Global Call SS7

Technology Guide

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Revision History

This revision history summarizes the changes made in each published version of this document.

Document No.	Publication Date	Description of Revisions
05-2274-004	July 2005	General: Updates to acknowledge Intel NetStructure® as a registered trademark. General: Replaced the term "DCM" with "Intel® Dialogic® configuration manager". General: Updates to indicate support for SS7G21 and SS7G22 Signaling Gateways in SIU Mode. Configuring an Intel NetStructure SS7 Board as a TDM Bus Master: Added text to describe configuration in Linux systems. ISUP Configuration: Added para to indicate support for CAL_MSG_HEARTBEAT ISUP messages. Dual-Resilient SIU Configuration Parameters: Added the SIU.Dual.TolerateCallTime parameter and description. Global Call Functions Supported by SS7: Added new supported utility functions: **gc_util_copy_parm_blk( )**, **gc_util_find_parm_ex( )**, **gc_util_insert_parm_ref_ex( )** and **gc_util_next_parm_ex( )** and new unsupported functions: **gc_AcceptModifyCall( )**, **gc_SetAuthenticationInfo( )**, **gc_RejectModifyCall( )** and **gc_ReqModifyCall( )**. gc_GetSigInfo( ) Variances for SS7: Rephrased note. gc_MakeCall( ) Variances for SS7: Rephrased the statement of support for the timeout parameter.
05-2274-003	March 2005	General: Updates to indicate support for SS7HD boards (both PCI and CompactPCI). General: Changed board names as follows (excluding command names and book titles): - SPCI2S to SS7SPCI2S - SPCI4 to SS7SPCI4 - CPM8 to SS7CPM8
05-2274-002	September 2004	SS7 Server Log File: Updated the location of the SS7 server log file under Windows. gc_GetParm( ) Variances for SS7 : Added new GCPR_IGNORE_BCI parameter. gc_SetParm( ) Variances for SS7 : Added new GCPR_IGNORE_BCI parameter. Global Call SS7 Software Configuration (gcss7.cfg): Added the following configuration parameters: Service.IgnoreBCI, Service.CleanCidBit15, SIU.ConfigureRsiLinks. Sample system.txt File for a System with SS7 Boards: Updated. Sample config.txt File for a System with Circuits and Signalling on an SS7 Board: Updated. Sample config.txt File for a System with Circuits and Signaling on DTI Trunks: Updated. Sample system.txt File for a Single-SIU and Dual-SIU System: Updated. Sample config.txt File for a Single SIU System with One Host: Updated. Sample config.txt File for a Single-SIU System with Two Host: Updated.

Document No.	Publication Date	Description of Revisions
05-2274-002 (continued)	September 2004	Sample config.txt File for SIU A in a Dual-Resilient SIU System with a Single Host: Updated. Sample config.txt File for SIU B in a Dual-Resilient SIU System with a Single Host: Updated. Section 3.5, “Configuring an Intel NetStructure SS7 Board as a TDM Bus Master”, on page 44: New section added. Section 5.6, “Using Overlap Send and Receive”, on page 75: Updated to indicate: 1) limitations when using **gc_SendMoreInfo( )**, 2) **gc_SndMsg( )** can still be used to send SAM.
05-2274-002-01	March 2004	Table 1, “Intel NetStructure SS7 Board Configurations - Features and Benefits”, on page 23: Removed reference to ISA in the caption and updated the first row to indicate support for “four” signaling links, not “three”. Section 3.8.1.2, “SIU Systems”, on page 49: Updated the first code segment under step 3 to reference RSICMD.EXE. Table 6, “Error Codes for SS7 Server Start Failure”, on page 50: Updated the error code descriptions for 0x5001 and 0x5002. Section 3.8.2.4, “SIU does not Function Correctly After Modification of config.txt”, on page 51: Updated the text for step 2 to better explain that 0x0d is equivalent to a carriage return symbol. Section 10.1, “SS7-Specific Error Codes”, on page 115: Updated some descriptions and added asterisks to identify codes not currently supported. Section 10.2, “SS7-Specific Event Cause Codes”, on page 118: Added new section. Section 11.8, “Sample config.txt File for a Single-SIU System with Two Host”, on page 129: Added new section. Section 11.6, “Sample system.txt File for a Single-SIU and Dual-SIU System”, on page 127: Added mandatory LOCAL and FORK_PROCESS commands. Section 11.9, “Sample system.txt File for a Dual-Resilient SIU System”, on page 127: Added mandatory LOCAL and FORK_PROCESS commands. Section 11.9, “Sample config.txt File for SIU A in a Dual-Resilient SIU System with a Single Host”, on page 130: Updated MTP_ROUTE commands. Section 11.10, “Sample config.txt File for SIU B in a Dual-Resilient SIU System with a Single Host”, on page 131: Updated MTP_ROUTE commands.

Document No.	Publication Date	Description of Revisions
05-2274-001	November 2003	Initial version of document. Much of the information contained in this document was previously published in the *Global Call SS7 Technology User's Guide for Windows Operating Systems*, document number 05-1380-006 and the *Global Call SS7 Technology User's Guide for Linux Operating Systems*, document number 05-1936-001. Major changes since these document versions are listed below. General: Updates to accommodate all Global Call SS7 software configuration in a single file called *gcss7.cfg*. Integrated the "Troubleshooting" chapter into the "Configuration and Startup" chapter. Viewing Parameter Values With the Intel Dialogic Configuration Manager: Added section to explain that it is only possible to view key parameters values in the configuration manager (DCM). Configuration of parameters previously configured using DCM is now done using the *gcss7.cfg* file. SS7 Call Scenarios: Replaced existing scenarios with more up-to-date and comprehensive scenarios. Building Global Call SS7 Applications: Added as a new chapter. gc_OpenEx( ) Variances for SS7: Removed ":L_SS7" from the devicename string; no longer required. (PT 30317) : S7_SIGINFO_BLK: Updated the length parameter description; 1 must be added for the NULL character. Supplementary Reference Information: Updated the sample configuration files.

About This Publication

The following topics provide information about this publication.

- Purpose
- Intended Audience
- How to Use This Publication
- Related Information

Purpose

This guide is for users of the Global Call API writing applications that use SS7 technology. This guide provides Global Call SS7-specific information only and should be used in conjunction with the *Global Call API Programming Guide* and the *Global Call API Library Reference* that describe the generic behavior of the Global Call API.

Intended Audience

This guide is intended for:

- Distributors
- System Integrators
- Toolkit Developers
- Independent Software Vendors (ISVs)
- Value Added Resellers (VARs)
- Original Equipment Manufacturers (OEMs)

This publication assumes that the audience is familiar with the Windows* and Linux* operating systems and has experience using the C programming language.

How to Use This Publication

Refer to this guide after you have installed the system software that includes the Global Call software.

This guide is divided into the following chapters:

- Chapter 1, "SS7 Overview" gives a brief introduction to SS7 technology for novice users.
- Chapter 2, "Global Call Architecture for SS7" describes how Global Call can be used with SS7 technology and provides an overview of the architecture.

- Chapter 4, "SS7 Call Scenarios" provides some call scenarios that are specific to SS7 technology.
- Chapter 3, "Configuration and Startup" describes how to configure the SS7 software environment and how to start a system that contains SS7 boards.
- Chapter 5, "SS7-Specific Operations" describes how to use the Global Call API to perform SS7-specific operations, such using overlap send and receive, performing continuity checks, etc.
- Chapter 6, "Building Global Call SS7 Applications" provides guidelines for building Global Call applications that use SS7 technology.
- Chapter 7, "Debugging Global Call SS7 Applications" provides information for debugging Global Call applications that use SS7 technology.
- Chapter 8, "SS7-Specific Function Information" describes the additional functionality of specific Global Call functions used with SS7 technology.
- Chapter 9, "SS7-Specific Data Structures" provides a data structure reference for SS7-specific data structures.
- Chapter 10, "SS7-Specific Error Codes and Event Cause Codes" provides descriptions of SS7-specific event cause codes.
- Chapter 11, "Supplementary Reference Information" provides supplementary information including technology references and sample configuration files.
- A Glossary and an Index can be found at the end of the document.

Related Information

Refer to the following documents and web sites when developing Global Call applications that use SS7 technology:

- *System7 ISUP Programmer's Manual*
- *System7 TUP Programmer's Manual*
- *System7 Software Environment Programmer's Manual*
- *Global Call API Library Reference*
- *Global Call API Programming Guide*
- *http://developer.intel.com/design/telecom/support/* (for technical support)
- *http://www.intel.com/network/csp/* (for product information)

Note: The SS7 stack and system documentation is available for download at *http://resource.intel.com/telecom/support/ss7/downloads/index.htm*. You will need to register with the support site to gain access to the documentation.

SS7 Overview 1

This chapter provides a brief overview of Signaling System 7 (SS7) technology. It is a high-level description of the technology and does not intend to provide details of any aspect of SS7 technology. Some references to where more detailed information can be obtained are provided.

Topics covered by this chapter include:

1.1 SS7 and Computer Telephony

Signaling System 7 (SS7) is a common-channel signaling (CCS) system that defines the procedures and protocol by which network elements (signaling points) in the public switched telephone network (PSTN) exchange information over a digital signaling network to facilitate wireline and wireless (cellular) call setup, routing and control.

In an SS7 network, control messages (packets) are routed through the network to perform call management (setup, maintenance, and termination) and network management functions. Therefore, the common-channeling signaling SS7 network is a packet-switched network, even though the network being controlled can be a circuit-switched network (PSTN).

An SS7 network is comprised of network elements connected together using signaling links. Such a network element that is capable of handling SS7 control messages is called a *Signaling Point* (SP). All signaling points in a SS7 network are identified by a unique code known as a point code.

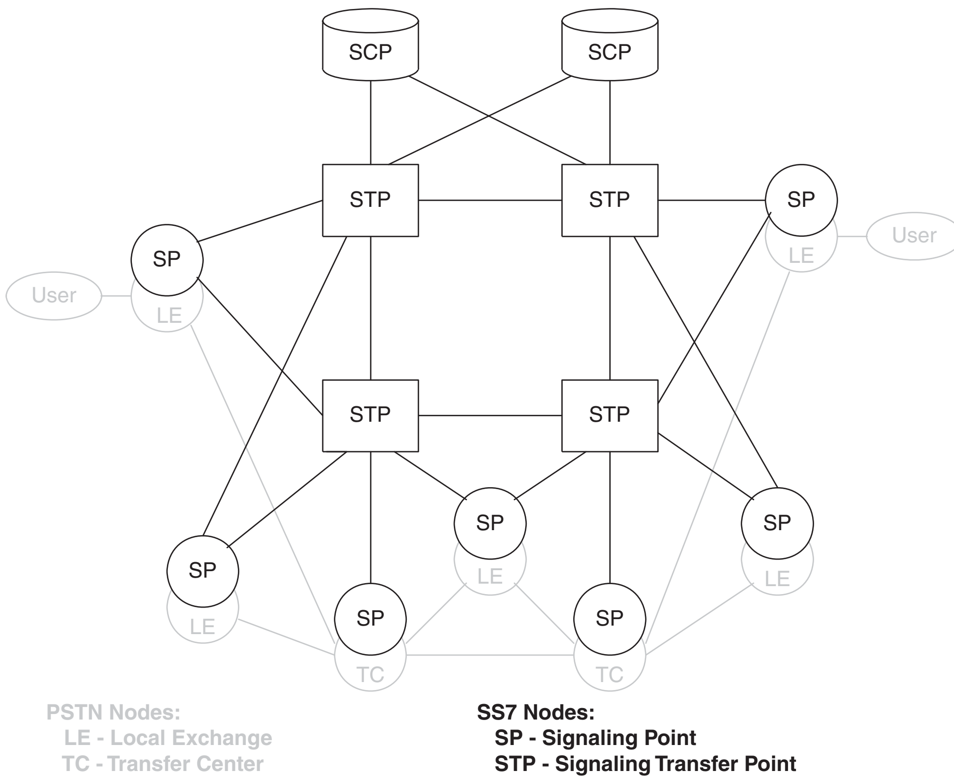
There are three different basic types of network elements:

- **Signaling Transfer Point** (STP) - A signaling point that is capable of routing control messages; that is, a message received on one signaling link is transferred to another link.
- **Service Control Point** (SCP) - Contains centralized network databases for providing enhanced services. An SCP accepts queries from an SP and returns the requested information to the originator of the query. For example, when an 800 call is initiated by a user, the originating SP sends a query to an 800 database (at the SCP) requesting information on how to route the call. The SCP returns the routing information to the SP originating the query and the call proceeds.
- **Service Switching Point** (SSP) - A signaling point in a switching office, either a local exchange or a tandem office. An SSP has the capability to control voice circuits via a voice switch. The SSP can either integrate the voice switch or can be an adjunct computer to the voice switch.

Network elements are interconnected using signaling links. A **signaling link** is a bidirectional transmission path for signaling, comprised of two data channels operating together in opposite directions at the same data rate. The standard rate on a digital transmission channel is 56 or 64 kilobits per second (kbps), although the minimum signaling rate for call control applications is 4.8 kbps. Network management applications may use bit rates lower than 4.8 kbps.

Figure 1 shows an example of an SS7 network that carries signaling information for the underlying PSTN network nodes.

Figure 1. Signaling and Information Transfer Networks



The signaling network is independent of the circuit-switched network. Signaling links can be physically located on trunks that carry voice circuits, but can also be completely independent, or even use a different transmission medium (for example, serial V.35). SSPs are the bridges between both networks.

To ensure reliable transfer of signaling information in an environment susceptible to transmission disturbances or network failures, an SS7 network employs error detection and error correction on each signaling link. An SS7 network is normally designed with redundant signaling links and includes functions for the automatic diversion of signaling traffic to alternative paths in case of link failures.

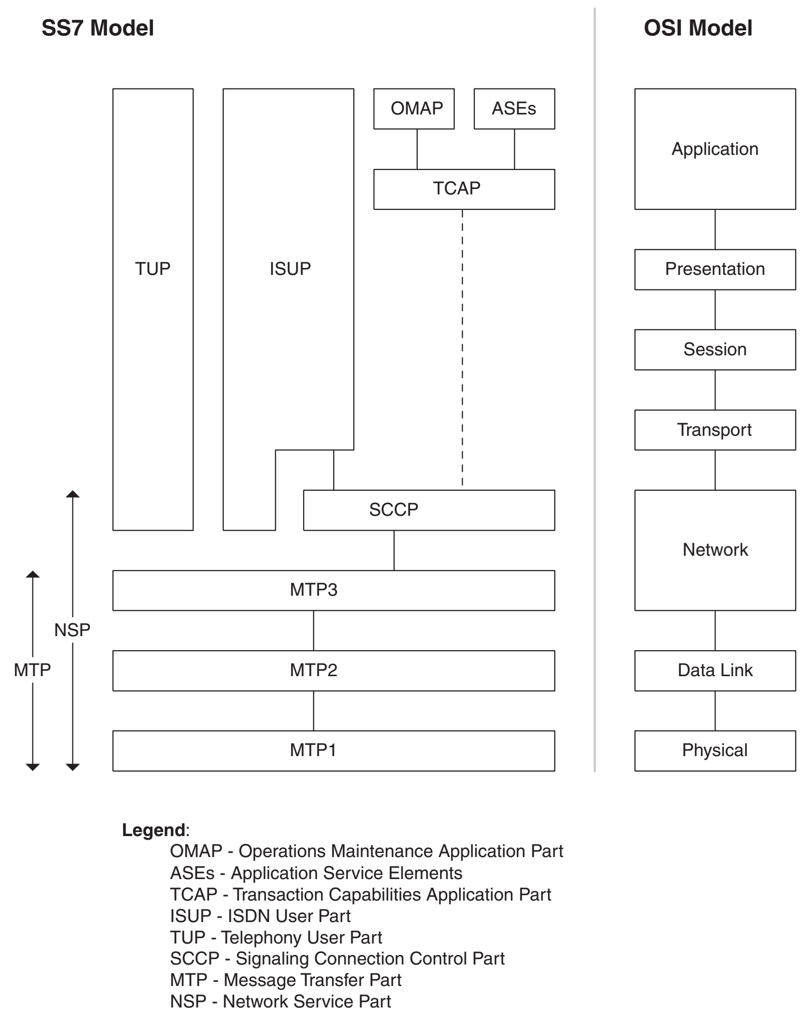
Another type of network element that appears in an Intelligent Network (IN) is the Intelligent Peripheral (IP). An IN is a service-independent telecommunications network, that is, a network in which intelligence is taken out of the switch and placed in computer nodes that are distributed throughout the network. An IP is an SP that provides enhanced services to the SSP, usually under control of an SCP. Those services range from providing user-input prompts and collecting digits to providing a complete service application.

1.2 SS7 Protocol Stack

The hardware and software functions of the SS7 protocol are divided into functional abstractions called levels. These levels map loosely to the Open Systems Interconnect (OSI) 7-layer reference model defined by the International Standards Organization (ISO). This model describes the structure for modeling the interconnection and exchange of information between users in a communications system.

Figure 2 shows the layers of the SS7 protocol stack when transporting SS7 signaling over the PSTN and how the layers relate to the layers of the OSI Model.

Figure 2. SS7 Protocol Stack Layers



1.2.1 Lower Stack Layers for SS7 Over a Circuit-Switched Network

When transporting SS7 signaling over a circuit-switched network, the lowest three levels of the SS7 stack, called the **Message Transfer Part** (MTP), provide a reliable but connectionless (datagram or packet style) service for routing messages through the SS7 network. This service is used by the various user parts described in Section 1.2.2, “Upper Stack Layers”, on page 18.

The MTP is subdivided into three parts as follows:

- **MTP1**, also called the **signaling data link** layer, is concerned with the physical and electrical characteristics of the signaling links. MTP1 corresponds to the physical layer of the OSI model.
- **MTP2**, also called the **signaling link** layer, is a data link control protocol that provides for the reliable sequenced delivery of data across a signaling data link. MTP2 corresponds to the data link layer of the OSI model.
- **MTP3**, also called the **signaling network** layer, provides for routing data across multiple STPs from control source to control destination. MTP3 corresponds to a part of the network layer of the OSI model.

The connectionless nature of the MTP provides a low-overhead facility tailored to the requirements of telephony. However, the MTP does not provide all the services of the corresponding OSI Network layer. To support Integrated Services Digital Network (ISDN) applications such as network management that requires expanded addressing capability and reliable message transfer, a separate module is provided:

- **Signaling Connection Control Part** (SCCP), defines a wide variety of network-layer services. SCCP corresponds to part of the network layer of the OSI model.

The MTP and the SCCP together form the **Network Service Part** (NSP). The resulting split in OSI network functions between MTP and SCCP has the advantage that the higher-overhead SCCP services can be used only when required, and the more efficient MTP services can be used in other applications.

1.2.2 Upper Stack Layers

The upper parts of the SS7 protocol stack are concerned with the actual contents of the SS7 messages and are sometimes called application layers. These include:

- **ISDN User Part** (ISUP), provides the signaling needed for basic ISDN circuit-mode bearer services as well as ISDN supplementary services having end-to-end significance. ISUP is the protocol that supports ISDN in the Public Switched Telephone Network. It corresponds to the transport, session, presentation, application layers and part of the network layer of the OSI model.
- **Telephony User Part** (TUP), an ISUP predecessor in providing telephony signaling functions. TUP has now been made obsolete by ISUP in most countries and in the international network. The TUP corresponds to the transport, session, presentation, application layers and part of the network layer of the OSI model.

- **Transaction Capabilities Application Part** (TCAP), provides the mechanisms for transaction-oriented (rather than connection-oriented) applications and functions. The TCAP corresponds to the application layer in the OSI model. TCAP is often used for database access by the SS7 switches but has many other applications through the network.
- **Operations and Maintenance Application Part** (OMAP), specifies network management functions and messages related to operations and maintenance. The OMAP corresponds to the application layer in the OSI model.
- **Application Service Elements** (ASEs), represent user parts that are highly application-specific, for example:
  - **Intelligent Network Application Part** (INAP)
  - **Mobile Application Part** (MAP), provides the signaling functions necessary for the mobile capabilities of voice and non-voice applications in a mobile network
  - **IS41**, an ANSI signaling standard used in cellular networks

For any application, all three MTP layers and at least one application layer are required. Typically, the word "user" in modules such as ISUP, TUP and so on explicitly identifies the module as a user of the transport mechanism MTP.

SS7 computer telephony applications that transport SS7 signaling over a circuit-switched network can use the ISUP (on top of the MTP layers) to control voice circuits, and sometimes TCAP to query for information or to receive commands from a SCP.

Global Call Architecture for SS7 2

This chapter describes the Global Call software architecture when using SS7 technology and provides a high-level description of how the Global Call API can be used to develop call control applications that use SS7. Topics include:

2.1 Using Global Call with SS7

The SS7 signaling system is a packet-switched data network that forms the backbone of the international telecommunications network. SS7 plays an important role in both wireline and wireless networks. SS7 provides two basic types of services:

- **Call Control** - SS7 provides fast and reliable common channel or out-of-band signaling for call control. At the heart of the SS7 call control function is a network of highly-reliable packet switches called Signal Transfer Points (STPs).
- **Intelligent Network** - The SS7 network enables the implementation of Intelligent Network (IN) and Advanced Intelligent Network (AIN) services. SS7 messages traverse STPs and enlist the use of System Control Points (SCPs), Service Switching Points (SSPs) and Intelligent Peripherals to deliver these services to the user.

Global Call provides a common *call control* interface for applications, regardless of the signaling protocol needed to connect to the local telephone network. This manual describes the use of Global Call to perform call control functions in a network that supports SS7 signaling.

For SS7 and other protocols, Global Call provides a higher level of abstraction for call control, shielding application developers from the need to deal with the low-level details.

Note: Global Call covers only the call control aspects of SS7. It does not provide an API for other user parts such as TCAP and INAP.

Currently, Global Call SS7 supports the ISUP protocol (ANSI version T1.609, ITU versions Q.761 to Q.764 and Q.767) and the TUP protocol.

