



Voice and Quality of Service Features for ADSL and G.SHDSL on Cisco 1700, Cisco 2600, and Cisco 3600 Series Routers

Feature History

Release	Modification
12.2(2)XQ	Voice and quality of service features for ADSL were introduced for Cisco 1700 series routers.
12.2(2)XK	Voice and quality of service features for ADSL were introduced for Cisco 2600 and Cisco 3600 series routers.
12.2(4)XL	This release further expanded voice and quality of service features for ADSL on Cisco 2600 and Cisco 3600 routers and provided full support for G.SHDSL on Cisco 1700 and Cisco 2600 series routers.
12.2(13)T	The voice and quality of service features for ADSL and G.SHDSL were fully implemented on Cisco 1700 series routers. Note The Tunable Transmission Ring feature is not supported on Cisco 1700 series routers in Cisco IOS Release 12.2(13)T.

This document describes the voice and quality of service (QoS) features for asymmetric digital subscriber lines (ADSL) and for single-pair high-bit-rate digital subscriber lines (G.SHDSL) on Cisco 1700 series, Cisco 2600 series, and Cisco 3600 series routers in Cisco IOS Release 12.2(13)T.

This document includes the following sections:

- [Feature Overview, page 2](#)
- [Supported Platforms, page 12](#)
- [Supported Standards, MIBs, and RFCs, page 13](#)
- [Prerequisites, page 13](#)
- [Configuration Tasks, page 14](#)
- [Configuration Examples, page 18](#)
- [Command Reference, page 33](#)

Feature Overview

Cisco 1700 series, Cisco 2600 series, and Cisco 3600 series routers with ADSL or G.SHDSL WAN interface cards support the integration of voice and data over the same ADSL or G.SHDSL circuit using Voice over IP (VoIP). Cisco 2600 series and Cisco 3600 series routers with ADSL or G.SHDSL WAN interface cards also support the integration of voice and data over the same ADSL or G.SHDSL circuit using Voice over ATM (VoATM).



Note

- To configure these voice and QoS features, you must first install and configure the ADSL or G.SHDSL WAN interface card (WIC) on your Cisco 1700 series, Cisco 2600 series, or Cisco 3600 series router. Refer to the installation and configuration instructions in the following documents:
 - [Configuring an ADSL WAN Interface Card on Cisco 1700 Series Routers](#)
 - [Installing the G.SHDSL WIC on the Cisco 1700 Series Router](#)
 - [1-Port ADSL WAN Interface Card for Cisco 2600 Series and 3600 Series Routers](#), Release 12.2(4)T
 - [1-Port G.SHDSL WAN Interface Card for Cisco 2600 Series and 3600 Series Routers](#), Release 12.2(4)XL

Quality of service (QoS) features make it possible to effectively combine voice and data traffic in the same WAN connection without sacrificing quality and reliability. Service providers can increase revenue by building differentiated service options based on premium, standard, or best-effort service classes.

The following voice and QoS features are supported in the Cisco IOS Release 12.2(13)T.

- [Classification and Marking](#)
 - [Class-Based Packet Marking with Differentiated Services](#)
 - [Committed Access Rate](#)
 - [Dial-Peer DSCP and IP Precedence Marking](#)
 - [IP QoS Map to ATM CoS](#)
 - [Local Policy Routing](#)
 - [Policy-Based Routing](#)
- [Queueing and Scheduling](#)
 - [Class-Based Weighted Fair Queueing](#)
 - [Low Latency Queueing](#)
 - [Per-VC Queueing](#)
- [Congestion Avoidance](#)
 - [Class-Based WRED with DSCP \(egress\)](#)
- [Policing and Traffic Shaping](#)
 - [Class-Based Policing](#)
 - [VC Shaping for VBR-NRT](#)

- [Link Latency](#)
 - [MLP with LFI – Bundling of VCs Across xDSL Interfaces](#)
 - [Tunable Transmission Ring](#) (supported only on Cisco 2600 and Cisco 3600 series routers; not supported on Cisco 1700 series routers until Cisco IOS Release 12.2(8)YN)
- [Other \(IP QoS\)](#)
 - [Access Control Lists](#)
 - [IP QoS Map to ATM CoS](#)
- [Additional Supported Features](#)
 - [F5 OAM CC Segment Functionality](#)
 - [H.323 and Media Gateway Control Protocol](#)
 - [ILMI](#)
 - [Multiple PVC Support](#)
 - [RFC 1483 Routing](#)

[Table 1](#) lists the voice and QoS features for ADSL and G.SHDSL and the releases in which they are available.

Table 1 Voice and QoS Features and the Releases in Which They Are Available

Feature	ADSL	G.SHDSL
Access Control Lists	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Class-Based Packet Marking with DSCP	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Class-Based Policing	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Class-Based Weighted Fair Queueing	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Class-Based WRED with DSCP (egress)	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Committed Access Rate	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Dial-Peer DSCP and IP Precedence Marking	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
F5 OAM CC Segment Functionality	12.2(4)XL and 12.2(13)T	12.2(4)XL and 12.2(13)T
H.323 and Media Gateway Control Protocol	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
ILMI	12.2(4)XL and 12.2(13)T	12.2(4)XL and 12.2(13)T
IP QoS Map to ATM CoS	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Local Policy Routing	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Low Latency Queueing	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T

Table 1 Voice and QoS Features and the Releases in Which They Are Available (continued)

MLP with LFI - Bundling of VCs Across xDSL Interfaces	12.2(2)XK and 12.2(13)T	12.2(4)XL and 12.2(13)T
Multiple PVC Support	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Per-VC Queueing	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Policy-Based Routing	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
RFC 1483 Routing	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Tunable Transmission Ring	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
VC shaping for VBR-NRT	12.2(2)XK, 12.2(4)XL, and 12.2(13)T	12.2(4)XL and 12.2(13)T
Note G.SHDSL WICs are not supported on Cisco 3600 series routers in the Cisco IOS Release 12.2(4)XL		

Classification and Marking

The following existing Cisco IOS classification and marking features are supported on ADSL and G.SHDSL WICs:

- [Class-Based Packet Marking with Differentiated Services](#)
- [Committed Access Rate](#)
- [Dial-Peer DSCP and IP Precedence Marking](#)
- [Local Policy Routing](#)
- [Policy-Based Routing](#)

Class-Based Packet Marking with Differentiated Services

For information about class-based packet marking with differentiated services, refer to the following document:

- The chapter “[Quality of Service Overview](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2

Committed Access Rate

For information about committed access rate (CAR), refer to the following document:

- The chapter “[Quality of Service Overview](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2

Dial-Peer DSCP and IP Precedence Marking

For information about dial-peer differentiated services code points (DSCPs) and IP precedence marking, refer to the following document:

- The chapter “[Quality of Service for Voice over IP](#)” in the *Cisco IOS Quality of Service Solutions*.

Local Policy Routing

For information about local policy routing (LPR), refer to the following documents:

- The chapter “[Configuring IP Routing Protocol—Independent Features](#)” in the *Cisco IOS IP Configuration Guide*, Release 12.2
- The chapter “[Configuring IP Routing Protocols](#)” in the *Router Products Configuration Guide*

Policy-Based Routing

For information about policy-based routing (PBR), refer to the following documents:

- The chapter “[Quality of Service Overview](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2
- The chapter “[Configuring Policy-Based Routing](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2

Queueing and Scheduling

The following existing Cisco IOS queueing and scheduling features are supported on ADSL WICs and G.SHDSL WICs:

- [Class-Based Weighted Fair Queueing](#)
- [Low Latency Queueing](#)
- [Per-VC Queueing](#)

Class-Based Weighted Fair Queueing

For information about class-based weighted fair queueing (CBWFQ), refer to the following document:

- The chapter “[Quality of Service Overview](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2

Low Latency Queueing

For information about low latency queueing (LLQ), refer to the following documents:

- The chapter “[Congestion Management Overview](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2
- The chapter “[Quality of Service for Voice over IP](#)” in the *Cisco IOS Quality of Service Solutions* document

**Note**

Low latency queueing works in conjunction with setting the transmission (tx) ring. (For more information about setting the tx ring, see the section “[Tunable Transmission Ring](#).”)

