Cisco Signaling Link Terminal

This document describes the Cisco signaling link terminal (Cisco SLT), which is designed to perform Signaling System 7 (SS7) signal pre-processing and MTP3 backhauling on a Cisco media gateway controller (MGC) or Cisco PGW2200. The Cisco SLT is a critical component of the Cisco PGW2200 node; the Cisco SLT is the physical interface point connecting the PSTN signaling network to the Cisco PGW2200.

The Cisco SLT consists of a custom Cisco IOS software image running on a Cisco 2611, Cisco 2611XM, Cisco 2651, or Cisco 2651XM; or the Cisco AS5350 or Cisco AS5400 integrated SLT.

This feature includes the following benefits:

- SS7 Link Termination on a High-Availability Platform

  SS7 network access and interconnection requires a high degree of reliability in the signaling links and associated equipment. The Cisco SLT provides the reliability of a dedicated signaling link terminal device and maximizes the availability of the SS7 signaling links.

- Distributed SS7 MTP Processing

  Processor-intensive parts of the SS7 Message Transfer Part (levels 1 and 2) are offloaded from the MGC to the Cisco SLT. This distributed MTP model allows the controller to better utilize its resources to provide optimal call control.

- Call Control

  Signaling backhaul provides a means for combining gateways into a virtual switch with the call control intelligence centralized in the MGC.

- Standard Physical Interfaces

  Interconnection with SS7 network elements is supported using the following SS7 physical interface standards:T1, E1, V.35, RS-449, and RS-530.

- Drop and Insert

  T1/E1 interface cards support Drop and Insert (also called TDM Cross-Connect), which allows individual T1/E1 channels to be transparently passed, uncompressed, between T1/E1 ports. This feature enables direct termination of SS7 A-links or F-links in T1 or E1 carriers, while the remaining bearer channels are passed on to a gateway device for processing.

Feature Specifications for the Cisco SLT

Feature History	
Release	**Modification**
12.0(7)XR	This feature was introduced.
12.1(1)T	This feature was integrated into Cisco IOS Release 12.1(1)T.

12.2(15)T	Support was added for the Cisco 2611XM and Cisco 2651XM SLT; and Cisco AS5350 and Cisco AS5400 integrated SLT.
Supported Platforms	
For platforms supported in Cisco IOS Release 12.1(1)T and 12.2(15)T, consult Cisco Feature Navigator.	

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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Prerequisites for Configuring the Cisco SLT

The Cisco SLT consists of a custom Cisco IOS software image running on a Cisco 2611, Cisco 2651, Cisco 2611XM, or Cisco 2651XM. For information about the Cisco AS5350 and Cisco AS5400 SLTs, refer to the *Integrated Signaling Link Terminal* feature document on Cisco.com.

Note The Cisco SLT requires a minimum of 64 MB of DRAM beginning with Cisco IOS Release 12.2(15)T and later releases.

The router must be equipped with at least one of the following interface cards:

- 1-port T1 multiflex trunk interface (VWIC-1MFT-T1)
- 1-port E1 multiflex trunk interface (VWIC-1MFT-E1)
- 2-port T1 multiflex trunk interface (VWIC-2MFT-T1)
- 2-port E1 multiflex trunk interface (VWIC-2MFT-E1)
- 2-port T1 multiflex trunk interface with Drop and Insert (VWIC-2MFT-T1-DI)
- 2-port E1 multiflex trunk interface with Drop and Insert (VWIC-2MFT-E1-DI)
- 1-port high-speed serial interface (WIC-1T)
- 2-port high-speed serial interface (WIC-2T)

Although only two MTP 2 links can be terminated using the Cisco SLT, the two MTP 2 links can be terminated by using both ports of a 2-port VWIC/WIC, or two links can be terminated across two VWIC/WICs, one on each.

The following minimum hardware is required:

- For 2T WICs, an individual cable from the following list is needed for each interface being used for link termination:
  - RS-449: CAB-SS-449FC RS-449 cable, DCE female to smart serial, 10 feet; CAB-SS-449MT RS-449 cable, DTE male to smart serial, 10 feet
  - RS-530: CAB-SS-530AMT RS-530 cable, DTE Male to smart serial, 10 feet (no female RS-530 available)
  - V.35: CAB-SS-V35FC V.35 cable, DCE female to smart serial, 10 feet; CAB-SS-V35MT V.35 cable, DTE male to smart serial, 10 feet
- For 1T WICs, an individual cable from the following list is needed for each interface being used for link termination:
  - RS-449: CAB-449MT RS-449 cable, DTE, male, 10 Feet; CAB-449FC RS-449 cable, DCE, female, 10 feet
  - RS-530: CAB-530MT RS-530 cable, DTE, male, 10 feet (no female RS-530 available)
  - V.35: CAB-V35MT V.35 cable, DTE, male, 10 feet; CAB-V35FC V.35 cable, DCE, female, 10 feet
- For a T1/E1 VWIC, a T1/E1 cable with RJ-45 connector is required
- Cable connectors—RS-449, RS-530, V.35, and gender—depend upon your preference and requirements
- The power source (48V or AC)—depends on your preference and requirements

The Cisco SLT ships standard with the following:

- Internal power supply as specified by the Cisco SLT product number (TC-SLT xxx-DC or TC-SLT-xxxx-AC)
- Cisco IOS SLT feature set (release specified by customer)
- Minimum recommended DRAM and Flash to support a Cisco SLT feature set:
  - Cisco 2611 and Cisco 2651—64 MB DRAM and 16 MB Flash
  - Cisco 2611XM and Cisco 2651XM—64 MB DRAM and 16 MB Flash
- Power cord (customer-specified option)
- Network Equipment Building Systems (NEBS) European Telecommunication Standards Institute (ETSI) compliance kit including 23/24” rack mounts, grounding lug kit, shielded LAN cables and bezel removal kit (for additional unit depth reduction)
- Configuration documentation
- Reference documentation (on CD-ROM)
- Auxiliary cable
- Console cable

Optional items include the following:

- One or two interface cards (one card is mandatory)
- 64 MB DRAM memory upgrade

- Serial transition cables
- Spare memory for inventory purposes

Note If you are using a Cisco 2611, DRAM may be increased by ordering MEM2600-32D= in either a quantity of 1 or 2 to replace one or both existing DRAM Dual In-line Memory Modules (DIMMs). Flash can be increased in a Cisco 2611 equipped with 4MB or 8MB of Flash by ordering Cisco part number MEM2600-16FS= to replace the existing Flash SIMM.

Restrictions for the Cisco SLT feature

- Only the following Interface Cards are supported. No other cards, or Cisco 2600 or Cisco 3600 series network modules, are supported.
  - 1-port T1 multiflex trunk interface (VWIC-1MFT-T1)
  - 1-port E1 multiflex trunk interface (VWIC-1MFT-E1)
  - 2-port T1 multiflex trunk interface (VWIC-2MFT-T1)
  - 2-port E1 multiflex trunk interface (VWIC-2MFT-E1)
  - 2-port T1 multiflex trunk interface with Drop and Insert (VWIC-2MFT-T1-DI)
  - 2-port E1 multiflex trunk interface with Drop and Insert (VWIC-2MFT-E1-DI)
  - 1-port high-speed serial interface (WIC-1T)
  - 2-port high-speed serial interface (WIC-2T)
- Only SS7 serial interfaces and protocols are supported. There is no support for HDLC, PPP, Frame Relay, ATM, X.25, or other non-SS7 serial WAN protocols.
- Only two SS7 signaling links are supported on the Cisco 2611- and Cisco 2611XM-based SLT.
- Up to four SS7 signaling A-links are supported on the Cisco 2651- and Cisco 2651XM-based SLT.
- Up to four SS7 signaling links are supported on the Cisco AS5350- and Cisco AS5400-based integrated SLT.
- Only one SS7 signaling link is supported per T1 or E1 port.

Information About the Cisco SLT

Before you configure the Cisco Signaling Link Terminal feature, you should understand the following concepts:

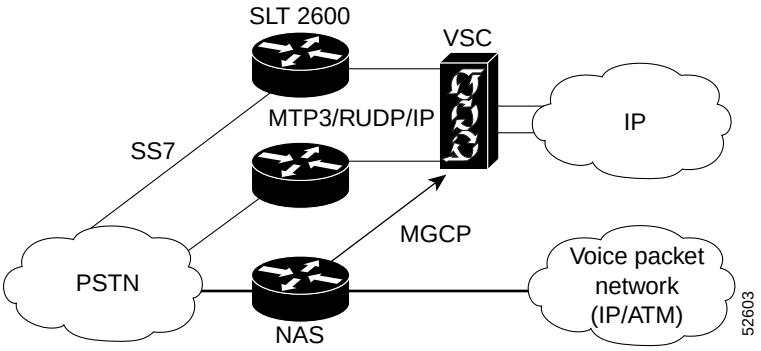
- Cisco SLT, page 5
- Cisco Session Manager, page 6
- Interface Card, page 6
- Cisco 2611 and Cisco 2651 SLT, page 7
- Cisco 2611XM and Cisco 2651XM SLT, page 7
- Cisco AS5350 and Cisco AS5400 Integrated SLT, page 7

Cisco SLT

As part of a complete Cisco Systems end-to-end solution, the Cisco SLT enables Service Providers to reliably transport SS7 protocols across an IP network. The Cisco SLT uses the Cisco Internetworking Operating System SS7 Cisco SLT feature set, providing reliable interoperability with the MGC.

The Cisco SLT uses Cisco Reliable User Datagram Protocol (RUDP) to backhaul, or transport, upper-layer SS7 protocols across an IP network. Figure 1 shows a typical Cisco SLT network.

Figure 1 Cisco SLT Network



The Cisco SLT supports the following:

- Message Transfer Part Level 3 (MTP 3)
- Integrated Service Digital Network User Part (ISUP)
- Signaling Connection Control Part (SCCP)
- Transaction Capabilities Application Part (TCAP)
- Advanced Intelligent Network (AIN)
- Intelligent Network Application Part (INAP)

The Cisco SLT supports the following Message Transfer Part level 1 (MTP 1) functions:

- Terminate up to two 64-Kbps or 56-Kbps SS7 signaling links
- T1, E1, V.35, RS-449, or RS-530 physical interfaces to the SS7 network

The Cisco SLT supports the following Message Transfer Part level 2 (MTP 2) functions:

- Link State Control (LSC)-Provides the overall coordination of the session.
- Initial Alignment Control (IAC)-Provides the link alignment processing.
- Transmission control-Provides the transmit flow control and processing.
- Reception control-Provides the receive flow control and processing.
- Congestion control-Provides congestion onset and abatement processing.
- Signal Unit Error Rate Monitor (SUERM)-Provides monitoring of signal unit events.
- Signal unit delimitation-Detecting individual signal units
- Signal unit alignment-Enforcing signal unit encoding rules and bit patterns
- Error detection-Detecting bit errors in signal units by using the cyclic redundancy check (CRC) field
- Error correction-Using positive and negative acknowledgments and re-transmitting errored signal units

- Alignment Error Rate Monitor (AERM)-Provides monitoring of link alignment errors.

Cisco Session Manager

The session manager software manages the communication sessions with the Cisco MGC. When the Cisco SLT is used with a redundant pair of controllers, the session manager maintains separate communication sessions with each controller in the pair. The session between the Cisco SLT and the active controller transports the SS7 traffic, while the session between the Cisco SLT and the standby controller provides backup.

The session manager uses RUDP to communicate between the Cisco SLT and the controller. RUDP is a simple, connection-oriented, packet-based transport protocol that is Cisco-proprietary and based on RFC 908 (Reliable Data Protocol) and RFC 1151(version 2 of the Reliable Data Protocol).

RUDP helps establish a reliable connection between a client and a server and provides flow and congestion control. The term client refers to the peer that initiates the connection and the term server refers to the peer that listened for the connection. At each end, the connection is made using the IP address of the peer and a specified User Datagram Protocol (UDP) port.

In combination with this application specific version of the Cisco IOS, the Cisco SLT hardware component leverages the widely deployed Cisco 2611 Multiservice Access Router. The Cisco 2611 has an RISC CPU architecture providing high performance routing. The Cisco 2600 series routers meet service provider's critical physical requirements for equipment depth fitting right alongside transmission equipment on standard 12 inch deep with a 1 Rack-unit height. NEBs compliance is assured by using the NEBs/ETSI Kit included with the TC -SLT. Common Language Equipment Identification (CLEI) coding is provided for easy identification and tracking of central-office equipment. Internal DC, or AC power supplies or a redundant AC power supply adapter options are available.

Specifically, when used for Cisco SLT applications, the modular Cisco 2611 dual Ethernet port router can be configured with dual serial as well as the Multiflex interface cards with integrated E1 DSUs or T1 CSU/DSUs WAN interface cards. These interface cards permit fast servicing as Field Replaceable Units (FRUs). For additional flexibility the Multiflex interface cards may also be ordered with a dual-port Drop and Insert capability.

Interface Card

When used with the Cisco 2611, Cisco 2611XM, Cisco 2651, or Cisco 2651XM, the T1/E1 Multiflex interface cards provide a highly manageable and reliable one-box solution for Central Offices. These Multiflex cards offer the following features:

- Single or dual port, T1 or E1 functionality
- E1 versions support both balanced and unbalanced modes
- Physical layer alarm forwarding between the two E1/T1 ports on dual-port cards
- Drop and Insert (also called TDM Cross-Connect) between the T1/E1 ports on dual-port cards, used to hairpin bearer channels to a media gateway device and allowing the interchange of time-division multiplexing (TDM) slots between the ports on a two-port card
- Shared between Cisco 2600 and Cisco 3600 series for common inventory sparing for various network applications

For additional information about the T1/E1 multiflex trunk interface cards, see *Cisco WAN Interface Cards Hardware Installation Guide*.

The dual-port serial WAN interface cards feature the Cisco compact high-density Smart Serial connector to support a wide variety of electrical interfaces when used with the appropriate transition cables. Ports on each card can be configured individually to support a variety of synchronous or asynchronous protocols. The high-speed WIC-2T supports port speeds up to 2.048 Mbps.

The single serial port WIC-1T supports synchronous-only connections using the Cisco 5-in-1 connector. It should be noted this card does not use the same transition cables as the WIC-2T.

Cisco 2611 and Cisco 2651 SLT

The Cisco SLT is supported on legacy Cisco 2611 and Cisco 2651 platforms. Refer to the *End of Sale Announcement for Cisco 2600 (Non XM) VPN Bundles* document on Cisco.com.

Cisco 2611XM and Cisco 2651XM SLT

The Cisco 2600XM multiservice routers are based on the current Cisco 2600 platform architecture and extend system performance by increasing default platform memory. The new XM functionality provides the same proven technology of the current Cisco 2600 Series platforms, including Cisco IOS software mainline feature support and the modularity of Network Modules (NMs), WAN Interface Cards (WICs) and Advanced Integration Modules (AIMs).

The Cisco 2611XM and Cisco 2651XM support FastEthernet interfaces and contain a common motherboard across the Cisco 2600XM product line. The Cisco 2600XM uses Synchronous Dynamic RAM (SDRAM) memory, rather than the older extended data output (EDO) memory that was used in the Cisco 2611 and Cisco 2651 platforms, which allows improvement in packet throughput.

Current Cisco SLT software automatically downloads the correct SS7 micropatch to migrate from the Cisco 2600-based SLT to the Cisco 2600XM-based SLT. The Cisco 2611XM and Cisco 2651XM use the same Motorola MPC860 processor as the Cisco 2611 and Cisco 2651 platforms and run at the same processor clock speeds.

The existing supported Cisco IOS software image for Cisco SLTs (c2600-ipss7-mz) operates on the Cisco 2611XM and Cisco 2651XM with no user changes required.

The Cisco 2611XM and Cisco 2651XM platforms are backwards compatible with the following Cisco SLT features:

- *56K CSU Support for the Cisco Signaling Link Terminal*
- *Cisco Signaling Link Terminal Dual Ethernet*
- *G.732 Support for the Integrated Signaling Link Terminal*
- *Integrated Signaling Link Terminal*
- *Multiple OPC Support for the Signaling Link Terminal*
- *SS7 Four-Link Support for Cisco Signaling Link Terminal*

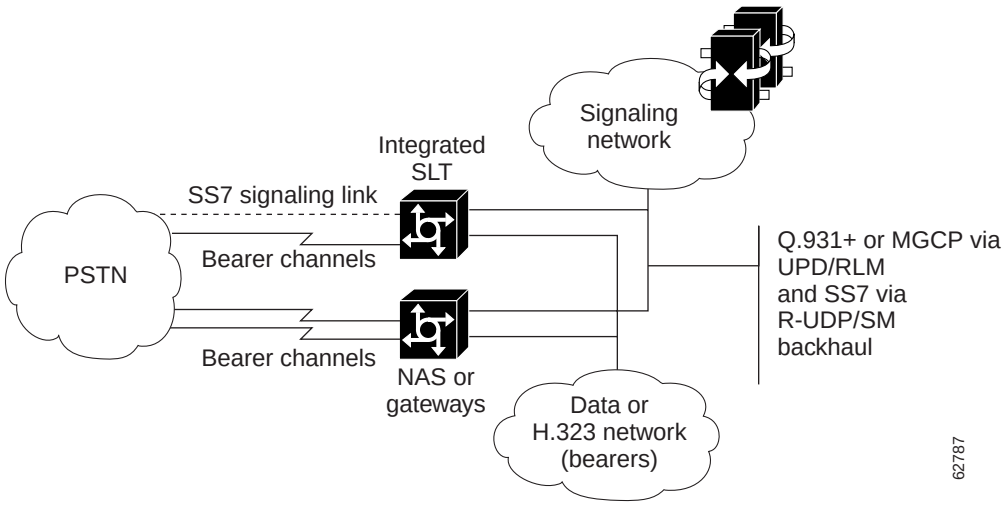
Cisco AS5350 and Cisco AS5400 Integrated SLT

The integrated SLT pulls existing Cisco distributed MTP SS7 signaling architecture functionality—previously available only on Cisco 2600-based SLTs—directly onto a single Cisco AS5350 or Cisco AS5400 gateway. Like the Cisco 2600-based SLT, the integrated SLT on a Cisco AS5350 or Cisco AS5400 backhauls upper-layer SS7 protocols across an IP network using RUDP, terminating the MTP1 and MTP2 layers of the SS7 protocol stack at the MGC or Cisco PGW2200.

Using the 2-, 4-, or 8-PRI dial feature card (DFC) or the CT3 (28-PRI) DFC card, the integrated Cisco SLT is designed for small points of presence (POPs) that require only one or two network access servers (NASs) or Voice-Over-IP (VoIP) gateways as part of a dial or VoIP solution.

When the Integrated SLT feature is implemented, a Cisco AS5350 or Cisco AS5400 functions as an SS7 signaling data link terminal and as a NAS, voice gateway, or both when universal ports are used. Figure 2 shows a typical integrated SLT configuration.

Figure 2 Integrated SLT Architecture



The existing supported Cisco IOS software image for Cisco SLTs (c2600-ipss7-mz) operates on the Cisco 2611XM and Cisco 2651XM with no user changes required.

For more information about the integrated Cisco SLT, refer to the *Integrated Signaling Link Terminal* feature document on Cisco.com.

How to Configure the Cisco SLT

To configure the Cisco SLT for the Cisco 2611, complete the following:

- Configuring the Basic Parameters, page 9
- Configuring the Physical Interfaces, page 11

Note For serial WICs, no particular configuration is required, except to ensure that the interfaces are not shut down.

- Configuring Drop and Insert, page 19
- Configuring the Serial Interfaces, page 21
- Configuring the Ethernet Interface, page 22
- Configuring the Fast Ethernet Interface, page 23
- Configuring the Session Manager and RUDP, page 25
- Configuring the MTP2 Variant, page 27
- Configuring the Media Gateway Controller, page 29

Note With Cisco SLT, the SS7 MTP 2 protocol is the *only* serial protocol supported. Therefore, you cannot configure serial interfaces for other protocols, such as HDLC, PPP, X.25, LAPB, and Frame Relay.

Note The **encapsulation** interface configuration command is not supported on the Cisco SLT image. Also, all other commands related to non-SS7 serial protocols are not supported.

Note We recommend that you take MTP 2 links out of service at the Cisco MGC before issuing Cisco SLT commands.

Configuring the Basic Parameters

To configure the basic parameters of the Cisco SLT, complete the following steps;

SUMMARY STEPS

1. Power on the Cisco SLT.
2. Enter **y** (yes) to begin the configuration.
3. Enter **y** (yes) to enter basic management setup.
4. Enter the host name for the router.
5. Enter the enable secret password.
6. Enter an enable password that is different from the enable secret password.
7. Enter the virtual terminal password.

8. Enter the interface name used to connect to the management network.
9. Configure the SNMP parameters.
10. Configure the Ethernet interface or configure the Fast Ethernet interface (see the "Configuring the Fast Ethernet Interface" section on page 23).
11. Specify the IP address and the subnet mask for the interface.
12. Save configuration to NVRAM and exit the initial configuration mode.

DETAILED STEPS

	Command or Action	Purpose
Step 1	Power ON the Cisco SLT	Turns on the Cisco 2611 router. **Note** Do not press any keys until the system messages stop. Any keys pressed during this time are interpreted as the first command, which may cause the Cisco SLT to power off and start over. It takes a few minutes for these messages to stop.
Step 2	Enter **y** (yes) to begin the configuration. **Example:** `Would you like to enter the initial configuration dialog? [yes/no]: y`	Decide to begin the initial configuration in initial configuration mode by entering yes. • At any point you may enter a question mark for help. Use Ctrl-C to abort configuration dialog at any prompt. Default settings are in square brackets.

