



T1/E1 Mode for SHDSL

This document describes the T1/E1 Mode for SHDSL feature for the Cisco 1700 series, Cisco 2600 series, Cisco 3631, Cisco 3700, and Cisco 3800 series routers.

The T1/E1 Mode for SHDSL feature adds T1 and E1 support on the new single-port multiline G.SHDSL WAN interface card (WIC), or WIC-1SHDSL-V2, to build on the existing features of the Multirate Symmetrical High-Digital Subscriber Line (G.SHDSL) feature supported on the 1-port G.SHDSL WAN interface card. Two-Wire Mode over SHDSL incorporates the 2.x firmware version and the latest hybrid circuit from Globespan.

The T1/E1 Mode for SHDSL feature supports T1 and E1 in two-wire mode. Embedded Operations Channel (EOC) message support for customer premises equipment (CPE) is provided for two-wire CPE mode. Some central office (CO) messages are also supported when in two-wire CO mode.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the [“Feature Information for T1/E1 Mode for SHDSL”](#) section on page 45.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

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Prerequisites for T1/E1 Mode for SHDSL

- A G.SHDSL WIC must be installed in the router to match the DSL service to be configured.
- Minimum memory recommendations are shown in [Table 30](#).

Table 30 Minimum Memory Recommendations for T1/E1 Mode for SHDSL

Platform Name	Image Name	Flash Memory Recommended	DRAM Memory Recommended
Cisco 1700 Series	IOS IP BASE	16 MB	64 MB
Cisco 2600 Series	IOS IP BASE	16 MB	64 MB
Cisco 3600 Series	IOS IP BASE	16 MB	64 MB
Cisco 3700 Series	IOS IP BASE	16 MB	64 MB
Cisco 3800 Series	IOS IP BASE	16 MB	64 MB

Restrictions for T1/E1 Mode for SHDSL

The following lists the restrictions for T1/E1 mode:

- The T1/E1 Mode for SHDSL feature is intended for use with the WIC-1SHDSL-V2. T1/E1 Mode is not supported on the WIC-1SHDSL.
- While this feature can work with earlier WICs, not all commands of this feature are supported in earlier WICs. If using a WIC other than WIC-1SHDSL-V2, refer to one of the following documents:
 - *The 1-Port G.SHDSL WAN Interface Card for Cisco 2600 Series and Cisco 3600 Series Routers* feature module at:
http://www.cisco.com/en/US/docs/ios/12_2t/12_2t8/feature/guide/ft_gdsl8.html
 - *Installing the G.SHDSL ATM WIC on the Cisco 1700 Series Router* at:
<http://www.cisco.com/en/US/docs/routers/access/1700/software/feature/guide/GSHDSLup.html>
- The WIC-1SHDSL-V2 should be inserted only into onboard WIC slots or NM-2W network modules. This WIC is not supported in combination network modules (NM-xFE2W and NM-xFE2W-V2).
- The T1/E1 Mode for SHDSL feature is frame-based (Time Division Multiplexing (TDM)) and therefore does not support ATM features. For example, T1/E1 Mode for SHDSL feature does not support ATM adaption layer 1 (AAL1) and/or circuit emulation service.
- T1/E1 Mode for SHDSL feature is not supported in four-wire mode.
- TDM cross-connects are only supported between WIC slots on NM-2W network modules.

Information About T1/E1 Mode for SHDSL

This section provides information about the T1/E1 Mode for SHDSL feature.

- [SHDSL Features, page 3](#)
- [Interface and Controller Numbering on the Cisco 1721 Router, page 3](#)
- [Interface Numbering on Cisco 2800 Series and Cisco 3800 Series Routers, page 4](#)

SHDSL Features

Supported SHDSL features are listed as follows:

- ITU G.991.2 support (full support for Annex A & B)
 - Dying Gasp (ITU G.991.2) is supported.
 - Terminating wetting current is supported.
 - T1/E1 mode when in two-wire configuration is supported.
- ITU G.991.2 support (partial support for Annex E)
 - E.4—Aligned DS1/fractional DS1 support for T1.
 - E.7—Aligned DS1/fractional DS1 support for E1.
 - E.9—ATM transport.

Interface and Controller Numbering on the Cisco 1721 Router

If a WIC-1SHDSL-V2 is installed in a Cisco 1721 router, the interfaces and controllers are assigned numbers based on a numbering scheme that is different from the slot numbering system on other Cisco routers. This is because the Cisco 1721 router assigns only a slot number without also assigning a port number. Other Cisco routers typically use a slot and port number combination.

If the WIC-1SHDSL-V2 is installed in slot 0, the T1/E1 controllers and the ATM interfaces (ADSL or SHDSL) will be numbered relative to the WIC-1SHDSL-V2 (as the DSL controller) in slot 0. See [Table 31](#) for examples of the slot numbering scheme on the Cisco 1721.

With an ATM or MFT T1/E1 card in slot 0, the WIC-1SHDSL-V2 in slot 1 will be numbered relative to the number of ports in slot 0.

If both slots are occupied by the WIC-1SHDSL-V2 as DSL controllers, the logical interfaces configured on each controller will have the same number as the slot number occupied by the DSL controller. All logical interfaces on the WIC-1SHDSL-V2, such as serial interfaces created during the configuration of channel groups in T1/E1 mode, will have the same number as the DSL controller.

Table 31 Examples of Slot Numbering on the Cisco 1721 Router

Interface Cards and Controllers Installed	Slot Numbering Assignment
A WIC-1SHDSL-V2 is in slot 0, and an MFT-T1/E1 is installed in the other slot, which will be numbered as slot 1.	For WIC-1SHDSL-V2: <pre>controller dsl 0 interface atm0 (or controller t1 0)</pre> For MFT-T1: <pre>controller t1 1</pre>
A WIC-1SHDSL-V2 is in slot 0, and an ADSL/SHDSL WIC is in slot 1.	For WIC-1SHDSL-V2: <pre>controller dsl 0, interface atm0 (or controller t1 0)</pre> For ADSL/SHDSL WIC: <pre>interface atm 1</pre>
An ATM or MFT T1/E1 card is in slot 0, and a WIC-1SHDSL-V2 is in slot 1. The WIC-1SHDSL-V2 will be numbered relative to the ports in slot 0.	For ADSL/SHDSL: <pre>interface atm 0</pre> For WIC-1SHDSL-V2: <pre>controller dsl 1, interface atm 1 (or controller t1 1)</pre>
A 1MFT-T1/E1 is in slot 0, and a WIC-1SHDSL-V2 is in slot 1.	For 1MFT T1/E1: <pre>controller t1 0</pre> For WIC-1SHDSL-V2: <pre>controller dsl 1, interface atm 1 (or controller t1 1)</pre>
A 2MFT-T1/E1 is in slot 0, and a WIC-1SHDSL-V2 is in slot 1.	For 2MFT T1/E1: <pre>controller t1 0 controller t1 1</pre> For WIC-1SHDSL-V2: <pre>controller dsl 2, interface atm 2 (or controller t1 2)</pre>

Interface Numbering on Cisco 2800 Series and Cisco 3800 Series Routers

This section describes the interface numbering scheme for Cisco 2800 and Cisco 3800 series routers. If an interface card is installed in a Cisco 2800 series or Cisco 3800 series router, the interfaces must use a triple-number scheme to identify them. This triple-number assignment is different from the standard interface numbering scheme on other Cisco routers.

[Table 32](#) shows the interface numbering for the onboard Fast Ethernet ports and the interface slots on Cisco 2800 and Cisco 3800 series routers.

Table 32 *Interface Numbering on Cisco 2800 Series and Cisco 3800 Series Router*

Port/Slot	Interface Numbering	Example
Fast Ethernet ports (onboard)	0/0, 0/1	FE 0/0, 0/1
Slot 1	Slot 0/0/0	FE 0/0/0, 0/0/1, 0/0/2, 0/0/3
Slot 2	Slot 0/1/0	(Serial 2T) Serial 0/1/0, 0/1/1
Slot 3	Slot 0/2/0	FE 0/2/0
Slot 4	Slot 0/3/0	(G.SHDSL) ATM 0/3/0

How to Configure T1/E1 Mode for SHDSL

To configure T1/E1 Mode for SHDSL, perform these tasks:

- [Configuring DSL, page 5](#) (required)
- [Configuring Two-Wire CPE T1/E1 Mode, page 8](#) (optional)
- [Configuring a Channel Group and a TDM Group, page 11](#) (optional)
- [Configuring a Channel Group, page 12](#) (optional)
- [Configuring a TDM Group, page 14](#)
- [Verifying Two-Wire CPE T1/E1 Configuration Status, page 16](#) (optional)
- [Troubleshooting Tasks, page 20](#) (optional)

Configuring DSL

This section details how to configure the DSL. To configure the DSL controller, complete the steps, in the following sections, beginning in global configuration mode.

Prerequisites

The following list of prerequisites should be followed for this configuration:

- A G.SHDSL WIC must be installed in the router to match the DSL service to be configured.
- Routers are set up for back-to-back operation as shown in [Figure 27](#).