Per-VC Queueing

Per-virtual circuit (per-VC) queueing is supported on ADSL and G.SHDSL interfaces at the driver level, similar to VC-queueing features on other ATM interfaces. This feature underlies many of the Cisco IOS QoS queueing features, such as LLQ.

For more information about per-VC queueing, refer to the following documents:

- [Understanding Weighted Fair Queuing on ATM](#)
- [Per-VC Class-Based, Weighted Fair Queuing \(Per-VC CBWFQ\) on the Cisco 7200, 3600, and 2600 Routers](#)

Congestion Avoidance

The following existing Cisco IOS congestion avoidance feature is supported on ADSL and G.SHDSL WICs:

- [Class-Based WRED with DSCP \(egress\)](#)

Class-Based WRED with DSCP (egress)

For information about class-based weighted random early detection (WRED), refer to the following documents:

- The chapter “[Quality of Service Overview](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2
- [Cisco IOS Quality of Service Solutions Command Reference](#), Release 12.2
- [DiffServ Compliant Weighted Random Error Detection](#)

Policing and Traffic Shaping

The following existing Cisco IOS policing and shaping features are now supported on ADSL and G.SHDSL WICs:

- [Class-Based Policing](#)
- [VC Shaping for VBR-NRT](#)

Class-Based Policing

For information about traffic classes and traffic policies, refer to the following document:

- The chapter “[Configuring Traffic Policing](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2

VC Shaping for VBR-NRT

For information about VC shaping for variable bit rate-nonreal time (VBR-NRT), refer to the following document:

- [Understanding the VBR-nrt Service Category and Traffic Shaping for ATM VCs](#)

Link Latency

The following link latency features are supported on ADSL and G.SHDSL WICs:

- [MLP with LFI – Bundling of VCs Across xDSL Interfaces](#)
- [Tunable Transmission Ring](#)

MLP with LFI – Bundling of VCs Across xDSL Interfaces

For information about the Multilink PPP Link Fragmentation and Interleaving (MLP and LFI) – Bundling of VCs Across ADSL and G.SHDSL (xDSL) Interfaces feature, refer to the following document:

- The chapter “[Configuring Link Fragmentation and Interleaving for Multilink PPP](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2

Tunable Transmission Ring

The tx ring is the first-in, first-out (FIFO) buffer used to hold frames before transmission at the DSL driver level. The tx ring defines the maximum number of packets that can wait for transmission at Layer 2.

The tx ring complements the ability of LLQ to minimize jitter and latency of voice packets. For maximum voice quality, a low tx ring setting should be used. For maximum data throughput, a high tx ring setting should be used.

You can configure the size of the tx ring for each permanent virtual circuit (PVC). The default value is 60. However, the value of the setting can be changed to 2 or 3. (The only permitted values are 2, 3, or 60). A low tx ring setting, such as 2 or 3, is required for latency-critical traffic. For example, when the tx ring limit is configured as 3 and LLQ is configured on the PVC, the worst case delay for a voice packet is the time required to transmit three data packets. When the buffering is reduced by configuring the tx ring limit, the delay experienced by voice packets is reduced by a combination of the tx ring and LLQ mechanism.



Note

- The size of the tx ring buffer is measured in packets, not particles.
- The Tunable Transmission Ring feature is not supported on Cisco 1700 series routers until Cisco IOS Release 12.2(8)YN.

Other (IP QoS)

The following IP QoS features are supported on ADSL and G.SHDSL WICs:

- [Access Control Lists](#)
- [IP QoS Map to ATM CoS](#)

Access Control Lists

For information about configuring access control lists, refer to the following document:

- The chapter “[Configuring IP Services](#)” in the *Cisco IOS IP Configuration Guide*, Release 12.2

IP QoS Map to ATM CoS

For information about IP QoS map to ATM class of service (CoS), refer to the following document:

- The chapter “[Configuring IP to ATM Class of Service](#)” in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2

Additional Supported Features

The following existing IOS features are supported on ADSL and G.SHDSL WICs:

- [F5 OAM CC Segment Functionality](#)
- [H.323 and Media Gateway Control Protocol](#)
- [ILMI](#)
- [Multiple PVC Support](#)
- [RFC 1483 Routing](#)

F5 OAM CC Segment Functionality

For information about F5 Operation, Administration, and Maintenance Continuity Check (F5 OAM CC) segment functionality, refer to the following documents:

- Cisco Product Bulletin No. 1518 about Cisco IOS software Release 12.2(2)XJ
- [Release Notes for the Cisco 1700 Series Routers for Cisco IOS Release 12.2\(XJ\)](#)

H.323 and Media Gateway Control Protocol

For information about Cisco H.323 and Media Gateway Control Protocol (MGCP) features, refer to the following documents:

- The chapter “[Configuring Voice over IP](#)” in the *Cisco IOS Voice, Video, and Fax Configuration Guide*, Release 12.2
- The chapter “[H.323 Applications](#)” in the *Cisco IOS Voice, Video, and Fax Configuration Guide*, Release 12.2

ILMI

For information about Integrated Local Management Interface (ILMI) protocol implementation for Cisco digital subscriber loop access multiplexers (DSLAMs) with N1-2 cards, refer to the following document:

- The chapter “[Configuring ILMI](#)” in the *Configuration Guide for Cisco DSLAMS with N1-2*

Multiple PVC Support

For information about PVCs, refer to the following documents:

- The chapter “[Wide-Area Networking Overview](#)” in the *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.2
- The chapter “[Configuring ATM](#)” in the *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.2

RFC 1483 Routing

For information about ATM and ATM adaptation layers (AALs), refer to the following document:

- The chapter “[Wide-Area Networking Overview](#)” in the *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.2

For information regarding AAL5 Subnetwork Access Protocol (AAL5SNAP) encapsulations, refer to the following document:

- The chapter “[Configuring ATM](#)” in the *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.2

Benefits

QoS provides improved and more predictable network service for ADSL and G.SHDSL by

- Supporting dedicated bandwidth.
- Improving loss characteristics.
- Avoiding and managing network congestion.
- Shaping network traffic.
- Setting traffic priorities across the network.

Restrictions

- G.SHDSL WICs are not supported on Cisco 3600 series routers in the Cisco IOS Release 12.2(4)XL.

**Note**

The G.SHDSL WIC is supported on Cisco 2600 series routers in the Cisco IOS Release 12.2(4)XL.

- Analog and BRI voice on the NM-1V/2V cards are not supported over VoATM in AAL2.

- Refer to the following documents for caveat information for multiple PVCs on Cisco 1700 series, Cisco 2600 series, and Cisco 3600 series routers:
 - [Release Notes for the Cisco 1700 Series Routers for Cisco IOS Release 12.2\(8\)YN](#)
 - [Release Notes for the Cisco 1700 Series Routers for Cisco IOS Release 12.2\(2\)XK](#)
 - [Release Notes for Cisco 2600 Series for Cisco IOS Release 12.2 XK](#)
 - [Release Notes for Cisco 3600 Series for Cisco IOS Release 12.2 XK](#)
 - [Release Notes for Cisco 2600 Series for Cisco IOS Release 12.2 XL](#)
 - [Release Notes for Cisco 3600 Series for Cisco IOS Release 12.2 XL](#)
- F5 OAM CC segment functionality is not currently supported on Cisco DSLAMs.

