Continuity Testing (COT)

The following sections are provided:

Feature Summary

The Continuity Test (COT) subsystem supports the Continuity Test, which is required by the SS7 network to conduct loopback and tone check testing on the path before a circuit is established.

COT will detect any failure of DS0 channels. It is required for North American SS7 compliance.

Benefits

The Cisco SS7/C7 Dial Access Solution System runs on the Cisco AS5200, AS5300, and AS5800 Access Servers in conjunction with Cisco Signaling Controller (CSC) on the Network Access Servers (NAS) to enhance features previously introduced in Cisco IOS release 11.3(5)AA. These features include:

- Redundant Link Management (RLM)
- Continuity Testing (COT)
- ISDN Module

Provided is support for IP connection to SS7/C7 Singnaling Controller and associated continuity testing. This support allows carrier customers to connect their access servers to the Public Switch Telephone Network (PSTN) directly, by using Signaling System #7 (SS7/C7) signaling protocols. The SS7/C7 signaling links terminate on a separate UNIX system called the Signaling Controller (SC2200). The SC2200 maps incoming calls, which are signaled via SS7/C7, to bearers on the

access servers. The access servers and SC2200 interact to set up and tear down calls using an extended Q.931 protocol over Q.921 and UDP. In this manner, the access servers and SC2200 form a system that emulates an end-office switch in the PSTN.

The Cisco SS7/C7 Dial Access Solution System uses the ISDN Q.931 and Q.921 protocols over a Redundant Link Manager (RLM) module. RLM makes use of the UDP protocol to transfer information from the NAS to the CSC and vice versa. The ISDN module works in conjunction with the RLM.

Restrictions

You must have installed MICA 2.6.1.0 portware, which supports the COT feature.

Related Technologies

The Cisco SS7/C7 Dial Access Solution System runs on the Cisco AS5200, AS5300, and AS5800 Access Servers in conjunction with the following Cisco technologies:

- Cisco Signaling Controller (CSC) on the Network Access Servers (NAS)
- Redundant Link Management (RLM)
- ISDN Module

Supported Platforms

The following hardware platforms support this feature:

- Cisco AS5800
- Cisco AS5300
- Cisco AS5200
- Cisco AccessPath TS and TS3
- Cisco SC2200 Signaling Controller

Supported MIBs and RFCs

None.

List of Terms

COT—Continuity test. Used to test individual DS0 channels via either loopback or tone detection and generation.

DSP—Digital Signal Processor. Many firmware functions of a NAS are performed by DSPs which are generally provisioned as banks of shared resources among all the DS0s. Typical DSP functions include: data modems, voice CODECS, fax modems and CODECs, and low-level signaling (such as CAS/R2).

HDLC—High-Level Data Link Control.

ISP—Internet service provider.

NAS—Network access server. A Cisco platform (or collection of platforms such as an AccessPath system which interfaces between the packet world (for example, the Internet) and the circuit world (for example, the PSTN).

PSTN—Public Switched Telephone Network.

SAS—Signaling access server. A server which interfaces between the NAS and the SS7 signaling network.

SLM—Signaling link management.

SNIP—SAS NAS Interface Protocol.

SS7—Signaling System Number 7.

SSP—Service switching point. An element of an SS7-based Intelligent Network which performs call origination, termination, or tandem switching. The combined NAS/SAS system looks like a single SSP to the SS7 network.

STP—Signal transfer point. An element of an SS7-based Intelligent Network which performs routing of the SS7 signaling.

T1—A digital carrier used to transmit a DS-1 formatted digital signal at 1.544 MHz.

TDM—Time-division multiplexing. The transmission scheme employed by all manner of digital circuits in the PSTN.

TIC—Trunk identification code.

RLM—Redundant link manager.

VoIP—Voice over IP. The ability to carry normal telephony-style voice over an IP-based Internet with POTS-like functionality, reliability, and voice quality.

Functional Description

The SS7 (Signaling System Number 7) network, in order to detect failures of DS0 channels, will at times request a Continuity Test (COT) of a channel before establishing a call. ITU-based networks use only the loopback method for continuity test. However, ANSI-based network usage varies. Some use only the loopback method and others use both tone and loopback methods. For this release of the SS7 system, only the loopback method is supported.