Figure 27 *Back-to-Back Setup*

SUMMARY STEPS

8. **enable**
9. **configure terminal**
10. **controller dsl** *slot/port*
11. **dsl-mode shdsl symmetric annex** *mode*
12. **line-term** {*co* | *cpe*}
13. **ignore-error-duration** *seconds*
14. **snr margin** {**current** [*snr-value* | **disable**] | **snext** [*snr-value* | **disable**]}
15. **loopback** {*analog* | *digital*}

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	controller dsl <i>slot/port</i> Example: Router(config)# controller dsl 0/1	Enters controller configuration mode. The keywords and arguments are as follows: <ul style="list-style-type: none"> • dsl—The type of controller. • <i>slot/port</i>—The backplane slot number and port number for the interface being configured.
Step 4	dsl-mode shdsl symmetric annex <i>mode</i> Example: Router(config-controller)# dsl-mode shdsl symmetric annex A	Sets the DSL operating mode. The valid values are: <ul style="list-style-type: none"> • A: Supports Annex A of G.991.2 standard for North America. This is the default. • B: Supports Annex B of G.991.2 standard for Europe. • A-B: Supports Annex A or B. For CPE mode only; not supported in CO mode. Selected when the line trains. • A-B-ANFP: Supports Annex A or B-ANFP. For CPE mode only; not supported in CO mode. Selected when the line trains. • B-ANFP: Supports Annex B-ANFP.
Step 5	line-term { <i>co</i> <i>cpe</i> }	(Optional) Configures the line termination as follows: <ul style="list-style-type: none"> • co—Central office. • cpe—Customer premises equipment.
	Example: Router(config-controller)# line-term cpe	

	Command or Action	Purpose
Step 6	<p>ignore-error-duration <i>seconds</i></p> <p>Example: Router(config-controller)# ignore-error-duration 20</p>	<p>(Optional) Permits the router to ignore errors for a given amount of time when training the line when connected to a controller with a different chipset type.</p> <ul style="list-style-type: none"> <i>seconds</i>—Sets the time for which errors will be ignored during training of the line. Range is from 15 to 30 seconds. If this value is omitted, an error message appears.
Step 7	<p>snr margin {current [<i>snr-value</i> disable] snext [<i>snr-value</i> disable]}</p> <p>Example: Router(config-controller)# snr margin current 10</p>	<p>(Optional) Sets the margin of the signal-to-noise ratio on the line to improve the line stability.</p> <ul style="list-style-type: none"> current—Sets the current signal-to-noise ratio (SNR) on the controller. To disable the current SNR, set current to disable. snext—Sets the Self Near End Cross Talk (SNEXT) signal-to-noise ratio. To disable the SNEXT, set snext to disable. <i>snr-value</i>—Value in decibels (dB) for the signal-to-noise ratio on the controller or the SNEXT. Range is from -10 dB to 10 dB. The default value is 0 dB. disable—Disables the snr margin command.
Step 8	<p>loopback {analog digital}</p> <p>Example: Router(config-controller)# loopback analog</p>	<p>(Optional) Configures the core loopback.</p> <ul style="list-style-type: none"> analog—Loops the circuit at the analog hybrid to verify the analog loopback hardware to the analog hybrid. digital—Loops the circuit at the framer to verify the hardware to the framer.

Examples

Example of the Configuration Prior to Configuring T1/E1 mode

```
controller DSL 0/0
line-term cpe
```

What to Do Next

Configure the router for two-wire T1/E1 mode using the steps shown in the [“Configuring Two-Wire CPE T1/E1 Mode”](#) section on page 8.

Configuring Two-Wire CPE T1/E1 Mode

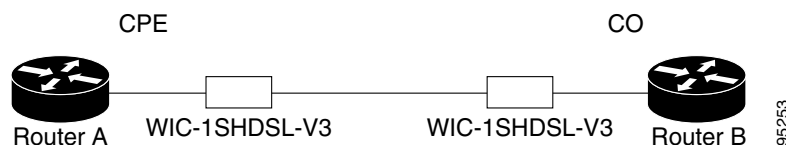
Use this section to configure the router for two-wire CPE T1/E1 mode. To configure G.SHDSL service in T1/E1 Framed mode on a Cisco router containing a G.SHDSL WIC, complete the steps in the following sections.

Prerequisites

The following list of prerequisites should be followed for this configuration:

- A G.SHDSL WIC must be installed in the router to match the DSL service to be configured.
- Perform the [Configuring DSL](#) task before beginning this task.
- The router should not be in ATM mode. If the router is in ATM mode, issue **no mode** command and reload the router.
- An example of a back-to-back setup is shown in [Figure 28](#).

Figure 28 Basic Configuration for T1/E1 with a Back-to-Back Setup



Restrictions

The following list of restrictions should be observed for this configuration:

- DSL line rates should be as follows:
 - T1 mode—1.544 Mbps
 - E1 mode—2.048 Mbps
- T1/E1 mode is supported only in back-to-back configurations. T1/E1 mode is supported in the on-board WIC slot or in the NM-2W.
 - IPBASE image: 64 MB RAM and 16 MB Flash
 - IPVOICE image: 128 MB RAM and 32 MB Flash

SUMMARY STEPS

Follow this summary of steps to configure Two-Wire CPE T1/E1 Mode.

1. **no mode**
2. **mode {t1 | e1}**
3. **controller {t1 | e1} slot/port**
4. **clock source {internal | line}**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<pre>no mode</pre> <p>Example: Router(config-controller)# no mode </p>	Clears any current logical controller.
Step 2	<pre>mode {t1 e1}</pre> <p>Example: Router(config-controller)# mode e1 </p>	Creates a logical T1 or E1 controller. <ul style="list-style-type: none"> • t1 e1—The type of controller.
Step 3	<pre>controller {t1 e1} slot/port</pre> <p>Example: Router(config-controller)# controller e1 0/1 </p>	Enters controller configuration mode and configures the logical T1/E1 controller created in Step 2 . The keywords and arguments are as follows: <ul style="list-style-type: none"> • {t1 e1}—The type of controller. • <i>slot/port</i>—The backplane slot number and port number for the interface being configured.
Step 4	<pre>clock source {internal line}</pre> <p>Example: Router(config-controller)# clock source internal </p>	Configures the clock source on the router: <ul style="list-style-type: none"> • internal—Configures the clock to derive its source internally. Use this on the CO controller. • line—Configures the clock to derive its source from the CO side of the line. Use this on the CPE controller. <p>Note This command only works when using an NM-2W network module. If the WIC is in a slot of the Cisco 2600 router, this command does not apply.</p> <p>Note This command works only when using a non-voice (data) image on the Cisco 1700 series routers. For IP voice images, use the tdm clock command instead (see the “Configuring the TDM Clock” section on page 9).</p>

What to Do Next

Verify the configuration using the detailed steps in [“Verifying Two-Wire CPE T1/E1 Configuration Status”](#) section on page 16

Configuring the TDM Clock

Use this section to configure the TDM clock source for voice images on the Cisco 1700 series routers. Configuring TDM clock is a prerequisite for configuring channel-groups in T1/E1 mode, but is an option for configuring ATM mode. The TDM clock configuration is not supported on data-only images.

The **tdm clock** global configuration command configures the clock source for the G.SHDSL WIC.

For more information about clock configuration for voice on the Cisco 1700 series routers, refer to the [“Clock Configuration for Voice Images”](#) in the *Clock Configuration for Cisco 1751/1760 Routers* document at the following location:

<http://www.cisco.com/en/US/docs/routers/access/1700/1751/software/feature/guide/TDMdesc.html>

SUMMARY STEPS

1. **tdm clock {T1 | E1} <slot/port> {voice | data | both} export line**
or
2. **tdm clock {atm | bri} <slot/port> export**
3. **tdm clock {T1 | E1} <slot/port> {voice | data | both} import {T1 | E1 | atm | bri | onboard} <slot/port> {line | internal}**
or
4. **tdm clock {atm | bri} <slot/port> import {T1 | E1 | atm | bri | onboard} <slot/port>**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<pre>tdm clock {T1 E1} <slot/port> {voice data both} export line</pre> <p>or</p> <pre>tdm clock {atm bri} <slot/port> export</pre> <p>Example: Router(config) # tdm clock atm 1/0 export</p>	(Optional) Configures external source as the clock.
Step 2	<pre>tdm clock {T1 E1} <slot/port> {voice data both} import {T1 E1 atm bri onboard} <slot/port> {line internal}</pre> <p>or</p> <pre>tdm clock {atm bri} <slot/port> import {T1 E1 atm bri onboard} <slot/port></pre> <p>Example: Router(config) # tdm clock atm 1/0 import onboard</p>	(Optional) Configures the internal onboard system clock as the source.
Step 3	<pre>end</pre> <p>Example: Router(config) # end</p>	Returns to privileged EXEC mode.

What to Do Next

Verify the configuration. See the “[Verifying Two-Wire CPE T1/E1 Configuration Status](#)” section on page 16.

Configuring a Channel Group and a TDM Group

Use this section to configure a channel group and a TDM group. Complete the steps in the following sections.

Prerequisites

The following list of prerequisites should be followed for this configuration:

- A G.SHDSL WIC must be installed in the router to match the DSL service to be configured.
- Perform the [Configuring DSL](#) task before beginning this task.
- Perform the [Configuring Two-Wire CPE T1/E1 Mode](#) task before beginning this task.
- The router should not be in ATM mode. If the router is in ATM mode, issue **no mode** command and reload the router.