Related Documents

[Table 2](#) lists related documents about the Voice and QoS for ADSL and G.SHDSL features on Cisco 1700, Cisco 2600, and Cisco 3600 series routers.

Table 2 Related Documents

Related Topic	Document Titles
ADSL WAN interface card	• Configuring an ADSL WAN Interface Card on Cisco 1700 Series Routers • 1-Port ADSL WAN Interface Card for Cisco 2600 Series and 3600 Series Routers, Release 12.2(4)T
ATM, configuring	• Cisco IOS Wide-Area Networking Configuration Guide, Release 12.2 • Cisco IOS Wide-Area Networking Command Reference, Release 12.2
Caveat information for the Cisco 1700 series, Cisco 2600 series, and Cisco 3600 series routers	• Release Notes for the Cisco 1700 Series Routers for Cisco IOS Release 12.2(2)XK • Release Notes for the Cisco 1700 Series Routers for Cisco IOS Release 12.2(8)YN • Release Notes for Cisco 2600 Series for Cisco IOS Release 12.2 XK • Release Notes for Cisco 3600 Series for Cisco IOS Release 12.2 XK • Release Notes for Cisco 2600 Series for Cisco IOS Release 12.2 XL • Release Notes for Cisco 3600 Series for Cisco IOS Release 12.2 XL
Dial-peer DSCPs and IP precedence marking	The chapter “ Quality of Service for Voice over IP ” in the <i>Cisco IOS Quality of Service Solutions</i>

Related Topic	Document Titles
F5 OAM CC segment functionality	“Cisco Product Bulletin No. 1518” about Cisco IOS software Release 12.2(2)XJ Release Notes for the Cisco 1700 Series Routers for Cisco IOS Release 12.2(XJ)
G.SHDSL WAN interface card	Installing the G.SHDSL WIC on the Cisco 1700 Series Router 1-Port G.SHDSL WAN Interface Card for Cisco 2600 Series and 3600 Series Routers, Release 12.2(4)XL
ILMI	The chapter “Configuring ILMI” in the <i>Configuration Guide for Cisco DSLAMS with N1-2</i>
IP, configuring	Cisco IOS IP Configuration Guide, Release 12.2 Cisco IOS IP Command Reference, Release 12.2 (there are three volumes)
Local policy routing	The chapter “Configuring IP Routing Protocols” in <i>Router Products Configuration Guide</i>
Per-VC queueing	Understanding Weighted Fair Queuing on ATM Per-VC Class-Based, Weighted Fair Queuing (Per-VC CBWFQ) on the Cisco 7200, 3600, and 2600 Routers
QoS, configuring	Cisco IOS Quality of Service Solutions Configuration Guide, Release 12.2 Cisco IOS Quality of Service Solutions Command Reference, Release 12.2
QoS features on Cisco 1700 series routers	Cisco IOS Software Release 12.2(2)XQ1
VC shaping for VBR-NRT	Understanding the VBR-nrt Service Category and Traffic Shaping for ATM VCs
Voice configuration	Cisco IOS Voice, Video, and Fax Configuration Guide, Release 12.2 Cisco IOS Voice, Video, and Fax Command Reference, Release 12.2
WRED	DiffServ Compliant Weighted Random Error Detection

Supported Platforms

- Cisco 1720
- Cisco 1721
- Cisco 1751
- Cisco 1751V
- Cisco 1760
- Cisco 1760V
- Cisco 2650
- Cisco 2651
- Cisco 2600XM
- Cisco 3640
- Cisco 3660

Determining Platform Support Through Feature Navigator

Cisco IOS software is packaged in feature sets that are supported on specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

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

<http://www.cisco.com/register>

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

<http://www.cisco.com/go/fn>

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

**Note**

As of Cisco IOS Release 12.2(2)XK and Release 12.2(4)XL, Feature Navigator does not support features included in these limited-lifetime releases.

Supported Standards, MIBs, and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

No new or modified MIBs are supported by this feature.

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

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

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

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

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

<http://www.cisco.com/register>

No new or modified RFCs are supported by these features.

RFCs

No new or modified RFCs are supported by this feature.

Prerequisites

To configure the voice and QoS features, you must first install and configure the ADSL or G.SHDSL WIC on your Cisco 1700 series, Cisco 2600 series, or Cisco 3600 series router. Refer to the installation and configuration instructions in the following documents:

- [Configuring an ADSL WAN Interface Card on Cisco 1700 Series Routers](#)
- [Installing the G.SHDSL ATM WIC on the Cisco 1700 Series Router](#)
- [1-Port ADSL WAN Interface Card for Cisco 2600 Series and 3600 Series Routers](#), Release 12.2(4)T
- [1-Port G.SHDSL WAN Interface Card for Cisco 2600 Series and 3600 Series Routers](#), Release 12.2(4)XL

Configuration Tasks

See the following section to configure voice and QoS features over ADSL and G.SHDSL:

- [Configuring the Error Duration for Digital Subscriber Line Access Multiplexers](#) (required)
- [Configuring the Tx Ring Limit](#) (required)
- [Verifying the TX Ring Limit](#)
- [Configuration Examples](#)

Configuring the Error Duration for Digital Subscriber Line Access Multiplexers

To configure the error duration for digital subscriber line access multiplexers (DSLAMs), use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# dsl equipment-type ignore-error duration {seconds}	Configures the DSLAMs. The <i>seconds</i> argument has a valid range from 15 to 30 seconds.

Configuring the Tx Ring Limit

To configure the tx ring limit, use the following commands beginning in global configuration mode:



Note

The Tunable Transmission Ring (tx ring) feature is not supported on Cisco 1700 series routers until Cisco IOS Release 12.2(8)YN.

	Command	Purpose
Step 1	Router (config)# interface atm <i>slot/port</i>	Configures an ATM interface type and enters interface configuration mode. The arguments are as follows: • <i>slot</i>—Specifies the backplane slot number on your router. The value ranges from 0 to 4, depending on what router you are configuring. Refer to your router hardware documentation. • <i>/port</i>—ATM port number on a Cisco 2600 or 3600 series router, indicating the T1 link that you are configuring. Enter a value from 0 to 3 or from 0 to 7, depending on whether the network module has four ports or eight ports.

	Command	Purpose
Step 2	<pre>Router (config-if)# pvc [name] vpi/vci [ces ilmi qsaal smds]</pre>	Creates or assigns a name to an ATM permanent virtual circuit (PVC), specifies the encapsulation type on an ATM PVC, and enters interface-ATM-VC configuration mode. The keywords and arguments are as follows: <i>name</i>—(Optional) Specifies the name of the PVC or map. The name can be a maximum of 16 characters. <i>vpi</i>—Specifies the ATM network virtual path identifier (VPI) for this PVC. The absence of the "/" and a VPI value defaults the VPI value to 0. On Cisco 2600 and 3600 series routers using inverse multiplexing over ATM (IMA), the ranges are 0 to 15, 64 to 79, 128 to 143, and 192 to 207. <i>vci</i>—Specifies the ATM network virtual channel identifier (VCI) for this PVC. This value ranges from 0 to 1 less than the maximum value set for this interface by the atm vc-per-vp command. Typically, lower values 0 to 31 are reserved for specific traffic (for example, F4 Operation, Administration, and Maintenance [OAM], switched virtual circuit [SVC] signaling, and Integrated Local Management Interface [ILMI] and should not be used). The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network, because it has local significance only. The <i>vpi</i> and <i>vci</i> arguments cannot both be set to 0; if one is 0, the other cannot be 0. ces—(Optional) circuit emulation service encapsulation. This keyword is available on the OC-3/STM-1 ATM Circuit Emulation Service network module only. ilmi—(Optional) Used to set up communication with the ILMI; the associated <i>vpi</i> and <i>vci</i> values ordinarily are 0 and 16, respectively. qsaal—(Optional) A signaling-type PVC used for setting up or tearing down SVCs; the associated <i>vpi</i> and <i>vci</i> values ordinarily are 0 and 5, respectively. smds—(Optional) Specifies encapsulation for Switched Multimegabit Data Service (SMDS) networks. If you are configuring an ATM PVC on the ATM Interface Processor (AIP), you must configure AAL3/4SMDS using the atm aal aal3/4 command before specifying SMDS encapsulation. If you are configuring an ATM network processor module (NPM), the atm aal aal3/4 command is not required. SMDS encapsulation is not supported on the ATM port adapter.