Continuity test requests will be received over an SS7 signaling path and processed within the SAS (Signaling Access Server). The SAS will request that the NAS put the particular bearer in external loopback mode (loopback incoming receive to outgoing transmit) or to insert a transponder in the incoming circuit. The continuity test will last until a COT message is received.

Configuration Tasks

None.

Command Reference

The three new COT commands are show, clear, and debug. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command references.

- **clear cot summary**
- **show cot dsp**
- **show cot request**
- **show cot summary**
- **debug cot**

clear cot summary

Use the **clear cot summary** command to reset the counters.

clear cot summary

Syntax Description

This command has no keywords or arguments.

Command Mode

Privileged EXEC.

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3(7).

Sample Display

There is no display generated, but the counters in the **show cot summary** command would be all zeros.

Related Commands

show cot dsp
show cot request
show cot summary
debug cot

show cot dsp

To display information about the COT DSP (Digital Signal Processor) configuration or current status, use the **show cot dsp** command.

show cot dsp { **config | status** } *applique/ds0* (Cisco AS5200 and Cisco AS5300)
show cot dsp { **config | status** } *shelf/slot/applique/ds0* (Cisco AS5800)

Syntax Description

config	Show COT DSP configuration.
status	Show COT DSP status.
applique	ID of the hardware unit that provides the external interface connections from a router to the network. Number of COT operation request.
ds0	Number of COT operation request.
shelf	Shelf ID of COT operation request.
slot#	Designate the slot number, 0 to 2.

Command Mode

Privileged EXEC.

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3(7).

Sample Display

The following is sample output from the **show cot dsp** command that shows the COT DSP configuration.

```
5300# show cot dsp status 1/1

Rx Freq 2010 Hx
Tx Freq 1780 Hx
Tx then Rx mode
in WaitRxOn state


5300# show cot dsp config 1/1

Rx Freq 2010 Hx
Tx Freq 1780 Hx
Tx then Rx mode
Timeout value:0
```

Table 1 describes the fields in these displays.

Table 1 Show COT DSP Field Descriptions

Field	Description
Rx Freq	The COT receive tone frequency.
Tx Freq	The COT transmit tone frequency.
Tx then Rx	Type of COT operation.
WaitRxOn	The state of the COT DSP.

Related Commands

clear cot summary
show cot request
show cot summary
debug cot

show cot request

To display information use the **show cot request** command.

show cot request *shelf/slot/applique/ds0* (Cisco AS5200 and Cisco AS5300)
show cot request *applique/ds0* (Cisco AS5800)

Syntax Description

shelf	Shelf ID of COT operation request.
slot#	Designate the slot number, 1 to 4.
applique	Hardware unit that provides the external interface connections from a router to the network. Number of COT operation request.
ds0	Number of COT operation request.

Command Mode

Privileged EXEC.

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3(7).

Sample Display

The following is sample output from the **show cot request** command.

```
5300# show cot request 1/1

00:19:29:COT Request@ 0x61064A20, CDB@ 0x60EBB48C, Params@0x61123DBC
00:19:29:  request type = COT_CHECK_TONE_ON
00:19:29:  shelf 0 slot 0 appl_no 1 ds0 1
00:19:29:  duration 100000 key FFF1 freqTx 1780 freqRx 2010
00:19:29:  state COT_WAIT_TD_ON_CT
00:19:29:  event_proc(0x6093B55C)
```

Table 2 describes the fields in these displays.

Table 2 Show COT Request Field Descriptions

Field	Description
COT Request	Internal COT operation request.
CDB	Internal controller information.
Params	Internal COT operation request parameters.
request type	Type of COT operation.
duration	Timeout duration of COT operation.
key	COT operation identifier.
freqTx	Transmit tone frequency.
freqRx	Receive tone frequency.

Table 2 Show COT Request Field Descriptions (continued)

Field	Description
state	COT subsystem machine state.
event_proc	COT subsystem state machine function.

Related Commands

clear cot summary
show cot dsp
show cot summary
debug cot

show cot summary

To display information about the COT activity, use the **show cot summary** command.

show cot summary

Syntax Description

This command has no keywords or arguments.

Command Mode

Privileged EXEC.

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3(7).