Restrictions

The following list of restrictions should be observed for this configuration:

- DSL line rates should be as follows:
 - T1 mode—1.544 Mbps
 - E1 mode—2.048 Mbps

SUMMARY STEPS

1. **channel-group** *channel-no* **timeslots** *timeslot-list* **speed** {56 | 64}
2. **tdm-group** *tdm-group-no* **timeslots** *timeslot-list*
3. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<pre>channel-group channel-no timeslots timeslot-list speed {56 64}</pre> <p>Example: Router(config-controller)# channel-group 2 timeslots 2 speed 64</p>	<p>(Optional) Configures a list of timeslots for voice channels on controller T1 or E1.</p> <ul style="list-style-type: none"> <i>channel-no</i>—ID number to identify the channel group. The valid range is 0 to 30. timeslots—enables timeslots to be configured. <i>timeslot-list</i>—Timeslots (DS0s) to include in this channel group. The valid timeslots are: 1 to 24 for T1; 1 to 31 for E1. speed {56 64}—The speed of the underlying DS0s: 56 kbps or 64 kbps.
Step 2	<pre>tdm-group tdm-group-no timeslots timeslot-list</pre> <p>Example: Router(config-controller)# tdm-group 10 timeslots 30</p>	<p>(Optional) Configures a list of timeslots for creating clear channel groups (pass-through) for time division multiplexing (TDM) cross-connect.</p> <ul style="list-style-type: none"> <i>tdm-group-no</i>—TDM group number. The valid range is 0 to 31. timeslots—Enables timeslots to be configured. <i>timeslot-list</i>—Timeslots (DS0s) to include in this TDM group. The valid timeslots are: 1 to 24 for T1; 1 to 31 for E1.
Step 3	<pre>end</pre> <p>Example: Router(config-controller)# end</p>	Exits configuration.

Configuring a Channel Group

Use this section to configure a channel group. Complete the steps in the following sections.

Prerequisites

The following list of prerequisites should be followed for this configuration:

- A G.SHDSL WIC must be installed in the router to match the DSL service to be configured.
- Perform the [Configuring DSL](#) task before beginning this task.
- Perform the [Configuring Two-Wire CPE T1/E1 Mode](#) task before beginning this task.
- The router should not be in ATM mode. If the router is in ATM mode, issue **no mode** command and reload the router.

Restrictions

The following list of restrictions should be observed for this configuration:

- DSL line rates should be as follows:

- T1 mode—1.544 Mbps
- E1 mode— 2.048 Mbps

SUMMARY STEPS

1. **channel-group** *channel-no* **timeslots** *timeslot-list* **speed** {56 | 64}
2. **tdm-group** *tdm-group-no* **timeslots** *timeslot-list*
3. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	channel-group <i>channel-no</i> timeslots <i>timeslot-list</i> speed {56 64} Example: Router(config-controller)# channel-group 2 timeslots 2 speed 64	(Optional) Configures a list of timeslots for voice channels on controller T1 or E1. <ul style="list-style-type: none"> • <i>channel-no</i>—ID number to identify the channel group. The valid range is 0 to 30. • timeslots—enables timeslots to be configured. • <i>timeslot-list</i>—Timeslots (DS0s) to include in this channel group. The valid timeslots are: 1 to 24 for T1; 1 to 31 for E1. • speed {56 64}—The speed of the underlying DS0s: 56 kbps or 64 kbps.
Step 2	tdm-group <i>tdm-group-no</i> timeslots <i>timeslot-list</i> Example: Router(config-controller)# tdm-group tdm-group-no timeslots timeslot-list	(Optional) Configures a list of timeslots for creating clear channel groups (pass-through) for time division multiplexing (TDM) cross-connect. <ul style="list-style-type: none"> • <i>tdm-group-no</i>—TDM group number. The valid range is 0 to 31. • timeslots—Enables timeslots to be configured. • <i>timeslot-list</i>—Timeslots (DS0s) to include in this TDM group. The valid timeslots are: 1 to 24 for T1; 1 to 31 for E1. <p>Note TDM groups are not supported on the Cisco 1700 series routers.</p>
Step 3	end Example: Router(config-controller)# end	Exits configuration.

Example

CPE Configuration

```

controller DSL 0/0
 mode e1
 line-term cpe
 line-mode 2-wire line-zero
 dsl-mode shdsl symmetric annex B
 ignore-error-duration 15
  
```

```
snr margin snext -10
!
!
!
controller E1 0/0
channel-group 0 timeslots 1-31
!
!
!
interface Serial0/0:0
ip address 10.0.0.2 255.0.0.0
!
!
!
```

CO Configuration

```
controller DSL 0/1
mode e1
line-term co
line-mode 2-wire line-zero
dsl-mode shdsl symmetric annex B
!
!
!
controller E1 0/1
channel-group 0 timeslots 1-31
!
!
!
interface Serial0/1:0
ip address 10.0.0.1 255.0.0.0
!
!
!
```

Configuring a TDM Group

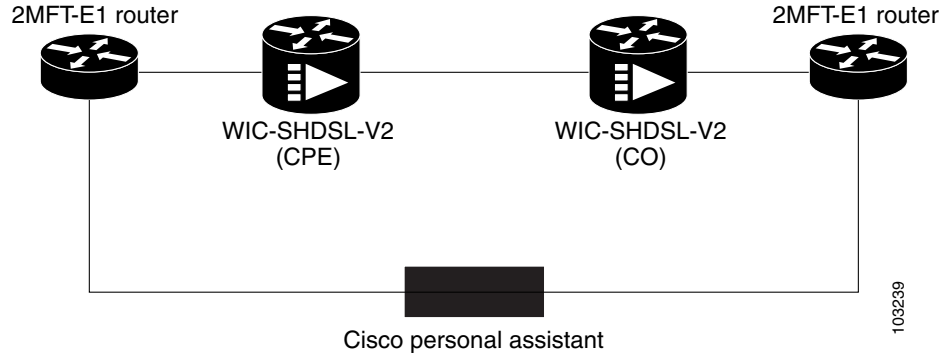
Use this section to configure a TDM group. Complete the steps in the following sections.

Prerequisites

The following list of prerequisites should be followed for this configuration:

- A G.SHDSL WIC must be installed in the router to match the DSL service to be configured.
- Perform the [Configuring DSL](#) task before beginning this task.
- Perform the [Configuring Two-Wire CPE T1/E1 Mode](#) task before beginning this task.
- A typical setup is show in [Figure 29](#).

Figure 29 Typical Router Setup



SUMMARY STEPS

1. `tdm-group tdm-group-no timeslots timeslot-list`
2. `end`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<pre><code>tdm-group tdm-group-no timeslots timeslot-list</code></pre> <p>Example: Router(config-controller)# <code>tdm-group 2</code> <code>timeslots 23</code></p>	(Optional) Configures a list of timeslots for creating clear channel groups (pass-through) for Time Division Multiplexing (TDM) cross-connect. <ul style="list-style-type: none"> • <i>tdm-group-no</i>—TDM group number. The valid range is 0 to 31. • timeslots—enables timeslots to be configured. • <i>timeslot-list</i>—Timeslots (DS0s) to include in this TDM group. The valid timeslots are: 1 to 24 for T1; 1 to 31 for E1.
Step 2	<pre><code>end</code></pre> <p>Example: Router(config-controller)# <code>end</code></p>	Exits configuration.

Example

CPE Configuration

```

controller E1 1/0
  tdm-group 0 timeslots 1-15
  !
  !
controller DSL 1/2
  mode e1
  line-term cpe
  line-mode 2-wire line-zero
  dsl-mode shdsl symmetric annex B
  !
controller E1 1/2

```

```
tdm-group 0 timeslots 1-15
!  
!  
!  
connect hp E1 1/0 0 E1 1/2 0
!  
!
```

CO Configuration

```
controller E1 1/0
tdm-group 0 timeslots 1-15
!  
controller E1 1/1
!  
controller DSL 1/2
mode e1
line-term co
line-mode 2-wire line-zero
dsl-mode shdsl symmetric annex B
!  
controller E1 1/2
clock source internal
tdm-group 0 timeslots 1-15
!  
!  
!  
connect hp E1 1/0 0 E1 1/2 0
!  
!  
!
```

Verifying Two-Wire CPE T1/E1 Configuration Status

Use the following commands to verify your configuration.

SUMMARY STEPS

1. **enable**
2. **show running-config**
3. **show controllers dsl**
4. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	show running-config Example: Router# show running-config	Displays the current running configuration and the status for all controllers.
Step 3	show controllers dsl Example: Router# show controllers dsl	Displays the status of the G.SHDSL modem.
Step 4	exit Example: Router# exit	Exits privileged EXEC mode.

Examples

Sample output—The WIC Configured and the Line Up

```

Router# show controller dsl 0/0

DSL 0/0 controller UP
SLOT 0:Globespan xDSL controller chipset
DSL mode:SHDSL Annex A
Frame mode:Utopia
Configured Line rate:Auto
Line Re-activated 25 times after system bootup
LOSW Defect alarm:None
CRC per second alarm:None
Line termination:CPE

Current 15 min CRC:0
Current 15 min LOSW Defect:0
Current 15 min ES:0
Current 15 min SES:0
Current 15 min UAS:0

Previous 15 min CRC:0
Previous 15 min LOSW Defect:0
Previous 15 min ES:0
Previous 15 min SES:0
Previous 15 min UAS:0

Chipset Version: 1
Firmware Version: R1.7
Modem Status: Data, Status 1
Line rate: 2312 Kbps
Framer Sync Status:In Sync
Rcv Clock Status:In the Range
Loop Attenuation: 0.9880 dB

```

```

Transmit Power: 7.5 dB
Receiver Gain: 21.420 dB
SNR Sampling: 39
Last Fail Mode: No Failure
Dying Gasp:Present

```

Sample Output—Show the Software Version

Router# **show version**

```

Cisco IOS Software, C2600 Software (C2600-IPVOICE-M), Experimental Version
12.3(20040202:201615) [eci 109]
Copyright (c) 1986-2004 by Cisco Systems, Inc.
Compiled Fri 13-Feb-04 16:48

ROM: System Bootstrap, Version 12.2(20011207:134652) [dmize-triple_play_rommon 219],
DEVELOPMENT SOFTWARE

Router uptime is 1 week, 1 day, 2 hours, 38 minutes
System returned to ROM by power-on
System restarted at 14:09:41 UTC Thu Feb 26 2004
Running default software

Cisco 2620XM (MPC860P) processor (revision 0x02) with 127627K/3445K bytes of memory.
Processor board ID FFFF (1219648036)
M860 processor: part number 5, mask 2
2 DSL controllers
1 FastEthernet interface
1 ATM interface
1 Channelized T1/PRI port
32K bytes of NVRAM.
49152K bytes of processor board System flash (Read/Write)

Configuration register is 0x0
This image supports System Controller functionality

```

Sample Output—Building Configuration

Router# **show running-config**

```

Building configuration...

Current configuration : 885 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
no logging console
!
no aaa new-model
prompt router>
ip subnet-zero
!
!
!