	Command	Purpose
Step 3	Router (config-if-atm-vc)# tx-ring-limit <i>ring-limit</i>	Limits the number of packets that can be used on a transmission ring on the permanent virtual circuit (PVC). The arguments are as follows: <i>ring-limit</i>—The maximum number of allowable packets that can be placed on the transmission ring. The default value is 60. On Cisco 2600 and Cisco 3600 series routers, the value can be changed to 2 or 3. (The only permitted values are 2, 3, and 60.)

Verifying the TX Ring Limit

The following output examples are for a tx ring limit over ADSL configuration:

The following **show policy-map interface** command output is for a tx ring-limit tuning configuration on a Cisco 2600 router. The **show policy-map interface** command displays the policy-map setup.

```
Router# show policy-map interface atm 0/1.1

ATM0/1.1:VC 11/201 -

Service-policy output:SERVICE-PACK-640

Class-map:VOICE-CLASS (match-all)
 5295 packets, 402420 bytes
 30 second offered rate 30000 bps, drop rate 0 bps
Match:access-group 100
Weighted Fair Queueing
  Strict Priority
  Output Queue:Conversation 72
  Bandwidth 160 (kbps) Burst 4000 (Bytes)
  (pkts matched/bytes matched) 5295/402420
  (total drops/bytes drops) 0/0

Class-map:class-default (match-any)
 42365 packets, 63625280 bytes
 30 second offered rate 4675000 bps, drop rate 4069000 bps
Match:any
```

The following **show interfaces atm** command output is for a tx ring-limit tuning configuration on a Cisco 2600 router. The **show interfaces atm** command displays statistics for the ATM interface.

```
Router# show interfaces atm0/1

ATM0/1 is up, line protocol is up
Hardware is DSL SAR (with Globespan G.SHDSL module)
MTU 4470 bytes, sub MTU 4470, BW 2304 Kbit, DLY 880 usec,
  reliability 255/255, txload 59/255, rxload 1/255
Encapsulation ATM, loopback not set
Encapsulation(s):AAL5, PVC mode
23 maximum active VCs, 256 VCs per VP, 1 current VCCs
VC idle disconnect time:300 seconds
Last input 00:01:35, output 00:00:00, output hang never
Last clearing of "show interface" counters never
queue:0/75/0/0 (size/max/drops/flushes); Total output drops:66321
Queueing strategy:None
second input rate 0 bits/sec, 0 packets/sec
30 second output rate 541000 bits/sec, 93 packets/sec
227 packets input, 5355 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
```



```

15 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
517351 packets output, 133910269 bytes, 0 underruns
93 output errors, 0 collisions, 2 interface resets
0 output buffer failures, 0 output buffers swapped out

```

The following **show queue** command output for a tx ring-limit tuning configuration on a Cisco 2600 router displays the flow of traffic that is currently being transported over the ATM interface:

```
Router# show queue atm 0/1
```

```

Interface ATM0/1 VC 11/201
Queueing strategy:weighted fair
Output queue:65/512/64/52265 (size/max total/threshold/drops)
Conversations 2/3/64 (active/max active/max total)
Reserved Conversations 0/0 (allocated/max allocated)
Available Bandwidth 320 kilobits/sec

(depth/weight/total drops/no-buffer drops/interleaves) 1/0/0/0/0
Conversation 72, linktype:ip, length:76
source:10.1.1.204, destination:10.10.11.254, id:0x0000, ttl:59,
TOS:160 prot:17, source port 400, destination port 400

(depth/weight/total drops/no-buffer drops/interleaves) 64/32384/52267/0/0
Conversation 49, linktype:ip, length:1502
source:10.1.1.205, destination:10.10.11.254, id:0x0000, ttl:59,
TOS:0 prot:17, source port 500, destination port 500

```

The following **show atm vc** command outputs are for a tx ring-limit tuning configuration on a Cisco 2600 router. The **show atm vc** command displays all ATM PVCs and SVCs and traffic information.

```
Router# show atm vc
```

```

VC not configured on interface ATM0/0
      VCD /
Interface Name  VPI  VCI  Type  Encaps  SC      Kbps  Peak  Avg/Min  Burst
0/1.1          1    11   201  PVC    SNAP   VBR    640   64    0        UP

```

```
Router# show atm vc 1
```

```

VC 1 doesn't exist on interface ATM0/0
ATM0/1.1:VCD:1, VPI:11, VCI:201
VBR-NRT, PeakRate:640, Average Rate:640, Burst Cells:0
AAL5-LLC/SNAP, etype:0x0, Flags:0x2000020, VCmode:0x0
OAM frequency:10 second(s)
InARP frequency:15 minutes(s)
InPkts:5, OutPkts:14707, InBytes:560, OutBytes:10698804
InPRoc:5, OutPRoc:5
InFast:0, OutFast:3, InAS:0, OutAS:0
InPktDrops:0, OutPktDrops:56701/0/56701 (holdq/outputq/total)
CrcErrors:0, SarTimeOuts:0, OverSizedSDUs:0, LengthViolation:0, CPIErrors:0
OAM cells received:46
OAM cells sent:51
Status:UP

```

Configuration Examples

This section provides the following configuration examples:

- [Differentiated Data Services over ADSL Example](#)
- [VoIP and Data over ADSL Example](#)
- [Tx Ring-Limit Tuning over ADSL Example](#)
- [MLP with LFI over G.SHDSL Example](#)

Differentiated Data Services over ADSL Example

The following is from a Cisco 1751 router. The output displays that the router is configured for differentiated services:

```
access-list 102 permit udp host 16.0.0.4 host 15.0.0.5
access-list 103 permit udp host 16.0.0.4 host 13.0.0.5
ip cef
class-map match-all traffic-INTRA
  match access-group 102
class-map match-all traffic-INTER
  match access-group 103
class-map match-all traffic-dscp1
  match ip dscp 1
class-map match-any traffic-prec3
  match ip dscp 24
  match ip dscp 25
  match ip dscp 26
  match ip dscp 27
policy-map ADSL-out
  class traffic-INTRA
    bandwidth percent 8
  class traffic-dscp1
    set ip dscp 5
  class traffic-prec3
    set ip precedence 2
  class traffic-INTER
    bandwidth percent 8
  class class-default
    fair-queue
!
interface ATM0/0
  no ip address
  no atm ilmi-keepalive
!
interface ATM0/0.1 point-to-point
  description COLLEGAMENTO
  mtu 576
  ip address 1.0.0.1 255.0.0.0
  pvc 99/99
    protocol ip 2.0.0.2 broadcast
    vbr-nrt 142 142 1
    oam-pvc 0
    oam retry 5 5 1
    encapsulation aal5snap
    service-policy out ADSL-out
!
dial-peer voice 201 voip
  destination-pattern 3640200
  session target ipv4:14.0.0.3
```

```
plout-delay maximum 300
ip qos dscp cs4 media
ip qos dscp cs4 signaling
```

The following is from a Cisco 2600 router. The output displays how CBWFQ, CAR, and WRED can be applied in the same configuration to provide differentiated services using QoS:

Building configuration...

```
Current configuration: 2603 bytes
!
version 12.2
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname 2600-1
!
memory-size iomem 20
!
ip subnet-zero
!
ip cef
!
class-map match-all GOLD
  match access-group 1
class-map match-all SILVER
  match access-group 2
!
policy-map GOLD-160-DATA-PACK-640
  class GOLD
    bandwidth 160
    random-detect dscp-based
    random-detect exponential-weighting-constant 3
    random-detect dscp 16 2 4 10
    random-detect dscp 32 4 12 10
  class SILVER
    bandwidth 320
    random-detect dscp-based
    random-detect exponential-weighting-constant 3
    random-detect dscp 0 30 60 10
    set ip dscp 0
!
interface ATM0/0
  no ip address
  load-interval 30
  atm vc-per-vp 256
  no atm ilmi-keepalive
  dsl operating-mode auto
!
interface ATM0/0.1 point-to-point
  ip address 192.168.1.2 255.255.255.0
  pvc 0/201
    protocol ip 192.168.1.1 broadcast
    vbr-nrt 640 640
    tx-ring-limit 3
    service-policy output GOLD-160-DATA-PACK-640
!
interface Ethernet0/0
  ip address 1.3.214.9 255.255.0.0
  half-duplex
!
interface Ethernet0/1
```

```

ip address 10.1.1.1 255.255.255.0
rate-limit input access-group 1 160000 4470 4470 conform-action set-dscp-transmit 32
exceed-action continue
rate-limit input access-group 1 80000 4470 4470 conform-action set-dscp-transmit 16
exceed-action drop
half-duplex
!
ip classless
ip route 10.10.11.200 255.255.255.255 192.168.3.1
ip route 223.255.254.254 255.255.255.255 1.3.0.1
ip http server
!
access-list 1 permit 10.1.1.201
access-list 2 permit 10.1.1.202
access-list 3 permit 10.1.1.203
access-list 100 permit udp any any precedence critical
!
snmp-server manager
call rsvp-sync
alias exec s sh run
alias exec c conf t
!
line con 0
exec-timeout 0 0
privilege level 15
line aux 0
line vty 0 4
login
line vty 5 15
login
!

```

Verifying the Differentiated Data Services over ADSL Configuration

The following **show policy-map interface** command output is for the CBWFQ, CAR, and WRED configuration. The **show policy-map interface** command displays the policy-map setup.

```
Router# show policy-map interface atm0/0.1
```

```
ATM0/0.1:VC 0/201 -
```

```
Service-policy output:GOLD-160-DATA-PACK-640
```

```

Class-map:GOLD (match-all)
  22738 packets, 34379856 bytes
  30 second offered rate 239000 bps, drop rate 50000 bps
Match:access-group 1
Weighted Fair Queueing
Output Queue:Conversation 73
Bandwidth 160 (kbps)
(pkts matched/bytes matched) 22738/34379856
(depth/total drops/no-buffer drops) 4/4739/0
exponential weight:3
mean queue depth:4

```

dscp	Random drop pkts/bytes	Tail drop pkts/bytes	Minimum threshold	Maximum threshold	Mark probability
af11	0/0	0/0	32	40	1/10
af12	0/0	0/0	28	40	1/10
af13	0/0	0/0	24	40	1/10
af21	0/0	0/0	32	40	1/0
af22	0/0	0/0	28	40	1/10

af23	0/0	0/0	24	40	1/10
af31	0/0	0/0	32	40	1/10
af32	0/0	0/0	28	40	1/10
af33	0/0	0/0	24	40	1/10
af41	0/0	0/0	32	40	1/10
af42	0/0	0/0	28	40	1/10
af43	0/0	0/0	24	40	1/10
cs1	0/0	0/0	22	40	1/10
cs2	332/501984	3907/5907384	2	4	1/10
cs3	0/	0/0	26	40	1/10
cs4	506/765072	0/0	4	12	1/10
cs5	0/0	0/0	30	40	1/10
cs6	0/0	0/0	32	40	1/10
cs7	0/0	0/0	34	40	1/10
ef	0/0	0/0	36	40	1/10
rsvp	0/0	0/0	36	40	1/10
default	0/0	0/0	20	40	1/10

```

Class-map:SILVER (match-all)
  114748 packets, 173498976 bytes
  30 second offered rate 1212000 bps, drop rate 832000 bps
Match:access-group 2
Weighted Fair Queueing
  Output Queue:Conversation 74
  Bandwidth 320 (kbps)
  (pkts matched/bytes matched) 115126/174070512
  (depth/total drops/no-buffer drops) 61/79012/0
  exponential weight:3
  mean queue depth:61

```

dscp	Random drop pkts/bytes	Tail drop pkts/bytes	Minimum threshold	Maximum threshold	Mark probability
af11	0/0	0/0	32	40	1/10
af12	0/0	0/0	28	40	1/10
af13	0/0	0/0	24	40	1/10
af21	0/0	0/0	32	40	1/10
af22	0/0	0/0	28	40	1/10
af23	0/0	0/0	24	40	1/10
af31	0/0	0/0	32	40	1/10
af32	0/0	0/0	28	40	1/10
af33	0/0	0/0	24	40	1/10
af41	0/0	0/0	32	40	1/10
af42	0/0	0/0	28	40	1/10
af43	0/0	0/0	24	40	1/10
cs1	0/0	0/0	22	40	1/10
cs2	0/0	0/0	24	40	1/10
cs3	0/0	0/0	26	40	1/10
cs4	0/0	0/0	28	40	1/10
cs5	0/0	0/0	30	40	1/10
cs6	0/0	0/0	32	40	1/10
cs7	0/0	0/0	34	40	1/10
ef	0/0	0/0	36	40	1/10
rsvp	0/0	0/0	36	60	1/10
default	9096/13753152	70065/105938280	30	60	1/10

```

QoS Set
  ip dscp 0
  Packets marked 115344

```

```

Class-map:class-default (match-any)
  114747 packets, 173497464 bytes
  30 second offered rate 1212000 bps, drop rate 1209000 bps
Match:any

```

The following **show interfaces** command is from a Cisco 2600 router. The **show interfaces** command displays statistics for all interfaces configured on the router.

```
Router# show interfaces e0/1 rate-limit

Ethernet0/1
  Input
    matches:access-group 1
      params: 160000 bps, 4470 limit, 4470 extended limit
      conformed 15673 packets, 23728922 bytes; action:set-dscp-transmit 32
      exceeded 102965 packets, 155889010 bytes; action:continue
      last packet:0ms ago, current burst:4146 bytes
      last cleared 00:19:46 ago, conformed 160000 bps, exceeded 1051000 bps
    matches:access-group 1
      params: 80000 bps, 4470 limit, 4470 extended limit
      conformed 7836 packets, 11863704 bytes; action:set-dscp-transmit 16
      exceeded 95130 packets, 144026820 bytes; action:drop
      last packet:4ms ago, current burst:3708 bytes
      last cleared 00:19:46 ago, conformed 79000 bps, exceeded 971000 bps
```

The following **show interfaces atm** command output is from a Cisco 2600 router. The **show interfaces atm** command displays information about the ATM interface.

```
Router# show interfaces atm 0/0

ATM0/0 is up, line protocol is up
Hardware is DSLSAR (with Alcatel ADSL Module)
MTU 4470 bytes, sub MTU 4470, BW 800 Kbit, DLY 2560 usec,
  reliability 255/255, txload 181/255, rxload 1/255
Encapsulation ATM, loopback not set
Encapsulation(s):AAL5 AAL2, PVC mode
23 maximum active VCs, 256 VCs per VP, 2 current VCCs
VC idle disconnect time:300 seconds
Last input 00:33:22, output 00:00:00, output hang never
Last clearing of "show interface" counters 00:20:09
Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:208908
Queueing strategy:None
30 second input rate 0 bits/sec, 0 packets/sec
30 second output rate 569000 bits/sec, 48 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  57315 packets output, 86075268 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
```

