt from suppression during congestion onset.
gsm-abis congestion enable	Sets the congestion detection algorithm to monitor the transmit jitter buffer and to send congestion indicator signals to the remote when congestion is detected.
gsm-abis jitter	Sets the amount of transmit jitter delay for the GSM-Abis interface.

Command	Description
gsm-abis local	Configures the local parameters for an IP/UDP backhaul connection.
gsm-abis remote	Configures the remote parameters for an IP/UDP backhaul connection.

gsm-abis jitter

Sets the amount of transmit jitter delay for the GSM-Abis interface.If the transmit jitter is set to 4 ms, data received on the backhaul with a time equal to 0 milliseconds will be stored in the jitter buffer and transmitted with a time equal to 4 milliseconds. The transmit jitter buffer allows some amount of jitter in the arrival of data on the backhaul to be tolerated without introducing errors into the stream of data.

To set the jitter, use the **gsm-abis jitter** Interface configuration command.

gsm-abis jitter *ms*

Syntax Description

ms	Sets the number of milliseconds for the jitter. The default value is 4 ms.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to set the jitter level to 8 ms:

```
Router(config)# interface Serial10/1/0:0
Router(config-if)# no ip address
Router(config-if)# encapsulation gsm-abis
Router(config-if)# load-interval 30
Router(config-if)# gsm-abis local 10.10.10.2 6661
Router(config-if)# gsm-abis remote 10.10.10.1 5553
Router(config-if)# gsm-abis jitter 8
Router(config-if)# no keepalive
```

Related Commands

Command	Description
gsm-abis congestion abate	Sets the congestion abatement detection level at which the remote router will stop suppressing timeslots because congestion has been alleviated.
gsm-abis congestion critical	Defines the critical timeslots that are exempt from suppression during congestion onset.
gsm-abis congestion enable	Sets the congestion detection algorithm to monitor the transmit jitter buffer and to send congestion indicator signals to the remote when congestion is detected.
gsm-abis congestion onset	Sets the congestion onset detection level at which the remote router will start suppressing all timeslots that are not defined as critical in an effort to alleviate the congestion.

Command	Description
gsm-abis local	Configures the local parameters for an IP/UDP backhaul connection.
gsm-abis remote	Configures the remote parameters for an IP/UDP backhaul connection.

gsm-abis local

To configure the local parameters required to establish an Internet Protocol/User Datagram Protocol (IP/UDP) backhaul connection, use the **gsm-abis local** Interface configuration command.

gsm-abis local [**ip-address**] [*port*]

Syntax Description

ip-address	(Optional) The IP address for the entry you wish to establish.
port	(Optional) The port you want to use for the entry you wish to establish.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to configure the local parameters:

```
Router(config)# interface Serial10/1/0.0
Router(config-if)# encapsulation gsm-abis
Router(config-if)# gsm-abis local 10.10.10.2 5502
```

Related Commands

Command	Description
gsm-abis remote	Configures the remote parameters for an IP/UDP backhaul connection.

gsm-abis remote

To configure the remote parameters required to establish an Internet Protocol/User Datagram Protocol (IP/UDP) backhaul connection, use the **gsm-abis remote** Interface configuration command.

gsm-abis remote [**ip-address**] [*port*]

Syntax Description

ip-address	(Optional) The IP address for the entry you wish to establish.
port	(Optional) The port you want to use for the entry you wish to establish.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to configure the remote parameters:

```
Router(config)# interface Serial10/1/0.0
Router(config-if)# encapsulation gsm-abis
Router(config-if)# gsm-abis remote 10.10.10.1 5504
```

Related Commands

Command	Description
gsm-abis local	Configures the local parameters for an IP/UDP backhaul connection.

gsm-abis retransmit

To enable retransmission of repetitive subrate sample, use the **gsm-abis retransmit** Interface configuration command. This command is useful when the latency introduced by the characteristics of the backhaul network is excessive. Examples are the use of satellite transmission facilities or multiple router hops on the backhaul network.

gsm-abis retransmit [*sample-delay*]

Syntax Description

sample-delay	The number of duplicate samples that must be observed before the duplicate sample will be retransmitted. The *sample-delay* in a range of 5 to 255 or 100 to 5100 ms at 20 ms intervals.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how a retransmit delay of 100 ms:

```
Router(config)# interface Serial10/1/0.0
Router(config-if)# encapsulation gsm-abis
Router(config-if)# gsm-abis local 10.10.10.1 5504
Router(config-if)# gsm-abis remote 10.10.10.2 5504
Router(config-if)# gsm-abis retransmit 5
```

Related Commands

Command	Description
gsm-abis local	Configures the local parameters for an IP/UDP backhaul connection.
gsm-abis remote	Configures the remote parameters for an IP/UDP backhaul connection.
show gsm-abis packet	Displays packet statistics counters of the GSM compression/decompression.
show gsm-abis packet | include retransmit	Displays packet statistics counters of the GSM compression/decompression to include the repetitive sub-rate samples retransmitted.

gsm-abis set dscp

To mark a packet by setting the differential services code point (DSCP) for GSM-Abis, use the **gsm-abis set dscp** Interface configuration command.

gsm-abis set dscp *value*

Note Use this command when configuring GSM shorthaul interfaces.

Syntax Description

value	A number from 0 to 63 or hex value that sets the GSM-Abis DSCP value.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(4)MR	This command is introduced.

Examples

The following example shows how to set a retransmit delay of 100 ms:

```
Router(config)# interface Serial10/1/0.0
Router(config-if)# encapsulation gsm-abis
Router(config-if)# gsm-abis local 10.10.10.1 5504
Router(config-if)# gsm-abis remote 10.10.10.2 5504
Router(config-if)# gsm-abis set dscp cs2
```

idle-pattern

To specify the data pattern transmitted on the T1/E1 when missing packets are detected on the PWE3 circuit, use the **idle-pattern** command in CEM configuration mode.

idle-pattern [*pattern*]

no idle-pattern

Syntax Description

pattern	An 8-bit hexadecimal number that is transmitted as the idle pattern.

Defaults

Default idle-pattern is 0xFF.

Command Modes

CEM circuit configuration

Command History

Release	Modification
12.4(12)MR2	This command was introduced.

Usage Guidelines

The idle-pattern data is sent to replace the data from missing packets.

Examples

The following example illustrates the use of the **idle-pattern** command:

```
Router# config t
Router(config)# interface cem 0/0/0
Router(config-if)# no ip address
Router(config-if)# cem 0
Router(config-if-cem)# idle-pattern 0x55
Router(config-if-cem)# xconnect 10.10.10.10 200 encapsulation mpls
Router(config-if-cem-xconn)# exit
Router(config-if-cem)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
cem	Enters circuit emulation configuration mode.
cem class	Applies the CEM interface parameters defined in the given <cem-class-name> to the circuit.
class cem	Configure’s CEM interface parameters in a class that’s applied to CEM interfaces together in the global configuration mode.

ima-group

To define physical links as inverse multiplexing over ATM (IMA) group members, use the **ima-group** Interface configuration command. When you first perform the configuration or when you change the group number, the interface is automatically disabled, moved to the new group, and then enabled. To remove the port from the group, use the **no** form of this command.

ima-group *group-number*

Syntax Description

group-number	Specifies an IMA group number from 0 to 3. IMA groups can span multiple ports on a port adapter but cannot span port adapters.

Defaults

Physical links are not included in IMA groups.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(5)XK	This command was introduced.
12.4(4)MR	This command was incorporated.

Usage Guidelines

Use the **ima-group** interface command to configure a T1/E1 IMA port adapter interface as part of an IMA group.

Examples

The following example shows how to define an IMA group:

```
Router(config)# interface ATM0/0/0
Router(config-if)# no ip address
Router(config-if)# no atm ilmi-keepalive
Router(config-if)# ima-group 0
```

Related Commands

Command	Description
interface atm	Configures an ATM interface.
interface atm ima	Configures an ATM IMA group.
show ima interface atm	Provides information about configured IMA groups or a specific IMA group.

interface atm ima

To configure an ATM IMA group and enter interface configurations mode, use the **interface atm ima** global configuration command. If the group does not exist when the command is issued, the command automatically creates the group.

interface atm *slot*/**ima**<*group-number*>

Syntax Description

slot	Specifies the slot location of the ATM IMA port adapter.
group-number	Specifies an IMA group number from 0 to 3. You can create up to four groups.

Defaults

By default there are no IMA groups, only individual ATM links.

Command Modes

Global configuration

Command History

Release	Modification
12.0(5)XE	This command was introduced.
12.4(4)MR	This command was incorporated.

Usage Guidelines

When a port is configured for IMA functionality, it no longer operates as an individual ATM link. Specifying ATM links as members of a group using the ima-group interface command does not enable the group. You must use the **interface atm** *slot*/**ima**<*group-number*> command to create the group.

Examples

The following example shows the how to create the IMA group:

```
Router(config)# interface ATM0/IMA0
Router(config-if)# no ip address
```

Related Commands

Command	Description
ima-group	Configures the physical links as IMA group members; execute this interface configuration command for each physical link that you include in an IMA group.
ima group-id	Enables the user to configure the IMA Group ID for the IMA interface.
interface atm	Configures physical links for ATM.
show ima interface atm	Displays general and detailed information about IMA groups and the links they include.

ip local interface

To configure the IP address of the provider edge (PE) router interface to be used as the source IP address for sending tunneled packets, use the **ip local interface** command in the pseudowire-class configuration mode. To remove the IP address, use the **no** form of this command.

ip local interface *interface-name*

no ip local interface *interface-name*

Syntax Description

interface-name	Name of the PE interface whose IP address is used as the source IP address for sending tunneled packets over a Layer 2 PW.

Defaults

No IP address is configured.

Command Modes

Pseudowire-class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Usage Guidelines

Use the same local interface name for all pseudowire-classes configured between a pair of PE routers. It is highly recommended that you configure a loopback interface with this command. If you do not, the router chooses the “best available local address,” which could be any IP address configured on a core-facing interface. This configuration could prevent a control channel from being established.

Note This command must be configured for pseudowire-class configurations using L2TPv3 as the data encapsulation method.

Examples

The following example shows how to configure the IP address of the local loopback 0 as the source IP address for sending packets through an L2TPv3 session:

```
Router# config t
Router(config)# pseudowire-class l2tp
Router(config-pw-class)# ip local interface loopback 0
Router(config-pw-class)# exit
Router(config)# exit
```

Related Commands

Command	Description
ima-group	Configures the physical links as IMA group members, which executes the interface configuration command for each physical link included in an IMA group.
ima group-id	Enables the user to configure the IMA Group ID for the IMA interface.
interface atm	Configures physical links for ATM.
show ima interface atm	Displays general and detailed information about IMA groups and the links they include.

ip protocol

To configure the Layer 2 Tunnel Protocol (L2TP) or Universal Tunnel Interface (UTI) as the IP protocol used for tunneling packets in a Layer 2 PW, use the **ip protocol** command in the pseudowire-class configuration mode. To remove the IP protocol configuration, use the **no** form of this command.

ip protocol {**l2tp** | **uti** | **udp**}

no ip protocol {**l2tp** | **uti** | **udp**}

Syntax Description

l2tp	(Default) Configures L2TP as the IP protocol used to tunnel packets in a Layer 2 PW.
uti	Configures UTI as the IP protocol used to tunnel packets in a Layer 2 PW and allows a router running L2TPv3 to interoperate with a peer running UTI.
udp	Configures UDP as the IP protocol used to tunnel packets in a Layer 2 PW.

Defaults

The default IP protocol is L2TP.

Command Modes

Pseudowire-class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Usage Guidelines

The **ip protocol uti** command is not supported on the Cisco 3825 router. You can use the **ip protocol** command only if you have already entered the **encapsulation l2tpv3** command.

Examples

The following example shows how to configure l2tp as the IP protocol used to tunnel packets in an L2TPv3 PW created from the pseudowire-class named “l2tp”:

```
Router# config t
Router(config)# pseudowire-class l2tp
Router(config-pw-class)# encapsulation l2tpv3
Router(config-pw-class)# ip protocol l2tp
Router(config-pw-class)# exit
Router(config)# exit
```

Related Commands

Command	Description
pseudowire-class	Specifies the name of an L2TP pseudowire-class and enters pseudowire-class configuration mode.

ip rtp header-compression

To enable Real-Time Transport Protocol (RTP) header compression, use the **ip rtp header-compression** command in interface configuration mode. To disable RTP header compression, use the **no** form of this command.

ip rtp header-compression [**passive** | **iphc-format** | **ietf-format**] [**periodic-refresh**]

no ip rtp header-compression [**passive** | **iphc-format** | **ietf-format**] [**periodic-refresh**]

Syntax Description

passive	(Optional) Compresses outgoing RTP packets only if incoming RTP packets on the same interface are compressed. If you do not specify the **passive** keyword, all RTP packets are compressed.
iphc-format	(Optional) Indicates that the IP Header Compression (IPHC) format of header compression will be used.
ietf-format	(Optional) Indicates that the Internet Engineering Task Force (IETF) format of header compression will be used.
periodic-refresh	(Optional) Indicates that the compressed IP header will be refreshed periodically.

Defaults

Disabled

For PPP interfaces, the default format for header compression is the IPHC format.

For High-Level Data Link Control (HDLC) and Frame Relay interfaces, the default format for header compression is the original proprietary Cisco format. The maximum number of compression connections for the proprietary Cisco format is 256.

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.
12.0	This command was incorporated into Cisco IOS Release 12.0. This command was modified to include the **iphc-format** keyword.
12.3(2)T	This command was incorporated into Cisco IOS Release 12.3(2)T. This command was modified to include the **periodic-refresh** keyword.
12.3(4)T	This command was modified to include the **ietf-format** keyword.
12.2(25)S	This command was incorporated.
12.4(2)MR	This command was incorporated.

Usage Guidelines

You can compress IP/UDP/RTP headers to reduce the size of your packets. Compressing headers is especially useful for RTP because RTP payload size can be as small as 20 bytes, and the uncompressed header is 40 bytes.

The passive Keyword

By default, the **ip rtp header-compression** command compresses outgoing RTP traffic. If you specify the **passive** keyword, outgoing RTP traffic is compressed only if *incoming* RTP traffic on the *same* interface is compressed. If you do not specify the **passive** keyword, *all* outgoing RTP traffic is compressed.

The **passive** keyword is ignored on PPP interfaces. PPP interfaces negotiate the use of header-compression, regardless of whether the **passive** keyword is specified. Therefore, on PPP interfaces, the **passive** keyword is replaced by the IPHC format, the default format for PPP interfaces.

The iphc-format Keyword

The **iphc-format** keyword indicates that the IPHC format of header compression that will be used. For PPP and HDLC interfaces, when the **iphc-format** keyword is specified, TCP header compression is also enabled. For this reason, the **ip tcp header-compression** command appears in the output of the **show running-config** command. Since both RTP header compression and TCP header compression are enabled, both UDP packets and TCP packets are compressed.

The **iphc-format** keyword includes checking whether the destination port number is even and is in the ranges of 16,385 to 32,767 (for Cisco audio) or 49,152 to 65,535 (for Cisco video). Valid RTP packets that meet the criteria (that is, the port number is even and is within the specified range) are compressed using the compressed RTP packet format. Otherwise, packets are compressed using the less-efficient compressed non-TCP packet format.

The **iphc-format** keyword is not available for interfaces that use Frame Relay encapsulation.

Note The header compression format (in this case, IPHC) must be the same at *both* ends of the network. That is, if you specify the **iphc-format** keyword on the local router, you must also specify the **iphc-format** keyword on the remote router.

The ietf-format Keyword

The **ietf-format** keyword indicates that the IETF format of header compression will be used. For HDLC interfaces, the **ietf-format** keyword compresses only UDP packets. For PPP interfaces, when the **ietf-format** keyword is specified, TCP header compression is also enabled. For this reason, the **ip tcp header-compression** command appears in the output of the **show running-config** command. Since both RTP header compression and TCP header compression are enabled, both UDP packets and TCP packets are compressed.

With the **ietf-format** keyword, any even destination port number higher than 1024 can be used. Valid RTP packets that meet the criteria (that is, the port number is even and is higher than 1024) are compressed using the compressed RTP packet format. Otherwise, packets are compressed using the less-efficient compressed non-TCP packet format.

The **ietf-format** keyword is not available for interfaces that use Frame Relay encapsulation.

Note The header compression format (in this case, IETF) must be the same at *both* ends of the network. That is, if you specify the **ietf-format** keyword on the local router, you must also specify the **ietf-format** keyword on the remote router.

Support for Serial Lines

RTP header compression is supported on serial lines using Frame Relay, HDLC, or PPP encapsulation. You must enable compression on both ends of a serial connection.

Unicast or Multicast RTP Packets

This command can compress unicast or multicast RTP packets, and, hence, multicast backbone (MBONE) traffic can also be compressed over slow links. The compression scheme is beneficial only when you have small payload sizes, as in audio traffic.

Examples

The following example enables RTP header compression on the Serial1/0/0 interface and limits the number of RTP header compression connections to 10. In this example, the optional **iphc-format** keyword of the **ip rtp header-compression** command is specified.

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0/0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression iphc-format
Router(config-if)# ip rtp compression-connections 10
Router(config-if)# exit
```

The following example enables RTP header compression on the Serial1/0/0 interface and limits the number of RTP header compression connections to 20. In this example, the optional **iphc-format** keyword of the **ip rtp header-compression** command is specified.

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0/0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression iphc-format
Router(config-if)# ip rtp compression-connections 20
Router(config-if)# exit
```

In the following example, RTP header compression is enabled on the Serial1/0/0 interface and the optional **periodic-refresh** keyword of the **ip rtp header-compression** command is specified:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0/0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression iphc-format periodic-refresh
Router(config-if)# ip rtp compression-connections 10
Router(config-if)# exit
```

Related Commands

Command	Description
clear ip rtp header-compression	Clears RTP header compression structures and statistics.
iprtp compression-connections	Specifies the total number of RTP header compression connections that can exist on an interface.
show ip rtp header-compression	Displays RTP header compression statistics.
show running-config	Displays the contents of the currently running configuration file or the configuration for a specific interface, or map class information.

ip tcp header-compression

To enable TCP header compression, use the **ip tcp header-compression** command in interface configuration mode. To disable compression, use the **no** form of this command.

ip tcp header-compression [**passive**] [**iphc-format**] [**ietf-format**]

no ip tcp header-compression [**passive**] [**iphc-format**] [**ietf-format]**

Syntax Description

passive	(Optional) Compresses outgoing TCP packets only if incoming TCP packets on the same interface are compressed. If you do not specify the **passive** keyword, all TCP packets are compressed.
iphc-format	(Optional) Indicates that the IP Header Compression (IPHC) format of header compression will be used.
ietf-format	(Optional) Indicates that the Internet Engineering Task Force (IETF) format of the header compression will be used.

Defaults

Disabled

For PPP interfaces, default format for header compression is the IPHC format.

For High-Level Data Link Control (HDLC) and Frame Relay interfaces, the default format is as described in RFC 1144, *Compressing TCP/IP Headers for Low-Speed Serial Links*.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.0	This command was incorporated. This command was modified to include the **iphc-format** keyword.
12.3(4)T	This command was incorporated. This command was modified to include the **ietf-format** keyword.
12.4(2)MR	This command was incorporated.

Usage Guidelines

You can compress the headers of your TCP/IP packets in order to reduce the size of your packets. TCP header compression is supported on serial lines using Frame Relay, HDLC, or PPP encapsulation. You must enable compression on both ends of a serial connection. Compressing the TCP header can speed up Telnet connections dramatically.

In general, TCP header compression is advantageous when your traffic consists of many small packets, not for traffic that consists of large packets. Transaction processing (usually using terminals) tends to use small packets and file transfers use large packets. This feature only compresses the TCP header, so it has no effect on User Datagram Protocol (UDP) packets or other headers.

Header Compression passive Keyword

By default, the **ip tcp header-compression** command compresses outgoing TCP traffic. This command includes an optional **passive** keyword. If you specify the **passive** keyword, outgoing TCP traffic is compressed only if *incoming* TCP traffic on the *same* interface is compressed. If you do not specify the passive keyword, *all* TCP traffic is compressed.

For PPP interfaces, the passive keyword is ignored. PPP interfaces negotiate the use of header-compression, regardless of whether the passive keyword is specified. Therefore, on PPP interfaces, the **passive** keyword is replaced by IPHC format, the default format for PPP interfaces.

Header Compression iphc-format Keyword

This command includes the **iphc-format** keyword. The **iphc-forma**t keyword indicates the type of header compression that will be used. For PPP and HDLC interfaces, when the **iphc-format** keyword is specified, Rapid Transport Protocol (RTP) header-compression is also enabled. For this reason, the **ip rtp header-compression** command appears in the output of the **show running-config** command. Because both TCP and RTP header compression are enabled, both TCP and UDP packets are compressed.

Note For Frame Relay interfaces, the **iphc-format** keyword is not available.

Header Compression ietf-format Keyword

This command includes the **ietf-format** keyword. The **ietf-format** keyword indicates the type of header compression that will be used. For HDLC interfaces, the **ietf-format** compresses only TCP packets. For PPP interfaces, when the **ietf-format** keyword is specified, RTP header-compression is also enabled. For this reason, the **ip rtp header-compression** command appears in the output of the **show running-config** command. Because both TCP and RTP header compression are enabled, both TCP and UDP packets are compressed.

Note For Frame Relay interfaces, the **ietf-format** keyword is not available.

Examples

The following example sets the first serial interface for header compression with a maximum of ten cache entries:

```
Router(config)# interface serial 0
Router(config-if)# ip tcp header-compression
Router(config-if)# ip tcp compression-connections 10
```

The following example enables RTP header compression on the Serial1/0/0.0 subinterface and limits the number of RTP header compression connections to 10. In this example, the optional **iphc-format** keyword of the **ip tcp header-compression** command is specified:

```
Router(config)# interface serial1/0/0.0
Router(config-if)# encapsulation ppp
Router(config-if)# ip tcp header-compression iphc-format
Router(config-if)# ip tcp compression-connections 10
```

The following example enables RTP header compression on the Serial1/0/0.0 subinterface and limits the number of RTP header compression connections to 20. In this example, the optional **ietf-format** keyword of the **ip tcp header-compression** command is specified:

```
Router(config)# interface serial1/0/0.0
Router(config-if)# ip tcp header-compression ietf-format
Router(config-if)# ip tcp compression-connections 20
```

Related Commands

Command	Description
ip tcp compression-connections	Specifies the total number of TCP header compression connections that can exist on an interface.
show ip tcp header-compression	Displays TCP header compression statistics.
show running-config	Displays the contents of the currently running configuration file or the configuration for a specific interface, or map class information.

ip tos (l2tp)

To configure the Type of Service (ToS) byte in the header of Layer 2 tunneled packets, use the **ip tos** command in the pseudowire-class configuration mode. To disable a configured ToS value or IP ToS reflection, use the **no** form of this command.

ip tos {**value** *value* | **reflect**}

no tos {**value** *value* | **reflect**}

Syntax Description

value *value*	Sets the value of the ToS byte for IP packets in a L2TPv3 session. Valid values range from 0 to 255. The default value is 0.
reflect	Sets the value of the ToS byte for IP packets in an L2TPv3 session to be reflected from the inner IP header.

Defaults

The default ToS value is 0.

Command Modes

Pseudowire-class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Usage Guidelines

The **ip tos** command allows you to manually configure the value of the ToS byte used in the headers of Layer 2 tunneled packets or to have the ToS value reflected from the IP header of the encapsulated packet.

Note IP ToS byte reflection functions only if traffic in an L2TPv3 session carries IP packets as its payload.

In addition, you can configure both IP ToS reflection and a ToS priority level (from 0 to 255) for a pseudowire-class. In this case, the ToS value in the tunnel header defaults to the value you specify with the **ip tos value** *value* command. IP packets received on the Layer 2 interface and encapsulated into the L2TPv3 session have their ToS byte reflected into the outer IP session, overriding the default value configured with the **ip tos value** *value* command.

Examples

In the following example, the ToS byte in the headers of tunneled packets in Layer 2 tunnels created from the pseudowire-class named “l2tp” is set as 5:

```
Router# config t
Router(config)# pseudowire-class l2tp
Router(config-pw-class)# ip tos 5
```

```
Router(config-pw-class)# exit
Router(config)# exit
```

Related Commands

Command	Description
pseudowire-class	Specifies the name of an L2TP pseudowire-class and enters pseudowire-class configuration mode.

ipran-mib backhaul-notify-interval

Use the **ipran-mib backhaul-notify-interval** command in the global configuration mode to specify the interval used to suppress the generation of the ciscoIpRanBackHaulRcvdUtil and the ciscoIpRanBackHaulSentUtil notifications from the CISCO-IP-RAN-BACKHAUL-MIB.

To set the interval used to suppress notifications, use the following configuration command or the **no** form of this command to remove the interval:

ipran-mib backhaul-notify-interval *60-900 seconds*

Notifications are suppressed for the number of seconds specified. Notifications are not suppressed when this keyword is set to zero. The minimum interval is one minute and the maximum is fifteen minutes. When suppression is enabled, notifications are generated when a worse state is encountered. For example, the following transitions generate notifications:

- "acceptable" to "warning"
- "warning" to "overloaded"

Later transitions to lesser states are suppressed. For example, the following transitions do not generate notifications:

- "warning" to "acceptable"
- "overloaded" to "warning"
- "overloaded" to "acceptable"

At the end of the specified interval, a notification is generated if the current state is different from the state reported by the last notification.

Syntax Description

ipran-mib backhaul-notify-interval	60-900 seconds

Defaults

Defaults to 0 (notifications are not suppressed).

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.
12.4(9)MR	Support for utilization notification was removed. This command is supported to maintain compatibility.

Examples

```
Router# config t
Router(config)# ipran-mib backhaul-notify-interval 60
Router(config)# ipran-mib backhaul-notify-interval 900
Router(config)# no ipran-mib backhaul-notify-interval
Router(config)# exit
```

Related Commands

Command	Description
ipran-mib threshold-acceptable	Specifies the acceptable level of traffic.
ipran-mib threshold-overloaded	Specifies the amount of traffic that indicates the backhaul is overloaded.
ipran-mib threshold-warning	Specifies the amount of traffic that indicates the backhaul is carrying traffic sufficient to impact performance, but is not overloaded.

ipran-mib location

Use the **ipran-mib location** command in the global configuration mode to define the location of the device. It is also used to assist the network management system in properly displaying the topology of the system.

ipran-mib location *location*

Syntax Description

ipran-mib location ?	• addSite located at BSC or RNC site. • cellSite Located at BTS or Node B site. • undefined Undefined location.

Defaults

cellSite.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.
12.4(9)MR	Support for utilization notification was removed. This command is supported to maintain compatibility.

Examples

```
Router# config t
Router(config)# ipran-mib location aggSite
Router(config)# ipran-mib location cellSite
Router(config)# ipran-mib location undefined
Router(config)# no ipran-mib location
Router(config)# exit
```

Related Commands

Command	Description
ipran-mib snmp-access	Defines the type of connectivity between the device and the network management system.

ipran-mib snmp-access

Use the **ipran-mib snmp-access** command in the global configuration mode to define the type of connectivity between the device and the network management system. It is used to limit the amount of traffic when in band polling.

ipran-mib snmp-access *access*

Syntax Description

ipran-mib snmp-access ?	• inBand In Band SNMP connectivity. • outOfBand Out of Band SNMP. • undefined Undefined connectivity.

Defaults

inBand.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.
12.4(9)MR	Support for utilization notification was removed. This command is supported to maintain compatibility.