```

```
!  
ip cef  
no ftp-server write-enable  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
controller DSL 1/0  
mode atm  
line-term cpe  
line-rate auto  
!  
!  
controller DSL 1/1  
mode t1  
line-term cpe  
!  
controller T1 1/1  
framing sf  
linecode ami  
!  
!  
!  
interface ATM1/0  
ip address 10.0.0.40 255.0.0.0  
no atm ilmi-keepalive  
pvc 2/100  
!  
!  
interface FastEthernet1/0  
ip address 10.0.208.41 255.0.0.0  
duplex auto  
speed auto  
!  
interface FastEthernet1/1  
no ip address  
shutdown  
duplex auto  
speed auto  
!  
!  
!  
!  
!  
!  
line con 0  
exec-timeout 0 0  
privilege level 15  
line aux 0  
line vty 0 4  
exec-timeout 0 0  
privilege level 15  
no login  
!  
!
```

```
!
!
end
```

Troubleshooting Tasks

The following commands verify hardware in the router:

- **show version**—Lists the modules installed in the router. If DSL controllers are installed, the output displays one of the following:
 - 1 DSL controller—If one DSL controller is installed in the router.
 - 1 ATM network interface(s)—If the DSL controller is configured for mode ATM.
 - 1 Channelized T1/PRI port(s)—If the DSL controller is configured for mode T1.
- **show controller dsl**—Displays the DSL controller status and statistics. The sample below shows the output in T1 mode. In ATM mode, the output is similar. Actual output may vary depending on the router and the configuration.

```
Router# show controllers dsl 0/2

DSL 0/2 controller UP
SLOT 0: Globespan xDSL controller chipset
DSL mode: SHDSL Annex B
Frame mode: Utopia
Configured Line rate: Auto
Line Re-activated 2 times after system bootup
LOSW Defect alarm: ACTIVE
CRC per second alarm: ACTIVE
Line termination: CPE
FPGA Revision: 0xA5

Current 15 min CRC: 0
Current 15 min LOSW Defect: 0
Current 15 min ES: 0
Current 15 min SES: 0
Current 15 min UAS: 203895

Previous 15 min CRC: 0
Previous 15 min LOSW Defect: 0
Previous 15 min ES: 0
Previous 15 min SES: 0
Previous 15 min UAS: 0

Line-0 status
Chipset Version: 1
Firmware Version: R2.3.1
Modem Status: Data, Status 1
Last Fail Mode: No Failure status:0x0
Line rate: 2312 Kbps
Framer Sync Status: In Sync
Rcv Clock Status: In the Range
Loop Attenuation: 0.7860 dB
Transmit Power: 9.5 dB
Receiver Gain: 21.420 dB
SNR Sampling: 37
Dying Gasp: Present
```

- **show controller t1**—Displays the T1 controller status and statistics. Actual output may vary depending on the router and the configuration.

```
Router# show controller t1

T1 0/1 is up.
  Applique type is Channelized T1
  No alarms detected.
  alarm-trigger is not set
  Framing is ESF, Clock Source is Line.
  Data in current interval (680 seconds elapsed):
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 24 hours)
    0 Line Code Violations, 0 Path Code Violations,
    0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
```

- **debug xdsl application**—Displays output from the xDSL to see what is happening if the DSL does not come up. When using the **debug xdsl application** command, resources and the buffer are used and will impact operation.

```
Router# debug xdsl application

xDSL application debugging is on
Router#
*Mar 12 08:22:59.300: DSL 0/2 xdsl_background_process: XDSL link up boolean event
received
*Mar 12 08:22:59.300: DSL 0/2 controller Link up! line rate: 2304 Kbps

*Mar 12 08:22:59.300: DSL 0/2 xdsl_controller_reset: cdb-state=up
*Mar 12 08:22:59.300: %CONTROLLER-5-UPDOWN: Controller DSL 0/2, changed state to up
*Mar 12 08:22:59.300: Dslsar data rate 2304
*Mar 12 08:22:59.300: DSL 0/2 TipRing 1, Xmit_Power Val 95, xmit_power 9.5
*Mar 12 08:22:59.300: DSL 0/2 Mode 2, BW 2304, power_base_value 145, power_backoff 5
*Mar 12 08:23:04.956: DSL 0/2 xdsl_background_process: EOC boolean event received
*Mar 12 08:23:05.816: DSL 0/2 SNR Sampling: 43 dB
*Mar 12 08:23:06.816: DSL 0/2 SNR Sampling: 42 dB
*Mar 12 08:23:07.816: DSL 0/2 SNR Sampling: 41 dB
*Mar 12 08:23:09.760: DSL 0/2 xdsl_background_process: EOC boolean event received
*Mar 12 08:23:09.816: DSL 0/2 SNR Sampling: 40 dB
*Mar 12 08:23:10.816: DSL 0/2 SNR Sampling: 40 dB
```

- **debug xdsl driver**—Displays what is happening when the drivers are downloaded and installed. The following example displays sample output from the **debug xdsl driver** command:

```
Router# debug xdsl driver

xDSL driver debugging is on
*Mar 12 08:01:04.772: DSL 0/2 dsp interrupt-download next block for line-0
*Mar 12 08:01:04.780: DSL 0/2 framer intr_status 0xC0
*Mar 12 08:01:05.072: DSL 0/2 dsp interrupt-download next block for line-0
*Mar 12 08:01:05.080: DSL 0/2 framer intr_status 0xC0
*Mar 12 08:01:06.484: DSL 0/2 dsp interrupt-download next block for line-0
*Mar 12 08:01:06.492: DSL 0/2 framer intr_status 0xC0
*Mar 12 08:01:08.092: DSL 0/2 dsp interrupt-download next block for line-0
*Mar 12 08:01:08.096: DSL 0/2 framer intr_status 0xC0
*Mar 12 08:01:19.180: DSL 0/2 dsp interrupt-download next block for line-0
*Mar 12 08:01:19.184: DSL 0/2 framer intr_status 0xC0
*Mar 12 08:01:19.480: DSL 0/2 dsp interrupt-download next block for line-0
*Mar 12 08:01:19.484: DSL 0/2 framer intr_status 0xC0
*Mar 12 08:01:19.680: DSL 0/2 dsp interrupt-download next block for line-0
*Mar 12 08:01:19.680: DSL 0/2 DSP interrupt disabled
```

```

*Mar 12 08:01:19.680: DSL 0/2 Download completed for line-0
*Mar 12 08:01:19.680: DSL 0/2 Framers interrupt enabled
*Mar 12 08:01:19.680: DSL 0/2 framer intr_status 0xC0
*Mar 12 08:01:19.680: DSL 0/2 controller Link up! line rate: 2304 Kbps

*Mar 12 08:01:19.680: %CONTROLLER-5-UPDOWN: Controller DSL 0/2, changed state to up
*Mar 12 08:01:19.680: Dslsar data rate 2304
*Mar 12 08:01:22.528: %LINK-3-UPDOWN: Interface ATM0/2, changed state to up
*Mar 12 08:01:23.528: %LINEPROTO-5-UPDOWN: Line protocol on Interface ATM0/2, changed
state to up
*Mar 12 08:01:23.812: DSL 0/2 framer intr_status 0xC4
*Mar 12 08:01:23.816: DSL 0/2 framer intr_status 0xC4
*Mar 12 08:01:23.904: DSL 0/2 framer intr_status 0xC1
*Mar 12 08:01:28.612: DSL 0/2 framer intr_status 0xC4
*Mar 12 08:01:28.616: DSL 0/2 framer intr_status 0xC4
*Mar 12 08:01:28.708: DSL 0/2 framer intr_status 0xC1
*Mar 12 08:01:28.804: DSL 0/2 framer intr_status 0xC1
*Mar 12 08:01:33.412: DSL 0/2 framer intr_status 0xC4
*Mar 12 08:01:33.420: DSL 0/2 framer intr_status 0xC4
*Mar 12 08:01:33.508: DSL 0/2 framer intr_status 0xC1
*Mar 12 08:01:33.604: DSL 0/2 framer intr_status 0xC1
*Mar 12 08:01:33.700: DSL 0/2 framer intr_status 0xC1
*Mar 12 08:01:38.212: DSL 0/2 framer intr_status 0xC4
*Mar 12 08:01:38.220: DSL 0/2 framer intr_status 0xC4
*Mar 12 08:01:38.308: DSL 0/2 framer intr_status 0xC1