Global Call supports the SS7 solutions implemented using Intel NetStructure SS7 hardware and software. Solutions are based on the following hardware and software components:

- SS7 Interface Boards: Intel NetStructure® PCCS6 (ISA), SS7SPCI4, SS7SPCI2S, and SS7HDP (PCI), and SS7CPM8, SS7HDCD16, SS7HDCQ16 and SS7HDCS8 (CompactPCI) boards. SS7HDCN16 is **not** supported.

- Signaling Interface Units: Intel NetStructure® SIU131, SIU231, SIU520 and SS7G2x (operating in SIU mode)
- Intel NetStructure® SS7 Protocols

Note: The PCCS6 (ISA) boards are licensed to handle either 64 or 256 circuits. The SS7SPCI4 and SS7SPCI2S (PCI) and SS7CPM8 (CompactPCI) boards can be licensed for 1024 or 4096 circuits. SS7HDP (PCI), and SS7HDCS8, SS7HDCD16 and SS7HDCQ16 (CompactPCI) boards can be licensed for 8192 or 32768 circuits. The SIUs can be licensed to handle up to 4,096 circuits for SIU131, up to 16,384 circuits for SIU231, SIU520 and SS7G21 and up to 65,535 circuits for SS7G22. Contact Intel for information about licensing.

2.1.1 SS7 Interface Boards

Intel NetStructure SS7 boards are intelligent SS7 signaling boards for use in PC-compatible computers. Intel NetStructure SS7 boards combine on-board support for the SS7 common channel signaling protocols, one, two, four or eight interfaces depending on the board type, and CT Bus local PCM time slots on a mezzanine bus. A dedicated on-board processor ensures that performance is independent of the load on the host PC. Downloadable operating software makes the board easy to upgrade when protocol specification changes are necessary.

The PCCS6 board is an ISA SS7 board with one or two E1 or T1 line interfaces, and because SS7 signaling is carried separately from the PCM stream in some situations, a V.35-compatible serial interface is also provided. The SCbus connection allows system integration with the complete set of Intel® Dialogic® solutions and a wide range of third-party voice, data, and fax products. A digital cross-connect switch allows voice and signaling channels to be connected between the line interfaces, the SCbus time slots, and the protocol processor.

The SS7SPCI4 and SS7SPCI2S boards are PCI boards that feature four T1/E1 or two T1/E1 interfaces, an H.100 PCM Highway, two serial network interfaces and four SS7 links.

The SS7HDP is an SS7 PCI board that provides up to four E1/T1 interfaces, V.11 (V.35-compatible) serial ports, an H.110 PCM Highway, and 64 SS7 links.

The SS7CPM8 is an SS7 CompactPCI board that provides up to eight E1/T1 interfaces, V.11 (V.35-compatible) serial ports, an H.110 PCM Highway, and four SS7 links.

The SS7HDCS8 is an SS7 CompactPCI board that provides up to eight E1/T1 interfaces, V.11 (V.35-compatible) serial ports, an H.110 PCM Highway and 32 SS7 links.

The SS7HDCD16 is an SS7 CompactPCI board that provides up to sixteen E1/T1 interfaces, V.11 (V.35-compatible) serial ports, an H.110 PCM Highway and 64 SS7 links.

The SS7HDCQ16 is an SS7 CompactPCI board that provides up to sixteen E1/T1 interfaces, V.11 (V.35-compatible) serial ports, an H.110 PCM Highway and 128 SS7 links.

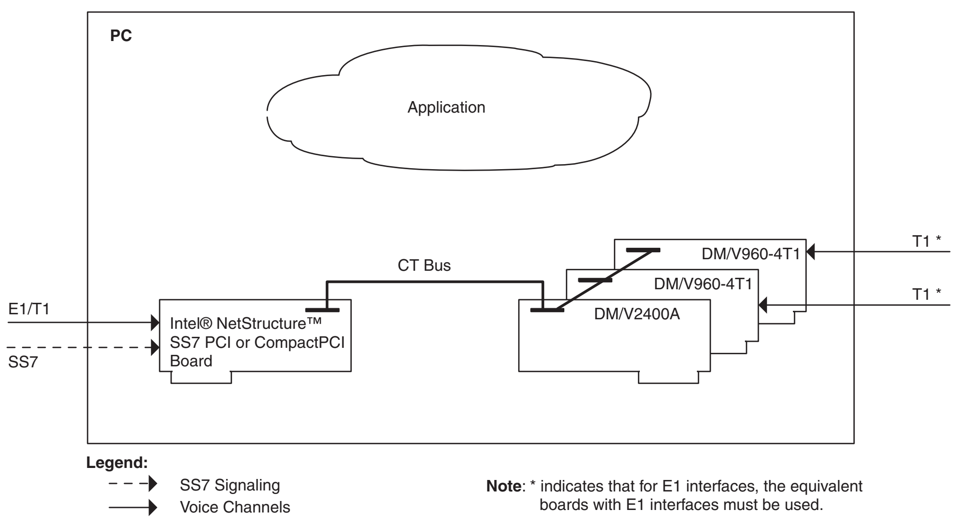
Note: Currently only one Intel NetStructure SS7 board can be used in a system.

Figure 3, Figure 4, and Figure 5 show some configurations that use an Intel NetStructure SS7 board in conjunction with Intel Dialogic boards in a single chassis that in each case supports up to 256 ports. Table 1 summarizes the features and benefits of each configuration.

Table 1. Intel NetStructure SS7 Board Configurations - Features and Benefits

Configuration	Features	Benefits
Intel NetStructure SS7 Board Configuration 1	T1/E1 line with SS7 signaling connected to the Intel NetStructure SS7 board Voice channels routed through the Intel NetStructure SS7 board via the SCbus SS7 T1/E1 managed by the Intel NetStructure SS7 board	Multiple signaling reliability with up to four signaling links
Intel NetStructure SS7 Board Configuration 2	SS7 link and bearer channels enter through Intel Dialogic network interface board T1/E1 with SS7 Signaling channel connects to a voice board The SS7 signaling is routed to the Intel NetStructure SS7 board via the SCbus	SCbus bus clocking managed via Intel Dialogic boards All voice and data resources managed by Intel Dialogic boards
Intel NetStructure SS7 Board Configuration 3	The SS7 link is connected via a synchronous V.35 connection All T1/E1 trunks (bearing voice circuits) enter through Intel Dialogic network interface boards	Separates the signaling channel from the bandwidth channels All signaling controlled using V.35 clocking via two V.11 connections on the Intel NetStructure SS7 board

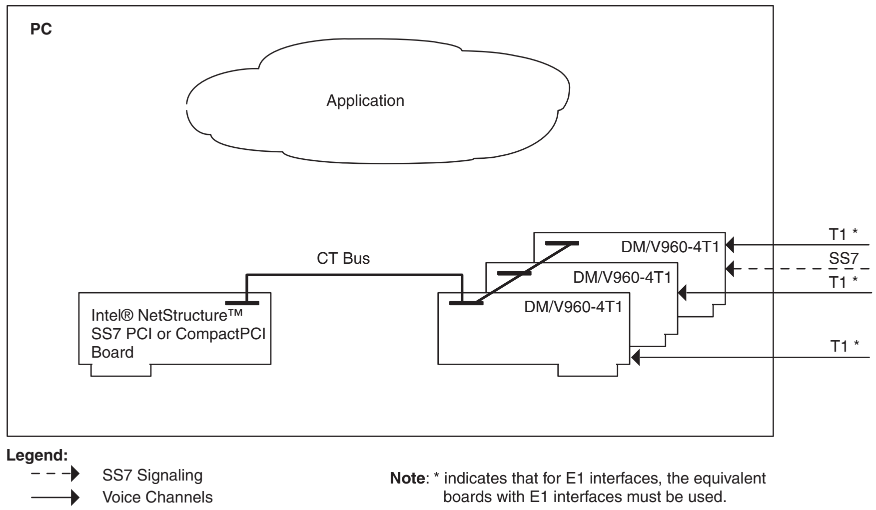
Figure 3. Intel NetStructure SS7 Board Configuration 1



The key features in this configuration are:

- The T1/E1 line with the SS7 signaling is connected to the Intel NetStructure SS7 board
- B-channels are routed through the Intel NetStructure SS7 board to voice resource via SCbus
- The SS7 T1/E1 is managed by the Intel NetStructure SS7 board
- Other T1/E1 trunks are managed by Intel Dialogic network interface boards

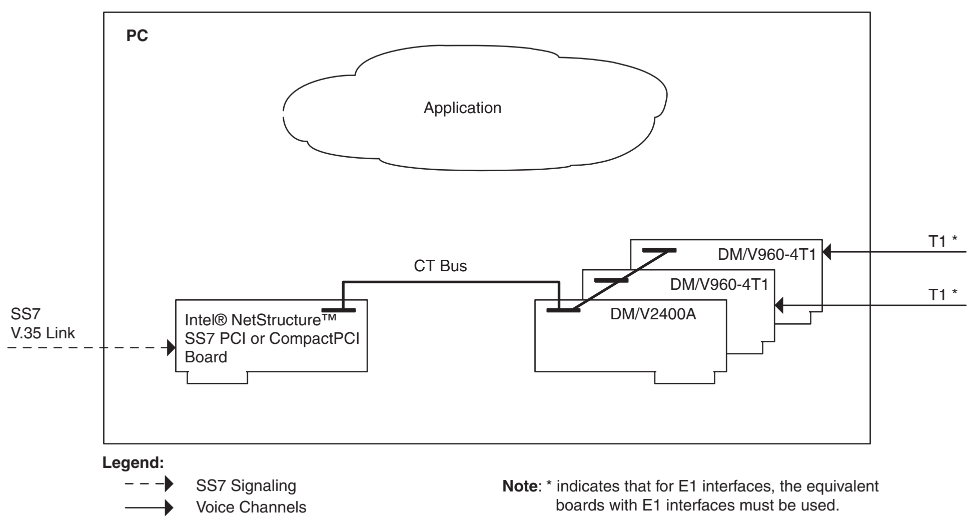
Figure 4. Intel NetStructure SS7 Board Configuration 2



The key features in this configuration are:

- SS7 link and bearer channels enter through Intel Dialogic network interface board
- All voice and data resources managed by Intel Dialogic boards
- T1/E1 with SS7 signaling connects to a voice board
- The SS7 signaling is routed to the Intel NetStructure SS7 board via the SCbus

Figure 5. Intel NetStructure SS7 Board Configuration 3



The key features in this configuration are:

- All T1/E1 trunks (bearing voice circuits) enter through Intel Dialogic network interface boards

- The SS7 link is via a synchronous V.35 connection

Note: The V.35 signaling is actually done via two V.11 ports using a using 26-pin D-type connector.

See the documentation accompanying the Intel NetStructure SS7 board for more detailed information.

Note: Global Call SS7 does **not** support multiple Intel NetStructure SS7 boards in the same system. The SIU is the preferred solution for configuring multi-board configurations.

2.1.2 Signal Interface Unit (SIU)

A *black-box* SS7 signaling server. Several models are available, the SIU131, SIU231, SIU520, SS7G21 and SS7G22. The capacity of each SIU type is shown in Table 2.

Table 2. Capacity of SIUs

	SIU131	SIU231	SIU520	SS7G21	SS7G22
Signalling cards	2	12	3	3	3**
Links	6	32	12	12	128 (max)
Linksets	6	8	12	12	64
Call Rate	100/sec.*	100/sec.*	450/sec.*	???	???

* Call rates can depend on issues in the network such as the way in which signaling is presented. The values should not be considered absolute.
** SS7HDP hig-density SS7 boards

SS7 signaling is extracted from the E1 or T1 trunks into the system and the voice circuits can be passed transparently to the outgoing E1 or T1 ports. Alternatively, signaling can be connected using V.35 serial links. Signaling information is automatically distributed by the SIU, via TCP/IP, to the host that controls the telephony circuits. Typically this is the system where the voice trunks are terminated on Intel Dialogic interface boards.

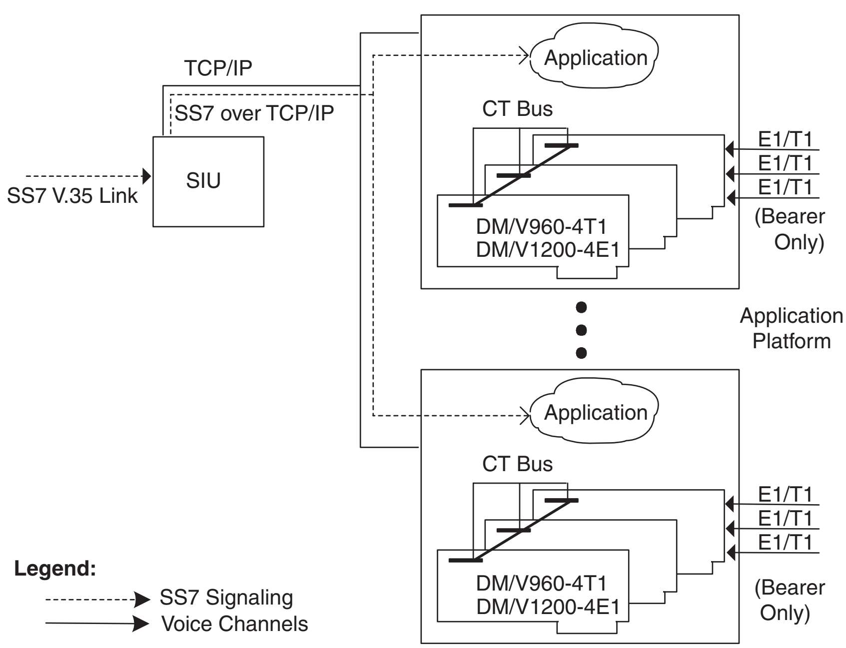
Two SIUs can be configured to share the same point code, providing fully resilient operation within a single point code. In normal operation, signaling can be load-shared across the two SIUs. Then, if one unit fails, the remaining unit handles all signaling. Multiple hosts can be connected to a single SIU, or to a resilient SIU pair, allowing large systems to be built.

Figure 6, Figure 7 and Figure 8 show some configurations using the SIU in conjunction with Intel Dialogic boards. Table 3 summarizes the features and benefits of each configuration.

Table 3. SIU Configurations - Features and Benefits

Configuration	Features	Benefits
SIU Configuration 1	V.35 SS7 connection to SIU (SIU131, SIU231, SIU520 or SS7G21) Additional T1/E1 B channels are connected to voice resources on media servers SS7 signaling terminated on an SIU SIU distributes SS7 information to media servers over TCP/IP	Manage greater number of channels than a single card Reduced maintenance cost due to smaller overhead relative to management of more circuits
SIU Configuration 2	SS7 E1/T1 connected to SIU (SIU131, SIU231, SIU520, SS7G21 or SS7G22) SS7 signaling terminated on SIU Voice channels routed through SIU via “drop and insert” E1/T1 SIU distributes SS7 information to media servers over TCP/IP	Additional T1/E1 B channels available for voice resources on media servers
SIU Configuration 3	SS7 link interconnects SIUs to provide a reliable management channel Dual SS7 links to separate SIUs SS7 distributed through a single or separate TCP/IP connection	Provides dual point code management Redundant SS7 links for back-up of signaling connections

Figure 6. SIU Configuration 1

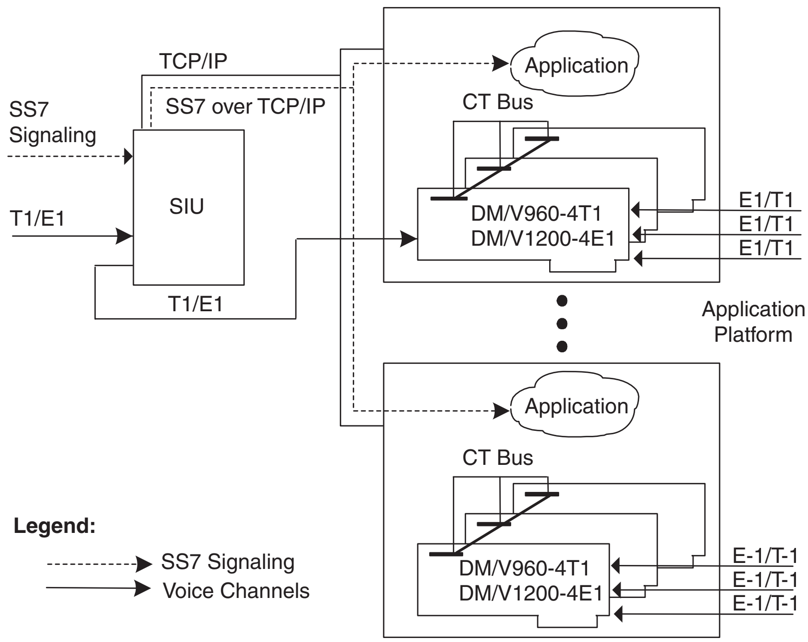


The key features in this configuration are:

- V.35 SS7 connection to SIU (SIU131, SIU231, SIU520 or SS7G21)

- T1/E1 voice channels are connected to voice resources on media servers
- SS7 signaling terminated on an SIU
- SIU distributes SS7 information to media servers over TCP/IP

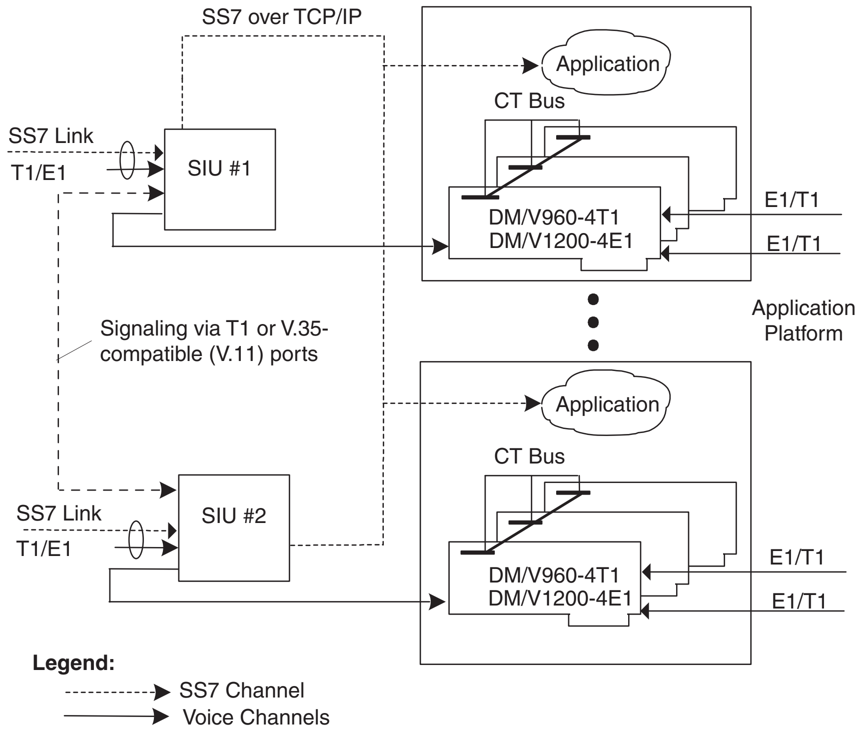
Figure 7. SIU Configuration 2



The key features in this configuration are:

- SS7 connected with E1/T1 bearer channels to SIU (SIU131, SIU231, SIU520, SS7G21 or SS7G22)
- E1/T1 voice channels connected to voice resources on media servers
- SS7 signaling terminated on SIU
- B channels routed through SIU via “drop and insert” E1/T1
- SIU distributes SS7 information to media servers over TCP/IP

Figure 8. SIU Configuration 3



The key features in this configuration are:

- SS7 link interconnects SIUs to provide a reliability management channel (for single point code management)
- Dual SS7 links to separate SIUs (for dual point-code management)
- SS7 distributed through a single or separate TCP/IP connection

Note: To arrange for this set up, you are using two T1 or E1 lines out of the SIU boards. This means that you are using one of the available slots of the SIU to pass the voice channels and signaling back out from one SIU to the other. Therefore, depending on the amount of bandwidth being administrated, you might need additional daughter boards.

See the documentation accompanying the SIU131, SIU231, SIU520, SS7G21 or SS7G22 product for more detailed information.

2.1.3 SS7 Protocol Stack

The protocol stack is the software that implements the various layers of the SS7 protocol. A suite of SS7 protocols is available and includes:

- Message Transfer Part (MTP)
- ISDN User Part (ISUP)
- Telephony User Part (TUP)

- SCCP
- TCAP

MTP is supplied with all SIUs. MTP is available as an option for the Intel NetStructure SS7 boards. Multiple country and switch variants are also available.

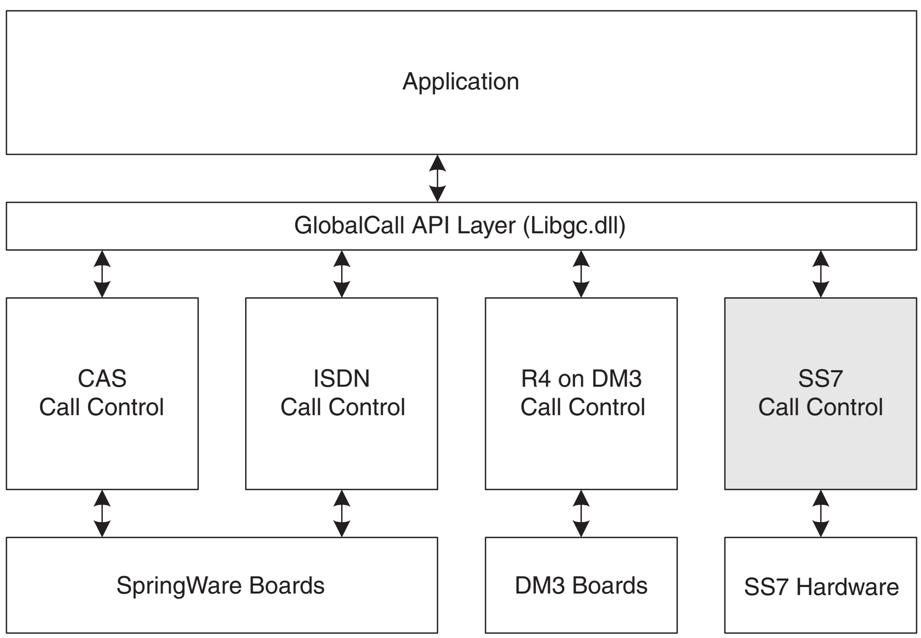
Note: MTP and ISUP or TUP run on the SIU.