Examples

```
Router# config t
Router(config)# ipran-mib snmp-access inBand
Router(config)# ipran-mib snmp-access outOfBand
Router(config)# ipran-mib snmp-access undefined
Router(config)# no ipran-mib snmp-access
Router(config)# exit
```

Related Commands

Command	Description
ipran-mib location	Defines the location of the device. It is also used to assist the network management system in properly displaying the topology of the system.

ipran-mib threshold-acceptable

Use the **ipran-mib threshold-acceptable** command in the global configuration mode to specify a level of traffic below which the instances of the cirbhBackHaulRcvdUtilState and cirbhBackHaulSentUtilState objects are marked as "acceptable." All changes to this threshold takes affect at the end of the current interval. The value for this object must be less than the values specified by **ipran-mib threshold-warning** and **ipran-mib threshold-overloaded** command keywords. This parameter corresponds to the cirbhBackHaulAcceptableThreshold object.

ipran-mib threshold-acceptable [20-100 Utilization (percent)]

Syntax Description

ipran-mib threshold-acceptable	ipran-mib threshold-acceptable percent.

Defaults

60 percent.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.
12.4(9)MR	Support for utilization notification was removed. This command is supported to maintain compatibility.

Examples

```
Router# config t
Router(config)# ipran-mib threshold-acceptable 50
Router(config)# ipran-mib threshold-acceptable 70
Router(config)# no ipran-mib threshold-acceptable
Router(config)# exit
```

Related Commands

Command	Description
ipran-mib threshold-overloaded	Specifies the amount of traffic that indicates the backhaul is overloaded.
ipran-mib threshold-warning	Specifies the amount of traffic that indicates the backhaul is carrying traffic sufficient to impact performance, but is not overloaded.
ipran-mib backhaul-notify-interval	Specifies the interval used to suppress the generation of utilization notifications.

ipran-mib threshold-overloaded

Use the **ipran-mib threshold-overloaded** command in the global configuration mode to specify a level of traffic where the instances of the cirbhBackHaulRcvdUtilState and cirbhBackHaulSentUtilState objects are marked as “overloaded.” Changes to this threshold take affect at the end of the current interval. The value for this object must be greater than the value specified for the cirbhBackHaulAcceptableThreshold object. Also, the value for this object must be greater than or equal to value of the cirbhBackHaulWarningThreshold object.

ipran-mib threshold-overloaded [40-100 Utilization default (percent)]

Syntax Description

ipran-mib threshold-overload	ipran-mib threshold-overload percent

Defaults

80 percent.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.
12.4(9)MR	Support for utilization notification was removed. This command is supported to maintain compatibility.

Examples

```
Router# config t
Router(config)# ipran-mib threshold-overloaded 60
Router(config)# ipran-mib threshold-overloaded 80
Router(config)# no ipran-mib threshold-warning
Router(config)# exit
```

Related Commands

Command	Description
ipran-mib threshold-acceptable	Specifies the acceptable level of traffic.
ipran-mib backhaul-notify-interval	Specifies the interval used to suppress the generation of utilization notifications.
ipran-mib threshold-warning	Specifies the amount of traffic that indicates the backhaul is carrying traffic sufficient to impact performance, but is not overloaded.

ipran-mib threshold-warning

Use the **ipran-mib threshold-warning** command in the global configuration mode to specify a level of traffic where the instances of the cirbhBackHaulRcvdUtilState and cirbhBackHaulSentUtilState objects are marked as "warning."

All changes to this threshold take affect at the end of the current interval. The value for this object must be greater than the value specified for the **ipran-mib threshold-acceptable** command keyword.

Also, the value for this object must be less than or equal to value of the cirbhBackHaulOverloadedThreshold object. This parameter corresponds to the cirbhBackHaulWarningThreshold object.

ipran-mib threshold-warning [30-100 Utilization default (percent)]

Syntax Description

ipran-mib threshold-warning	ipran-mib threshold-warning percent

Defaults

70 percent.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.
12.4(9)MR	Support for utilization notification was removed. This command is supported to maintain compatibility.

Examples

```
Router# config t
Router(config)# ipran-mib threshold-warning 60
Router(config)# ipran-mib threshold-warning 80
Router(config)# no ipran-mib threshold-warning
Router(config)# exit
```

Related Commands

Command	Description
ipran-mib threshold-acceptable	Specifies the acceptable level of traffic.
ipran-mib threshold-overloaded	Specifies the amount of traffic that indicates the backhaul is overloaded.
ipran-mib backhaul-notify-interval	Specifies the interval used to suppress the generation of utilization notifications.

keepalive

To enable keepalive packets and to specify the number of times that the Cisco IOS software tries to send keepalive packets without a response before bringing down the interface or before bringing the tunnel protocol down for a specific interface, use the keepalive command in interface configuration mode. When the keepalive function is enabled, a **keepalive** packet is sent at the specified time interval to keep the interface active. To turn off keepalive packets entirely, use the no form of this command.

keepalive [*period* [*retries*]]

no keepalive [*period* [*retries*]]

Syntax Description

period	(Optional) Integer value in seconds greater than 0. The default is 10.
retries	(Optional) Number of times that the device will continue to send keepalive packets without response before bringing the interface down. The integer value is greater than 1 and less than 255. If omitted, the value that was previously set is used; if no value was specified previously, the default value of 5 is used. If this command is used with a tunnel interface, then this variable specifies the number of times that the device will continue to send keepalive packets without response before bringing the tunnel interface protocol down.

Defaults

period: 10 seconds

retries: 5

If you enter only the **keepalive** command with no arguments, the defaults for both arguments are used.

If you enter only the **keepalive** command and the timeout (*period*) parameter, the default number of retries (5) is used.

If you enter the **no keepalive** command, keepalive packets are disabled on the interface.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(8)T	The *retries* argument was added and made available on tunnel interfaces.
12.2(8)MC2	This command was incorporated.
12.2(13)	The default value for the *retries* argument was increased to 5.
12.2(15)MC1	This command was incorporated.
12.3(11)T	This command was incorporated.

Usage Guidelines

Keepalive Time Interval

You can configure the keepalive time interval, which is the frequency at which the Cisco IOS software sends messages to itself (Ethernet and Token Ring) or to the other end (serial and tunnel), to ensure that a network interface is alive. The interval is adjustable in 1-second increments, down to a minimum of 1 second. An interface is declared down after three update intervals have passed without receiving a keepalive packet unless the retry value is set higher.

Setting the keepalive timer to a low value is very useful for rapidly detecting Ethernet interface failures (such as a transceiver cable disconnecting, or cable that is not terminated).

Line Failure

A typical serial line failure involves losing the Carrier Detect (CD) signal. Because this sort of failure is typically noticed within a few milliseconds, adjusting the keepalive timer for quicker routing recovery is generally not useful.

Keepalive Packets with Tunnel Interfaces

GRE keepalive packets may be sent either from both sides of a tunnel or from just one side. If they are sent from both sides, the period and retry parameters can be different at each side of the link. If you configure keepalives on only one side of the tunnel, the tunnel interface on the sending side might perceive the tunnel interface on the receiving side to be down because the sending interface is not receiving keepalives. From the receiving side of the tunnel, the link appears normal because no keepalives were enabled on the second side of the link.

Dropped Packets

Because keepalive packets are treated as ordinary packets, it is possible that they will be dropped. To reduce the possibility that dropped keepalive packets will cause the tunnel interface to be taken down, increase the number of retries.

Note When adjusting the keepalive timer for a very-low-bandwidth serial interface, large datagrams can delay the smaller keepalive packets long enough to cause the line protocol to go down. You may need to experiment to determine the best values to use for the timeout and the number of retry attempts.

Examples

The following example shows how to set the keepalive interval to 3 seconds:

```
Router(config)# interface ethernet 0
Router(config-if)# keepalive 3
```

The following example shows how to set the keepalive interval to 3 seconds and the retry value to 7:

```
Router(config)# interface tunnel 1
Router(config-if)# keepalive 3 7
```

load-interval

To change the length of time for which data is used to compute load statistics, use the **load-interva**l interface configuration command. Use the **no** form of this command to revert to the default setting.

load-interval *seconds*

no load-interval *seconds*

Syntax Description

seconds	Length of time for which data is used to compute load statistics. A value that is a multiple of 30, from 30 to 600 (30, 60, 90, 120, and so forth).

Defaults

300 seconds (or 5 minutes)

Command Modes

Interface configuration

Command History

Release	Modification
10.3	This command was introduced.
12.4(4)MR	This command was incorporated.

Usage Guidelines

If you want load computations to be more reactive to short bursts of traffic, rather than averaged over 5-minute periods, you can shorten the length of time over which load averages are computed.

If the load interval is set to 30 seconds, new data is used for load calculations over a 30-second period. This data is used to compute load statistics, including input rate in bits and packets per second, output rate in bits and packets per second, load, and reliability.

Load data is gathered every 5 seconds. This data is used for a weighted average calculation in which more-recent load data has more weight in the computation than older load data. If the load interval is set to 30 seconds, the average is computed for the last 30 seconds of load data.

The **load-interval** command allows you to change the default interval of 5 minutes to a shorter or longer period of time. if you change it to a shorter period of time, the input and output statistics that are displayed when you use the **show interface** command will be more current, and based on more instantaneous data, rather than reflecting a more average load over a longer period of time.

This command is often used for dial backup purposes, to increase or decrease the likelihood of a backup interface being implemented, but it can be used on any interface.

Examples

In the following example, the default 5-minute average is set to a 30-second average. A burst in traffic that would not trigger a dial backup for an interface configured with the default 5-minute interval might trigger a dial backup for this interface that is set for a shorter, 30-second interval.

```
Router(config)# interface serial 0
Router(config-if)# load-interval 30
```

Related Commands

Command	Description
show interfaces	Displays ALC information.

match ip dscp

To identify a specific IP differential service code point (DSCP) value as a match criterion, use the **match ip dscp** class-map configuration command. To remove a specific IP DSCP value from a class map, use the **no** form of this command.

match ip dscp *ip-dscp-value* [*ip-dscp-value ip-dscp-value ip-dscp-value ip-dscp-value ip-dscp-value ip-dscp-value ip-dscp-value*]

no match ip dscp *ip-dscp-value* [*ip-dscp-value ip-dscp-value ip-dscp-value ip-dscp-value ip-dscp-value ip-dscp-value ip-dscp-value*]

Syntax Description

ip-dscp-value	Specifies the exact value from 0 to 63 used to identify an IP DSCP value.

Defaults

This command has no default behavior or values.

Command Modes

Class-map configuration

Command History

Release	Modification
12.0(5)XE	This command was introduced.
12.0(9)S	This command was incorporated.
12.1(2)T	This command was incorporated.
12.4(4)MR	This command was incorporated.

Usage Guidelines

Up to eight IP DSCP values can be matched in one match statement. For example, if you wanted the IP DSCP values of 0, 1, 2, 3, 4, 5, 6, or 7 (note that only one of the IP DSCP values must be a successful match criterion, not all of the specified IP DSCP values), enter the **match ip dscp 0 1 2 3 4 5 6 7** command.

This command is used by the class map to identify a specific IP DSCP value marking on a packet. The *ip-dscp-value* arguments are used as markings only. The IP DSCP values have no mathematical significance. For instance, the *ip-dscp-value* of 2 is not greater than 1. The value simply indicates that a packet marked with the *ip-dscp-value* of 2 is different than a packet marked with the *ip-dscp-value* of 1. The treatment of these marked packets is defined by the user through the setting of QoS policies in policy-map class configuration mode.

Examples

The following example shows how to configure the service policy called priority50 and attach service policy priority50 to an interface. In this example, the class map called ipdscp15 will evaluate all packets entering interface Gigabit Ethernet 0/0 for an IP DSCP value of 15. If the incoming packet has been marked with the IP DSCP value of 15, the packet will be treated with a priority level of 55.

```
Router(config)# class-map ipdscp15
Router(config-cmap)# match ip dscp 15
Router(config-cmap)# exit
```

```
Router(config)# policy-map priority55
Router(config-pmap)# class ipdscp15
Router(config-pmap-c)# priority55
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface GigabitEthernet0/0
Router(config-if)# service-policy input priority55
```

Related Commands

Command	Description
class-map	Creates a class map to be used for matching packets to a specified class.
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
set ip dscp	Marks the IP DSCP value for packets within a traffic class.
show class-map	Displays all class maps and their matching criteria.

mode y-cable

To access the command mode that allows you to manually control the relays on the voice/WAN interface card (VWIC) or high-speed WAN interface card (HWIC), use the **mode y-cable** command in redundancy configuration mode.

mode y-cable

Syntax Description

This command has no parameters, it invokes the y-cable mode.

Defaults

There are no default settings or behaviors.

Command Modes

Redundancy configuration

Command History

Release	Modification
12.2(8)MC2	This command was introduced.
12.2(15)MC1	This command was incorporated.
12.3(11)T	This command was incorporated.
12.4(2)MR	This command was incorporated.

Examples

The following example enables y-cable mode:

```
Router(config)# redundancy
Router(config-r)# mode y-cable
```

Related Commands

Command	Description
standalone	Indicates whether the Cisco 3825 router is being used as a standalone device and manually sets the relays.
standby use-interface	Designates a loopback interface as a health or revertive interface.
redundancy	Invokes redundancy mode.

mpls ip

To enable MPLS forwarding of IPv4 packets along normally routed paths for a specified interface, use the **mpls ip** command in the interface configuration mode. To disable this feature, use the **no** form of this command.

mpls ip

no mpls ip

Syntax Description

This command has no arguments or keywords.

Defaults

MPLS forwarding of IPv4 packets along normally routed paths for the interface is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
12.0(14)ST	This command was integrated into Cisco IOS Release 12.0(14)ST.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.4(16)MR	This command was integrated into Cisco IOS Release 12.4(16)MR.

Usage Guidelines

MPLS forwarding of IPv4 packets along normally routed paths is sometimes called dynamic label switching. If dynamic label switching has been enabled for the platform when this command is issued on an interface, label distribution for the interface begins with the periodic transmission of neighbor discovery Hello messages on the interface. When the outgoing label for a destination routed through the interface is known, packets for the destination are labeled with that outgoing label and forwarded through the interface.

The **no** form of this command causes packets routed out through the interface to be sent unlabeled; this form of the command also terminates label distribution for the interface. However, the **no** form of the command does not affect the sending of labeled packets through any Label Switched Path (LSP) tunnels that might use the interface.

For an LC-ATM interface, the **no** form of this command prevents the establishment of label virtual circuits (LVCs) beginning at, terminating at, or passing through the interface.

Examples

The following example shows that label switching is enabled on the specified Ethernet interface:

```
Router# config t
Router(config)# configure terminal
Router(config-if)# interface Ethernet 0/1/0
Router(config-if)# mpls ip
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
mpls ldp maxhops	Limits the number of hops permitted in an Label Switched Path (LSP) established by the downstream-on-demand method of label distribution.
show mpls interfaces	Displays information about one or more interface that has been configured for label switching.

pseudowire-class

To specify the name of a Layer 2 pseudowire-class and enter **pseudowire-class** configuration mode, use the **pseudowire-class** command in the global configuration mode.

pseudowire-class [*pw-class-name*]

Syntax Description

pw-class-name	(Required) The name of a Layer 2 pseudowire-class.

Defaults

No pseudowire-class is defined.

Command Modes

Global configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Usage Guidelines

The **pseudowire-class** command configures a pseudowire-class template that consists of configuration settings used by all attachment circuits bound to the class. A pseudowire-class includes the following configuration settings:

- Data encapsulation type
- Control protocol
- Sequencing
- IP address of the local Layer 2 interface
- Type of service (ToS) value in IP headers

After entering the **pseudowire-class** command, the router switches to pseudowire-class configuration mode where PW settings can be configured.

Examples

The following example shows how to enter pseudowire-class configuration mode to configure a PW configuration template named “ether-pw”:

```
Router# config t
Router(config)# pseudowire-class l2tp
Router(config-pw-class)# encapsulation l2tpv3
Router(config-pw-class)# exit
Router(config)# exit
```

Related Commands

Command	Description
l2tp-class	Creates a template of L2TP control plane configuration settings that can be inherited by different pseudowire-classes, and then enters the L2TP-class configuration mode.
pseudowire	Binds an attachment circuit to a Layer 2 PW for an xconnect service.
xconnect	Binds an attachment circuit to an L2TPv3 PW for an xconnect service and then enters xconnect configuration mode.

pw-pvc

To configure permanent virtual circuit (PVC) mapping or rewrite the PW configured for a PVC, use the **pw-pvc** command. This command specifies the PW-side vpi/vci value to be used inside PW packet payload in sending and receiving PW packets for a specified PVC.

pw-pvc [pw-vpi]/[pw-vci]

Syntax Description

pw-vpi	Pseudowire-side vpi value
pw-vci	Pseudowire-side vci value

Defaults

By default, PW-side vpi/vci value is the same as the attachment circuit-side vpi/vci value.

Command Modes

l2transport VC mode

Command History

Release	Modification
12.4(2)MR2	This command was introduced.

Examples

The following example illustrates the use of the **pw-pvc** command.

```
Router# config t
Router(config-if)# pvc 0/40 l2transport
Router(config-if-atm-l2trans-pvc)# encapsulation aal0
Router(config-if-atm-l2trans-pvc)# pw-pvc 1/40
Router(config-if-atm-l2trans-pvc)# xconnect 1.1.1.1 40 encapsulation mpls
Router(config-if-atm-l2trans-pvc-xconn)# exit
Router(config-if-atm-l2trans-pvc)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
xconnect	The **xconnect** command is used to bind an attachment circuit to a PW in one of the supported configuration modes.

redundancy

To access the command mode that allows you to configure aspects of redundancy, use the **redundancy** command in global configuration mode.

redundancy

Syntax Description

This command has no parameters; it invokes the redundancy mode.

Defaults

There are no default settings or behaviors.

Command Modes

Global configuration

Command History

Release	Modification
12.2(8)MC2	This command was introduced.
12.2(15)MC1	This command was incorporated.
12.3(11)T	This command was incorporated.
12.4(2)MR	This command was incorporated.

Examples

The following example enables redundancy mode:

```
Router(config)# redundancy
Router(config-r)
```

Related Commands

Command	Description
mode y-cable	Invokes y-cable mode.
standalone	Indicates whether the Cisco 3825 router is being used as a standalone device and manually sets the relays.
standby use-interface	Designates a loopback interface as a health or revertive interfaces.

sample-rate

To specify in milliseconds the rate hardware samples the data on the attached circuit, use the **sample-rate** command in the circuit emulation (CEM) circuit configuration mode.

sample-rate [*sample-rate*]

Syntax Description

sample rate	Sample rate translates into the *payload-size* sent over the circuit. The default is 1 ms. • 32-timeslots at 1ms = 256-bytes (32-timeslots * 8-bytes/timeslot/ms) • 24-timeslots at 2ms = 384-bytes (24-timeslots * 16-bytes/timeslot/ms)

Command Modes

CEM circuit configuration

Command History

Release	Modification
12.4(12)MR2	This command was introduced.

Examples

The following example illustrates the use of the **sample-rate** command:

```
Router# config t
Router(config)# interface cem 0/0/0
Router(config-if)# no ip address
Router(config-if)# cem 0
Router(config-if-cem)# sample-rate 2
Router(config-if-cem)# xconnect 10.10.10.10 200 encapsulation mpls
Router(config-if-cem-xconn)# exit
Router(config-if-cem)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
cem	Apply CEM class.
cem class	Applies the CEM interface parameters defined in the given <cem-class-name> to the circuit.
class cem	Configure's CEM interface parameters in a class that's applied to CEM interfaces together in the global configuration mode.

scrambling-payload

To improve data reliability, randomize the ATM cell payload frames. This avoids continuous non-variable bit patterns and improves the efficiency of the ATM's cell delineation algorithms. To do this, use the **scrambling-payload** command in interface configuration mode. The **no** form disables scrambling.

scrambling-payload

Syntax Description

This command has no arguments or keywords.

Defaults

By default, payload scrambling is on for E1 links and off for T1 1inks.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(5)XE	This command was introduced.
12.4(4)MR	This command was incorporated.

Usage Guidelines

Normally, you do not issue the scrambling-payload command explicitly, because the default value is sufficient. On T1 links, the default B8ZS line encoding normally assures sufficient reliability. The scrambling setting must match that of the far end.

Examples

The following example shows scrambling-payload on ATM configuration:

```
Router(config)# interface ATM0/0/0
Router(config-if)# no ip address
Router(config-if)# no atm ilmi-keepalive
Router(config-if)# ima-group 0
Router(config-if)# scrambling-payload
```

sequencing

To configure the direction in which sequencing is enabled for data packets in a Layer 2 PW, use the **sequencing** command in the pseudowire-class configuration mode. To remove the sequencing configuration from the pseudowire-class, use the **no** form of this command.

sequencing {**transmit** | **receive** | **both** | **resync** {*number*}}

no sequencing {**transmit** | **receive** | **both** | **resync** {*number*}}

Syntax Description

transmit	Updates the Sequence Number field in the headers of data packets sent over the PW according to the data encapsulation method that is used.
receive	Keeps the value in the Sequence Number field in the headers of data packets received over the PW. Out-of-order packets are dropped.
both	Enables both the **transmit** and **receive** options.
resync	Enables the reset of packet sequencing after the disposition router receives a specified number of out-of-order packets.
number	The number of out-of-order packets that cause a reset of packet sequencing. The range is 5 to 65,535.

Defaults

Sequencing is disabled.

Command Modes

Pseudowire-class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced for Layer 2 Tunnel Protocol Version 3 (L2TPv3).
12.0(29)S	This command was updated to support Any Transport over MPLS (AToM).
12.0(30)S	The resync keyword was added.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Usage Guidelines

When you enable sequencing using any of the available options, the sending of sequence numbers is automatically enabled and the remote provider edge (PE) peer is requested to send sequence numbers. Out-of-order packets received on the PW are dropped only if you use the **sequencing receive** or **sequencing both** command.

It is useful to specify the **resync** keyword for situations when the disposition router receives many out-of-order packets. It allows the router to recover from situations where too many out-of-order packets are dropped.

Set the sequence number to 0 in the slow path before packets are punted to the local CPU, because packets may become out of order.

Note Sequencing will not override the value for CEM circuits.

Examples

The following example shows how to enable sequencing in data packets in Layer 2 PWs that were created from the pseudowire-class named “ether-pw” so that the Sequence Number field is updated in tunneled packet headers for data packets that are both sent and received over the PW:

```
Router# config t
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls
Router(config-pw-class)# sequencing both
Router(config-pw-class)# exit
Router(config)# exit
```

The following example shows how to enable the disposition router to reset packet sequencing after it receives 1,000 out-of-order packets:

```
Router# config t
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls
Router(config-pw-class)# sequencing both
Router(config-pw-class)# sequencing resync 1000
Router(config-pw-class)# exit
Router(config)# exit
```

Related Commands

Command	Description
ip cef	Enables Cisco Express Forwarding (CEF) on the Route Processor card.
pseudowire-class	Specifies the name of an L2TP pseudowire-class and enters pseudowire-class configuration mode.

show atm cell-packing

To display cell packing information for the Layer 2 attachment circuits (ACs) configured on your system, use the **show atm cell-packing** command in the EXEC mode.

show atm cell-packing

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
Release 3.4.1	This command was introduced on the Cisco XR 12000 Series Router.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Examples

The following sample output is from the **show atm cell-packing** command:

```
Router# show atm cell-packing
                                   avg #                 avg #

     Circuit                local  cells/pkt  negotiated  cells/pkt    MCPT
     Type                   MNCP    rcvd       MNCP         sent       (us)
ATM0/2/0/1.200    vc 1/200    1       0          1           0           50
ATM0/2/0/1.300    vc 1/300    1       0          1           0           50
```

Related Commands

Command	Description
cell-packing	Packs multiple ATM cells into each MPLS or L2TPv3 packet.
atm cell-packing	Packs multiple ATM cells into each MPLS or L2TPv3 packet.

show cem circuit

To display a summary of circuit emulation (CEM) circuits, use the **show cem circuit** command in the privileged EXEC mode.

show cem circuit [*cem-id*]

Syntax Description

cem-id	(Optional) Identifies the circuit configured via the cem-group configuration mode.

Command Modes

Privileged EXEC

Command HistoryGl

Release	Modification
12.4(12)MR2	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router# show cem circuit
CEM Int.       ID   Ctrlr     Admin     Circuit         AC
--------------------------------------------------------------
CEM0/0/0       0    UP        UP        Enabled         UP
CEM0/0/1       1    UP        UP        Enabled         UP
CEM0/1/0       2    UP        UP        Enabled         UP
CEM0/1/1       3    UP        UP        Enabled         UP
CEM0/2/0       4    UP        UP        Enabled         UP
CEM0/2/1       5    UP        UP        Enabled         UP


Router# show cem circuit 5

CEM0/2/1, ID: 5, Line: UP, Admin: UP, Ckt: Enabled
Controller state: up
Idle Pattern: 0xFF, Idle cas: 0x8
Dejitter: 4, Sample Rate: 1, Payload Size: 192
Framing: Framed, (DS0 channels: 1-24)
CEM Defects Set
None

Signalling: No CAS
RTP: No RTP

Ingress Pkts:    527521938           Dropped:             0
Egress Pkts:     527521938           Dropped:             0

CEM Counter Details
Input Errors:    0                   Output Errors:       0
Pkts Missing:    0                   Pkts Reordered:      0
Misorder Drops:  0                   JitterBuf Underrun:  0
Error Sec:       0                   Severly Errored Sec: 0
Unavailable Sec: 0                   Failure Counts:      0
Pkts Malformed:  0
```

Related Commands

Command	Description
show cem circuit detail	Displays detailed information about all CEM circuits.
show cem platform	Displays platform-specific error counters for all CEM circuits.
show cem platform errors	Displays platform-specific error counters for all CEM circuits.

show cem platform

To display platform-specific error counters for all circuit emulation (CEM) circuits, use the **show cem platform** command in the privileged EXEC mode.

show cem platform [*interface*]

Syntax Description

interface	(Optional) Identifies the CEM interface (for example, CEM0/0/1).

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(12)MR2	This command was introduced.

Examples

The following is an example of the output generated by this command:

```
Router# show cem platform
CEM0/0/0 errors:
  net2cem_drops ============== 50/527658758
    net2cem_drops_underflow === 26
    net2cem_drops_overflow ==== 24
  Last cleared 6d02h
CEM0/0/1 errors:
  net2cem_drops ============== 50/527658759
    net2cem_drops_underflow === 25
    net2cem_drops_overflow ==== 25
  Last cleared 6d02h
CEM0/1/0 errors:
  net2cem_drops ============== 2/526990836
    net2cem_drops_overflow ==== 2
  Last cleared never
CEM0/1/1 errors:
  net2cem_drops ============== 1/526982274
    net2cem_drops_overflow ==== 1
  Last cleared never
CEM0/2/0 errors:
  net2cem_drops ============== 51/527658758
    net2cem_drops_underflow === 26
    net2cem_drops_overflow ==== 25
  Last cleared 6d02h
CEM0/2/1 errors:
  net2cem_drops ============== 48/527660498
    net2cem_drops_underflow === 24
    net2cem_drops_overflow ==== 24
  Last cleared 6d02h

Router# show cem platform cem0/0/1
CEM0/0/1 errors:
  net2cem_drops ============== 50/527678398
    net2cem_drops_underflow === 25
    net2cem_drops_overflow ==== 25
  Last cleared 6d02h
```

Related Commands

Command	Description
show cem circuit	Displays a summary of CEM circuits.
show cem circuit detail	Displays detailed information about all CEM circuits.
show cem platform errors	Displays platform-specific error counters for all CEM circuits.

show connection

To display the status of interworking connections, use the **show connection** command in the privileged EXEC mode.

show connection [**all** | *element* | **id** *ID* | **name** *name* | **port** *port*]

Syntax Description

all	(Optional) Displays information about all interworking connections.
element	(Optional) Displays information about the specified connection element.
id *ID*	(Optional) Displays information about the specified connection identifier.
name *name*	(Optional) Displays information about the specified connection name.
port *port*	(Optional) Displays information about all connections on an interface. (In Cisco IOS Release 12.0S, only ATM, serial.)