Sample Display

The following is sample output from the **show cot summary** command that shows the COT DSP configuration.

```
5300# show cot summary
router#
08:23:24:  COT Subsystem - Request Statistics

08:23:24: COT Request Type = COT_DS0_LOOPBACK_ON
08:23:24: # of request(s)           : 4         # of restart requests(s)  : 0
08:23:24: # of successful request(s): 4         # of invalid request(s)   : 0
08:23:24: # of cot timeout(s)       : 0         # of dsp error(s)         : 0
08:23:24: # of no dsp(s)            : 0

08:23:24: COT Request Type = COT_DS0_LOOPBACK_OFF
08:23:24: # of request(s)           : 4         # of restart requests(s)  : 0
08:23:24: # of successful request(s): 4         # of invalid request(s)   : 0
08:23:24: # of cot timeout(s)       : 0         # of dsp error(s)         : 0
08:23:24: # of no dsp(s)            : 0

08:23:24: COT Request Type = COT_CHECK_TONE_ON
08:23:24: # of request(s)           : 7         # of restart requests(s)  : 0
08:23:24: # of successful request(s): 3         # of invalid request(s)   : 2
08:23:24: # of cot timeout(s)       : 1         # of dsp error(s)         : 0
08:23:24: # of no dsp(s)            : 0

08:23:24: COT Request Type = COT_CHECK_TONE_OFF
08:23:24: # of request(s)           : 0         # of restart requests(s)  : 0
08:23:24: # of successful request(s): 0         # of invalid request(s)   : 0
08:23:24: # of cot timeout(s)       : 0         # of dsp error(s)         : 0
08:23:24: # of no dsp(s)            : 0
```

```
08:23:24: COT Request Type = COT_CUT_IN_TRANSPONDER
08:23:24: # of request(s)           : 0         # of restart requests(s)  : 0
08:23:24: # of successful request(s): 0         # of invalid request(s)   : 0
08:23:24: # of cot timeout(s)       : 0         # of dsp error(s)         : 0
08:23:24: # of no dsp(s)            : 0

08:23:24: COT Request Type = COT_CUT_OUT_TRANSPONDER
08:23:24: # of request(s)           : 0         # of restart requests(s)  : 0
08:23:24: # of successful request(s): 0         # of invalid request(s)   : 0
08:23:24: # of cot timeout(s)       : 0         # of dsp error(s)         : 0
08:23:24: # of no dsp(s)            : 0
```

Table 3 describes the fields in these displays.

Table 3 Show COT DSP Field Descriptions

Field	Description
# of request(s)	Number of COT operation requests.
# of successful request(s)	Number of successful COT operation requests.
# of cot timeout(s)	Number of COT subsystem timeouts.
# of no dsp(s)	Number of COT operation requests rejected because of unavailable DSP.
# of restart request(s)	Number of COT operation requests restarted.
# of invalid request(s)	Number of invalid COT operation requests.
# of dsp error(s)	Number of DSP errors.

Related Commands

clear cot summary
show cot dsp
show cot request
debug cot

Debug Commands

debug cot

Use the **debug cot** command to display information about the COT functionality. The **no** form of this command disables debugging output.

debug cot { api | dsp | queue | detail }
no debug cot

Syntax Description

api	Display information about the COT Application Program Interface (API).
dsp	Display information related to the COT/DSP interface. Typical DSP functions include: data modems, voice CODECS, fax modems and CODECs, and low-level signaling such as CAS/R2.
queue	Display information related to the COT internal queue.
detail	Display information about COT internal detail; summary of **debug cot api**, **debug cot dsp**, and **debug cot queue**.

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3(7).

Sample Display

Figure 1 shows sample **debug cot api** output.

Figure 1 Sample Debug COT API Output

```
5300# debug cot api
COT API debugging is on
08:29:55: cot_request_handler(): CDB@0x60DEDE14, req(COT_CHECK_TONE_ON):
08:29:55:     shelf 0 slot 0 appl_no 1 ds0 1
08:29:55:     freqTX 2010 freqRX 1780 key 0xFFF1 duration 60000
```

Table 4 describes the fields in these displays.

Table 4 Debug COT API Field Descriptions

Field	Description
CDB	Internal controller information.
req	Type of COT operation requested.