```

- **debug xdsl eoc**—Displays what is in the embedded operations channel (EOC) messages. The following example displays sample output from the **debug xdsl eoc** command.

```

Router# debug xdsl eoc

xDSL EOC debugging is on
Router#
*Mar 12 08:19:08.564: DSL 0/2 controller Link up! line rate: 2304 Kbps

*Mar 12 08:19:08.564: %CONTROLLER-5-UPDOWN: Controller DSL 0/2, changed state to up
*Mar 12 08:19:08.564: Dslsar data rate 2304
*Mar 12 08:19:12.528: %LINK-3-UPDOWN: Interface ATM0/2, changed state to up
*Mar 12 08:19:13.528: %LINEPROTO-5-UPDOWN: Line protocol on Interface ATM0/2, changed
state to up
*Mar 12 08:19:14.500: DSL 0/2: line 0 EOC Rcv Intr :: 0xC4
*Mar 12 08:19:14.500: DSL 0/2:Current length 40 GTI_OK
*Mar 12 08:19:14.500: DSL 0/2: GT_FAIL
*Mar 12 08:19:14.500: Rx EOC remove transparency:: 12 1 0 39 EF
*Mar 12 08:19:14.500: data_transparency_remove: Done, eoc packet size = 5

*Mar 12 08:19:14.500: Good eoc packet received
*Mar 12 08:19:14.500: incoming request eocmsgid: 1
*Mar 12 08:19:14.500: Tx Converted EOC message:: 21 81 1 43 43 49 53 43 4F 0 0 0
2 1 0 E9 61
*Mar 12 08:19:14.500: data_transparency_add: eoc packet size - before 17, after 17

*Mar 12 08:19:14.504: DSL 0/2: line 0 EOC Rcv Intr :: 0xC4
*Mar 12 08:19:14.504: DSL 0/2: Current length 40 GTI_EOM
*Mar 12 08:19:14.504: DSL 0/2: GT_FAIL
*Mar 12 08:19:14.600: DSL 0/2: line 0 EOC TX Complete Intr :: 0xC1
*Mar 12 08:19:19.300: DSL 0/2: line 0 EOC Rcv Intr :: 0xC4
*Mar 12 08:19:19.300: DSL 0/2:Current length 40 GTI_OK
*Mar 12 08:19:19.300: DSL 0/2: GT_FAIL
*Mar 12 08:19:19.300: Rx EOC remove transparency:: 12 2 74 8A
*Mar 12 08:19:19.300: data_transparency_remove: Done, eoc packet size = 4

*Mar 12 08:19:19.300: Good eoc packet received
*Mar 12 08:19:19.300: incoming request eocmsgid: 2

```

```

*Mar 12 08:19:19.300: Tx Converted EOC message:: 21 82 1 0 0 0 0 0 52 32 2E 33
2E 31 43 4E 53 38 44 44 30 41 41 41 43 43 49 53 43 4F 0 0 0 43 53 43 4F 2D 31 53 48
44 53 4C 0 46 48 48 30 37 31 39 30 31 4C 51 0 31 32 2E 33 28 32 30 30 33 30 36 0 A8
F3
*Mar 12 08:19:19.300: data_transparency_add: eoc packet size - before 71, after 71

*Mar 12 08:19:19.308: DSL 0/2: line 0 EOC Rcv Intr :: 0xC4
*Mar 12 08:19:19.308: DSL 0/2: Current length 40 GTI_EOM
*Mar 12 08:19:19.308: DSL 0/2: GT_FAIL
*Mar 12 08:19:19.400: DSL 0/2: line 0 EOC TX Complete Intr :: 0xC1
*Mar 12 08:19:19.496: DSL 0/2: line 0 EOC TX Complete Intr :: 0xC1
*Mar 12 08:19:24.100: DSL 0/2: line 0 EOC Rcv Intr :: 0xC4
*Mar 12 08:19:24.100: DSL 0/2:Current length 40 GTI_OK
*Mar 12 08:19:24.100: DSL 0/2: GT_FAIL
*Mar 12 08:19:24.100: Rx EOC remove transparency:: 12 B B5 17
*Mar 12 08:19:24.100: data_transparency_remove: Done, eoc packet size = 4

*Mar 12 08:19:24.100: Good eoc packet received
*Mar 12 08:19:24.100: incoming request eocmsgid: 11
*Mar 12 08:19:24.100: Tx Converted EOC message:: 21 8B 10 0 1 C5 DD
*Mar 12 08:19:24.100: data_transparency_add: eoc packet size - before 7, after 7

*Mar 12 08:19:24.104: Tx Converted EOC message:: 21 8C 0 10 0 0 0 0 0 0 0 C 85
1 B0 4A
*Mar 12 08:19:24.104: data_transparency_add: eoc packet size - before 15, after 15

*Mar 12 08:19:24.104: size of eoc status response :: 13
*Mar 12 08:19:24.104: Tx Converted EOC message:: 21 89 5 52 93
*Mar 12 08:19:24.104: data_transparency_add: eoc packet size - before 5, after 5

*Mar 12 08:19:24.104: size of eoc status response :: 3GSI Tx buffer yet to transmit

*Mar 12 08:19:24.108: DSL 0/2: line 0 EOC Rcv Intr :: 0xC4
*Mar 12 08:19:24.108: DSL 0/2: Current length 40 GTI_EOM
*Mar 12 08:19:24.108: DSL 0/2: GT_FAIL
*Mar 12 08:19:24.204: DSL 0/2: line 0 EOC TX Complete Intr :: 0xC1
*Mar 12 08:19:24.300: DSL 0/2: line 0 EOC TX Complete Intr :: 0xC1
*Mar 12 08:19:24.396: DSL 0/2: line 0 EOC TX Complete Intr :: 0xC1
*Mar 12 08:19:28.904: DSL 0/2: line 0 EOC Rcv Intr :: 0xC4
*Mar 12 08:19:28.904: DSL 0/2:Current length 40 GTI_OK
*Mar 12 08:19:28.904: DSL 0/2: GT_FAIL
*Mar 12 08:19:28.904: Rx EOC remove transparency:: 12 11 6E A8
*Mar 12 08:19:28.904: data_transparency_remove: Done, eoc packet size = 4

*Mar 12 08:19:28.904: Good eoc packet received
*Mar 12 08:19:28.904: incoming request eocmsgid: 17
*Mar 12 08:19:28.904: Tx Converted EOC message:: 21 91 0 0 0 D6 56
*Mar 12 08:19:28.904: data_transparency_add: eoc packet size - before 7, after 7

*Mar 12 08:19:28.904: size of eoc status response :: 5
*Mar 12 08:19:28.908: DSL 0/2: line 0 EOC Rcv Intr :: 0xC4
*Mar 12 08:19:28.908: DSL 0/2: Current length 40 GTI_EOM
*Mar 12 08:19:28.908: DSL 0/2: GT_FAIL
*Mar 12 08:19:29.004: DSL 0/2: line 0 EOC TX Complete Intr :: 0xC1
*Mar 12 08:19:33.704: DSL 0/2: line 0 EOC Rcv Intr :: 0xC4
*Mar 12 08:19:33.704: DSL 0/2:Current length 40 GTI_OK
*Mar 12 08:19:33.704: DSL 0/2: GT_FAIL
*Mar 12 08:19:33.704: Rx EOC remove transparency:: 12 B B5 17
*Mar 12 08:19:33.704: data_transparency_remove: Done, eoc packet size = 4

*Mar 12 08:19:33.704: Good eoc packet received
*Mar 12 08:19:33.704: incoming request eocmsgid: 11
*Mar 12 08:19:33.704: Tx Converted EOC message:: 21 8B E 0 1 4B 48
*Mar 12 08:19:33.704: data_transparency_add: eoc packet size - before 7, after 7

```

```
*Mar 12 08:19:33.704: Tx Converted EOC message:: 21 8C 0 E 0 0 0 0 0 0 9 5
1 68 AC
*Mar 12 08:19:33.704: data_transparency_add: eoc packet size - before 15, after 15
```

The following example displays a sample output using the **undebug** form of this command to turn off the monitoring:

```
Router# undebug xdsl eoc
xDSL EOC debugging is off
```

- **debug xdsl error**—Displays error messages. The following example shows use of the **debug xdsl error** command, sample output, and use of the command to stop the display.

```
Router# debug xdsl error
xDSL error debugging is on
Router#
```

Configuration Examples for T1/E1 Mode for SHDSL

The following are configuration examples for the T1/E1 Mode for SHDSL feature:

- [Router A: CPE Configuration Example](#)
- [Router B: CO Configuration Example](#)
- [PBX Voice TDM Traffic over SHDSL Example](#)
- [Configuration Examples for the Cisco 1760 Router in E1 Mode with Voice](#)
- [Configuration Examples for the Cisco 1760 Router in T1 Mode with Voice](#)

Router A: CPE Configuration Example

```
controller E1 1/0
  tdm-group 0 timeslots 1-15
  !
  !
controller DSL 1/2
  mode e1
  line-term cpe
  line-mode 2-wire line-zero
  dsl-mode shdsl symmetric annex B
  !
controller E1 1/2
  tdm-group 0 timeslots 1-15
  !
  !
  !
connect hp E1 1/0 0 E1 1/2 0
  !
  !
```