Each of the user parts can run on the host. See the Intel NetStructure SS7 product documentation at *http://resource.intel.com/telecom/support/ss7/downloads/index.htm* for detailed information. Global Call SS7 currently supports the ISUP and TUP layers. However, non-call-control related user parts could be accessed using the lower-level SS7 system software environment API.

2.2 Architecture Overview

Figure 9 is a high level view of the Global Call software architecture and shows how Global Call is used to provide a common call control interface for a variety of network interface technologies including E1 CAS, T-1 Robbed Bit, analog, ISDN, R4 on DM3, and SS7.

Figure 9. Global Call Architecture



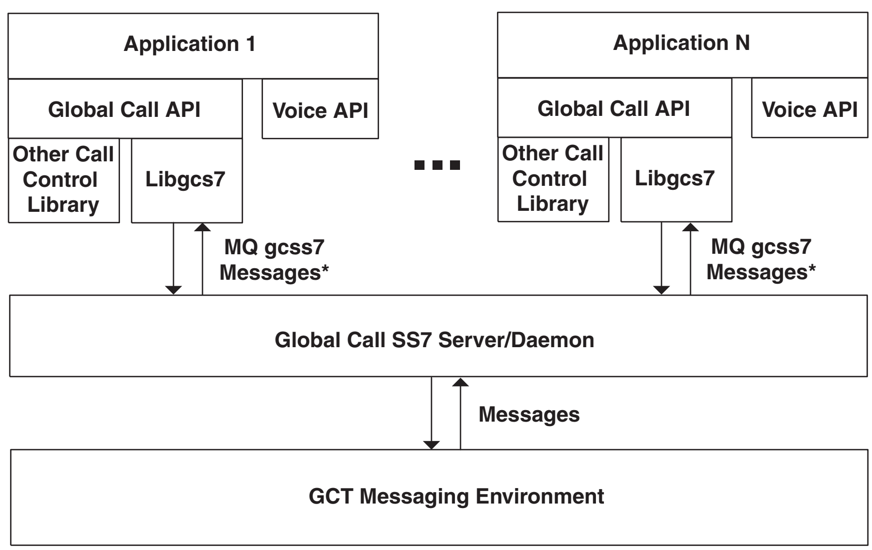
Multiple interface technologies can be mixed within a single application, allowing for example the connection to ISDN and SS7 trunks.

See the *Global Call API Programming Guide* for more information about the overall Global Call architecture.

For SS7, Global Call requires integration with the SS7 system environment software. The environment software is based on a number of communicating modules. Each module is a separate task, process, or program (depending on the operating system type) and has a unique identifier called a **module ID**. Modules communicate with each other by sending and receiving messages. Each module has a message queue for the reception of messages. This process is called Inter Process Communication (IPC). See the *SIU131/SIU231 User's Manual*, the *SIU520 Developer's Manual* or the *SS7G2x SIU Mode User Manual* for more information. See also the *SS7 Programmer's Manual for PCCS6*, the *SS7 Programmer's Manual for SPCI4, SPCI2S and CPM8* or the *SS7HD Programmer's Manual* for more information on the software environment and the *System7 Software Environment Programmer's Manual* for more information on IPC. These manuals are accessible via http://resource.intel.com/telecom/support/ss7/downloads/index.htm.

Global Call SS7 extends this architecture by providing an Intel Dialogic SS7 server module (with a configurable module ID, typically 0x4d) that can communicate with existing modules. This assignment is automatically made by the SS7 server. An example of interaction of the Global Call SS7 software components is shown in Figure 10.

Figure 10. Global Call SS7 Architecture



Note: * indicates the IPC mechanism used internally by Global Call SS7 for communication between the library and the server.

The figure shows how multiple applications can simultaneously use Global Call SS7, provided they do not attempt to control the same line devices (circuits).

The SS7 Call Control Library is called Libgcs7 and is responsible for the communication with other SS7 components in the system. Consequently, an application using Global Call SS7 does not have to care about any of the lower-level aspects and can be written to the standard Global Call API irrespective of the interface to the SS7 stack, hardware, or communication mechanisms being used. The integration with the actual SS7 stack software environment and the hardware only requires attention during the configuration phase.

For SS7, a Global Call line device maps directly to a telephony circuit in the PSTN. Calls made or received on a circuit are assigned a Call Reference Number (CRN) that is used between the application and the Global Call software to identify the call, just like any other Global Call network interface technology.

2.3 Dialogic SS7 Server

The Intel Dialogic SS7 Server is started with all other Intel Dialogic system components and is responsible for performing the following tasks:

- Reading and analyzing the system configuration (reads the files or pulls the configuration from SIU(s) via FTP when applicable)
- Performing start-up tasks, such as CT Bus transmit time slot assignments for SS7SPCI4, SS7SPCI2S or SS7HDP (PCI) and CMP8, SS7HDCS8, SS7HDCD16, or SS7HDCQ16 (CompactPCI) board systems or SCbus transmit time slot assignments for PCCS6 (ISA) board systems
- Taking care of all communications with the underlying SS7 stack
- Handling of circuits (call control, blocking/reset etc.), groups, SIU(s) and other state machines, thus hiding SS7 environment complexity from the application
- Automatic handling of dual resilient operations (circuit groups activation and transfer to partner SIU)
- Managing multiple application connections

The messages dispatched by the SS7 server are handled by Libgcs7, eventually generating standard Global Call events to the application.

In Intel NetStructure SS7 board systems, time slots that are used for voice circuits on trunks connected to the SS7 board are automatically assigned a transmit time slot on the CT Bus for SS7SPCI4, SS7SPCI2S or SS7HDP (PCI) and CMP8, SS7HDCS8, SS7HDCD16 or SS7HDCQ16 (CompactPCI) boards, or SCbus for PCCS6 (ISA) boards, allowing the application to perform routing of these time slots by using the standard set of bus routing functions, without having to care about special aspects of interconnecting Intel NetStructure SS7 boards with Intel Dialogic hardware in the system.

The SS7 signaling can be routed over the SCbus or CT Bus and passed through a digital network interface front end by the Intel Dialogic SS7 Server as well.

2.4 Global Call SS7 Library

The Global Call SS7 library (Libgcs7) is responsible for performing the following tasks:

- Executing Global Call API functions that are invoked by the application for SS7 line devices
- Sending telephony events, such as call state transitions (for example, GCEV_OFFERED, GCEV_DISCONNECTED etc.), to the application
- Communicating in both directions with the SS7 server

See Chapter 8, "SS7-Specific Function Information" for a list of supported Global Call SS7 library functions and how to use them in an SS7 environment.

2.5 SS7 Protocol Stack

The SS7 protocol stack, which consists of the ISUP/TUP layer and the MTP layers, manages the transfer of signal units (some containing messages) between the various layers of the stack and the network.

Configuration and Startup 3

Configuration of the SS7 environment and the Global Call SS7 software for operation in that environment is described in the following topics:

3.1 SS7 System Environment Configuration (system.txt)

The SS7 system environment configuration is defined by the *system.txt* file. This file is used by the GCTLOAD program to create message queues and spawn appropriate child processes.

The SS7 system software uses the concept of modules that send messages to each other. Each module has a unique **module ID**, which must be specified by other modules in order to exchange messages to each other. The module IDs that exist on the host system must be defined using LOCAL commands in the *system.txt* file. Many module IDs are predefined and the lines that specify these modules in the *system.txt* file should be left unchanged.

The command types that are found in the *system.txt* file are:

LOCAL commands

These commands are used to define the IDs.

Note: Earlier versions of the Global Call SS7 software required the inclusion of extra LOCAL commands in the *system.txt* file for each application to define the Global Call SS7 application IDs, but these are no longer required. Only the GCSS7 service module ID (typically 0x4d) should be defined in the *system.txt* file.

REDIRECT commands

These commands force the SS7 runtime system environment to redirect messages intended for a specific destination module to a different module. For example, in a Intel NetStructure® SS7 board system, this is used to redirect messages for the ISUP module to the module that interfaces with the board (ISUP is running on the board and not on the host).

Besides normal redirections for proper operation of the SS7 system software environment (see sample configuration files and the Intel NetStructure SS7 product documentation), a system configured for Global Call SS7 should redirect status and management messages to the SS7 server.

In an Intel NetStructure SS7 board system, this is done using the following lines (assuming the SS7 server uses module ID 0x4d, the default value):

```
REDIRECT 0xdf 0x4d    * LIU/MTP2 status messages
```

In an SIU based system, the command is:

```
REDIRECT 0xcf 0x4d    * management messages
```

SS7 system environment trace messages can also be directed to the Global Call SS7 server. This is convenient because it allows the synchronized logging of SS7 system environment trace messages with ISUP, management and other messages being logged in one log file. The command to redirect SS7 system environment trace messages to the Global Call SS7 server is:

```
REDIRECT 0xef 0x4d    * trace messages
```

Note: Care must be taken to ensure that there is no s7_log module running with the 0xef module ID, that is, there should not be a FORK_PROCESS ss7_log command left uncommented in the *system.txt* file. There should never be more than one module reading messages with the same module ID in the system. Failing to follow these rules will result in unpredictable results or even unstable behavior in the system.

FORK_PROCESS commands

These commands tell the GCTLOAD program to spawn child processes. For example, in an Intel NetStructure® PCCS6 (ISA) board system, this is used to start the SSD module (or the SSDS module for Intel NetStructure® SS7 CompactPCI and PCI boards) that interfaces with the board, and to start the timer modules. On SIU host systems, it can be used to launch the RSI module that is responsible for the TCP/IP communication with the SIU units. A FORK_PROCESS command can also be used to automatically start S7_LOG, a message logging tool that displays system status messages.

This tool is most useful when proving or debugging a configuration because it provides a visual indication of the PCM trunk status, the link status, and so on. However, when working with the Global Call SS7 software, it can be easier to redirect all the trace messages into the GCSS7 server's trace file and therefore have all the messages in one file with real timestamps avoiding the need to synchronize different logs for analysis. Care must be taken to avoid having several modules reading messages for the same module ID, that is, when redirecting 0xef to GCSS7 server, there should not be an S7_LOG utility running on the stem reading messages for the same 0xef module ID. See Section 7.1, "SS7 Call Control Library Trace File", on page 83 for more information.

On SIU systems, FORK_PROCESS should only be used to start the RSI module. It should not be used to issue the RSI link activation commands (RSICMD) because these are sent automatically by the SS7 server.

Note: The Intel® Dialogic® SS7 software does not require any special FORK_PROCESS commands.

It is possible to configure the SS7 server to launch the GCTLOAD program automatically. In Intel NetStructure SS7 board systems, it is necessary to add the **-i** option to the S7_MGT program in order to complete the startup sequence.

For example:

```
FORK PROCESS S7_MGT -i0x4d    * notify Dialogic SS7 service
```

Note: The module ID specified in the example shown should be that of the SS7 server.

3.2 SS7 Protocol Stack Configuration (config.txt)

The SS7 protocol stack is typically configured based on the *config.txt* configuration file.

For Intel NetStructure SS7 board systems, this file is used by the S7_MGT program, normally spawned by the GCTLOAD program. The S7_MGT program reads the *config.txt* file and sends corresponding configuration messages to the protocol stack modules.

For SIU systems, configuration is done in two stages:

- Selection of protocol modules and assignment as either SIUA or SIUB is achieved using the **CNSYS** management console command.
- Editing of SS7 protocol parameters in the *config.txt* file.

The following sections describe only aspects of the protocol stack configuration that are important for operation with the Global Call SS7 software. See the Intel NetStructure SS7 product documentation at *http://resource.intel.com/telecom/support/ss7/downloads/index.htm* for detailed explanations of all the commands in the *config.txt* file.

3.2.1 TDM Bus Configuration of Intel NetStructure SS7 Boards

For Intel NetStructure SS7 board systems that use the CT Bus (to access voice circuits on a trunk connected to an Intel NetStructure SS7 board, or for routing the SS7 signaling), the CT Bus clocking must be configured.

An Intel NetStructure SS7 board can be configured to take its clock from the CT Bus, acting as an bus “slave”, or to take it from one of its E1 interfaces and act as a bus “master”, providing the clock for all other boards on the CT bus.

For the PCCS6 (ISA) board, the `PCCS6_BOARD` command in the *config.txt* file should have its **flags** argument set as indicated in Table 4.

Table 4. SCbus Clock Configuration for PCCS6 Boards

Configuration	Flags
SCbus Slave	0x00C2
SCbus Master - clock from LIU1	0x0043
SCbus Master - clock from LIU2	0x0047
SCbus Master - Intel NetStructure SS7 board internal clock	0x0042

For the Intel NetStructure SS7 CompactPCI and PCI boards, the `SEPTELCP_BOARD` and `SEPTELPCI_BOARD` commands respectively in the *config.txt* file should have the **flags** argument set to one of the values indicated in Table 5.

Table 5. CT Bus Clock Configuration for Intel NetStructure SS7 CompactPCI and PCI Boards

Configuration	Flags
CT Bus Slave	0x00C2
CT Bus Master - clock from one of the line interfaces	0x0043
CT Bus Master - Intel NetStructure SS7 board internal clock	0x0042

Once the Intel NetStructure SS7 board has been configured, the Intel® Dialogic® configuration manager can be used to specify that the board is a TDM master. See Section 3.5, "Configuring an Intel NetStructure SS7 Board as a TDM Bus Master", on page 44 for more information.

3.2.2 MTP Configuration

When using an Intel NetStructure PCCS6 board that has links routed over the SCBus, the **stream** parameter of the MTP_LINK command must always be set to 0x12 and the **timeslot** parameter must be set in such a way that the same time slot of stream 0x12 is not used for more than one signaling link. Normally, you would start with time slot 1 for the first link and increase the number for every additional link routed over the CT Bus. For example, the following lines define two signaling links that must be routed to/from time slots 16 of dtiB1 and dtiB2 boards.

```
MTP_LINK 0  0  0  0  0  0   0x12  0x01  0x06
MTP_LINK 1  0  1  1  0  1   0x12  0x02  0x06
```

When using an Intel NetStructure SS7 PCI or CompactPCI board that has links routed over the CT Bus, the **stream** parameter should be set to 0x83, and the **timeslot** parameter should be set to 0 for the first link, 1 for the second link, 2 for the third link and 3 for the fourth link. The other parameters should be set to the correct values for the link being configured.

```
MTP_LINK 0  0  0  0  0  0   0x83    0  0x06
MTP_LINK 1  1  0  0  0  1   0x83    1  0x06
```

See the sample configuration files in Chapter 11, "Supplementary Reference Information" for more information.

In the gcss7.cfg file, the corresponding links should be configured as well as providing the correct Intel Dialogic board device names for every link being routed over the SCbus or the CT bus. For example:

```
MtpLink <link_ID> <device_name>
```

where, **<device_name>** is the Intel Dialogic DTI time slot device name (for example, dtiB1T1 or dtiB1T31) on which the SS7 signaling link is present.

For E1 lines, physical time slot 16 on a network interface (DTI) board is usually reserved for signaling, but is named dtiB1T31 (because physical time slot 17 is named dtiB1T16).

3.2.3 ISUP Configuration

There are two items that require special attention in the ISUP configuration for a system using Global Call SS7 software.

The ISUP_CONFIG command must specify in its UserID argument that the module using the ISUP component is the SS7 server. By default, the SS7 server uses module ID 0x4d.

Additionally, Global Call SS7 relies on a specific type of circuit release procedure in the ISUP module. This is the procedure recommended and it requires that bit 2 (**ISPF_ACR**) and bit 4 (**ISPF_NAI**) of the **<options>** argument of the ISUP_CONFIG command be set to 1. You must also set bit 6 (**ISPF_GSPS**) to 1 for proper generation of GCEV_BLOCKED and GCEV_UNBLOCKED events.

Consequently, a standard ISUP_CONFIG line for ITU operation looks like the following (assuming Point Code 1 and a maximum of 2 circuit groups):

```
ISUP_CONFIG 1 0x08 0x4d 0x0474 2 64
```

Also, circuit groups are defined by the ISUP_CFG_CCTGRP command in the *config.txt* file. For example:

```
* Configure ISUP circuit groups:
* ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
*                       <user_inst> <user_id> <opc> <ssf> <variant> <options2>
ISUP_CFG_CCTGRP 0 2 0x01 0x01 0x3fffffff 0x001e 0 0x4d 1 0x8 0 0
ISUP_CFG_CCTGRP 1 1 0x01 0x21 0x3fffffff 0x001e 0 0x4d 2 0x8 0 0
ISUP_CFG_CCTGRP 2 2 0x21 0x41 0x7fff7fff 0x001e 0 0x4d 1 0x8 0 0
ISUP_CFG_CCTGRP 3 1 0x21 0x61 0x7fff7fff 0x001e 0 0x4d 2 0x8 0 0
ISUP_CFG_CCTGRP 4 2 0x41 0x81 0x7fffffff 0x001e 0 0x4d 1 0x8 0 0
ISUP_CFG_CCTGRP 5 1 0x41 0xa1 0x7fffffff 0x001e 0 0x4d 2 0x8 0 0
```

Because an application that uses the Global Call API opens circuits by giving their device name (for example, dtiB1T1 for the first circuit on the first DTI board), Global Call SS7 requires that circuit groups that are being used by GCSS7 are configured in the *gcss7.cfg* file also. This is done using the following command for each circuit group:

```
CGrp <gid> <trunk_name> [<base_TS>[<Pref_SIU>]]
```

where,

<gid>
: Specifies the circuit group ID, which must match the corresponding group ID configured in the *config.txt* file.

<trunk_name>
: Specifies the physical device where the circuits in the group are terminated. This can be a reference to an Intel Dialogic digital network interface board in which case the name is of the form dtiB*x* (for example, dtiB1, dtiB2, and so on) or one of the trunks on an Intel NetStructure SS7 board in which case the name is dkB1 for the first trunk and dkB2 for the second trunk. The same name is used as a basis by the application for the network device name when it opens a Global Call SS7 device. See Section 8.2.14, "gc_OpenEx( ) Variances for SS7", on page 100 for details.

The following parameters are optional:

<base_Ts>
Specifies the first time slot of the trunk that corresponds to the first circuit of the group. This time slot number is a true physical time slot number (1-31, for E1). If omitted, the first time slot (number 1) is assumed.

Note: The **<base_Ts>** parameter is especially useful when running ANSI ISUP over E1 trunks with, for example, two groups of 15 circuits on each E1 trunk; the second circuit group would be configured with the same **<trunk_name>** as the first one, but with **<Base_Ts>**=17.

<Pref_SIU>
Specifies the default SIU for the group, that is, the SIU on which the group should be preferably active (for load-balancing). Possible values are SIUA or SIUB. This parameter is only valid for dual-resilient SIU configurations.

Each circuit group configuration command in the *gcss7.cfg* file must correspond to a circuit group configuration command line in the *config.txt* file, that is, the group ID <gid> parameters should match. For example, if the *config.txt* file contains the following circuit group definition commands:

```
* Configure ISUP circuit groups:
* ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
*                        <user_inst> <user_id> <opc> <ssf> <variant> <options2>
ISUP_CFG_CCTGRP 0 2 0x01 0x01 0x3fffffff 0x001e 0 0x4d 1 0x8 0 0
ISUP_CFG_CCTGRP 1 1 0x01 0x21 0x3fffffff 0x001e 0 0x4d 2 0x8 0 0
ISUP_CFG_CCTGRP 2 2 0x21 0x41 0x7fff7fff 0x001e 0 0x4d 1 0x8 0 0
ISUP_CFG_CCTGRP 3 1 0x21 0x61 0x7fff7fff 0x001e 0 0x4d 2 0x8 0 0
ISUP_CFG_CCTGRP 4 2 0x41 0x81 0x7fffffff 0x001e 0 0x4d 1 0x8 0 0
ISUP_CFG_CCTGRP 5 1 0x41 0xa1 0x7fffffff 0x001e 0 0x4d 2 0x8 0 0
```

The following commands are valid in the *gcss7.cfg* file:

```
# Circuit Group configuration, Group ID must match the value in config.txt.
# CGrp <gid> <"trunk_name"> [<base_TS> [<"Pref_SIU">]]
CGrp 0 dkB1 2
CGrp 1 dtiB2 2
CGrp 2 dkB2
CGrp 3 dtiB1
CGrp 4 dumB1
CGrp 5 dumB2
```

The Global Call SS7 software also supports CAL_MSG_HEARTBEAT ISUP messages. For details on how to configure the “Detection of Failed Host Applications” ISUP feature, see the *ISUP Programmer’s Manual*. When using Global Call SS7 software, it is recommended to use this feature in multiple-host SIU-based systems only.

3.2.4 TUP Configuration

TUP configuration is achieved in much the same way as the ISUP configuration described in Section 3.2.3, “ISUP Configuration”, on page 37 with the following differences:

- In the *system.txt* file, there should be a REDIRECT command for the TUP module as follow:

```
REDIRECT   0x4A   0x20   *TUP Module
```

- In the *config.txt* file, the appropriate binary should be downloaded and the corresponding license applied. The following are some examples:

  For a PCCS6 (ISA) board system:

  ```
  PCCS6_BOARD 0 0 0 0X0042 tup76.dc2
  ```

  For an Intel NetStructure SS7 PCI board system:

  ```
  SEPTELPCI_BOARD 0 0X0042 SS7.dc3 TUP-L
  ```

  For an Intel NetStructure SS7 CompactPCI board system:

  ```
  SEPTELCP_BOARD 0 0X0042 SS7.dc3 TUP-L
  ```

  See the Intel NetStructure SS7 product documentation at *http://resource.intel.com/telecom/support/ss7/downloads/index.htm* for more information.

- TUP parameters must be configured. The TUP_CONFIG command is described in the *SS7 Programmer's Manual for Septel cP/Septel PCI* and the *SS7 Programmer's Manual for Septel ISA (PCCS6)*.