Step 3	Enter **y** (yes) to enter basic management setup.
	Example:
	`Would you like to enter basic management setup? [yes/no]: y`
	`Configuring global parameters:`
		Decide to begin basic management setup by entering yes.
		• Basic management setup provides only enough connectivity for management of the system. Extended setup asks you to configure each interface on the system.

Step 4	Enter the host name for the router. `Enter host name [Router]: router_name`	Initiates configuration of global parameters.
Step 5	Enter the enable secret password. **Example:** `Enter enable secret: enable_secret`	Protects access to privileged EXEC and configuration modes. • This password becomes encrypted in the configuration and cannot be seen when viewing the configuration.
Step 6	Enter an enable password that is different from the enable secret password. **Example:** `Enter enable password: enable_password`	Protects access when you do not specify an enable secret password. • This password is not encrypted and can be seen when viewing the configuration.
Step 7	Enter the virtual terminal password. **Example:** `Enter virtual terminal password: vt_password`	Prevents unauthenticated access to the Cisco SLT through ports other than the console port. • The virtual terminal password is used to protect access to the router over a network interface.

	Command or Action	Purpose
Step 8	Enter the interface name used to connect to the management network. **Example:** `Ethernet 0/0`	Selects the interface name. • The interface name is found from the information in the current interface summary output. • Any interface listed with OK? value "NO" does not have a valid configuration and cannot, therefore, be used.

Step 9	Configure the SNMP parameters.
	
	Example:
	`Configure SNMP Network Management? [yes]: yes`
	`Community string [public]:`
		Decide to configure the SNMP parameters by entering yes.

Step 10	Configure the Ethernet interface.
	
	Example:
	`Configuring interface Ethernet0/0:`
	`Configure IP on this interface? [yes]: y`
		Decide to configure the Ethernet interface by entering yes.

Step 11	Specify the IP address and the subnet mask for the interface.
	
	Example:
	`IP address for this interface: 10.1.1.5`
	`Subnet mask for this interface [255.0.0.0]:`
	`255.255.0.0`
		Specifies the IP address and the subnet mask for the interface.

Step 12	Save configuration to NVRAM and exit the initial configuration mode.
	
	Example:
	`Save this configuration to nvram and exit`
	`Enter your selection [2]: 2`
		Decide to save the configuration to NVRAM from three choices in the configuration command script output:
		• 0—Go to the Cisco IOS command prompt without saving this configuration.
		• 1—Return back to the setup without saving this configuration.
		• 2—Save this configuration to NVRAM and exit.

This completes the basic Cisco SLT configuration.

Configuring the Physical Interfaces

The following section contains information about how to configure T1 or E1 multiflex trunk interfaces for the Cisco SLT.

Cisco SLT T1/E1 Multiflex Trunk Interfaces Overview

The T1/E1 multiflex trunk interface cards are dual-mode T1 or E1 interfaces in a VWIC (Voice/WAN Interface card) form for voice, data, and integrated voice and data applications. They support the SS7 Cisco SLT function, as do serial WICs.

The T1/E1 VWIC supports the following T1/E1 functionality:

- Single or dual port, structured or unstructured T1/E1 functionality
- Drop and Insert (also called TDM Cross-Connect) between the T1/E1 ports on dual-port cards, used to hairpin bearer channels to a media gateway device and allowing the interchange of time-division multiplexing (TDM) slots between the ports on a two-port card
- Physical layer alarm forwarding feature between the two E1/T1 ports on dual-port cards

For additional information about the T1/E1 multiflex trunk interface cards, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*.

Configuring T1/E1 Multiflex Trunk Interfaces

The following steps show how to configure T1/E1 multiflex trunk interfaces.

Note For serial WICs, no particular configuration is required, except to ensure that the interfaces are not shut down.

For information about configuring other types of WICs, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller** {**T1** | **E1**} **0**/*port*
4. **framing** {**sf** | **esf**}
5. **linecode** {**ami** | **b8zs** | **hdb3**}
6. **line-termination** {**75-ohm** | **120-ohm**}
7. **cablelength long** {**gain26** | **gain36**} {**-15db** | **-22.5db** | **-7.5db** | **0db**}
8. **cablelength short** {**133** | **266** | **399** | **533** | **655**}
9. **channel-group** *channel-group-number* **timeslots** *range*
10. **exit**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	**controller** {**T1** | **E1**} 0/*port* **Example:** Router(config)# controller {T1 | E1} 0/*port*	Enters controller configuration mode for the T1 controller at the specified *slot/port* location. • The value for *slot* is always 0, and the *port* value is from 0 to 3.
Step 4	**framing** {**sf** | **esf**} **Example:** Router(config-controller)# framing esf or Router(config-controller)# framing crc4	Sets T1 or E1 Extended SuperFrame (ESF) framing. • For T1, framing is usually set to the most common ESF format. • For E1, set the framing to CRC4.
Step 5	**linecode** {**ami** | **b8zs** | **hdb3**} **Example:** Router(config-controller)# linecode b8zs or Router(config-controller)# linecode hdb3	Sets the T1 or E1 line code type. • For T1, set the line coding to the most common binary zero 0 substitution (B8ZS). • For E1, set the line coding to high density binary 3 (HDB3). • These are the most common settings. Refer to the *Wide Area Network Configuration Guide* for more information. • The **ami** keyword specifies AMI as the linecode type. Valid for both T1 and E1 interfaces.
Step 6	**line-termination** {**75-ohm** | **120-ohm**} **Example:** Router(config-controller)# line-termination {75-ohm | 120-ohm}	(E1 only) Enters a line-termination value. • This command specifies the impedance (amount of wire resistance and reactivity to current) for the E1 interface termination. Impedance levels are maintained to avoid data corruption over long-distance links. • Specify **120-ohm** to match the balanced 120-ohm interface. This is the default. • **75-ohm** is for an unbalanced BNC 75-ohm interface.

Step 7	`cablelength long {gain26 | gain36} {-15db | -22.5db | -7.5db | 0db}`
	
	Example:
	`Router(config-controller)# cablelength long {gain26 | gain36} {-15db | -22.5db | -7.5db | 0db}`
		(T1 interfaces only) Configures transmit and receive levels for a cable length (line build-out) longer than 655 feet for a T1 trunk with a CSU interface.
		• Configurable cable lengths are as follows:
		– **gain26** specifies the decibel pulse gain at 26. This is the default pulse gain.
		– **gain36** specifies the decibel pulse gain at 36.
		– **-15db** specifies the decibel pulse rate at -15 decibels.
		– **-22.5db** specifies the decibel pulse rate at -22.5 decibels.
		– **-7.5db** specifies the decibel pulse rate at -7.5 decibels.
		– **0db** specifies the decibel pulse rate at 0 decibels. This is the default pulse rate.
		• Default receive sensitivity value appearing in the CLI is 26; the hardware is fixed at 36. If you do not set the cable length, the system defaults to **cablelength long gain26 0db**.

Step 8	**`cablelength short {133 | 266 | 399 | 533 | 655}`** **Example:** `Router(config-controller)# cablelength short {133 | 266 | 399 | 533 | 655}`	(T1 interfaces only) Configures transmit attenuation for a cable length (line build-out) of 655 feet or shorter for a T1 trunk with a DSX-1 interface. • Configurable cable lengths are as follows: – **133** specifies a cable length from 0-133 feet. – **266** specifies a cable length from 134-266 feet. – **399** specifies a cable length from 267-399 feet. – **533** specifies a cable length from 400-533 feet. – **655** specifies a cable length from 534-655 feet. • Default transmit attenuation is set for a cable length of 0 to 133 feet.

Step 9	**channel-group** *channel-group-number* **timeslots** *range*
	
	Example:
	`Router(config-controller)# channel-group 0 timeslots 24`
	
	or
	
	`Router(config-controller)# channel-group 0 timeslots 16`
		Specifies the channel group and time slots to be mapped.
		• Only channel group 0 can be configured. Generally, only one time slot is configured when you are using the Cisco SLT feature. For example, time slot 24 is used for a T1 interface, and time slot 16 is used for an E1 interface.
		• The **channel-group** command creates a virtual serial interface. It is numbered *slot*/*port*:*subinterface*, as follows:
		– *slot* is the slot location of the WIC/VWIC where the channel group was created (always 0).
		– *port* is the WIC/VWIC port address (0 to 3).
		– *subinterface* is the channel group number (always 0).
		• Return to Step 2 if your router has other T1/E1 interfaces that you need to configure.

Step 10	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode.

Verifying T1/E1 Multiflex Trunk Interface Configuration

To verify the initial T1/E1 trunk interface configuration, follow these steps.

SUMMARY STEPS

1. **enable**
2. **show controllers t1**
3. **show controllers e1**
4. **show interface serial** *0/0:0*
5. **show controllers serial**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show controllers t1** **Example:** `Router# show controllers t1`	Displays information about the T1 links or to displays the hardware and software driver information for the T1 controller.

	Command or Action	Purpose
Step 3	**show controllers e1** **Example:** `Router# show controllers e1`	Displays information about the E1 links or to displays the hardware and software driver information for the E1 controller.
Step 4	**show interface serial** *slot/port:subinterface* **Example:** `Router# show interface serial 0/0:0`	Displays information about channel groups configured as virtual serial interfaces.
Step 5	**show controllers serial** *slot/port:subinterface* **Example:** `Router# show controllers serial 0/0:0`	Displays information that is specific to the interface hardware.

The following is sample output from the **show controllers e1** command. Important information appears in bold:

```
Router# show controllers e1

E1 0/2 is up.
  Applique type is Channelized E1 - balanced
  Cablelength is Unknown
  No alarms detected.
  Version info Firmware: 19990702, FPGA: 6
  Framing is CRC4, Line Code is HDB3, Clock Source is Line.
  Data in current interval (599 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 10 15 minute intervals):
     435334 Line Code Violations, 1 Path Code Violations,
     8 Slip Secs, 69 Fr Loss Secs, 9 Line Err Secs, 0 Degraded Mins,
     8 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 69 Unavail Secs
E1 0/3 is down.
  Applique type is Channelized E1 - balanced
  Cablelength is Unknown
  Far End Block Errors Detected
  Receiver has loss of signal.
  Version info Firmware: 19990702, FPGA: 6
  Framing is CRC4, Line Code is HDB3, Clock Source is Line.
  Data in current interval (602 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 602 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 603 Unavail Secs
  Total Data (last 10 15 minute intervals):
     0 Line Code Violations, 0 Path Code Violations,
     0 Slip Secs, 9000 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 9000 Unavail Secs
```

The following is sample output from the show controllers t1 command. Important information is shown in bold:

```
Router# show controllers t1

T1 0/0 is up.
  Applique type is Channelized T1
  Cablelength is short 133
  No alarms detected.
  Version info Firmware: 19990702, FPGA: 6
```

```
  Framing is ESF, Line Code is B8ZS, Clock Source is Line.
  Data in current interval (608 seconds elapsed):
     136066 Line Code Violations, 778727 Path Code Violations
     567 Slip Secs, 0 Fr Loss Secs, 608 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 608 Unavail Secs
  Total Data (last 10 15 minute intervals):
     4286812 Line Code Violations, 11478885 Path Code Violations,
     7734 Slip Secs, 69 Fr Loss Secs, 8996 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 9000 Unavail Secs
```

To find out about channel groups configured as virtual serial interfaces, enter the **show interface serial** *slot*/*port*:*subinterface* command. Important information is shown in bold in the following sample output:

```
Router# show interface serial 0/0:0

Serial0/0:0 is reset, line protocol is down
  Hardware is PowerQUICC Serial
  MTU 1500 bytes, BW 56 Kbit, DLY 20000 usec,
     reliability 253/255, txload 1/255, rxload 1/255
  Encapsulation SS7 MTP2, loopback not set
  Keepalive set (10 sec)
  Last input never, output 00:12:22, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     1437 input errors, 2 CRC, 31 frame, 0 overrun, 0 ignored, 1404 abort
     128055 packets output, 512220 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 output buffer failures, 0 output buffers swapped out
     1 carrier transitions
  Timeslot(s) Used:1, Transmitter delay is 0 flags
```

The following sample output shows information about the virtual serial interface:

```
Router# show controllers serial 0/2:0

Interface Serial0/2:0
Hardware is PowerQUICC MPC860idb at 0x81143590, driver data structure at 0x81145
474
SCC Registers:
General [GSMR]=0x2:0x00000033, Protocol-specific [PSMR]=0x8
Events [SCCE]=0x0200, Mask [SCCM]=0x001F, Status [SCCS]=0x02
Transmit on Demand [TODR]=0x0, Data Sync [DSR]=0x7E7E
Interrupt Registers:
Config [CICR]=0x00367F80, Pending [CIPR]=0x04000246
Mask   [CIMR]=0x60240000, In-srv  [CISR]=0x00000000
Command register [CR]=0xD40
Port A [PADIR]=0x00F0, [PAPAR]=0x25F0
       [PAODR]=0x0000, [PADAT]=0x5A4F
Port B [PBDIR]=0x0000F, [PBPAR]=0x0000E
       [PBODR]=0x00000, [PBDAT]=0x37FFD
Port C [PCDIR]=0x00C, [PCPAR]=0xA00
       [PCSO]=0x000,  [PCDAT]=0x5F2, [PCINT]=0xFFF
Receive Ring
        rmd(68012930): status 9000 length 6 address 2DA22E4
        rmd(68012938): status 9000 length 6 address 2DA3AA4
        rmd(68012940): status 9000 length 6 address 2DA1E24
```

```
        rmd(68012948): status 9000 length 6 address 2DA27A4
        rmd(68012950): status 9000 length 6 address 2DA5724
        rmd(68012958): status 9000 length 6 address 2DA14A4
        rmd(68012960): status 9000 length 6 address 2DA5264
        rmd(68012968): status 9000 length 6 address 2DA4684
        rmd(68012970): status 9000 length 6 address 2DA4424
        rmd(68012978): status 9000 length 6 address 2DA1964
        rmd(68012980): status 9000 length 6 address 2DA4B44
        rmd(68012988): status 9000 length 6 address 2DA60A4
        rmd(68012990): status 9000 length 6 address 2DA2544
        rmd(68012998): status 9000 length 6 address 2DA3124
        rmd(680129A0): status 9000 length 6 address 2DA0FE4
        rmd(680129A8): status B000 length 6 address 2DA3844
Transmit Ring
        tmd(680129B0): status DC00 length 4 address 2AD9EA8
        tmd(680129B8): status DC00 length 4 address 2AD7568
        tmd(680129C0): status DC00 length 4 address 2ADA428
        tmd(680129C8): status DC00 length 4 address 2ADA6E8
        tmd(680129D0): status DC00 length 4 address 2AD7DA8
        tmd(680129D8): status DC00 length 4 address 2AD5468
        tmd(680129E0): status DC00 length 4 address 2AD8328
        tmd(680129E8): status DC00 length 4 address 2AD85E8
        tmd(680129F0): status DC00 length 4 address 2AD5CA8
        tmd(680129F8): status CE00 length 4 address 2AD8B68
        tmd(68012A00): status DC00 length 4 address 2AD8E28
        tmd(68012A08): status DC00 length 4 address 2AD64E8
        tmd(68012A10): status DC00 length 4 address 2AD67A8
        tmd(68012A18): status DC00 length 4 address 2AD9668
        tmd(68012A20): status DC00 length 4 address 2AD9928
        tmd(68012A28): status FC00 length 4 address 2AD6FE8
SPI Mode [SPMODE]=0xF70, Events [SPIE]=0x0
    Mask [SPIM]=0x0, Command [SPCOM]=0x0
SI Mode [SIMODE]=0x80408040, Global [SIGMR]=0xE
   Cmnd [SICMR]=0x0, Stat [SISTR]=0x0
SI Clock Route [SICR]=0x00004040

SCC GENERAL PARAMETER RAM (at 0x68013D00)
Rx BD Base [RBASE]=0x2930, Fn Code [RFCR]=0x18
Tx BD Base [TBASE]=0x29B0, Fn Code [TFCR]=0x18
Max Rx Buff Len [MRBLR]=1548
Rx State [RSTATE]=0x0, BD Ptr [RBPTR]=0x2970
Tx State [TSTATE]=0x188920A3, BD Ptr [TBPTR]=0x2A08

SCC SS7 PARAMETER RAM (at 0x68013D38)
CRC Preset [C_PRES]=0xFFFF, Mask [C_MASK]=0xF0B8
Error-free SUs [EFSUC] = 22927
Max frm len [MFLR] = 278
Erm [ERM] = 0x0,N [NOCTETS] = 16, N_cnt [NOCTETS_CNT] = 12, T [ERM_THRESH] = 64,
 D [ERM_EFSUS] = 256, D_cnt [ERM_EFSUS_CNT] = 97
SS7 options [SS7_OPT] = 0x10F
Filter masks [MASK1] = 0xFFFFFFFF, [MASK2] = 0xFF

buffer size 1524
PQUICC SCC specific errors:
0 input aborts on receiving flag sequence
0 throttles, 0 enables
0 overruns
0 transmitter underruns
0 transmitter CTS losts
```

Configuring Drop and Insert

To configure Drop and Insert (the TDM cross-connect function), complete the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller** {**T1** | **E1**} **0**/*port*
4. **tdm-group** *tdm-group-no* **timeslots** *timeslot-list*
5. **no shutdown**
6. **exit**
7. **connect** *id* **T1** *slot*/*port tdm-group-number-1* **T1** *slot*/*port tdm-group-number-2*
8. **exit**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`controller {T1 | E1} 0/port`
	
	Example:
	`Router(config)# controller T1 0/2`
		Enters controller configuration mode for the T1 controller at the specified *slot/port* location.
		• The value for *slot* is always 0, and the *port* value is from 0 to 3.

	Command or Action	Purpose
Step 4	**tdm-group** *tdm-group-number* **timeslots** *timeslot-list* **Example:** `Router(config-controller)# tdm-group 1 timeslots 24`	Creates TDM channel groups for the Drop-and-Insert function with a two-port T1 or E1 multiflex trunk interface card. • You must set up a TDM group for each interface that you wish to cross-connect. • The *tdm-group-number* argument identifies the channel group. Valid values are from 1 to 31. • The group numbers for controller groups must be unique. For example, a TDM group should not have the same ID number as a channel group. • The *timeslot-list* argument can be a single number, numbers separated by commas, or a pair of numbers separated by a hyphen to indicate a range of time slots. For T1, allowable values are from 1 to 24. For E1, allowable values are from 1 to 15 and 17 to 31.
Step 5	**no shutdown** **Example:** `Router(config-controller)# no shutdown`	Activates the controller. • Repeat Steps 3 and 4 for the second interface.
Step 6	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode.
Step 7	**connect** *id* **T1** *slot/port tdm-group-number-1* **T1** *slot/port tdm-group-number-2* **Example:** `Router(config)# connect id T1 0/port tdm-group-number-1 T1 slot/port tdm-group-number-2`	Sets up the connection between two T1 or E1 TDM groups of timeslots on the trunk interfaces—for Drop and Insert. • The *id* argument is a name for the connection. • Identify each T1 controller by its *slot*/*port* location. The *slot* value is always 0; the *port* value can be from 0 to 3. • The *tdm-group-number-1* and *tdm-group-number-2* arguments identify the TDM group numbers (from 1 to 31) on the specified controller. The groups were set up in Step 3 above.
Step 8	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode and completes the configuration.

Configuring the Serial Interfaces

The following steps show how to configure 1T and 2T serial interfaces.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface serial** *slot/port*
4. **no shutdown**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface serial** *slot/port* **Example:** `Router(config)# interface serial 0/2`	Enters interface configuration mode for the serial interface.
Step 4	**no shutdown** **Example:** `Router(config-if)# no shutdown`	Activates the interface.
Step 5	**end** **Example:** `Router(config-if)# end`	Exits interface configuration mode and completes the configuration.

Configuring the Ethernet Interface

The Cisco SLT uses the built-in Ethernet interface for connection to the IP network that backhauls SS7 MSUs between the Cisco 2611 router and the MGC. Follow the steps below to configure the Ethernet interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface Ethernet** *0/0*
4. **ip address** *ip-address-mask* [**secondary**]
5. **no shutdown**
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	`Router(config)# interface Ethernet 0/0`	Enters interface configuration mode for the built-in Ethernet interface.
Step 4	**ip address** *ip-address-mask* [**secondary**] **Example:** `Router(config-if)# ip address 10.10.11.1 255.255.255.0`	Assigns an IP address and subnet mask to the interface. • The *ip-address-mask* argument specifies the IP address and mask for the associated IP subnet • The optional secondary keyword specifies that the configured address is a secondary IP address. If this keyword is omitted, the configured address is the primary IP address.
Step 5	`Router(config-if)# no shutdown`	Activates the interface.
Step 6	`Router(config-if)# exit`	Exits to global configuration mode.

Verifying the Ethernet Interface Configuration

To verify the Ethernet interface configuration, enter the **show interface ethernet 0/0** privileged EXEC command. The following text is sample output from the command:

```
Router# show interface ethernet 0/0
Ethernet0/0 is up, line protocol is up
  Hardware is AmdP2, address is 0050.7337.5100 (bia 0050.7337.5100)
```

```
Internet address is 255.251.111.6/24
MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
   reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:00:00, output 00:00:00, output hang never
Last clearing of "show interface" counters 10:00:36
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue -196/75, 0 drops
5 minute input rate 3000 bits/sec, 5 packets/sec
5 minute output rate 2000 bits/sec, 4 packets/sec
   45891 packets input, 3234949 bytes, 0 no buffer
   Received 1593 broadcasts, 0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
   0 input packets with dribble condition detected
   61546 packets output, 3728838 bytes, 0 underruns(518/2091/0)
   0 output errors, 2609 collisions, 3 interface resets
   0 babbles, 0 late collision, 875 deferred
   0 lost carrier, 0 no carrier
   0 output buffer failures, 0 output buffers swapped out
```

Configuring the Fast Ethernet Interface

The Cisco 2611XM, Cisco 2651, and Cisco 2651XM SLTs use the built-in Fast Ethernet interface to connect to the IP network that backhauls SS7 Message Signal Units (MSUs) between the Cisco SLT and the media gateway controller or Cisco PGW2200. The Cisco 2611XM, Cisco 2651, and Cisco 2651XM routers have two Fast Ethernet ports which need to be configured instead of the two Ethernet interface ports found on the Cisco 2611-based Cisco SLT.