Command Modes

Privileged EXEC

Command History

Release	Modification
12.1(2)T	This command was introduced as **show connect** (FR-ATM).
12.0(27)S	This command was integrated into Cisco IOS Release 12.0(27)S and updated to show all ATM, serial, and Fast Ethernet interworking connections.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.4(2)T	This command output was changed to add Segment 1 and Segment 2 fields for Segment state and channel ID.
12.0(30)S	This command was integrated into Cisco IOS Release 12.0(30)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.4(8)	This command was integrated into Cisco IOS Release 12.4(8).
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.4(11)T	This command was integrated into Cisco IOS Release 12.4(11)T.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example shows the local interworking connections on a router:

```
Router# show connection
ID   Name                 Segment 1            Segment 2           State
========================================================================
1    conn1          ATM 1/0/0 AAL5 0/100   ATM 2/0/0 AAL5 0/100   UP
2    conn2          ATM 2/0/0 AAL5 0/300   Serial0/1 16           UP
3    conn3          ATM 2/0/0 AAL5 0/400   FA 0/0.1 10            UP
4    conn4          ATM 1/0/0 CELL 0/500   ATM 2/0/0 CELL 0/500   UP
5    conn5          ATM 1/0/0 CELL 100     ATM 2/0/0 CELL 100     UP
```

Table 1 describes the significant fields shown in the display.

Table 1 show connection Field Descriptions

Field	Description
ID	Arbitrary connection identifier assigned by the operating system.
Name	Name of the connection.
Segment 1 Segment 2	Information about the interworking segments, including: • Interface name and number. • Segment state, interface name and number, and channel ID. Segment state will displays nothing if the segment state is UP, "-" if the segment state is DOWN, and "***Card Removed***" if the segment state is DETACHED. • Type of encapsulation (if any) assigned to the interface. • Permanent virtual circuit (PVC) assigned to the ATM interface, data-link connection identifier (DLCI) assigned to the serial interface, or VLAN ID assigned to the Ethernet interface.
State or Status	Status of the connection, which is one of the following: INVALID, UP, ADMIN UP, ADMIN DOWN, OPER DOWN, COMING UP, NOT VERIFIED, ERR.

Related Commands

Command	Description
connect (L2VPN local switching)	Connects two different or like interfaces on a router.
show atm pvc	Displays the status of ATM PVCs and SVCs.
show frame-relay pvc	Displays the status of Frame Relay interfaces.

show gsm-abis efficiency

To display history of the GSM compression/decompression efficiency averages at 1 second, 5 seconds, 1 minute, 5 minutes, and 1 hour intervals, use the **show gsm-abis efficiency** command in privileged EXEC mode. Efficiency is defined as the percentage of bandwidth savings obtained by using the compression/decompression algorithm to suppress GSM data.

show gsm-abis efficiency [**history**]

Syntax Description

history	Creates a graph display of the efficiency.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router# show gsm-abis efficiency ser0/1/0:0
GSM-Abis(Serial0/2:0): efficiency (1sec/5sec/1min/5min/1hr) units(%%)
    compression efficiency (091/091/091/091/---) estimate
  decompression efficiency (091/091/091/091/---)

Router# sh gsm eff history ser0/1/0:0

mwr1   04:00:00 PM Tuesday Apr 5 2005 est


    9999999999999999999999999999999999999999999999999999999999
    1111111111111111111111111111111111111111111111111111111111
100
 90 ************************************************************
 80 ************************************************************
 70 ************************************************************
 60 ************************************************************
 50 ************************************************************
 40 ************************************************************
 30 ************************************************************
 20 ************************************************************
 10 ************************************************************
   0....5....1....1....2....2....3....3....4....4....5....5....
             0    5    0    5    0    5    0    5    0    5
 GSM-Abis(Serial0/1/0:0) compression efficiency%/sec (last 60 secs)

    999999999
    111111111
100
 90 ########*
 80 #########
 70 #########
 60 #########
 50 #########
```

```
 40 #########
 30 #########
 20 #########
 10 #########
   0....5....1....1....2....2....3....3....4....4....5....5....
             0    5    0    5    0    5    0    5    0    5
 GSM-Abis(Serial0/1/0:0) compression efficiency%/min (last 60 mins)
   * = maximum eff%   # = average eff%



100
 90
 80
 70
 60
 50
 40
 30
 20
 10
   0....5....1....1....2....2....3....3....4....4....5....5....6....6....7.
             0    5    0    5    0    5    0    5    0    5    0    5    0
 GSM-Abis(Serial0/1/0:0) compression efficiency%/hr (last 72 hrs)
   * = maximum eff%   # = average eff%


mwr1   04:00:03 PM Tuesday Apr 5 2005 est


    999999999999999999999999999999999999999999999999999999999999
    111111111111111111111111111111111111111111111111111111111111
100
 90 ************************************************************
 80 ************************************************************
 70 ************************************************************
 60 ************************************************************
 50 ************************************************************
 40 ************************************************************
 30 ************************************************************
 20 ************************************************************
 10 ************************************************************
   0....5....1....1....2....2....3....3....4....4....5....5....
             0    5    0    5    0    5    0    5    0    5
 GSM-Abis(Serial0/1/0:0) decompression efficiency%/sec (last 60 secs)

    999999999
    111111111
100
 90 ########*
 80 #########
 70 #########
 60 #########
 50 #########
 40 #########
 30 #########
 20 #########
 10 #########
   0....5....1....1....2....2....3....3....4....4....5....5....
             0    5    0    5    0    5    0    5    0    5
 GSM-Abis(Serial0/1/0:0) decompression efficiency%/min (last 60 mins)
   * = maximum eff%   # = average eff%
```

```
100
 90
 80
 70
 60
 50
 40
 30
 20
 10
   0....5....1....1....2....2....3....3....4....4....5....5....6....6....7.
             0    5    0    5    0    5    0    5    0    5    0    5    0
 GSM-Abis(Serial0/1/0:0) decompression efficiency%/hr (last 72 hrs)
   * = maximum eff%   # = average eff%
```

Related Commands

Command	Description
clear gsm-abis	Clears the statistics displayed.

show gsm-abis errors

To display error statistics counters of the GSM compression/decompression, use the **show gsm-abis errors** command in privileged EXEC mode.

show gsm-abis errors

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)MR	This command was introduced.
12.4(9)MR	The output response of this command was modified.

Examples

The following is an example of the output generated by this command.

```
Router# show gsm-abis errors
GSM-Abis(Serial0/1/0:0): backhaul_rxLostPakInd =========== 1/431956
GSM-Abis(Serial0/1/0:0): backhaul_txLostPakInd =========== 1/432539
GSM-Abis(Serial0/1/0:0): backhaul_missedPaks ============= 654/431956
GSM-Abis(Serial0/1/0:0): backhaul_latePaks =============== 591
GSM-Abis(Serial0/1/0:0): backhaul_lostPaks =============== 1
GSM-Abis(Serial0/1/0:0): backhaul_txRset ================= 33
GSM-Abis(Serial0/1/0:0): backhaul_overun ================= 29
GSM-Abis(Serial0/1/0:0): compression_failures ============ 39661
GSM-Abis(Serial0/1/0:0): backhaul_congestion_drops ======= 39661
GSM-Abis(Serial0/1/0:0): backhaul_congestion_events ====== 1
GSM-Abis(Serial0/1/0:0): backhaul_congestion_duration(sec) == 80
GSM-Abis(Serial0/1/0:0): backhaul_congestion_bytes ========== 16498976
Last cleared 00:14:24
```

Table A-3 describes the significant fields shown in the display.

Table A-2 show gsm-abis errors Field Descriptions

Field	Description
tx_gsmPak_failures	Send GSM-Abis packer failed.
txPtcl_no_memory	No particles available, for example, getparticle() failure.
backhaul_peer_not_ready	Backhaul peer not ready for input.
backhaul_peer_not_active	Backhaul peer is not active. Backhaul peer is marked active when first. Backhaul peer is received from peer.
backhaul_invalid_pak	Received backhaulPak is invalid. Returns errCode to indentify reason.

Table A-2 show gsm-abis errors Field Descriptions (continued)

Field	Description
backhaul_rxLostPakInd	Receive backhaul_lostPak indicator
backhaul_txLostPakInd	Transmit backhaul_lostPak indicator
backhaul_missedPak	Received backhaulPak is missed/dropped.
backhaul_latePaks	No backhaul packet arrived in time to fill txParticles with data (backhaul packet was lost or late).
backhaul_lostPaks	Backhaul packet was lost.
backhaul_txPtcl_no_memory	No particles available, for example, getparticle () failure.
backhaul_txReset	Packets lost due to txBufferRing reset.
decompression_failures	Decompression of input backhaulPak failed.
compression_failures	Compression of input GSM packet failed.
no-backhaul_pak_available	No memory for backhaulPak buffer.
no-backhaul_interface	Could not find an output interface that corresponds to configured remote ipAddr.
backhaul_interface_down	Interface used for backhaul is not active.
backhaul_encap_failures	The pak-encap failed.
backhaul_qos_classify_drops	QoS classification drops.
rxInterrupt_failures	Count number of Abis packets missed because of unexpected rxInterrupt.
abis_late	GSM-Abis rxInterrupt arrived too late.
abis_early	GSM-Abis rxInterrupt arrived too early.

Related Commands

Command	Description
clear gsm-abis	Clears the statistics displayed.

show gsm-abis packets

To display packet statistics counters of the GSM compression/decompression, use the **show gsm-abis packets** command in privileged EXEC mode. Add the **include retransmit** to see the repetitive sub-rate samples at a specific configuration level (100 ms to 5100 ms).

show gsm-abis packets

show gsm-abis packets | include retransmit

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)MR	This command was introduced.
12.4(9)MR	The output response for the is command was modified.

Examples

The following is a **show gsm-abis packets** example of the output generated by this command.

```
Router# show gsm-abis packets
GSM-Abis(Serial0/1/0:0): packets:
    rxGSM_count ================== 164011
    txGSM_count ================= 164011
    rxBackhaul_packets ========== 163428
    txBackhaul_packets ========== 164011
    rxBackhaul_bytes ============ 7649833
    txBackhaul_bytes ============ 7638262
  rx_sampleCount ============= 40674728
    rx_suppressedCount ======== 36629047
    rx_retransmittedCount ===== 0
    rx_all_presentCount ======= 29
    tx_sampleCount ============= 4053144
        tx_presentCount ========== 66522
    tx_all_presentCount ======= 8
  backhaul_forced_inclusions == 1
    Last cleared 00:05:27
```

The following is a **show gsm-abis packets | include retransmit** example of the output generated by this command.

```
Router# show gsm-abis packet | include retransmit
    rx-retransmittedCount ====== 71405
```

Related Commands

Command	Description
clear gsm-abis	Clears the statistics displayed.

show gsm-abis peering

To display peering status, statistics, and history of the GSM compression/decompression, use the **show gsm-abis peering** command in privileged EXEC mode.

show gsm-abis peering [**details**]

Syntax Description

details	Provides detail information about peering.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router# show gsm-abis peering ser0/1/0:0
GSM-Abis(Serial0/1/0:0): Peering Information
GSM-Abis(Serial0/1/0:0):  Local (10.10.10.1:5555) States:
GSM-Abis(Serial0/1/0:0):    Connect State Is:    CONNECTED
GSM-Abis(Serial0/1/0:0):    Local Alarm Is:      CLEAR (NO ALARM)
GSM-Abis(Serial0/1/0:0):    Redundancy State:    ACTIVE
GSM-Abis(Serial0/1/0:0):    Local Peer Version:  1.0
GSM-Abis(Serial0/1/0:0):  Remote (10.10.10.2:5555) States:
GSM-Abis(Serial0/1/0:0):    Remote Alarm Is:     CLEAR (NO ALARM)
GSM-Abis(Serial0/1/0:0):    Remote Peer Version: 1.0

Router# show gsm-abis peering detail ser0/1/0:0
GSM-Abis(Serial0/1/0:0): Peering Information (Version 1.0) History with current state at
the bottom  GSM Peering History:

      Connect State Is:                                  System Time
      ------------------                                 -------------------
      DISCONNECT  *Apr 26 19:00:20.303
      SND_CONNECT                                        *Apr 26 15:48:30.568
      ACK_CONNECT                                    *Apr 26 15:48:31.572
     **CONNECTED                                          *Apr 26 15:50:57.113

      Local Peer Is:         Conn Info                   System Time
      ---------------------- ----------                  -------------------
      CLEAR (NO ALARM)       DISCONNECT              *Mar 1 19:00:20.303
      SENDING AIS          DISCONNECT                  *Apr 24 15:48:31.980
    **CLEAR (NO ALARM)       CONNECTED               *Apr 26 15:51:04.113

      Remote Peer Is:        Conn Info   Local Redundancy System Time
      ---------------------- ----------  ---------------- -------------------
      UNAVAILABLE            DISCONNECT  STANDBV  *Mar 1 19:00:20.303
      UNAVAILABLE          DISCONNECTACTIVE   *Mar 1 15:50:57.113
      RX LOF RED) ALARM  CONNECTED  ACTIVE  *Apr 26 15:50:57.117
    **CLEAR (NO ALARM)       CONNECTED ACTIVE  *Apr 26 15:50:57.117

Current System Time:                                    *Apr 26 16:00:33.133 est
```

```
Peer Pak Info:
 No Backhaul Interface ======= 0 packets
 Backhaul Encap Failures ===== 0 packets
 Get CtrlPak Failures ======== 0 packets
 RX Ctrl Paks ================ 7 packets
 TX Ctrl Paks ================ 11 packets
   Out Of Sequence Paks ======== 1 packets
   Out Of Sequence Paks ====== 0 packets
 Unsolicited Connect Paks ==== 1 (times)
   Unsolicited Connect Paks == 0 (times)
 Remove Retransmit Errors ==== 8 (error)
 Backhaul QOS classify drops = 0 packets

Peer Ctrl Type Info:
 Unknown Ctrl Types ========== 0 (times)
 Invalid Ctrl Lens =========== 0 (times)
 Missed Keepalives =========== 0 (times)
 Extra Keepalives ============ 0 (times)
 Peer Restarts =============== 5 (times)
   Due to Cfg Change ========= 2(times)
   Due to Internal Err ======= 1(times)
   Due to Lost Keepalive ===== 0 (times)
   Due to Interface Down ===== 0 (times)
   Due to Critical Pak Lost == 0 (times)
   Due to Interface Cleanup == 0 (times)
   Due to Excess Seq No Err == 0 (times)

Peer Ctrl Variable Info:
 peer_enable ================= 1 (on/off)
 peer_ready ================== 1 (on/off)
 connecting ================== 0 (on/off)
 detectAlmErr ================ 1 (on/off)

Peer Queue/Memory Info:
 Retransmition Contexts Used = 1 (in use)
 Data Buffers Used =========== 0 (in use)
 Seq Num: tx_fsn/tx_bsn ====== 4/4
 Seq Num: rx_fsn/rx_bsn ====== 4/4
  Adjacent serial number: 'FTX1021A44Q'
```

Related Commands

Command	Description
clear gsm-abis	Clears the statistics displayed.

show gsm-abis traffic

To display traffic rates, in bits per second, at 1 second, 5 seconds, 1 minute, 5 minutes, and 1 hour intervals for GSM data transmitted and received over the backhaul, use the **show gsm-abis traffic** command in privileged EXEC mode.

show gsm-abis traffic

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(12)MR	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router# show gsm-abis traffic

GSM-Abis(Serial1/1/0:0): traffic (1sec/5sec/1min/5min/1hr) units(bps)
    compression traffic(  964000/  966758/  965928/  965937/  48831)
  decompression traffic(  132000/  136774/  134428/  134430/   6799)
```

Related Commands

Command	Description
clear gsm-abis	Clears the statistics displayed.

show ip rtp header-compression

To show Real-Time Transport Protocol (RTP) header compression statistics, use the **show ip rtp header-compression** privileged EXEC command.

show ip rtp header-compression [*type number*] **[detail]**

Syntax Description

type number	(Optional) Interface type and number.
detail	(Optional) Displays details of each connection. **Note** This keyword is not supported on the Cisco 3825 router.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3	This command was introduced.
12.1(5)T	The command output was modified to include information related to the Distributed Compressed Real-Time Transport Protocol (dCRTP) feature.
12.2(8)MC2	This command was incorporated.
12.2(15)MC1	This command was incorporated.
12.3(11)T	This command was incorporated.
12.4(2)MR	This command was incorporated.

Usage Guidelines

The **detail** keyword is not available with the **show ip rtp header-compression** command on a Route Switch Processor (RSP). However, the **detail** keyword is available with the **show ip rtp header-compression** command on a Versatile Interface Processor (VIP). Enter the **show ip rtp header-compression type number detail** command on a VIP to retrieve detailed information about RTP header compression on a specific interface.

Examples

The following is sample output from the **show ip rtp header-compression** command:

```
Router# show ip rtp header-compression

RTP/UDP/IP header compression statistics:
 Interface Multilink1 (compression off, IETF, RTP)
  Rcvd: 0 total, 0 compressed, 0 errors
     0 dropped, 0 buffer copies, 0 buffer failures
  Sent: 430 total 429 compressed
     15122 bytes saved, 0 bytes sent
     0 efficiency improvement factor
  Connect: 16 rx slots, 16 tx slots, 0 long searches, 1 misses
     99% hit ratio, five minute miss rate 0 misses/sec, 0 max.
```

Table A-3 describes the significant fields shown in the display.

Table A-3 show ip rtp header-compression Field Descriptions

Field	Description
Interface	Type and number of interface.
Rcvd: total	Number of packets received on the interface.
compressed	Number of packets with compressed header.
errors	Number of errors.
dropped	Number of dropped packets.
buffer copies	Not applicable to the Cisco 3825 router.
buffer failures	Not applicable to the Cisco 3825 router.
Sent: total	Total number of packets sent.
compressed	Number of packets sent with compressed header.
bytes saved	Total savings in bytes as a result of compression.
bytes sent	Not applicable to the Cisco 3825 router.
efficiency improvement factor	Efficiency achieved through compression.
Connect: rx slots	Total number of receive slots.
tx slots	Total number of transmit slots.
long searches	Not applicable to the Cisco 3825 router.
misses	Number of new states that were created.
hit ratio	Number of times that existing states were revised.
five minute miss rate	Average miss rate.
max.	Maximum miss rate.
negative cache	Not applicable to the Cisco 3825 router.

Related Commands

Command	Description
ip rtp compression-connections	Specifies the total number of RTP header compression connections that can exist on an interface.
ip rtp header-compression	Enables RTP header compression.

show l2tp session

To display basic information about all active L2TP sessions, use the **show l2tp session** command in the user EXEC mode.

show l2tp session

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC

Command History

Release	Modification
12.1(1)T	This command was enhanced to display Point-to-Point Protocol over Ethernet (PPPoE) information.
12.1(2)T	This command was enhanced to display PPPoE session information on actual Ethernet interfaces.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Usage Guidelines

Use the **show l2tp session** command to display information about all active sessions using L2TP.

Examples

The following is sample output from the **show l2tp session** command on a device with active L2TP sessions:

```
Router# show l2tp session

L2TP Session Information Total tunnels 1 sessions 4

LocID      RemID      TunID      Username, Intf/      State  Last Chg Uniq ID
                                 Vcid, Circuit
9547       61932      2220       100, AT0/0:          est    2w6d     1
9580       61966      2220       1100, AT0/1:0/100    est    2w6d     21
9584       61970      2220       1200, AT0/1.1:       est    2w6d     29
9595       61981      2220       1101, AT0/1:0/101    est    1w0d     37
Router#
```

Related Commands

Command	Description
show l2tp domain	Displays all VPDN domains and DNIS groups configured on the NAS.
show l2tp group	Displays a summary of the relationships among VPDN groups and customer/VPDN profiles, or summarizes the configuration of a VPDN group including DNIS/domain, load sharing information and current session information.
show l2tp history failure	Displays the content of the failure history table.
show l2tp multilink	Displays the multilink sessions authorized for all VPDN groups.

Command	Description
show l2tp redirect	Displays statistics for L2TP redirects and forwards.
show l2tp session	Displays session information about active Layer 2 sessions for a VPDN.
show l2tp tunnel	Displays information about active Layer 2 tunnels for a VPDN.

show l2tp tunnel

To display basic information about all L2TP tunnels, use the **show l2tp tunnel** command in the user EXEC mode.

show l2tp tunnel

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC

Command History

Release	Modification
11.2	This command was integrated into Cisco IOS Release 12.4(12)MR2.
12.1(1)T	This command was enhanced to display Point-to-Point Protocol over Ethernet (PPPoE) information.
12.1(2)T	This command was enhanced to display PPPoE session information on actual Ethernet interfaces.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Usage Guidelines

Use the **show l2tp tunnel** command to display information about all active tunnels using L2TP.

Examples

The following is sample output from the **show l2tp tunnel** command on a device with active L2F and L2TP tunnels:

```
Router# show l2tp tunnel

L2TP Tunnel Information Total tunnels 1 sessions 4

LocID RemID Remote Name   State  Remote Address  Port  Sessions L2TP Class/
                                                                VPDN Group
2220  55756 mwr2          est    99.99.99.99     0     4        l2tp_default_cl
Router#
Router#
Router#
Router#
```

Related Commands

Command	Description
show l2tp domain	Displays all VPDN domains and DNIS groups configured on the network access server (NAS).
show l2tp group	Displays a summary of the relationships among VPDN groups and customer/VPDN profiles, or summarizes the configuration of a VPDN group including DNIS/domain, load sharing information and current session information.
show l2tp history failure	Displays the content of the failure history table.

Command	Description
show l2tp multilink	Displays the multilink sessions authorized for all VPDN groups.
show l2tp redirect	Displays statistics for L2TP redirects and forwards.
show l2tp session	Displays session information about active Layer 2 sessions for a VPDN.

show mpls l2transport vc

To display information about Any Transport over MPLS (AToM) virtual connections (VCs) that have been enabled to route Layer 2 packets on a router, use the **show mpls l2transport vc** command in the privileged EXEC mode.

show mpls l2transport vc {[**vcid** *vc-id*] | [**vcid** *vc-id-min vc-id-max*]} [**interface** *name* [*local-circuit-id*]] [**destination** *ip-address* | *name*] [**detail**]

Syntax Description

vcid	(Optional) Allows you to enter a specific VC ID to display.
vc-id	(Optional) The VC ID number.
vc-id-min *vc-id-max*	(Optional) Allows you to enter a range of VCs to display. The range is from 1 to 4294967295. (This argument is primarily used for legacy implementations.)
interface	(Optional) The interface or subinterface of the router that has been enabled to transport Layer 2 packets. This keyword lets you display information about the VCs that have been assigned VC IDs on that interface or subinterface.
name	(Optional) The name of the interface or subinterface.
local-circuit-id	(Optional) The number assigned to the local circuit. This argument value is supported only by the following transport types: • For ATM adaptation layer 5 (AAL5) and cell relay, enter the virtual path identifier (VPI)/virtual channel identifier (VCI) of the PVC. • For Ethernet VLANs, enter the VLAN number.
destination	(Optional) Information about the VCs that have been assigned VC IDs for the remote router you specify.
ip-address	(Optional) The IP address of the remote router.
name	(Optional) The name assigned to the remote router.
detail	(Optional) Detailed information about the VCs that have been assigned VC IDs.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.1(8a)E	This command was introduced.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was implemented on the Cisco 10720 router.
12.0(23)S	The **interface** and **destination** keywords were added.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(14)SX	This command was implemented on the Supervisor Engine 720.
12.2(14)SZ	This command was integrated into Cisco IOS Release 12.2(14)SZ.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.2(18)S	This command was implemented on Cisco 7304 routers.
12.0(25)S	This command was updated with new output and fields to display information about tunnel selection and ATM cell relay port mode.

Release	Modification
12.2(17d)SXB	Support for this command on the Supervisor Engine 2 was extended to Release 12.2 SX.
12.2(25)S	This command was updated with new output and fields for nonstop forwarding (NSF), stateful switchover (SSO), and graceful restart (GR) abilities.
12.2(28)SB	This command was implemented on the Cisco 10000 series routers. Example output was changed for the Cisco 10000 series router, and two fields (SSO Descriptor and SSM segment/switch IDs) were removed from the output because they are not supported.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.4(16)MR	This command was integrated into Cisco IOS Release 12.4(16)MR.

Usage Guidelines

If you do not specify any keywords or arguments, the command displays a summary of all the VCs.

Examples

The output of the commands varies, depending on the type of Layer 2 packets being transported over the AToM VCs.

The following sample output shows information about the interfaces and VCs that have been configured to transport various Layer 2 packets on the router:

```
Router# show mpls l2transport vc

Local intf     Local circuit      Dest address    VC ID      Status
-------------  ------------------ --------------- ---------- ----------
AT4/0          ATM AAL5 0/100     10.0.0.1        100        UP
AT4/0          ATM AAL5 0/200     10.0.0.1        200        UP
AT4/0.300      ATM AAL5 0/300     10.0.0.1        300        UP
```

Table A-4 describes the significant fields shown in the display.

Table A-4 show mpls l2transport vc Field Descriptions

Field	Description
Local intf	The interface on the local router that has been enabled to transport Layer 2 packets.
Local circuit	The type and number (if applicable) of the local circuit. The output shown in this column varies, depending on the transport type: • For ATM cell relay and AAL5, the output shows the VPI/VCI of the PVC. • For Ethernet VLANs, the output shows the VLAN number.
Dest address	The IP address of the remote router's interface that is the other end of the VC.
VC ID	The VC identifier assigned to one of the interfaces on the router.

Table A-4 show mpls l2transport vc Field Descriptions (continued)

Field	Description
Status	The status of the VC. The status can be one of the following: • UP—The VC is in a state where it can carry traffic between the two VC endpoints. A VC is up when both imposition and disposition interfaces are programmed. – The disposition interface is programmed if the VC has been configured and the client interface is up. – The imposition interface is programmed if the disposition interface is programmed and you have a remote VC label and an Interior Gateway Protocol (IGP) label. The IGP label can be implicit null in a back-to-back configuration. An IGP label means there is a Label Switched Path (LSP) to the peer. • DOWN—The VC is not ready to carry traffic between the two VC endpoints. Use the **detail** keyword to determine the reason that the VC is down. • ADMIN DOWN—The VC has been disabled by a user. • RECOVERING—The VC is recovering from a stateful switchover.

The following example shows information about the NSF/SSO and graceful restart capability. The SSO portion indicates when checkpointing data has either been sent (on active) or received (on standby). When SSO data has not been successfully sent or has been released, the SSO information is not shown.