  For example:

  ```
  * TUP_CONFIG <reserved> <reserved> <user_id> <options> <num_grps> <num_ccts>

  TUP_CONFIG 0 0 0x4d 0x8166 128 4096
  ```

  The **options** parameter is a 16-bit value containing global run-time options for the operation of the TUP module. The meaning of each bit is as defined for the **options** parameter in the TUP *Configuration Request* message described in the *TUP Programmer's Manual*. For Global Call SS7 to function correctly, the following bits in the options argument **must** be set:

  – bit 5 (TUPF_GSPS)

  – bit 6 (TUPF_ACR)

  – bit 15 (TUPF_NAI)

- Circuit groups are configured using the TUP_CFG_CCTGRP command (instead of the ISUP_CFG_CCTGRP command for ISUP) and each corresponding circuit group used by the Global Call SS7 must also be configured in the *gcss7.cfg* file. See Section 3.2.3, "ISUP Configuration", on page 37 for an example.

3.3 Global Call SS7 Software Configuration (gcss7.cfg)

The Global Call SS7 software is configured by editing the *gcss7.cfg* file. The *gcss7.cfg* file is organized in sections where each section contains the parameters for a specific functional group. See Section 11.2, "Sample gcss7.cfg Configuration File", on page 122 for more information.

System Configuration Type Parameter

System.Configuration

Specifies the type of system operation. Allowed values are: "None", "Card", "SIU", "DualSIU". The default value is "None", that is, at startup, there will be no attempt to start a GCSS7 server (*dlgcs7d* on Linux* systems, *DlgcS7Srv.exe* on Windows* systems).

Global Call SS7 Call Control Library Parameters

Library.LogFile
Enables library logging to be activated on the first call to **gc_OpenEx( )** on an SS7 circuit with the trace file named as specified by the value of this parameter. The default trace file name is *ss7.log*.

Library.LogLevels
Controls the generation of library logging information. If set to All, the library will produce a log file that can be very useful in troubleshooting a system. The default value is All.

Library.LogMaxLines
Limits the maximum length of a library log file to the value specified in kilobytes. The default value is 200.

SS7 Service/Daemon Parameters

Service.LogLevels
Controls the generation of SS7 server logging information. If set to All, the SS7 server will produce a log file that can be very useful in troubleshooting a system. See Section 7.2, "SS7 Server Log File", on page 84 for more on this topic. The default value is All.

Service.LogMaxSize
Limits the maximum length of an SS7 server's log file to the value specified in kilobytes. The default value is 200.

Service.GCTLOAD_Control
Determines if the GCTLOAD program should run automatically at startup. If set to Yes, the SS7 server will try to start the GCTLOAD program automatically. The default value is No.

Note: This option should only be used **after** you have adapted and fully tested your configuration since the GCTLOAD window, which provides very useful configuration debugging information, is no longer displayed when this option is enabled.

Service.GCTLOAD_Path
Contains the path to the GCTLOAD program file. This field must be set if the **GCTLOAD Control** parameter is set to Yes. The default value is *c:\septel* (Windows) or */usr/septel* (Linux).

Service.ModuleID
Defines the module ID used by the SS7 server. This must be one of the module IDs declared LOCAL in the *system.txt* file. Default value: 0x4d. See Section 3.1, "SS7 System Environment Configuration (system.txt)", on page 33.

Service.GroupCommandTimer
Defines the time interval to accumulate circuit group supervision requests (for example, reset, block or unblock) for a circuit group. The default value is 500. Units are in milliseconds.

Service.IgnoreBCI
Inhibits the Global Call SS7 software from analyzing the Backward Call Indicator (BCI) in incoming ACM messages and alerting the application of the call only when the "Called party's status indicator" fields are set to "Subscriber Free". When this parameter is set to 1, the Global Call SS7 software ignores the BCI content and always sends the GCEV_ALERTING event to the application in response to an incoming ACM ISUP message. The parameter setting applies

to all circuits that are being controlled by a specific host. The value specified by this parameter can be considered the default for the **GCPR_IGNORE_BCI** parameter that can be set using the **gc_SetParm( )** function (see Section 8.2.21, "gc_SetParm( ) Variances for SS7", on page 102). The default value is 0.

Service.CleanCidBit15
Recent versions of ISUP and TUP support up to 65,535 circuits per module, which means that a 16-bit wide CID is necessary to address all of the configured circuits. The default value of this parameter supports a backward-compatibility mode when the most significant bit is ignored by the GCSS7 service. The default value is 1.

Intel NetStructure SS7 Board Configuration Parameters

SeptelCard.ConfigDir
The path to the *config.txt* file. The default value is "c:\septel" (Windows) or "/usr/septel" (Linux).

SeptelCard.Auto_Links_Activation
Determines if MTP links should be activated automatically. Possible values are: All and None. The default value is "All".

Note: The term "septel" in configuration files relates to Intel NetStructure SS7 boards.

SIU Configuration Parameters

SIUA.HostID
The host ID of the machine. If there is only one host connected to the SIU(s), select ID 0. The default value is 0.

SIU.A.IP_Address
Defines the IP address of SIU A. The format of the IP address is 111.112.113.114.

SIU.A.FTP_Account
Defines the account name to be used when connecting to SIU A via FTP. The default name is "ftp". For SIU520, SS7G21 and SS7G22, the default name should be set to "siuftp".

SIU.A.FTP_Password
Defines the account password to be used when connecting to SIU A via FTP. The default value is "ftp". For SIU520, SS7G21 and SS7G22, the default password should be set to "siuftp".

SIU.A.RemoteConfigDir
Defines the directory on SIU A in which the *config.txt* file is located. The default value is "." (the dot character).

SIU.InitTimeout
Defines the maximum time that the SS7 server will wait at startup for an SIU to come on-line before considering it as being down. The default value is 10 seconds.

SIU.FTP_Timeout
Defines the maximum time to wait for a response from an SIU while getting the *config.txt* file via FTP. The default value is 5 seconds.

Note: Currently, the **SIU.FTP_Timeout** parameter is not configurable for Linux systems. The Global Call SS7 software relies on the default ftp client timeout value.

SIU.FTP_Retries
Defines the number of times the Intel Dialogic SS7 server will reattempt to get the *config.txt* file from an SIU. The default value is 2 attempts.

Note: Currently, the **SIU.FTP_Retries** parameter is not configurable for Linux systems. The Global Call SS7 software relies on the default ftp client retries value.

SIU.ConfigureRsiLinks
Enables/disables the generation of the RSI_MSG_CONFIG message by the GCSS7 service. When set to 0, RSI_MSG_CONFIG messages from the GCSS7 service are disabled, allowing other applications that need to receive RSI status messages to co-exist with the Global Call SS7 software. The default value is 1 (enable).

Note: For the GCSS7 service to function correctly with another application, that application must forward all RSI messages to the GCSS7 service, which typically has the 0x4d module ID.

Dual-Resilient SIU Configuration Parameters

SIU.B.IP_Address
Defines the IP address of SIU B. The format of the IP address is 111.112.113.114.

SIU.B.FTP_Account
Defines the account name to be used when connecting to SIU B via FTP. The default name is "ftp". For SIU520, SS7G21 and SS7G22, the default name should be set to "siuftp".

SIU.B.FTP_Password
Defines the account password to be used when connecting to SIU B via FTP. The default value is "ftp". For SIU520, SS7G21 and SS7G22, the default password should be set to "siuftp".

SIU.B.RemoteConfigDir
defines the directory on SIU B in which the config.txt file is located. The default value is "." (the dot character).

SIU.Dual.SiuCommandTimeout
Specifies the timeout value to use when waiting for group activation or deactivation command responses from an SIU. The default value is 5 seconds.

SIU.Dual.SiuUpDebounceTime
Specifies the time to use when detecting SIU availability. This debounce avoids undertaking unnecessary actions in case of intermittent TCP/IP connection failures. The default value is 8 seconds.

SIU.Dual.MaxCmdRetries
Specifies the maximum number of times the SS7 server reattempts sending a group (de)activation command to an SIU before declaring failure. A resend is required when the SIU is already performing a command for another host system. The default value is 5 attempts.

SIU.Dual.TolerateCallTime

This parameter specifies the maximum amount of time (in seconds) for which the service keeps calls in speech after control of a circuit group is transferred to another unit due to SIU and/or RSI failure or restoration. This feature allows the complete restoration of the system's normal functionality after any failure event on unit(s) or RSI link(s). The functionality covers all cases of glare where the GCSS7 service does not receive or process the REL message from the stack caused by RSI or SIU failure and recovery. The format of this parameter is Integer. The default value is 600 seconds; 0 means the feature is off.

Note: All the parameters for a single SIU configuration are applicable to a dual-resilient system also.

config.txt Related Parameters

MtpLink <link_id> <"link_source">

Identifies the MTP link source and link ID and must match the corresponding information in the *config.txt* file.

CGrp <gid> <"trunk_name"> [<base_TS> [<"Pref_SIU">]]

Identifies circuit group configuration and group ID and must match the corresponding information in the *config.txt* file.

- **<gid> –** Specifies the circuit group ID.
- **<"trunk_name"> –** Specifies the physical device where the circuits in the group are terminated. This can be a reference to an Intel Dialogic digital network interface board in which case the name is of the form dtiB*x* (for example, dtiB1, dtiB2, and so on) or one of the trunks on an Intel NetStructure SS7 board in which case the name is dkB1 for the first trunk and dkB2 for the second trunk. The same name is used as a basis by the application for the network device name when it opens a Global Call SS7 device. See Section 8.2.14, "gc_OpenEx( ) Variances for SS7", on page 100 for details.
- **<base_Ts> –** An optional parameter that specifies the first time slot of the trunk that corresponds to the first circuit of the group. This time slot number is a true physical time slot number (1-31, for E1). If omitted, the first time slot (number 1) is assumed.
- **<Pref_SIU> –** An optional parameter that specifies the default SIU for the group, that is, the SIU on which the group should be preferably active (for load-balancing). Possible values are SIUA or SIUB. This parameter is only valid for dual-resilient SIU configurations.

Note: The **<base_Ts>** parameter is especially useful when running ANSI ISUP over E1 trunks with, for example, two groups of 15 circuits on each E1 trunk; the second circuit group would be configured with the same **<trunk_name>** as the first one, but with **<Base_Ts>**=17.

3.4 Viewing Parameter Values With the Intel Dialogic Configuration Manager

Caution: Using the Intel Dialogic configuration manager to set parameters for Intel NetStructure SS7 boards or SIUs is **not** supported. However, the Intel Dialogic configuration manager can be used to view the values of a number of key configuration parameters, such as the path to the *gcss7.cfg* file and the IP addresses for SIUs.

Note: The Intel Dialogic configuration manager **cannot** be used to manually add an Intel NetStructure SS7 board or SIU. Always allow the Intel Dialogic system service to detect devices automatically.

SS7 Board Parameters

In the Intel Dialogic configuration manager main windows, double-click on an Intel NetStructure SS7 board device to open the property sheets for that device.

The **System** property sheet, that is specific to SS7 boards, contains the following property:

ConfigFile
: Displays the path to the *gcss7.cfg* file that contains configurable parameters.

SIU Parameters

In the Intel Dialogic configuration manager main windows, double-click on an Intel NetStructure® SIU device to open the property sheets for that device. The property sheets window contains three property sheets that are specific to SS7 SIUs.

The **System** property sheet contains the following property:

ConfigFile
: Displays the path to the *gcss7.cfg* file that contains configurable parameters.

The **SIU Server** property sheet contains the following parameter:

SIU A IP Address
: Defines the IP address of SIU A. The format of the IP address is 111.112.113.114.

The **Dual Resilient** property sheet contains the following parameter:

SIU B IP Address
: Defines the IP address of SIU B. The format of the IP address is 111.112.113.114.

3.5 Configuring an Intel NetStructure SS7 Board as a TDM Bus Master

To configure an Intel NetStructure SS7 board as a TDM bus master, the *config.txt* file must be modified (see Section 3.2.1, “TDM Bus Configuration of Intel NetStructure SS7 Boards”, on page 35).

On Linux Systems

When using Intel® Dialogic® System Release 6.1 for Linux or later, to configure an SS7 board as the primary TDM bus master, it is necessary to set the clock daemon mode to PASSIVE (by default, the mode is set to ACTIVE). Proceed as follows:

1. Open the */usr/dialogic/cfg/dlgsys.cfg* file.
2. Change the **ClockDaemonMode** field to PASSIVE.

The updated file should look like the following:

```
; Copyright (C) 2004.  Intel Corporation. All Rights Reserved.

; Intel Dialogic System-wide Configuration File

; The following parameters are currently supported.
; ClockDaemonMode
;    ACTIVE     - Clock Daemon is started
;    PASSIVE    - Clock Daemon is started in passive mode
;    DISABLED   - Clock Daemon is not started

[TDMBus 0] {
    ;ClockDaemonMode          : ACTIVE
    ClockDaemonMode          : PASSIVE
}
```

The update above applies to all mixed system configurations when making an SS7 board the primary TDM bus master. These include:

- SS7 and DM3 boards in a mixed system configuration
- SS7 and Springware boards in a mixed system configuration
- SS7, DM3 and Springware in a mixed system configuration

The update also applies in systems where a third-party board is the TDM bus master irrespective of the mix of SS7, DM3 and Springware boards in the system.

Note: When Springware boards are included in a mixed system, it is important to ensure that all Springware boards are configured in SLAVE clocking mode, otherwise, two boards will be configured as TDM bus master in the system. For DM3 boards, it is not as important to ensure that all DM3 boards are configured in SLAVE clocking mode, because the clocking daemon in PASSIVE mode esnures that all DM3 boards are in SLAVE clocking mode.

To ensure that each Springware board is set in SLAVE clocking mode, check that the **PrimaryMaster** field in the *./usr/dialogic/cfg/dialogic.cfg* configuration file is set to NONE for each Springware board.

If a DM3 or Springware board is the primary TDM bus master, with the SS7 board as a TDM slave, the **ClockDaemonMode** parameter in the */usr/dialogic/cfg/dlgsys.cfg* file must be set to ACTIVE.

On Windows Systems

When the Intel Dialogic configuration manager is invoked, it is possible to set the Intel NetStructure SS7 board as the primary master FRU. This is achieved as follows:

1. In the Intel Dialogic configuration manager, double-click on **Configured Devices**.
2. Double-click on **TDM Bus**.
3. Double-click on **Bus-0** to open the Properties window.
4. Scroll down and click on **Primary Master FRU (User Defined)**.

5. In the **Values** field, choose the name of the SS7 board that you want to be the CT Bus master.
6. Click **OK**, then close the Intel Dialogic configuration manager.

Caution: If an Intel NetStructure SS7 board is a CT Bus master and it is being removed from the Intel Dialogic configuration manager configuration or the system, it is imperative to set another board as the CT Bus master **before** making the configuration changes or removing the Intel NetStructure SS7 board from the system.

3.6 Starting an Intel NetStructure SS7 Board System

The Intel Dialogic system service downloads the required firmware to Intel Dialogic boards, starts all Intel Dialogic device drivers, and assigns CT Bus time slots.

Starting the system involves two steps:

1. Start the SS7 system environment. This involves starting the `gctload` program, which sets up the IPC (Inter Process Communication) and messaging system.

   The gctload program also launches the s7_mgt program that reads the *config.txt*, downloads the specified firmware to the board and configures the stack as specified in the *config.txt* file.

2. Start the Intel Dialogic system service that automatically performs all initialization steps required by the Global Call SS7 system (excluding the preceding step 1).

Note: Starting the `gctload` program can be done manually by launching the gctload program from the */usr/septel* directory on Linux* systems or the *c:\Septel* directory on Windows* systems. It can also be started automatically during the Intel Dialogic system service startup as controlled by the **GCTLOAD_Control** setting in the gc*ss7.cfg* file. See Section 3.3, “Global Call SS7 Software Configuration (gcss7.cfg)”, on page 39 for more information.

3.7 Starting an SIU-based System

When you start an SIU-based system, the Intel Dialogic system service downloads the required firmware to Intel Dialogic boards, starts all Intel Dialogic device drivers, and assigns time slots.

Caution: At least one SIU must be up and running when you start the service. This is required because the configuration is read from the SIU.

Starting the system involves two steps:

1. Start the SS7 system software environment. This involves starting the `gctload` program, which sets up the IPC (Inter Process Communication) and messaging system.

   If the *system.txt* file is correctly configured, the `gctload` program loads the RSI module responsible for communicating with the server(s). However, the actual connection to the server(s) is made by the Intel Dialogic SS7 server.

2. Start the Intel Dialogic system service that automatically performs all initialization steps required by the Global Call SS7 system.

Note: Starting the `gctload` program can be done manually by launching the gctload program from the */usr/septel* directory in Linux* systems or the *c:\Septel* directory in Windows* systems. It can also be started automatically during the Intel Dialogic system service startup as controlled by the **GCTLOAD_Control** setting in the *gcss7.cfg* file. See Section 3.3, "Global Call SS7 Software Configuration (gcss7.cfg)", on page 39 for more information.

3.8 Troubleshooting

This section provides information on troubleshooting problems encountered when configuring and starting up a system. Topics include:

- Proving the Configuration
- Common Problems and Solutions

3.8.1 Proving the Configuration

An important step in troubleshooting a Global Call SS7 system is proving the SS7 stack configuration and the SS7 network connection (links), independently of any Intel Dialogic component.

3.8.1.1 Intel NetStructure SS7 Board Systems

Verify an Intel NetStructure SS7 board system configuration as follows:

1. Depending on the type of Intel NetStructure SS7 board being used, add debug flags to the *system.txt* file as follows:

   For PCCS6 (ISA) board systems: Add debugging flags to SSD and S7_MGT modules and make sure S7_LOG is launched:

```
FORK_PROCESS   .\SSD.EXE -d
FORK_PROCESS   .\SSD_POLL.EXE
FORK_PROCESS   .\TIM_NT.EXE
FORK_PROCESS   .\TICK_NT.EXE
FORK_PROCESS   .\S7_MGT.EXE -d
FORK_PROCESS   .\S7_LOG.EXE -m0xef
```

   For Intel NetStructure SS7 CompactPCI and PCI board systems: Add debugging flags to SSD and S7_MGT modules and make sure S7_LOG is launched:

```
FORK_PROCESS   .\SSDS.EXE -d
FORK_PROCESS   .\TIM_NT.EXE
FORK_PROCESS   .\TICK_NT.EXE
FORK_PROCESS   .\S7_MGT.EXE -d
FORK_PROCESS   .\S7_LOG.EXE -m0xef
```

2. Start GCTLOAD and watch out for any error message (for example, "Timeout waiting for…"). A first part of the boot sequence should show messages similar to the following:

```
(61)gctload: Initialisation complete

S7_log : mod ID=0xef, options=0xaf0d
S7MGT >> M-t7f0f-i0000-fcf-dcf-s00-p(8)00ff000000000000
S7MGT << M-t7f0f-i0000-fcf-dcf-s00-p(8)00ff000000000000
S7MGT >> M-t7680-i0000-fcf-d20-s00-p(24)200000cf70637337332e646331000000000
0000000000010
ssd : 16 boards
S7MGT << M-t3680-i0000-fcf-dcf-s00-p(24)200000cf70637337332e646331000000000
0000000000010
S7MGT >> M-t7681-i0000-fcf-d20-s00-p(24)0001000000006973757037362e646332000
0000000000000
ssd[0] : pccs6
ssd[0] : reset requested
S7MGT << M-t3681-i0000-fcf-dcf-s00-p(24)0001000000006973757037362e646332000
0000000000000
ssd[0] : code download requested
ssd[0] : code download started(isup76.dc2)
ssd[0] : code download complete
ssd[0] : run requested
ssd[0] : running
```

If a "Timer expiry" message is displayed after the "ssd[0] : reset requested" line above, it is likely that the I/O settings are incorrect. Try different I/O port and/or SRAM address settings. These settings can be changed using the PCCSXCFG tool as described in the *SS7 Programmer's Manual for PCCS6*. Remember that the I/O port value must also be changed accordingly on the SW1 switch on the board.

If a "Reset failed" message is displayed on the console, check that the PCCS device is started. In Windows systems, Open the "Devices" part of the Windows NT Control Panel and check the status of the PCCS device. The PCCS device is started when you run the PCCSXCFG toll. However, the PCCS device is set to manual mode and is consequently not restarted when you reboot your system. It is recommended to change the startup mode to Automatic.

For Intel NetStructure CompactPCI and PCI boards, there should be an Intel NetStructure SS7 device. In Windows 2000, right click on **My Computer**, then choose **Manage** to open the **Computer Management** dialog. Select **Device Manager**, then choose **Show hidden devices** from the **View** menu. Under **Non-Plug and Play Drivers**, there should be an Intel NetStructure SS7 device and you can check if it has started or not.

Note: If an Intel NetStructure SS7 device does not appear in the **Non-Plug and Play Drivers** list, type `net start Septel` at the command line.

At this point, the last thing you should see on the console is "**S7_MGT Boot Complete**" and a final S7_MGT message:

```
S7MGT << M-t3311-i0001-fcf-dcf-s00-p(16)00010171000100060000000000000000
S7MGT >> M-t7312-i0000-fcf-d22-s00-p(32)00000002000000000000002000000000000
00000000000000000000000000000
S7MGT << M-t3312-i0000-fcf-dcf-s00-p(32)00000002000000000000002000000000000
00000000000000000000000000000
S7MGT >> M-t7700-i0000-fcf-d23-s00-p(40)0475234d4d22004d0001000a00020040011
085000000000000000000000000000000000000000000
S7MGT << M-t3700-i0000-fcf-dcf-s00-p(40)0475234d4d22004d0001000a00020040011
085000000000000000000000000000000000000000000
S7MGT >> M-t7701-i0000-fcf-d23-s00-p(30)000000010000000200010001 7fff7fff001e
000000000000000000000000
S7MGT << M-t3701-i0000-fcf-dcf-s00-p(30)000000010000000200010001 7fff7fff001e
000000000000000000000000
S7MGT >> M-t7701-i0001-fcf-d23-s00-p(30)00000001000000020021002 17fff7fff001e
```

```
000000000000000000000000
S7MGT << M-t3701-i0001-fcf-dcf-s00-p(30)00000001000000002002100217fff7fff001e
000000000000000000000000

        ****************************
        *   S7_MGT Boot complete   *
        ****************************

S7MGT << M-t3f0f-i0000-fcf-dcf-s00-p(8)00ff000000000000
```

3. Check that all messages on this last screen have a status of 0, indicating success. The status is indicated as `-sXX` in each message, where XX is an hexadecimal number.