Router B: CO Configuration Example

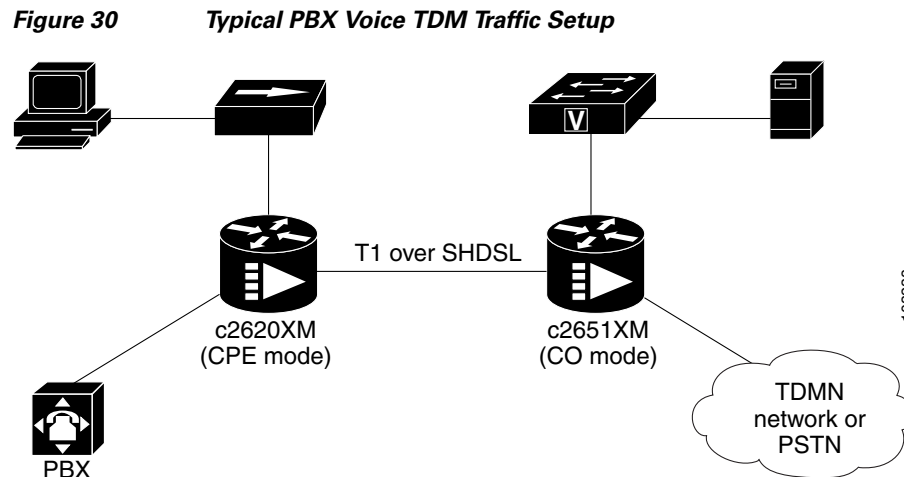
```
controller E1 1/0
```



```

tdm-group 0 timeslots 1-15
!
controller E1 1/1
!
controller DSL 1/2
mode e1
line-term co
line-mode 2-wire line-zero
dsl-mode shdsl symmetric annex B
!
controller E1 1/2
clock source internal
tdm-group 0 timeslots 1-15
!
!
!
connect hp E1 1/0 0 E1 1/2 0
!
!
!
```

PBX Voice TDM Traffic over SHDSL Example



In this example, a WIC-1SHDSL-V2 is used on both sides to link the Cisco 2620XM and the Cisco 2651XM by using one pair of copper wire, as shown in [Figure 30](#). The two WICs are configured into T1 mode.

Under newly created logical T1 controller at the Cisco 2620XM router, ten TDM groups are allocated to deliver TDM voice traffic from the PBX. The TDM voice traffic from the PBX passes first into the VWIC-2MFT-T1 at the Cisco 2620 router, where the voice traffic is switched onto the WIC-1SHDSL-V2 and in turn is delivered over SHDSL to the CO side, the Cisco 2651XM. At the Cisco 2651XM, the TDM voice traffic is switched and passed onto the TDM or PSTN network, which can be done through another VWIC-2MFT-T1 at the CO side.

In the same T1 logical Controllers on both CPE and CO sides, the left time slots are allocated to channel-groups. The created channel-groups are used to make serial interfaces at both CPE and CO sides. The logical serial interfaces can be used to deliver any IP traffic; for example, the PC can communicate to file server on the remote CO side.

The following sample configurations are given for reference.

CPE Sample Configuration

```

Current configuration : 1081 bytes
!
version 12.3
service config
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname 2651XM-CPE
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
ip subnet-zero
!
!
!
ip host dirt 192.168.254.254
no ftp-server write-enable
!
!
!
controller DSL 1/0
mode t1
line-term cpe
!
controller T1 1/0
framing esf
crc-threshold 0
linecode b8zs
channel-group 1 timeslots 11-24
tdm-group 0 timeslots 1-10 type e&m
!
controller T1 1/1
framing esf
crc-threshold 320
linecode b8zs
tdm-group 0 timeslots 1-10 type e&m
!
controller T1 1/2
framing sf
crc-threshold 320
linecode ami
!
!
interface FastEthernet0/0
ip address dhcp
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
shutdown
duplex auto
speed auto
!
interface Serial1/0:1
ip address 10.0.0.2 255.0.0.0

```

```

!
ip classless
ip http server
!
!
connect PBX_TDMDSL T1 1/0 0 T1 1/1 0
!
!
!
control-plane
!
!
line con 0
  exec-timeout 0 0
  privilege level 15
line aux 0
line vty 0 4
  exec-timeout 0 0
  privilege level 15
  no login
!
!
!
end

```

CO Sample Configuration

```

version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname 2620XM-CO
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
ip subnet-zero
!
!
!
!
ip host dirt 192.168.254.254
no ftp-server write-enable
!
!
!
!
controller DSL 1/0
  mode t1
  line-term co
!
controller T1 1/0
  framing esf
  crc-threshold 0
  clock source internal
  linecode b8zs
  channel-group 1 timeslots 11-24
  tdm-group 0 timeslots 1-10 type e&m
!

```

```

controller T1 1/1
  framing esf
  crc-threshold 320
  linecode b8zs
  tdm-group 0 timeslots 1-10 type e&m
!
controller T1 1/2
  framing sf
  crc-threshold 320
  linecode ami
!
!
interface FastEthernet0/0
  ip address dhcp
  duplex auto
  speed auto
!
interface Serial1/0:1
  ip address 10.0.0.1 255.0.0.0
!
ip classless
ip http server
!
!
connect PBX_TDMDSL T1 1/0 0 T1 1/1 0
!
!
!
control-plane
!
!
line con 0
  exec-timeout 0 0
  privilege level 15
line aux 0
line vty 0 4
  exec-timeout 0 0
  privilege level 15
  no login
!
!
!
end

```

Configuration Examples for the Cisco 1760 Router in E1 Mode with Voice

This section contains output examples for configuring the Cisco 1760 CO and the Cisco 1760 CPE in E1 mode with voice.

Configuration Example for a Cisco 1760 CO in E1 Mode

```
Router#p 12.0.0.2
```

Type escape sequence to abort.

```
Sending 5, 100-byte ICMP Echos to 12.0.0.2, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/8 ms
```

```
Router#p 20.0.0.2
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.0.0.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/6/8 ms
Router#show run
Building configuration...

Current configuration : 913 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
!
tdm multichannel E1 1/0 timeslots 24-31
tdm clock E1 1/0 data import onboard internal
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
no aaa new-model
ip subnet-zero
ip cef
!
!
!
no ftp-server write-enable
!
!
!
!
!
controller DSL 1/0
  mode el
  line-term co
  line-mode 2-wire
!
controller E1 1/0
  channel-group 0 timeslots 1-12
  channel-group 1 timeslots 24-31 speed 56
!
!
!
interface FastEthernet0/0
  no ip address
  shutdown
  speed auto
!
interface Serial1/0:0
  ip address 12.0.0.1 255.0.0.0
!
interface Serial1/0:1
  ip address 20.0.0.1 255.0.0.0
!
ip classless
no ip http server
!
```

```

!
!
control-plane
!
!!
line con 0
line aux 0
line vty 0 4
!
no scheduler allocate
end

```

Router#

Router#**show controller e1 1/0**

```

E1 1/0 is up.
  Applique type is Channelized E1 - balanced
  Receiver has remote alarm.
  alarm-trigger is not set
  Framing is CRC4, Clock Source is Internal.
  Data in current interval (201 seconds elapsed):
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs

```

Router#**show controller dsl 1/0**

```

DSL 1/0 controller UP
Globespan xDSL controller chipset
DSL mode: SHDSL Annex A
Frame mode: E1 Slotted
Line Re-activated 0 times after system bootup
LOSW Defect alarm: ACTIVE
CRC per second alarm: ACTIVE
Line termination: CO
FPGA Revision: 0xA9

```

```

Current 15 min CRC: 0
Current 15 min LOSW Defect: 0
Current 15 min ES: 0
Current 15 min SES: 0
Current 15 min UAS: 0

```

```

Previous 15 min CRC: 0
Previous 15 min LOSW Defect: 0
Previous 15 min ES: 0
Previous 15 min SES: 0
Previous 15 min UAS: 0

```

```

Line-0 status
Chipset Version: 1
Firmware Version: A29733
Modem Status: Data, Status 1
Last Fail Mode: No Failure status:0x0
Line rate: 2056 Kbps
Framer Sync Status: In Sync
Rcv Clock Status: Out of Range
Loop Attenuation: 0.9890 dB

```

```

Transmit Power: 7.5 dB
Receiver Gain: 19.5420 dB
SNR Sampling: 39.1570 dB
Dying Gasp: Present

```

Router#

Router#**show version**

```

Cisco IOS Software, C1700 Software (C1700-IPVOICE-M), Experimental Version
12.3(20040114:170452) [gvsriks-crusher_pi5 101]
Copyright (c) 1986-2004 by Cisco Systems, Inc.
Compiled Thu 15-Jan-04 22:18 by gvsriks

```

ROM: System Bootstrap, Version 12.2(4r)XL, RELEASE SOFTWARE (fc1)

```

Router uptime is 34 minutes
System returned to ROM by power-on
Running default software

```

```

Cisco 1760 (MPC860P) processor (revision 0x200) with 61584K/3952K bytes of memory.
Processor board ID VEN05300043 (2247167129), with hardware revision 0000
MPC860P processor: part number 5, mask 2
1 DSL controller
1 FastEthernet interface
2 Serial interfaces
1 Channelized E1/PRI port
32K bytes of NVRAM.
16384K bytes of processor board System flash (Read/Write)

```

Configuration register is 0x40

Router#

Router#sh int se 1/0:0

```

Serial1/0:0 is up, line protocol is up
  Hardware is DSX1
  Internet address is 12.0.0.1/8
  MTU 1500 bytes, BW 768 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:01, output 00:00:00, output hang never
  Last clearing of "show interface" counters 00:08:29
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/1/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 576 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    1064 packets input, 264136 bytes, 0 no buffer
    Received 59 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    1065 packets output, 264435 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
  Timeslot(s) Used:1-12, SCC: 0, Transmitter delay is 0 flags
Router#