To configure the Fast Ethernet interface, use the following commands.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface fastethernet 0/0**
4. **ip address** *ip-address subnet-mask*
5. **no shutdown**
6. **exit**

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command	Purpose
Step 3	**interface fastethernet 0/0** **Example:** `Router(config)# interface fastethernet 0/0`	Enters interface configuration mode for the built-in Fast Ethernet interface.
Step 4	**ip address** *ip-address address-number* **Example:** `Router(config-if)# ip address 10.30.18.41 255.255.255.0`	Assigns an IP address and subnet mask to the interface.
Step 5	**no shutdown** **Example:** `Router(config-if)# no shutdown`	Activates the interface.
Step 6	**exit** **Example:** `Router(config-if)# exit`	Exits back to global configuration mode.

Verifying the Fast Ethernet Interface Configuration

To verify the Fast Ethernet interface configuration, enter the **show interface fastethernet** privileged EXEC command. The following example shows statistics for port 0/0:

```
SLT-2651# sh interface fastethernet 0/0
FastEthernet0/0 is up, line protocol is up
  Hardware is AmdFE, address is 0003.e38d.db20 (bia 0003.e38d.db20)
  Description:This port used for Signalling Backhaul
  Internet address is 10.30.18.41/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s, 100BaseTX/FX
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy:fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     775355 packets input, 55085581 bytes
     Received 7194 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog
     0 input packets with dribble condition detected
     716414 packets output, 56748158 bytes, 0 underruns(0/0/0)
     0 output errors, 0 collisions, 1 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Configuring the Session Manager and RUDP

The session manager and the RUDP are responsible for managing the communication sessions with the MGCs. Regardless of the number of SS7 links that the MGC activates on the Cisco 2611, the router maintains only one session manager session with each of the MGC devices.

Note You must reboot the router after setting a new session configuration or after changing existing session configuration. Do not change session timers unless instructed to do so by Cisco technical support. Changing timers may result in service interruption or outage.

To configure the session for establishing communications with the Cisco MGC, use the following commands. You can define just one session or as many as two sessions.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ss7 set failover-timer** *ft-value*
4. **ss7 session** *session-id* **address** *destination-address destinaion-port local-address local-port* [**session-set** *session-number*]
5. **ss7 session** *session-id* **address** *destination-address destinaion-port local-address local-port* [**session-set** *session-number*]
6. **exit**
7. **copy system:running-config nvram:startup-config**
8. **reload**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

	Command or Action	Purpose
Step 3	**ss7 set failover-timer** *ft-value* **Example:** `Router(config)# ss7 set failover-timer 5`	Independently selects failover-timer values for each session set and specifies the amount of time that the SS7 session manager waits for the active session to recover or for the standby Cisco MGC to indicate that the Cisco SLT should switch traffic to the standby session • If the timer expires without a recovery of the original session or an active message from the standby Cisco MGC, the signaling links are taken out of service. • Valid values range from 1 to 10. Default is 3.
Step 4	**ss7 session** *session-id* **address** *destination-address destinaion-port local-address local-port* [**session-set** *session-number*] **Example:** `Router(config)# ss7 session-0 address 10.10.11.1 255.255.255.0`	Configures the address pairs and ports for the first session manager session, using the following syntax: • The **session set** *session number* argument is either 1 or 0. • Specify the remote four-part IP address and the remote port first, then the local IP address and UDP port. • There are two possible sessions: One for the active Cisco MGC and one for the standby Cisco MGC.
Step 5	**ss7 session** *session-id* **address** *destination-address destinaion-port local-address local-port* [**session-set** *session-number*] **Example:** `Router(config)# ss7 session-1 address 10.10.11.1 255.255.255.0`	Configures the address pairs and UDP ports for the second session manager session. • You can specify any UDP port not used by another protocol defined in RFC 1700 or otherwise used within your network.
Step 6	**exit** **Example:** `Router(config)# exit`	Exit configuration mode.
Step 7	**copy system:running-config nvram:startup-config** **Example:** `Router# copy system:running-config nvram:startup-config`	Saves the new configuration as the startup configuration.
Step 8	**reload** **Example:** `Router# reload`	Reloads the router. • The router must be reloaded any time you delete a session or modify any of the parameters of a session.

Verifying the Session Manager and RUDP Configuration

To verify the session manager and RUDP configuration, use the following commands

SUMMARY STEPS

1. **enable**
2. **show ss7 sm session**
3. **show ss7 sm set**
4. **show ss7 sm stats**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		• Enter your password if prompted.

Step 2	`show ss7 sm session`
	
	Example:
	`Router# show ss7 sm session`
		Displays information about an SS7 session manager session.
		• (Optional) You can specify a session number of 0 or 1.

Step 3	`show ss7 sm set`
	
	Example:
	`Router# show ss7 sm set`
		Displays information about the failover timer setting.

Step 4	`show ss7 sm stats`
	
	Example:
	`Router# show ss7 sm stats`
		Displays information about session manager statistics.
		• (Optional) You can specify a session number of 1 or 2.

Configuring the MTP2 Variant

SS7 MTP2 supports four variants: Telcordia (formerly Bellcore), ITU, NTT (Japan), and TTC (Japan Telecom). The parameters under one variant have different meanings, purposes, and ranges in another.

See the following command references for the appropriate MTP 2 variant commands and the parameters:

- **ss7 mtp2-variant bellcore**
- **ss7 mtp2-variant itu**
- **ss7 mtp2-variant ntt**
- **ss7 mtp2-variant ttc**

Note Parameters that are not configured will remain at the default values.

The channel to be configured must be out of service at the MGC before the variant or the variant configuration can be changed.

Note Once the variant configuration changes have been made, the router must be reloaded to apply the changes.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **memory-size iomem** *i/o-memory-percentage*
4. **ss7 mtp2-variant bellcore 2**
5. **T3 30000**
6. **unacked-MSUs 16**
7. **T7 50000**
8. **exit**
9. **end**
10. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	`mem iomem` *i/o-memory-percentage* **Example:** `Router(config)# mem iomem 40`	Sets the amount of DRAM to be used for I/O memory to 40 percent. • The values permitted are 10, 15, 20, 25, 30, 40, and 50 percent. A minimum of 4 MB of memory is required for I/O memory. • If you do not set the I/O memory to at least 40 percent, there will not be enough memory for the SS7 MTP2 signaling.
Step 4	**ss7 mtp2-variant Bellcore 2** **Example:** `Router(config)# ss7 mtp2-variant Bellcore 2`	Configures the MTP2 variant Telcordia (formerly Bellcore) for channel 2. • Enters Bellcore variant configuration mode.

	Command or Action	Purpose

Step 5	`T3 30000`
	
	Example:
	`Router(config-Bellcore)# T3 30000`
		Sets the aligned timer to 30,000 milliseconds.
		• Valid values range from 1000 to 65535. Default is 11500.

Step 6	`unacked-MSUs 16`
	
	Example:
	`Router(config-Bellcore)# unacked-MSUs 16`
		Sets the maximum number of MSUs waiting for acknowledgment to 16.
		• Valid values range from 16 to 127. Default is 127.

Step 7	`T7 50000`
	
	Example:
	`Router(config-Bellcore)# T7 50000`
		Sets the excessive delay timer to 50,000 milliseconds.
		• Valid values range from 500 to 65535. Default is 1000.

Step 8	`exit`
	
	Example:
	`Router(config-Bellcore)# exit`
		Exits Bellcore variant configuration mode.

Step 9	`end`
	
	Example:
	`Router(config)# end`
		Exits global configuration mode.

Step 10	`copy running-config startup-config`
	
	Example:
	`Router# copy running-config startup-config`
		Saves the running configuration to startup configuration.

Configuring the Media Gateway Controller

The MGC provides call control. Once the Cisco SLT is configured, you must configure the point codes, linksets, SS7 signaling links, and the associated MTP 2 parameters on the MGC.

Each SS7 link defined on the MGC is considered a logical channel, and each logical channel corresponds to a physical interface on the Cisco 2611. You can define two SS7 links (logical channels) from the MGC to a Cisco 2600 series router. The logical channels defined on the TCS map to the physical serial interfaces on the router from right to left, as follows:

- Numbering for an interface in the first slot always starts with channel 0.
- Numbering for an interface in the second slot always starts with channel 2.
- If a slot is empty, these rules still apply.

Table 1shows some examples of how different signaling termination channels might map to interface positions.

For more information about configuring the MGC software, refer to the Cisco Media Gateway Controllers documentation on Cisco.com.

Table 1 Examples of Logical Channels and Physical Interfaces

Logical Channel	Cisco 2600 Series Physical Interface			
	Two 2-Port WICs	1-Port WIC on Right, 2-Port on Left	Two 2-Port WICs	2-Port WIC on Right, 1-Port on Left
0	Not used: Serial 0/0	Assigned to port in first (right) slot: Serial 0/0	Not used: Serial 0/0	Not used: Serial 0/0
1	Assigned to second port in first (right) slot: Serial 0/1		Not used: Serial 0/1	Assigned to second port in first (right) slot: Serial 0/1
2	Not used: Serial 0/2	Assigned to first port in second (left) slot: Serial 0/1	Assigned to first port in second (left) slot: Serial 0/2	Assigned to first port in second (left) slot: Serial 0/2
3	Assigned to second port in second (left) slot: Serial 0/3	Not used: Serial 0/2	Assigned to second port in second (left) slot: Serial 0/3	

Troubleshooting Tips

The following are the **show** and **clear** commands that you can use to maintain the Cisco SLT

Command	Purpose
clear rudpv0 statistics	Clears the counters that track RUDP statistics.
clear ss7 sm stats	Clear the counters that track session manager statistics.
show rudpv0 failures	Shows RUDP failure statistics.
show rudpv0 statistics	Shows RUDP performance statistics.
show ss7 mtp2 ccb	Shows channel control block information.
show ss7 mtp2 state	Shows MTP 2 state machine information.
show ss7 mtp2 stats	Shows MTP 2 operational statistics.
show ss7 mtp2 timer	Shows MTP 2 timer settings.
show ss7 mtp2 variant	Shows MTP 2 Telcordia (formerly Bellcore) protocol variant information.
show ss7 sm session	Shows session configuration for timers, addresses, and ports.
show ss7 sm set	Shows the setting of the failover timer.
show ss7 sm stats	Shows session manager performance statistics.

Configuration Examples for the Cisco SLT

This section provides the following configuration examples:

- Basic Cisco SLT Configuration Parameters Example, page 31

- Cisco SLT T1 Configuration Example, page 32
- Cisco SLT E1 with Drop and Insert Configuration Example, page 34
- Session Manager and RUDP Configuration Example, page 36

Basic Cisco SLT Configuration Parameters Example

The following is an example of the initial configuration dialog system prompt. In this example, **y** (yes) has been entered in order to begin the configuration process:

```
Would you like to enter the initial configuration dialog? [yes/no]: y
```

Basic management setup provides only enough connectivity for management of the system. The following is an example of an extended setup prompt that asks you to configure each interface on the system. In this example, **y** (yes) has been entered to begin basic management setup:

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

The following is an example a host name system prompt. In this example, the host name is for the Cisco 2611 router:

```
Enter host name [Router]: 2611_name
```

The following is an example of the enable secret password system prompt. The enable secret is a password used to protect access to privileged EXEC and configuration modes. This password becomes encrypted in the configuration and cannot be seen when viewing the configuration:

```
Enter enable secret: enable_secret
```

The following is an example of the enable password that is different from the enable secret password. This password is not encrypted and can be seen when viewing the configuration. The enable password is used when you do not specify an enable secret password.

```
Enter enable password: enable_password
```

The following is an example of the virtual terminal password, which prevents unauthenticated access to the Cisco SLT through ports other than the console port. The virtual terminal password is used to protect access to the router over a network interface.

```
Enter virtual terminal password: vt_password
```

The following is an example of how to answer the configure the SNMP parameters system prompt:

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

The following is an example of the interface name used to connect to the management network:

```
Current interface summary

Controller Timeslots D-Channel Configurable modes Status
T1 0/2     24         23        pri/channelized    Administratively up
T1 0/3     24         23        pri/channelized    Administratively up

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

Interface                  IP-Address      OK? Method Status Protocol
Ethernet0/0                unassigned      NO  unset  up up
Serial0/0                  unassigned      NO  unset  down                  down
Ethernet0/1                unassigned      NO  unset  up                    down
```

```
Serial0/1                  unassigned      NO  unset  down                    down

Enter interface name used to connect to the management network from the above interface
summary: Ethernet0/0
```

The following is an example of how to configure the Ethernet interface:

```
Configuring interface Ethernet0/0:
Configure IP on this interface? [yes]: y
```

The following is an example of how to specify the IP address and the subnet mask for the interface:

```
IP address for this interface: 10.1.1.5
Subnet mask for this interface [255.0.0.0]: 255.255.0.0
Class A network is 10.0.0.0, 16 subnet bits; mask is /16
```

The following is an example of how to save the configuration to NVRAM and exit the initial configuration mode.

```
The following configuration command script was created:

hostname aladdin
enable secret 5 $1$0gLU$vLK1YHrMcianH5oVWFJNP/
enable password lablab
line vty 0 4
password lab
no snmp-server
!
no ip routing
!
interface Ethernet0/0
no shutdown
ip address 10.1.1.5 255.255.0.0
!
interface Serial0/0
shutdown
no ip address
!
interface Ethernet0/1
shutdown
no ip address
!
interface Serial0/1
shutdown
no ip address
!
end

[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.
Enter your selection [2]: 2
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.

Press RETURN to get started!
```

Cisco SLT T1 Configuration Example

The following example shows the configuration of the Cisco SLT with a T1 interface card.

```
version 12.0
no service pad
```

```
service timestamps debug datetime msec
service timestamps log datetime msec localtime
no service password-encryption
!
hostname Router_T1
!
logging buffered 4096 debugging
!
ip subnet-zero
!
```

Extended SuperFrame (ESF) framing and binary-8 zero substitution (B8ZS) are configured on the T1 0/0 controller. For these settings, the defaults are usually sufficient and only need to be changed because the service provider requires it.

```
Because this is a short-haul link, the cable length is specified as short.
controller T1 0/0
 framing esf
 linecode b8zs
 cablelength short 133
```

The **channel-group** controller configuration command creates a channel group 0 that occupies a single time slot.

```
 channel-group 0 timeslots 24
!
controller T1 0/1
 framing esf
 tdm-group 2 timeslots 1-23
!
process-max-time 200
!
```

Ethernet 0/0 provides the IP connection for backhauling SS7 information between the Cisco 2600 series router and the MGC.

```
interface Ethernet0/0
 ip address 255.1.1.6
 no ip directed-broadcast
 no ip mroute-cache
 no cdp enable
!
```

The **channel-group** command creates a logical serial interface that corresponds to the slot and port location of the T1 interface, and to the channel group number of 0.

```
interface Serial0/0:0
 no ip address
 no ip directed-broadcast
!
interface Ethernet0/1
 no ip address
 no ip directed-broadcast
 no ip mroute-cache
!
ip classless
no ip http server
!
```

The SS7 commands all use the default settings. This is especially important for the session timers, which should not be changed except at the instruction of Cisco technical assistance. Two sessions are configured here.

```
ss7 set failover-timer 3
```

```
ss7 session-0 address 255.1.0.2 8060 255.1.1.6 8060
ss7 session-0 retrans_t 600
ss7 session-0 cumack_t 300
ss7 session-0 kp_t 2000
ss7 session-0 m_retrans 2
ss7 session-0 m_cumack 3
ss7 session-0 m_outseq 3
ss7 session-0 m_rcvnum 32
ss7 session-1 address 255.1.0.1 8061 255.1.1.6 8061
ss7 session-1 retrans_t 600
ss7 session-1 cumack_t 300
ss7 session-1 kp_t 2000
ss7 session-1 m_retrans 2
ss7 session-1 m_cumack 3
ss7 session-1 m_outseq 3
ss7 session-1 m_rcvnum 32
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
end
```

The **ss7 mtp2-variant** command determines the MTP 2 variant on each channel.

```
ss7 mtp2-variant NTT 0
ss7 mtp2-variant NTT 1
ss7 mtp2-variant Bellcore 2
ss7 mtp2-variant Bellcore 3
```

Cisco SLT E1 with Drop and Insert Configuration Example

The following example shows configuration of the Cisco SLT with an E1 voice/WAN interface card that has Drop-and-Insert capabilities.

```
version 12.0
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec localtime
no service password-encryption
!
hostname Router_E1
!
logging buffered 4096 debugging
!
ip subnet-zero
!
```

The **channel-group** controller configuration commands create channel groups 0, each of which occupies a single time slot. The TDM groups use the rest of the time slots.

```
!
controller E1 0/0
 channel-group 0 timeslots 16
 tdm-group 1 timeslots 1-15,17-31
!
controller E1 0/1
```

```
 clock source internal
 tdm-group 1 timeslots 1-15,17-31
!
controller E1 0/2
 channel-group 0 timeslots 16
!
controller E1 0/3
!
process-max-time 200
!
```

Ethernet 0/0 provides the IP connection for backhauling SS7 information between the Cisco 2600 series router and the MGC.

```
interface Ethernet0/0
 ip address 10.1.1.6
 no ip directed-broadcast
 no ip mroute-cache
 no cdp enable
!
```

The **channel-group** command creates two logical serial interfaces that correspond to the slot and port locations of the E1 interfaces, and to the channel group number of 0.

```
interface Serial0/0:0
 no ip address
 no ip directed-broadcast
 no keepalive
!
interface Ethernet0/1
 no ip address
 no ip directed-broadcast
 no ip mroute-cache
!
interface Serial0/2:0
 no ip address
 no ip directed-broadcast
 no keepalive
!
ip classless
no ip http server
!

The connect command links the two VWIC ports for Drop and Insert.
connect my_connection E1 0/0 1 E1 0/1 1
 !
```

The SS7 commands all use the default settings. This is especially important for the session timers, which should not be changed except at the direction of Cisco technical assistance. Two sessions are configured here.

```
ss7 set failover-timer 3
ss7 session-0 address 10.1.0.2 8060 10.1.1.6 8060
ss7 session-0 retrans_t 600
ss7 session-0 cumack_t 300
ss7 session-0 kp_t 2000
ss7 session-0 m_retrans 2
ss7 session-0 m_cumack 3
ss7 session-0 m_outseq 3
ss7 session-0 m_rcvnum 32
ss7 session-1 address 10.1.0.1 8061 10.1.1.6 8061
ss7 session-1 retrans_t 600
ss7 session-1 cumack_t 300
ss7 session-1 kp_t 2000
```

```
ss7 session-1 m_retrans 2
ss7 session-1 m_cumack 3
ss7 session-1 m_outseq 3
ss7 session-1 m_rcvnum 32
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
end
```

The **ss7 mtp2-variant** command determines the MTP 2 variant on each channel.