4. If, instead of the “S7_MGT Boot complete” message, you receive an “S7_MGT: Timeout occurred” message, check that the firmware you have specified in your *config.txt* file corresponds to the license button installed on the board.

5. Activate the MTP link(s) using the MTPSL tool (assuming linkset id 0 and link 0):

   ```
   MTPSL ACT 0 0
   ```

   If the MTP link is configured properly and activated at the adjacent point code and your system is properly clocked (this might require that Intel Dialogic boards be downloaded if the PCCS6 (ISA) board is taking its clock from the SCbus), you should see messages similar to the ones below. The important thing to check for is the presence of “Destination available”.

   ```
   S7L:I00 MTP Event : linkset_id/link_ref=0000 Changeback
   S7L:I00 MTP Event : linkset_id=00 Link set recovered
   S7L:I00 MTP Event : linkset_id=00 Adjacent SP accessible
   S7L:I00 MTP Event : point code=00000002
    Destination available
   ```

   If no other message appears on the console after a couple of minutes, you can reasonably assume that your configuration is correct.

3.8.1.2 SIU Systems

For proving the configuration of an SIU based system, follow the steps described in this section. This description assumes a single host system connected to a single SIU.

1. Check that your *system.txt* file on the host system contains all standard LOCAL module definitions and the following FORK_PROCESS commands:

   ```
   FORK_PROCESS   .\S7_LOG.EXE -m0xef
   FORK_PROCESS   .\RSI.EXE -r.\RSI_LNK.EXE -l1
   ```

2. Run GCTLOAD and power up the SIU.

3. Establish the TCP/IP link with the SIU using the following command (where <SIU_IP_Address> is the actual IP address assigned to the SIU):

   ```
   RSICMD.EXE 0 0xef 0 <SIU_IP_Address> 9000
   ```

   When the SIU is booted, you should see the following messages on the S7_LOG screen (where GCTLOAD is running):

```
S7L:I00 RSI_MSG_LNK_STATUS : Link 0 now down
S7L:I00 RSI_MSG_LNK_STATUS : Link 0 now up
```

The second message indicates that the host system is able to communicate with the SIU. If the link remains down, check that all LEDs on the SIU are lit. Also check the IP address of the SIU by doing a **ping** to it. If not all the LEDs are lit before establishing the TCP/IP link, it may indicate a mistake in the configuration of the SIU (*config.txt* or system settings) or a hardware problem. See the documentation for the specific SIU model for more information on diagnosing and solving such problems.

Once the TCP/IP link between the host system and the SIU is established, the SIU will start activating its MTP links. Messages similar to the following ones should appear on the console:

```
S7L:I00 Level 2 State : id=0 INITIAL ALIGNMENT
S7L:I00 Level 2 State : id=0 ALIGNED READY
S7L:I00 Level 2 State : id=0 IN SERVICE
S7L:I00 MTP Event : linkset_id/link_ref=0000 Changeback
S7L:I00 MTP Resume, dpc=00000001
```

The last message indicates that the destination point code (00000001 in this example) is reachable. If you do not see this and the link is activated at the adjacent point code, check the *config.txt* file on the SIU. Start by checking the point codes, the Signaling Link Code (SLC) and Sub-Service Field (SSF) parameters.

3.8.2 Common Problems and Solutions

The following paragraphs list mistakes that are often made while installing and configuring a Global Call SS7 system. The symptoms are described together with suggested approach to fix the problem.

3.8.2.1 Intel® Dialogic® SS7 Server Fails to Start

The Global Call SS7 server returns a meaningful error code when it fails to start. The relevant error codes in this context are given in Table 6.

Table 6. Error Codes for SS7 Server Start Failure

Error Code	Description
0x5001	Error reading configuration; phase A: SYSTEM (*gcss7.cfg*).
0x5002	Error reading configuration; phase B: SEPTEL (*config.txt*)
0x5003	Error starting the GCTLOAD program
0x5007	Failed to attach to GCT messaging environment
0x5009	Unable to initialize SIU(s) correctly.
0x500a	Error initializing CardController, phase A; ReserveTimeSlotRange(m_numTS) if needed.
0x500b	Error initializing CardController, phase B; load DTI, activate links, route CT Bus etc.
0x500c	Failed to create QMsg messaging environment

Table 6. Error Codes for SS7 Server Start Failure (Continued)

Error Code	Description
0x500d	Error creating final Init thread (Windows only)
0x500e	Timeout waiting for DSS (Dialogic services)

In Windows* systems, view the system log using the NT Event Viewer. If there are several error events, locate the one that happened first in time, it is likely to be the one with the more precise description of the failure. Other error events are usually consequences of the first one.

Note: It is always helpful to check the contents of the *DlgcS7.log* file in case the server fails to start.

3.8.2.2 Intel Dialogic SS7 Server Consumes 100% of the CPU Cycles

Check that the module ID for the SS7 server is correctly defined as a LOCAL module ID in the *gcss7.cfg* file.

3.8.2.3 Intel Dialogic SS7 Server Hangs During Startup

During startup, the SS7 server retrieves the *config.txt* file from the SIU via ftp. Currently, the Global Call SS7 software for Linux uses the system's default ftp-client timeout and retries values. The timeout could be significant, up to three minutes. One of the possible reasons for ftp to fail and consequently force the SS7 server to wait for a long time is an incorrect IP configuration setting for the SIU.

If the SIU and the host are in different subnets and the subnet mask or a gateway are not set properly, the host and the SIU will not be able to communicate with each other. The value of the subnet mask and a gateway can easily be checked by using telnet to access the SIU and checking the SIU's configuration. For example:

```
telnet 111.122.133.144 8100
>cnsyp;
```

In the resulting display, check that the SUBNET and the GATEWAY values are set correctly.

For details on configuring SIUs and all the MML commands, see the *SIU131/SIU231 User's Manual*, the *SIU520 Developer's Manual*, or the *SS7G2x SIU Mode User Manual*, available for download via *http://resource.intel.com/telecom/support/ss7/downloads/index.htm*.

3.8.2.4 SIU does not Function Correctly After Modification of config.txt

Proceed as follows:

1. Download the *config.txt* file from the SIU via ftp using binary file transfer mode.

2. Check that the file does not contain any 0x0d symbols, that is, carriage return (<cr>) symbols that do not have a graphical representation in the ASCII table. If it does, remove all the 0x0d symbols using a text editor.

3. Upload the corrected *config.txt* file back to the SIU and restart it.

3.8.2.5 Intel Dialogic SS7 Server Freezes at Startup (Linux Only)

Using the `ps -ef` command lists the dlgcs7d process as <defunct>, */var/dialogic/log/DlgcS7.log* contains 0 bytes.

This can occur on some Linux builds due to incorrect behavior of the **gettimeofday( )** system function. This issue will be resolved in future releases of the Global Call SS7 software.

Check the time zone setting on your Linux machine as follows:

```
echo $TZ
```

If the variable is empty, set the appropriate value before starting the SS7 Server, for example:

```
export TZ=CST
```

SS7 Call Scenarios 4

This chapter describes some common call setup and call release scenarios when using SS7 technology. The first topic below describes how the scenarios are presented in this chapter, subsequent topics describe each specific scenario:

4.1 Scenario Presentation

Each scenario is presented in tabular format. The tables provide the following information:

- **Application** - Shows functions issued by the application (::>).
- **Libgcs7** - Shows SS7 call control library activities including Global Call events sent to the application (<::) and messages sent to the Global Call SS7 server (==>)
- **Server** - Shows Global Call SS7 server activities including messages sent to the Global Call SS7 library (<==) and messages sent to the SS7 stack (-->).
- **Stack** - Shows SS7 stack activities including messages received from the SS7 stack (<--).

Notes: ***1.*** All scenarios described in this chapter operate in asynchronous mode.

2. For simplicity, all tables use ISUP message type names instead of *primitive* names.

3. The term "Stack" in each table represents the interface to the ISUP module and does not identify messages sent to or received from the network.

4.2 Opening a Device Scenario

Table 7 shows the scenario.

Table 7. Opening a Device Scenario

Application	Libgcs7	Server	Stack
gc_OpenEx( ) ::>			

Table 7. Opening a Device Scenario (Continued)

Application	Libgcs7	Server	Stack
	Open_REQ ==>		
		<== Open_CONF	

4.3 Application-Initiated Outbound Call Scenarios

Details on the following scenarios are provided:

- Common Outbound Call Scenario
- ITU-T Alternative Outbound Call Scenario
- Outbound Call Where ACM Has No Indication Scenario

4.3.1 Common Outbound Call Scenario

Table 8 shows a common application-initiated outbound call scenario.

Table 8. Common Outbound Call Scenario

Application	Libgcs7	Server	Stack
gc_MakeCall( ) ::>			
	MakeCall_REQ ==>		
		IAM -->	
			<-- ACM
		<== Alerting_IND	
	<:: GCEV_ALERTING		
			<-- ANM
		<== Connected_IND	
	<:: GCEV_CONNECTED		

4.3.2 ITU-T Alternative Outbound Call Scenario

Table 9 shows an alternative application-initiated outbound scenario for ITU-T operation only.

Table 9. Alternative Outbound Call Scenario for ITU-T Operation Only

Application	Libgcs7	Server	Stack
gc_MakeCall( ) ::>			
	MakeCall_REQ ==>		
		IAM -->	
			<-- CON

Table 9. Alternative Outbound Call Scenario for ITU-T Operation Only (Continued)

Application	Libgcs7	Server	Stack
		<== Connected_IND	
	<:: GCEV_CONNECTED		

4.3.3 Outbound Call Where ACM Has No Indication Scenario

Table 10 shows an application-initiated outbound call scenario where the ACM has "no indication".

Table 10. Outbound Call Scenario Where ACM has No Indication

Application	Libgcs7	Server	Stack
gc_MakeCall( ) ::>			
	MakeCall_REQ ==>		
		IAM -->	
			<-- ACM
			<-- CPG
		<== Alerting_IND	
	<:: GCEV_ALERTING		
			<-- ANM
		<== Connected_IND	
	<:: GCEV_CONNECTED		

4.4 Network-Initiated Inbound Call Scenarios

Details on the following scenarios are provided:

- Common Inbound Call Scenario
- Alternative Inbound Call Scenario

4.4.1 Common Inbound Call Scenario

Table 11 shows a common network-initiated inbound call scenario.

Table 11. Common Inbound Call Scenario

Application	Libgcs7	Server	Stack
gc_WaitCall( ) ::>			
	WaitCall_REQ ==>		
			<-- IAM

Table 11. Common Inbound Call Scenario (Continued)

Application	Libgcs7	Server	Stack
		<== Offered_IND	
	<:: GCEV_OFFERED		
gc_AcceptCall( ) ::>			
	Accept_REQ ==>		
	<:: GCEV_ACCEPT	ACM -->	
gc_AnswerCall( ) ::>			
	Answer_REQ ==>		
	<:: GCEV_ANSWERED	ANM -->	

4.4.2 Alternative Inbound Call Scenario

Table 12 shows an alternative network-initiated inbound call scenario.

Table 12. Alternative Inbound Call Scenario

Application	Libgcs7	Server	Stack
gc_WaitCall( ) ::>			
	WaitCall_REQ ==>		
			<-- IAM
		<== Offered_IND	
	<:: GCEV_OFFERED		
gc_AnswerCall( ) ::>			
	Answer_REQ ==>		
	<:: GCEV_ANSWERED	CON -->	

4.5 Disconnect Scenarios

Details on the following scenarios are provided:

- Application-Initiated Disconnect Scenario
- Network-Initiated Disconnect Scenario
- Server-Initiated Disconnect with Application Informed Scenario
- Server-Initiated Disconnect with Application Not Informed Scenario

4.5.1 Application-Initiated Disconnect Scenario

Table 13 shows an application-initiated disconnect scenario.

Table 13. Application-Initiated Disconnect Scenario

Application	Libgcs7	Server	Stack
gc_DropCall( ) ::>			
	DropCall_REQ ==>		
		REL -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		

4.5.2 Network-Initiated Disconnect Scenario

Table 14 shows a network-initiated disconnect scenario.

Table 14. Network-Initiated Disconnect Scenario

Application	Libgcs7	Server	Stack
			<-- REL
		<== Disconnect_IND	
	<:: GCEV_DISCONNECTED	REL -->	
gc_DropCall( ) ::>			
	DropCall_REQ ==>		
		RLC -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		

4.5.3 Server-Initiated Disconnect with Application Informed Scenario

Table 15 shows a server-initiated disconnect scenario when the application is informed. This scenario is commonly used in continuity check procedures.

Table 15. Server-Initiated Disconnect with Application Informed Scenario

Application	Libgcs7	Server	Stack
		<== Disconnect_IND	
	<:: GCEV_DISCONNECTED		
gc_DropCall( ) ::>			
	DropCall_REQ ==>		
		REL -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		

4.5.4 Server-Initiated Disconnect with Application Not Informed Scenario

Table 16 shows a server-initiated disconnect scenario when the application is **not** informed. This scenario is commonly when processing unsuccessful calls with overlap receive.

Table 16. Server-Initiated Disconnect with Application Not Informed Scenario

Application	Libgcs7	Server	Stack
			<-- IAM
		REL -->	
			<-- RLC

4.6 Call Collision Scenarios

Details on the following scenarios are provided:

- Glare Scenario
- Inbound Call Received Before Call Clearing Completion Scenario
- SRL Queue-Related Call Collision Scenario
- MQ Queue-Related Call Collision Scenario
- GCT Queue-Related Call Collision With Application Informed Scenario
- GCT Queue-Related Call Collision With Application Not Informed Scenario

4.6.1 Glare Scenario

Table 13 shows a glare scenario.

Table 17. Glare Scenario

Application	Libgcs7	Server	Stack
gc_MakeCall(#1) ::>			
	MakeCall_REQ ==>		
		IAM -->	
			<-- IAM
		<== Offered_IND	
	<:: GCEV_DISCONNECTED (#1)		
	<:: GCEV_OFFERED (#2)		
gc_DropCall(#1) ::>			
	<:: GCEV_DROPCALL (#1)		
gc_ReleaseCallEx(#1) ::>			
	<:: GCEV_RELEASECALL (#1)		
Continue call setup (#2) ...			

4.6.2 Inbound Call Received Before Call Clearing Completion Scenario

Table 18 shows a call collision scenario where an inbound call is received before the completion of call clearing on an existing call.

Table 18. Inbound Call Before Completion of Call Clearing Scenario

Application	Libgcs7	Server	Stack
			<-- REL
		<== Disconnect_IND	
	<:: GCEV_DISCONNECTED (#1)	REL -->	
gc_DropCall(#1) ::>			
	DropCall_REQ ==>		
		RLC -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL (#1)		
			<-- IAM
		<== Offered_IND	
	<:: GCEV_OFFERED (#2)		

Table 18. Inbound Call Before Completion of Call Clearing Scenario (Continued)

Application	Libgcs7	Server	Stack
gc_ReleaseCallEx(#1) ::>			
	<:: GCEV_RELEASECALL (#1)		
Continue call setup (#2) ...			

4.6.3 SRL Queue-Related Call Collision Scenario

Table 19 shows a call collision scenario related to the SRL queue.

Table 19. Disconnect Collision on SRL Queue

Application	Libgcs7	Server	Stack
			<-- REL
	<:: GCEV_DISCONNECTED sent	<== Disconnect_IND	
		REL -->	
gc_DropCall( ) ::>			
Application must ignore this event.	<:: GCEV_DISCONNECTED		
	DropCall_REQ ==>		
		RLC -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		
Note: The two references to GCEV_DISCONNECTED in the table above represent one GCEV_DISCONNECTED event at two different points in time; the first when the event is sent by the Libgcs7 library and the second when the event is received by the application.			

4.6.4 MQ Queue-Related Call Collision Scenario

Table 20 shows a call collision scenario related to the MQ queue. MQ is the abbreviation for the Inter Process Communication (IPC) mechanism used internally by the Global Call SS7 software for communication between the library and the server.

Table 20. Disconnect Collision on MQ Queue

Application	Libgcs7	Server	Stack
gc_DropCall( ) ::>			<-- REL
	DropCall_REQ ==>>	<== Disconnect_IND	
		REL -->	

Table 20. Disconnect Collision on MQ Queue (Continued)

Application	Libgcs7	Server	Stack
	Ignored Disconnect_IND <==	==> DropCall_REQ	
		RLC -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		

4.6.5 GCT Queue-Related Call Collision With Application Informed Scenario

Table 21 shows a call collision scenario related to the GCT queue where the application is informed.

Table 21. Disconnect Collision on GCT Queue with Application Informed

Application	Libgcs7	Server	Stack
gc_DropCall( ) ::>			
	DropCall_REQ ==>>		
		REL -->	
			<-- REL
		RLC -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		

4.6.6 GCT Queue-Related Call Collision With Application Not Informed Scenario

Table 22 shows a call collision scenario related to the GCT queue where the application is **not** informed. This scenario is used for processing unsuccessful calls that use overlap receive.

Table 22. Disconnect Collision on GCT Queue with Application Not Informed

Application	Libgcs7	Server	Stack
			<-- IAM
		REL -->	

Table 22. Disconnect Collision on GCT Queue with Application Not Informed (Continued)

Application	Libgcs7	Server	Stack
			<-- REL
		RLC -->	
			<-- RLC

4.7 Continuity Testing Scenarios

Details on the following scenarios are provided:

- Successful Outbound Out-Of-Call Continuity Test Scenario
- Successful Inbound Out-Of-Call Continuity Test Scenario
- Outbound Out-Of-Call Continuity Test with One Failure Scenario
- Inbound Out-Of-Call Continuity Test with One Failure Scenario
- Successful Outbound In-Call Continuity Test Scenario
- Successful Inbound In-Call Continuity Test Scenario
- Outbound In-Call Continuity Test Scenario with One Failure (Old Method)
- Outbound In-Call Continuity Test Scenario with One Failure (New Method)
- Inbound In-Call Continuity Test with One Failure Scenario

4.7.1 Successful Outbound Out-Of-Call Continuity Test Scenario

Table 23 shows a successful outbound out-of-call continuity test scenario.

Table 23. Successful Outbound Out-Of-Call Continuity Test Scenario

Application	Libgcs7	Server	Stack
gc_Extension( ) ::> (ext_id = REQUESTCONTCHECK)			
	COT_Outbound_REQ ==>		
	<:: GCEV_EXTENSION (ext_id = CONTCHECK)	SZE -->	
		(ANSI only; do nothing)	<-- LPA
gc_Extension( ) ::> (ext_id = SENDCONTCHECKRESULT)			
	COT_Result_REQ ==>		
		REL -->	
			<-- RLC

Table 23. Successful Outbound Out-Of-Call Continuity Test Scenario (Continued)

Application	Libgcs7	Server	Stack
		<== DropCall_CONF	
	<:: GCEV_EXTENSION (CONTCHECK_END)		

4.7.2 Successful Inbound Out-Of-Call Continuity Test Scenario

Table 24 shows a successful inbound out-of-call continuity testing scenario.

Table 24. Successful Inbound Out-Of-Call Continuity Test Scenario

Application	Libgcs7	Server	Stack
			<-- SZE
		<== Detected_IND	
	<:: GCEV_DETECTED		
		<== ApplyLoop_IND	
	ApplyLoopback( ) (Internal)	LPA --> (shortcut if ANSI)	
			<-- REL
		<== RemoveLoop_IND	
	RemoveLoopback( ) (internal)		
		<== Disconnect_IND	
	<:: GCEV_DISCONNECTED		
gc_DropCall( ) ::>			
	DropCall_REQ ==>		
		RLC -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		

4.7.3 Outbound Out-Of-Call Continuity Test with One Failure Scenario

Table 25 shows an outbound out-of-call continuity test scenario with one failure.

Table 25. Outbound Out-Of-Call Continuity Test One Failure Scenario

Application	Libgcs7	Server	Stack
gc_Extension( ) ::> (ext_id = REQUESTCONTCHECK)			
	COT_Outbound_REQ ==>		
	<:: GCEV_EXTENSION (ext_id = CONTCHECK)	SZE -->	
		(ANSI only; do nothing)	<-- LPA
gc_Extension( ) ::> (ext_id = SENDCONTCHECKRESULT) (failure)			
	COT_Result_REQ ==> (failure)		
		COT -->	
gc_Extension( ) ::> (ext_id = REQUESTCONTCHECK)			
	COT_Outbound_REQ ==>		
	<:: GCEV_EXTENSION (ext_id = CONTCHECK)	SZE -->	
		(ANSI only; do nothing)	<-- LPA
gc_Extension( ) ::> (ext_id = SENDCONTCHECKRESULT)			
	COT_Result_REQ ==>		
		REL -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_EXTENSION (ext_id = CONTCHECK_END)		

4.7.4 Inbound Out-Of-Call Continuity Test with One Failure Scenario

Table 26 shows an inbound out-of-call continuity test scenario with one failure.

Table 26. Inbound Out-Of-Call Continuity Test with One Failure Scenario

Application	Libgcs7	Server	Stack
			<-- SZE
		<== Detected_IND	

Table 26. Inbound Out-Of-Call Continuity Test with One Failure Scenario (Continued)

Application	Libgcs7	Server	Stack
	<:: GCEV_DETECTED		
		<== ApplyLoop_IND	
	ApplyLoopback( ) (internal)	LPA --> (shortcut if ANSI)	
		failure	<-- COT
			<-- REL
		<== RemoveLoop_IND	
	RemoveLoopback( ) (internal)	RLC -->	
			<-- SZE
		<== ApplyLoop_IND	
	ApplyLoopback( ) (internal)	LPA --> (shortcut if ANSI)	
			<-- REL
		<== RemoveLoop_IND	
	RemoveLoopback( ) (internal)		
		<== Disconnect_IND	
	<:: GCEV_DISCONNECTED		
gc_DropCall( ) ::>			
	DropCall_REQ ==>		
		RLC -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		

4.7.5 Successful Outbound In-Call Continuity Test Scenario

Table 27 shows a successful outbound in-call continuity test scenario.

Table 27. Successful Outbound In-Call Continuity Test Scenario

Application	Libgcs7	Server	Stack
gc_MakeCall( ) ::>	Continuity Check Required...		
	MakeCall_REQ ==>	Continuity Check Required...	