Table 4 Debug COT API Field Descriptions (continued)

Field	Description
shelf	Shelf ID of COT operation request.
slot	Designate the slot number, 1 to 4.
application	Hardware unit that provides the external interface connections from a router to the network.
ds0	Number of COT operation request.
key	COT operation identifier.
duration	Timeout duration of COT operation.
freqTX	Requested transmit tone frequency.
freqRX	Requested receive tone frequency.

Figure 2 shows sample **debug cot dsp** output.

Figure 2 Sample Debug COT DSP Output

```
5300# debug cot dsp
5300#
00:10:42:COT:DSP (1/1) Allocated
00:10:43:In cot_callback
00:10:43:  returned key 0xFFF1, status = 0
00:10:43:COT:Received DSP Q Event
00:10:43:COT:DSP (1/1) Done
00:10:43:COT:DSP (1/1) De-allocated
```

Table 5 describes the fields in these displays.

Table 5 Debug COT DSP Field Descriptions

Field	Description
DSP (1/1) Allocated	The slot and port of the DSP allocated for the COT operation.
Received DSP Q Event	Indicates the COT subsystem received an event from the DSP.
DSP (1/1) Done	The slot and port of the DSP transitioning to IDLE state.
DSP (1/1) De-allocated	The slot and port of the DSP de-allocated after the completion of the COT operation.

Figure 3 shows sample **debug cot queue** output.

Figure 3 Sample Debug COT Queue Output

```
5300# debug cot queue
5300#
00:11:26:COT(0x60EBB48C):Adding new request (0x61123DBC) to In
Progress Q
00:11:26:COT(0x60EBB48C):Adding COT(0x61123DBC) to the Q head
00:11:27:In cot_callback
00:11:27:  returned key 0xFFF1, status = 0
```

Table 6 describes the fields in these displays.

Table 6 Debug COT Queue Field Descriptions

Field	Description
COT	Internal COT operation request.
Adding new request	Internal COT operation request queue.

Figure 4 shows sample **debug cot detail** output.

Figure 4 Sample Debug COT Detail Output

```
5300# debug cot detail
5300#
00:04:57:cot_request_handler():CDB@0x60EBB48C, req(COT_CHECK_TONE_ON):

00:04:57:    shelf 0 slot 0 appl_no 1 ds0 1
00:04:57:    freqTX 1780 freqRX 2010 key 0xFFF1 duration 1000

00:04:57:COT:DSP (1/0) Allocated
00:04:57:COT:Request Transition to COT_WAIT_TD_ON
00:04:57:COT(0x60EBB48C):Adding new request (0x61123DBC) to In
Progress Q
00:04:57:COT(0x60EBB48C):Adding COT(0x61123DBC) to the Q head
00:04:57:COT:Start Duration Timer for Check Tone Request
00:04:58:COT:Received Timer Event
00:04:58:COT:T24 Timer Expired
00:04:58:COT Request@ 0x61123DBC, CDB@ 0x60EBB48C, Params@0x61123E08
00:04:58:  request type = COT_CHECK_TONE_ON
00:04:58:  shelf 0 slot 0 appl_no 1 ds0 1
00:04:58:  duration 1000 key FFF1 freqTx 1780 freqRx 2010
00:04:58:  state COT_WAIT_TD_ON_CT
00:04:58:  event_proc(0x6093B55C)

00:04:58:Invoke NI2 callback to inform COT request status
00:04:58:In cot_callback
00:04:58:  returned key 0xFFF1, status = 0
00:04:58:Return from NI2 callback
00:04:58:COT:Request Transition to IDLE
00:04:58:COT:Received DSP Q Event
00:04:58:COT:DSP (1/0) Done
00:04:58:COT:DSP (1/0) De-allocated
```

Because **debug cot detail** is a summary of **debug cot api**, **debug cot dsp**, and **debug cot queue**, the field descriptions are the same.

What to Do Next

For additional software configuration information, see the following publications:

- *Cisco SS7/CCS7 Dial Access Solution System Integration Guidelines*
- *Cisco AS5300 Universal Access Server Software Configuration Guide*
- *Cisco AS5800 Universal Access Server Installation and Configuration Guide*
- *Dial Solutions Configuration Guide* (Cisco IOS Release 12.0)