```
ss7 mtp2-variant NTT 0
ss7 mtp2-variant NTT 1
ss7 mtp2-variant Bellcore 2
ss7 mtp2-variant Bellcore 3
```

Session Manager and RUDP Configuration Example

The following example shows information about an SS7 session manager session:

```
Router# show ss7 sm session

Session[0]: Remote Host 255.251.250.252:8060, Local Host 255.251.251.252:8060
      retrans_t = 600
      cumack_t  = 300
      kp_t      = 2000
      m_retrans = 2
      m_cumack  = 3
      m_outseq  = 3
      m_rcvnum  = 32

Session[1]: Remote Host 255.251.250.253:8060, Local Host 255.251.251.252:8061
      retrans_t = 600
      cumack_t  = 300
      kp_t      = 2000
      m_retrans = 2
      m_cumack  = 3
      m_outseq  = 3
      m_rcvnum  = 32
```

The following example shows information about the failover timer setting:

```
Router# show ss7 sm set

Session Manager Set
      failover timer = 3 seconds
```

The following example shows session manager statistics:

```
Router# show ss7 sm stats

-------------------- Session Manager  --------------------

Session Manager state             = SESSION SET STATE-ACTIVE
Session Manager Up count          = 1
Session Manager Down count        = 0
```

```
   lost control packet count      = 0
              lost PDU count      = 0
 failover timer expire count      = 0
 invalid_connection_id_count      = 0

Session[0] statistics  SM SESSION STATE-STANDBY:
Session Down count                = 0
   Open Retry count               = 0

   Total Pkts receive count       = 1
   Active Pkts receive count      = 0
   Standby Pkts receive count     = 1
   PDU Pkts receive count         = 0
   Unknown Pkts receive count     = 0

   Pkts send count                = 0
   Pkts requeue count             = 0
    -Pkts window full count       = 0
    -Pkts resource unavail count  = 0
    -Pkts enqueue fail count      = 0
   PDUs dropped (Large)           = 0
   PDUs dropped (Empty)           = 0

   RUDP Not Ready Errs            = 0
   RUDP Connection Not Open       = 0
   RUDP Invalid Conn Handle       = 0
   RUDP Unknown Errors            = 0
   RUDP Unknown Signal            = 0
   NonActive Receive count        = 0

Session[1] statistics  SM SESSION STATE-ACTIVE:
Session Down count                = 0
   Open Retry count               = 0

   Total Pkts receive count       = 2440
   Active Pkts receive count      = 1
   Standby Pkts receive count     = 0
   PDU Pkts receive count         = 2439
   Unknown Pkts receive count     = 0

   Pkts send count                = 2905
   Pkts requeue count             = 0
    -Pkts window full count       = 0
    -Pkts resource unavail count  = 0
    -Pkts enqueue fail count      = 0
   PDUs dropped (Large)           = 0
   PDUs dropped (Empty)           = 0

   RUDP Not Ready Errs            = 0
   RUDP Connection Not Open       = 0
   RUDP Invalid Conn Handle       = 0
   RUDP Unknown Errors            = 0
   RUDP Unknown Signal            = 0
   NonActive Receive count        = 0
```

Additional References

For additional information related to the Cisco SLT feature, refer to the following references:

- Related Documents, page 38

- Standards, page 39
- MIBs, page 39
- RFCs, page 40
- Technical Assistance, page 40

Related Documents

For additional information on how to install and configure a Cisco 2600 and for information about the VWIC interfaces, refer to the following documentation on Cisco.com.

Related Topic	Document Title
Cisco 2600 series software	Cisco 2600 Series Configuration Notes
Cisco IOS software on the Cisco 2600 series	Cisco IOS Release Notes
Cisco SLT documentation	Cisco Signaling Link Terminal
How to configure your Cisco router or access server to support voice, video, and fax applications	*Cisco IOS Voice, Video, and Fax Configuration Guide*, Release 12.2 T
How to use Cisco IOS commands to support voice, video, and fax applications	*Cisco IOS Voice, Video, and Fax Command Reference*, Release 12.2 T
How to install WAN and voice interface cards on the Cisco 2600 series	*Cisco WAN Interface Cards Hardware Installation Guide*.
Cisco 2600 series hardware	Hardware installation documents for Cisco 2600 series
How to configure the Cisco 2600 series	Software configuration documents for Cisco 2600 series
How to set up and cable the Cisco 2600 series	Quick Start Guide Cisco 2600 Series Cabling and Setup

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

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

RFCs

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

Technical Assistance

Description	Link
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.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

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

- **clear rudpv0 statistics**
- **clear ss7 sm stats**
- **debug rudpv0 application**
- **debug rudpv0 performance**
- **debug rudpv0 retransmit**
- **debug rudpv0 segment**
- **debug rudpv0 signal**
- **debug rudpv0 timer**
- **debug ss7 mtp2 aerm**
- **debug ss7 mtp2 backhaul**
- **debug ss7 mtp2 cong**
- **debug ss7 mtp2 iac**
- **debug ss7 mtp2 lsc**
- **debug ss7 mtp2 msu**
- **debug ss7 mtp2 packet**
- **debug ss7 mtp2 rcv**
- **debug ss7 mtp2 suerm**
- **debug ss7 mtp2 timer**
- **debug ss7 mtp2 txc**

- debug ss7 sm session
- debug ss7 sm set
- debug ss7 sm timer
- forward-alarms
- line-termination
- loopback (E1 controller)*
- loopback (T1 controller)*
- show rudpv0 failures
- show rudpv0 statistics
- show ss7 mtp2 ccb
- show ss7 mtp2 state
- show ss7 mtp2 stats
- show ss7 mtp2 timer
- show ss7 mtp2 variant
- show ss7 sm session
- show ss7 sm set
- show ss7 sm stats
- ss7 mtp2-variant bellcore
- ss7 mtp2-variant itu
- ss7 mtp2-variant ntt
- ss7 mtp2-variant ttc
- ss7 session
- ss7 session cumack_t
- ss7 session kp_t
- ss7 session m_cumack
- ss7 session m_outseq
- ss7 session m_rcvnum
- ss7 session m_retrans
- ss7 session retrans_t
- ss7 set failover-timer

clear rudpv0 statistics

To clear the counters that track RUDP statistics, enter the **clear rudpv0 statistics** command in privileged EXEC mode.

clear rudpv0 statistics

Syntax Description

This command has no arguments or keywords.

Defaults

The statistical information accumulates.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following example shows how to clear RUDP statistics on a Cisco 2611 (Cisco SLT):

```
clear rudpv0 statistics
```

Related Commands

Command	Description
show rudpv0 failures	Displays RUDP information about failed connections and the reasons for them.
show rudpv0 statistics	Displays RUDP information about number of packets sent, received, and so forth.

clear ss7 sm stats

To clear the counters that track session manager statistics, use the **clear ss7 sm stats** command in privileged EXEC mode.

clear ss7 sm stats

Syntax Description

This command has no arguments or keywords.

Defaults

The statistical information accumulates

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following example shows how to clear session manager statistics on a Cisco 2611:

```
clear ss7 sm stats
```

Related Commands

Command	Description
show ss7 sm stats	Displays session manager information about number of packets queued, received, and so forth.

debug rudpv0 application

To enable SS7 Reliable User Datagram Protocol (RUDP) application debugging, enter the **debug rudpv0 application** privileged EXEC command. The **no** form of this command disables debugging output.

debug rudpv0 application

no debug rudpv0 application

Warning **Use this command only for testing problems in a controlled environment. This command can generate significant amounts of output. If there is any significant amount of traffic flow when you issue the command, the processor may slow down so much that RUDP connections fail.**

Syntax Description

This command has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The output for this command shows the sequence numbers of segments as they are being passed to the upper layer protocol.

Examples

The following is an example of **debug rudpv0 application** command output:

```
*Mar  1 00:41:09.387: Turning application debugging on
*Mar  1 00:41:09.395: Send to appl, seq 204
*Mar  1 00:41:13.722: Send to appl, seq 205
*Mar  1 00:41:23.631: Send to appl, seq 206
*Mar  1 00:41:37.225: Send to appl, seq 207
*Mar  1 00:41:37.225: Send to appl, seq 208
*Mar  1 00:41:37.225: Send to appl, seq 209
*Mar  1 00:41:39.404: Send to appl, seq 210
*Mar  1 00:41:39.444: Send to appl, seq 211
*Mar  1 00:41:48.632: Send to appl, seq 212
```

debug rudpv0 performance

To view information about sent and received SS7 Reliable User Datagram Protocol (RUDP) packets, enter the **debug rudpv0 performance** privileged EXEC command. The **no** form of this command disables debugging output.

debug rudpv0 performance

no debug rudpv0 performance

Syntax Description

This command has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The output for this command shows the average number of segments that are sent and received per second for all RUDP connections combined. The “Sent” and “Rcvd” counts report the total number of segments (both internal RUDP segments and data segments) averaged over the time since the last issue of the **clear rudpv0 statistics** command or the last reboot.

The “Data Bytes” and packet counts are averaged only over the number of segments when there is actual data traffic flowing. For example, sent keepalive segments do not affect these counts.

Examples

The following is an example of **debug rudpv0 performance** command output:

```
Router# debug rudpv0 performance

*Mar  1 01:12:34.065: Turning performance debugging on
*Mar  1 01:12:41.817:
*Mar  1 01:12:41.817: Sent: Pkts 1,  Data Bytes 118,  Data Pkts 1
*Mar  1 01:12:41.817: Rcvd: Pkts 1,  Data Bytes 47,  Data Pkts 1
*Mar  1 01:12:41.817: Discarded: 0,  Retransmitted 0
*Mar  1 01:12:41.817:
*Mar  1 01:12:51.846:
*Mar  1 01:12:51.846: Sent: Pkts 1,  Data Bytes 118,  Data Pkts 1
*Mar  1 01:12:51.846: Rcvd: Pkts 1,  Data Bytes 47,  Data Pkts 1
*Mar  1 01:12:51.846: Discarded: 0,  Retransmitted 0
*Mar  1 01:12:51.846:
*Mar  1 01:13:01.874:
*Mar  1 01:13:01.874: Sent: Pkts 1,  Data Bytes 118,  Data Pkts 1
*Mar  1 01:13:01.874: Rcvd: Pkts 1,  Data Bytes 47,  Data Pkts 1
*Mar  1 01:13:01.874: Discarded: 0,  Retransmitted 0
*Mar  1 01:13:01.874:
*Mar  1 01:13:11.907:
*Mar  1 01:13:11.907: Sent: Pkts 1,  Data Bytes 118,  Data Pkts 1
*Mar  1 01:13:11.907: Rcvd: Pkts 1,  Data Bytes 47,  Data Pkts 1
*Mar  1 01:13:11.907: Discarded: 0,  Retransmitted 0
*Mar  1 01:13:11.907:
```

```
*Mar  1 01:13:21.931:
*Mar  1 01:13:21.931: Sent: Pkts 1,  Data Bytes 118,  Data Pkts 1
*Mar  1 01:13:21.931: Rcvd: Pkts 1,  Data Bytes 47,  Data Pkts 1
```

debug rudpv0 retransmit

To show information about SS7 Reliable User Datagram Protocol (RUDP) retransmit timer performance, enter the **debug rudpv0 retransmit** privileged EXEC command. The **no** form of this command disables debugging output.

debug rudpv0 retransmit

no debug rudpv0 retransmit

Warning **Use this command only for testing problems in a controlled environment. This command can generate significant amounts of output. If there is any significant amount of traffic flow when you issue the command, the processor may slow down so much that RUDP connections fail.**

Syntax Description

This command has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The output for this command shows internal RUDP events that are involved in retransmitting segments.

Examples

The following is an example of **debug rudpv0 retransmit** command output:

```
Router# debug rudpv0 retransmit

*Mar  1 01:14:21.405: Turning retransmit/softreset debugging on
*Mar  1 01:14:21.633: Retrans timer, set to ack 67
*Mar  1 01:14:22.647: Retrans timer, set to ack 45
*Mar  1 01:14:23.636: Retrans timer, set to ack 46
*Mar  1 01:14:23.636: Retrans timer, set to ack 68
*Mar  1 01:14:25.640: Retrans timer, set to ack 47
*Mar  1 01:14:25.644: Retrans timer, set to ack 69
*Mar  1 01:14:27.639: Retrans timer, set to ack 48
*Mar  1 01:14:27.643: Retrans timer, set to ack 70
*Mar  1 01:14:29.642: Retrans timer, set to ack 49
*Mar  1 01:14:29.646: Retrans timer, set to ack 71
*Mar  1 01:14:31.645: Retrans timer, set to ack 50
*Mar  1 01:14:31.649: Retrans timer, set to ack 72
*Mar  1 01:14:33.649: Retrans timer, set to ack 51
*Mar  1 01:14:33.653: Retrans timer, set to ack 73
*Mar  1 01:14:35.648: Retrans timer, set to ack 52
*Mar  1 01:14:35.652: Retrans timer, set to ack 74
*Mar  1 01:14:37.203: Retrans timer, set to ack 53
*Mar  1 01:14:37.655: Retrans timer, set to ack 75
*Mar  1 01:14:39.210: Retrans timer, set to ack 56
*Mar  1 01:14:39.659: Retrans timer, set to ack 76
```

```
*Mar  1 01:14:41.209: Retrans timer, set to ack 57
*Mar  1 01:14:41.662: Retrans timer, set to ack 77
```

debug rudpv0 segment

To show information about segments being sent and received by the SS7 Reliable User Datagram Protocol (RUDP), enter the **debug rudpv0 segment** privileged EXEC command. The **no** form of this command disables debugging output.

debug rudpv0 segment

no debug rudpv0 segment

Warning **Use this command only for testing problems in a controlled environment. This command can generate significant amounts of output. If there is any significant amount of traffic flow when you issue the command, the processor may slow down so much that RUDP connections fail.**

Syntax Description

This command has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The output for this command shows segments that are being sent and received by the RUDP and the control bits that are set in those segments. The number in parentheses is the length of the segment.

Examples

The following is an example of **debug rudpv0 segment** command output:

```
Router# debug rudpv0 segment

*Mar  1 01:16:57.981: Turning segment debugging on
*Mar  1 01:16:58.005: RUDP:  Rcvd ACK 30..145 (4),
*Mar  1 01:16:58.642: RUDP:  Send NUL ACK 143..155 (4),
*Mar  1 01:16:58.895: RUDP:  Rcvd ACK 156..143 (4),
*Mar  1 01:16:59.808: RUDP:  Send NUL ACK 146..29 (4),
*Mar  1 01:17:00.105: RUDP:  Rcvd ACK 30..146 (4),
*Mar  1 01:17:00.646: RUDP:  Send NUL ACK 144..155 (4),
*Mar  1 01:17:00.898: RUDP:  Rcvd ACK 156..144 (4),
*Mar  1 01:17:01.812: RUDP:  Send NUL ACK 147..29 (4),
*Mar  1 01:17:02.108: RUDP:  Rcvd ACK 30..147 (4),
*Mar  1 01:17:02.645: RUDP:  Send NUL ACK 145..155 (4),
*Mar  1 01:17:02.897: RUDP:  Rcvd ACK 156..145 (4),
*Mar  1 01:17:03.811: RUDP:  Send NUL ACK 148..29 (4),
*Mar  1 01:17:04.107: RUDP:  Rcvd ACK 30..148 (4),
*Mar  1 01:17:04.648: RUDP:  Send NUL ACK 146..155 (4),
*Mar  1 01:17:04.897: RUDP:  Rcvd ACK 156..146 (4),
*Mar  1 01:17:05.814: RUDP:  Send NUL ACK 149..29 (4),
*Mar  1 01:17:06.107: RUDP:  Rcvd ACK 30..149 (4),
*Mar  1 01:17:06.652: RUDP:  Send NUL ACK 147..155 (4),
```

```
*Mar  1 01:17:06.896: RUDP:  Rcvd ACK 156..147 (4),
*Mar  1 01:17:07.188: RUDP:  Rcvd ACK 156..147 (24),
*Mar  1 01:17:07.192: RUDP:  Rcvd ACK 157..147 (24),
*Mar  1 01:17:07.192: RUDP:  Rcvd ACK 158..147 (24),
*Mar  1 01:17:07.196: RUDP:  Send ACK 148..158 (136),
```

debug rudpv0 signal

To enable SS7 Reliable User Datagram Protocol (RUDP) signaling debugging, enter the **debug rudpv0 signal** privileged EXEC command. The **no** form of this command disables debugging output.

debug rudpv0 signal

no debug rudpv0 signal

Syntax Description

This command has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The output for this command shows the signals that the RUDP is sending to the upper-layer protocol.

Examples

The following is an example of **debug rudpv0 signal** command output:

```
Router# debug rudpv0 signal

*Mar  1 00:00:35.093:Turning signal debugging on
*Mar  1 00:02:29.060:Sent CONN_RESET_SIG to connID 811BE94C
*Mar  1 00:02:30.061:Sent CONN_OPEN_SIG to connID 811BE94C
*Mar  1 00:04:11.195:Sent CONN_RESET_SIG to connID 811BEB24
*Mar  1 00:04:15.202:Sent CONN_OPEN_SIG to connID 811BEB24
```

debug rudpv0 timer

To see SS7 Reliable User Datagram Protocol (RUDP) timer delay setting and start and stops, enter the **debug rudpv0 timer** privileged EXEC command. The **no** form of this command disables debugging output.

debug rudpv0 timer

no debug rudpv0 timer

Warning **Use this command only for testing problems in a controlled environment. This command can generate significant amounts of output. If there is any significant amount of traffic flow when you issue the command, the processor may slow down so much that RUDP connections fail. This command is recommended for field support personnel only, and is not recommended for use without prior recommendation from Cisco.**

Syntax Description

This command has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The output for this command shows the timers that RUDP starts and stops, as well as those that expire.

Examples

The following is an example of **debug rudpv0 timer** command output showing the configured delays for active timers used in the specified connections (connection ID 81164054 and so on):

```
Router# debug rudpv0 timer

*Mar  1 01:19:46.842: Turning timer debugging on
*Mar  1 01:19:47.479: Timer Keepalive (NullSeg) triggered for conn = 81164054
*Mar  1 01:19:47.479: Starting Retrans timer for connP = 81164054, delay = 600
*Mar  1 01:19:47.479: Stopping SentList timer for connP = 81164054
*Mar  1 01:19:47.479: Starting NullSeg timer for connP = 81164054, delay = 2000
*Mar  1 01:19:47.700: Stopping Retrans timer for connP = 81164054
*Mar  1 01:19:47.992: Timer Keepalive (NullSeg) triggered for conn = 8116422C
*Mar  1 01:19:47.992: Starting Retrans timer for connP = 8116422C, delay = 600
*Mar  1 01:19:47.992: Stopping SentList timer for connP = 8116422C
*Mar  1 01:19:47.992: Starting NullSeg timer for connP = 8116422C, delay = 2000
*Mar  1 01:19:48.196: Stopping Retrans timer for connP = 8116422C
*Mar  1 01:19:48.629: Starting Retrans timer for connP = 81164054, delay = 600
*Mar  1 01:19:48.629: Stopping SentList timer for connP = 81164054
```

debug ss7 mtp2 aerm

To display SS7 MTP 2 Alignment Error Rate Monitor (AERM) events and state transitions, enter the **debug ss7 mtp2 aerm** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 aerm [*channel*]

no debug ss7 mtp2 aerm

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is an example of **debug ss7 mtp2 aerm** command output. See the MTP 2 specification for details:

```
Router# debug ss7 mtp2 aerm 0

*Mar  8 08:59:30.991:itu2AERM_Start  chnl=0  MTP2AERM_IDLE
*Mar  8 08:59:35.070:itu2AERM_Stop  chnl=0  MTP2AERM_MONITORING
```

debug ss7 mtp2 backhaul

To display SS7 MTP 2 events and messages received from the media gateway controller (MGC) and sent to the MGC, enter the **debug ss7 mtp2 backhaul** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 backhaul [*channel*]

no debug ss7 mtp2 backhaul

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

This command helps debug communications between the MGC and the Cisco 2611.

Examples

The following is an example of **debug ss7 mtp2 backhaul** command output for channel 0:

```
Router# debug ss7 mtp2 backhaul 0

*Mar  1 03:08:04.433: MTP2: send Disc Ind  ch=0  reason=0x14-T2 expired waiting for SIO
*Mar  1 03:08:04.433: MTP2: send LSC Ind  ch=0  event=0x8-lost link alignment cause=0x0
*Mar  1 03:08:08.721: MTP2: rcvd Conn Req - Normal  ch=0
*Mar  1 03:08:10.311: MTP2: rcvd Statistics Req-Send&Reset   ch=0
*Mar  1 03:08:10.311: MTP2: send Stats Cfm  ch=0
*Mar  1 03:08:20.440: MTP2: send Disc Ind  ch=0  reason=0x14-T2 expired waiting for SIO
*Mar  1 03:08:20.444: MTP2: send LSC Ind  ch=0  event=0x8-lost link alignment cause=0x0
*Mar  1 03:08:24.719: MTP2: rcvd Conn Req - Normal  ch=0
*Mar  1 03:08:36.438: MTP2: send Disc Ind  ch=0  reason=0x14-T2 expired waiting for SIO
*Mar  1 03:08:36.438: MTP2: send LSC Ind  ch=0  event=0x8-lost link alignment cause=0x0
*Mar  1 03:08:40.312: MTP2: rcvd Statistics Req-Send&Reset   ch=0
*Mar  1 03:08:40.312: MTP2: send Stats Cfm  ch=0
*Mar  1 03:08:40.721: MTP2: rcvd Conn Req - Normal  ch=0
*Mar  1 03:08:52.444: MTP2: send Disc Ind  ch=0  reason=0x14-T2 expired waiting for SIO
*Mar  1 03:08:52.444: MTP2: send LSC Ind  ch=0  event=0x8-lost link alignment cause=0x0
*Mar  1 03:08:56.719: MTP2: rcvd Conn Req - Normal  ch=0
*Mar  1 03:09:08.438: MTP2: send Disc Ind  ch=0  reason=0x14-T2 expired waiting for SIO
*Mar  1 03:09:08.438: MTP2: send LSC Ind  ch=0  event=0x8-lost link alignment cause=0x0
```

The following tables explain codes that appear in the command output.

Table 2 Backhaul Debug Event Codes

Event Code	Explanation
0x0	local processor outage
0x1	Local processor outage recovered
0x2	Entered a congested state
0x3	Exited a congested state
0x4	Physical layer up
0x5	Physical layer down
0x7	Protocol error (see cause code)
0x8	Link alignment lost
0x9	Retransmit buffer full
0xa	Retransmit buffer no longer full
0xb	Negative acknowledgment received from far end
0xc	Remote entered congestion
0xd	Remote exited congestion
0xe	Remote entered processor outage
0xf	Remote exited processor outage

Table 3 Backhaul Debug Cause Codes

Cause Code	Explanation
0x0	Cause unknown - default
0x1	Management initiated
0x2	Abnormal BSN (Backward Sequence Number)
0x3	Abnormal FIB (Forward Indicator Bit)
0x4	Congestion discard

Table 4 Backhaul Debug Reason Codes

Cause Code	Explanation
0x0	Layer management request
0x1	SUERM (Signal Unit Error Monitor) failure
0x2	Excessively long alignment period
0x3	T7 timer expired
0x4	Physical interface failure
0x5	Two or three invalid BSNs
0x6	Two or three invalid FIBs

Table 4 Backhaul Debug Reason Codes (continued)

Cause Code	Explanation
0x7	LSSU (Link Status Signal Unit) condition
0x8	Excessive MTP 2 congestion
0x13	SIOs (Service Information Octets) received in Link State Control (LSC)
0x14	Timer T2 expired waiting for SIO
0x15	Timer T3 expired waiting for SIE/SIN
0x16	SIO received in initial alignment control (IAC)
0x17	Proving period failure
0x18	Timer T1 expired waiting for FISU (Fill-In Signal Unit)
0x19	SIN received in the in-service state
0x20	CTS lost
0x25	No resources

debug ss7 mtp2 cong

To display information about SS7 MTP 2 congestion state machine events and transitions, enter the **debug mtp2 cong** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 cong [*channel*]

no debug mtp2 cong

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is an example of **debug ss7 mtp2 cong** command output. See the MTP 2 specification for details:

```
Router# debug ss7 mtp2 cong 0

*Mar  8 09:10:56.219:itu2CongestionOnset  chnl=0  MTP2CONGESTION_IDLE
*Mar  8 09:10:59.332:itu2CongestionAbatement chnl=0
MTP2CONGESTION_ACTIVE
*Mar  8 09:11:01.143:itu2CongestionAbatement chnl=0  MTP2CONGESTION_IDLE
```

debug ss7 mtp2 iac

To display information about SS7 MTP 2 initial alignment control (IAC) events and transitions, enter the **debug ss7 mtp2 iac** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 iac [*channel*]

no debug mtp2 iac

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is an example of **debug ss7 mtp2 iac** command output. See the MTP 2 specification for details:

```
Router# debug ss7 mtp2 iac 0

*Mar  8 09:17:58.367:itu2IAC_Start  chnl=0  MTP2IAC_IDLE
*Mar  8 09:17:58.739:itu2IAC_Rcvd_SIO  chnl=0  MTP2IAC_NOT_ALIGNED
*Mar  8 09:17:58.739:itu2IAC_Rcvd_SIN  chnl=0  MTP2IAC_ALIGNED
*Mar  8 09:17:58.739:itu2IAC_Rcvd_SIN  chnl=0  MTP2IAC_PROVING
*Mar  8 09:18:02.814:itu2IAC_T4_TMO   chnl=0  MTP2IAC_PROVING
```

debug ss7 mtp2 lsc

To display information about SS7 MTP 2 Link State Control (LSC) events and transitions, enter the **debug ss7 mtp2 lsc** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 lsc [*channel*]

no debug mtp2 lsc

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is an example of **debug ss7 mtp2 lsc** command output. See the MTP 2 specification for details:

```
Router# debug ss7 mtp2 lsc 0

*Mar  8 09:20:21.105:itu2LSC_Rcvd_SIOS  chnl=0  MTP2LSC_INSERVICE
*Mar  8 09:20:21.121:itu2LSC_Retrieve_BSNT  chnl=0  MTP2LSC_OOS
*Mar  8 09:20:22.058:itu2LSC_SetEmergency  chnl=0  MTP2LSC_OOS
*Mar  8 09:20:22.058:itu2LSC_Start  chnl=0  MTP2LSC_OOS
*Mar  8 09:20:33.785:itu2LSC_AlignmentNotPossible  chnl=0
MTP2LSC_INITIAL_ALIGNMENT
*Mar  8 09:20:38.758:itu2LSC_SetEmergency  chnl=0  MTP2LSC_OOS
*Mar  8 09:20:38.758:itu2LSC_Start  chnl=0  MTP2LSC_OOS
*Mar  8 09:20:44.315:itu2LSC_Rcvd_SIO  chnl=0  MTP2LSC_INITIAL_ALIGNMENT
*Mar  8 09:20:44.315:itu2LSC_Rcvd_SIO  chnl=0  MTP2LSC_INITIAL_ALIGNMENT
*Mar  8 09:20:44.319:itu2LSC_Rcvd_SIE  chnl=0  MTP2LSC_INITIAL_ALIGNMENT
*Mar  8 09:20:44.319:itu2LSC_Rcvd_SIE  chnl=0  MTP2LSC_INITIAL_ALIGNMENT
*Mar  8 09:20:48.397:itu2LSC_AlignmentComplete  chnl=0
MTP2LSC_INITIAL_ALIGNMENT
```

debug ss7 mtp2 msu

To trace backhaul SS7 MTP 2 Message Signaling Units (MSUs), enter the **debug ss7 mtp2 msu** command during a low-traffic period. The **no** form of this command disables debugging output.

debug ss7 mtp2 msu [*channel*]

no debug mtp2 msu

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

MSUs carry addressed signaling information for call setup and tear down and SS7 network management.

The output for this command can slow traffic under busy conditions, so enter it when there is low traffic.

Examples

The following is an example of **debug ss7 mtp2 msu** command output for channel 2:

```
Router# debug ss7 mtp2 msu 2

*Mar  1 01:01:12.447: MTP2: send MSU Ind  ch=2  len=25
*Mar  1 01:01:12.455: MTP2: rcvd MSU Req  ch=2  len=252
```

debug ss7 mtp2 packet

To display debug messages for SS7 MTP 2 packets, enter the **debug ss7 mtp2 packet** privileged EXEC privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 packet [*channel*] [**all**]

no debug ss7 mtp2 packet

Warning **Use this command only for testing problems in a controlled environment. This command can generate significant amounts of output. If there is any significant amount of traffic flow when you issue the command, the processor may slow down so much that RUDP connections fail. This command is recommended for field support personnel only, and is not recommended for use without prior recommendation from Cisco**

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.
all	Enter a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number or enter the **all** keyword, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is an example of **debug ss7 mtp2 packet** command output for channel 0:

```
Router# debug ss7 mtp2 packet 0

*Mar  1 00:53:00.052: MTP2 incoming trace enabled on channel 0.
*Mar  1 00:53:00.052: MTP2 outgoing trace enabled on channel 0.
*Mar  1 00:53:07.220: ---- Incoming Rudp msg (20 bytes) ----
SM_msg_type    0x00008000
protocol_type  0x0001
msg_ID         0x0001
msg_type       0x0044
channel_ID     0x0000
bearer_ID      0x0000
length         0x0004
data           0x00000001

*Mar  1 00:53:07.224: ---- Outgoing Rudp msg (132 bytes) ----
SM_msg_type    0x00008000
protocol_type  0x0001
msg_ID         0x0001
```

```
msg_type        0x0045
channel_ID      0x0000
bearer_ID       0x0000
length          0x0074
data            0x0000001E 0x00000000 0x00000000 0x00000000
                0x00000000 0x00000000 0x00000000 0x00000000
                0x00000000 0x00000000 0x00000000 0x00000000
                0x00000002 0x00000000 0x00008317 0x00000000
                0x00000002 0x00000000 0x00000008 0x009B5C97
                0x00000000 0x0032A2A7 0x0000061C 0x000000BF
                0x00000000 0x00000000 0x00000006 0x00000000
                0x000000ED

*Mar  1 00:53:11.343: ---- Outgoing Rudp msg (41 bytes) ----
SM_msg_type     0x00008000
protocol_type   0x0001
msg_ID          0x0000
msg_type        0x0011
channel_ID      0x0000
bearer_ID       0x0000
length          0x0019
data            0x8201190A 0x03190A00 0x11F01122 0x33445566
                0x778899AA 0xBBCCDDEE

*Mar  1 00:53:11.351: ---- Incoming Rudp msg (41 bytes) ----
SM_msg_type     0x00008000
protocol_type   0x0001
msg_ID          0x0001
msg_type        0x0010
channel_ID      0x0000
bearer_ID       0x0000
length          0x0019
data            0xB203190A 0x01190A00 0x21F01122 0x33445566
                0x778899AA 0xBBCCDDEE

*Mar  1 00:53:13.739: ---- Incoming Rudp msg (27 bytes) ----
SM_msg_type     0x00008000
protocol_type   0x0001
msg_ID          0x0001
msg_type        0x0010
channel_ID      0x0000
bearer_ID       0x0000
length          0x000B
data            0x9503190A 0x01190A00
```

debug ss7 mtp2 rcv

To display information about SS7 MTP 2 receiver state machine events and transitions, enter the **debug ss7 mtp2 rcv** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 rcv [*channel*]

no debug mtp2 rcv

Warning **Use this command only for testing problems in a controlled environment. This command can generate significant amounts of output. If there is any significant amount of traffic flow when you issue the command, the processor may slow down so much that RUDP connections fail. This command is recommended for field support personnel only, and is not recommended for use without prior recommendation from Cisco.**

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is an example of **debug ss7 mtp2 rcv** command output. See the MTP 2 specification for details:

```
Router# debug ss7 mtp2 rcv 0

*Mar  8 09:22:35.160:itu2RC_Stop  chnl=0  MTP2RC_INSERVICE
*Mar  8 09:22:35.164:itu2RC_Start  chnl=0  MTP2RC_IDLE
*Mar  8 09:22:52.565:BSNR not in window
        bsnr=2  bibr=0x80    fsnr=66  fibr=0x80  fsnf=0  fsnl=127  fsnx=0
fsnt=127

*Mar  8 09:22:52.569:BSNR not in window
        bsnr=2  bibr=0x80    fsnr=66  fibr=0x80  fsnf=0  fsnl=127  fsnx=0
fsnt=127

*Mar  8 09:22:52.569:AbnormalBSN_flag == TRUE
*Mar  8 09:22:52.569:itu2RC_Stop  chnl=0  MTP2RC_INSERVICE
*Mar  8 09:22:57.561:itu2RC_Start  chnl=0  MTP2RC_IDLE
```

debug ss7 mtp2 suerm

To display information about SS7 MTP 2 Signal Unit Error Rate Monitor (SUERM) state machine events and transitions, enter the **debug ss7 mtp2 suerm** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 suerm [*channel*]

no debug mtp2 suerm

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is an example of **debug ss7 mtp2 suerm** command output. See the MTP 2 specification for details:

```
Router# debug ss7 mtp2 suerm 0

*Mar  8 09:33:51.108:itu2SUERM_Stop  chnl=0  MTP2SUERM_MONITORING
*Mar  8 09:34:00.155:itu2SUERM_Start  chnl=0  MTP2SUERM_IDLE
```

debug ss7 mtp2 timer

To display information about SS7 Message Transfer Part level 2 (MTP 2) timer starts and stops, enter the **debug ss7 mtp2 timer** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 timer [*channel*]

no debug mtp2 timer

Warning **Use this command only for testing problems in a controlled environment. This command can generate significant amounts of output. If there is any significant amount of traffic flow when you issue the command, the processor may slow down so much that RUDP connections fail. This command is recommended for field support personnel only, and is not recommended for use without prior recommendation from Cisco.**

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is an example of **debug ss7 mtp2 timer** command output for channel 0:

```
Router# debug ss7 mtp2 timer 0

*Mar  1 01:08:13.738: Timer T7 (ex delay) Start    chnl=0
*Mar  1 01:08:13.762: Timer T7 (ex delay) Stop     chnl=0
*Mar  1 01:08:13.786: Timer T7 (ex delay) Start    chnl=0
*Mar  1 01:08:13.810: Timer T7 (ex delay) Stop     chnl=0
*Mar  1 01:08:43.819: Timer T7 (ex delay) Start    chnl=0
*Mar  1 01:08:43.843: Timer T7 (ex delay) Stop     chnl=0
*Mar  1 01:08:48.603: Timer T7 (ex delay) Start    chnl=0
*Mar  1 01:08:48.627: Timer T7 (ex delay) Stop     chnl=0
*Mar  1 01:09:13.784: Timer T7 (ex delay) Start    chnl=0
*Mar  1 01:09:13.808: Timer T7 (ex delay) Stop     chnl=0
*Mar  1 01:09:13.885: Timer T7 (ex delay) Start    chnl=0
*Mar  1 01:09:13.909: Timer T7 (ex delay) Stop     chnl=0
```

debug ss7 mtp2 txc

To display information about SS7 MTP 2 transmit state machine events and transitions, enter the **debug ss7 mtp2 txc** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 mtp2 txc [*channel*]

no debug mtp2 txc

Warning **Use this command only for testing problems in a controlled environment. This command can generate significant amounts of output. If there is any significant amount of traffic flow when you issue the command, the processor may slow down so much that RUDP connections fail. This command is recommended for field support personnel only, and is not recommended for use without prior recommendation from Cisco.**

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is an example of **debug ss7 mtp2 txc** command output for channel 2. The transmission control is functioning and updating Backward Sequence Numbers (BSNs). See the MTP 2 specification for details:

```
Router# debug ss7 mtp2 txc 2

*Mar  1 01:10:13.831: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:13.831: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:13.831: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:13.839: itu2TXC_PDU2xmit  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:13.863: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:13.863: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:23.603: itu2TXC_PDU2xmit  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:23.627: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:23.627: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:23.631: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:23.631: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:23.635: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:43.900: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:43.900: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:43.900: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:43.908: itu2TXC_PDU2xmit  chnl=2  MTP2TXC_INSERVICE
```

```
*Mar  1 01:10:43.928: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVICE
*Mar  1 01:10:43.932: itu2TXC_bsn_update  chnl=2  MTP2TXC_INSERVIC
```

debug ss7 sm session

To display debugging information for an SS7 session manager session, enter the **debug ss7 sm session** privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 sm session [*session*]

no debug ss7 sm session

Syntax Description

channel	Enters a logical channel number. Valid values are from 0 to 3.

Defaults

If you do not specify a channel number, the command displays information for channel 0.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

Use this command to watch the session manager and RUDP sessions. The session manager is responsible for establishing the RUDP connectivity to the media gateway controller (MGC).

Examples

The following is an example of **debug ss7 sm session** command output for session 0. The session manager has established the connection (RUDP_CONN_OPEN_SIG):

```
Router# debug ss7 sm session-0

*Mar  8 09:37:52.119:SM:rudp signal RUDP_SOFT_RESET_SIG, session = 0
*Mar  8 09:37:58.129:SM:rudp signal RUDP_CONN_RESET_SIG, session = 0
*Mar  8 09:37:58.129:SM:Opening session[0] to 10.5.0.4:8060
*Mar  8 09:37:58.137:SM:rudp signal RUDP_CONN_OPEN_SIG, session = 0
```

debug ss7 sm set

To display debugging information for the SS7 session manager failover timer, enter the **debug ss7 sm set** privileged EXEC privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 sm set

no debug ss7 sm set

Syntax Description

This command has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

Use this command to watch the session manager progression for the set, which is the aggregation of the two RUDP sessions. **What should the user be looking for?**

Examples

The following is an example of **debug ss7 sm set** command output. The session manager connection is up (SM_UP):

```
Router# debug ss7 sm set

*Mar  6 12:37:10.176:SESSION SET STATE-INACTIVE   Active session = 1
*Mar  6 12:37:10.176:Session[0]:SM SESSION STATE-OPENING  |  Session[1]:
SM SESSION STATE-STANDBY
*Mar  6 12:37:10.176:Event:0x02-SM EVENT-ACTIVE on Session 1
*Mar  6 12:37:10.176:SM:SM_UP sent to MTP2
```

debug ss7 sm timer

To enable SS7 session manager timer debugging, enter the **debug rudp timer** privileged EXEC privileged EXEC command. The **no** form of this command disables debugging output.

debug ss7 sm timer

no ss7 sm timer

Warning **Use this command only for testing problems in a controlled environment. This command can generate significant amounts of output. If there is any significant amount of traffic flow when you issue the command, the processor may slow down so much that RUDP connections fail. This command is recommended for field support personnel only, and is not recommended for use without prior recommendation from Cisco.**

Syntax Description

This command has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

Use this command to watch the session manager timer progressions.

Examples

The following is an example of **debug ss7 sm timer** command output:

```
Router# debug ss7 sm timer

*Mar  6 12:38:30.483:SM:Open Timer is stoped for Session=0
*Mar  6 12:38:30.483:SM:Open Timer is started for Session=0
*Mar  6 12:41:56.141:SM:Fail-Over Timer is stopped
```

forward-alarms

To turn on alarm forwarding so that alarms that arrive on one T1/E1 port are sent to the other port on dual-mode multiflex trunk interface cards, use the **forward-alarms** command in controller configuration mode on the one port. To reset to the default so that no alarms are forwarded, use the **no** form of this command.

forward-alarms

no forward-alarms

Syntax Description

This command has no arguments or keywords.

Defaults

Alarm forwarding is disabled

Command Modes

Controller configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

When you enter this command, physical-layer alarms on the configured port are forwarded to the other port on dual-port cards, simulating a one-way repeater operations. The system forwards RAIs (remote alarm indications, or Yellow Alarms), alarm indication signals (AIS, or Blue Alarms), losses of frame (LOF alarms, or Red Alarms), and losses of signaling (LOS alarms, or Red Alarms).

Examples

The following example turns on alarm forwarding on controller E1 0/0 of a Cisco 2600 series:

```
controller e1 0/0
 forward-alarms
```

line-termination

To set the line termination on an E1 controller, enter the **line-termination** controller configuration command. Use the **no** form of this command to restore the default value.

line-termination {**75-ohm** | **120-ohm**}

no line-termination

Syntax Description

120-ohm	Matches the unbalanced twisted-pair 120-ohm interface.
75-ohm	Matches the balanced BNC 75-ohm interface.

Defaults

120-ohm

Command Modes

Controller configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

This command applies to E1 controllers only.

Examples

The following example shows how to set controller E1 0/0 to a line-termination of 75-ohm:

```
Router(config)# controller e1 0/0
Router(config-controller)# line-termination 75-ohm
```

loopback (E1 controller)

To set the loopback method for testing the E1 interface, enter the **loopback** controller configuration command. Use the **no** form of this command to restore the default value.

loopback {**diag** | **local** {**line** | **payload**}}

no loopback

Syntax Description

diag	Places the interface into local diagnostic loopback mode.
local	Places the interface into local loopback mode.
line	Places the interface into external loopback mode at the line level.
payload	Places the interface into external loopback mode at the payload level.

Defaults

No loopback is configured.

Command Modes

Controller configuration

Command History

Release	Modification
11.3 MA	This command was introduced as a controller configuration command for the Cisco MC3810.
12.0(5)T and 12.0(7)XR	This command was introduced as an ATM interface configuration command for the Cisco 2600 and 3600 series.
12.0(5)XE	This command was introduced as an ATM interface configuration command for the Cisco 7200 series and Cisco 7500 series.
12.1(1)T	This command was modified as a controller configuration command for the Cisco 2600 series.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

You can use a loopback test on lines to detect and distinguish equipment malfunctions caused either by line and Channel Service Unit/Digital Service Unit (CSU/DSU) or by the interface. If correct data transmission is not possible when an interface is in loopback mode, the interface is the source of the problem.

Examples

The following example shows how to set the payload loopback method on controller E1 0/0:

```
Router(config)# controller e1 0/0
Router(config-controller)# loopback local payload
```

loopback (T1 controller)

To set the loopback method for testing the T1 interface, enter the **loopback** controller configuration command. Use the **no** form of this command to restore the default value.

loopback {**diagnostic** | **local** {**payload** | **line**} | **remote** {**iboc** | **esf** {**payload** | **line**}}

no loopback

Syntax Description

diagnostic	Loops the outgoing transmit signal back to the receive signal
line	Places the interface into external loopback mode at the line level.
local	Places the interface into local loopback mode.
payload	Places the interface into external loopback mode at the payload level.
remote	Keeps the local end of the connection in remote loopback mode.
iboc	Sends an in band bit oriented code to the far-end to cause it to go into line loopback.
esf	Specifies extended super frame as the T1 or E1 frame type.

Defaults

No loopback is configured.

Command Modes

Controller configuration

Command History

Release	Modification
11.3 MA	This command was introduced as a controller configuration command for the Cisco MC3810.
12.0(5)T and 12.0(7)XR	This command was introduced as an ATM interface configuration command for the Cisco 2600 and Cisco 3600 series.
12.0(5)XE	This command was introduced as an ATM interface configuration command for the Cisco 7200 and Cisco 7500 series.
12.1(1)T	This command was introduced as a controller configuration command for the Cisco 2600 series.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

You can use a loopback test on lines to detect and distinguish equipment malfunctions caused either by line and Channel Service Unit/Digital Service Unit (CSU/DSU) or by the interface. If correct data transmission is not possible when an interface is in loopback mode, the interface is the source of the problem.

Examples

The following example shows how to set the diagnostic loopback method on controller T1 0/0:

```
Router(config)# controller t1 0/0
Router(config-controller)# loopback diagnostic
```

show rudpv0 failures

To display SS7 Reliable User Datagram Protocol (RUDP) failure statistics, enter the **show rudpv0 failures** command in privileged EXEC mode.

show rudpv0 failures

Syntax Description

This command has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is sample output from this command showing displaying RUDP failures.

```
Router# show rudpv0 failures

**** RUDP Failure Stats ****

CreateBufHdrsFailure       0
CreateConnRecsFailure      0
CreateEventsFailure        0

NotReadyFailures           0
OptionNotSupportedFailures 0
OptionRequiredFailures     0
GetConnRecFailures         0
InvalidConnFailures        0
EventUnavailFailures       0

EmptyBufferSendFailures    0
BufferTooLargeFailures     0
ConnNotOpenFailures        0
SendWindowFullFailures     0
GetBufHdrSendFailures      0

GetDataBufFailures         0
GetBufHdrFailures          0

SendEackFailures           0
SendAckFailures            0
SendSynFailures            0
SendRstFailures            0
SendNullFailures           0

TimerNullFailures          0
FailedRetransmits          0
IncomingPktsDropped        0
UnknownRudpEvents          0
```

Related Commands

Command	Description
clear rudpv0 statistics	Resets the counters for the statistics generated by the **show rudpv0 failures** command to 0.
show rudpv0 statistics	Displays RUDP information about number of packets sent, received, and so forth. The **clear rudpv0 statistics** command resets counters for these statistics to 0.

show rudpv0 statistics

To display SS7 Reliable User Datagram Protocol (RUDP) internal statistics, use the **show rudpv0 statistics** command in privileged EXEC command.

show rudpv0 statistics

Syntax Description

This commands has no arguments or keywords.

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

Because statistics counters are continually updated, the cumulative total may not be exactly equal to individual connection counters. After a connection is reset, previous statistics are lost, so the current connection statistics reflect only instances of the RUDP connection since the last reset.

Cumulative statistics reflect counts since the router was rebooted or since the **clear rudpv0 statistics** command was used.

Examples

The following is sample output from this command displaying RUDP statistics and states for two connections. The fields are self-explanatory.