The following **show queue** command output from a Cisco 2600 router displays the flow of traffic that is currently being transported over the ATM interface:

```
Router# show queue atm0/0

Interface ATM0/0 VC 0/201
Queueing strategy:weighted fair
Output queue:130/512/64/214301 (size/max total/threshold/drops)
Conversations 3/3/64 (active/max active/max total)
Reserved Conversations 2/2 (allocated/max allocated)
Available Bandwidth 0 kilobits/sec

(depth/weight/total drops/no-buffer drops/random/tail/interleaves) 5/228/5124/0/0/0/0
Conversation 73, linktype:ip, length:1512
source:10.1.1.201, destination:10.10.11.200, id:0x0000, ttl:59,
TOS:128 prot:17, source port 100, destination port 100
```

```
(depth/weight/total drops/no-buffer drops/random/tail/interleaves)
61/114/85189/0/9843/75346/0
Conversation 74, linktype:ip, length:1512
source:10.1.1.202, destination:10.10.11.200, id:0x0000, ttl:59,
TOS:0 prot:17, source port 200, destination port 200

(depth/weight/total drops/no-buffer drops/interleaves) 64/32384/123990/0/0
Conversation 41, linktype:ip, length:1512
source:10.1.1.203, destination:10.10.11.200, id:0x0000, ttl:59,
TOS:0 prot:17, source port 300, destination port 300
```

VoIP and Data over ADSL Example

The following is sample output from a Cisco 2611 router. In this example, the customer premises equipment (CPE) is restricted to only a single PVC. Voice and data are sent over a single VC. The **tx-ring-limit** command and LLQ are used to give preferential treatment for voice traffic.

Building configuration...

```
Current configuration :1861 bytes
!
version 12.2
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname CPE-2611-1
!
voice-card 1
 dspfarm
!
ip subnet-zero
!
ip cef
!
class-map match-all VOICE
 match access-group 100
!
policy-map VOICE-160-DATA-480-PACK
 class VOICE
  priority 160
 class class-default
  bandwidth 320
!
controller T1 1/0
 framing esf
 linecode b8zs
 ds0-group 0 timeslots 1-24 type e&m-wink-start
!
controller T1 1/1
 framing sf
 linecode ami
!
interface ATM0/0
 no ip address
 load-interval 30
 atm vc-per-vp 256
 no atm ilmi-keepalive
 dsl operating-mode auto
!
interface ATM0/0.1 point-to-point
```

```

ip address 192.168.1.2 255.255.255.0
pvc 0/201
    protocol ip 192.168.1.1 broadcast
    vbr-nrt 640 640
    tx-ring-limit 3
    service-policy output VOICE-160-DATA-480-PACK
!
interface Ethernet0/0
ip address 1.3.214.51 255.255.0.0
half-duplex
!
interface ATM0/1
no ip address
shutdown
atm vc-per-vp 256
no atm ilmi-keepalive
atm voice aal2 aggregate-svc upspeed-number 0
dsl equipment-type CPE
dsl operating-mode GSHDSL symmetric annex A
dsl linerate AUTO
!
interface Ethernet0/1
ip address 10.1.1.1 255.255.255.0
half-duplex
!
ip classless
ip route 223.255.254.254 255.255.255.255 1.3.0.1
ip http server
!
access-list 100 permit udp any any precedence critical
!
snmp-server manager
call rsvp-sync
!
voice-port 1/0:0
!
mgcp profile default
!
dial-peer cor custom
!
dial-peer voice 1 pots
    destination-pattern 7...
    port 1/0:0
!
dial-peer voice 2 voip
    destination-pattern 8...
    session target ipv4:192.168.3.1
    ip qos dscp cs5 media
    ip qos dscp cs5 signaling
    no vad
!
alias exec s sh run
alias exec c conf t
!
line con 0
    exec-timeout 0 0
    privilege level 15
line aux 0
line vty 0 4
    login
line vty 5 15
    login

```


Verifying the VoIP and Data over ADSL Configuration

The following **show policy-map interface** command output from a Cisco 2600 router displays the service-policy setup:

```
Router# show policy-map interface atm0/0

ATM0/0:VC 0/201 -

Service-policy output:VOICE-160-DATA-480

Class-map:class-default (match-any)
  27234 packets, 41109865 bytes
  30 second offered rate 7000 bps, drop rate 3000 bps
Match:any
  Weighted Fair Queueing
  Queue:Conversation 73
  Bandwidth 320 (kbps) Max Threshold 64 (packets)
  (pkts matched/bytes matched) 27231/41105329
  (depth/total drops/no-buffer drops) 0/14711/0

For
Class-map:class-default (match-any)
  113187 packets, 140760375 bytes
  30 second offered rate 1205000 bps, drop rate 787000 bps
Match:any
```

The following **show queue** command output from a Cisco 2600 router displays the flow of traffic that is currently being transported over an ATM interface:

```
Router# show queue atm 0/0

Interface ATM0/0 VC 0/201
Queueing strategy:weighted fair
Output queue:70/512/64/70462 (size/max total/threshold/drops)
  Conversations 3/6/64 (active/max active/max total)
  Reserved Conversations 0/0 (allocated/max allocated)
  Available Bandwidth 320 kilobits/sec

(depth/weight/total drops/no-buffer drops/interleaves) 3/0/0/0/0
Conversation 72, linktype:ip, length:72
source:192.168.1.2, destination:192.168.1.1, id:0xC77E, ttl:254,
TOS:160 prot:17, source port 19406, destination port 16406

(depth/weight/total drops/no-buffer drops/interleaves) 1/32384/0/0/0
Conversation 23, linktype:ip, length:196
source:192.168.1.2, destination:192.168.1.1, id:0x0000, ttl:255,
TOS:0 prot:17, source port 18653, destination port 18691

(depth/weight/total drops/no-buffer drops/interleaves) 64/32384/65793/0/0
Conversation 59, linktype:ip, length:1502
source:10.1.1.205, destination:10.10.11.200, id:0x0000, ttl:59,
TOS:0 prot:17, source port 500, destination port 500
```

The following **show queueing interface** command output from a Cisco 2600 router displays the queueing configuration of the ATM interface:

```
Router# show queueing interface atm0/0

Interface ATM0/0 VC 0/201
Queueing strategy:weighted fair
Output queue:66/512/64/61642 (size/max total/threshold/drops)
  Conversations 2/6/64 (active/max active/max total)
```

```
Reserved Conversations 0/0 (allocated/max allocated)
Available Bandwidth 320 kilobits/sec
```

The following **show interfaces atm** command output from a Cisco 2600 router displays statistics for the ATM interface:

```
Router# show interfaces atm0/0

ATM0/0 is up, line protocol is up
Hardware is DSLSAR (with Alcatel ADSL Module)
Internet address is 192.168.1.2/24
MTU 4470 bytes, sub MTU 4470, BW 800 Kbit, DLY 2560 usec,
  reliability 255/255, txload 166/255, rxload 21/255
Encapsulation ATM, loopback not set
Encapsulation(s):AAL5 AAL2, PVC mode
23 maximum active VCs, 256 VCs per VP, 2 current VCCs
VC idle disconnect time:300 seconds
Last input 00:00:02, output 00:00:00, output hang never
Last clearing of "show interface" counters never
Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:62360
Queueing strategy:None
30 second input rate 66000 bits/sec, 113 packets/sec
30 second output rate 523000 bits/sec, 229 packets/sec
 1603630 packets input, 403845485 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
 2680554 packets output, 518308502 bytes, 0 underruns
    0 output errors, 0 collisions, 4 interface resets
    buffer failures, 0 output buffers swapped out
```