```

```

Router#show int se 1/0:1
Serial1/0:1 is up, line protocol is up
  Hardware is DSX1
  Internet address is 20.0.0.1/8
  MTU 1500 bytes, BW 448 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters 00:08:53
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/1/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 336 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    2648 packets input, 1485798 bytes, 0 no buffer
    Received 62 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    2648 packets output, 1485798 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
Router#

```

Configuration Example for a Cisco 1760 CPE in E1 Mode

```

Router#p 12.0.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 12.0.0.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/5/8 ms
Router#p 20.0.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.0.0.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/8 ms
Router#show run
Building configuration...

Current configuration : 902 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
!
tdm multichannel E1 1/0 timeslots 24-31
tdm clock E1 1/0 data export line
mmi polling-interval 60
no mmi auto-configure
no mmi pvc

```



```
mmi snmp-timeout 180
no aaa new-model
ip subnet-zero
ip cef
!
!
!
!
no ftp-server write-enable
!
!
!
!
controller DSL 1/0
 mode e1
  line-term cpe
  line-mode 2-wire
!
controller E1 1/0
 channel-group 0 timeslots 1-12
 channel-group 1 timeslots 24-31 speed 56
!
!
!
interface FastEthernet0/0
 no ip address
 shutdown
 speed auto
!
interface Serial1/0:0
 ip address 12.0.0.2 255.0.0.0
!
interface Serial1/0:1
 ip address 20.0.0.2 255.0.0.0
!
ip classless
no ip http server
!
!
!
control-plane
!
!
!
!
line con 0
line aux 0
line vty 0 4
!
no scheduler allocate
end

Router#

Router#show controller e1 1/0
E1 1/0 is up.
  Applique type is Channelized E1 - balanced
  No alarms detected.
  alarm-trigger is not set
  Framing is CRC4, Clock Source is Line.
  Data in current interval (345 seconds elapsed):
    0 Line Code Violations, 0 Path Code Violations
```

```

    0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
Router#

```

```
Router#show controller dsl 1/0
```

```

DSL 1/0 controller UP
Globespan xDSL controller chipset
DSL mode: SHDSL Annex A
Frame mode: E1 Slotted
Line Re-activated 0 times after system bootup
LOSW Defect alarm: ACTIVE
CRC per second alarm: ACTIVE
Line termination: CPE
FPGA Revision: 0xA9

```

```

    Current 15 min CRC: 0
    Current 15 min LOSW Defect: 0
    Current 15 min ES: 0
    Current 15 min SES: 0
    Current 15 min UAS: 0

```

```

    Previous 15 min CRC: 0
    Previous 15 min LOSW Defect: 0
    Previous 15 min ES: 0
    Previous 15 min SES: 0
    Previous 15 min UAS: 0

```

```

Line-0 status
Chipset Version: 1
Firmware Version: A29733
Modem Status: Data, Status 1
Last Fail Mode: No Failure status:0x0
Line rate: 2056 Kbps
Framer Sync Status: In Sync
Rcv Clock Status: In the Range
Loop Attenuation: 1.4160 dB
Transmit Power: 7.5 dB
Receiver Gain: 19.5420 dB
SNR Sampling: 38.4000 dB
Dying Gasp: Present

```

```

Router#
Router#

```

```
Router#
```

```
Router#show version
```

```

Cisco IOS Software, C1700 Software (C1700-IPVOICE-M), Experimental Version
12.3(20040114:170452) [gvsriks-crusher_pi5 101]
Copyright (c) 1986-2004 by Cisco Systems, Inc.
Compiled Thu 15-Jan-04 22:18 by gvsriks

```

```
ROM: System Bootstrap, Version 12.2(7r)XM2, RELEASE SOFTWARE (fc1)
```

```

Router uptime is 37 minutes
System returned to ROM by power-on
Running default software

```

```

Cisco 1760 (MPC860P) processor (revision 0x500) with 87799K/10505K bytes of memory.
Processor board ID FOC073817AG (2398817686), with hardware revision 0000
MPC860P processor: part number 5, mask 2

```

```

1 DSL controller
1 FastEthernet interface
2 Serial interfaces
1 Channelized E1/PRI port
32K bytes of NVRAM.
32768K bytes of processor board System flash (Read/Write)

Configuration register is 0x0

Router#

Router#sh int se 1/0:0
Serial1/0:0 is up, line protocol is up
  Hardware is DSX1
  Internet address is 12.0.0.2/8
  MTU 1500 bytes, BW 768 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:08, output 00:00:09, output hang never
  Last clearing of "show interface" counters 00:11:42
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/1/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 576 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    1087 packets input, 265788 bytes, 0 no buffer
    Received 82 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    1086 packets output, 265489 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
  Timeslot(s) Used:1-12, SCC: 0, Transmitter delay is 0 flags
Router#

Router#show int se 1/0:1
Serial1/0:1 is up, line protocol is up
  Hardware is DSX1
  Internet address is 20.0.0.2/8
  MTU 1500 bytes, BW 448 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:05, output 00:00:08, output hang never
  Last clearing of "show interface" counters 00:11:58
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/1/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 336 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    2670 packets input, 1487151 bytes, 0 no buffer
    Received 84 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    2669 packets output, 1487127 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets

```

```

    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
Router#

```

Configuration Examples for the Cisco 1760 Router in T1 Mode with Voice

This section contains output examples for configuring the Cisco 1760 CO and the Cisco 1760 CPE in T1 mode using a voice image.

Configuration Example for a Cisco 1760 CO in T1 Mode

```

Router#show run
Building configuration...

Current configuration :906 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
!
tdm multichannel T1 1/0 timeslots 16-24
tdm clock T1 1/0 data import onboard internal
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
no aaa new-model
ip subnet-zero
ip cef
!
!
!
!
no ftp-server write-enable
!
!
!
!
!
controller DSL 1/0
mode t1
line-term co
!
controller T1 1/0
framing sf
channel-group 0 timeslots 1-12
channel-group 1 timeslots 16-24 speed 56
!
!
!
interface FastEthernet0/0
no ip address
shutdown

```

```
    speed auto
    !
interface Serial1/0:0
    ip address 12.0.0.1 255.0.0.0
    !
interface Serial1/0:1
    ip address 20.0.0.1 255.0.0.0
    !
ip classless
no ip http server
!
!
!
control-plane
!
!
!
!
line con 0
line aux 0
line vty 0 4
!
no scheduler allocate
end
```

Router#

Router#**show version**

```
Cisco IOS Software, C1700 Software (C1700-IPVOICE-M), Experimental Version
12.3(20040114:170452) [gvsriks-crusher_pi5 101]
Copyright (c) 1986-2004 by Cisco Systems, Inc.
Compiled Thu 15-Jan-04 22:18 by gvsriks
```

ROM:System Bootstrap, Version 12.2(4r)XL, RELEASE SOFTWARE (fc1)

```
Router uptime is 2 hours, 7 minutes
System returned to ROM by power-on
Running default software
```

```
Cisco 1760 (MPC860P) processor (revision 0x200) with 61584K/3952K bytes of memory.
Processor board ID VEN05300043 (2247167129), with hardware revision 0000
MPC860P processor:part number 5, mask 2
```

```
1 DSL controller
1 FastEthernet interface
2 Serial interfaces
1 Channelized T1/PRI port
32K bytes of NVRAM.
16384K bytes of processor board System flash (Read/Write)
```

Configuration register is 0x40

Router#

```
-----
Router#ping 12.0.0.2 da dd repeat 1000 si 256
```

Type escape sequence to abort.

Sending 1000, 256-byte ICMP Echos to 12.0.0.2, timeout is 2 seconds:

Packet has data pattern 0x00DD

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

```

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (1000/1000), round-trip min/avg/max = 8/8/32 ms
Router#
Router#
Router#show controller t1 1/0
T1 1/0 is up.
  Applique type is Channelized T1
  No alarms detected.
  alarm-trigger is not set
  Framing is SF, Clock Source is Internal.
  Data in current interval (37 seconds elapsed):
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs

Router#show controller dsl 1/0

DSL 1/0 controller UP
Globespan xDSL controller chipset
DSL mode:SHDSL Annex A
Frame mode:T1
Line Re-activated 0 times after system bootup
LOSW Defect alarm:ACTIVE
CRC per second alarm:ACTIVE
Line termination:CO
FPGA Revision:0xA9

      Current 15 min CRC:0
      Current 15 min LOSW Defect:0
      Current 15 min ES:0
      Current 15 min SES:0
      Current 15 min UAS:0

      Previous 15 min CRC:0
      Previous 15 min LOSW Defect:0
      Previous 15 min ES:0
      Previous 15 min SES:0
      Previous 15 min UAS:0

Line-0 status
Chipset Version: 1
Firmware Version: A29733
Modem Status: Data, Status 1
Last Fail Mode: No Failure status:0x0
Line rate: 1552 Kbps
Framer Sync Status:In Sync
Rcv Clock Status:Out of Range
Loop Attenuation: 0.4580 dB
Transmit Power: 7.5 dB
Receiver Gain: 22.5420 dB
SNR Sampling: 36.6390 dB
Dying Gasp:Present

Router#

Router#show int se 1/0:0
Serial1/0:0 is up, line protocol is up
  Hardware is DSX1
  Internet address is 12.0.0.1/8
  MTU 1500 bytes, BW 768 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255

```

```

Encapsulation HDLC, loopback not set
Keepalive set (10 sec)
Last input 00:00:09, output 00:00:06, output hang never
Last clearing of "show interface" counters 00:06:40
Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
Queueing strategy:weighted fair
Output queue:0/1000/64/0 (size/max total/threshold/drops)
  Conversations 0/1/256 (active/max active/max total)
  Reserved Conversations 0/0 (allocated/max allocated)
  Available Bandwidth 576 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  1047 packets input, 263053 bytes, 0 no buffer
  Received 47 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  1047 packets output, 263053 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
Timeslot(s) Used:1-12, SCC:0, Transmitter delay is 0 flags
Router#

```

```

Router#show int se 1/0:1
Serial1/0:1 is up, line protocol is up
  Hardware is DSX1
  Internet address is 20.0.0.1/8
  MTU 1500 bytes, BW 504 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:03, output 00:00:09, output hang never
  Last clearing of "show interface" counters 00:06:54
  Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
  Queueing strategy:weighted fair
  Output queue:0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/1/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 378 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  1049 packets input, 263101 bytes, 0 no buffer
  Received 49 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  1048 packets output, 263077 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
Router#

```

Configuration Example for a Cisco 1760 CPE in T1 Mode

```

Router#show run

Building configuration...

Current configuration :895 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!