Table 27. Successful Outbound In-Call Continuity Test Scenario (Continued)

Application	Libgcs7	Server	Stack
	<:: GCEV_EXTENSION( ) (ext_id = CONTCHECK)	IAM -->	
		(ANSI only; do nothing)	<-- LPA
gc_Extension( ) ::> (ext_id = SENDCONTCHECKRESULT)			
	COT_Result_REQ ==>		
	<:: GCEV_EXTENSION (ext_id = CONTCHECK_END)	COT --> (success)	
Continue normal call setup...			

4.7.6 Successful Inbound In-Call Continuity Test Scenario

Table 28 shows a successful inbound in-call continuity test scenario.

Table 28. Successful Inbound In-Call Continuity Test Scenario

Application	Libgcs7	Server	Stack
		Continuity Check Required...	<-- IAM
		<== Detected_IND	
	<:: GCEV_DETECTED		
		<== ApplyLoop_IND	
	ApplyLoopback( ) (internal)	LPA --> (shortcut if ANSI)	
			<-- COT (success)
		<== RemoveLoop_IND	
	RemoveLoopback( ) (internal)		
		<== Offered_IND	
	<:: GCEV_OFFERED		
Continue normal call setup...			

4.7.7 Outbound In-Call Continuity Test Scenario with One Failure (Old Method)

Table 29 shows an older variation of the outbound in-call continuity test with one failure scenario.

Table 29. Outbound In-Call Continuity Test with One Failure Scenario (Old Method)

Application	Libgcs7	Server	Stack
gc_MakeCall( ) ::>	Continuity Check Required...		
	MakeCall_REQ ==>	Continuity Check Required...	
	<:: GCEV_EXTENSION (ext_id = CONTCHECK)	IAM -->	
		(ANSI only; do nothing)	<-- LPA
gc_DropCall( ) ::> (reason = CONTCHECK_FAILED)			
	COT_Result_REQ ==> (failure)		
		COT -->	
gc_Extension( ) ::> (ext_id = REQUESTCONTCHECK)			
	COT_Outbound_REQ ==>		
	<:: GCEV_EXTENSION (ext_id = CONTCHECK)	SZE -->	
		(ANSI only; do nothing)	<-- LPA
gc_Extension( ) ::> (ext_id = SENDCONTCHECKRESULT)			
	COT_Result_REQ ==>		
	<:: GCEV_EXTENSION (ext_id = CONTCHECK_END)	REL -->	
			<-- RLC
		<== AbortCall_IND	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<::GCEV_RELEASECALL		

4.7.8 Outbound In-Call Continuity Test Scenario with One Failure (New Method)

Table 30 shows a newer variation of the outbound in-call continuity test with one failure scenario.

Table 30. Outbound In-Call Continuity Test with One Failure Scenario (New Method)

Application	Libgcs7	Server	Stack
gc_MakeCall( ) ::>	Continuity Check Required...		
	MakeCall_REQ ==>	Continuity Check Required...	
	<:: GCEV_EXTENSION (ext_id = CONTCHECK)	IAM -->	
		(ANSI only; do nothing)	<-- LPA
gc_Extension( ) ::> (ext_id = SENDCONTCHECKRESULT) (failure)			
	COT_Result_REQ ==> (failure)		
		COT -->	
gc_Extension( ) ::> (ext_id = REQUESTCONTCHECK)			
	COT_Outbound_REQ ==>		
	<:: GCEV_EXTENSION (ext_id = CONTCHECK)	SZE -->	
		(ANSI only, do nothing)	<-- LPA
gc_Extension( ) ::> (ext_id = SENDCONCHECKRESULT)			
	COT_Result_REQ ==>		
	<:: GCEV_EXTENSION (ext_id = CONTCHECK_END)	REL -->	
			<-- RLC
		<== AbortCall_IND	
	<:: GCEV_DISCONNECTED		
gc_DropCall( ) ::>			
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		

4.7.9 Inbound In-Call Continuity Test with One Failure Scenario

Table 31 shows the inbound in-call continuity test with one failure scenario.

Table 31. Inbound In-Call Continuity Test with One Failure Scenario

Application	Libgcs7	Server	Stack
		Continuity Check Required...	<-- IAM
		<== Detected_IND	
	<:: GCEV_DETECTED		
		<== ApplyLoop_IND	
	ApplyLoopback( ) (internal)	LPA --> (shortcut if ANSI)	
			<-- COT (failure)
			<-- REL
		<== RemoveLoop_IND	
	RemoveLoopback( ) (internal)	RLC -->	
			<-- SZE
		<== ApplyLoop_IND	
	ApplyLoopback( ) (internal)	LPA --> (shortcut if ANSI)	
			<-- REL
		<== RemoveLoop_IND	
	RemoveLoopback( ) (internal)		
		<== Disconnect_IND	
	<:: GCEV_DISCONNECTED		
gc_DropCall( ) ::>			
	DropCall_REQ ==>		
		RLC -->	
			<-- RLC
		<== DropCall_CONF	
	<:: GCEV_DROPCALL		
gc_ReleaseCallEx( ) ::>			
	<:: GCEV_RELEASECALL		

SS7-Specific Operations 5

This chapter describes how Global Call is used to perform certain SS7-specific operations. These tasks include:

5.1 Handling of Glare Conditions

A glare condition occurs when an outgoing call has been initiated (**gc_MakeCall( )** succeeded) and an incoming call is detected. Global Call SS7 and the SS7 stack almost completely hide this condition from the application that will see its outbound call fail and will then be notified of the inbound call. See Section 4.6.1, "Glare Scenario", on page 59 for an example.

However, in order to avoid adding delay to the handling of the inbound call, the SS7 call control library does not wait for the failed outbound call to be released before it notifies the application of the inbound call. This means that, in case of glare, the following type of scenario can be seen:

Application	Libgcs7
`gc_MakeCall(crn1)` `-->`	
	`GCEV_DISCONNECTED(`**`crn1`**`)` `<--`
`gc_DropCall(crn1)` `-->`	
	`GCEV_OFFERED(`**`crn2`**`)` `<--`

This shows that an application running on bidirectional circuits should be ready to handle two CRNs on a single line device. However, the application can be purely "reactive" with respect to the failed call (crn1) and just respond to events using their associated CRN: simply perform a **gc_ReleaseCallEx( )** upon reception of any GCEV_DROPCALL, whether the CRN is the "active" one or not. Using this procedure, the application only needs to store one CRN per line device.

Another case of glare condition is at disconnection. If the application calls **gc_DropCall( )** while a GCEV_DISCONNECTED has already been put in the SRL event queue, the application will receive it after it does **gc_DropCall( )** when it is waiting for GCEV_DROPCALL. This late GCEV_DISCONNECTED event must be ignored by the application. The call control library will send the GCEV_DROPCALL as usual when the call is dropped. Other glare conditions at disconnection are all hidden from the application.

5.2 Controlling Priority in Circuit Groups

ISUP allows the setting of different priority schemes on a per circuit group basis:

- Priority to incoming call on all circuits
- Priority to outgoing call on all circuits
- Highest point code has priority on even CICs (Circuit Identification Codes)
- Highest point code has priority on odd CICs

The third scheme is the one recommended by the ITU (Q.764). With the SS7 stack, the priority scheme can be selected in the **<options>** field of the **ISUP_CFG_CCTGRP** commands in the *config.txt* file. Once priority has been given to one of the calls by the SS7 stack, upper software layers (Global Call SS7 and the application) must conform.

Because of the multiple layers of the software architecture and the asynchronous nature of the communication between them, it is possible that collisions appear to exist even though there has not been a true glare condition on the signaling link. For example, if the SS7 stack has posted an IAM message for the Global Call SS7 call control library but that the application issues a **gc_MakeCall( )** before this message is received, the application will see the equivalent of a glare condition: the outbound call will fail and the inbound call will be offered. This can happen regardless of the configured priority scheme, even with priority given to outbound calls on all circuits.

5.3 SCBus or CT Bus Routing

Routing is described under the following topics:

- Routing Functions
- Time Slot Assignment for Intel NetStructure SS7 Boards
- Using Time Slot 16 on Intel Dialogic E1 Network Interface Boards

5.3.1 Routing Functions

The Global Call SS7 Call Control Library (Libgcs7) supports the Global Call routing functions (**gc_Listen( )**, **gc_UnListen( )**, and **gc_GetXmitSlot( )**). These functions are available to user application for performing routing of SS7 circuits regardless of their physical location (for example, on an Intel® Dialogic® network interface (DTI) board or on an Intel NetStructure® SS7 board). This allows the application to use one single set of functions without having to know where the circuit is located (that is, on a DTI board or on an Intel NetStructure SS7 board).

The following functions are provided:

- **int gc_Listen(LINEDEV linedev, SC_TSINFO *sctsinfo_p, mode)**
- **int gc_Unlisten(LINEDEV linedev, mode)**
- **int gc_GetXmitSlot(LINEDEV linedev, SC_TSINFO *sctsinfo_p, mode)**

5.3.2 Time Slot Assignment for Intel NetStructure SS7 Boards

The SS7 server automatically assigns CT Bus transmit time slots for telephony circuits located on an Intel NetStructure SS7 board. The SS7 server also performs the full-duplex routing required for the signaling connection, when the signaling links are routed over the CT Bus between an Intel NetStructure SS7 board and a network interface (DTI) board. The configuration required for this to happen is described in Chapter 4.

5.3.3 Using Time Slot 16 on Intel Dialogic E1 Network Interface Boards

Traditionally, E1 trunks reserve physical time slot 16 for signaling, which is designated as dtiB#T31, where # is the logical number of the trunk. With SS7 however, signaling can be on a different physical trunk than the telephony circuits. The signalling time slots can then be used for a normal voice circuit.

With Intel Dialogic E1 network interface boards, setting time slot 16 to the "clear channel" mode requires that special ISDN firmware to be downloaded to the board and that ISDN D channel be disabled. For Springware boards, this can be done using the CTR4 (ISCTR4 v6.65) firmware for example and by changing parameter 16 in the *CTR4.PRM* parameter file to 2. For DM3 boards, the special _TS16 firmware can be used, but see the limitation below.

Similarly, if an SS7 link is routed from time slot 16 of an Intel Dialogic E1 network interface board to an Intel NetStructure SS7 board, the Intel Dialogic board must leave time slot 16 in **clear channel** mode, as described.

When using DM3 boards, due to some backward-incompatible changes to the **_ts16.config* and corresponding **_ts16.fcd* files in recent releases, each appropriate **_ts16.config* file must be reconfigured, and the corresponding **_ts16.fcd* file regenerated, to restore the correct time slot assignment, that is, TS16 = "dtiBxT31" and TS17 = "dtiBxT16 etc., required for correct operation of the Global Call SS7 software. This is achieved as follows:

1. In the Intel® Dialogic® configuration manager, double-click on the board device to open the property sheets, click on the **Misc** property sheet if not already selected, and check the name next to the **FCDFileName** property.
2. Open the corresponding **_ts16.config* file in a text editor.
3. Replace the lines that start with **defineBSet** with the following lines:

```
defineBSet=10,1,1,31, 0,0,0,1,20,1, 1,1,3,15, 16,17,3,15, 31,16,3,1, 0
defineBSet=20,2,1,31, 0,0,0,1,20,1, 1,1,3,15, 16,17,3,15, 31,16,3,1, 0
defineBSet=30,3,1,31, 0,0,0,1,20,1, 1,1,3,15, 16,17,3,15, 31,16,3,1, 0
defineBSet=40,4,1,31, 0,0,0,1,20,1, 1,1,3,15, 16,17,3,15, 31,16,3,1, 0
```

4. Run the *fcdgen* utility on the **_ts16.config* file to generate the correct **_ts16.fcd* file.
5. Start the Dialogic system service.

5.4 Connecting Multiple Hosts to SIUs

SIU systems may have multiple hosts connected to the same SIU or pair of SIUs. In this case, each host is responsible for the telephony circuits that it terminates. This must be specified in the *config.txt* file on the SIU(s). Each ISUP_CFG_CCTGRP command must specify in its **<host_id>** field which host is responsible for the circuit group. Additionally, the *config.txt* file must also specify, using the SIU_HOSTS command, the number of hosts that will be used.

On each host, the **SIU.HostID** parameter must be set to reflect which one is the local host. This allows Global Call SS7 to correctly identify the host when communicating with the SIU(s) and to know which circuit groups are configured on the local host.

5.5 Using Dual Resilient SIU Configurations

A dual-resilient SIU configuration brings an additional level of fault tolerance to a Global Call SS7 system. It consists of two SIUs configured as a single point code in the SS7 network. Host systems are connected via TCP/IP to both servers.

Under normal circumstances (both SIUs up and running) the load is shared between both units (see Section 3.2.3, "ISUP Configuration", on page 37). If one unit fails, either the whole unit or its communication with the hosts - the partner unit maintains MTP operation of the node. However, telephony circuit groups that were active on the failing SIU need to be transferred to the partner SIU in order to be restored. With Global Call SS7, this procedure is performed automatically by the Intel Dialogic SS7 server. The application will only see that circuits are blocked (GCEV_BLOCKED event is received) and then unblocked after they are successfully transferred to the partner SIU. The application should handle this as any other case of blocked circuits.

Global Call SS7 automatically handles the restoration of the circuit groups to their "preferred" SIU when it comes back up after a failure. Again, the only thing the application will notice is that circuits are blocked before they are transferred and unblocked when the transfer is complete. Because this transfer must be done for a complete circuit group, Global Call SS7 will block each circuit in the group as they become idle. Circuits that have an active call are only blocked after the call is finished. Once all circuits are blocked, the transfer to the preferred SIU is performed and circuits are then unblocked.

5.5.1 Configuration of Dual Resilient SIUs

Dual-resilient SIU systems must have two SIUs configured. This configuration is done in the *gcss7.cfg* file. SIUs are configured as either SIU A or SIU B. The first SIU configured must be SIU A, and the second SIU must be B.

For Global Call SS7 to be able to automatically handle dual-resilient SIU operations, the *gcss7.cfg* file must specify which is the preferred SIU for each circuit group. See the sample configuration files in Chapter 11, "Supplementary Reference Information".

5.6 Using Overlap Send and Receive

The S77 call control library supports overlap sending using the **gc_SendMoreInfo( )** function. When using **gc_SendMoreInfo( )**, the only **info_id** parameter value supported by the SS7 call control library is DESTINATION_ADDRESS (DNIS). See the *Global Call API Library Reference* for more information.

Note: To use **gc_SendMoreInfo( )** for overlap sending, the GCST_SENDMOREINFO call state must be enabled using the **gc_SetConfigData( )** function. See the section on "Call State Configuration" in the *Global Call API Programming Guide*.

An older method of overlap sending is also still supported, that is, using the **gc_SndMsg( )** function to send a Subsequent Address Message (SAM). See Section 8.2.24, "gc_SndMsg( ) Variances for SS7", on page 103 for more information.

Two methods of overlap receiving are supported, the preferred method, and an older method maintained for backward compatibility reasons only. Both methods are described below.

The preferred method for implementing overlap receiving is as follows:

1. Issue **gc_CallAck(GCACK_SERVICE_INFO)** to determine if digits are available.
2. Receive a GCEV_MOREINFO event.
3. Use **gc_ResultValue( )** to determine the status, which is one of the following:
   - GCRV_INFO_PRESENT_ALL - The requested digits are now available.
   - GCRV_INFO_PRESENT_MORE - The requested digits are now available. More/additional digits are available.
   - GCRV_INFO_SOME_TIMEOUT - Only some digits are available due to a time out.
   - GCRV_INFO_SOME_NOMORE - Only some digits are available, no more digits will be received.
   - GCRV_INFO_NONE_TIMEOUT - No digits are available due to a time out.
   - GCRV_INFO_NONE_NOMORE - No more digits are available.
4. Issue **gc_GetCallInfo(DESTINATION_ADDRESS)** to retrieve the digits.
5. If the status returned via GCEV_MOREINFO in step 3 indicates that more digits are available, the application can do the following:
   - Issue **gc_ReqMoreInfo( )** to request the additional digits.
   - Receive a GCEV_MOREINFO event with a status as indicated in step 3 above.

- Issue **gc_GetCallInfo(DESTINATION_ADDRESS)** to retrieve the additional digits.

6. Repeat step 5 until all information has been retrieved.

The following method of overlap receiving continues to be supported for backward compatibility reasons only:

1. Issue **gc_CallAck(GCACK_SERVICE_DNIS)** identifying the number of digits to retrieve (dnis.accept) in the GC_CALLACK_BLK structure pointed to by the **callack_blkp** function parameter.
2. Receive a GCEV_MOREDIGITS event.
3. Issue **gc_GetDNIS( )** to retrieve the digits.

Note: To retrieve a certain number of digits at a time, specify that number in the dnis.accept field and repeat steps 1, 2 and 3 above until all information has been retrieved.

See the *Global Call API Programming Guide* for more detailed information on overlap sending and receiving in general and the *Global Call API Library Reference* for more information about the functions mentioned above.

5.7 Suspending and Resuming Calls

Call suspend and resume features are supported using the **gc_HoldCall( )** and **gc_RetrieveCall( )** functions. A call can be suspended by the application or by the network.

When a call is in the Connected state, the application can issue **gc_HoldCall( )** on the CRN of the current call to put the call in the suspended state. The application receives a GCEV_HOLDACK event indicating that the call has entered the suspended state. The call remains in the suspended state until a **gc_RetrieveCall( )** is issued on the CRN for the call. The application receives a GCEV_RETRIEVEACK event when this occurs.

If the action of suspending a call is initiated by the network (with an SS7 SUS message), the application receives a GCEV_HOLDCALL event. When the network resumes the call, the application receives a GCEV_RETRIEVECALL event. If the network decides to drop the call or the call remains in the suspended state for too long, the application will not receive the GCEV_RETRIEVECALL event but instead receives a GCEV_DROPCALL event. While a call is in the suspended state, it can be dropped or released by the application.

Notes:

1. The Global Call call state, as returned by **gc_GetCallState( )**, for a suspended call is GCST_ONHOLD.
2. A suspended call can only be resumed by the side that originally put the call in the suspended state. If a call has been placed in the suspended state by the network, the application **cannot** resume the call using the **gc_RetrieveCall( )** function. The **gc_RetrieveCall( )** function will fail if this is attempted. Similarly, if a call has been placed in the suspended state by the application, an SS7 RES message from the network will **not** resume the call.

5.8 Performing Continuity Checks

The continuity check feature is implemented using the **gc_Extension( )** function and the associated GCEV_EXTENSION event.

The structure associated with the GCEV_EXTENSION event (METAEVENT structure) contains the extevtdatap field which is a pointer to an EXTENSIONEVTBLK structure. The value of the ext_id field in the EXTENSIONEVTBLK structure can be:

- S7_EXT_CONTCHECK to indicate the beginning of a continuity check process
- S7_EXT_CONTCHECK_END to signal the end of a continuity check process

The parmblk field in the EXTENSIONEVTBLK structure contains additional information. The parmblk field, which is of type GC_PARM_BLK, contains only one element of parameter data of type GC_PARM_DATA. The set ID of this parameter is S7SET_CONTCHECK and the parameter ID is S7PARM_CONTCHECK_TYPE. The parm_data_size is sizeof(int).

Note: In earlier releases of the Global Call SS7 software, S7SET_ parameter sets and S7PARM_ parameter IDs were defined with values that are different than the current release. An application that uses the S7SET_ and S7PARM_ defines **must** be recompiled with the correct header file from the current release.

In this feature, the **gc_Extension( )** function does not require any GC_PARM_BLK data, except when sending continuity check result and the outcome of the test must be sent. Also, the **gc_Extension( )** function does not return anything via the **retblkp** parameter.

5.8.1 Inbound Continuity Check

When a continuity check request is received from the network, the call control library does the following:

1. Saves, if necessary, the current time slot assignment of the current line.
2. Sends a GCEV_DETECTED event to the application to prevent attempts to make outbound calls.

Note: The application should first enable the GCEV_DETECTED event. Enabling the GCEV_DETECTED event is not required for correct operation of the inbound continuity check, but it is recommended in order to minimize the possiblity of call collisions.

3. Puts the line in loopback for the continuity test.

When the continuity check completes:

1. The Global Call SS7 software removes the loopback and restores the previous CT Bus routing.

Note: For CT Bus routing to be restored correctly, it is important that any routing be done using Global Call API routing functions and not using other available routing options, such as using the dt_* functions or the nr_* CT Bus routing functions, or the sending of CT Bus routing messages directly to the board.

2. The application receives a GCEV_OFFERED event (for an in-call continuity check) or a GCEV_DISCONNECTED event (for an out-of-call continuity check).

3. The application should continue processing the call in the normal way.

5.8.2 Outbound Continuity Check

As for the inbound continuity check, the outbound continuity check can be done outside of any call (Out-of-Call) or as part of an outgoing call (In-Call). However, in the outbound case, since the check is initiated by the application, the procedures for both types of check differ.

5.8.2.1 Outbound Out-of-Call Continuity Check

When requesting an outbound **out-of-call** continuity check on a circuit, the line device must be in the Idle state, that is, the circuit must be unblocked and cannot have any active calls. The application can then use the **gc_Extension( )** function with an **ext_id** of S7_EXT_REQUESTCONTCHECK to send an SS7 CCR message to the network.

The application receives a GCEV_EXTENSION event with an ext_id of S7_EXT_CONTCHECK and with a parameter value of S7RV_CC_OUTBOUND to indicate that it can begin the continuity check by connecting the test equipment to the line.

When the continuity check is completed and the result analyzed, the application must call **gc_Extension( )** with an **ext_id** of S7_EXT_SENDCONTCHECKRESULT to communicate the results of the check to the remote party. To achieve this, the application must build a GC_PARM_BLK structure. The set_ID must be S7SET_CONTCHECK and the param_ID must be S7PARM_CONTCHECK_RESULT and the parameter value must be either CONTI_SUCCESS or CONTI_FAILURE.

If the function is called with CONTI_SUCCESS, the continuity check process is finished and the application is notified by a GCEV_EXTENSION event with an ext_id of S7_EXT_CONTCHECK_END and with a parameter value of S7RV_CCEND_OUTBOUND. When the application receives this event, the line can be used for making or receiving calls.