```
Router# show mpls l2transport vc detail

Local interface: Fa0/1.1 down, line protocol down, Eth VLAN 2 up
  Destination address: 10.55.55.2, VC ID: 1002, VC status: down
    Output interface: Fa0/0, imposed label stack {16}
    Preferred path: not configured
    Default path: active
    Tunnel label: imp-null, next hop point2point
  Create time: 02:03:29, last status change time: 02:03:26
  Signaling protocol: LDP, peer 10.55.55.2:0 down
    MPLS VC labels: local 16, remote unassigned
    Group ID: local 0, remote unknown
    MTU: local 1500, remote unknown
    Remote interface description:
  Sequencing: receive disabled, send disabled
  SSO Descriptor: 10.55.55.2/1002, local label: 16
    SSM segment/switch IDs: 12290/8193, PWID: 8193
  VC statistics:
    packet totals: receive 0, send 0
    byte totals:   receive 0, send 0
    packet drops:  receive 0, send 0
```

Table A-5 describes the significant fields shown in the display.

Table A-5 show mpls l2transport vc Field Descriptions

Field	Description
line protocol	Status of the line protocol on the edge-facing interface.
Destination address	IP address of the remote router specified for this VC. Specify the destination IP address as part of the **mpls l2transport route** command.

Table A-5 show mpls l2transport vc Field Descriptions (continued)

Field	Description
Local interface	Interface on the local router that has been enabled to send and receive Layer 2 packets. The interface varies, depending on the transport type. The output also shows the status of the interface.
VC ID	VC identifier assigned to the interface on the router.
VC status	Status of the VC, which is one of the following: UP—The VC is in a state where it can carry traffic between the two VC endpoints. A VC is up when both imposition and disposition interfaces are programmed. • The disposition interface is programmed if the VC has been configured and the client interface is up. • The imposition interface is programmed if the disposition interface is programmed and a remote VC label and an IGP label exist. The IGP label can be an implicit null in a back-to-back configuration. (An IGP label means there is an LSP to the peer.) DOWN—The VC is not ready to carry traffic between the two VC endpoints. ADMIN DOWN—The VC has been disabled by a user.
Output interface	Interface on the remote router that has been enabled to transmit and receive Layer 2 packets.
imposed label stack	Summary of the MPLS label stack used to direct the VC to the PE router.
Preferred path	Path that was assigned to the VC and the status of that path. The path can be an MPLS traffic engineering tunnel or an IP address or hostname of a PE router.
Default path	Status of the default path, which can be disabled or active. By default, if the preferred path fails, the router uses the default path. However, you can disable the router from using the default path when the preferred path fails by specifying the **disable-fallback** keyword with the **preferred-path** command.
Create time	Time when the VC was provisioned.
last status change time	Last time the VC state changed.
Signaling protocol	Type of protocol used to send the MPLS labels. The output also shows the status of the peer router.
MPLS VC labels	Local VC label is a disposition label, which determines the egress interface of an arriving packet from the MPLS backbone. The remote VC label is a disposition VC label of the remote peer router.
Group ID	Local group ID is used to group VCs locally. The remote group ID is used by the peer to group several VCs.
MTU	Maximum transmission unit specified for the local and remote interfaces.
Remote interface description	Interface on the remote router that has been enabled to transmit and receive Layer 2 packets.
Sequencing	Indicates whether sequencing of out-of-order packets is enabled or disabled.

Table A-5 show mpls l2transport vc Field Descriptions (continued)

Field	Description
Tunnel label	An IGP label used to route the packet over the MPLS backbone to the destination router with the egress interface. The first part of the output displays the type of label. The second part of output displays the route information. The tunnel label information can display any of the following states: • imp-null—The provider (P) router is absent and the tunnel label is not to be used. Alternatively, imp-null can signify traffic engineering tunnels between the PE routers. • unassigned—The label has not been assigned. • no route—The label is not in the routing table. • no adjacency—The adjacency for the next hop is missing. • not ready, no route—An IP route for the peer does not exist in the routing table. • not ready, not a host table—The route in the routing table for the remote peer router is not a host route. • not ready, Cisco Express Forwarding disabled—Cisco Express Forwarding is disabled. • not ready, LFIB disabled—The MPLS switching subsystem is disabled. • not ready, label forwarding information base (LFIB) entry present—The tunnel label exists in the LFIB, but the VC is down.
SSO Descriptor	Identifies the VC for which the information was checkpointed.
local label	The value of the local label that was checkpointed (that is, sent on the active Route Processor [RP], and received on the standby RP).
SSM segment/switch IDs	The IDs used to refer to the control plane and data plane contexts for this VC. This data is not for customer use but for Cisco personnel for troubleshooting purposes. When the source specific multicast (SSM) IDs are followed by the word "used," the checkpointed data has been successfully sent and not released.
PWID	The PW ID used in the data plane to correlate the switching context for the segment mentioned with the MPLS switching context. This data is not for customer use but for Cisco personnel for troubleshooting purposes.
packet totals	Number of packets sent and received. Received packets are those AToM packets received from the MPLS core. Sent packets are those AToM packets sent to the MPLS core. This does not include dropped packets.
byte totals	Number of bytes sent and received from the core-facing interface, including the payload, control word if present, and AToM VC label.
packet drops	Number of dropped packets.

Related Commands

Command	Description
show mpls l2transport summary	Displays summary information about VCs that have been enabled to route AToM Layer 2 packets on a router.

show redundancy

To display information about the current redundant configuration and recent changes in states, use the **show redundancy** command in privileged EXEC mode.

show redundancy

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(8)MC2	This command was introduced.
12.2(15)MC1	This command was incorporated.
12.3(11)T	This command was incorporated.
12.4(2)MR	This command was incorporated.

Usage Guidelines

In the **standby** *group* **name** *group-name* command, if you omit the *group-name* or if you enter a group name that does not begin with 1 or 2, the configuration will fail and there will be a mismatch in the information displayed by the **show redundancy** and **show standby** commands.

Examples

The following is an example of the output generated by this command.

```
Router# show redundancy
MWR3825 is the Active Router
Previous States with most recent at bottom

 INITL_INITL     Dec 31 19:00:00.000
 LISTN_INITL     Feb 28 19:00:15.568
 LISTN_LISTN     Feb 28 19:00:15.568
 SPEAK_LISTN     Feb 28 19:00:18.568
 SPEAK_SPEAK     Feb 28 19:00:18.568
 STDBY_SPEAK     Mar 19 08:54:26.191
 ACTIV_SPEAK     Mar 19 08:54:26.191
 ACTIV_STDBY     Mar 19 08:54:26.191
 ACTIV_ACTIV     Mar 19 08:54:26.191
 INITL_ACTIV     Mar 19 08:56:22.700
 INITL_INITL     Mar 19 08:56:22.700
 INITL_LISTN     Mar 19 08:56:28.544
 LISTN_LISTN     Mar 19 08:56:28.652
 LISTN_SPEAK     Mar 19 08:56:31.544
 SPEAK_SPEAK     Mar 19 08:56:31.652
 SPEAK_STDBY     Mar 19 08:56:34.544
 SPEAK_ACTIV     Mar 19 08:56:34.544
 STDBY_ACTIV     Mar 19 08:56:34.652
 ACTIV_ACTIV     Mar 19 08:56:34.652
 INITL_ACTIV     Mar 19 10:20:41.455
 INITL_INITL     Mar 19 10:20:41.455
 INITL_LISTN     Mar 19 10:20:49.243
```

```
LISTN_LISTN     Mar 19 10:20:49.299
LISTN_SPEAK     Mar 19 10:20:52.244
SPEAK_SPEAK     Mar 19 10:20:52.300
SPEAK_STDBY     Mar 19 10:20:55.244
STDBY_STDBY     Mar 19 10:20:55.300
ACTIV_STDBY     Mar 19 10:21:01.692
ACTIV_ACTIV     Mar 19 10:21:01.692
```

Related Commands

Command	Description
mode y-cable	Invokes y-cable mode.
redundancy	Invokes redundancy mode.
standalone	Specifies whether the Cisco 3825 router is used in a redundant or standalone configuration.
standby	Sets HSRP attributes.
standby use-interface	Specifies the interfaces to be used for health and revertive interfaces.

show umts-iub congestion

To display history of the UMTS congestion, use the **show umts-iub congestion** command in privileged EXEC mode.

show umts-iub congestion

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(4)MR1	This command is introduced.

Examples

The following is an example of the output generated by this command.

```
Router# show umts congestion atm 0/0/1
UMTS(ATM0/0/1):
    Congestion: ON
    Throttled ATM cells: 415801
    Last congestion time: Dec 13 18:09.858 duration: 0h 0m 53s
```

Related Commands

Command	Description
clear umts-iub	Clears the statistics displayed.

show umts-iub efficiency

To display history of the UMTS interface efficiency averages at 1 second, 5 seconds, 1 minute, 5 minutes, and 1 hour intervals, use the **show umts-iub efficiency** command in privileged EXEC mode. Efficiency is defined as the percentage of bandwidth savings obtained by using the compression/decompression algorithm to suppress GSM data.

show umts-iub efficiency [**history**]

Syntax Description

history	Creates a graph display of the efficiency.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router# show umts eff
Router# show umts efficiency atm 0/0/1
UMTS(ATM0/0/1): efficiency (1sec/5sec/1min/5min/1hr) units(%%)
   decompression efficiency (100/100/100/100/---)
     compression efficiency (100/100/100/100/---)
```

Related Commands

Command	Description
clear umts-iub	Clears the statistics displayed.

show umts-iub errors

To display the error statistics of the UMTS Iub interface, use the **show umts-iub errors** command in privileged EXEC mode.

show umts-iub errors

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following are examples of the output generated by this command.

Example 1:

Receiving traffic from shorthaul when the peering connection is not connected with the remote router yet.

```
Router# show umts errors atm 0/0/1
UMTS-Iub(ATM0/0/1): backhaul_peer_not_ready ========= 5

5 is the number of packets received from shorthaul.
```

Example 2

The peering connection is up and shorthaul is receiving traffic from a pvc that's *NOT* configured on the remote peering router’s shorthaul.

```
Router# show umts errors atm 0/0/1
UMTS-Iub(ATM0/0/1):     no_remote_pvc =============== 5

5 is also the number of packets.
```

Example 3

Error statistics that the code keeps track of if the number is not zero.

```
Router# show umts errors

UMTS-Iub(ATM1/1/1): backhaul_peer_not_ready ===== 6
UMTS-Iub(ATM1/1/1): no_remote_pvc ============== 6
UMTS-Iub(ATM1/1/1): backhaul_invalid_pak ======== 1
UMTS-Iub(ATM1/1/1): decompression_failures ====== 1
UMTS-Iub(ATM1/1/1):     no_shorthaul_pak_available == 1
UMTS-Iub(ATM1/1/1): compression_failures ======== 1
UMTS-Iub(ATM1/1/1):     no_backhaul_pak_available === 1
UMTS-Iub(ATM1/1/1):     no_backhaul_interface ======= 1
UMTS-Iub(ATM1/1/1):     backhaul_interface_down ===== 1
```

```
UMTS-Iub(ATM1/1/1):     backhaul_encap_failures ===== 1
UMTS-Iub(ATM1/1/1):     umts_encap_failures ========= 1
UMTS-Iub(ATM1/1/1):     no_local_pvc ================ 1
UMTS-Iub(ATM1/1/1):     no_remote_pvc =============== 1
```

Related Commands

Command	Description
clear umts-iub	Clears the statistics displayed.

show umts-iub packets

To display packet statistics of the UMTS-Iub interface, use the **show umts-iub packets** command in privileged EXEC mode.

show umts-iub packets

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)MR	This command was introduced.
12.4(4)MR	The command output was modified to include information related to the exceeding of the Maximum Transmission Unit (MTU) of the backhaul link (see Note).

Examples

The following is an example of the output generated by this command.

```
Router# show umts packets atm 0/1/0
UMTS-Iub(ATM0/1/0): packets:
  rxUMTS_count ================ 288799
  txUMTS_count ================ 288799
  rxUMTS_bytes ================ 13862352
  txUMTS_bytes ================ 13862352
  rxBackhaul_packets ========== 238484
  txBackhaul_packets ========== 247328
  rxBackhaul_bytes ============ 156844691
  txBackhaul_bytes ============ 15736957
    txBackhaul_pak_overrun ====== 0
```

Note The txBackhaul_pak_overrun line in the **show umts packets** command represents the number of times that the MTU of the backhaul link was exceeded. It does not indicate a major problem, nor does it indicate any loss of data. However, if you choose a umts backhaul-timer that is too large, then the amount of data that is available during that time period may exceed the allowed MTU of the backhaul causing 2 backhaul packets to be sent. This reduces the umts backhaul efficiency. The allowed MTU is 450 bytes for Multi-Link Point-to-Point Protocol (MLPPP) backhauls and for other backhaul interfaces, such as GE, the allowed MTU is the physical interface MTU less the backhaul packet overhead (which is approximately 4 bytes).

show umts-iub peering

To display the peering status, statistics, and history of the UMTS Iub interface, use the **show umts-iub peering** command in privileged EXEC mode.

show umts-iub peering [**details**]

Syntax Description

details	Provides detail information about peering.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)MR	This command was introduced.
12.4(4)MR	This command added IMA in the output, how traffic for a PVC is off loaded to an alternate backhaul, and how alarms are carried over primary backhaul.

Examples

The following are examples of the output generated by this command.

Example 1

```
Router# show umts peering atm 0/0/1
UMTS-Iub(ATM0/0/1): Peering Information
UMTS-Iub(ATM0/0/1):      Local (40.40.40.40:6666) States:
UMTS-Iub(ATM0/0/1):           Connect State: OPEN
UMTS-Iub(ATM0/0/1):           Redundancy State: ACTIVE
UMTS-Iub(ATM0/0/1):           Alarm State: RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/0/1):Version: 1
UMTS-Iub(ATM0/0/1):      Remote (40.40.40.41:6666) States:
UMTS-Iub(ATM0/0/1):           Alarm State: RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/0/1):           Version: 1
```

Example 2

```
Router# show umts peering detail atm 0/0/1
UMTS-Iub(ATM0/0/1): Peering Information (Version 1)
 05/15/02 02:35:50 AM: BACKHAUL UP     INIT     --> CLOSED
 05/15/02 02:35:50 AM: OPEN            CLOSED   --> CON_SENT
 05/15/02 02:35:50 AM: CLOSE           CON_SENT --> CLOSING
 05/15/02 02:35:50 AM: OPEN            CLOSING  --> STOPPING
 05/15/02 02:35:59 AM: TIMEOUT-        STOPPING --> STOPPED
 05/15/02 02:36:28 AM: OPEN            STOPPED  --> CON_SENT
 05/15/02 02:36:28 AM: RCR+            CON_SENT --> ACK_SENT
 05/15/02 02:36:28 AM: RCA             ACK_SENT --> OPEN


 03/01/02 12:00:37 AM: Local RX(NOT AVAILABLE) TX(NOT AVAILABLE),  Remote RX(NOT
AVAILABLE) TX(NOT AVAILABLE)
 05/15/02 02:35:52 AM: Local RX(NO ALARM     ) TX(NO ALARM     ),  Remote RX(NOT
AVAILABLE) TX(NOT AVAILABLE)
 05/15/02 02:36:28 AM: Local RX(NO ALARM     ) TX(NO ALARM     ),  Remote RX(NO ALARM
) TX(NO ALARM     )
```

```
Peer Info:
 No Backhaul Interface ======= 5 packets
 Backhaul Encap Failures ===== 2 packets
 RX Ctrl Paks ================ 62 packets
 RX Ctrl Bytes =============== 2078 bytes
 TX Ctrl Paks ================ 62 packets
 TX Ctrl Bytes =============== 1365 bytes
 Out Of Sequence Paks ======== 0 packets
 Backhaul QOS classify drops = 0 packets
 Version Mismatch ============ 0 packets
 Shorthaul Mismatch ========== 0 times

Peer Errors:
 No Pak Mem ================== 0 (times)
 No Event Mem ================ 0 (times)
 No VC Mem =================== 0 (times)
 No Alarm Link Mem =========== 0 (times)
 No Print Buf ================ 0 (times)
 Unknown Msg Type ============ 0 (times)
 Unexpected Attrs ============ 0 (times)
 RX Msg Length Err =========== 0 (times)
 Retransmit Counter Err ====== 0 (times)
 NULL Retransmit Err ========= 0 (times)
 PVC Delete Mismatch ========= 0 (times)
 PVC Add Existing ============ 0 (times)
```

Example 3 with IMA

```
Router# show umts peering
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0): Peering Information
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):      Local (20.20.20.21:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Connect State: OPEN
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/0/0): RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/0/1): RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):      Remote (20.20.20.20:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA0):           Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/0/0):           RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/0/1):           RX(NO ALARM)       TX(NO ALARM)
```

Note In the previous output, the local shorthaul/interface name appears before the dash (–), and the remote shorthaul/interface name appears after the dash (–).

Example 4 with Alternate Backhaul (192.168.10.2 to 192.168.10.1)

```
Router# show umts peering
UMTS-Iub(ATM0/IMA0): Peering Information
UMTS-Iub(ATM0/IMA0):   Local (20.20.20.21:6666) States:
UMTS-Iub(ATM0/IMA0):       Connect State: OPEN
UMTS-Iub(ATM0/IMA0):       Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0):       Version: 3
UMTS-Iub(ATM0/IMA0):       Alarm State:
UMTS-Iub(ATM0/0/0) ID(1):       RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/0/1) ID(2):       RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/IMA0):   Remote (20.20.20.20:6666) States:
UMTS-Iub(ATM0/IMA0):       Version: 3
```

```
UMTS-Iub(ATM0/IMA0):       Alarm State:
UMTS-Iub(ATM0/0/0) ID(1):       RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/0/1) ID(2):       RX(NO ALARM) TX(NO ALARM)

UMTS-Iub(ATM0/IMA0.1): Peering Information
UMTS-Iub(ATM0/IMA0.1):   Local (192.168.10.2:6666) States:
UMTS-Iub(ATM0/IMA0.1):       Connect State: OPEN
UMTS-Iub(ATM0/IMA0.1):       Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0.1):       Version: 3
UMTS-Iub(ATM0/IMA0.1):   Remote (192.168.10.1:6666) States:
UMTS-Iub(ATM0/IMA0.1):       Version: 3
```

Example 5 with Alarms over Primary Backhaul

```
Router# show umts peering
UMTS-Iub(ATM0/IMA0): Peering Information
UMTS-Iub(ATM0/IMA0):   Local (20.20.20.21:6666) States:
UMTS-Iub(ATM0/IMA0):       Connect State: OPEN
UMTS-Iub(ATM0/IMA0):       Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0):       Version: 3
UMTS-Iub(ATM0/IMA0):       Alarm State:
UMTS-Iub(ATM0/0/0) ID(1):       RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/0/1) ID(2):       RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/IMA0):   Remote (20.20.20.20:6666) States:
UMTS-Iub(ATM0/IMA0):       Version: 3
UMTS-Iub(ATM0/IMA0):       Alarm State:
UMTS-Iub(ATM0/0/0) ID(1):       RX(NO ALARM) TX(NO ALARM)
UMTS-Iub(ATM0/0/1) ID(2):       RX(NO ALARM) TX(NO ALARM)

UMTS-Iub(ATM0/IMA0.1): Peering Information
UMTS-Iub(ATM0/IMA0.1):   Local (192.168.10.2:6666) States:
UMTS-Iub(ATM0/IMA0.1):       Connect State: OPEN
UMTS-Iub(ATM0/IMA0.1):       Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0.1):       Version: 3
UMTS-Iub(ATM0/IMA0.1):   Remote (192.168.10.1:6666) States:
UMTS-Iub(ATM0/IMA0.1):       Version: 3
```

Example 6 with Congestion Control Status

```
Router# show umts-iub peering atm 0/ima0
UMTS-Iub(ATM0/IMA0): Peering Information
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):       Local (20.20.20.21:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Connect State: OPEN
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Redundancy State: ACTIVE
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Congestion Control: ON
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/2):                    RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/3):                    RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):       Remote (20.20.20.20:6666) States:
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Version: 4
UMTS-Iub(ATM0/IMA0 - ATM0/IMA1):            Alarm State:
UMTS-Iub(ATM0/0/0 - ATM0/2):                    RX(NO ALARM)       TX(NO ALARM)
UMTS-Iub(ATM0/0/1 - ATM0/3):                    RX(NO ALARM)       TX(NO ALARM)
```

Related Commands

Command	Description
clear umts-iub	Clears the statistics displayed.

show umts-iub pvc

To display the pvc mapping of the UMTS Iub interface, use the **show umts-iub pvc** command in privileged EXEC mode.

show umts-iub pvc

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router# show umts pvc
UMTS(ATM0/0/1): VCD info
VCD Mapping:
  Local Index(1) <--> Local VCD(1) <--> Remote Index(1)



Local VCDs (not sent):

Local VCDs (sent):
  Index(1), VPI/VCI(2/100), Encap(6), SC(0), Peak(1920), Avg/Min(0), Burst Cells(0)

Remote VCDs:
  Index(1), VPI/VCI(2/100), Encap(6), SC(0), Peak(1920), Avg/Min(0), Burst Cells(0)
```

show umts-iub traffic

To display traffic rates, in bits per second, at 1 second, 5 seconds, 1 minute, 5 minutes, and 1 hour intervals for UMTS data transmitted and received over the backhaul, use the **show umts-iub traffic** command in privileged EXEC mode.

show umts-iub traffic

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(12)MR	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router# show umts-iub traffic

UMTS-Iub(ATM1/0/0.1): traffic (1sec/5sec/1min/5min/1hr) units(bps)
     compression traffic(  2400/  2496/  2495/  2496/  203)
   decompression traffic( 81120/ 81120/ 80989/ 81006/ 6287)
UMTS-Iub(ATM1/0/0.2): traffic (1sec/5sec/1min/5min/1hr) units(bps)
     compression traffic(  0/  0/  4/  4/  1)
   decompression traffic(  0/  0/ 19/ 19/  2)
```

Related Commands

Command	Description
clear umts-iub	Clears the statistics displayed.

show xconnect all

To display information about xconnect attachment circuits and pseudowires (PWs), use the **show xconnect all** command in the privileged EXEC mode.

show xconnect {**all** | **interface** *interface* | **peer** *ip-address* {**all** | **vcid** *vcid*}} [**detail**]

Syntax Description

all	Displays information about all xconnect attachment circuits and PWs.
interface *interface*	Displays information about xconnect attachment circuits and PWs on the specified interface. Valid values for the interface argument are as follows: • **atm** *numbe*r—Displays xconnect information for a specific ATM interface or subinterface. • **atm** *number* **vp** *vpi-value*—Displays virtual path (VP) xconnect information for a specific ATM virtual path identifier (VPI). This command does not display information about virtual connection (VC) xconnects using the specified VPI. • **atm** *number* **vp** *vpi-value/vci-value*—Displays VC xconnect information for a specific ATM VPI and virtual circuit identifier (VCI) combination. • **ethernet** ***number***—Displays port-mode xconnect information for a specific Ethernet interface or subinterface. • **fastethernet** *number*—Displays port-mode xconnect information for a specific Fast Ethernet interface or subinterface. • **serial** *number*—Displays xconnect information for a specific serial interface. • **serial** *number dlci-number*—Displays xconnect information for a specific Frame Relay data-link connection identifier (DLCI).
peer *ip-address* {**all** | **vcid** *vcid*}	Displays information about xconnect attachment circuits and PWs associated with the specified peer IP address. • **all**—Displays all xconnect information associated with the specified peer IP address. • **vcid** *vcid*—Displays xconnect information associated with the specified peer IP address and the specified VC ID.
detail	(Optional) Displays detailed information about the specified xconnect attachment circuits and PWs.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(31)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.4(11)T	This command was integrated into Cisco IOS Release 12.4(11)T.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
12.4(16)MR	This command was integrated into Cisco IOS Release 12.4(16)MR.

Usage Guidelines

The **show xconnect all** command can be used to display, sort, and filter basic information about all xconnect attachment circuits and PWs.

You can use the **show xconnect all** command output to help determine the appropriate steps to troubleshoot an xconnect configuration problem. More specific information about a particular type of xconnect can be displayed using the commands listed in the Related Commands table.

Examples

The following example shows **show xconnect all** command output in the brief (default) display format.

The sample output shows information about the interfaces and VCs that have been configured to transport various Layer 2 packets on the router:

```
Router# show xconnect all

Legend: XC ST=Xconnect State, S1=Segment1 State, S2=Segment2 State
UP=Up, DN=Down, AD=Admin Down, IA=Inactive, NH=No Hardware
XC ST     Segment 1                          S1 Segment 2                         S2
------+--------------------------------+--+--------------------------------+--
UP     ac   Et0/0(Ethernet)             UP mpls 10.55.55.2:1000            UP
UP     ac   Et1/0.1:200(Eth VLAN)       UP mpls 10.55.55.2:5200            UP
IA pri ac   Et1/0.2:100(Eth VLAN)       UP ac   Et2/0.2:100(Eth VLAN)      UP
UP sec ac   Et1/0.2:100(Eth VLAN)       UP mpls 10.55.55.3:1101            UP
```

Table A-6 describes the significant fields shown in the display.

Table A-6 show xconnect all Field Descriptions

Field	Description
XC ST	• State of the xconnect attachment circuit or PW. Valid states are: • UP—The xconnect attachment circuit or PW is up. Both segment 1 and segment 2 must be up for the xconnect to be up. • DN—The xconnect attachment circuit or PW is down. Either segment 1, segment 2, or both segments are down. • IA—The xconnect attachment circuit or PW is inactive. This state is valid only when PW redundancy is configured. • NH—One or both segments of this xconnect no longer has the required hardware resources available to the system.
Segment1 or Segment2	Information about the type of xconnect, the interface type, and the IP address the segment is using. Types of xconnects are: • ac—Attachment circuit. • pri ac—Primary attachment circuit. • sec ac—Secondary attachment circuit. • mpls—Multiprotocol Label Switching. • l2tp—Layer 2 Tunnel Protocol.

Table A-6 show xconnect all Field Descriptions (continued)

Field	Description
S1 or S2	State of the segment. Valid states are: • UP—The segment is up. • DN—The segment is down. • AD—The segment is administratively down.

The following example shows **show xconnect al**l command output in the detailed display format:

```
Router# show xconnect all detail

Legend: XC ST=Xconnect State, S1=Segment1 State, S2=Segment2 State
UP=Up, DN=Down, AD=Admin Down, IA=Inactive, NH=No HardwareXC
ST     Segment 1                         S1 Segment 2                          S2
------+---------------------------------+--+----------------------------------+--
UP     ac   Et0/0(Ethernet)              UP mpls 10.55.55.2:1000               UP
            Interworking: ip                     Local VC label 16
                                                 Remote VC label 16
                                                 pw-class: mpls-ip
UP     ac   Et1/0.1:200(Eth VLAN)        UP mpls 10.55.55.2:5200               UP
            Interworking: ip                     Local VC label 17
                                                 Remote VC label 20
                                                 pw-class: mpls-ip
IA pri ac   Et1/0.2:100(Eth VLAN)        UP ac   Et2/0.2:100(Eth VLAN)         UP
            Interworking: none                   Interworking: none
UP sec ac   Et1/0.2:100(Eth VLAN)        UP mpls 10.55.55.3:1101               UP
            Interworking: none                   Local VC label 23
                                                 Remote VC label 17
                                                 pw-class: mpls
```

The additional fields displayed in the detailed output are self-explanatory.

Related Commands

Command	Description
show atm pvc	Displays all ATM PVCs and traffic information.
show atm vc	Displays all ATM PVCs and SVCs and traffic information.
show atm vp	Displays the statistics for all VPs on an interface or for a specific VP.
show connect	Displays configuration information about drop-and-insert connections that have been configured on a router.
show frame-relay pvc	Displays statistics about PVCs for Frame Relay interfaces.
show interfaces	Displays statistics for all interfaces configured on the router or access server.
show l2tun session	Displays the current state of Layer 2 sessions and protocol information about L2TP control channels.
show mpls l2transport binding	Displays VC label binding information.
show mpls l2transport vc	Displays information about AToM VCs that have been enabled to route Layer 2 packets on a router.

snmp-server enable traps ipran

To enable all ipran notifications via Simple Network Management Protocol (SNMP) notifications (traps) available on your system, use the **snmp-server enable traps ipran** command in global configuration mode. To disable ipran alarm-gsm notifications, use the **no** form of this command.

snmp-server enable traps ipran

no snmp-server enable traps ipran

Related Commands

This command has no arguments or keywords.

Defaults

This command is disabled by default. No notifications are sent.

Command Modes

Global configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router(config)# snmp-server enable traps ipran
```

Related Commands

Command	Description
snmp-server enable traps ipran alarm-gsm	Provides information alarms associated with GSM-Abis interfaces.
snmp-server enable traps ipran alarm-umts	Provides information alarms associated with UMTS-Iub interfaces.
snmp-server enable traps ipran util	Provides information on backhaul utilization.

snmp-server enable traps ipran alarm-gsm

To provide information alarms associated with GSM-Abis interfaces via Simple Network Management Protocol (SNMP) notifications (traps) available on your system, use the **snmp-server enable traps ipran alarm-gsm** command in global configuration mode. To disable ipran alarm-gsm notifications, use the **no** form of this command.

snmp-server enable traps ipran alarm-gsm

no snmp-server enable traps ipran alarm-gsm

This statement controls the generation of the cisco IpRanBackHaulGsmAlarm notification from the CISCO-IP-RAN-BACKHAUL-MIB.

Syntax Description

This command has no arguments or keywords.

Defaults

This command is disabled by default. No notifications are sent.

Command Modes

Global configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router(config)# snmp-server enable traps ipran alarm-gsm
```

Related Commands

Command	Description
snmp-server enable traps ipran alarm-umts	Provides information alarms associated with UMTS-Iub interfaces.
snmp-server enable traps ipran util	Provides information on backhaul utilization.
snmp-server enable traps ipran	Enables all notifications.

snmp-server enable traps ipran alarm-umts

To provide information alarms associated with UMTS-Iub interfaces via Simple Network Management Protocol (SNMP) notifications (traps) available on your system, use the **snmp-server enable traps ipran alarm-umts** command in global configuration mode. To disable ipran alarm-umts notifications, use the **no** form of this command.

snmp-server enable traps ipran alarm-umts

no snmp-server enable traps ipran alarm-umts

This statement controls the generation of the cisco IpRanBackHaulUmtsAlarm notification from the CISCO-IP-RAN-BACKHAUL-MIB.