```

```
hostname Router
!
boot-start-marker
boot-end-marker
!
!
tdm multichannel T1 1/0 timeslots 16-24
tdm clock T1 1/0 data export line
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
no aaa new-model
ip subnet-zero
ip cef
!
!
!
!
no ftp-server write-enable
!
!
!
!
!
controller DSL 1/0
 mode t1
  line-term cpe
!
controller T1 1/0
 framing sf
  channel-group 0 timeslots 1-12
  channel-group 1 timeslots 16-24 speed 56
!
!
!
interface FastEthernet0/0
 no ip address
 shutdown
 speed auto
!
interface Serial1/0:0
 ip address 12.0.0.2 255.0.0.0
!
interface Serial1/0:1
 ip address 20.0.0.2 255.0.0.0
!
ip classless
no ip http server
!
!
!
control-plane
!
!
!
!
!
line con 0
line aux 0
line vty 0 4
!
no scheduler allocate
```



```

LOSW Defect alarm:ACTIVE
CRC per second alarm:ACTIVE
Line termination:CPE
FPGA Revision:0xA9

```

```

    Current 15 min CRC:0
    Current 15 min LOSW Defect:0
    Current 15 min ES:0
    Current 15 min SES:0
    Current 15 min UAS:0

```

```

    Previous 15 min CRC:0
    Previous 15 min LOSW Defect:0
    Previous 15 min ES:0
    Previous 15 min SES:0
    Previous 15 min UAS:0

```

```

Line-0 status
Chipset Version: 1
Firmware Version: A29733
Modem Status: Data, Status 1
Last Fail Mode: No Failure status:0x0
Line rate: 1552 Kbps
Framer Sync Status:In Sync
Rcv Clock Status:In the Range
Loop Attenuation: 0.7800 dB
Transmit Power: 7.5 dB
Receiver Gain: 22.5420 dB
SNR Sampling: 35.8470 dB
Dying Gasp:Present

```

Router#show int se 1/0:0

```

Serial1/0:0 is up, line protocol is up
  Hardware is DSX1
  Internet address is 12.0.0.2/8
  MTU 1500 bytes, BW 768 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:05, output 00:00:08, output hang never
  Last clearing of "show interface" counters 00:02:03
  Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
  Queueing strategy:weighted fair
  Output queue:0/1000/64/0 (size/max total/threshold/drops)
    Conversations  0/1/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 576 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    1014 packets input, 260886 bytes, 0 no buffer
    Received 14 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    1014 packets output, 260886 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions

```

Router#show int se 1/0:1

```

Serial1/0:1 is up, line protocol is up
  Hardware is DSX1
  Internet address is 20.0.0.2/8
  MTU 1500 bytes, BW 504 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set

```

```

Keepalive set (10 sec)
Last input 00:00:07, output 00:00:01, output hang never
Last clearing of "show interface" counters 00:02:15
Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
Queueing strategy:weighted fair
Output queue:0/1000/64/0 (size/max total/threshold/drops)
  Conversations  0/1/256 (active/max active/max total)
  Reserved Conversations 0/0 (allocated/max allocated)
  Available Bandwidth 378 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  1016 packets input, 261209 bytes, 0 no buffer
  Received 16 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  1017 packets output, 261233 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
Router#

```

Additional References

Related Documents

Related Topic	Document Title
1-Port G.SHDSL WAN Interface Card	1-Port G.SHDSL WAN Interface Card for Cisco 2600 Series and Cisco 3600 Series Routers
Voice configuration	Cisco IOS Voice Configuration Library
Voice command	Cisco IOS Voice Command Reference
IP configuration	Cisco IOS IP Configuration Guide
ATM configuration	“Configuring ATM” in the ATM Configuration Guide
Clock configuration for voice images	“Clock Configuration for Voice Images” section in Clock Configuration for Cisco 1751/1760 Routers

Standards

Standards	Title
ITU-T G.991.2 (SHDSL)	Single-pair High-speed Digital Subscriber Line (SHDSL) Transceivers
ITU-T G.994.1 (G.HDSL)	Handshake Procedures for Digital Subscriber Line (DSL) Transceivers

MIBs

MIBs	MIBs Link
<ul style="list-style-type: none"> • ATM MIB • HDSL2-SHDSL-LINE-MIB(RFC3276) • G.SHDSL MIB 	<p>To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:</p> <p>http://www.cisco.com/go/mibs</p>

RFCs

RFCs	Title
<p>No new or modified RFCs are supported by this feature and support for existing RFCs has not been modified by this feature.</p>	<p>—</p>

Technical Assistance

Description	Link
<p>Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</p>	<p>http://www.cisco.com/public/support/tac/home.shtml</p>

Feature Information for T1/E1 Mode for SHDSL

Table 33 lists the release history for this feature.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.



Note

Table 33 lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 33 Feature Information for T1/E1 Mode for SHDSL

Feature Name	Releases	Feature Information
T1/E1 Mode for SHDSL	12.3(4)XD 12.3(4)XG 12.3(7)T 12.3(11)T	<p><<Brief description of the feature.>></p> <p><<Optionally specify platform information. For example:</p> <p>This feature (WIC-1SHDSL-V2) was introduced on the Cisco 2600XM series routers to add support for T1/E1 two-wire mode.</p> <p>This feature (WIC-1SHDSL-V2) was integrated into Cisco IOS Release 12.3(4)XG on the Cisco 1700 series routers.</p> <p>This feature (WIC-1SHDSL-V2) was integrated into Cisco IOS Release 12.3(7)T on the Cisco 2600XM series routers to add support for T1/E1 two-wire mode. Cisco 1700 series routers do not support the WIC-1SHDSL-V2 in this release.</p> <p>Support for the following was added: T1/E1 mode support for Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers; and additional annex parameters for Cisco 2600, Cisco 3631, Cisco 3700, and Cisco 3800 series routers.</p> <p>The following commands were introduced or modified: controller dsl, dsl-mode shdsl symmetric annex, ignore-error-duration, line-rate, line-term, loopback (DSL controller), mode (ATM/T1/E1 controller), show controller dsl, debug xdsl application, debug xdsl driver, debug xdsl eoc, debug xdsl error.</p>

Glossary

ABR—available bit rate. An ATM service type in which the ATM network makes a “best effort” to meet the transmitter's bandwidth requirements. ABR uses a congestion feedback mechanism that allows the ATM network to notify the transmitters that they should reduce their rate of data transmission until the congestion decreases. Thus, ABR offers a qualitative guarantee that the transmitter's data can get to the intended receivers without unwanted cell loss.

CO—central office. Local telephone company office to which all local loops in a given area connect and in which circuit switching of subscriber lines occur.

CPE—customer premises equipment. CPE includes devices such as CSU/DSUs, modems, and ISDN terminal adapters, required to provide an electromagnetic termination for wide-area network circuits before connecting to the router or access server. This equipment was historically provided by the telephone company, but is now typically provided by the customer in North American markets.

DMT—Discrete Multi-Tone is the ANSI-specified modulation technique for G.SHDSL (ANSI-T1.413). DMT is theoretically capable of more speed than CAP. The key providers of DMT are Alcatel, Amati, Aware/ADI, and Orckit.

Downstream—Refers to the transmission of data from the central office (CO or COE) to the customer premises equipment (CPE).

G.SHDSL—Multirate Symmetrical High-Speed Digital Subscriber Line.

UBR—unspecified bit rate. QoS class defined by the ATM Forum for ATM networks. UBR allows any amount of data up to a specified maximum to be sent across the network, but there are no guarantees in terms of cell loss rate and delay. Compare with ABR (available bit rate), CBR, and VBR.

Upstream—Refers to the transmission of data from the customer premise equipment (CPE) to the central office equipment (CO or COE).

VBR—variable bit rate. QoS class defined by the ATM Forum for ATM networks. VBR is subdivided into a real time (rt) class and non-real time (nrt) class.

VBR-rt—VBR-real time is used for connections in which there is a fixed timing relationship between samples.

VBR-nrt—VBR-non-real time is used for connections in which there is no fixed timing relationship between samples, but that still need a guaranteed QoS. Compare with ABR (available bit rate), CBR, and UBR.

VDSL—very high-speed digital subscriber line. This is a high-speed asymmetrical service in the 10 to 25-Mbps range and is typically limited to less than 5000 feet. The targeted application for this technology is a hybrid fiber copper system (fiber to the neighborhood).

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