If the function is called with CONTI_FAILURE, the remote side is waiting for a re-check, and therefore the application does not receive a GCEV_EXTENSION event with an ext_id of S7_EXT_CONTCHECK_END.

5.8.2.2 Outbound In-Call Continuity Check

To request an **in-call** continuity check, the application must call **gc_MakeCall( )** with the continuity_check_indicator field in the S7_MAKECALL_BLK structure set to CCI_CC_REQUIRED, so that the Global Call library sends an SS7 IAM message, with continuity check requested, to the network.

The application receives a GCEV_EXTENSION event with an ext_id of S7_EXT_CONTCHECK and with a parameter value of S7RV_CC_OUTBOUND to indicate that it can begin the continuity check by connecting the test equipment to the line.

If the continuity check is successful, the application indicates the success to the remote side by calling **gc_Extension( )** with an **ext_id** of S7_EXT_SENDCONTCHECKRESULT and a parameter value of CONTI_SUCCESS. Since the continuity check process is now finished, the application receives a GCEV_EXTENSION event with an ext_id of S7_EXT_CONTCHECK_END with a parameter value of S7RV_CCEND_OUTBOUND. When the application receives this event, the call proceeds in the normal way.

If the continuity check fails, to indicate the failure to the remote side, the application must call either **gc_Extension( )** with an **ext_id** of S7_EXT_SENDCONTCHECKRESULT and a parameter value of CONTI_FAILURE or the **gc_DropCall( )** function with a cause value of CONTCHECK_FAILED. The call is cleared internally by Global Call and the other side will have no knowledge of the call. The other side only recognizes a failed continuity check test and waits for a re-check.

Caution: If a failure result is sent to the other side, the other side will expect a re-check on the circuit. Therefore, another call to **gc_Extension( )** with an **ext_id** of S7_EXT_REQUESTCONTCHECK should be issued by the application, until the continuity check succeeds. Alternatively, the application could reset the circuit using **gc_ResetLineDev( )** on the corresponding line device. In this case, the application does not receive a GCEV_EXTENSION event, but receives a GCEV_RESETLINEDEV event corresponding to the **gc_ResetLineDev( )** function call.

The GCEV_EXTENSION event with an ext_id of S7_EXT_CONTCHECK_END may be received in two other cases:

- If the parameter value is S7RV_CCEND_OUTBOUND_ERROR, an error occurred during the continuity check, for example, if the time waiting for the SS7 REL message at the remote side expires.
- If the parameter value is S7RV_CCEND_OUTBOUND_GLARE, a glare condition occurred, for example, while seizing the line for a continuity check, an SS7 IAM message was received.

Caution: In both cases of the GCEV_EXTENSION event with ext_id of EXT_CONTCHECK_END above, the continuity check process is abandoned by the Global Call library. The application should not try to perform the physical continuity test again or try to send any continuity check results because the remote side is not ready to receive the results and the send operation will fail.

5.9 Sending and Receiving ISUP/TUP Messages

The **gc_SndMsg( )** function can be used to send any ISUP/TUP message (for example, facility) that does not alter the call state or circuit state. See Section 8.2.24, "gc_SndMsg( ) Variances for SS7", on page 103 for more information.

Incoming ISUP/TUP messages that trigger Global Call events can be retrieved using the **gc_GetSigInfo( )** function. See Section 8.2.11, "gc_GetSigInfo( ) Variances for SS7", on page 97 for more information.

Global Call can also be used to configure a line device to receive ISUP/TUP messages processed by the underlying stack but not recognized by the SS7 call control library. To configure a line device to receive these ISUP/TUP messages, use the **gc_SetParm( )** function as follows:

```
GC_PARM t_gcparm;
t_gcparm.intvalue = true;
gc_SetParm(ldev, GCPR_UNKNOWN_ISUP_MSGS, t_gcparm);
```

When an ISUP/TUP message is received on the line device, a GCEV_EXTENSION event with an ext_id of S7_EXT_ISUP_EVENT is generated. The application can retrieve the message parameters using code similar to the following:

```
void getextevtdata(METAEVENT* a_me_p) {
    int ext_id = ((EXTENSIONEVTBLK*)(a_me_p->extevtdatap))->ext_id;
    if (S7_EXT_ISUP_EVENT == ext_id) {
        GC_PARM_BLKP t_parmblk_p =
            &(((EXTENSIONEVTBLK*)a_me_p->extevtdatap)->parmblk);
        GC_PARM_DATAP t_parm_p =
            gc_util_find_parm(t_parmblk_p, S7SET_ISUP_EVENT,
                              S7PARM_ISUP_EVENT_PARM);
        if (t_parm_p) {
            printf(" parm size=%d. 0x...", t_parm_p->value_size);
            for (int i=0; i < t_parm_p->value_size; ++i) {
                printf(" %02x", t_parm_p->value_buf[i]);
            }
        }
    }
}
```

For a GCEV_EXTENSION event that was caused by an unprocessed ISUP message, the **gc_GetSigInfo( )** function can be used instead of parsing the EXTENSIONEVTBLK data structure, assuming that the **GCPR_RECEIVE_INFO_BUF** parameter has been set (by the **gc_SetParm( )** function) to enable the retrieval of the messages. See Section 8.2.11, “gc_GetSigInfo( ) Variances for SS7”, on page 97 for more information.

Building Global Call SS7 Applications 6

This chapter describes the SS7-specific header files and libraries required when building applications. Topics include:

6.1 Header Files

When compiling Global Call applications for the SS7 technology, it is necessary to include the following header files in addition to the standard Global Call header files, which are listed in the *Global Call API Library Reference* and *Global Call API Programming Guide*:

Libgcs7.h
: Contains defines and definitions specific to using the Global Call SS7 software.

Note: The *Libgcs7.h* file has an include statement for the *cc_s7.h* file that contains many of the definitions used by the Global Call SS7 software. The *cc_s7.h* file should not be included directly when developing Global Call SS7 applications.

6.2 Required Libraries

When building Global Call applications for SS7 technology, it is not necessary to link any libraries other than the standard Global Call library, *libgc.lib.*

6.3 Required System Software

The Intel® Dialogic® system software must be installed on the development system. See the *Software Installation Guide* for your system release for more information.

Debugging Global Call SS7 Applications — 7

This chapter describes the tools available for testing and debugging SS7 applications. Topics include:

7.1 SS7 Call Control Library Trace File

When the library trace is enabled by the **Library.LogFile** and **Library.LogLevels** parameters in the *gcss7.cfg* file or by calling the **gc_StartTrace( )** function, a binary trace file is generated. The trace file includes the following information:

- Call control requests from the application
- Events sent to the application
- Messages sent to the SS7 Server
- Messages received from the SS7 Server
- Call state changes
- Error conditions

The file includes real time stamps to mark when the events took place. Where applicable the concerned circuit and call are contained in the logged data. Trace entries contain time stamps in milliseconds.

The trace file is in a binary format, as opposed to plain readable text, in order to optimize system performance and minimize the file size. Use the *ss7trace* utility to generate a readable text file equivalent.

The following is a short extract from a library trace file:

```
 24.03.2003  12:48
12:48 00.688  LocalConfigFile::Open(AutoTest.cfg) SUCCEEDED
12:48 00.809  GCDK product version: 3,0,0,3
12:48 01.119  ::>   s7_OpenEx(:N_dkB1T1:P_SS7:V_dxxxB1C1)
12:48 01.119    ==> MT_CONFIG_REQ     size=2
```

The following is a guide to the format of the text file that is generated from the binary library trace file:

```
 ______ messages or calls to/from the application
|  _____ Library
| |  ____ messages to/from Server
| | |
v v v
  <== Received from Server
  <== [CID] Received from Server for LineDevice
  ==> [CID] Sent to Server by LineDevice
  ==> Sent to Server
::>   User's application call
::>   [CID] User's application call to LineDevice
<::   [CID] Message sent to the User's application by LineDevice
<::   Message sent to the User's application
 <*** Received from MQ
      Any other internal message
```

Note: All error messages are prefixed with an ERROR: label and all warning messages are prefixed with a WARNING: label.

For additional help analyzing the contents of the trace file, contact customer support via the web site at *http://developer.intel.com/design/telecom/support/*.

7.2 SS7 Server Log File

By default, logging is enabled, but it can be disabled by editing the **Service.LogLevels** parameter in the *gcss7.cfg* file.

The Intel® Dialogic® SS7 server writes logging information to the *%DLGCROOT%\log\DlgcS7.log* (Windows) or the *${DLGCROOT}/log/DlgcS7.log* (Linux) file. This binary file contains status messages received from the SS7 stack, SIU failure indications, and circuit groups activation information with real time stamps of when the information occurred.

The trace file is in a binary format, as opposed to plain readable text, in order to optimize system performance and minimize the file size. Use the *ss7trace* utility to generate a readable text file equivalent.

The following is a guide to the format of the text file that is generated from the binary SS7 server log file:

```
 ______ messages to/from the library
|  _____ Server
| |  ____ messages to/from DK stack
| | |
v v v
  <-- Received from DK stack
  <-- [CID] Received from DK stack by Circuit
  <-- <GID> Received from DK stack by Group
  --> Sent to DK stack
  --> [CID] Sent to DK stack by Circuit
  --> <GID> Sent to DK stack by Group
==>   (d) Received from Application id number d
```

```
==>   [CID] (d) Received by Circuit from Application id number d
<==   [CID] (d) Sent by Circuit to Application id number d
<==   (d) Sent to Application id number d
***>  Received from MQ
      Any other internal message
```

Note: All error messages are prefixed with an ERROR: label and all warning messages are prefixed with a WARNING: label.

For additional help analyzing the contents of the SS7 server log file, contact customer support via the web site at *http://developer.intel.com/design/telecom/support/*.

Note: It is possible to redirect all SS7 system environment trace messages to the Global Call SS7 server trace file so that all logging information is in one file. This is achieved using a REDIRECT command in the *system.txt* file. See Section 3.1, "SS7 System Environment Configuration (system.txt)", on page 33 for more information.

SS7-Specific Function Information 8

This chapter describes the Global Call API functions that have additional functionality or perform differently when used in with SS7 technology. The function descriptions are presented alphabetically and contain information that is specific to SS7 applications. Generic function description information (that is, information that is not technology-specific) is provided in the *Global Call API Library Reference*.

8.1 Global Call Functions Supported by SS7

The following is a list of all functions in the Global Call API library. The description under each function indicates whether the function is supported, not supported, or supported with variances.

gc_AcceptCall( )
: Supported with variances described in Section 8.2.1, "gc_AcceptCall( ) Variances for SS7", on page 94.

gc_AcceptModifyCall( )
: Not supported.

gc_AcceptInitTransfer( )
: Not supported.

gc_AcceptXfer( )
: Not supported.

gc_AlarmName( )
: Not Supported.

gc_AlarmNumber( )
: Not Supported.

gc_AlarmNumberToName( )
: Not Supported.

gc_AlarmSourceObjectID( )
: Not Supported.

gc_AlarmSourceObjectIDToName( )
: Not Supported.

gc_AlarmSourceObjectName( )
: Not Supported.

gc_AlarmSourceObjectNameToID( )
Not Supported.

gc_AnswerCall( )
Supported with variances described in Section 8.2.2, "gc_AnswerCall( ) Variances for SS7", on page 94.

gc_Attach( ) (deprecated)
Supported.

gc_AttachResource( )
Not Supported.

gc_BlindTransfer( )
Not supported.

gc_CallAck( )
Supported with variances described in Section 8.2.3, "gc_CallAck( ) Variances for SS7", on page 95.

gc_CallProgress( )
Not supported.

gc_CCLibIDToName( )
Supported.

gc_CCLibNameToID( )
Supported.

gc_CCLibStatus( ) (deprecated)
Supported.

gc_CCLibStatusAll( ) (deprecated)
Supported.

gc_CCLibStatusEx( )
Supported.

gc_Close( )
Supported.

gc_CompleteTransfer( )
Not supported.

gc_CRN2LineDev( )
Supported.

gc_Detach( )
Supported.

gc_DropCall( )
Supported with variances described in Section 8.2.4, "gc_DropCall( ) Variances for SS7", on page 95.

gc_ErrorInfo( )
Supported.

gc_ErrorValue( ) (deprecated)
Supported with variances described in Section 8.2.5, "gc_ErrorValue( ) Variances for SS7", on page 95.

gc_Extension( )
Supported with variances described in Section 8.2.6, "gc_Extension( ) Variances for SS7", on page 95.

gc_GetAlarmConfiguration( )
Not Supported.

gc_GetAlarmFlow( )
Not Supported.

gc_GetAlarmParm( )
Not supported.

gc_GetAlarmSourceObjectList( )
Not Supported.

gc_GetAlarmSourceObjectNetworkID( )
Not Supported.

gc_GetANI( ) (deprecated)
Supported.

gc_GetBilling( )
Not supported.

gc_GetCallInfo( )
Supported with variances described in Section 8.2.7, "gc_GetCallInfo( ) Variances for SS7", on page 96.

gc_GetCallProgressParm( )
Not supported.

gc_GetCallState( )
Supported.

gc_GetConfigData( )
Not supported.

gc_GetCRN( )
Supported.

gc_GetCTInfo( )
Not supported.

gc_GetDNIS( ) (deprecated)
Supported with variances described in Section 8.2.8, "gc_GetDNIS( ) Variances for SS7", on page 96.

gc_GetFrame( ) (deprecated)
Not supported.

gc_GetInfoElem( ) (deprecated)
Not supported.

gc_GetLineDev( )
Supported.

gc_GetLinedevState( )
Supported.

gc_GetMetaEvent( )
Supported.

gc_GetMetaEventEx( ) (Windows extended asynchronous model only)
Supported.

gc_GetNetCRV( ) (deprecated)
Not supported.

gc_GetNetworkH( ) (deprecated)
Supported with variances described in Section 8.2.9, "gc_GetNetworkH( ) Variances for SS7", on page 97.

gc_GetParm( )
Supported with variances described in Section 8.2.10, "gc_GetParm( ) Variances for SS7", on page 97.

gc_GetResourceH( )
Supported.

gc_GetSigInfo( )
Supported with variances described in Section 8.2.11, "gc_GetSigInfo( ) Variances for SS7", on page 97.

gc_GetUserInfo( )
Not supported.

gc_GetUsrAttr( )
Supported.

gc_GetVer( )
Supported.

gc_GetVoiceH( ) (deprecated)
Supported.

gc_GetXmitSlot( )
Supported.

gc_HoldACK( )
Not supported.

gc_HoldCall( )
Supported with variances described in Section 8.2.12, "gc_HoldCall( ) Variances for SS7", on page 98.

gc_HoldRej( )
Not supported.

gc_InitXfer( )
Not supported.

gc_InvokeXfer( )
Not supported.

gc_LinedevToCCLIBID( )
Supported.

gc_Listen( )
Supported.

gc_LoadDxParm( )
Not supported.

gc_MakeCall( )
Supported with variances described in Section 8.2.13, "gc_MakeCall( ) Variances for SS7", on page 99.

gc_Open( ) (deprecated)
Supported.

gc_OpenEx( )
Supported with variances described in Section 8.2.14, "gc_OpenEx( ) Variances for SS7", on page 100.

gc_QueryConfigData( )
Not supported.

gc_RejectInitXfer( )
Not supported.

gc_RejectModifyCall( )
Not supported.

gc_RejectXfer( )
Not supported.

gc_ReleaseCall( ) (deprecated)
Supported.

gc_ReleaseCallEx( )
Supported.

gc_ReqANI( )
Not supported.

gc_ReqModifyCall( )
Not supported.

gc_ReqMoreInfo( )
Supported.

gc_ReqService( )
Not supported.

gc_ResetLineDev( )
Supported with variances described in Section 8.2.15, "gc_ResetLineDev( ) Variances for SS7", on page 100.

gc_RespService( )
Not supported.

gc_ResultInfo( )
Supported.

gc_ResultMsg( ) (deprecated)
Supported.

gc_ResultValue( ) (deprecated)
Supported with variances described in Section 8.2.16, "gc_ResultValue( ) Variances for SS7", on page 101.

gc_RetrieveAck( )
Not supported.

gc_RetrieveCall( )
Supported with variances described in Section 8.2.17, "gc_RetrieveCall( ) Variances for SS7", on page 101.

gc_RetrieveRej( )
Not supported.

gc_SendMoreInfo( )
Supported.

gc_SetAlarmConfiguration( )
Not supported.

gc_SetAlarmFlow( )
Not supported.

gc_SetAlarmNotifyAll( )
Not supported.

gc_SetAlarmParm( )
Not supported.

gc_SetAuthenticationInfo( )
Not supported.

gc_SetBilling( )
Supported with variances described in Section 8.2.18, "gc_SetBilling( ) Variances for SS7", on page 101.

gc_SetCallingNum( ) (deprecated)
Supported.

gc_SetCallProgressParm( )
Not supported.

gc_SetChanState( )
Supported with variances described in Section 8.2.19, "gc_SetChanState( ) Variances for SS7", on page 101.

gc_SetConfigData( )
Supported with variances described in Section 8.2.23, "gc_SetConfigData( ) Variances for SS7", on page 103.

gc_SetEvtMsk( ) (deprecated)
Supported.

gc_SetInfoElem( ) (deprecated)
Supported with variances described in Section 8.2.20, "gc_SetInfoElem( ) Variances for SS7", on page 101.

gc_SetParm( )
Supported with variances described in Section 8.2.21, "gc_SetParm( ) Variances for SS7", on page 102.

gc_SetupTransfer( )
Not supported.

gc_SetUserInfo( )
Not supported.

gc_SetUsrAttr( )
Supported.

gc_SndFrame( ) (deprecated)
Not supported.

gc_SndMsg( ) (deprecated)
Supported with variances described in Section 8.2.24, "gc_SndMsg( ) Variances for SS7", on page 103.

gc_Start( )
Supported.

gc_StartTrace( )
Supported with variances described in Section 8.2.22, "gc_StartTrace( ) Variances for SS7", on page 103.

gc_Stop( )
Supported.

gc_StopTrace( )
Supported with variances described in Section 8.2.25, "gc_StopTrace( ) Variances for SS7", on page 104.

gc_StopTransmitAlarms( )
Not supported.

gc_SwapHold( )
Not supported.

gc_TransmitAlarms( )
Not supported.

gc_UnListen( )
Supported.

gc_util_copy_parm_blk( )
Supported.

gc_util_delete_parm_blk( )
Supported.

gc_util_find_parm( )
Supported.

gc_util_find_parm_ex( )
Supported.

gc_util_insert_parm_ref( )
Supported.

gc_util_insert_parm_ref_ex( )
Supported.

gc_util_insert_parm_val( )
Supported.

gc_util_next_parm( )
Supported.

gc_util_next_parm_ex( )
Supported.

gc_WaitCall( )
Supported.

8.2 Global Call Function Variances for SS7

The Global Call function variances that apply when using SS7 technology are described in the following sections. See the *Global Call API Library Reference* for generic (technology-independent) descriptions of the Global Call API functions.

Notes: ***1.*** For SS7, all the Global Call API functions that have a mode argument must be used in asynchronous mode, except the routing functions (**gc_Listen( )**, **gc_UnListen( )**, and **gc_GetXmitSlot( )**) that must be used in synchronous mode.

2. The SS7 specific constants and data structures are defined in the *Libgcs7.h* and *cc_s7.h* header files. An application should only include *Libgcs7.h* (*cc_s7.h* being included by the latter).

8.2.1 gc_AcceptCall( ) Variances for SS7

The **gc_AcceptCall( )** function is used to send an Address Complete Message (ACM). The **rings** parameter is ignored.

8.2.2 gc_AnswerCall( ) Variances for SS7

The **gc_AnswerCall( )** function is used to send an Answer Message (ANM). In the case of ITU-T operation, if no ACM message has been sent, the **gc_AnswerCall( )** function sends a Connect message (CON) instead of an ANM message. The **rings** parameter is ignored.

8.2.3 gc_CallAck( ) Variances for SS7

The GCST_GETMOREINFO and GCST_SENDMOREINFO states must be enabled by issuing the **gc_SetConfigData( )** function with a **target_type** of GCTGT_GCLIB_CHAN and a **target_ID** of a line device, and passing the GCSET_CALLSTATE_MSK set ID and the GCACT_ADDMSK parameter ID with one of the following values:

- GCMSK_GETMOREINFO_STATE
- GCMSK_SENDMOREINFO_STATE

See the **gc_SetConfigData( )** function description in the *Global Call API Library Reference* and the section on Call State Configuration in the *Global Call API Programming Guide* for more information.

8.2.4 gc_DropCall( ) Variances for SS7

The **gc_DropCall( )** function sends a Release message (REL) to the SS7 stack if the active call has not been released by the other side. The REL message contains an SS7 cause translated from a Global Call cause specified as an argument to the **gc_DropCall( )** function. Otherwise, the **gc_DropCall( )** function sends a Release Complete message (RLC).

Bits 8 to 11 from the **gc_DropCall( )** parameter are being transparently packed into the location field of the cause value. See the "Cause Indicators" section in *ITU-T Recommendation Q.763, "Signaling System No. 7 - ISDN User Part Formats and Codes"* for more information.

8.2.5 gc_ErrorValue( ) Variances for SS7

The SS7 call control library provides both standard Global Call error codes and SS7-specific error codes (*cclib_errorp* argument), which are useful when diagnosing function failures. See Chapter 10, "SS7-Specific Error Codes and Event Cause Codes" for more information. The error codes are also listed in the *cc_s7.h* header file, that is included by including the *Libgcs7.h* file when compiling and building applications.

Note: The **gc_ErrorValue( )** function is deprecated. The preferred alternative is **gc_ErrorInfo( )**.

8.2.6 gc_Extension( ) Variances for SS7

The **gc_Extension( )** function and corresponding GCEV_EXTENSION event is used to support the Continuity Check feature.

For the GCEV_EXTENSION event, the extevtdatap field of the METAEVENT structure is a pointer to an EXTENSIONEVTBLK structure. The ext_id member of EXTENSIONEVTBLK can be:

- S7_EXT_CONTCHECK - Indicating the beginning of a Continuity Check.
- S7_EXT_CONTCHECK_END - Indicating the end of a Continuity Check

The parmblk field of the EXTENSIONEVTBLK structure contains additional information. The parmblk field is of type GC_PARM_BLK and contains only a GC_PARM_DATA structure. The set_ID of GC_PARM_DATA is S7SET_CONTCHECK, and the parm_ID is S7PARM_CONTCHECK_TYPE. The parm_data_size is sizeof(int).