Syntax Description

This command has no arguments or keywords.

Defaults

This command is disabled by default. No notifications are sent.

Command Modes

Global configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.

Examples

The following is an example of the output generated by this command.

```
Router(config)# snmp-server enable traps ipran alarm-umts
```

Related Commands

Command	Description
snmp-server enable traps ipran alarm-gsm	Provides information alarms associated with GSM-Abis interfaces.
snmp-server enable traps ipran util	Provides information on backhaul utilization.
snmp-server enable traps ipran	Enables all notifications.

snmp-server enable traps ipran util

To provide information alarms associated with backhaul utilization via Simple Network Management Protocol (SNMP) notifications (traps) available on your system, use the **snmp-server enable traps ipran util** command in global configuration mode. To disable ipran alarm-gsm notifications, use the **no** form of this command.

snmp-server enable traps ipran util

no snmp-server enable traps ipran util

Syntax Description

This command has no arguments or keywords.

Defaults

This command is disabled by default. No notifications are sent.

Command Modes

Global configuration

Command History

Release	Modification
12.4(2)MR1	This command was introduced.
12.4(9)MR	Support for utilization notification has been removed and the command is provided only to maintain compatibility.

Examples

The following is an example of the output generated by this command.

```
Router(config)# snmp-server enable traps ipran util
```

Related Commands

Command	Description
snmp-server enable traps ipran alarm-gsm	Provides information alarms associated with GSM-Abis interfaces.
snmp-server enable traps ipran alarm-umts	Provides information alarms associated with UMTS-Iub interfaces.
snmp-server enable traps ipran	Enables all notifications.
ipran-mib backhaul-notify-interval	Specifies the interval used to calculate the utilization.
ipran-mib threshold-acceptable	Specifies the acceptable level of traffic.
ipran-mib threshold-overloaded	Specifies the amount of traffic that indicates the backhaul is overloaded.
ipran-mib threshold-warning	Specifies the amount of traffic that indicates the backhaul is carrying traffic sufficient to impact performance, but is not overloaded.

standalone

To specify that the Cisco 3825 router is being used in a standalone configuration (which impacts the relays on the VWIC/HWIC), use the **standalone** command in y-cable configuration mode. To use the router in a redundant configuration, use the **no** form of this command.

[**no**] **standalone**

Syntax Description

This command has no arguments or keywords.

Defaults

By default, the Cisco 3825 router is configured to be used in a redundant configuration (**no standalone**) and the relays are open.

Command Modes

Y-cable configuration

Command History

Release	Modification
12.2(8)MC2	This command was introduced.
12.2(15)MC1	This command was incorporated.
12.3(11)T	This command was incorporated.
12.4(2)MR	This command was incorporated.

Usage Guidelines

Issuing the **standalone** command closes the relays on the VWICs/HWICs installed in the Cisco 3825 router.

Examples

The following example closes the relays so that the router can be used as a standalone device.

```
Router# standalone
```

Related Commands

Command	Description
mode y-cable	Invokes y-cable mode.
standby use-interface	Specifies the interfaces to be used for health and revertive interfaces.

standby use-interface

To designate a loopback interface as a health or revertive interface, use the **standby use-interface** command in y-cable configuration mode.

standby use-interface *interface* {**health** | **revertive** | **backhaul**}

Syntax Description

interface	Interface to be used with the specified parameter. For **health** and **revertive**, this is the loopback interface that is specified in the **standby track** command. For **backhaul**, the interface must be an MLPPP interface. If you want to use a serial interface as the backhaul, you must first configure that interface to be part of an MLPPP bundle.
health	Interface that will the router for an overtemperature condition, the state of the processor, and the state of the T1/E1 firmware. If any of these conditions indicates a failure, this interface is brought down. Otherwise, the health interface remains in the up state.
revertive	Interface that acts as the revertive interface. If the Cisco 3825 router changes state from active to standby, the revertive interface is brought up. If the router changes state from standby to active, the revertive interface is brought down.
backhaul	Interface to be used for backhauling.

Defaults

By default, the Cisco 3825 is configured to be used in a redundant configuration (**no standalone**) and the relays are open.

Command Modes

Y-cable configuration

Command History

Release	Modification
12.2(8)MC2	This command was introduced.

Usage Guidelines

The loopback interfaces that you specify for the health and revertive interfaces must be the same loopback interfaces that you specified in the **standby track** command. In the **standby track** command, the decrement value for the revertive interface should always be less than that for other interfaces. We recommend that you use loopback101 for health and loopback102 for revertive.

The interface that you specify for the backhaul must be an MLPPP interface. If you want to use a serial interface as the backhaul, you must first configure that interface to be part of an MLPPP bundle. We recommend you that use multilink1 for the backhaul interface.

Examples

The following example specifies loopback101 as the health interface and loopback102 as the revertive interface:

```
Router# standby use-interface loopback101 health
Router# standby use-interface loopback102 revertive
Router# standby use-interface multilink1 backhaul
```

Related Commands

Command	Description
mode y-cable	Invokes y-cable mode.
redundancy	Invokes redundancy mode.
standalone	Specifies whether the Cisco 3825 router is used in a redundant or stand-alone configuration.
standby	Sets HSRP attributes.

umts-iub backhaul-oam

To configure the local parameters required to provide OAM cells received on the UMTS ATM interface to be sent across the backhaul, use the **umts-iub backhaul-oam** Interface configuration command. To not transport the OAM cells across the backhaul, use the **no** form of this command.

Note When using the **no** form of the command, the end devices may only use OAM loopback cells. I.610 OAM messages are not supported by the Cisco 3825 router; therefore, if you are using this mode, OAM cells should be backhauled.

Additionally, the **pvc-oam manage** Interface configuration for ATM-VC commands at the PVC configuration level should be enabled for UMTS PVCs on the Cisco 3825 router. These PVCs will respond to OAM cells if the no version of the **umts-iub backhaul-oam** command is used.

umts-iub backhaul-oam

Syntax Description

This command has no arguments or keywords.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to configure the local parameters:

```
Router(config)# interface ATM0/2/0
Router(config-if) atm umts-iub
Router(config-if) umts-iub local 10.10.10.2 5504
Router(config-if) umts-iub backhaul-oam
```

umts-iub backhaul-timer

To determine how often backhaul packets are sent for UMTS, use the **umts-iub backhaul-timer** Interface configuration command. This option is commonly used for High Speed Downlink Data Packet Access (HSDPA) offload environments. HSDPA traffic requires much more bandwidth than voice/signaling traffic on UMTS. Customers can offload the HSDPA traffic to an alternate backhaul media, such as metro-Ethernet while still maintaining low latency traffic (voice/signaling) on the existing T1/E1s. By configuring a separate UMTS peer for the HSPDA interface(s) and a timer value in the 3 ms to 8 ms range, customers can reduce CPU utilization on the Cisco 3825 router and save backhaul costs by sending HSDPA across the lower cost metro-Ethernet.

Note The value should be carefully selected. Typically, it should not exceed 2 ms when the backhaul is T1/E1 MLPPP. However for alternate backhaul Frame Forwarding (FF) or Gigabit Ethernet (GE), this value can be selected at a greater value to reduce the CPU load on the platform. Depending on the load the UMTS interface and timer selected, the UMTS payload could exceed the Maximum Transmission Unit (MTU). In this case, the backhaul packets will be sent when they reach the backhaul MTU (for non-MLPPP backhauls). A maximum MTU of 450 bytes is used for MLPPP backhauls.

umts-iub backhaul-timer ? [*1-8*] **timer value(in ms)**

Syntax Description

This command has no arguments or keywords.

Defaults

Timer value of 1 ms.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(4)MR	This command was introduced.

Examples

The following example shows how to determine how often the backhaul packets are sent for UMTS:

```
Router(config)# interface a0/3/0
Router(config-if) umts-iub backhaul-timer ?
<1-8> timer value(in msec)
Router(config-if)#
```

umts-iub congestion-control

To enable control under the UMTS shorthaul interface, use the **umts-iub congestion-control** Interface configuration command.

umts-iub congestion-control

Syntax Description

This command has no arguments or keywords.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(4)MR1	This command was introduced.

Examples

The following example shows how to enable congestion control under UMTS shorthaul interface:

```
Router(config-if) umts-iub congestion-control
```

Related Commands

Command	Description
umts-iub congestion control priority	Configures the congestion control priority under UMTS.

umts-iub congestion priority

To configure the congestion control priority for UMTS, use the **umts-iub congestion priority** PVC configuration command.

umts-iub congestion priority [*protected*] [*2-9*]

Syntax Description

protected	The highest priority traffic which will never be throttled during congestion.
2-9	The congestion priority with 2 being the highest and 9 being the lowest priority. Lower priority traffic are throttled before higher priority traffic.

Defaults

The default setting is 9.

Command Modes

PVC configuration

Command History

Release	Modification
12.4(4)MR1	This command was introduced.

Examples

The following example shows how to configure the UMTS congestion priority:

```
Router(config-if) pvc 2/1 qsaal
Router(config-if-atm-vc) umts-iub congestion priority protected
```

Related Commands

Command	Description
umts-iub congestion-control	Enables the congestion control under the UMTS shorthaul interface.

umts-iub local

To configure the local parameters required to establish an Internet Protocol/User Datagram Protocol (IP/UDP) backhaul connection for use with the ATM path on the UMTS Iub interface, use the **umts-iub local** Interface configuration command.

umts-iub local [**ip-address**] [*port*]

Syntax Description

ip-address	(Optional) The IP address for the entry you wish to establish.
port	(Optional) The port you want to use for the entry you wish to establish.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to configure the local parameters:

```
Router(config)# interface ATM0/2/0
Router(config-if) atm umts-iub
Router(config-if) umts-iub local 10.10.10.2 5504
```

Related Commands

Command	Description
umts-iub remote	Configures the remote parameters for an IP/UDP backhaul connection.

umts-iub remote

To configure the remote parameters required to establish an Internet Protocol/User Datagram Protocol (IP/UDP) backhaul connection for use with the ATM path on the UMTS Iub interface, use the **umts-iub local** Interface configuration command.

umts-iub remote [**ip-address**] [*port*]

Syntax Description

ip-address	(Optional) The IP address for the entry you wish to establish.
port	(Optional) The port you want to use for the entry you wish to establish.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(2)MR	This command was introduced.

Examples

The following example shows how to configure the remote parameters:

```
Router(config)# interface ATM0/2/0
Router(config-if) atm umts-iub
Router(config-if) umts-iub remote 10.10.10.1 5502
```

Related Commands

Command	Description
umts-iub local	Configures the local parameters for an IP/UDP backhaul connection.

umts-iub set dscp

To mark a packet by setting the differential services code point (DSCP) for UMTS-Iub value for the backhaul packet including the peering and data generated from the shorthaul, use the **umts-iub set dscp** Interface configuration command.

umts-iub set dscp *value*

Note Use this command when configuring UMTS shorthaul interfaces.

Syntax Description

value	A number from 0 to 63 or hex value that sets the UMTS-Iub DSCP value.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(4)MR	This command was introduced.

Examples

The following example shows how to configure the parameters:

```
Router(config)# interface ATM0/2/0
Router(config-if) atm umts-iub
Router(config-if) umts-iub set dscp [value]
```

Related Commands

Command	Description
umts-iub set peering dscp	This command overwrites the interface default value defined in the **umts-iub set dscp** *value* and is used to tag peering backhaul packet.

umts-iub set dscp

To overwrite the interface default value defined in the **umts-iub set dscp** *value* for UMTS shorthaul interfaces and is used to tag the backhaul packet generated from traffic from a PVC, use the **umts-iub set dscp** ATM-VC configuration command.

umts-iub set dscp *value*

Note Use this command when configuring PVCs of the UMTS shorthaul interfaces

Syntax Description

value	A number from 0 to 63 or hex value that sets the UMTS-Iub DSCP value.

Defaults

There are no default settings or behaviors.

Command Modes

ATM-VC configuration

Command History

Release	Modification
12.4(4)MR	This command was introduced.

Examples

The following example shows how to configure the remote parameters:

```
Router(config)# interface ATM0/2/0
Router(config-if)# atm umts-iub
Router(config-if)# umts-iub set dscp value
Router(config-if-atm-vc)# umts-iub set dscp value
```

Related Commands

Command	Description
umts-iub set dscp (Interface Configuration mode)	This command sets the description value used as the interface default description value to tag the backhaul packet including the peering and data generated from the shorthaul
umts-iub set peering dscp	This command overwrites the interface default value defined in the **umts-iub set dscp** *value* and is used to tag the peering backhaul packet

umts-iub set peering dscp

To overwrite the interface default value defined in the **umts-iub set dscp** *value* and is used to tag the peering backhaul packet, use the **umts-iub set peering dscp** Interface configuration command.

umts-iub set peering dscp *value*

Note Use this command when configuring UMTS shorthaul interfaces.

Syntax Description

value	A number from 0 to 63 that sets the UMTS-Iub DSCP value.

Defaults

There are no default settings or behaviors.

Command Modes

Interface configuration

Command History

Release	Modification
12.4(4)MR	This command was introduced.

Examples

The following example shows how to configure the parameters:

```
Router(config)# interface ATM0/2/0
Router(config-if) atm umts-iub
Router(config-if) umts-iub set dscp value
```

Related Commands

Command	Description
umts-iub set dscp (Interface Configuration mode)	This command sets the description value used as the interface default description value to tag the backhaul packet including the peering and data generated from the shorthaul.
umts-iub set dscp (ATM-VC Configuration mode)	This command overwrites the interface default value defined in the **umts-iub set dscp** *value* for UMTS shorthaul interfaces and is used to tag the backhaul packet generated from traffic from a PVC

umts local

To configure local ip address for the atm subinterfaces, use the **umts local** Sub-Interface configuration command. This command is used when you want to off load PVC traffic from a physical ATM shorthaul to an alternate backhaul. For each alternate backhaul, you need to create a logical shorthaul by creating an atm subinterface. Traffic for the PVCs configured under this logical shorthaul will go through the corresponding alternate backhaul.

umts local [**ip-address**]

Syntax Description

ip-address	The IP address for the entry you wish to establish.

Command Modes

Sub-Interface configuration

Command History

Release	Modification
12.4(4)MR	This command was introduced.

Examples

The following example illustrates the use of the **umts local** command in Sub-Interface command mode.

```
Router(config)# interface ATM0/2/0
Router(config-if)# atm umts-iub
Router(config-subif)# atm umts
Router(config-subif)# umts local 10.10.10.2 5504
```

Note You do not need to input UDP port. The UDP port number will be inherited automatically from the base atm interface's **umts remote [ip-address] [port]** port configuration.

Related Commands

Command	Description
atm umts	This command enables the UMTS mode for alternate backhaul.
umts remote [ip-address]	This command configures remote IP address for alternate backhaul.

umts remote

To configure local ip address for the atm subinterfaces, use the **umts remote** Sub-Interface configuration command. This command is used when you want to off load one or more PVC's traffic from a physical ATM shorthaul to go over alternate backhaul. For each alternate backhaul, you need to create a logical shorthaul by creating an atm subinterface. Traffic for the PVCs configured under this logical shorthaul will go through the corresponding alternate backhaul.

umts remote [**ip-address**]

Syntax Description

ip-address	The IP address for the entry you wish to establish.

Command Modes

Sub-Interface configuration

Command History

Release	Modification
12.4(4)MR	This command was introduced.

Examples

The following example illustrates the use **umts remote** command.

```
Router(config)# interface ATM0/2/0
Router(config-if)# atm umts-iub
Router(config-subif)# atm umts
Router(config-subif)# umts remote 10.10.10.1 5502
```

Note The port number will be inherited from the base ATM interfaces's remote port number.

Related Commands

Command	Description
atm umts	This command enables the UMTS mode for alternate backhaul.
umts local [ip-address]	This command configures the remote IP address for alternate backhaul.

xconnect

To bind an attachment circuit to a pseudowire (PW), use the **xconnect** command in one of the supported configuration modes. To restore the default values, use the **no** form of this command.

xconnect *peer-ip-address* | *vcid* | *pseudowire-parameters* [**sequencing** {**transmit** | **receive** | **both** | **one-to-one**}] [**ignore-vpi-vci**]

Syntax Description

peer-ip-address	IP address of the remote provider edge (PE) peer.
vcid	The 32-bit identifier of the virtual circuit between the PE routers.
pseudowire-parameters	Encapsulation and pseudowire-class parameters to be used for the attachment circuit. At least one of the following PW parameters must be configured: • **encapsulation** {**l2tpv3** | **mpls**}— Specifies the tunneling method to encapsulate the data in the PW: – **l2tpv3**—Specifies L2TPv3 as the tunneling method. – **mpls**—Specifies MPLS as the tunneling method. • **pw-class** *pw-class-name*—Specifies the pseudowire-class configuration from which the data encapsulation type is taken. This option is mandatory if you select an encapsulation method.
sequencing	(Optional) Sets the sequencing method to be used for packets received or sent. **Note** Sequencing is not supported for CEM circuits.
transmit	Sequences data packets received from the attachment circuit.
receive	Sequences data packets sent into the attachment circuit.
both	Sequences data packets that are both sent and received from the attachment circuit.
one-to-one	Only apply when the **xconnect** command is configured under the AAL0 encapsulation PVC. It specifies the PW type as a one-to-one VCC cell relay.
ignore-vpi-vci	With the **ignore-vpi-vci** keyword configured, the MWR ignores the VPI/VCI value in the PW packet and does a blind rewrite with the local configured AC-side PVC's VPI/VCI value. Only apply when the **xconnect** command is configured under the PVC, which is the N:1 with N=1 special case. Do not apply when the **xconnect** command is configured under the subinterface, which supports N>1.

Defaults

The attachment circuit is not bound to the PW.

Command Modes

CEM circuit configuration

Interface configuration

Subinterface configuration

l2transport configuration (for ATM)

Connect configuration mode Global configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.0(28)S	Support was added for Multilink Frame Relay connections.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.4(11)T	This command was integrated into Cisco IOS Release 12.4(11)T.
12.4(12)MR2	This command was integrated into Cisco IOS Release 12.4(12)MR2.

Usage Guidelines

The combination of the *peer-ip-address* and *vcid* arguments must be unique on the router. Each xconnect configuration must have a unique combination of peer-ip-address and vcid configuration.

Note If the remote router is a Cisco 12000 series Internet router, the *peer-ip-address* argument must specify a loopback address on the router.

The same vcid value that identifies the attachment circuit must be configured using the **xconnect** command on the local and remote PE router. The vcid creates the binding between a PW and an attachment circuit.

The **pw-class** pw-class-name value binds the xconnect configuration of an attachment circuit to a specific pseudowire-class. In this way, the pseudowire-class configuration serves as a template that contains settings used by all attachment circuits bound to it with the **xconnect** command.

Note If you specify the encapsulation keywords, you must specify the **pw-class** keyword.

Keyword ignore-vpi-vci

Using the **xconnect** command with keyword **ignore-vpi-vci** provides benefits over using the **pw-pvc** command for PVC mapping.

Originally, PVC mapping was done through the **pw-pvc pw-vpi/pw-vci** command. When the MWR received the MPLS PW packet, it decoded the PW payload and looked up the PW VPI/VCI value to see if it matched any local configured PVC values. If a match was made, the PW-VPI/PW-VCI was translated to the AC-side VPI/VCI and the cell was sent to the local PVC. Without a match, the MWR dropped the received PW packet. When the MWR generated the PW packet, it used configured **pw-vpi/pw-vci** values. In this case, the PVC mapping was done completely on the MWR and was transparent to the remote end.

The scenario differs when keyword **ignore-vpi-vci** is configured. For N:1 with N=1 special case, when the PW packet is received from the MWR, the receiving router ignores the VPI/VCI value contained in the PW payload. It does a blind rewrite to use the AC-side VPI/VCI and sends the cell to the AC side PVC.

The **xconnect** command with keyword **ignore-vpi-vci** results in the PVC mapping being done in a cooperative way if the MWR works the same way as the receiving router. Without this command, the MWR checks the VPI/VCI value inside PW packet for matches against the local configured PVC or PVC-mapping. With the **ignore-vpi-vci** keyword configured, the MWR ignores the VPI/VCI header inside the received PW packet and does a blind rewrite with the local configured AC-side PVC's VPI/VCI value.

Note This applies only to N:1 VCC PW with N=1 special case.

Examples

The following example illustrates the configured **xconnect** service for an ATM interface by binding the ATM circuit to the PW named 123 with a remote peer 10.0.3.201. The configuration settings in the pseudowire-class named ATM-xconnect are used.

```
Router# config t
Router(config)# interface ATM 0/0/0
Router(config-if)# xconnect 10.0.3.201 123 pw-class ATM-xconnect
Router(config-if-xconn)# exit
Router(config-if)# exit
Router(config)# exit
```

The following example illustrates PVC mapping using the keyword **ignore-vpi-vci** with the **xconnect** command. The example shows both the MWR and remote end (7600) routers.

MWR:

```
Router# config t
Router(config)# interface ATM 0/0
Router(config-if)# pvc 0/10 12transport
Router(config-if-atm-12trans-pvc)# encapsulation aa10
Router(config-if-atm-12trans-pvc)# xconnect 10.10.10.10 100 encapsulation mpls ignore-vpi-vci
Router(config-if-atm-12trans-pvc-xconn)# exit
Router(config-if-atm-12trans-pvc)# exit
Router(config-if)# exit
Router(config)# exit
```

7600:

```
Router# config t
Router(config)# interface ATM 0/0
Router(config-if)# pvc 2/20 12transport
Router(config-if-atm-12trans-pvc)# encapsulation aa10
Router(config-if-atm-12trans-pvc)# xconnect 20.20.20.20 100 encapsulation mpls
Router(config-if-atm-12trans-pvc-xconn)# exit
Router(config-if-atm-12trans-pvc)# exit
Router(config-if)# exit
Router(config)# exit
```

Related Commands

Command	Description
show xconnect	Displays information about xconnect attachment circuits and PWs.
pseudowire-class	Configures a template of PW configuration settings used by the attachment circuits transported over a PW.

xconnect logging redundancy

To enable system message log (syslog) reporting of the status of the xconnect redundancy group, use the **xconnect logging redundancy** command in global configuration mode. To disable syslog reporting of the status of the xconnect redundancy group, use the **no** form of this command.

xconnect logging redundancy

no xconnect logging redundancy

Syntax Description

This command has no arguments or keywords.

Defaults

Syslog reporting of the status of the xconnect redundancy group is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.0(31)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.4(11)T	This command was integrated into Cisco IOS Release 12.4(11)T.
12.4(16)MR	This command was integrated into Cisco IOS Release 12.4(16)MR.

Usage Guidelines

Use this command to enable syslog reporting of the status of the xconnect redundancy group.

Examples

The following example enables syslog reporting of the status of the xconnect redundancy group and shows the messages that are generated during switchover events:

```
Router# config t
Router(config)# xconnect logging redundancy
Router(config)# exit
```

Activating the Primary Member

```
00:01:07: %XCONNECT-5-REDUNDANCY: Activating primary member 10.55.55.2:1000
```

Activating the Backup Member:

```
00:01:05: %XCONNECT-5-REDUNDANCY: Activating secondary member 10.55.55.3:1001
```

Related Commands

Command	Description
xconnect	Binds an Ethernet, 802.1q VLAN, or Frame Relay attachment circuit to an L2TPv3 PW for xconnect service and enters xconnect configuration mode.

APPENDIX B

Configuration Examples

This appendix provides real-world examples of RAN-O configurations.

Note The network addresses in these examples are generic addresses, so you must replace them with actual addresses for you network.

Overview

The Radio Access Network-Optimization (RAN-O) supports a variety of topology designs based on various Global System for Mobile Communications (GSM) and Universal Mobile Telecommunications System (UMTS) configurations. Here are some common pieces to this topology:

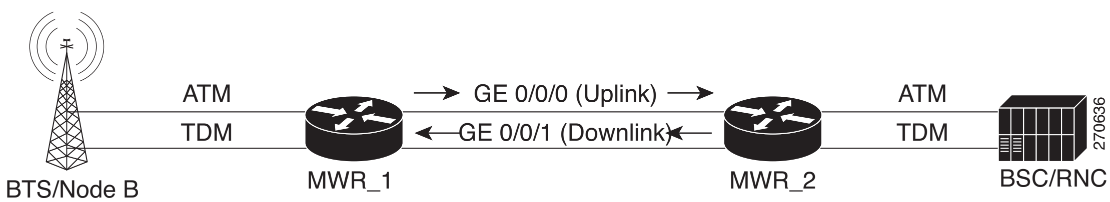
- A *backhaul* interface is used to transfer optimized GSM/UMTS traffic between RAN-O devices. The traditional backhaul interface is comprised of one or more T1/E1 controllers logically combined to form a *multilink* connect (except High-Speed Down link Packet Access [HSDPA] which uses the backhaul interface for T1/E1 line clocking). The current versions of RAN-O deployment will include faster backhaul interfaces such as Fast Ethernet (FE) and Gigabit Ethernet (GE).

- A *shorthaul* interface is used to transfer GSM and UMTS traffic from the Base Transceiver Station (BTS)/Node-B to the Cisco 3825 router and from the Cisco 3825 router to the Base Station Controller/Radio Network Controller (BSC/RNC). The traditional shorthaul connections on the RAN-O devices are connected through the Cisco 2-port T1/E1-RAN interface cards.
- Topology naming conventions such as, 3x2 and 4x3 are used to describe the type of deployment. The first number signifies the number of GSM/UMTS shorthaul interface connections while the second number signifies the number of multilink backhaul interface connections. In the case of a combined GSM/UMTS network, the conventional 3:2x2 can be used where :2 signifies the number of UMTS shorthaul interface connections.