```
Router# show rudpv0 statistics

*** RUDP Internal Stats ****

Connection ID: 811641AC,   Current State: OPEN

RcvdInSeq                  1
RcvdOutOfSeq               0

SoftResets                 0
SoftResetsRcvd             0

TotalPacketsSent           4828
TotalPacketsReceived       4826
TotalDataBytesSent         0
TotalDataBytesReceived     4
TotalDataPacketsSent       0
TotalDataPacketsReceived   1
TotalPacketsRetrans        0
TotalPacketsDiscarded      0

Connection ID: 81163FD4,   Current State: OPEN

RcvdInSeq                  2265
RcvdOutOfSeq               0
```

```
SoftResets                0
SoftResetsRcvd            0

TotalPacketsSent          7863
TotalPacketsReceived      6755
TotalDataBytesSent        173690
TotalDataBytesReceived    56121
TotalDataPacketsSent      2695
TotalDataPacketsReceived  2265
TotalPacketsRetrans       0
TotalPacketsDiscarded     0

Cumulative RudpV0 Statistics

RcvdInSeq                 2266
RcvdOutOfSeq              0

SoftResets                0
SoftResetsRcvd            0

TotalPacketsSent          12691
TotalPacketsReceived      11581
TotalDataBytesSent        173690
TotalDataBytesReceived    56125
TotalDataPacketsSent      2695
TotalDataPacketsReceived  2266
TotalPacketsRetrans       0
TotalPacketsDiscarded     0
```

Related Commands

Command	Description
clear rudpv0 statistics	Resets the counters for the statistics generated by the **show rudpv0 statistics** command to 0.
show rudpv0 failures	Displays RUDP information about failed connections and the reasons for them. The **clear rudpv0 statistics** command resets counters for these statistics to 0.

show ss7 mtp2 ccb

To display Signaling System 7 (SS7) Message Transfer Part level 2 (MTP2) call-control block (CCB) information, use the **show ss7 mtp2 ccb** command in privileged EXEC mode.

show ss7 mtp2 ccb [*channel*]

Syntax Description

channel	(Optional) Specific channel. Range is from 0 to 3. Default is 0.

Defaults

Channel 0. The default is set when you first configure the MTP2 variant. The link must be out of service when you change the variant.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The application and meaning of the output is dependent on the MTP2 variant. For example, Japanese Nippon Telephone and Telegraph Cellular System (NTT) and the Japanese Telecommunications Technology Committee (TTC) support only emergency alignment.

Examples

The following is sample output from this command:

```
Router# show ss7 mtp2 ccb 0

SS7 MTP2 Internal Channel Control Block Info for channel 0
Protocol version for channel 0 is Japan NTT Q.703 Version 1-1
ModuloSeqNumber             = 128   (0x80  )
MaxSeqNumber                = 127   (0x7F  )
Unacked-MSUs (MaxInRTB)     = 40    (0x28  )
MaxProvingAttempts          = 5     (0x5   )
error_control               = Basic
LSSU_Len                    = 1     (0x1   )
MSU_Len                     = 272   (0x110 )

SUERM-threshold             = 64    (0x40  )
SUERM-number-octets         = 16    (0x10  )
SUERM-number-SUs            = 256   (0x100 )

Tie-AERM-Emergency          = 1     (0x1   )
Tin-AERM-Normal             = 1     (0x1   )

MSU_FISU_Accepted_flag      = FALSE
```

```
LSSU_available              = TRUE
AbnormalBSN_flag            = FALSE
AbnormalBSN_flag            = FALSE
UnreasonableBSN             = FALSE
UnreasonableFSN             = FALSE
Abnormal_FIBR_flag          = FALSE
congestionDiscard           = TRUE

ThisIsA_MSU                 = FALSE
local_processor_outage      = FALSE
remote_processor_outage     = FALSE

provingEmergencyFlag        = FALSE
RemoteProvingEmergencyFlag  = FALSE
further_proving_required    = FALSE
ForceRetransmitFlag         = FALSE
RetransmissionFlag          = FALSE

link_present                = FALSE
Debug Mask                  = 0x0
```

show ss7 mtp2 state

To display internal Signaling System 7 (SS7) Message Transfer Part level 2 (MTP2) state-machine information, use the **show ss7 mtp2 state** command in privileged EXEC mode.

show ss7 mtp2 state [*channel*]

Syntax Description

channel	(Optional) Specific channel. Range is from 0 to 3.

Defaults

Information for all channels is displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is sample output from this command displaying MTP2 state machine information for two different channels:

```
Router# show ss7 mtp2 state 0

SS7 MTP2 states for channel 0
Protocol version for channel 0 is Japan NTT Q.703 Version 1-1
  MTP2LSC_OOS             MTP2IAC_IDLE
  MTP2TXC_INSERVICE       MTP2RC_IDLE
  MTP2SUERM_IDLE          MTP2AERM_IDLE
  MTP2CONGESTION_IDLE
    Congestion Backhaul  = Abate
Remote Processor Outage  = FALSE

Router# show ss7 mtp2 state 1

SS7 MTP2 states for channel 1
Protocol version for channel 1 is Japan NTT Q.703 Version 1-1
  MTP2LSC_OOS             MTP2IAC_IDLE
  MTP2TXC_INSERVICE       MTP2RC_IDLE
  MTP2SUERM_IDLE          MTP2AERM_IDLE
  MTP2CONGESTION_IDLE
    Congestion Backhaul  = Abate
Remote Processor Outage  = FALSE
```

Table 5 describes significant fields shown in this output.

Table 5 show ss7 mtp2 state Field Descriptions

State	Description	Possible Values
MTP2LSC	Overall status of the link.	OOS—Link is out of service. INITIAL_ALIGNMENT—Link is in a transitional link alignment state. ALIGNED_READY—Link is in a transitional link alignment state. ALIGNED_NOT_READY—Link is in a transitional link alignment state. INSERVICE—Link is in service. PROCESSOR_OUTAGE—There is an outage in the local processor. This state implies that the link has been aligned. POWER_OFF—It is possible you don't have the I/O memory set to at least 40 percent. There may not be enough memory for the SS7 MTP2 signaling.
MTP2IAC	Status of the initial alignment control state machine.	IDLE—State machine is idle. It is not aligning the link. NOT_ALIGNED—State machine has begun the alignment process. ALIGNED— Link has exchanged the alignment handshake with the remote device. PROVING—Link alignment is being proven. This is a waiting period before the LSC state changes to INSERVICE.
MTP2TXC	Status of the transmission control state machine.	IDLE—State machine is inactive. INSERVICE—State machine is the active transmitter.
MTP2RC	Status of the receive control state machine.	IDLE—State machine is inactive. INSERVICE—State machine is the active receiver.
MTP2SUERM	Status of the signal unit error monitor (SUERM).	IDLE—State machine is inactive. MONITORING—SUERM is active. SUERM uses a leaky-bucket algorithm to track link errors while the link is in service. If the number of link errors reaches the threshold, the link is taken out of service.

Table 5 show ss7 mtp2 state Field Descriptions (continued)

State	Description	Possible Values
MTP2AERM	Status of the alignment error rate monitor state machine (AERM).	IDLE—State machine is inactive. MONITORING—Alignment error monitor is active. This is part of the alignment process.
MTP2CONGESTION	Status of the congestion control state machine.	IDLE—State machine is inactive. No congestion is detected; normal traffic flow. ACTIVE—Congestion has been declared. The Cisco 2600 series router is sending SIBs every T5, which indicates that the remote end should stop sending new MSUs until the local Cisco 2600 series router can catch up.
Congestion Backhaul	Congestion status of the backhaul link between the Cisco SLT and the MGC.	Abate—Link between the Cisco 2600 series router and the MGC is not under congestion. Onset—Link between the Cisco 2600 series router and the MGC is under congestion. and the MGC should stop sending new MSUs until the local Cisco 2600 series router can catch up.
Remote Processor Outage	Processor outage status of the remote.	TRUE indicates that the remote is in processor outage. FALSE indicates that the remote has not declared processor outage.

show ss7 mtp2 stats

To display Signaling System 7 (SS7) Message Transfer Part level 2 (MTP2) operational statistics, use the **show ss7 mtp2 stats** command in privileged EXEC mode.

show ss7 mtp2 stats [*channel*]

Syntax Description

channel	(Optional) Specific channel. Range is from 0 to 3.

Defaults

Information for all channels is displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Examples

The following is sample output from this command showing operations and maintenance (OM) statistics for MTP2 channel 0:

```
Router# show ss7 mtp2 stats 0

SS7 MTP2 Statistics for channel 0
Protocol version for channel 0 is Japan NTT Q.703 Version 1-1
OMIACAlignAttemptCount  = 0
OMIACAlignFailCount     = 0
OMIACAlignCompleteCount = 0

OMMSU_TO_XMIT_Count     = 0
OMMSU_XMIT_Count        = 0
OMMSU_RE_XMIT_Count     = 0
OMMSU_RCV_Count         = 0
OMMSU_Posted_Count      = 0
OMMSU_too_long          = 0

OMFISU_XMIT_Count       = 0
OMFISU_RCV_Count        = 0

OMLSSU_XMIT_Count       = 17
OMLSSU_XMIT_SINCount    = 0
OMLSSU_XMIT_SIECount    = 0
OMLSSU_XMIT_SIOCount    = 0
OMLSSU_XMIT_SIOSCount   = 17
OMLSSU_XMIT_SIPOCount   = 0
OMLSSU_XMIT_SIBCount    = 0

OMLSSU_RCV_Count        = 0
```

```
OMLSSU_RCV_SINCount      = 0
OMLSSU_RCV_SIECount      = 0
OMLSSU_RCV_SIOCount      = 0
OMLSSU_RCV_SIOSCount     = 0
OMLSSU_RCV_SIPOCount     = 0
OMLSSU_RCV_SIBCount      = 0
OMLSSU_RCV_InvalidCount = 0

OMRemote_PO_Count        = 0
OMRemote_Congestion_Cnt = 0

OMtimeINSV (secs)        = 0
OMtimeNotINSV (secs)     = 9550
OMMSUBytesTransmitted    = 0
OMMSUBytesReceived       = 0

OMTransmitReqCount       = 33
OMPDU_notAcceptedCount   = 0
OMPDU_NACK_Count         = 0
OMunreasonableFSN_rcvd   = 0
OMunreasonableBSN_rcvd   = 0

OMT1_TMO_Count           = 0
OMT2_TMO_Count           = 0
OMT3_TMO_Count           = 0
OMT4_TMO_Count           = 0
OMT5_TMO_Count           = 0
OMT6_TMO_Count           = 0
OMT7_TMO_Count           = 0
OMT8_TMO_Count           = 0
OMTA_TMO_Count           = 0
OMTF_TMO_Count           = 0
OMTO_TMO_Count           = 0
OMTS_TMO_Count           = 477218
OMLostTimerCount         = 0

OMOMLostBackHaulMsgs     = 0

OMAERMCount              = 0
OMAERMFailCount          = 0
OMSUERMCount             = 0
OMSUERMFailCount         = 0
OMCongestionCount        = 0
OMCongestionBackhaulCnt = 0
```

Table 6 describes significant fields shown in this output.

Table 6 show ss7 mtp2 stats Field Descriptions

Field	Description
OMIACAlignAttemptCount OMIACAlignFailCount OMIACAlignCompleteCount	Counts for Initial Alignment Control (IAC) attempts.
OMMSU_TO_XMIT_Count	Related to the results of the **show ss7 sm stats** command's PDU_pkts_recieve_count statistic. The number shown in OMMSU_TO_XMIT_Count is less than the PDU_pkts_recieve_count because OMMSU_TO_XMIT_Count shows the number of PDUs going out on the link, while the PDU_pkts_recieve_count includes PDUs that are internal to MTP2.

Table 6 show ss7 mtp2 stats Field Descriptions (continued)

Field	Description
OMMSU_RCV_Count	Related to the results of the **show ss7 sm stats** command's packets_send_count.
OMLSSU_XMIT_Count OMLSSU_XMIT_SINCount OMLSSU_XMIT_SIECount OMLSSU_XMIT_SIOCount OMLSSU_XMIT_SIOSCount OMLSSU_XMIT_SIPOCount OMLSSU_XMIT_SIBCount	Number of times that MTP 2 has posted the specific Link Status Signal Unit (LSSU) to MTP 1. They do *not* show the number of LSSUs actually sent over the link.
OMLSSU_RCV_Count OMLSSU_RCV_SINCount OMLSSU_RCV_SIECount OMLSSU_RCV_SIOCount OMLSSU_RCV_SIOSCount OMLSSU_RCV_SIPOCount OMLSSU_RCV_SIBCount OMLSSU_RCV_InvalidCount	Number of LSSUs received by MTP 2 from MTP 1. Because of MTP 1 filtering, this is *not* the same as the actual LSSUs sent over the link.
OMT1_TMO_Count OMT2_TMO_Count OMT3_TMO_Count OMT4_TMO_Count OMT5_TMO_Count OMT6_TMO_Count OMT7_TMO_Count OMT8_TMO_Count OMTA_TMO_Count OMTF_TMO_Count OMTO_TMO_Count OMTA_TMO_Count OMLostTimerCount	Information about timers in use.
OMLostBackhaulMsgs	How many messages received from the MGC have been lost because of a lack of resources in the Cisco 2600 series router. This count is related to the results of the **show ss7 sm stats** command's PDU_pkts_recieve_count statistic. For example, if the MGC sends 100 MSUs and the Cisco 2600 series router only has 65 free buffers, 35 MSUs might be lost.

show ss7 mtp2 timer

To display durations of the Signaling System 7 (SS7) Message Transfer Part level 2 (MTP2) state-machine timers, use the **show ss7 mtp2 timer** command in privileged EXEC mode.

show ss7 mtp2 timer [*channel*]

Note The eight timers whose status is displayed using this command are set on the media gateway controller (MGC) using MML commands. The timers are then downloaded from the controller to the Cisco signaling link terminal (SLT).

Syntax Description

channel	(Optional) Specific channel. Range is from 0 to 3.

Defaults

Information for all sessions is displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

MTP2 uses eight different timers on each link. Throughout the link-state transitions, multiple timers are active. An in-service MTP2 link requires timers that are constantly started, stopped, and restarted. Use this command to display the configured timer durations.

Note All MTP2 configuration parameters are set at the Cisco SLT command-line interface. MGC parameter data files are no longer used to configure the Cisco SLT.

Examples

The following is sample output from this command displaying timer information for channel 0:

```
Router# show ss7 mtp2 timer 0

SS7 MTP2 Timers for channel 0 in milliseconds
Protocol version for channel 0 is Japan NTT Q.703 Version 1-1
    T1 aligned/ready = 15000
      T2 not aligned = 5000
          T3 aligned = 3000
T4 Emergency Proving = 3000
   T4 Normal Proving = 3000
      T5 sending SIB = 200
```

```
      T6 remote cong = 3000
 T7 excess ack delay = 2000
  T8 errored int mon = 0
TA SIE timer = 20
       TF FISU timer = 20
        TO SIO timer = 20
       TS SIOS timer = 20
```

show ss7 mtp2 variant

To display information about the Signaling System 7 (SS7) Message Transfer Part level 2 (MTP2) protocol variant, use the **show ss7 mtp2 variant** command in privileged EXEC mode.

show ss7 mtp2 variant [*channel*]

Syntax Description

channel	(Optional) Specific channel. Range is from 0 to 3.

Defaults

Information for all channels is displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(11)T	This command was implemented on the Cisco AS5350 and Cisco AS5400.
12.2(15)T	Support was added for the Cisco 2611XM and Cisco 2651XM signaling link terminal (SLT).

Usage Guidelines

This command can take an optional channel ID at the end (for example, **show ss7 mtp2 variant 0**). If the optional channel ID is omitted, the command displays the SS7 variant for all configured SS7 links.

Each country specifies its own variant of SS7, and the Cisco SLT supports several variants of the MTP2 protocol. The selected variant can affect the MTP2 statistics displayed by various commands. The Cisco SLT support the following variants:

- Telcordia Technologies (formerly Bellcore)
- ITU: International Telecommunication Union
- NTT: Japanese Nippon Telephone and Telegraph Cellular System
- TTC: Japanese Telecommunications Technology Committee

Each channel can be configured to any one of the protocol variants. When you change from one variant to another, for example from Bellcore to NTT, the MTP2 parameters default to those specified by NTT. You can then change the defaults as required.

Examples

The following is sample output from this command showing protocol-variant information for channel 1:

```
Router# show ss7 mtp2 variant 1

Protocol version for channel 1 is Bellcore GR-246-Core Issue 2, Dec 1997
```

The following is sample output showing the SS7 variant for the SS7 link whose channel ID is 2:

```
Router# show ss7 mtp2 variant 2

Protocol version for channel 2 is Bellcore GR-246-Core Issue 2, Dec 1997
```

The following is sample output showing the SS7 variant for all configured links:

```
Router# show ss7 mtp2 variant

Protocol version for channel 0 is Bellcore GR-246-Core Issue 2, Dec 1997
Protocol version for channel 1 is Bellcore GR-246-Core Issue 2, Dec 1997
Protocol version for channel 2 is Bellcore GR-246-Core Issue 2, Dec 1997
Protocol version for channel 3 is Bellcore GR-246-Core Issue 2, Dec 1997
```

In each case, all SS7 links are clearly provisioned to use the Bellcore variant (refer to the **ss7 mtp2 variant bellcore** command).

Command output shows that the MTP2 variant is being used for each of the SS7 links and that the Bellcore version is implemented; it also shows where the links are identified by their assigned channel IDs.

Related Commands

Command	Description
show controllers serial	Displays information about the virtual serial interface.
show ss7 mtp1 channel-id	Displays information for a given session channel ID.
show ss7 mtp2 ccb	Displays SS7 MTP 2 CCB information.
show ss7 mtp2 state	Displays internal SS7 MTP 2 state machine information.
show ss7 mtp2 stats	Displays SS7 MTP 2 operational statistics.
show ss7 mtp2 timers	Displays durations of the SS7 MTP 2 state machine timers.
show ss7 sm session	Displays information about SS7 session manager session.
show ss7 sm set	Displays information about the SS7 failover timer.
show ss7 mtp2 ccb	Displays SS7 MTP 2 CCB information.
show ss7 mtp2 state	Displays internal SS7 MTP 2 state machine information.
show ss7 mtp2 stats	Displays SS7 MTP 2 operational statistics.
ss7 mtp2 variant bellcore	Configures the device for Telcordia Technologies (formerly Bellcore) standards.

show ss7 sm session

To display information about a Signaling System 7 (SS7) session manager session, use the **show ss7 sm session** command in privileged EXEC mode.

show ss7 sm session [*session*]

Syntax Description

session	(Optional) Session. Range is from 0 to 3.

Defaults

Information for all sessions is displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T. Support for up to four session manager sessions was added.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

If no sessions are configured, the message “No Session is configured” appears.

Support for up to four session manager sessions was added in Cisco IOS Release 12.2(11)T. session manager sessions are now numbered from 0 to 3. The *Cisco Signalling Link Terminal Dual Ethernet* feature changes the command-line-interface syntax and adds sessions 2 and 3.

Examples

The following is sample output from this command displaying session information for both sessions:

```
Router# show ss7 sm session

Session[0]: Remote Host 255.255.251.254:8060, Local Host 255.255.255.254:8060
      retrans_t = 600
      cumack_t  = 300
      kp_t      = 2000
      m_retrans = 2
      m_cumack  = 3
      m_outseq  = 3
      m_rcvnum  = 32

Session[1]: Remote Host 255.255.251.255:8061, Local Host 255.255.255.254:8061
      retrans_t = 600
      cumack_t  = 300
      kp_t      = 2000
      m_retrans = 2
      m_cumack  = 3
```

```
m_outseq  = 3
m_rcvnum  = 32
```

Table 7 describes significant fields shown in this output.

Table 7 show ss7 sm session Field Descriptions

Field	Description
Remote Host, Local Host	IP address and port number for the session.
retrans_t	Retransmission timer value.
cumack_t	Cumulative acknowledgment timer value.
m_cumack	Maximum number of segments that can be received before the RUDP sends an acknowledgment.
m_outseq	Maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment.
m_rcvnum	Maximum number of segments that the remote end can send before receiving an acknowledgment.

Related Commands

Command	Description
ss7 session	Establishes a session.
ss7 session retrans_t	Sets the retransmission timer.
ss7 session m_rcvnum	Sets the maximum number of segments that the remote end can send before receiving an acknowledgment.
ss7 session m_outseq	Sets the maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment.
ss7 session m_cumack	Sets the maximum number of segments that can be received before the RUDP sends an acknowledgment.
ss7 session cumack_t	Sets the cumulative acknowledgment timer.

show ss7 sm set

To display information about the Signaling System 7 (SS7) session set state, failover timer, member sessions, and SS7 links that belong to an SS7 session set or range of SS7 session sets, use the **show ss7 sm set** command in privileged EXEC mode.

show ss7 sm set [*ss-id-range*]

Syntax Description

ss-id-range	(Optional) Displays the SS7 session set ID, state, member sessions, and SS7 links that belong to an SS7 session set or range of SS7 session sets.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	The *ss-id-range* argument was added. This command previously displayed only the failover-timer value and had no arguments. Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

This command is available on all Cisco Signaling Link Terminal (SLT) platforms.

If the optional *ss-id-range* argument is omitted, information is displayed for all SS7 session sets. The following are valid SS7 session set ranges. The default is 3 seconds.

1	Selects SS7 session set 1.
0, 2, 3	Selects SS7 session sets 0, 2, and 3.
0-2	Selects SS7 session sets 0, 1, and 2.
0, 2-3	Selects SS7 session sets 0, 2, and 3.
0, 2	Selects SS7 session sets 0 and 2.

Examples

The following is sample output from this command displaying failover timer information; the failover timer is set to the default of 3 seconds:

```
Router# show ss7 sm set

Session Manager Set
      failover timer = 3 seconds
```

The following example displays the SS7 session set state, failover-timer, member sessions, and SS7 links that belong to a range of SS7 session sets:

```
Router# show ss7 sm set

Session-set:0
  State          = ACTIVE
  Failover-timer = 5 secs.
  2 Sessions:
    session 0  session-state ACTIVE   remote-host 172.16.0.0:5555
    session 1  session-state STANDBY  remote-host 172.31.255.255:4444
  3 SS7 Links:
       7/0 (ser.)    chan-id 0  variant Bellcore   link-state INSERVICE
       7/0:0 (dig.)  chan-id 1  variant Bellcore   link-state INSERVICE
       7/0:2 (dig.)  chan-id 3  variant Bellcore   link-state INITIAL_ALIGNMENT
Session-set:1
  State          = IDLE
  Failover-timer = 5 secs.
  0 Sessions:
  0 SS7 Links:
Session-set:2
  State          = ACTIVE
  Failover-timer = 5 secs.
  2 Sessions:
    session 2  session-state ACTIVE   remote-host 172.16.0.0:6666
    session 3  session-state STANDBY  remote-host 172.31.255.255:7777
  1 SS7 Links:
       7/0:1 (dig.)  chan-id 2  variant Bellcore   link-state INSERVICE
Session-set:3
  State          = IDLE
  Failover-timer = 5 secs.
0 Sessions:
  0 SS7 Links:
```

Table 8 describes significant fields in this output.

Table 8 show ss7 sm set Field Descriptions

Field	Description
Session-set:0	One of four SS7 session sets is configured.
State	The session is ACTIVE.
Failover-timer	The number of seconds is set to 5.
2 Sessions:	• Session 0—session state is ACTIVE and connected to port 5555 of remote-host 172.16.0.0 • Session 1—session state is STANDBY and connected to port 4444 of remote-host 172.31.255.255
3 SS7 Links:	• SS7 link at serial interface 7/0 has channel ID 0 and current MTP2 link state of INSERVICE. • SS7 link at serial interface 7/0:0 has channel ID 1 and current MTP2 link state of INSERVICE. • SS7 link at serial interface 7/0:2 has channel ID 3 and current MTP2 link state of INITIAL_ALIGNMENT.
Session-set:1	One of four SS7 session sets is configured.
State	The session is IDLE.
Failover-timer	The number is set to 5 seconds.
0 Sessions:	No sessions are configured.
0 SS7 Links:	No SS7 links are configured.
Session-set:2	One of four SS7 session sets is configured.
State	The session is ACTIVE.
Failover-timer	The number is set to 5 seconds.
2 Sessions:	• Session 2 is ACTIVE and connected to port 6666 of remote host 172.16.0.0 • Session 3 is STANDBY and connected to port 7777 of remote host 172.31.255.255.
1 SS7 Links:	SS7 link at serial interface 7/0:1 has channel ID 2 and current MTP2 link state of INSERVICE.
Session-set:3	One of four SS7 session sets is configured.
State	The session is IDLE.
Failover-timer	The number is set to 5 seconds.
0 Sessions:	No sessions are configured.
0 SS7 Links:	No SS7 links are configured.

Related Commands

Command	Description
ss7 session	Creates a Reliable User Datagram Protocol (RUDP) session and explicitly adds an RUDP session to a Signaling System 7 (SS7) session set.
ss7 set	Independently selects failover-timer values for each session set and specifies the amount of time that the SS7 session manager waits for the active session to recover or for the standby media gateway controller (MGC) to indicate that the Cisco Signaling Link Terminal (SLT) should switch traffic to the standby session.
ss7 set failover timer	Specifies the amount of time that the session manager waits for the session to recover before declaring the session inactive.

show ss7 sm stats

To display Signaling System 7 (SS7) session manager session statistics, use the **show ss7 sm stats** command in privileged EXEC mode.

show ss7 sm stats

Syntax Description

There are no arguments or keywords for this command.

Defaults

The command shows information for both sessions.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

If no sessions are configured, the message “No Session is configured” appears.

Examples

The following is sample output from this command displaying SS7 session manager statistics. The fields are self-explanatory and show information about the session state, protocol data units (PDUs) packets sent and received, and SS7 Reliable User Datagram Protocol (RUDP) performance:

```
Router# show ss7 sm stats

------------------- Session Manager  --------------------

Session Manager state             = SESSION SET STATE-ACTIVE
Session Manager Up count          = 1
Session Manager Down count        = 0
   lost control packet count      = 0
              lost PDU count      = 0
 failover timer expire count      = 0
 invalid_connection_id_count      = 0

Session[0] statistics  SM SESSION STATE-STANDBY:
Session Down count               = 0
   Open Retry count              = 0

   Total Pkts receive count      = 1
   Active Pkts receive count     = 0
   Standby Pkts receive count    = 1
   PDU Pkts receive count        = 0
   Unknown Pkts receive count    = 0
```

```
Pkts send count               = 0
   Pkts requeue count            = 0
    -Pkts window full count      = 0
    -Pkts resource unavail count = 0
    -Pkts enqueue fail count     = 0
   PDUs dropped (Large)          = 0
   PDUs dropped (Empty)          = 0

   RUDP Not Ready Errs           = 0
   RUDP Connection Not Open      = 0
   RUDP Invalid Conn Handle      = 0
   RUDP Unknown Errors           = 0
   RUDP Unknown Signal           = 0
   NonActive Receive count       = 0

Session[1] statistics  SM SESSION STATE-ACTIVE:
Session Down count               = 0
   Open Retry count              = 0

   Total Pkts receive count      = 2440
   Active Pkts receive count     = 1
   Standby Pkts receive count    = 0
   PDU Pkts receive count        = 2439
   Unknown Pkts receive count    = 0

   Pkts send count               = 2905
   Pkts requeue count            = 0
    -Pkts window full count      = 0
    -Pkts resource unavail count = 0
    -Pkts enqueue fail count     = 0
   PDUs dropped (Large)          = 0
   PDUs dropped (Empty)          = 0

   RUDP Not Ready Errs           = 0
   RUDP Connection Not Open      = 0
   RUDP Invalid Conn Handle      = 0
   RUDP Unknown Errors           = 0
   RUDP Unknown Signal           = 0
   NonActive Receive count       = 0
```

Related Commands

Command	Description
clear ss7 sm-stats	Clears the counters that track session manager statistics for the **show ss7 sm stats** command.
ss7 session	Establishes a session.

ss7 mtp2-variant bellcore

To configure the router for Telcordia Technologies (formerly Bellcore) standards, use the **ss7 mtp2-variant bellcore** command in global configuration mode.

ss7 mtp2-variant bellcore [*channel*] [*parameters*]

Syntax Description

channel	(Optional) Channel. Range is from 0 to 3.
parameters	(Optional) Particular Bellcore standard. See Table 9 for descriptions, defaults, and ranges.

Defaults

Bellcore is the default variant if no other is configured.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

This MTP2 variant has timers and parameters that can be configured using the values listed in Table 9. To restore the designated default, use the **no** or the **default** form of the command (see example below).

Note Timer durations are converted to 10-millisecond units. For example, a T1 value of 1005 is converted to 100, which results in an actual timeout duration of 1000 ms. This is true for all timers and all variants.

Table 9 Bellcore (Telcordia Technologies) Parameters and Values

Parameter	Description	Default	Range
T1	Aligned/ready timer duration (milliseconds)	13000	1000 to 65535
T2	Not aligned timer (milliseconds)	11500	1000 to 65535
T3	Aligned timer (milliseconds)	11500	1000 to 65535
T4-Emergency-Proving	Emergency proving timer (milliseconds)	600	1000 to 65535
T4-Normal-Proving	Normal proving period (milliseconds)	2300	1000 to 65535
T5	Sending SIB timer (milliseconds)	100	80 to 65535
T6	Remote congestion timer (milliseconds)	6000	1000 to 65535
T7	Excessive delay timer (milliseconds)	1000	500 to 65535

Table 9 Bellcore (Telcordia Technologies) Parameters and Values (continued)

Parameter	Description	Default	Range
lssu-len	1- or 2-byte LSSU format	1	1 to 2
unacked-MSUs	Maximum number of MSUs waiting ACK	127	16 to 127
proving-attempts	Maximum number of attempts to prove alignment	5	3 to 8
SUERM-threshold	SUERM error-rate threshold	64	32 to 128
SUERM-number-octets	SUERM octet-counting mode	16	8 to 32
SUERM-number-signal-units	Signal units (good or bad) needed to dec ERM	256	128 to 512
Tie-AERM-Emergency	AERM emergency error-rate threshold	1	1 to 8
Tie-AERM-Normal	AERM normal error-rate threshold	4	1 to 8

Examples

The following example sets the aligned/ready timer duration on channel 0 to 30,000 ms:

```
ss7 mtp2-variant bellcore 0 T1 30000
```

The following example restores the aligned/ready timer default value of 13,000 ms:

```
ss7 mtp2-variant bellcore 0 no T1
```

Related Commands

Command	Description
ss7 mtp2-variant itu	Specifies the MTP2-variant as ITU.
ss7 mtp2-variant ntt	Specifies the MTP2-variant as NTT.
ss7 mtp2-variant ttc	Specifies the MTP2-variant as TTC.

ss7 mtp2-variant itu

To configure the router for ITU (International Telecom United) standards, use the **ss7 mtp2-variant itu** command in global configuration mode.

ss7 mtp-variant itu [*channel*] [*parameters*]

Syntax Description

channel	Channel. Range is from 0 to 3.
parameters	(Optional) Particular Bellcore standard. See Table 10 for descriptions, defaults, and ranges.

Defaults

Bellcore

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The ITU MTP2 variant has timers and parameters that can be configured using the values listed in Table 10. To restore the designated default, use the **no** or the **default** form of the command (see the example below).

Table 10 ITU (White) Parameters and Values

Parameter	Description	Default	Range
T1	Aligned/ready timer duration (milliseconds)	40000	1000 to 65535
T2	Not aligned timer (milliseconds)	5000	1000 to 65535
T3	Aligned timer (milliseconds)	1000	1000 to 65535
T4-Emergency-Proving	Emergency proving timer (milliseconds)	500	1000 to 65535
T4-Normal-Proving	Normal proving timer (milliseconds)	8200	1000 to 65535
T5	Sending SIB timer (milliseconds)	100	80 to 65535
T6	Remote congestion timer (milliseconds)	6000	1000 to 65535
T7	Excessive delay timer (milliseconds)	1000	1000 to 65535
lssu-len	1- or 2-byte LSSU format	1	1 to 2

Table 10 ITU (White) Parameters and Values (continued)

Parameter	Description	Default	Range
msu-len			
unacked-MSUs	Maximum number of MSUs waiting ACK	127	16 to 127
proving-attempts	Maximum number of attempts to prove alignment	5	3 to 8
SUERM-threshold	SUERM error rate threshold	64	32 to 128
SUERM-number-octets	SUERM octet counting mode	16	8 to 32
SUERM-number-signal-units	Signal units (good or bad) needed to dec ERM	256	128 to 512
Tie-AERM-Emergency	AERM emergency error-rate threshold	1	1 to 8
Tin-AERM-Normal	AERM normal error-rate threshold	4	1 to 8

Examples

The following example sets the emergency proving period on channel 1 to 10,000 ms:

```
ss7 mtp2-variant itu 1
 t4-Emergency-Proving 10000
```

The following example restores the emergency proving period default value of 5,000 ms:

```
ss7 mtp2-variant itu 1
 default t4-Emergency-Proving
```

Related Commands

Command	Description
ss7 mtp2-variant bellcore	Specifies the MTP2-variant as Bellcore.
ss7 mtp2-variant ntt	Specifies the MTP2-variant as NTT.
ss7 mtp2-variant ttc	Specifies the MTP2-variant as TTC.

ss7 mtp2-variant ntt

To configure the router for NTT (Japan) standards, use the **ss7 mtp2-variant ntt** command in global configuration mode.

ss7 mtp-variant ntt [*channel*] [*parameters*]

Syntax Description

channel	Channel. Range is from 0 to 3.
parameters	(Optional) Particular Bellcore standard. See Table 11 for descriptions, defaults, and ranges.

Defaults

Bellcore

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The NTT MTP2 variant has timers and parameters that can be configured using the values listed in Table 11. To restore the designated default, use the **no** or the **default** form of the command (see the example below).

Table 11 NTT Parameters and Values

Parameter	Description	Default	Range
T1	Aligned/ready timer duration (milliseconds)	15000	1000 to 65535
T2	Not aligned timer (milliseconds)	5000	1000 to 65535
T3	Aligned timer (milliseconds)	3000	1000 to 65535
T4-Emergency-Proving	Emergency proving timer (milliseconds)	3000	1000 to 65535
T5	Sending SIB timer (milliseconds)	200	80 to 65535
T6	Remote congestion timer (milliseconds)	2000	1000 to 65535
T7	Excessive delay timer (milliseconds)	3000	1000 to 65535
TA	SIE interval timer (milliseconds)	20	10 to 500
TF	FISU interval timer (milliseconds)	20	10 to 500
TO	SIO interval timer (milliseconds)	20	10 to 500

Table 11 NTT Parameters and Values (continued)

Parameter	Description	Default	Range
TS	SIOS interval timer (milliseconds)	20	10 to 500
unacked-MSUs	Maximum number of MSUs waiting ACK	40	16 to 40
proving-attempts	Maximum number of attempts to prove alignment	5	3 to 8
SUERM-threshold	SUERM error rate threshold	64	32 to 128
SUERM-number-octets	SUERM octet counting mode	16	8 to 32
SUERM-number-signal-units	Signal units (good or bad) needed to dec ERM	256	128 to 512
Tie-AERM-Emergency	AERM emergency error-rate threshold	1	1 to 8

Examples

The following example sets the SUERM error rate threshold on channel 2 to 100:

```
ss7 mtp2-variant ntt 2
 SUERM-threshold 100
```

The following example restores the SUERM error rate threshold default value of 64:

```
ss7 mtp2-variant ntt 2
 no SUERM-threshold
```

Related Commands

Command	Description
ss7 mtp2-variant bellcore	Specifies the MTP2-variant as Bellcore.
ss7 mtp2-variant itu	Specifies the MTP2-variant as ITU.
ss7 mtp2-variant ttc	Specifies the MTP2-variant as TTC.

ss7 mtp2-variant ttc

To configure the router for TTC (Japan Telecom) standards, use the **ss7 mtp2-variant ttc** command in global configuration mode.

ss7 mtp-variant ttc [*channel*] [*parameters*]

Syntax Description

channel	Channel. Range is from 0 to 3.
parameters	(Optional) Particular Bellcore standard. See Table 12 for descriptions, defaults, and ranges.

Defaults

Bellcore

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The TTC MTP2 variant has timers and parameters that can be configured using the values listed in Table 12. To restore the designated default, use the **no** or the **default** form of the command (see the example below).

Table 12 TTC Parameters and Values

Parameter	Description	Default	Range
T1	Aligned/ready timer duration (milliseconds)	15000	1000 to 65535
T2	Not aligned timer (milliseconds)	5000	1000 to 65535
T3	Aligned timer (milliseconds)	3000	1000 to 65535
T4-Emergency-Proving	Emergency proving timer (milliseconds)	3000	1000 to 65535
T5	Sending SIB timer (milliseconds)	200	80 to 65535
T6	Remote congestion timer (milliseconds)	2000	1000 to 65535
T7	Excessive delay timer (milliseconds)	3000	1000 to 65535
TA	SIE interval timer (milliseconds)	20	10 to 500
TF	FISU interval timer (milliseconds)	20	10 to 500
TO	SIO interval timer (milliseconds)	20	10 to 500

Table 12 TTC Parameters and Values (continued)

Parameter	Description	Default	Range
TS	SIOS interval timer (milliseconds)	20	10 to 500
unacked-MSUs	Maximum number of MSUs waiting ACK	40	16 to 40
proving-attempts	Maximum number of attempts to prove alignment	5	3 to 8
SUERM-threshold	SUERM error rate threshold	64	32 to 128
SUERM-number-octets	SUERM octet counting mode	16	8 to 32
SUERM-number-signal-units	Signal units (good or bad) needed to dec ERM	256	128 to 512
Tie-AERM-Emergency	AERM emergency error-rate threshold	1	1 to 8

Examples

The following example sets the maximum number of proving attempts for channel 3 to 3:

```
ss7 mtp2-variant ttc 3
 proving-attempts 3
```

The following example restores the maximum number of proving attempts to the default value:

```
ss7 mtp2-variant ttc 3
 default proving-attempts
```

Related Commands

Command	Description
ss7 mtp2-variant bellcore	Specifies the MTP2-variant as Bellcore.
ss7 mtp2-variant itu	Specifies the MTP2-variant as ITU.
ss7 mtp2-variant ntt	Specifies the MTP2-variant as NTT.

ss7 session

To create a Reliable User Datagram Protocol (RUDP) session and explicitly add an RUDP session to a Signaling System 7 (SS7) session set, use the **ss7 session** command in global configuration mode. To delete the session, use the **no** form of this command.

ss7 session *session-id* **address** *destination-address destination-port local-address local-port* [**session-set** *session-number*]

no ss7 session *session-id*

Syntax Description

session-id	SS7 session number. Valid values are 0 and 1. You must enter a hyphen with no space following it after the **session** keyword.
address *destination-address*	Specifies the SS7 session IP address.
destination-address	The local IP address of the router in four-part dotted-decimal format. The local IP address for both sessions, 0 and 1, must be the same.
destination-port	The number of the local UDP port on which the router expects to receive messages from the media gateway controller (MGC). Specify any UDP port that is not used by another protocol as defined in RFC 1700 and that is not otherwise used in your network. The local UDP port must be different for session 0 and session 1. Valid port ranges are from 1024 to 9999.
local-address	The remote IP address of the MGC in four-part dotted-decimal format.
local-port	The number of the remote UDP port on which the MGC is configured to listen. This UDP port cannot be used by another protocol as defined in RFC 1700 and cannot be otherwise used in the network. Valid port ranges are from 1024 to 9999.
session-set *session-number*	(Optional) Assigns an SS7 session to an SS7 session set.

Defaults

No session is configured.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	The **session-set** keyword and the *session-number* argument were added. Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

For the Cisco 2600-based SLT, you can configure a maximum of four sessions, two for each Cisco SLT. In a redundant VSC configuration, session 0 and session 2 are configured to one VSC, and session 1 and session 3 are configured to the other. Session 0/1 and session 2/3 run to the Cisco SLT.

The VSC must be configured to send messages to the local port, and it must be configured to listen on the remote port. You must also reload the router whenever you remove a session or change the parameters of a session.

This command replaces the **ss7 session-0 address** and **ss7 session-1 address** commands, which contain hard-coded session numbers. The new command is used for the new dual Ethernet capability.

The new CLI supports both single and dual Ethernet configuration by being backward compatible with the previous **session-0** and **session-1** commands so that you can configure a single Ethernet instead of two, if needed.

For the Cisco AS5350 and Cisco AS5400-based SLT, you can configure a maximum of two sessions, one for each signaling link. In a redundant MGC configuration, session 0 is configured to one MGC and session 1 is configured to the other.

The MGC must be configured to send messages to the local port, and the MGC must be configured to listen on the remote port.

You must reload the router whenever you remove a session or change the parameters of a session.

By default, each RUDP session must belong to SS7 session set 0. This allows backward compatibility with existing SS7 configurations.

If the **session-set** keyword is omitted, the session is added to the default SS7 session set 0. This allows backward compatibility with older configurations. Entering the **no** form of the command is still sufficient to remove the session ID for that RUDP session.

If you want to change the SS7 session set to which a session belongs, you have to remove the entire session first. This is intended to preserve connection and recovery logic.

Examples

The following example sets up two sessions on a Cisco 2611 and creates session set 2:

```
ss7 session-0 address 172.16.1.0 7000 172.16.0.0 7000 session-set 2
ss7 session-1 address 172.17.1.0 7002 172.16.0.0 7001 session-set 2
```

Note The example above shows how the local IP addresses in session-0 and session-1 must be the same.

Related Commands

Command	Description
ss7 session cumack_t	Sets the cumulative acknowledgment timer.
ss7 session k_pt	Sets the null segment (keepalive) timer.
ss7 session m_cumack	Sets the maximum number of segments that can be received before the RUDP sends an acknowledgment.
ss7 session m_outseq	Sets the maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment.
ss7 session m_retrans	Sets the maximum number of times that the RUDP attempts to resend a segment before declaring the connection invalid.
ss7 session retrans_t	Sets the retransmission timer.
ss7 session m_rcvnum	Sets the maximum number of segments that the remote end can send before receiving an acknowledgment.

ss7 session cumack_t

To set the Reliable User Datagram Protocol (RUDP) cumulative acknowledgment timer for a specific SS7 signaling link session, use the **ss7 session cumack_t** command in global configuration mode. To reset to the default, use the **no** form of this command.

ss7 session- *session number* **cumack_t** *milliseconds*

no ss7 session- *session number* **cumack_t**

Caution Use the default setting. Do not change session timers unless instructed to do so by Cisco technical support. Changing timers may result in service interruption or outage.

Syntax Description

session-number	SS7 session number. Valid values are 0 and 1. You must enter the hyphen, with no space following it, after the **session** keyword.
milliseconds	Interval, in milliseconds, that the RUDP waits before it sends an acknowledgment after receiving a segment. Range is from 100 to 65535. The value should be less than the value configured for the retransmission timer by using the **ss7 session** *session number* **retrans_t** command.

Defaults

300 ms

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The cumulative acknowledgment timer determines when the receiver sends an acknowledgment. If the timer is not already running, it is initialized when a valid data, null, or reset segment is received. When the cumulative acknowledgment timer expires, the last in-sequence segment is acknowledged. The RUDP typically tries to “piggyback” acknowledgments on data segments being sent. However, if no data segment is sent in this period of time, it sends a standalone acknowledgment.

Examples

The following example sets up two sessions and sets the cumulative acknowledgment timer to 320 ms for each one:

```
ss7 session-0 address 255.255.255.251 7000 255.255.255.254 7000
ss7 session-0 cumack_t 320
ss7 session-1 address 255.255.255.253 7002 255.255.255.254 7001
```

```
ss7 session-1 cumack_t 320
```

Related Commands

Command	Description
ss7 session retrans_t	Sets the retransmission timer.
ss7 session m_retrans	Sets the maximum number of times that the RUDP attempts to resend a segment before declaring the connection invalid.
ss7 session m_rcvnum	Sets the maximum number of segments that the remote end can send before receiving an acknowledgment.
ss7 session m_outseq	Sets the maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment.
ss7 session m_cumack	Sets the maximum number of segments that can be received before the RUDP sends an acknowledgment.
ss7 session k_pt	Sets the null segment (keepalive) timer.
show ss7	Displays the SS7 configuration.

ss7 session kp_t

To set the null segment (keepalive) timer for a specific SS7 signaling link session, use the **ss7 session kp_t** command in global configuration mode. To reset to the default, use the **no** form of this command.

ss7 session- *session number* **kp_t** *milliseconds*

no ss7 session- *session number* **kp_t**

Caution Use the default setting. Do not change session timers unless instructed to do so by Cisco technical support. Changing timers may result in service interruption or outage.

Syntax Description

session-number	SS7 session number. Valid values are 0 and 1. You must enter the hyphen, with no space following it, after the **session** keyword.
milliseconds	Interval, in milliseconds, that the Reliable User Datagram Protocol (RUDP) waits before sending a keepalive to verify that the connection is still active. Valid values are 0 and from100 to 65535. Default is 2000.

Defaults

2000 ms

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The null segment timer determines when a null segment (keepalive) is sent by the client Cisco 2600 series router. On the client, the timer starts when the connection is established and is reset each time a data segment is sent. If the null segment timer expires, the client sends a keepalive to the server to verify that the connection is still functional. On the server, the timer restarts each time a data or null segment is received from the client.

The value of the server's null segment timer is twice the value configured for the client. If no segments are received by the server in this period of time, the connection is no longer valid.

To disable keepalive, set this parameter to 0.

Examples

The following example sets up two sessions and sets a keepalive of 1,800 ms for each one:

```
ss7 session-0 address 255.255.255.251 7000 255.255.255.254 7000
ss7 session-0 kp_t 1800
ss7 session-1 address 255.255.255.253 7002 255.255.255.254 7001
ss7 session-1 kp_t 1800
```

Related Commands

Command	Description
ss7 session retrans_t	Sets the retransmission timer.
ss7 session m_retrans	Sets the maximum number of times that the RUDP attempts to resend a segment before declaring the connection invalid.
ss7 session m_rcvnum	Sets the maximum number of segments that the remote end can send before receiving an acknowledgment.
ss7 session m_outseq	Sets the maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment.
ss7 session m_cumack	Sets the maximum number of segments that can be received before the RUDP sends an acknowledgment.
ss7 session cumack_t	Sets the cumulative acknowledgment timer.
show ss7	Displays the SS7 configuration.

ss7 session m_cumack

To set the maximum number of segments that can be received before the Reliable User Datagram Protocol (RUDP) sends an acknowledgment in a specific SS7 signaling link session, use the **ss7 session m_cumack** command in global configuration mode. To reset to the default, use the **no** form of this command.

ss7 session-*session number* **m_cumack** *segments*

no ss7 session-*session number* **m_cumack**

Caution Use the default setting. Do not change session timers unless instructed to do so by Cisco technical support. Changing timers may result in service interruption or outage.

Syntax Description

session-number	SS7 session number. Valid values are 0 and 1. You must enter the hyphen, with no space following it, after the **session** keyword.
segments	Maximum number of segments that can be received before the RUDP sends an acknowledgment. Range is from 0 to 255. Default is 3.

Defaults

3 segments

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The cumulative acknowledgment counter records the number of unacknowledged, in-sequence data, null, or reset segments received without a data, null, or reset segment being sent to the transmitter. If this counter reaches the configured maximum, the receiver sends a standalone acknowledgment (a standalone acknowledgment is a segment that contains only acknowledgment information). The standalone acknowledgment contains the sequence number of the last data, null, or reset segment received.

If you set this parameter to 0, an acknowledgment is sent immediately after a data, null, or reset segment is received.

Examples

The following example sets up two sessions and in each session sets a maximum of two segments for receipt before acknowledgment:

```
ss7 session-0 address 255.255.255.251 7000 255.255.255.254 7001
ss7 session-0 m_cumack 2
ss7 session-1 address 255.255.255.253 7002 255.255.255.254 7000
ss7 session-1 m_cumack 2
```

Related Commands

Command	Description
ss7 session retrans_t	Sets the retransmission timer.
ss7 session m_retrans	Sets the maximum number of times that the RUDP attempts to resend a segment before declaring the connection invalid.
ss7 session m_rcvnum	Sets the maximum number of segments that the remote end can send before receiving an acknowledgment.
ss7 session m_outseq	Sets the maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment.
ss7 session k_pt	Sets the null segment (keepalive) timer.
ss7 session cumack_t	Sets the cumulative acknowledgment timer.
show ss7	Displays the SS7 configuration.

ss7 session m_outseq

To set the maximum number of out-of-sequence segments that can be received before the Reliable User Datagram Protocol (RUDP) sends an extended acknowledgment in a specific SS7 signaling link session, use the **ss7 session m_outseq** command in global configuration mode. To reset to the default, use the **no** form of this command.

ss7 session-*session number* **m_outseq** *segments*

no ss7 session-*session number* **m_outseq**

Caution Use the default setting. Do not change session timers unless instructed to do so by Cisco technical support. Changing timers may result in service interruption or outage.

Syntax Description

session-number	SS7 session number. Valid values are 0 and 1. You must enter the hyphen, with no space following it, after the **session** keyword.
segments	Maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment. If the specified number of segments are received out of sequence, an Extended Acknowledgment segment is sent to inform the sender which segments are missing. Range is from 0 to 255. Default is 3.

Defaults

3 segments

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The out-of-sequence acknowledgment counter records the number of data segments that have arrived out of sequence. If this counter reaches the configured maximum, the receiver sends an extended acknowledgment segment that contains the sequence numbers of the out-of-sequence data, null, and reset segments received. When the transmitter receives the extended acknowledgment segment, it retransmits the missing data segments.

If you set this parameter to 0, an acknowledgment is sent immediately after an out-of-sequence segment is received.

Examples

The following example sets up two sessions and sets a maximum number of four out-of-sequence segments for each session:

```
ss7 session-0 address 255.255.255.251 7000 255.255.255.254 7001
ss7 session-0 m_outseq 4
ss7 session-1 address 255.255.255.253 7002 255.255.255.254 7000
ss7 session-1 m_outseq 4
```

Related Commands

Command	Description
ss7 session retrans_t	Sets the retransmission timer.
ss7 session m_retrans	Sets the maximum number of times that the RUDP attempts to resend a segment before declaring the connection invalid.
ss7 session m_rcvnum	Sets the maximum number of segments that the remote end can send before receiving an acknowledgment.
ss7 session m_cumack	Sets the maximum number of segments that can be received before the RUDP sends an acknowledgment.
ss7 session k_pt	Sets the null segment (keepalive) timer.
ss7 session cumack_t	Sets the cumulative acknowledgment timer.
show ss7	Displays the SS7 configuration.

ss7 session m_rcvnum

To set the maximum number of segments that the remote end can send before receiving an acknowledgment in a specific SS7 signaling link session, use the **ss7 session m_rcvnum** command in global configuration mode. To reset to the default, use the **no** form of this command.

ss7 session-*session number* **m_rcvnum** *segments*

no ss7 session-*session number* **m_rcvnum**

Caution Use the default setting. Do not change session timers unless instructed to do so by Cisco technical support. Changing timers may result in service interruption or outage.

Syntax Description

session-number	SS7 session number. Valid values are 0 and 1. You must enter the hyphen, with no space following it, after the **session** keyword.
segments	Maximum number of segments that the remote (Cisco IOS software) end can send before receiving an acknowledgment. Range is from 1 to 64. Default is 32.

Defaults

32 segments

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The outstanding segments counter is the maximum number of segments that the Cisco IOS software end of the connection can send without getting an acknowledgment from the receiver. The receiver uses the counter for flow control.

Examples

The following example sets up two sessions and for each session sets a maximum of 36 segments for receipt before an acknowledgment:

```
ss7 session-0 address 255.255.255.251 7000 255.255.255.254 7001
ss7 session-0 m_rcvnum 36
ss7 session-1 address 255.255.255.253 7002 255.255.255.254 7000
ss7 session-1 m_rcvnum 36
```

Related Commands

Command	Description
ss7 session retrans_t	Sets the retransmission timer.
ss7 session m_retrans	Sets the maximum number of times that the Reliable User Datagram Protocol (RUDP) attempts to resend a segment before declaring the connection invalid.
ss7 session m_outseq	Sets the maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment.
ss7 session m_cumack	Sets the maximum number of segments that can be received before the RUDP sends an acknowledgment.
ss7 session k_pt	Sets the null segment (keepalive) timer.
ss7 session cumack_t	Sets the cumulative acknowledgment timer.
show ss7	Displays the SS7 configuration.

ss7 session m_retrans

To set the maximum number of times that the Reliable User Datagram Protocol (RUDP) attempts to resend a segment before declaring the connection invalid in a specific SS7 signaling link session, use the **ss7 session m_retrans** command in global configuration mode. To reset to the default, use the **no** form of this command.

ss7 session-*session number* **m_retrans** *number*

no ss7 session-*session number* **m_retrans**

Caution Use the default setting. Do not change session timers unless instructed to do so by Cisco technical support. Changing timers may result in service interruption or outage.

Syntax Description

session-number	SS7 session number. Valid values are 0 and 1. You must enter the hyphen, with no space following it, after the **session** keyword.
number	Maximum number of times that the RRUDP attempts to resend a segment before declaring the connection broken. Range is from 0 to 255. Default is 2.

Defaults

2 times

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The retransmission counter is the number of times a segment has been retransmitted. If this counter reaches the configured maximum, the transmitter resets the connection and informs the upper-layer protocol.

If you set this parameter to 0, the RUDP attempts to resend the segment continuously.

Examples

The following example sets up two sessions and for each session sets a maximum number of three times to resend before a session becomes invalid:

```
ss7 session-0 address 255.255.255.251 7000 255.255.255.254 7001
ss7 session-0 m_retrans 3
ss7 session-1 address 255.255.255.253 7002 255.255.255.254 7000
ss7 session-1 m_retrans 3
```

Related Commands

Command	Description
ss7 session retrans_t	Sets the retransmission timer.
ss7 session m_rcvnum	Sets the maximum number of segments that the remote end can send before receiving an acknowledgment.
ss7 session m_outseq	Sets the maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment.
ss7 session m_cumack	Sets the maximum number of segments that can be received before the RUDP sends an acknowledgment.
ss7 session k_pt	Sets the null segment (keepalive) timer.
ss7 session cumack_t	Sets the cumulative acknowledgment timer.
show ss7	Displays the SS7 configuration.

ss7 session retrans_t

To set the amount of time that the Reliable User Datagram Protocol (RUDP) waits to receive an acknowledgment for a segment in a specific SS7 signaling link session, use the **ss7 session retrans_t** command in global configuration mode. If the RUDP does not receive the acknowledgment in this time period, the RUDP retransmits the segment. To reset to the default, use the **no** form of this command.

ss7 session-*session number* **retrans_t** *milliseconds*

no ss7 session-*session number* **retrans_t**

Caution Use the default setting. Do not change session timers unless instructed to do so by Cisco technical support. Changing timers may result in service interruption or outage.

Syntax Description

session-number	SS7 session number. Valid values are 0 and 1. You must enter the hyphen, with no space following it, after the **session** keyword.
milliseconds	Amount of time, in milliseconds, that the RUDP waits to receive an acknowledgment for a segment. Range is from 100 to 65535. Default is 600.

Defaults

600 ms

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

The retransmission timer is used to determine whether a packet must be retransmitted and is initialized each time a data, null, or reset segment is sent. If an acknowledgment for the segment is not received by the time the retransmission timer expires, all segments that have been transmitted—but not acknowledged—are retransmitted.

This value should be greater than the value configured for the cumulative acknowledgment timer by using the **ss7 session cumack_t** command.

Examples

The following example sets up two sessions and specifies 550 ms as the time to wait for an acknowledgment for each session:

```
ss7 session-0 address 255.255.255.251 7000 255.255.255.254 7001
ss7 session-0 retrans_t 550
```

```
ss7 session-1 address 255.255.255.253 7002 255.255.255.254 7000
ss7 session-1 retrans_t 550
```

Related Commands

Command	Description
show ss7	Displays the SS7 configuration.
ss7 session m_retrans	Sets the maximum number of times that the RUDP attempts to resend a segment before declaring the connection invalid.
ss7 session m_rcvnum	Sets the maximum number of segments that the remote end can send before receiving an acknowledgment.
ss7 session m_outseq	Sets the maximum number of out-of-sequence segments that can be received before the RUDP sends an extended acknowledgment.
ss7 session m_cumack	Sets the maximum number of segments that can be received before the RUDP sends an acknowledgment.
ss7 session k_pt	Sets the null segment (keepalive) timer.
ss7 session cumack_t	Sets the cumulative acknowledgment timer.

ss7 set failover-timer

To specify the amount of time that the SS7 session manager waits for the active session to recover or for the standby media gateway controller (MGC) to indicate that the SLT should switch traffic to the standby session, use the **ss7 set failover-timer** command in global configuration mode. To reset ti the default, use the **no** form of this command.

ss7 set failover-timer [*seconds*]

no ss7 set failover-timer

Syntax Description

seconds	Time, in seconds, that the session manager waits for a session to recover. Range is from 1 to 10. Default is 3.

Defaults

3 seconds

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)XR	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(15)T	Support was added for the Cisco 2611XM, Cisco 2651XM, Cisco AS5350, and Cisco AS5400 signaling link terminal (SLT).

Usage Guidelines

This command specifies the number of seconds that the session manager waits for the active session to recover or for the standby MGC to indicate that the SLT should switch traffic to the standby session and to make that session the active session. If the timer expires without a recovery of the original session or an active message from the standby MGC, the signaling links are taken out of service.

Examples

The following example sets the failover timer to 4 seconds:

```
ss7 set failover-timer 4
```

Related Commands

Command	Description
show ss7 sm set	Displays the current failover timer setting.
ss7 session	Establishes a session.

Glossary

AIM—Advanced Integration Modules.

AIN—Advanced Intelligent Network.

AERM—Alignment Error Rate Monitor. SS7 MTP 2 function that provides monitoring of link alignment errors.

AIS—Alarm Indication Signal. In a T1 transmission, an all-ones signal transmitted instead of the normal signal to maintain transmission continuity and to indicate to the receiving terminal that there is a transmission fault that is located either at, or upstream from, the transmitting terminal.

AMI—Alternate Mark Inversion. Line-code type used on T1 and E1 circuits. In AMI, zeros are represented by 01 during each bit cell, and ones are represented by 11 or 00, alternately, during each bit cell. AMI requires that the sending device maintain ones density. Ones density is not maintained independently of the data stream. Sometimes called binary coded alternate mark inversion. Compare with B8ZS.

B8ZS—binary 8-zero substitution. Line-code type, used on T1 and E1 circuits, in which a special code is substituted whenever 8 consecutive zeros are sent over the link. This code is then interpreted at the remote end of the connection. This technique guarantees ones density independent of the data stream. Sometimes called bipolar 8-zero substitution. Compare with AMI.

BER—bit error rate. Ratio of received bits that contain errors.

BIB—Backward Indicator Bit. Part of an SS7 MSU that when toggled signals a negative acknowledgment by the remote signaling point.

BISDN—Broadband ISDN. ITU-T communication standards designed to handle high-bandwidth applications such as video. BISDN currently uses ATM technology over SONET-based transmission circuits to provide data rates from 155 to 622 Mbps and more.

BSN—Backward Sequence Number. Part of SS7 MSU that acknowledges the receipt of signal units by the remote signaling point, contains the sequence number of the signal unit being acknowledged.

CEPT—European Conference of Postal and Telecommunications Administrations.

CCB—Channel Control Block.

CRC—cyclic redundancy check. Error-checking technique in which the frame recipient calculates a remainder by dividing frame contents by a prime binary divisor and compares the calculated remainder to a value stored in the frame by the sending node.

CCS—common channel signaling. Signaling system used in telephone networks that separates signaling information from user data. A specified channel is exclusively designated to carry signaling information for all other channels in the system. See also SS7.

CSU—channel service unit. Digital interface device that connects end-user equipment to the local digital telephone loop. Often referred to together with DSU, as CSU/DSU.

DIMM—Dual In-line Memory Module.

DSP—digital signal processor.

DSU—data service unit. Device used in digital transmission that adapts the physical interface on a DTE device to a transmission facility such as T1 or E1. The DSU is also responsible for such functions as signal timing. Often referred to together with CSU, as CSU/DSU.

E1—Wide-area digital transmission scheme used predominantly in Europe that carries data at a rate of 2.048 Mbps. E1 lines can be leased for private use from common carriers.

ESF—Extended Super Frame. Framing type used on T1 circuits that consists of 24 frames of 192 bits each, with the 193rd bit providing timing and other functions. ESF is an enhanced version of SF.

FDL—Facility Data Link. A 4-Kbps channel, provided by the Extended SuperFrame (ESF) T1 framing format. The FDL performs outside the payload capacity and allows a service provider to check error statistics on terminating equipment, without intrusion.

FISU—Fill-In Signal Unit. SS7 message that is transmitted in both directions whenever other signal units are not present. Provides a CRC checksum for use by both signaling endpoints.

FSN—Forward Sequence Number. Part of an SS7 MSU that contains the sequence number of the signal unit.

HDB3—high density binary 3. Zero suppression line coding used on E1 links.

HDLC—High-Level Data Link Control. Bit-oriented synchronous data link layer protocol developed by ISO. Derived from SDLC, HDLC specifies a data encapsulation method on synchronous serial links using frame characters and checksums.

IAC—Initial Alignment Control. SS7 MTP 2 function that provides the link alignment processing.

INAP—Intelligent Network Application Part. SS7 architectural protocol layer.

ISDN—Integrated Services Digital Network. Communication protocol, offered by telephone companies, that permits telephone networks to carry data, voice, and other source traffic.

ISUP—ISDN User Part. SS7 protocol layer that defines the protocol used to prepare, manage, and release trunks that carry voice and data between calling and called parties.

LOF—loss of frame. Red alarm.

LOS—loss of signal. Red alarm.

LSC—Link State Control. SS7 MTP 2 function that provides the overall coordination of a session.

LSSU—SS7 message that carries one or two octets (8-bit bytes) of link status information between signaling points at either end of a link, used to control link alignment and to provide the status of a signaling point (such as a local processor outage) to the remote signaling point.

MIB—Management Information Base.

MSU—Message Signal Unit. SS7 message that carries call control, database traffic, network management, and network maintenance data in the signaling information field (SIF).

MTP—SS7 protocol layer consisting of three levels.

MTP 1—Message Transfer Part Level 1. SS7 architectural level that defines the physical, electrical, and functional characteristics of the digital signaling link.

MTP 2—Message Transfer Part Level 2. SS7 data link layer protocol. SS7 architectural level that exercises flow control, message sequence validation, error checking, and retransmission.

MTP 3—Message Transfer Part Level 2. SS7 architectural level that provides messages between signaling points in the network, helping control traffic when congestion or failures occur.

PDU—protocol data unit.

RAI—Remote Alarm Indication. Yellow alarm.

RTB—ReTransmit Buffer.

RUDP—Reliable User Datagram Protocol. Cisco proprietary signaling backhaul protocol.

SCCP—Signaling Connection Control Part. SS7 protocol level that provides connectionless and connection-oriented network services, and addressing services. Is the transport layer for TCAP-based services.

SF—SuperFrame. Common framing type used on T1 circuits. SF consists of 12 frames of 192 bits each, with the 193rd bit providing error checking and other functions. SF is superseded by ESF, but is still widely used. Also called D4 framing.

SIF—signaling information field. Part of the MSU that carries call control information.

SLT—signaling link terminal for SS7.

SS7—Signaling System 7. Signaling System 7. Standard CCS system used with BISDN and ISDN. Developed by Bellcore (now Telcordia).

SIO—Service Information Octet. Field of an SS7 MSU that contains a four-bit subservice field and a four-bit service indicator.

SUERM—Signal Unit Error Rate Monitor. SS7 MTP 2 function that provides monitoring of signal unit events.

T1—Digital WAN carrier facility. T1 transmits DS-1-formatted data at 1.544 Mbps through the telephone-switching network, using AMI or B8ZS coding. Compare with E1.

TCAP—Transaction Capabilities Applications Part. SS7 protocol layer that helps exchange non-circuit related data between applications across the network. Handles queries such as verification of a caller's Personal Identification Number (PIN) for telephony billing purposes.

WAN—Wide-area network.

WIC—WAN interface card.

Note Refer to the *Internetworking Terms and Acronyms* for terms not included in this glossary.