The following **show atm vc** command output from a Cisco 2600 router displays information about the ATM virtual circuit:

```
Router# show atm vc

          VCD /
Interface Name      VPI VCI  Type  Encaps  SC   Kbps  Peak  Avg/Min  Burst
0/0         1         0  201  PVC   SNAP    VBR   640   640    0       UP
VC not configured on interface ATM0/1
```

The following **show atm vc** command output from a Cisco 2600 router displays detailed information about the virtual circuit descriptor (VCD):

```
Router# show atm vc 1

ATM0/0:VCD:1, VPI:0, VCI:201
VBR-NRT, PeakRate:640, Average Rate:640, Burst Cells:0
AAL5-LLC/SNAP, etype:0x0, Flags:0x2000820, VCmode:0x0
OAM frequency:10 second(s)
InARP frequency:15 minutes(s)
InPkts:1606861, OutPkts:2682709, InBytes:404080341, OutBytes:519701804
InPRoc:108900, OutPRoc:109133, Broadcasts:1
InFast:1497961, OutFast:0, InAS:0, OutAS:0
InPktDrops:0, OutPktDrops:64078/0/64078 (holdq/outputq/total)
CrcErrors:0, SarTimeOuts:0, OverSizedSDUs:0, LengthViolation:0, CPIErrors:0
OAM cells received:4765
OAM cells sent:4767
Status:UP
VC 1 doesn't exist on interface ATM0/1
```

Tx Ring-Limit Tuning over ADSL Example

The following is output from a Cisco 2600 router. The output shows that tx ring-limit tuning is configured:



Note

The Tunable Transmission Ring (tx ring) feature is not supported on Cisco 1700 series routers until Cisco IOS Release 12.2(8)YN.

```
Building configuration...

Current configuration :2018 bytes
!
version 12.2
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname CPE-2600-1
!
voice-card 1
  dspfarm
!
ip subnet-zero
!
ip cef
!
class-map match-all VOICE-CLASS
  match access-group 100
!
policy-map SERVICE-PACK-640
  class VOICE-CLASS
    priority 160
!
controller T1 1/0
  framing esf
  linecode b8zs
  ds0-group 0 timeslots 1-24 type e&m-wink-start
!
controller T1 1/1
  framing sf
  linecode ami
!
interface FastEthernet0/0
  ip address 1.3.214.50 255.255.0.0
  duplex auto
  speed auto
!
interface ATM0/1
  no ip address
  load-interval 30
  atm vc-per-vp 256
  no atm ilmi-keepalive
  atm voice aal2 aggregate-svc upspeed-number 0
  dsl equipment-type CPE
  dsl operating-mode GSHDSL symmetric annex A
  dsl linerate AUTO
!
interface ATM0/1.1 point-to-point
  ip address 192.168.1.2 255.255.255.0
  pvc 11/201
```

```

protocol ip 192.168.1.1 broadcast
vbr-nrt 640 640
tx-ring-limit 3
oam-pvc manage
service-policy output SERVICE-PACK-640
!
interface FastEthernet0/1
ip address 10.10.11.1 255.255.255.0
load-interval 30
duplex auto
speed auto
!
ip classless
ip route 10.10.11.254 255.255.255.255 192.168.1.1
ip route 223.255.254.254 255.255.255.255 1.3.0.1
ip http server
ip pim bidir-enable
!
ip director cache time 60
access-list 100 permit udp any any precedence critical
!
snmp-server manager
call rsvp-sync
!
voice-port 1/0:0
!
mgcp profile default
!
dial-peer cor custom
!
dial-peer voice 1 pots
destination-pattern 7...
!
dial-peer voice 2 voip
destination-pattern 8...
session target ipv4:192.168.1.1
ip qos dscp cs5 media
ip qos dscp cs5 signaling
no vad
!
alias exec s sh run
alias exec c conf t
!
line con 0
exec-timeout 0 0
privilege level 15
line aux 0
line vty 0 4
login
line vty 5 15
login
!

```

MLP with LFI over G.SHDSL Example

The following output is from a Cisco 1751 router. The output shows that MLP with LFI is configured for G.SHDSL:

```

class-map match-all VOIP
match ip dscp 32
class-map CRITICAL
match access-group 100

```

```

!
policy-map 1751_DSL
  class CRITICAL
    priority 48
  class VOIP
    priority 64
    set ip precedence 6
!
interface ATM0/0
  no ip address
  no atm ilmi-keepalive
!
interface ATM0/0.1 point-to-point
  pvc 0/33
    vbr-rt 150 150 30
    protocol ppp Virtual-Template1
!
interface Loopback1
  ip address 10.0.0.10 255.255.255.255
interface Virtual-Template1
  bandwidth 320
  ip unnumbered Loopback1
  service-policy output 1751_DSL
  ppp multilink
  ppp multilink fragment-delay 4
  ppp multilink interleave
!
access-list 100 permit udp any any precedence critical
dial-peer voice 201 voip
  destination-pattern 3640200
  session target ipv4:10.0.0.11
  ip qos dscp cs4 media
  ip qos dscp cs4 signalling

```

The following output is from a Cisco 2600 router. The output shows that MLP with LFI is configured for G.SHDSL:

Building configuration...

```

Current configuration :2107 bytes
!
version 12.2
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname CPE-2600-1
!
memory-size iomem 20
voice-card 1
  dspfarm
!
ip subnet-zero
!
ip cef
!
class-map match-all VOICE-CLASS
  match access-group 100
!
policy-map SERVICE-PACK-640
  class VOICE-CLASS
    priority 160
!
controller T1 1/0

```

```

framing esf
linecode b8zs
ds0-group 0 timeslots 1-24 type e&m-wink-start
!
controller T1 1/1
framing sf
linecode ami
!
interface FastEthernet0/0
ip address 1.3.214.50 255.255.0.0
duplex auto
speed auto
!
interface ATM0/1
no ip address
load-interval 30
atm vc-per-vp 256
no atm ilmi-keepalive
atm voice aal2 aggregate-svc upspeed-number 0
dsl equipment-type CPE
dsl operating-mode GSHDSL symmetric annex A
dsl linerate AUTO
!
interface ATM0/1.1 point-to-point
pvc 11/201
vbr-nrt 640 640
tx-ring-limit 3
oam-pvc manage
protocol ppp Virtual-Template1
!
interface FastEthernet0/1
ip address 10.10.11.1 255.255.255.0
load-interval 30
duplex auto
speed auto
!
interface Virtual-Template1
bandwidth 640
ip address 192.168.1.2 255.255.255.0
load-interval 30
service-policy output SERVICE-PACK-640
ppp multilink
ppp multilink fragment-delay 4
ppp multilink interleave
!
ip classless
ip route 10.10.11.254 255.255.255.255 192.168.1.1
ip route 223.255.254.254 255.255.255.255 1.3.0.1
ip http server
ip pim bidir-enable
!
ip director cache time 60
access-list 100 permit udp any any precedence critical
!
snmp-server manager
call rsvp-sync
!
voice-port 1/0:0
!
mgcp profile default
!
dial-peer cor custom
!
destination-pattern 7...

```

```

!
dial-peer voice 2 voip
 destination-pattern 8...
 session target ipv4:192.168.1.1
 ip qos dscp cs5 media
 ip qos dscp cs5 signaling
 no vad
!
alias exec s sh run
alias exec c conf t
!
line con 0
 exec-timeout 0 0
 privilege level 15
line aux 0
line vty 0 4
 login
line vty 5 15
 login

```

Verifying the MLP with LFI over G.SHDSL Configuration

The following **show users** command output is for the MLP with LFI configuration on a Cisco 2600 router. The **show users** command displays information about the active lines on the router.