Asymmetric PWE3 Configuration

The following is an example of an Asymmetric PWE3 configuration (see Figure B-1):

Figure B-1 Asymmetric PWE3 Configuration



PE_1

```
version 12.4
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
hostname MWR1
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type e1 0 1
card type e1 0 2
card type e1 1 0
card type e1 1 1
logging buffered 2147483
!
no aaa new-model
memory-size iomem 25
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 1/1/1
```

```
ipran-alt-interrupt tracing
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
!
no ip domain lookup
vlan ifdescr detail
multilink bundle-name authenticated
mpls label protocol ldp
mpls traffic-eng tunnels
vpdn enable
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
archive
 log config
!
!
controller E1 0/0/0
 clock source internal
 cem-group 1 unframed
!
controller E1 0/0/1
 clock source internal
 cem-group 20 unframed
!
controller E1 0/1/0
 clock source internal
 cem-group 12 unframed
 description connected to E1 4/0 of BERT
!
controller E1 0/1/1
 clock source internal
 cem-group 30 unframed
!
controller E1 0/2/0
 clock source internal
 cem-group 8 unframed
!
controller E1 0/2/1
 clock source internal
 cem-group 25 unframed
!
controller E1 1/0/0
 mode atm aim 1
 clock source internal
```

```
!
controller E1 1/0/1
 mode atm aim 1
 clock source internal
!
controller E1 1/1/0
 mode atm aim 1
 clock source internal
!
controller E1 1/1/1
!
!
pseudowire-class mpls
 encapsulation mpls
 sequencing both
 preferred-path peer 50.0.0.2
!
pseudowire-class l2tp
 encapsulation l2tpv3
 sequencing both
 ip protocol udp
 ip local interface Loopback50
!
!
class cem cemclass
 sample-rate 2
!
class cem cemclass1
 dejitter-buffer 400
!
!
!
!
!
!
!
interface Loopback50
 ip address 50.0.0.1 255.255.255.255
!
interface CEM0/0/0
 no ip address
 cem 1
  xconnect 50.0.0.2 1 encapsulation mpls
 !
!
interface GigabitEthernet0/0
 ip address 20.0.0.1 255.0.0.0
 load-interval 30
 duplex auto
 speed auto
 mpls label protocol ldp
 mpls ip
!
interface CEM0/0/1
 no ip address
 cem 20
  xconnect 50.0.0.2 2 encapsulation mpls
!
interface GigabitEthernet0/1
 ip address 60.0.0.1 255.0.0.0
 duplex auto
 speed auto
 mpls ip
!
```

```
interface CEM0/1/0
 no ip address
 cem 12
  xconnect 50.0.0.2 3 encapsulation mpls
 !
!
interface CEM0/1/1
 no ip address
 cem 30
  xconnect 50.0.0.2 4 encapsulation mpls
!
interface CEM0/2/0
 no ip address
 cem 8
  xconnect 50.0.0.2 5 encapsulation mpls
 !
!
interface CEM0/2/1
 no ip address
 cem 25
  xconnect 50.0.0.2 6 encapsulation mpls
 !
!
interface ATM0/IMA0
 no ip address
 load-interval 30
 atm mcpt-timers 2000 6000 10000
 no atm ilmi-keepalive
 pvc 1/10 l2transport
  xconnect 50.0.0.2 101 encapsulation mpls sequencing both
 !
 pvc 1/11 l2transport
  xconnect 50.0.0.2 102 pw-class mpls
 !
 pvc 1/21 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 2
  xconnect 50.0.0.2 111 encapsulation mpls sequencing both
 !
 pvc 1/22 l2transport
  encapsulation aal0
  cell-packing 18 mcpt-timer 3
  xconnect 50.0.0.2 112 encapsulation mpls sequencing both one-to-one
 !
!
interface ATM0/IMA0.1 point-to-point
 no snmp trap link-status
 pvc 1/12 l2transport
  xconnect 50.0.0.2 103 encapsulation mpls sequencing both
 !
!
interface ATM0/IMA0.2 multipoint
 no snmp trap link-status
 atm cell-packing 20 mcpt-timer 2
 xconnect 50.0.0.2 104 pw-class mpls
 pvc 1/13 l2transport
  encapsulation aal0
 !
 pvc 1/14 l2transport
  encapsulation aal0
 !
!
interface ATM0/IMA0.3 point-to-point
 no snmp trap link-status
```

```
 pvc 1/15 l2transport
  encapsulation aal0
  cell-packing 10 mcpt-timer 3
  xconnect 50.0.0.2 105 pw-class mpls
 !
!
interface ATM0/IMA0.4 point-to-point
 no snmp trap link-status
 pvc 1/16 l2transport
  encapsulation aal0
  cell-packing 14 mcpt-timer 3
  xconnect 50.0.0.2 106 pw-class mpls one-to-one
 !
!
interface ATM0/IMA0.6 multipoint
 no snmp trap link-status
 pvc 1/17 l2transport
  xconnect 50.0.0.2 107 pw-class mpls
 !
 pvc 1/18 l2transport
  encapsulation aal0
  xconnect 50.0.0.2 108 encapsulation mpls sequencing both
 !
 pvc 1/19 l2transport
  encapsulation aal0
  cell-packing 12 mcpt-timer 1
  xconnect 50.0.0.2 109 encapsulation mpls sequencing both one-to-one
 !
!
interface ATM1/0/0
 no ip address
 load-interval 30
 scrambling-payload
 atm mcpt-timers 1000 5000 10000
 no atm ilmi-keepalive
 pvc 0/5 l2transport
  encapsulation aal0
  cell-packing 10 mcpt-timer 3
  xconnect 50.0.0.2 10 pw-class l2tp
 !
 pvc 0/6 l2transport
  xconnect 50.0.0.2 20 pw-class l2tp
 !
 pvc 0/7 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 50.0.0.2 30 encapsulation mpls pw-class mpls one-to-one
 !
 pvc 0/8 l2transport
  xconnect 50.0.0.2 40 pw-class mpls
 !
 pvc 0/9 l2transport
  encapsulation aal0
  xconnect 50.0.0.2 50 pw-class mpls one-to-one
 !
!
interface ATM1/0/0.1 point-to-point
 no snmp trap link-status
 pvc 0/15 l2transport
  xconnect 50.0.0.2 13 pw-class mpls
 !
!
interface ATM1/0/0.2 multipoint
 no snmp trap link-status
```

```
 atm cell-packing 2 mcpt-timer 1
 xconnect 50.0.0.2 12 encapsulation mpls sequencing both
 pvc 0/10 l2transport
  encapsulation aal0
 !
 pvc 0/11 l2transport
  encapsulation aal0
 !
 pvc 0/12 l2transport
  encapsulation aal0
 !
 pvc 0/13 l2transport
  encapsulation aal0
 !
!
interface ATM1/0/0.3 point-to-point
 no snmp trap link-status
 pvc 0/16 l2transport
  encapsulation aal0
  xconnect 50.0.0.2 14 encapsulation mpls
 !
!
interface ATM1/0/0.4 point-to-point
 no snmp trap link-status
 pvc 0/17 l2transport
  encapsulation aal0
  xconnect 50.0.0.2 15 pw-class mpls one-to-one
 !
!
interface ATM1/0/0.6 multipoint
 no snmp trap link-status
 pvc 0/26 l2transport
  xconnect 50.0.0.2 16 pw-class mpls
 !
 pvc 0/27 l2transport
  encapsulation aal0
  cell-packing 8 mcpt-timer 3
  xconnect 50.0.0.2 17 pw-class mpls
 !
 pvc 0/28 l2transport
  encapsulation aal0
  cell-packing 16 mcpt-timer 2
  xconnect 50.0.0.2 18 pw-class mpls sequencing both one-to-one
 !
!
interface ATM1/0/0.7 multipoint
 no snmp trap link-status
!
interface ATM1/0/1
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 5000 10000
 no atm ilmi-keepalive
 atm cell-packing 20 mcpt-timer 2
 xconnect 50.0.0.2 11 encapsulation mpls sequencing both
 pvc 0/21 l2transport
  encapsulation aal0
 !
 pvc 0/22 l2transport
  encapsulation aal0
 !
 pvc 0/23 l2transport
  encapsulation aal0
 !
```

```
!
interface ATM1/0/1.1 point-to-point
 no snmp trap link-status
!
interface ATM1/0/1.2 multipoint
 no snmp trap link-status
!
interface ATM1/1/0
 no ip address
 scrambling-payload
 ima-group 0
 no atm ilmi-keepalive
!
ip route 9.10.0.254 255.255.255.255 9.11.49.254
ip route 30.0.0.0 255.0.0.0 GigabitEthernet0/0
ip route 50.0.0.2 255.255.255.255 20.0.0.2
ip route 50.0.0.5 255.255.255.255 20.0.0.2
!
!
ip http server
no ip http secure-server
!
!
mpls ldp router-id Loopback50 force
!
!
!
!
!
alias exec cpu show proc cpu | i CPU
alias exec hist show proc cpu history
alias exec clc clear counters
alias exec cmpls clear mpls counters
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 login
!
end
```

PE_2

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname MWR2
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type e1 0 1
card type e1 0 2
card type e1 1 0
card type e1 1 1
logging buffered 1000000
enable password lab
!
no aaa new-model
```

```
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
network-clock-select 2 E1 0/0/1
network-clock-select 3 E1 0/1/0
network-clock-select 4 E1 0/1/1
network-clock-select 5 E1 0/2/0
network-clock-select 6 E1 0/2/1
ipran-alt-interrupt tracing
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
!
no ip domain lookup
vlan ifdescr detail
multilink bundle-name authenticated
mpls label protocol ldp
mpls traffic-eng tunnels
vpdn enable
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
archive
 log config
!
!
controller E1 0/0/0
 cem-group 1 unframed
!
controller E1 0/0/1
 cem-group 20 unframed
!
controller E1 0/1/0
 cem-group 12 unframed
!
controller E1 0/1/1
 cem-group 30 unframed
!
```

```
controller E1 0/2/0
 cem-group 8 unframed
!
controller E1 0/2/1
 cem-group 25 unframed
!
controller E1 1/0/0
 mode atm aim 1
 clock source internal
!
controller E1 1/0/1
 mode atm aim 1
 clock source internal
!
controller E1 1/1/0
 mode atm aim 1
 clock source internal
!
controller E1 1/1/1
 clock source internal
!
pseudowire-class mpls
 encapsulation mpls
 sequencing both
 preferred-path peer 50.0.0.1
!
pseudowire-class l2tp
 encapsulation l2tpv3
 sequencing both
 ip protocol udp
 ip local interface Loopback50
!
!
class cem test
!
class cem cemclass
 sample-rate 2
!
!
!
!
!
!
!
interface Loopback50
 ip address 50.0.0.2 255.255.255.255
!
interface CEM0/0/0
 no ip address
 cem 1
  xconnect 50.0.0.1 1 encapsulation mpls
 !
!
interface GigabitEthernet0/0
 ip address 30.0.0.1 255.0.0.0
 duplex auto
 speed auto
 mpls ip
!
interface CEM0/0/1
 no ip address
 cem 20
  xconnect 50.0.0.1 2 encapsulation mpls
 !
```

```
!
interface GigabitEthernet0/1
 ip address 70.0.0.1 255.0.0.0
 no ip proxy-arp
 duplex auto
 speed auto
 mpls ip
!
interface CEM0/1/0
 no ip address
 cem 12
  xconnect 50.0.0.1 3 encapsulation mpls
 !
!
interface CEM0/1/1
 no ip address
 cem 30
  xconnect 50.0.0.1 4 encapsulation mpls
 !
!
interface CEM0/2/0
 no ip address
 cem 8
  xconnect 50.0.0.1 5 encapsulation mpls
 !
!
interface CEM0/2/1
 no ip address
 cem 25
  xconnect 50.0.0.1 6 encapsulation mpls
 !
!
interface ATM0/IMA0
 no ip address
 load-interval 30
 atm mcpt-timers 2000 6000 10000
 no atm ilmi-keepalive
 pvc 1/10 l2transport
  xconnect 50.0.0.1 101 encapsulation mpls sequencing both
 !
 pvc 1/11 l2transport
  xconnect 50.0.0.1 102 pw-class mpls
 !
 pvc 1/21 l2transport
  encapsulation aal0
  xconnect 50.0.0.1 111 encapsulation mpls sequencing both
 !
 pvc 1/22 l2transport
  encapsulation aal0
  xconnect 50.0.0.1 112 encapsulation mpls sequencing both one-to-one
 !
!
interface ATM0/IMA0.1 point-to-point
 no snmp trap link-status
 pvc 1/12 l2transport
  xconnect 50.0.0.1 103 encapsulation mpls sequencing both
 !
!
interface ATM0/IMA0.2 multipoint
 no snmp trap link-status
 atm cell-packing 15 mcpt-timer 3
 xconnect 50.0.0.1 104 pw-class mpls
 pvc 1/13 l2transport
  encapsulation aal0
```

```
 !
 pvc 1/14 l2transport
  encapsulation aal0
 !
!
interface ATM0/IMA0.3 point-to-point
 no snmp trap link-status
 pvc 1/15 l2transport
  encapsulation aal0
  xconnect 50.0.0.1 105 pw-class mpls
 !
!
interface ATM0/IMA0.4 point-to-point
 no snmp trap link-status
 pvc 1/16 l2transport
  encapsulation aal0
  cell-packing 7 mcpt-timer 2
  xconnect 50.0.0.1 106 pw-class mpls one-to-one
 !
!
interface ATM0/IMA0.6 multipoint
 no snmp trap link-status
 pvc 1/17 l2transport
  xconnect 50.0.0.1 107 pw-class mpls
 !
 pvc 1/18 l2transport
  encapsulation aal0
  xconnect 50.0.0.1 108 encapsulation mpls sequencing both
 !
 pvc 1/19 l2transport
  encapsulation aal0
  cell-packing 9 mcpt-timer 3
  xconnect 50.0.0.1 109 encapsulation mpls sequencing both one-to-one
 !
!
interface ATM1/0/0
 ip address 1.1.1.2 255.0.0.0
 load-interval 30
 scrambling-payload
 atm mcpt-timers 1000 5000 10000
 no atm ilmi-keepalive
 pvc 0/5 l2transport
  encapsulation aal0
  cell-packing 25 mcpt-timer 3
  xconnect 50.0.0.1 10 pw-class l2tp
 !
 pvc 0/6 l2transport
  xconnect 50.0.0.1 20 pw-class l2tp
 !
 pvc 0/7 l2transport
  encapsulation aal0
  cell-packing 12 mcpt-timer 2
  xconnect 50.0.0.1 30 encapsulation mpls pw-class mpls one-to-one
 !
 pvc 0/8 l2transport
  xconnect 50.0.0.1 40 pw-class mpls
 !
 pvc 0/9 l2transport
  encapsulation aal0
  xconnect 50.0.0.1 50 pw-class mpls one-to-one
 !
 pvc 0/99
  protocol ip 1.1.1.1 broadcast
  encapsulation aal5snap
```

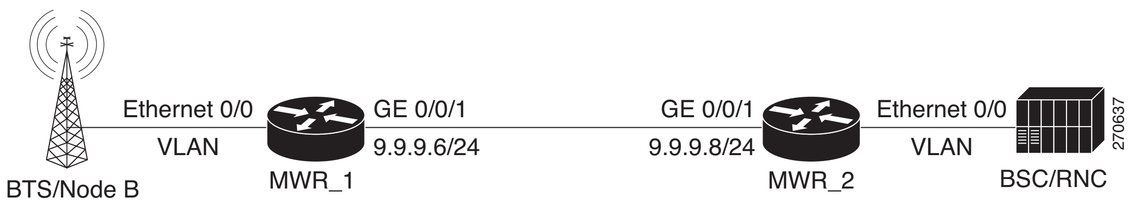
```
 !
!
interface ATM1/0/0.1 point-to-point
 no snmp trap link-status
 pvc 0/15 l2transport
  xconnect 50.0.0.1 13 pw-class mpls
 !
!
interface ATM1/0/0.2 multipoint
 no snmp trap link-status
 atm cell-packing 10 mcpt-timer 2
 xconnect 50.0.0.1 12 encapsulation mpls sequencing both
 pvc 0/10 l2transport
  encapsulation aal0
 !
 pvc 0/11 l2transport
  encapsulation aal0
 !
 pvc 0/12 l2transport
  encapsulation aal0
 !
 pvc 0/13 l2transport
  encapsulation aal0
 !
!
interface ATM1/0/0.3 point-to-point
 no snmp trap link-status
 pvc 0/16 l2transport
  encapsulation aal0
  xconnect 50.0.0.1 14 encapsulation mpls
 !
!
interface ATM1/0/0.4 point-to-point
 no snmp trap link-status
 pvc 0/17 l2transport
  encapsulation aal0
  xconnect 50.0.0.1 15 pw-class mpls one-to-one
 !
!
interface ATM1/0/0.6 multipoint
 no snmp trap link-status
 pvc 0/26 l2transport
  xconnect 50.0.0.1 16 pw-class mpls
 !
 pvc 0/27 l2transport
  encapsulation aal0
  cell-packing 18 mcpt-timer 3
  xconnect 50.0.0.1 17 pw-class mpls
 !
 pvc 0/28 l2transport
  encapsulation aal0
  cell-packing 24 mcpt-timer 2
  xconnect 50.0.0.1 18 pw-class mpls sequencing both one-to-one
 !
!
interface ATM1/0/0.7 multipoint
 no snmp trap link-status
!
interface ATM1/0/1
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 5000 10000
 no atm ilmi-keepalive
 atm cell-packing 20 mcpt-timer 2
```

```
 xconnect 50.0.0.1 11 encapsulation mpls sequencing both
 pvc 0/21 l2transport
  encapsulation aal0
 !
 pvc 0/22 l2transport
  encapsulation aal0
 !
 pvc 0/23 l2transport
  encapsulation aal0
 !
!
interface ATM1/1/0
 no ip address
 scrambling-payload
 ima-group 0
 no atm ilmi-keepalive
!
ip route 9.10.0.254 255.255.255.255 9.11.49.254
ip route 20.0.0.0 255.0.0.0 GigabitEthernet0/0
ip route 50.0.0.1 255.255.255.255 70.0.0.2
ip route 50.0.0.5 255.255.255.255 70.0.0.2
!
!
ip http server
no ip http secure-server
!
!
mpls ldp router-id Loopback50 force
!
!
!
!
!
alias exec cpu show proc cpu | i CPU
alias exec hist show proc cpu history
alias exec clc clear counters
alias exec cmpls clear mpls counters
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 exec-timeout 0 0
 login
!
end
```

Ethernet over MPLS—VLAN and Port Mode Configuration

The following is an example of an Ethernet over Multiprotocol Label Switching (MPLS) configuration in VLAN and Port mode (see Figure B-2):

Figure B-2 Ethernet over MPLS—VLAN and Port Mode Configuration



The following represents both a VLAN and port mode in an Ethernet over MPLS configuration:

MWR_1

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr-pe1
!
boot-start-marker
boot-end-marker
!
card type e1 0 1
card type e1 0 2
card type e1 1 0
card type e1 1 1
logging buffered 10000000
enable password lab
!
no aaa new-model
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 1/1/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
!
!
!
no ip domain lookup
vlan ifdescr detail
multilink bundle-name authenticated
mpls label protocol ldp
```

```
vpdn enable
!
archive
 log config
  hidekeys
!
!
controller E1 0/0/0
 clock source internal
 !
controller E1 0/0/1
!
controller E1 0/1/0
 !
controller E1 0/1/1
 clock source internal
 !
controller E1 1/0/0
  clock source internal
!
controller E1 1/0/1
!
controller E1 1/1/0
 !
controller E1 1/1/1
  clock source internal
!
!
!
!
!
!
!
!
interface Loopback0
 no ip address
!
interface Loopback1
 ip address 1.1.1.1 255.255.255.255
 load-interval 30
!
interface Loopback101
 no ip address
!
! Port mode
interface GigabitEthernet0/0
 no ip address
 load-interval 30
 speed 1000
 full-duplex
 no cdp enable
 xconnect 2.2.2.2 1 encapsulation mpls
!
! vlan mode
interface GigabitEthernet0/0.3
encapsulation dot1q 3
 xconnect 2.2.2.2 2 encapsulation mpls
!
interface GigabitEthernet0/1
 ip address 9.9.9.6 255.255.255.0
 load-interval 30
 speed 1000
 full-duplex
 mpls ip
```

```
!
!
ip forward-protocol nd
ip route 2.2.2.2 255.255.255.255  9.9.9.8
!
ip http server
no ip http secure-server
!
!
snmp-server community public RO
!
!
!
control-plane
!
!
!
!
!
!
!
line con 0
 exec-timeout 0 0
 logging synchronous
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
exception data-corruption buffer truncate
!
end
```

MRW_2

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr-pe2
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type e1 0 1
card type e1 0 2
card type e1 1 0
card type e1 1 1
logging buffered 10000000
enable password lab
!
no aaa new-model
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 0
network-clock-participate wic 1
```

```
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip arp proxy disable
ip cef
!
!
!
!
no ip domain lookup
vlan ifdescr detail
l2tp-class l2tp
multilink bundle-name authenticated
mpls label protocol ldp
mpls ldp session protection
mpls oam
 echo revision 4
vpdn enable
!

!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
archive
 log config
  hidekeys
!
!
controller E1 0/0/0
 !
controller E1 0/0/1
 clock source internal
!
controller E1 0/1/0
!
controller E1 0/1/1
 clock source internal
  !
controller E1 0/2/0
 clock source internal
 !
controller E1 0/2/1
!
controller E1 1/0/0
```

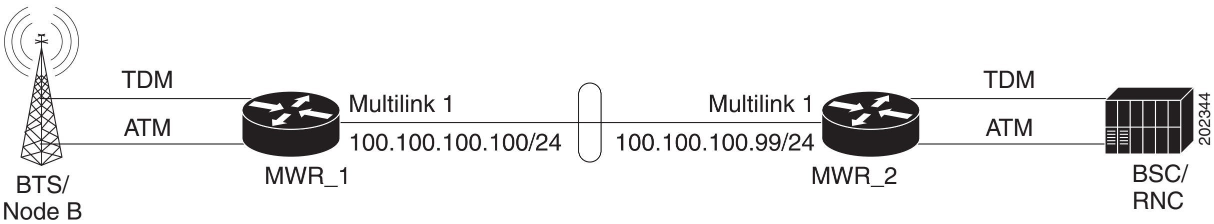
```
 clock source internal
!
controller E1 1/0/1
 clock source internal
 !
controller E1 1/1/0
 clock source internal
 !
controller E1 1/1/1
  clock source internal
!
!
!
interface Loopback1
 ip address 2.2.2.2 255.255.255.255
!
!  port mode
interface GigabitEthernet0/0
 no ip address
 load-interval 30
 speed 1000
 full-duplex
 no cdp enable
 xconnect 1.1.1.1 1 encapsulation mpls
!
! vlan mode
interface GigabitEthernet0/0.3
encapsulation dot1q 3
xconnect 1.1.1.1 2 encapsulation mpls
!
!
interface GigabitEthernet0/1
 ip address 9.9.9.8 255.255.255.0
 load-interval 30
 speed 1000
 full-duplex
 mpls ip
 no cdp enable
!
ip forward-protocol nd
ip route 1.1.1.1 255.255.255.255  9.9.9.6
!
no ip http server
no ip http secure-server
!
!
snmp-server community private RW
snmp-server community public RO
snmp-server ifindex persist
snmp-server trap link ietf
no snmp-server sparse-tables
snmp-server queue-length 100
snmp-server enable traps snmp authentication linkdown linkup coldstart warmstart
snmp-server enable traps ipran
no cdp run
route-map test permit 10
 match mpls-label
!
!
!
mpls ldp router-id Loopback1 force
!
control-plane
!
```

```
no call rsvp-sync
!
!
!
line con 0
 exec-timeout 0 0
 logging synchronous
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
exception data-corruption buffer truncate
!
end
```

PWE3 over MLPPP Configuration

The following is an example of a PWE3 over Multi-link Point-to-Point Protocol (MLPPP) configuration (see Figure B-3):

Figure B-3 PWE3 over MLPPP Configuration



MWR_1

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr-pe1
!
boot-start-marker
boot-end-marker
!
card type e1 0 1
card type e1 0 2
card type e1 1 0
card type e1 1 1
logging buffered 10000000
enable password lab
!
no aaa new-model
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 1/1/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
!
!
!
no ip domain lookup
vlan ifdescr detail
multilink bundle-name authenticated
mpls label protocol ldp
vpdn enable
```

```
!
archive
 log config
  hidekeys
!
!
controller E1 0/0/0
 clock source internal
 cem-group 0 unframed
!
controller E1 0/0/1
 channel-group 0 timeslots 1-31
!
controller E1 0/1/0
 channel-group 0 timeslots 1-31
!
controller E1 0/1/1
 clock source internal
 cem-group 3 timeslots 1-31
!
controller E1 1/0/0
 mode atm aim 1
 clock source internal
!
controller E1 1/0/1
 channel-group 0 timeslots 1-31
!
controller E1 1/1/0
 channel-group 0 timeslots 1-31
!
controller E1 1/1/1
 mode atm aim 1
 clock source internal
!
!
class-map match-any mpls
 match mpls experimental topmost 1
!
!
policy-map llq-policy
 class mpls
  priority percent 99
 class class-default
  bandwidth percent 1
  queue-limit 45
!
!
!
pseudowire-class class1
 encapsulation mpls
 sequencing both
 mpls experimental 1
!
!
!
!
!
!
interface Loopback0
 no ip address
!
interface Loopback1
 ip address 1.1.1.1 255.255.255.255
 load-interval 30
```

```
!
interface Loopback101
 no ip address
!
interface Multilink1000
 ip address 100.100.100.100 255.255.255.0
 ip tcp header-compression ietf-format
 mpls ip
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1000
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
interface CEM0/0/0
no ip address
 cem 0
  xconnect 2.2.2.2 1 pw-class class1
 !
!
interface GigabitEthernet0/0
 ip address 172.18.18.78 255.255.255.0
 load-interval 30
 speed 1000
 full-duplex
 no cdp enable
!
interface GigabitEthernet0/1
 ip address 9.9.9.6 255.255.255.0
 load-interval 30
 shutdown
 speed 1000
 full-duplex
 mpls ip
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 ppp multilink
 ppp multilink group 1000
 max-reserved-bandwidth 100
!
interface Serial0/1/0:0
 no ip address
 encapsulation ppp
 ppp multilink
 ppp multilink group 1000
 max-reserved-bandwidth 100
!
interface CEM0/1/1
 no ip address
 cem 3
  xconnect 2.2.2.2 2 pw-class class1
 !
!
```

```
interface ATM1/0/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 xconnect 2.2.2.2 3 pw-class class1
 pvc 0/1 l2transport
  encapsulation aal0
 !
!
interface Serial1/0/1:0
 no ip address
 encapsulation ppp
 ppp multilink
 ppp multilink group 1000
 max-reserved-bandwidth 100
!
interface Serial1/1/0:0
 no ip address
 encapsulation ppp
 ppp multilink
 ppp multilink group 1000
 max-reserved-bandwidth 100
!
interface ATM1/1/1
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 pvc 0/1 l2transport
  encapsulation aal0
  xconnect 2.2.2.2 4 pw-class class1
 !
 pvc 0/2 l2transport
  encapsulation aal5
  xconnect 2.2.2.2 5 pw-class class1
 !
 pvc 0/5 l2transport
  encapsulation aal0
  xconnect 2.2.2.2 6 pw-class class1 one-to-one
 !
!
ip forward-protocol nd
ip route 2.2.2.2 255.255.255.255 Multilink1000
!
ip http server
no ip http secure-server
!
!
snmp-server community public RO
!
!
!
control-plane
!
!
!
!
!
!
!
line con 0
 exec-timeout 0 0
 logging synchronous
line aux 0
line vty 0 4
```

```
 exec-timeout 0 0
 password lab
 login
!
exception data-corruption buffer truncate
!
end
```

MWR_2

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr-pe2
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type e1 0 1
card type e1 0 2
card type e1 1 0
card type e1 1 1
logging buffered 10000000
enable password lab
!
no aaa new-model
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip arp proxy disable
ip cef
!
!
!
!
no ip domain lookup
ip host bizarre 64.102.16.25
vlan ifdescr detail
l2tp-class l2tp
multilink bundle-name authenticated
mpls label protocol ldp
mpls ldp session protection
mpls oam
 echo revision 4
vpdn enable
!
!
!
```

```
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
archive
 log config
  hidekeys
!
!
controller E1 0/0/0
 cem-group 0 timeslots 1-31
!
controller E1 0/0/1
 clock source internal
 cem-group 1 unframed
!
controller E1 0/1/0
!
controller E1 0/1/1
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/2/0
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/2/1
!
controller E1 1/0/0
 mode atm aim 1
 clock source internal
!
controller E1 1/0/1
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 1/1/0
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 1/1/1
 mode atm aim 1
 clock source internal
!
!
class-map match-any mpls
 match mpls experimental topmost 1
!
!
policy-map llq-policy
 class mpls
```

```
  priority percent 99
 class class-default
  bandwidth percent 1
  queue-limit 45
!
pseudowire-class class1
 encapsulation mpls
 sequencing both
 mpls experimental 1
!
!
!
!
!
!
!
interface Loopback1
 ip address 2.2.2.2 255.255.255.255
!
!
interface Multilink1000
 ip address 100.100.100.99 255.255.255.0
 ip tcp header-compression ietf-format
 mpls ip
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1000
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
interface CEM0/0/0
 no ip address
 cem 0
  xconnect 1.1.1.1 2 pw-class class1
 !
!
interface GigabitEthernet0/0
 ip address 172.18.18.179 255.255.255.0
 load-interval 30
 speed 1000
 full-duplex
 mpls mtu 2000
 no cdp enable
!
interface CEM0/0/1
 no ip address
 cem 1
  xconnect 1.1.1.1 1 pw-class class1
 !
!
interface GigabitEthernet0/1
 ip address 9.9.9.8 255.255.255.0
 load-interval 30
 shutdown
 speed 1000
```

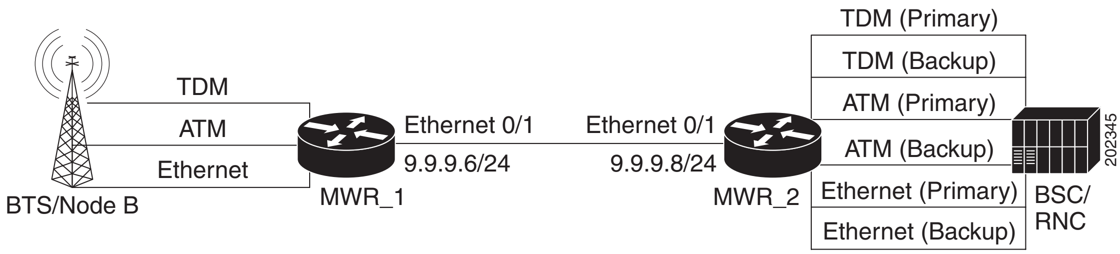
```
 full-duplex
 mpls ip
 no cdp enable
!
interface Serial0/1/1:0
 no ip address
 encapsulation ppp
 ppp multilink
 ppp multilink group 1000
 max-reserved-bandwidth 100
!
interface Serial0/2/0:0
 no ip address
 encapsulation ppp
 ppp multilink
 ppp multilink group 1000
 max-reserved-bandwidth 100
!

interface ATM1/0/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 xconnect 1.1.1.1 3 pw-class class1
 pvc 0/1 l2transport
  encapsulation aal0
 !
!
interface Serial1/0/1:0
 no ip address
 encapsulation ppp
 ppp multilink
 ppp multilink group 1000
 max-reserved-bandwidth 100
!
interface Serial1/1/0:0
 no ip address
 encapsulation ppp
 ppp multilink
 ppp multilink group 1000
 max-reserved-bandwidth 100
!
interface ATM1/1/1
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 pvc 0/1 l2transport
  encapsulation aal0
  xconnect 1.1.1.1 4 pw-class class1
 !
 pvc 0/2 l2transport
  encapsulation aal5
  xconnect 1.1.1.1 5 pw-class class1
 !
 pvc 0/5 l2transport
  encapsulation aal0
  xconnect 1.1.1.1 6 pw-class class1 one-to-one
 !
!
ip forward-protocol nd
ip route 1.1.1.1 255.255.255.255 Multilink1000
!
no ip http server
no ip http secure-server
```

```
!
!
snmp-server community private RW
snmp-server community public RO
snmp-server ifindex persist
snmp-server trap link ietf
no snmp-server sparse-tables
snmp-server queue-length 100
snmp-server enable traps snmp authentication linkdown linkup coldstart warmstart
snmp-server enable traps ipran
no cdp run
route-map test permit 10
 match mpls-label
!
!
!
mpls ldp router-id Loopback1 force
!
control-plane
!
no call rsvp-sync
!
!
!
line con 0
 exec-timeout 0 0
 logging synchronous
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
exception data-corruption buffer truncate
!
end
```

PWE3 Redundancy Configuration

The following is an example of a PWE3 Redundancy configuration (see Figure B-4):

Figure B-4 PWE3 Redundancy Configuration



MWR_1

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr-pe1
!
boot-start-marker
boot-end-marker
!
card type e1 0 1
card type e1 0 2
card type e1 1 0
card type e1 1 1
logging buffered 10000000
enable password lab
!
no aaa new-model
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 1/1/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
!
!
!
no ip domain lookup
vlan ifdescr detail
multilink bundle-name authenticated
mpls label protocol ldp
vpdn enable
!
```

```
archive
 log config
  hidekeys
!
!
controller E1 0/0/0
 clock source internal
 cem-group 0 unframed
!
controller E1 0/0/1
!
controller E1 0/1/0
!
controller E1 0/1/1
 clock source internal
!
controller E1 1/0/0
 mode atm aim 1
 clock source internal
!
controller E1 1/0/1
!
controller E1 1/1/0
!
controller E1 1/1/1
 clock source internal
!
interface cem0/0/0
cem 0
 xconnect 2.2.2.2 1 encapsulation mpls
 backup peer 2.2.2.2 2
 backup delay 20 20
!
interface ATM01/0/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 xconnect 2.2.2.2 3 encapsulation mpls
 backup peer 2.2.2.2 4
 backup delay 20 20
 pvc 0/1 l2transport
  encapsulation aal0
!
interface Loopback0
 no ip address
!
interface Loopback1
 ip address 1.1.1.1 255.255.255.255
 load-interval 30
!
interface Loopback101
 no ip address
!
!
!
!
interface GigabitEthernet0/0.3
encapsulation dot1q 3
 xconnect 2.2.2.2 5 encapsulation mpls
 backup peer 2.2.2.2 6
 backup delay 20 20
!
interface GigabitEthernet0/1
 ip address 9.9.9.6 255.255.255.0
```

```
 load-interval 30
 speed 1000
 full-duplex
 mpls ip
!
!
ip forward-protocol nd
ip route 2.2.2.2 255.255.255.255  9.9.9.8
!
ip http server
no ip http secure-server
!
!
snmp-server community public RO
!
!
!
control-plane
!
!
!
!
!
!
!
line con 0
 exec-timeout 0 0
 logging synchronous
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
exception data-corruption buffer truncate
!
end
```

MWR_2

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr-pe2
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type e1 0 1
card type e1 0 2
card type e1 1 0
card type e1 1 1
logging buffered 10000000
enable password lab
!
no aaa new-model
!
redundancy
  mode y-cable
   standalone
```

```
!
network-clock-participate slot 1
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip arp proxy disable
ip cef
!
!
!
!
no ip domain lookup
vlan ifdescr detail
l2tp-class l2tp
multilink bundle-name authenticated
mpls label protocol ldp
mpls ldp session protection
mpls oam
 echo revision 4
vpdn enable
!

!
!
!
archive
 log config
  hidekeys
!
!
controller E1 0/0/0
 cem-group 0 unframed
!
controller E1 0/0/1
 clock source internal
 cem-group 0 unframed
!
controller E1 0/1/0
!
controller E1 0/1/1
 clock source internal
!
controller E1 0/2/0
 clock source internal
 !
controller E1 0/2/1
!
controller E1 1/0/0
 mode atm aim 1
 clock source internal
!
controller E1 1/0/1
 clock source internal
 !
controller E1 1/1/0
 clock source internal
 !
controller E1 1/1/1
```

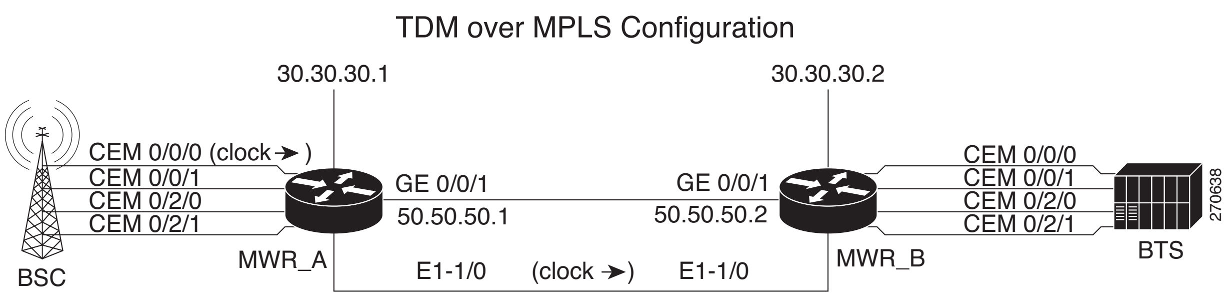
```
 mode atm aim 1
 clock source internal
!
! Primary
interface cem0/0/0
cem 0
 xconnect 1.1.1.1 1 encapsulation mpls
!
! Backup
interface cem0/0/1
cem 0
 xconnect 1.1.1.1 2 encapsulation mpls
!
! Primary
interface ATM1/0/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 xconnect 1.1.1.1 3 encapsulation mpls
 pvc 0/1 l2transport
  encapsulation aal0
 !
! Backup
interface ATM1/1/1
no ip address
 scrambling-payload
 no atm ilmi-keepalive
 xconnect 1.1.1.1 4 encapsulation mpls
 pvc 0/1 l2transport
  encapsulation aal0
 !
!
interface Loopback1
 ip address 2.2.2.2 255.255.255.255
!

! Primary
interface GigabitEthernet0/0.3
encapsulation dot1q 3
xconnect 1.1.1.1 5 encapsulation mpls
!
! Backup

interface GigabitEthernet0/0.4
encapsulation dot1q 4
xconnect 1.1.1.1 6 encapsulation mpls
!
!
!
interface GigabitEthernet0/1
 ip address 9.9.9.8 255.255.255.0
 load-interval 30
 speed 1000
 full-duplex
 mpls ip
 no cdp enable
!
ip forward-protocol nd
ip route 1.1.1.1 255.255.255.255  9.9.9.6
!
no ip http server
no ip http secure-server
!
!
```

```
snmp-server community private RW
snmp-server community public RO
snmp-server ifindex persist
snmp-server trap link ietf
no snmp-server sparse-tables
snmp-server queue-length 100
snmp-server enable traps snmp authentication linkdown linkup coldstart warmstart
snmp-server enable traps ipran
no cdp run
route-map test permit 10
 match mpls-label
!
!
!
mpls ldp router-id Loopback1 force
!
control-plane
!
no call rsvp-sync
!
!
!
line con 0
 exec-timeout 0 0
 logging synchronous
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
exception data-corruption buffer truncate
!
end
```

TDM over MPLS Configuration

The following is an example of a time-division multiplexing (TDM) over MPLS configuration (see Figure B-5):

Figure B-5 TDM over MPLS Configuration



MWR_A

```
!
version 12.4
service timestamps debug datetime msec localtime show-timezone
service timestamps log datetime msec localtime show-timezone
no service password-encryption
service internal
!
hostname mwr_A
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type t1 0 2
enable password xxx
!
no aaa new-model
clock timezone est -5
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 0
network-clock-participate wic 2
network-clock-select 1 E1 0/0/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
controller E1 0/0/0
cem-group 0 timeslots 1-31
description E1 CESoPSN example
!
controller E1 0/0/1
clock source internal
cem-group 1 unframed
description E1 SATOP example
```

```
!
controller T1 0/2/0
framing esf
clock source internal
linecode b8zs
cem-group 4 unframed
description T1 SATOP example
!
controller T1 0/2/1
framing esf
clock source internal
linecode b8zs
cem-group 5 timeslots 1-24
description T1 CESoPSN example
!
controller E1 1/0/0
clock source internal
!
controller E1 1/0/1
!
interface Loopback0
ip address 30.30.30.1 255.255.255.255
!
interface CEM0/0/0
no ip address
cem 0
  xconnect 30.30.30.2 300 encapsulation mpls
!
!
interface GigabitEthernet0/0
no ip address
no ip proxy-arp
duplex auto
speed auto
no cdp enable
!
interface CEM0/0/1
no ip address
cem 1
  xconnect 30.30.30.2 301 encapsulation mpls
!
!
interface GigabitEthernet0/1
ip address 50.50.50.1 255.255.255.0
no ip proxy-arp
duplex auto
speed auto
mpls ip
no cdp enable
!
interface CEM0/2/0
no ip address
cem 4
  xconnect 30.30.30.2 304 encapsulation mpls
!
!
interface CEM0/2/1
no ip address
cem 5
  xconnect 30.30.30.2 305 encapsulation mpls
!
!
no ip classless
ip route 30.30.30.2 255.255.255.255 50.50.50.2
```

```
!
no ip http server
no ip http secure-server
!
line con 0
password xxx
login
line aux 0
password xxx
login
no exec
line vty 0 4
password xxx
login
!
end
```

MWR_B

```
!
version 12.4
service timestamps debug datetime msec localtime show-timezone
service timestamps log datetime msec localtime show-timezone
no service password-encryption
service internal
!
hostname mwr_B
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type t1 0 2
enable password xxx
!
no aaa new-model
clock timezone est -5
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-select 1 E1 1/0/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
controller E1 0/0/0
clock source internal
cem-group 0 timeslots 1-31
description E1 CESoPSN example
!
controller E1 0/0/1
clock source internal
cem-group 1 unframed
description E1 SATOP example
!
```

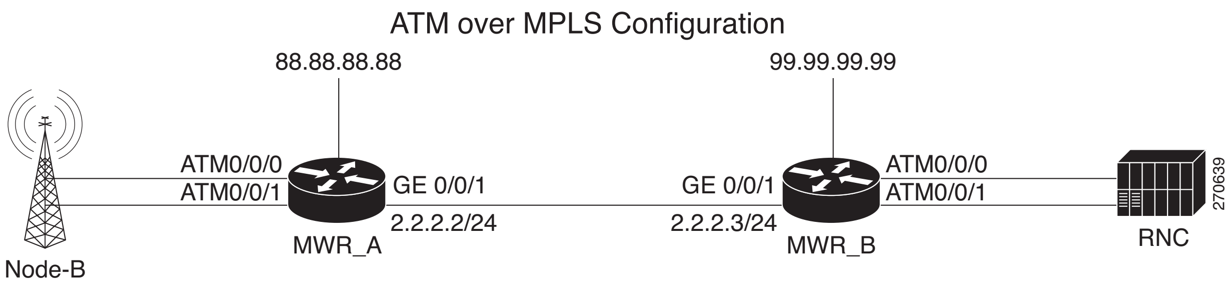
```
controller T1 0/2/0
framing esf
clock source internal
linecode b8zs
cem-group 4 unframed
description T1 SATOP example
!
controller T1 0/2/1
framing esf
clock source internal
linecode b8zs
cem-group 5 timeslots 1-24
description T1 CESoPSN example
!
controller E1 1/0/0

!
controller E1 1/0/1
!
interface Loopback0
ip address 30.30.30.2 255.255.255.255
!
interface CEM0/0/0
no ip address
cem 0
  xconnect 30.30.30.1 300 encapsulation mpls
!
!
interface GigabitEthernet0/0
no ip address
no ip proxy-arp
duplex auto
speed auto
no cdp enable
!
interface CEM0/0/1
no ip address
cem 1
  xconnect 30.30.30.1 301 encapsulation mpls
!
!
interface GigabitEthernet0/1
ip address 50.50.50.2 255.255.255.0
no ip proxy-arp
duplex auto
speed auto
mpls ip
no cdp enable
!
interface CEM0/2/0
no ip address
cem 4
  xconnect 30.30.30.1 304 encapsulation mpls
!
!
interface CEM0/2/1
no ip address
cem 5
  xconnect 30.30.30.1 305 encapsulation mpls
!
!
no ip classless
ip route 30.30.30.2 255.255.255.255 50.50.50.1
!
```

```
no ip http server
no ip http secure-server
!
line con 0
password xxx
login
line aux 0
password xxx
login
no exec
line vty 0 4
password xxx
login
!
end
```

ATM over MPLS Configurations

The illustration below configures an ATM port mode pseudowire (PW) on interface ATM 0/0/0, ATM AAL5 SDU mode PW on ATM0/0/1 PVC 0/100, ATM N:1 VCC cell mode PW on ATM0/0/1 PVC 0/101, multiple PVCs N:1 VCC cell mode PW on ATM 0/0/1.1, and ATM 1:1 VCC cell mode PW on ATM0/0/1 PVC 0/102. It also configures Cell-Packing for port mode PWs, VCC cell-relay mode PWs and PVC mapping for ATM0/0/1.1 N:1 VCC cell relay PWs (see Figure B-6).

Figure B-6 ATM over MPLS Configuration



MWR_A

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr_A
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type e1 0 1
card type e1 0 2
card type e1 1 0
logging buffered 4096
enable password lab
!
no aaa new-model
memory-size iomem 25
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate slot 1
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 1/0/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
```

```
!
no ip domain lookup
ip domain name cisco.com
multilink bundle-name authenticated
mpls label range 100 100000 static 16 99
vpdn enable
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
archive
 log config
!
!
controller E1 0/0/0
 mode atm aim 1
 clock source internal
!
controller E1 0/0/1
 mode atm aim 1
 clock source internal
!
controller E1 0/1/0
 mode atm aim 1
 clock source internal
!
controller E1 0/1/1
 mode atm aim 1
 clock source internal
!
controller E1 0/2/0
!
controller E1 0/2/1
!
controller E1 1/0/0
!
controller E1 1/0/1
!
pseudowire-class mpls-exp-5
 encapsulation mpls
 sequencing both
 mpls experimental 5
!
!
!
!
!
!
!
!
```

```
interface Loopback0
 ip address 88.88.88.88 255.255.255.255
!
interface ATM0/0/0
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 100 encapsulation mpls sequencing both
 pvc 1/35 l2transport
  encapsulation aal0
 !
 pvc 1/36 l2transport
  encapsulation aal0
 !
 pvc 1/37 l2transport
  encapsulation aal0
 !
!
interface GigabitEthernet0/0
 ip address 172.18.52.129 255.255.255.0
 duplex auto
 speed auto
 no keepalive
!
interface ATM0/0/1
 no ip address
 load-interval 30
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 pvc 0/10
 !
 pvc 0/100 l2transport
  encapsulation aal5
  xconnect 99.99.99.99 1100 encapsulation mpls sequencing both
 !
 pvc 0/101 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 99.99.99.99 1101 encapsulation mpls sequencing both
 !
 pvc 0/102 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 99.99.99.99 1102 encapsulation mpls sequencing both one-to-one
 !
 pvc 0/103 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 99.99.99.99 1103 pw-class mpls-exp-5
 !
!
interface ATM0/0/1.1 multipoint
 no snmp trap link-status
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 1200 encapsulation mpls sequencing both
 pvc 1/35 l2transport
  encapsulation aal0
  pw-pvc 2/135
 !
 pvc 1/36 l2transport
  encapsulation aal0
```

```
  pw-pvc 2/136
 !
 pvc 1/37 l2transport
  encapsulation aal0
  pw-pvc 2/137
 !
!
interface GigabitEthernet0/1
 description interface to 7600 fas 3/5
 ip address 2.2.2.2 255.255.255.0
 duplex auto
 speed auto
 mpls ip
 no keepalive
!
interface ATM0/1/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
!
interface ATM0/1/1
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
!
interface ATM0/IMA1
 no ip address
 no atm ilmi-keepalive
!
ip route 0.0.0.0 0.0.0.0 172.18.52.1
ip route 99.99.99.99 255.255.255.255 2.2.2.3
!
!
ip http server
no ip http secure-server
!
!
mpls ldp router-id Loopback0
disable-eadi
!
!
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 exec-timeout 0 0
 privilege level 15
 password lab
 no login
!
end
```

MWR_B

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr_B
!
```

```
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type e1 0 1
logging buffered 4096
enable password lab
!
no aaa new-model
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
!
no ip domain lookup
ip domain name cisco.com
multilink bundle-name authenticated
mpls label protocol ldp
vpdn enable
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
archive
 log config
!
!
controller E1 0/0/0
 mode atm aim 1
!
controller E1 0/0/1
 mode atm aim 1
!
controller E1 0/1/0
 mode atm aim 1
!
controller E1 0/1/1
 mode atm aim 1
```

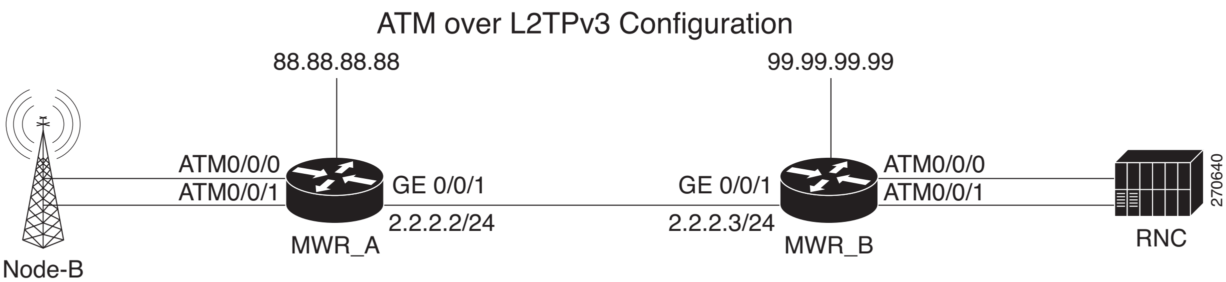
```
!
controller E1 0/2/0
!
controller E1 0/2/1
!
pseudowire-class mpls-exp-5
 encapsulation mpls
 sequencing both
 mpls experimental 5
!
!
!
!
!
!
!
!
interface Loopback0
 ip address 99.99.99.99 255.255.255.255
!
interface ATM0/0/0
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 atm cell-packing 28 mcpt-timer 3
 xconnect 88.88.88.88 100 encapsulation mpls sequencing both
 pvc 1/35 l2transport
  encapsulation aal0
 !
 pvc 1/36 l2transport
  encapsulation aal0
 !
 pvc 1/37 l2transport
  encapsulation aal0
 !
!
interface GigabitEthernet0/0
 ip address 172.18.52.130 255.255.255.0
 duplex auto
 speed auto
 keepalive 1
!
interface ATM0/0/1
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 pvc 0/2
 !
 pvc 0/100 l2transport
  encapsulation aal5
  xconnect 88.88.88.88 1100 encapsulation mpls sequencing both
 !
 pvc 0/101 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 88.88.88.88 1101 encapsulation mpls sequencing both
 !
 pvc 0/102 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 88.88.88.88 1102 encapsulation mpls sequencing both one-to-one
 !
```

```
 pvc 0/103 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 88.88.88.88 1103 pw-class mpls-exp-5
 !
!
interface ATM0/0/1.1 multipoint
 no snmp trap link-status
 atm cell-packing 28 mcpt-timer 3
 xconnect 88.88.88.88 1200 encapsulation mpls sequencing both
 pvc 2/135 l2transport
  encapsulation aal0
 !
 pvc 2/136 l2transport
  encapsulation aal0
 !
 pvc 2/137 l2transport
  encapsulation aal0
 !
!
interface GigabitEthernet0/1
 ip address 2.2.2.3 255.255.255.0
 duplex auto
 speed auto
 mpls ip
!
interface ATM0/1/0
 no ip address
 scrambling-payload
 ima-group 0
 no atm ilmi-keepalive
!
interface ATM0/1/1
 no ip address
 scrambling-payload
 ima-group 0
 no atm ilmi-keepalive
!
ip route 0.0.0.0 0.0.0.0 172.18.52.1
ip route 88.88.88.88 255.255.255.255 2.2.2.2
!
!
ip http server
no ip http secure-server
!
!
mpls ldp router-id Loopback0
!
!
!
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
end
```

ATM over L2TPv3 Configuration

The illustration below configures an ATM port mode PW on interface ATM 0/0/0, ATM AAL5 SDU mode PW on ATM0/0/1 PVC 0/100, ATM N:1 VCC cell mode PW on ATM0/0/1 PVC 0/101, and multiple PVCs N:1 VCC cell mode PW on ATM 0/0/1.1. It also configures Cell-Packing for port mode PWs, VCC cell-relay mode PWs and PVC mapping for ATM0/0/1.1 N:1 VCC cell relay PWs (see Figure B-7).

Figure B-7 ATM over L2TPv3 Configuration



MWR_A

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr_A
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type e1 0 1
card type e1 0 2
card type e1 1 0
logging buffered 4096
enable password lab
!
no aaa new-model
memory-size iomem 25
!
redundancy
  mode y-cable
    standalone
!
network-clock-participate slot 1
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 1/0/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
```

```
!
no ip domain lookup
ip domain name cisco.com
multilink bundle-name authenticated
mpls label range 100 100000 static 16 99
vpdn enable
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
archive
 log config
!
!
controller E1 0/0/0
 mode atm aim 1
 clock source internal
!
controller E1 0/0/1
 mode atm aim 1
 clock source internal
!
controller E1 0/1/0
 mode atm aim 1
 clock source internal
!
controller E1 0/1/1
 mode atm aim 1
 clock source internal
!
controller E1 0/2/0
!
controller E1 0/2/1
!
controller E1 1/0/0
!
controller E1 1/0/1
!
pseudowire-class l2tp
 encapsulation l2tpv3
 sequencing both
 ip local interface Loopback0
 ip tos value 15
!
!
!
!
!
!
!
```

```
!
interface Loopback0
 ip address 88.88.88.88 255.255.255.255
!
interface ATM0/0/0
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 100 pw-class l2tp
 pvc 1/35 l2transport
  encapsulation aal0
 !
 pvc 1/36 l2transport
  encapsulation aal0
 !
 pvc 1/37 l2transport
  encapsulation aal0
 !
!
interface GigabitEthernet0/0
 ip address 172.18.52.129 255.255.255.0
 duplex auto
 speed auto
 no keepalive
!
interface ATM0/0/1
 no ip address
 load-interval 30
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 pvc 0/100 l2transport
  encapsulation aal5
  xconnect 99.99.99.99 1100 pw-class l2tp
 !
 pvc 0/101 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 99.99.99.99 1101 pw-class l2tp
 !
!
interface ATM0/0/1.1 multipoint
 no snmp trap link-status
 atm cell-packing 28 mcpt-timer 3
 xconnect 99.99.99.99 1200 pw-class l2tp
 pvc 1/35 l2transport
  encapsulation aal0
  pw-pvc 2/135
 !
 pvc 1/36 l2transport
  encapsulation aal0
  pw-pvc 2/136
 !
 pvc 1/37 l2transport
  encapsulation aal0
  pw-pvc 2/137
 !
!
interface GigabitEthernet0/1
 description interface to 7600 fas 3/5
 ip address 2.2.2.2 255.255.255.0
 duplex auto
```

```
 speed auto
 mpls ip
 no keepalive
!
interface ATM0/1/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
!
interface ATM0/1/1
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
!
interface ATM0/IMA1
 no ip address
 no atm ilmi-keepalive
!
ip route 0.0.0.0 0.0.0.0 172.18.52.1
ip route 99.99.99.99 255.255.255.255 2.2.2.3
!
!
ip http server
no ip http secure-server
!
!
mpls ldp router-id Loopback0
disable-eadi
!
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 exec-timeout 0 0
 privilege level 15
 password lab
 no login
!
end
```

MWR_B

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mwr_B
!
boot-start-marker
boot-end-marker
!
card type e1 0 0
card type e1 0 1
logging buffered 4096
enable password lab
!
no aaa new-model
!
redundancy
  mode y-cable
```