Router# **show users**

Line	User	Host(s)	Idle	Location
* 0 con 0		idle	00:00:00	

Interface	User	Mode	Idle	Peer Address
Vi1		Virtual PPP (ATM)	-	
Vi2		Virtual PPP (Bundle)	00:14:06	192.168.1.1

The following **show interfaces** command output is for the MLP with LFI configuration on a Cisco 2600 router. The **show interfaces** command displays statistics for all interfaces configured on the router.

Router# **show interfaces virtual-access 2**

```

Virtual-Access2 is up, line protocol is up
Hardware is Virtual Access interface
Internet address is 192.168.1.2/24
MTU 1500 bytes, BW 640 Kbit, DLY 100000 usec,
 reliability 255/255, txload 207/255, rxload 1/255
Encapsulation PPP, loopback not set
DTR is pulsed for 5 seconds on reset
LCP Open, multilink Open
Open:IPCP
Last input 00:14:20, output never, output hang never
Last clearing of "show interface" counters 00:26:31
Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:477969
Queueing strategy:weighted fair
Output queue:64/1000/64/477969 (size/max total/threshold/drops)
Conversations 1/2/256 (active/max active/max total)
Reserved Conversations 0/0 (allocated/max allocated)
Available Bandwidth 320 kilobits/sec
30 second input rate 0 bits/sec, 0 packets/sec
30 second output rate 522000 bits/sec, 91 packets/sec
12 packets input, 911 bytes, 0 no buffer
Received 0 broadcasts, 0 runs, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
136585 packets output, 97029054 bytes, 0 underruns
0 output errors, 0 collisions, 0 interface resets

```

```
0 output buffer failures, 0 output buffers swapped out
0 carrier transitions
```

The following **show policy-map interface** command is for the MLP with LFI configuration on a Cisco 2600 route. The **show policy-map interface** command displays the policy-map setup.

```
Router# show policy-map interface virtual-access 2

Virtual-Access2

Service-policy output:SERVICE-PACK-640

Class-map:VOICE-CLASS (match-all)
 30887 packets, 2100316 bytes
 30 second offered rate 27000 bps, drop rate 0 bps
 Match:access-group 100
  Weighted Fair Queueing
   Strict Priority
   Output Queue:Conversation 264
   Bandwidth 160 (kbps) Burst 4000 (Bytes)
   (pkts matched/bytes matched) 30888/2100384
   (total drops/bytes drops) 0/0

Class-map:class-default (match-any)
 247101 packets, 369168894 bytes
 30 second offered rate 4785000 bps, drop rate 4283000 bps
 Match:any
```

The following **show ppp multilink** command output is for the MLP with LFI configuration on a Cisco 2600 router. The **show ppp multilink** command displays bundle information for the Multilink PPP bundles.

```
Router# show ppp multilink

Virtual-Access2, bundle name is green-gateway-3660
Bundle up for 00:26:05
0 lost fragments, 0 reordered, 0 unassigned
0 discarded, 0 lost received, 215/255 load
0xC received sequence, 0x55914 sent sequence
Member links:1 (max not set, min not set)
Virtual-Access1, since 00:26:05, last rcvd seq 00000B 320 weight
```

The following **show interfaces atm** command output is for the MLP with LFI configuration. The **show interfaces atm** command displays information about the ATM interface.

```
Router# show interfaces atm 0/1

ATM0/1 is up, line protocol is up
Hardware is DSL SAR (with Globespan G.SHDSL module)
MTU 4470 bytes, sub MTU 4470, BW 2304 Kbit, DLY 880 usec,
 reliability 255/255, txload 59/255, rxload 1/255
Encapsulation ATM, loopback not set
Encapsulation(s):AAL5 , PVC mode
23 maximum active VCs, 256 VCs per VP, 1 current VCCs
VC idle disconnect time:300 seconds
Last input never, output 00:00:00, output hang never
Last clearing of "show interface" counters never
Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:75
Queueing strategy:None
30 second input rate 0 bits/sec, 0 packets/sec
30 second output rate 539000 bits/sec, 257 packets/sec
186 packets input, 3409 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
```



```
433482 packets output, 103985075 bytes, 0 underruns  
0 output errors, 0 collisions, 2 interface resets  
0 output buffer failures, 0 output buffers swapped out
```

Command Reference

This section documents a modified command. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

Modified

- [dsl equipment-type](#)
- [tx-ring-limit](#)

dsl equipment-type

To configure the DSL ATM interface to function as central office equipment or customer premises equipment, use the **dsl equipment-type** command in ATM interface mode. To restore the default (no equipment type), use the **no** form of this command.

dsl equipment-type {co | cpe} **ignore-error-duration** {seconds}

no dsl equipment-type

Syntax Description

co	Configures the DSL ATM interface to function as central office equipment.
cpe	Configures the DSL ATM interface to function as customer premises equipment.
ignore-error-duration <i>seconds</i>	Number of seconds that errors are ignored. The valid range is from 15 to 30 seconds. The default is 0.
Note	This keyword was added for digital subscriber line access multiplexers (DSLAMs).

Defaults

The DSL ATM interface functions as customer premises equipment.

Command Modes

ATM interface

Command History

Release	Modification
12.2(4)XL	This command was integrated into Cisco IOS Release 12.2(4)XL on the G.SHDSL WIC on the Cisco 2600 series routers.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T on the G.SHDSL WIC on the Cisco 2600 series and Cisco 3600 series routers.
12.2(13)T	The ignore-error-duration keyword was added for DSLAMs.

Usage Guidelines

This configuration command applies to a specific ATM interface. You must specify the ATM interface before you enter this command.

The ATM interface must be in the shutdown state before you enter this command.

Examples

The following example shows the configuration of 20 seconds to ignore errors for a DSLAM on DSL ATM interface 1/1:

```
interface atm 1/1
 dsl equipment-type ignore-error-duration 20
```

Related Commands	Command	Description
	dsl linerate	Specifies a line rate for the DSL ATM interface.
	dsl operating-mode (G.SHDSL)	Specifies an operating mode of the DSL ATM interface.

tx-ring-limit

To limit the number of packets that can be used on a transmission ring on the DSL WIC, use the **tx-ring-limit** command in ATM VC configuration mode. To not limit the number of packets that can be used on a transmission ring on a DSL WIC, use the no form of this command.

tx-ring-limit *ring-limit*

no tx-ring-limit *ring-limit*

Syntax Description

ring-limit Maximum number of allowable packets that can be placed on the transmission ring. The default value is 60. On a Cisco 2600 or Cisco 3600 series router, the value can be changed to 3. (The only permitted values are 3 or 60.) A tx ring setting of 3 is required for latency-critical traffic. When the buffering is reduced by configuring the tx ring limit, the delay experienced by voice packets is reduced by a combination of the tx ring and LLQ mechanism.

Note The **tx-ring-limit** command is not supported on the Cisco 1700 in Cisco IOS Release 12.2(13)T.

Defaults

The default value of the *ring-limit* argument is 60.

Command Modes

ATM VC configuration

Command History

Release	Modification
12.0(7)XE1	This command was introduced.
12.0(9)S	This command was integrated into Cisco IOS Release 12.0 S.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.

Examples

The following example configures the transmission ring limit to three packets on an ATM interface:

```
interface atm 1/0/0
 atm pvc 32 0 32 aal5snap 10000 8000 2000 tx-ring-limit 3
```

The following example configures the transmission ring limit to 60 packets on an ATM permanent virtual circuit (PVC) subinterface:

```
interface ATM1/0/0.1 point-to-point
 pvc 2/200
 tx-ring-limit 60
```

Related Commands

Command	Description
dsl	Specifies DSL equipment and the seconds to ignore errors.
show atm vc	Displays all ATM PVCs and traffic information.
tx-queue-limit	Controls the number of transmit buffers available to a specified interface or the MCI and SCI cards.

■ tx-ring-limit