```
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip cef
!
!
no ip domain lookup
ip domain name cisco.com
multilink bundle-name authenticated
mpls label protocol ldp
vpdn enable
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
archive
 log config
!
!
controller E1 0/0/0
 mode atm aim 1
!
controller E1 0/0/1
 mode atm aim 1
!
controller E1 0/1/0
 mode atm aim 1
!
controller E1 0/1/1
 mode atm aim 1
!
controller E1 0/2/0
!
controller E1 0/2/1
!
pseudowire-class l2tp
 encapsulation l2tpv3
 sequencing both
 ip local interface Loopback0
 ip tos value 15
!
!
```

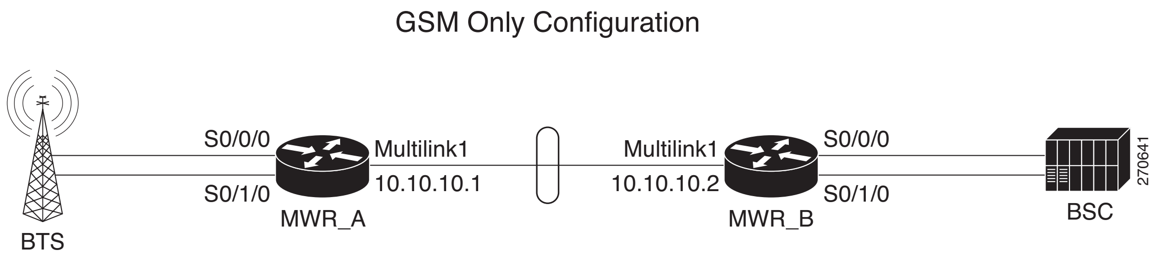
```
!
!
!
!
!
!
interface Loopback0
 ip address 99.99.99.99 255.255.255.255
!
interface ATM0/0/0
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 atm cell-packing 28 mcpt-timer 3
 xconnect 88.88.88.88 100 pw-class l2tp
 pvc 1/35 l2transport
  encapsulation aal0
 !
 pvc 1/36 l2transport
  encapsulation aal0
 !
 pvc 1/37 l2transport
  encapsulation aal0
 !
!
interface GigabitEthernet0/0
 ip address 172.18.52.130 255.255.255.0
 duplex auto
 speed auto
 keepalive 1
!
interface ATM0/0/1
 no ip address
 scrambling-payload
 atm mcpt-timers 1000 2000 3000
 no atm ilmi-keepalive
 pvc 0/2
 !
 pvc 0/100 l2transport
  encapsulation aal5
  xconnect 88.88.88.88 1100 pw-class l2tp
 !
 pvc 0/101 l2transport
  encapsulation aal0
  cell-packing 28 mcpt-timer 3
  xconnect 88.88.88.88 1101 pw-class l2tp
 !
!
interface ATM0/0/1.1 multipoint
 no snmp trap link-status
 atm cell-packing 28 mcpt-timer 3
 xconnect 88.88.88.88 1200 pw-class l2tp
 pvc 2/135 l2transport
  encapsulation aal0
 !
 pvc 2/136 l2transport
  encapsulation aal0
 !
 pvc 2/137 l2transport
  encapsulation aal0
 !
!
interface GigabitEthernet0/1
```

```
 ip address 2.2.2.3 255.255.255.0
 duplex auto
 speed auto
 mpls ip
!
interface ATM0/1/0
 no ip address
 scrambling-payload
 ima-group 0
 no atm ilmi-keepalive
!
interface ATM0/1/1
 no ip address
 scrambling-payload
 ima-group 0
 no atm ilmi-keepalive
!
ip route 0.0.0.0 0.0.0.0 172.18.52.1
ip route 88.88.88.88 255.255.255.255 2.2.2.2
!
!
ip http server
no ip http secure-server
!
!
mpls ldp router-id Loopback0
!
!
!
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
end
```

GSM Only Configuration

The standard GSM topology includes one or more shorthaul interface connections from the BTS to a RAN-O device via separate T1/E1 connections. The RAN-O devices are connected back-to-back using an MLPPP backhaul connection (two or more T1/E1 connections). At the BSC side, the RAN-O to BSC connectivity is exactly like the BTS to RAN-O connections. In this scenario, only GSM traffic traverses the topology (see Figure B-8).

Figure B-8 GSM Only Configuration



MWR_A

```
!
card type E1 0 0
card type E1 0 1
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate aim 1
network-clock-select 1 E1 0/0/1
!
ipran-mib snmp-access inBand
ipran-mib location cellSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/0/1
 channel-group 0 timeslots 1-31
!
controller E1 0/1/0
 framing NO-CRC4
 clock source internal
 channel-group 0 timeslots 1-31
!
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
```

```
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
interface Multilink1
ip address 10.10.10.1 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4444
 gsm-abis remote 10.10.10.2 4444
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface Serial0/1/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4446
 gsm-abis remote 10.10.10.2 4446
 gsm-abis set dscp ef
 no keepalive
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

MWR_B

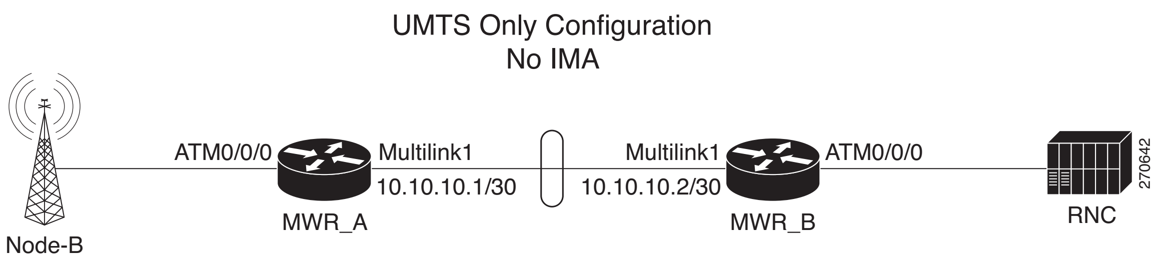
```
!
card type E1 0 0
card type E1 0 1
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
network-clock-select 2 E1 0/1/0
!
ipran-mib snmp-access outOfBand
ipran-mib location aggSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 channel-group 0 timeslots 1-31
!
controller E1 0/0/1
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/1/0
 framing NO-CRC4
 channel-group 0 timeslots 1-31
!
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
interface Multilink1
ip address 10.10.10.2 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
```

```
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4444
 gsm-abis remote 10.10.10.1 4444
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface Serial0/1/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4446
 gsm-abis remote 10.10.10.1 4446
 gsm-abis set dscp ef
 no keepalive
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

UMTS Only Configuration without IMA

The traditional UMTS configuration is similar to the GSM configuration except only UMTS traffic traverses the topology. Unlike GSM traffic, UMTS traffic arrives at the RAN-O device via ATM PVCs. The UMTS traffic is then routed over the traditional MLPPP backhaul connection. At the RNC side, the RAN-O to RNC connectivity is exactly like the Node-B to RAN-O interface connections. Aside from the necessity of ATM connectivity, the physical connectivity for UMTS is exactly like the GSM topology (see Figure B-9 on page B-59).

Figure B-9 UMTS Only Configuration without IMA



MWR_A

```
!
card type E1 0 0
card type E1 0 1
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate aim 1
network-clock-select 1 E1 0/0/1
!
ipran-mib snmp-access inBand
ipran-mib location cellSite
!
!
controller E1 0/0/0
mode atm aim 1
clock source internal
!
controller E1 0/0/1
 channel-group 0 timeslots 1-31
!
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
```

```
interface Multilink1
ip address 10.10.10.1 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
!
interface ATM0/0/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 atm umts-iub
 umts-iub set dscp ef
 umts-iub local 10.10.10.1 6000
 umts-iub remote 10.10.10.2 6000
 pvc 1/1 qsaal
 !
 pvc 1/2 qsaal
 !
 pvc 1/100
  encapsulation aal0
 !
!
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

MWR_B

```
!
card type E1 0 0
card type E1 0 1
```

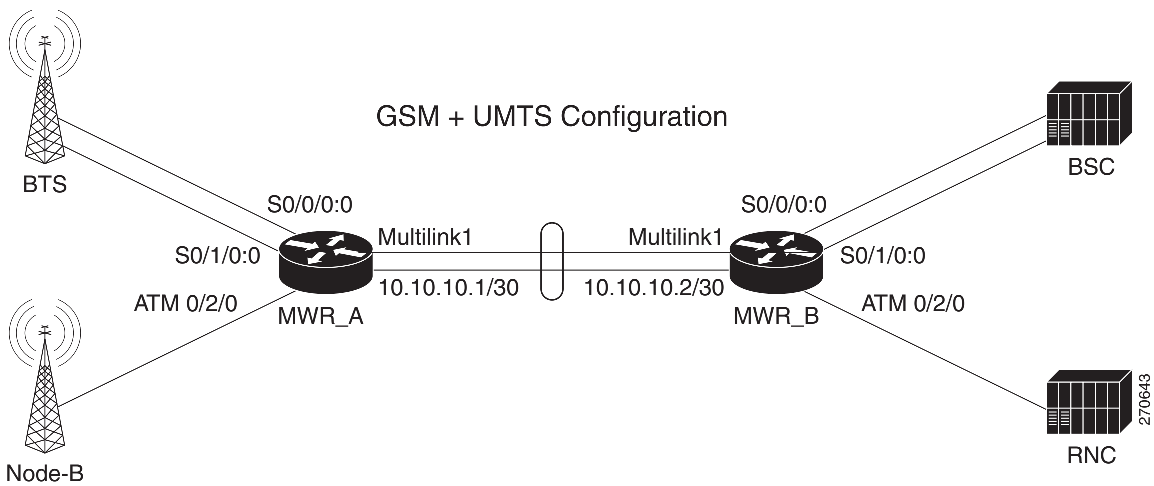
```
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
!
ipran-mib snmp-access outOfBand
ipran-mib location aggSite
!
!
controller E1 0/0/0
mode atm aim 1
!
controller E1 0/0/1
 clock source internal
 channel-group 0 timeslots 1-31
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
interface Multilink1
ip address 10.10.10.2 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
!
interface ATM0/0/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 atm umts-iub
 umts-iub set dscp ef
 umts-iub local 10.10.10.2 6000
 umts-iub remote 10.10.10.1 6000
 pvc 1/1 qsaal
 !
 pvc 1/2 qsaal
```

```
 !
 pvc 1/100
  encapsulation aal0
 !
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

Combined GSM and UMTS Configuration

The combined GSM and UMTS configuration allows both the GSM and UMTS technologies to become aggregated over the traditional multilink backhaul connection (see Figure B-10).

Figure B-10 Combined GSM and UMTS Configuration



MWR_A

```
!
card type E1 0 0
card type E1 0 1
card type E1 0 2
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/1
network-clock-select 1 E1 0/1/1
!
ipran-mib snmp-access inBand
ipran-mib location cellSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/0/1
 channel-group 0 timeslots 1-31
!
controller E1 0/1/0
 framing NO-CRC4
 clock source internal
 channel-group 0 timeslots 1-31
```

```
!
controller E1 0/1/1
 channel-group 0 timeslots 1-31
!
controller E1 0/2/0
  clock source internal
mode atm aim 1
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
interface Multilink1
ip address 10.10.10.1 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4444
 gsm-abis remote 10.10.10.2 4444
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface Serial0/1/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4446
 gsm-abis remote 10.10.10.2 4446
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/1/1:0
 no ip address
 encapsulation ppp
```

```
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface ATM0/2/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 atm umts-iub
 umts-iub set dscp ef
 umts-iub local 10.10.10.1 6000
 umts-iub remote 10.10.10.2 6000
 pvc 1/1 qsaal
 !
 pvc 1/2 qsaal
 !
 pvc 1/100
  encapsulation aal0
 !
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

MWR_B

```
!
card type E1 0 0
card type E1 0 1
card type E1 0 2
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
network-clock-select 2 E1 0/1/0
network-clock-select 3 E1 0/2/0
!
ipran-mib snmp-access outOfBand
ipran-mib location aggSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 channel-group 0 timeslots 1-31
!
```

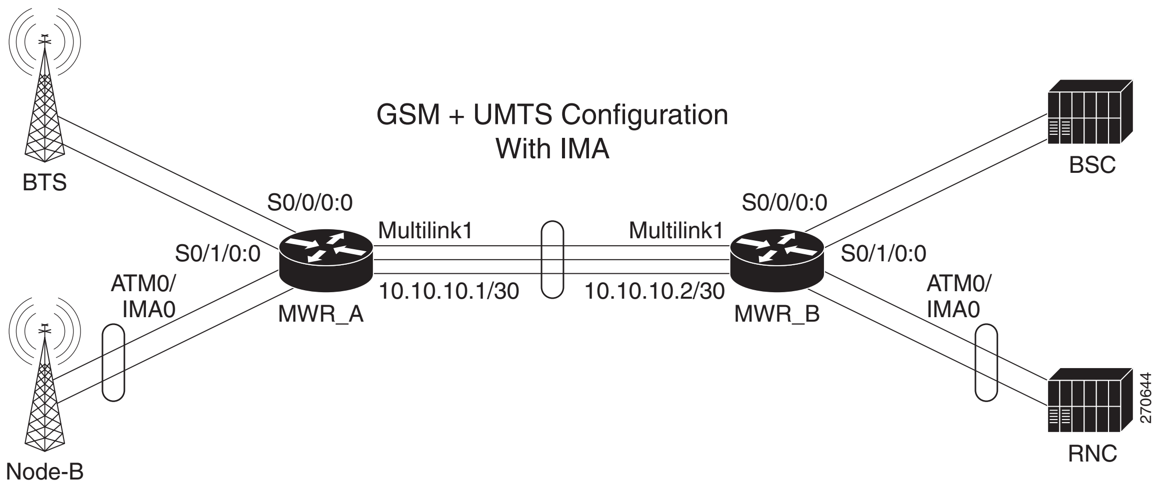
```
controller E1 0/0/1
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/1/0
 framing NO-CRC4
 channel-group 0 timeslots 1-31
!
controller E1 0/1/1
 clock source internal
 channel-group 0 timeslots 1-31
!
!
controller E1 0/2/0
mode atm aim 1
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
interface Multilink1
ip address 10.10.10.2 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4444
 gsm-abis remote 10.10.10.1 4444
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface Serial0/1/0:0
 no ip address
```

```
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4446
 gsm-abis remote 10.10.10.1 4446
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/1/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface ATM0/2/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 atm umts-iub
 umts-iub set dscp ef
 umts-iub local 10.10.10.2 6000
 umts-iub remote 10.10.10.1 6000
 pvc 1/1 qsaal
 !
 pvc 1/2 qsaal
 !
 pvc 1/100
  encapsulation aal0
 !

!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

GSM and UMTS with IMA Configuration

The combined GSM and UMTS with Inverse Multiplexing over ATM (IMA) configuration allows both the GSM and UMTS technologies to become aggregated over the traditional multilink backhaul connection (see Figure B-11).

Figure B-11 GSM and UMTS with IMA Configuration



MWR_A

```
!
card type E1 0 0
card type E1 0 1
card type E1 0 2
card type E1 1 0
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate slot 1
network-clock-participate aim 1
network-clock-select 1 E1 0/0/1
network-clock-select 2 E1 0/1/1
network-clock-select 3 E1 0/2/1
!
ipran-mib snmp-access inBand
ipran-mib location cellSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/0/1
 channel-group 0 timeslots 1-31
!
```

```
controller E1 0/1/0
 framing NO-CRC4
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/1/1
 channel-group 0 timeslots 1-31
!
controller E1 0/2/0
  clock source internal
mode atm aim 1
!
controller E1 0/2/1
 channel-group 0 timeslots 1-31
!
controller E1 1/0/0
  clock source internal
mode atm aim 1
!

class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
interface Multilink1
ip address 10.10.10.1 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4444
 gsm-abis remote 10.10.10.2 4444
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
```

```
!
interface Serial0/1/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4446
 gsm-abis remote 10.10.10.2 4446
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/1/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface ATM0/2/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 ima-group 0
!
interface Serial0/2/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface ATM1/0/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 ima-group 0
!
interface ATM0/IMA0
no ip address
atm bandwidth dynamic
atm umts-iub
umts-iub set dscp ef
umts-iub local 10.10.10.1 6000
umts-iub remote 10.10.10.2 6000
no atm ilmi-keepalive
pvc 2/1
  encapsulation aal0
!
pvc 2/2 qsaal
!
!
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

MWR_B

```
!
card type E1 0 0
card type E1 0 1
card type E1 0 2
card type E1 1 0
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate slot 1
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
network-clock-select 2 E1 0/1/0
network-clock-select 3 E1 0/2/0
!
ipran-mib snmp-access outOfBand
ipran-mib location aggSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 channel-group 0 timeslots 1-31
!
controller E1 0/0/1
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/1/0
 framing NO-CRC4
 channel-group 0 timeslots 1-31
!
controller E1 0/1/1
 clock source internal
 channel-group 0 timeslots 1-31
!
!
controller E1 0/2/0
  mode atm aim 1
!
controller E1 0/2/1
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 1/0/0
  mode atm aim 1
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
```

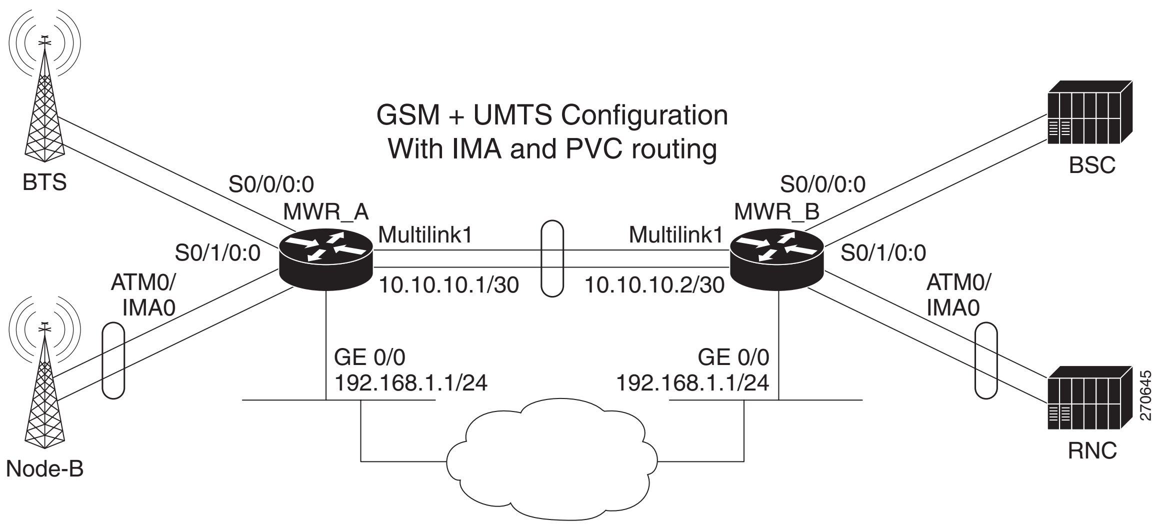
```
interface Multilink1
ip address 10.10.10.2 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4444
 gsm-abis remote 10.10.10.1 4444
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface Serial0/1/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4446
 gsm-abis remote 10.10.10.1 4446
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/1/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface ATM0/2/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 ima-group 0
!
interface Serial0/2/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface ATM1/0/0
 no ip address
```

```
 scrambling-payload
 no atm ilmi-keepalive
 ima-group 0
!
interface ATM0/IMA0
no ip address
atm bandwidth dynamic
atm umts-iub
umts-iub set dscp ef
umts-iub local 10.10.10.2 6000
umts-iub remote 10.10.10.1 6000
no atm ilmi-keepalive
pvc 2/1
  encapsulation aal0
!
pvc 2/2 qsaal
!
!
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

GSM and UMTS with IMA and PVC Routing (HSDPA Offload) Configuration

The combined GSM and UMTS with IMA and PVC Routing configuration allows PVC Routing to be off-loaded to an alternate backhaul (see Figure B-12 on page B-74).

Figure B-12 GSM and UMTS with IMA and PVC Routing (HSDPA Offload) Configuration



MWR_A

```
!
card type E1 0 0
card type E1 0 1
card type E1 0 2
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/1
network-clock-select 2 E1 0/1/1
!
ipran-mib snmp-access inBand
ipran-mib location cellSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/0/1
 channel-group 0 timeslots 1-31
!
controller E1 0/1/0
 framing NO-CRC4
 clock source internal
```

```
 channel-group 0 timeslots 1-31
!
controller E1 0/1/1
 channel-group 0 timeslots 1-31
!
!
controller E1 0/2/0
  clock source internal
mode atm aim 1
!
controller E1 0/2/1
  clock source internal
mode atm aim 1
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
interface Multilink1
ip address 10.10.10.1 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
interface GigabitEthernet0/0
 ip address 192.168.1.1 255.255.255.0
 duplex auto
 speed auto
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4444
 gsm-abis remote 10.10.10.2 4444
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
```

```
interface Serial0/1/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4446
 gsm-abis remote 10.10.10.2 4446
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/1/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface ATM0/2/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 ima-group 0
!
interface ATM0/2/1
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 ima-group 0
!
interface ATM0/IMA0
no ip address
atm bandwidth dynamic
atm umts-iub
umts-iub set dscp ef
umts-iub set peering dscp ef
umts-iub local 10.10.10.1 6000
umts-iub remote 10.10.10.2 6000
no atm ilmi-keepalive
pvc 2/1
  encapsulation aal0
!
pvc 2/2 qsaal
!
!
interface ATM0/IMA0.1 multipoint
 atm umts-iub
 umts-iub set dscp ef
 umts-iub set peering dscp ef
 umts-iub local 192.168.1.1
 umts-iub remote 192.168.1.2
 pvc 2/3
   encapsulation aal0

!
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
```

```
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

MWR_B

```
!
card type E1 0 0
card type E1 0 1
card type E1 0 2
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate wic 1
network-clock-participate wic 2
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
network-clock-select 2 E1 0/1/0
network-clock-select 3 E1 0/2/0
network-clock-select 4 E1 0/2/1
!
ipran-mib snmp-access outOfBand
ipran-mib location aggSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 channel-group 0 timeslots 1-31
!
controller E1 0/0/1
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/1/0
 framing NO-CRC4
 channel-group 0 timeslots 1-31
!
controller E1 0/1/1
 clock source internal
 channel-group 0 timeslots 1-31
!
controller E1 0/2/0
  mode atm aim 1
!
controller E1 0/2/1
  mode atm aim 1
!
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
interface Multilink1
```

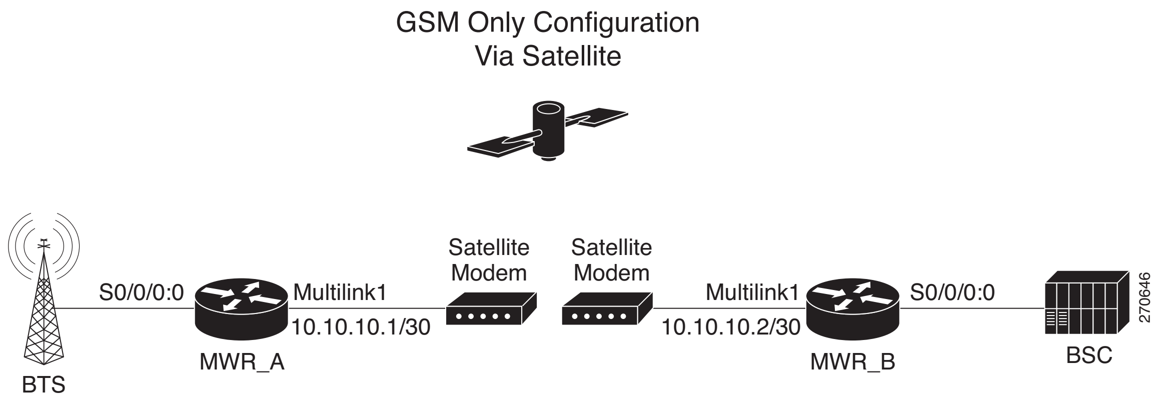
```
ip address 10.10.10.2 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
interface GigabitEthernet0/0
 ip address 192.168.1.2 255.255.255.0
 duplex auto
 speed auto
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4444
 gsm-abis remote 10.10.10.1 4444
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface Serial0/1/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4446
 gsm-abis remote 10.10.10.1 4446
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/1/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
interface ATM0/2/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 ima-group 0
!
interface ATM0/2/1
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 ima-group 0
```

```
!
interface ATM0/IMA0
no ip address
atm bandwidth dynamic
atm umts-iub
umts-iub set dscp ef
umts-iub set peering dscp ef
umts-iub local 10.10.10.2 6000
umts-iub remote 10.10.10.1 6000
no atm ilmi-keepalive
pvc 2/1
  encapsulation aal0
!
pvc 2/2 qsaal
!
!
interface ATM0/IMA0.1 multipoint
atm umts-iub
umts-iub set dscp ef
umts-iub peering dscp ef
umts-iub local 192.168.1.2
umts-iub remote 192.168.1.1
pvc 2/3
  encapsulation aal0

!
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

GSM Only Configuration via Satellite

The GSM only via satellite configuration allows for point-to-point network optimization (see Figure B-13).

Figure B-13 GSM Only Configuration via Satellite



MWR_A

```
!
card type E1 0 0
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate aim 1
network-clock-select 1 E1 0/0/1
!
ipran-mib snmp-access inBand
ipran-mib location cellSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 clock source internal
 channel-group 0 timeslots 1-20
!
controller E1 0/0/1
 channel-group 0 timeslots 1-20
!
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
```

```
interface Multilink1
ip address 10.10.10.1 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4444
 gsm-abis remote 10.10.10.2 4444
 gsm-abis set dscp ef
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

MWR_B

```
!
card type E1 0 0
!
!
redundancy
  mode y-cable
   standalone
!
network-clock-participate wic 0
network-clock-participate aim 1
network-clock-select 1 E1 0/0/0
!
ipran-mib snmp-access outOfBand
ipran-mib location aggSite
!
!
controller E1 0/0/0
 framing NO-CRC4
 channel-group 0 timeslots 1-20
!
controller E1 0/0/1
 clock source internal
 channel-group 0 timeslots 1-20
!
!
class-map match-any llq-class
match ip dscp ef
!
!
policy-map llq-policy
class llq-class
  priority percent 99
class class-default
  bandwidth remaining percent 1
  queue-limit 45
!
interface Multilink1
ip address 10.10.10.2 255.255.255.252
load-interval 30
 no keepalive
 no cdp enable
 ppp pfc local request
 ppp pfc remote apply
 ppp acfc local request
 ppp acfc remote apply
 ppp multilink
 ppp multilink interleave
 ppp multilink group 1
 ppp multilink fragment delay 0 1
 ppp multilink multiclass
 max-reserved-bandwidth 100
 service-policy output llq-policy
 hold-queue 50 out
 ip rtp header-compression ietf-format
!
!
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4444
 gsm-abis remote 10.10.10.1 4444
 gsm-abis set dscp ef
```

```
 no keepalive
!
interface Serial0/0/1:0
 no ip address
 encapsulation ppp
 keepalive 1
 ppp multilink group 1
 max-reserved-bandwidth 100
!
logging history size 500
logging history debugging
logging trap warnings
snmp-server community public RO
snmp-server queue-length 100
snmp-server enable traps snmp linkdown linkup coldstart warmstart
snmp-server enable traps ipran
snmp-server enable traps syslog
snmp-server trap link ietf
snmp-server ifIndex persist
no snmp-server sparse-table
snmp-server host 64.50.100.254 version 2c V2C
disable-eadi
```

GSM Congestion Management

The GSM congestion management configuration.

BTS side:

```
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.1 4444
 gsm-abis remote 10.10.10.2 4444
 gsm-abis congestion enable
 gsm-abis congestion critical 1-10
 gsm-abis congestion critical 31
 gsm-abis set dscp ef
 no keepalive
```

BSC side:

```
interface Serial0/0/0:0
 no ip address
 encapsulation gsm-abis
 gsm-abis local 10.10.10.2 4444
 gsm-abis remote 10.10.10.1 4444
 gsm-abis congestion enable
 gsm-abis congestion critical 1-10
 gsm-abis congestion critical 31
 gsm-abis set dscp ef
 no keepalive
```

UMTS Congestion Management

The UMTS congestion management configuration.

Node-B side:

```
interface ATM0/2/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 atm umts-iub
 umts-iub set dscp ef
 umts-iub congestion-control
 umts-iub local 10.10.10.1 6000
 umts-iub remote 10.10.10.2 6000
 pvc 1/1 qsaal
  umts-iub congestion priority protected
 !
 pvc 1/2 qsaal
  umts-iub congestion priority 2
 !
 pvc 1/100
encapsulation aal0
  umts-iub congestion priority 5
 !
```

RNC side:

```
interface ATM0/2/0
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 atm umts-iub
 umts-iub set dscp ef
 umts-iub congestion-control
 umts-iub local 10.10.10.2 6000
 umts-iub remote 10.10.10.1 6000
 pvc 1/1 qsaal
   umts-iub congestion priority protected
 !
 pvc 1/2 qsaal
   umts-iub congestion priority 2
 !
 pvc 1/100
encapsulation aal0
 umts-iub congestion priority 5
 !
```

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