Note: In earlier releases of the Global Call SS7 software, S7SET_ parameter sets and S7PARM_ parameter IDs were defined with values that are different than the current release. An application that uses the S7SET_ and S7PARM_ defines **must** be recompiled with the correct header file from the current release.

For an outbound, out-of-call Continuity Check request, the application can use the **gc_Extension( )** function with an **ext_id** of S7_EXT_REQUESTCONTCHECK. See Section 5.8.2, "Outbound Continuity Check", on page 78 for more information.

For an outbound, in-call Continuity Check request, the application **must** use the **gc_MakeCall( )** function. See Section 8.2.13, "gc_MakeCall( ) Variances for SS7", on page 99 for more information.

8.2.7 gc_GetCallInfo( ) Variances for SS7

The **gc_GetCallInfo( )** function can retrieve the following information:

CATEGORY_DIGIT
: The calling party category for the call.

DESTINATION_ADDRESS
: The destination address. This method of retrieving the destination address is preferred over the equivalent **gc_GetDNIS( )** function.

ORIGINATION_ADDRESS
: The origination address. This method of retrieving the origination address is preferred over the equivalent **gc_GetANI( )** function.

PRESENT_RESTRICT
: The calling party presentation restriction.

REDIRECTING_NUMBER
: The destination address before the last redirection (forward or diversion).

Other info_id values are not currently supported for SS7. The functionality of the U_IES (Unformatted Information Elements) info_id can be obtained by using the more appropriate **gc_GetSigInfo( )** functions that associates messages with Global Call events. See Section 8.2.11, "gc_GetSigInfo( ) Variances for SS7", on page 97 for more details.

8.2.8 gc_GetDNIS( ) Variances for SS7

The **gc_GetDNIS( )** function returns the full DNIS string available, including any digits received in overlap mode after the Initial Address Message (IAM).

Note: The **gc_GetDNIS( )** function is deprecated; use **gc_GetCallInfo( )**.

8.2.9 gc_GetNetworkH( ) Variances for SS7

The **gc_GetNetworkH( )** function is supported for backward compatibility only. The function can be used to retrieve the network device handle associated with the line device. For circuits located on an Intel® Dialogic® network interface board (DTI), the returned handle can then be used when invoking Dialogic DTI functions. For circuits located on an Intel NetStructure® SS7 board, the returned handle will be the same as the specified line device. This handle cannot be used with DTI functions.

Typical usage of this function was to perform routing of a Global Call line device (**dt_listen( )**, **dt_getxmitslot( )**). However, this call control library supports the Global Call routing functions (**gc_Listen( )**, **gc_GetXmitSlot( )**) that can be used regardless of the type of network interface device (DTI or SS7) and allow correct operation of a loopback in a circuit for inbound continuity checks. See Section 5.8.1, "Inbound Continuity Check", on page 77 for more information. Therefore, for routing of SS7 line devices, it is strongly recommended to always use the Global Call functions instead of the DTI functions. This makes the network device type transparent to the application.

See Section 5.3, "SCBus or CT Bus Routing", on page 72 later in this document for more on routing.

Note: The **gc_GetNetworkH( )** function is deprecated. The preferred alternative is **gc_GetResourceH( )**.

8.2.10 gc_GetParm( ) Variances for SS7

The **gc_GetParm( )** function can be used to retrieve the following parameters:

GCPR_CALLINGPARTY
Default Calling Party Address.

GCPR_IGNORE_BCI
Inhibits the Global Call SS7 software from analyzing the Backward Call Indicator (BCI) in incoming ACM messages and alerting the application of the call only when the "Called party's status indicator" fields are set to "Subscriber Free". When this parameter is set to 1, the Global Call SS7 software ignores the BCI content and always sends the GCEV_ALERTING event to the application in response to an incoming ACM ISUP message. By default, this parameter is set to 0.

GCPR_MINDIGITS
The minimum number of digits to collect before reporting an OFFERED call.

GCPR_RECEIVE_INFO_BUF
The size, that is, the number of messages that can be stored in the cyclic buffer. Messages can be retrieved using the **gc_GetSigInfo( )** function. See Section 8.2.11, "gc_GetSigInfo( ) Variances for SS7", on page 97 for details.

8.2.11 gc_GetSigInfo( ) Variances for SS7

The **gc_GetSigInfo( )** function enables an application to retrieve the content of the message that triggered an event. This can be used if the application requires access to some SS7 specific message parameter that is not directly accessible using another Global Call function. It is then up to the application to parse the message and extract the information it requires.

Since events are delivered to the application using an asynchronous mechanism (SRL event queue), it is possible that a subsequent message may already be received and other events already be put in the queue by the time the application calls the **gc_GetSigInfo( )** function. Therefore the SS7 call control library stores messages in a cyclic buffer so that the application can retrieve a message associated with a particular event. The event for which the application wishes to retrieve the associated message is specified by passing the Global Call metaevent to the function.

The maximum number of messages that can be stored in the cyclic buffer is configurable by using the **gc_SetParm( )** function and specifying the **GCPR_RECEIVE_INFO_BUF** parameter. There is one cyclic buffer for each circuit. Since, by default, the cyclic buffer is configured to store 0 (zero) messages, an application that wishes to use the **gc_GetSigInfo( )** function **must** set the **GCPR_RECEIVE_INFO_BUF** parameter for each line device. For most practical uses of this mechanism, a cyclic buffer depth of 8 messages should be sufficient, although the Global Call SS7 library limits this number to 777 in order to prevent extremely inefficient memory use. See Section 8.2.21, "gc_SetParm( ) Variances for SS7", on page 102 for more information.

Note: The third parameter in the **gc_GetSigInfo( )** function signature, **info_id**, is currently not used by the SS7 call control library. It must be set to *zero* unless otherwise specified.

The returned messages contain 2 bytes indicating the length at the beginning of the buffer followed by the message data that is encoded as specified in the "Application Message - User Data Format" section in the *Intel NetStructure® SS7 Protocols ISUP Programmer's Manual (Issue 12)*.

The following code demonstrates the use of **gc_GetSigInfo( )**:

```
METAEVENT metaevt;
gc_GetMetaEvent(&metaevt);
char buffer[322]; // max size of DK message + length
if (GC_SUCCESS == gc_GetSigInfo(m_ldid, buffer, 0, &metaevt)) {
    S7_IE_BLK *blk_p = (S7_IE_BLK *)buffer;
        // further parsing of an obtained message
} else {
        // process error here
}
```

Notes:
1. The *cc_S7.h* file mistakenly defines S7_MAXLEN_IEDATA as 254. The correct value is 320.
2. The S7_SIGINFO_BLK and S7_IE structures defined in the cc_s7.h file can be used for parsing of received messages, but should never be used for allocation of buffers.

8.2.12 gc_HoldCall( ) Variances for SS7

At any time after a call is in the Connected state, the application can call the **gc_HoldCall( )** function to put the call in the Suspended state. The application receives a GCEV_HOLDACK event indicating that the call has entered the Suspended state. The call remains in the Suspended state until the **gc_RetrieveCall( )** function is called with the same CRN to resume the call. See Section 8.2.17, "gc_RetrieveCall( ) Variances for SS7", on page 101 for related information.

8.2.13 gc_MakeCall( ) Variances for SS7

The SS7 call control library supports the **timeout** parameter regardless of the fact that the **gc_MakeCall( )** function can be used in ASYNC mode only.

The GC_MAKECALL_BLK data structure contains a **cclib** field. When the **cclib** field is set to zero, default values are used for all call setup parameters. When the **cclib** field is set to a pointer to an S7_MAKECALL_BLK data structure which contains parameters usually set in an Initial Address Message (IAM), the specified fields overwrite the default values in the IAM.

The S7_MAKECALL_BLK structure contains the following IAM parameters:

- destination_number_type
- destination_number_plan
- internal_network_number
- origination_phone_number
- origination_number_type
- oringination_number_plan
- calling_party_category
- origination_present_restrict
- origination_screening
- forward_call_indicators
- trans_medium_req
- satellite_indicator
- echo_device_indicator
- continuity_check_indicator
- user_to_user_indicators

Notes: ***1.*** The fields in the S7_MAKECALL_BLK structure that are not used must be set to 0 (zero) before calling the **gc_MakeCall( )** function.

2. Other parameters can be added using the **gc_SetInfoElem( )** function. See Section 8.2.20, "gc_SetInfoElem( ) Variances for SS7", on page 101 for more information.

3. It is the responsibility of the application to ensure that the parameters that are being added via the S7_MAKECALL_BLK data structure are not duplicated in **gc_SetInfoElem( )** calls for use with the same **gc_MakeCall( )**. Otherwise, it is not possible to guarantee which parameter value will be processed by the underlying stack.

The **gc_MakeCall( )** function can be used to request an in-call continuity check. The continuity_check_indicator in the S7_MAKECALL_BLK structure must be set to CCI_CC_REQUIRED so that Global Call will send an SS7 IAM message with continuity check to the network. See Section 5.8.2, "Outbound Continuity Check", on page 78 for more information.

8.2.14 gc_OpenEx( ) Variances for SS7

Global Call device naming conventions apply to SS7 telephony devices. The protocol name to use is SS7. A voice device name may be specified, in which case this device will be opened and its handle will be available through the **gc_GetVoiceH( )** function. An application should use the following device name format:

```
N_network_device_name:P_SS7:V_voice_device_name
```

See the *Global Call API Library Reference* for more on the device name format.

The result of specifying a voice device name in the Global Call device name given to **gc_OpenEx( )** is equivalent to opening the voice device separately, using **dx_open( )**, performing a **gc_Attach( )**, then routing the network and the voice devices together. A voice device opened as part of a Global Call line device can later be detached from the line device using **gc_Detach( )**. A voice device that has been opened together with a Global Call line device but that has later been detached from it is not closed during the corresponding **gc_Close( )**.

The network device that is specified is the physical time slot where the voice circuit is located. This is completely independent of the signaling path. The latter need only be specified in the configuration of the system. The circuit time slot can reside on a Intel Dialogic board that includes network interfaces (for example, a DM/V960-4T1 or a DM/V1200-4E1) or on an Intel NetStructure SS7 board.

For an Intel Dialogic board with network interfaces, the standard device names are used: **dtiB*xTy*** where *x* is the logical board number and *y* is the logical circuit number (from 1 to the number of circuit on the trunk, no gaps are left for unused time slots or time slots used for signaling).

For Intel NetStructure SS7 boards, the device names used are: **dkB*xTy*** where *x* is 1 for the first trunk of the board and 2 for the second trunk (if present) and *y* is the logical circuit number (same as for DTI boards).

Notes: ***1.*** When a voice device is specified in the **devicename** string, a full duplex routing is established between the network interface device and the voice resource. The full duplex routing is performed regardless of whether or not the network device name is a DTI device (**dtiBxTy**, on an Intel Dialogic network interface board) or an SS7 device (**dkBxTy**, on an Intel NetStructure SS7 board).

2. In this release of the software, trunk device (for example,dtiB1) may not be opened for SS7.

As part of executing **gc_OpenEx( )**, Global Call SS7 will start initializing the circuit. The application must wait for a **GCEV_UNBLOCKED** event to be received before it can start using the opened line device.

8.2.15 gc_ResetLineDev( ) Variances for SS7

The **gc_ResetLineDev( )** function releases any resource allocated to the circuit and any of its associated calls and performs a reset of the telephony circuit.

This function also cancels **gc_WaitCall( )** and sets the channel state to GCLS_INSERVICE. See Section 8.2.19, "gc_SetChanState( ) Variances for SS7", on page 101 for more information.

A GCEV_RESETLINEDEV event indicates successful completion of the function. Upon reception of this event, the application may issue a new **gc_WaitCall()** in order to start receiving calls again.

8.2.16 gc_ResultValue( ) Variances for SS7

The call control library-specific result value will indicate the actual SS7 network cause value, if available.

Note: The **gc_ResultValue( )** function is deprecated. The preferred alternative is **gc_ResultInfo( )**.

8.2.17 gc_RetrieveCall( ) Variances for SS7

An application can use the **gc_RetrieveCall( )** function to resume a call previously placed in the Suspended state by using the **gc_HoldCall( )** function. The application receives a GCEV_RETRIEVEACK event if the call is resumed successfully. If the network has placed the call in the Suspended state, a call to **gc_RetrieveCall( )** to resume the call will fail. See Section 8.2.12, "gc_HoldCall( ) Variances for SS7", on page 98 for related information.

8.2.18 gc_SetBilling( ) Variances for SS7

The **gc_SetBilling( )** function may be used before calling **gc_AcceptCall( )** or **gc_AnswerCall( )** to control charging (charge or no-charge). After the **gc_SetBilling( )** function is called, Global Call sets accordingly the BCI (Backward Call Indicator) parameter in each ACM or CON message that it sends.

- If the specified rate type is any value other than GCR_NOCHARGE, the charge indicator of the BCI is set to **charge**.
- If the specified rate type is GCR_NOCHARGE, the charge indicator of the BCI is set to **no charge**.

The charge indicator is left in the default value in case the **gc_SetBilling( )** function is not called by the application.

8.2.19 gc_SetChanState( ) Variances for SS7

The **gc_SetChanState( )** function allows an application to block a circuit. This release of Global Call SS7 will always perform maintenance blocking, whether the specified state is GCLS_MAINTENANCE or GCLS_OUT_OF_SERVICE. Consequently, any active call on the circuit will always proceed unaffected but further calls will be blocked. Setting the channel state to GCLS_INSERVICE unblocks the circuit.

8.2.20 gc_SetInfoElem( ) Variances for SS7

The **gc_SetInfoElem( )** function allows the application to add ISUP message parameters (that is, information elements) to outgoing messages sent by the SS7 call control library while executing a Global Call call control function. The format of the information elements is typically identical to the ISUP format, with the exception that all parameters are formatted as optional parameter

(parameter name, length, and contents). It is possible to add multiple information elements in one **gc_SetInfoElem( )** function call. The parameters must be put in an S7_IE_BLK structure, a pointer to which is set in the cclib field of the GC_IE_BLK specified as argument to the function. The following code fragment illustrates the use of the function:

```
/*  Add User-to-user information to Initial Address Message */
S7_IE_BLK ie_blk;
GC_IE_BLK gc_ie_blk;

ie_blk.length = 5;
ie_blk.data[0] = 0x20;  /* Parameter name - User-to-user info */
ie_blk.data[1] = 0x03;  /* Parameter length - 3 bytes */
ie_blk.data[2] = 'A';   /* Parameter value - 1st byte */
ie_blk.data[3] = 'B';   /* Parameter value - 2nd byte */
ie_blk.data[4] = 'C';   /* Parameter value - 3rd byte */

gc_ie_blk.gclib = NULL;
gc_ie_blk.cclib = &ie_blk;
if (gc_SetInfoElem(linedev, &gc_ie_blk) != GC_SUCCESS) /* Process error */
if (gc_MakeCall(linedev, &crn, "7124311", NULL, 15, EV_ASYNC) != GC_SUCCESS)
/* Process error */
```

Note: Parameter values (such as 0x20 in the example above, which corresponds to the User-to-User Information parameter) should correspond to parameter values from the ISUP/TUP specifications.

8.2.21 gc_SetParm( ) Variances for SS7

The **gc_SetParm( )** function can be used to configure the following line device parameters:

GCPR_CALLINGPARTY
The default calling party address for the circuit. This parameter is overwritten by the one in the S7_MAKECALL_BLK if specified. Use the paddress field of the GC_PARM union.

GCPR_IGNORE_BCI
This parameter inhibits the Global Call SS7 software from analyzing the Backward Call Indicator (BCI) in incoming ACM messages and alerting the application of the call only when the "Called party's status indicator" fields are set to "Subscriber Free". When this parameter is set to 1, the Global Call SS7 software ignores the BCI content and always sends the GCEV_ALERTING event to the application in response to an incoming ACM ISUP message. Use the intvalue field of the GC_PARM union. By default, this parameter is set to 0.

GCPR_MINDIGITS
The minimum number of digits to collect before reporting an OFFERED call. An overlap receive procedure is used in case the initial number of digits does not reach the minimum number set using this function. Use the intvalue field of the GC_PARM union.

GCPR_RECEIVE_INFO_BUF
The depth of the cyclic IE buffer. Sets the number of messages that can be stored in the cyclic buffer. The recommended number of messages is 8. Messages can be retrieved using the **gc_GetSigInfo( )** function. See Section 8.2.11, "gc_GetSigInfo( ) Variances for SS7", on page 97 for details. Use the intvalue field of the GC_PARM union.

GCPR_UNKNOWN_ISUP_MSGS
Enables the configuration of a line device to receive ISUP messages not recognized by the SS7 call control library. See Section 5.9, "Sending and Receiving ISUP/TUP Messages", on page 79 for more information.

8.2.22 gc_StartTrace( ) Variances for SS7

The **gc_StartTrace( )** function starts SS7 call control library tracing. See Section 7.1, “SS7 Call Control Library Trace File”, on page 83 for more information. Starting a trace on one channel starts a process-wide tracing, that is, tracing on all circuits opened within the process in which **gc_StartTrace( )** was called. The function must be called on a circuit line device.

8.2.23 gc_SetConfigData( ) Variances for SS7

The **gc_SetConfigData( )** function is supported for the purpose of enabling call states only. For example, the **gc_SetConfigData( )** function can be used to enable the GCST_GETMOREINFO and GCST_SENDMOREINFO states that are used for overlap send and receive. See Section 8.2.3, “gc_CallAck( ) Variances for SS7”, on page 95 and Section 5.6, “Using Overlap Send and Receive”, on page 75 for more information.

8.2.24 gc_SndMsg( ) Variances for SS7

The **gc_SndMsg( )** function enables sending of application-ISUP messages, as long as they do not alter the call state or circuit state.

Messages must be formatted as required by the SS7 stack. This format is very similar to the ISUP format with the exception that all message parameters are coded as optional parameters (parameter name, length and contents).

The ISUP message type (also know as **primitive**) is specified in the *msg_type* argument. The message parameters are specified in the S7_IE_BLK pointed to by the cclib field of the GC_IE_BLK given as an argument to this function. Multiple parameters can be put one after the other in the data field of the S7_IE_BLK structure. The total length of the parameters section must be set in the length field of the structure.

The following code fragment illustrates the use of **gc_SndMsg( )** for SS7:

```
/* Send a Subsequent Address Message
 * (SAM) with digits 234 (overlap sending)
 */
S7_IE_BLK ie_blk;
GC_IE_BLK gc_ie_blk;

ie_blk.length = 5;
ie_blk.data[0] = 0x05;  /* Parameter 1 name - Subsequent Number */
ie_blk.data[1] = 0x03;  /* Parameter 1 length - 3 bytes */
ie_blk.data[2] = 0x80;  /* Parameter 1 value - odd number of digits */
ie_blk.data[3] = 0x32;  /* Parameter 1 value - digits '2' and '3' */
ie_blk.data[4] = 0x04;  /* Parameter 1 value - digit  '4' */

gc_ie_blk.gclib = NULL;
gc_ie_blk.cclib = &ie_blk;
ret = gc_SndMsg(linedev, crn, 0x02 /* SAM */, &gc_ie_blk);
```

Note: Parameter values (for example, 0x05 which corresponds to the Subsequent Number parameter) should correspond to parameter values from the ISUP/TUP specifications. Similarly, message type values (for example, 0x02 in the **gc_SndMsg( )** function call above) should correspond to message type values from the ISUP/TUP specification.

8.2.25 gc_StopTrace( ) Variances for SS7

The **gc_StopTrace( )** function stops the process-wide tracing associated with a specific channel. See Section 7.1, "SS7 Call Control Library Trace File", on page 83. The function must be called on a circuit line device.

SS7-Specific Data Structures 9

This chapter describes the data structures that are specific to SS7 technology.

Note: These data structures are defined in the *cc_s7.h* header file, but are included by including the *Libgcs7.h* header file when compiling and linking applications. The *cc_s7.h* file should **not** be included directly.

S7_IE

```
typedef struct {
    unsigned char parm;      /* Parameter type */
    unsigned char length;    /* Number of bytes in the value part */
    unsigned char value;     /* First byte of the value part (there may be more) */
} S7_IE;
```

■ Description

The S7_IE data structure describes an ISUP message parameter. This structure should not be used to allocate storage space for message parameters because its value field is defined as a single byte whereas an actual parameter value may be multi-byte. The S7_IE_BLK structure can be used to allocate storage for a block of parameters, if required.

■ Field Descriptions

The fields of the S7_IE data structure are described as follows:

parm
: The parameter type.

length
: The number of bytes in the value part.

value
: The first byte of the value part.

S7_IE_BLK

```
typedef struct {
  short  length;                  /* must be less than MAXLEN_IEDATA  */
  char  data[S7_MAXLEN_IEDATA];   /* First IE (there may be more)     */
} S7_IE_BLK, *S7_IE_BLK_PTR;
```

■ Description

The S7_IE_BLK data structure contains ISUP message parameters.

■ Field Descriptions

The fields of the S7_IE_BLK data structure are described as follows:

length
: IE data block length, which must be less than S7_MAXLEN_IEDATA. This length includes a trailing 0 that is included in each message.

Note: The *cc_S7.h* header file mistakenly defines S7_MAXLEN_IEDATA as 254. The correct value is 320.

data[s7_MAXLEN_IEDATA]
: Message parameters themselves, one after the other.

S7_MAKECALL_BLK

```
typedef union {
    struct ss7 {

      unsigned char trans_medium_req;
      /*
         TMR_SPEECH
         TMR_64K_UNREST
         TMR_3DOT1K_AUDIO
         TMR_64K_PREFERRED
         TMR_2_64K_UNREST
         TMR_386K_UNREST
         TMR_1536K_UNREST
         TMR_1920K_UNREST
         TMR_3_64K_UNREST
         TMR_4_64K_UNREST
         TMR_5_64K_UNREST
         TMR_7_64K_UNREST
         TMR_8_64K_UNREST
         TMR_9_64K_UNREST
         ...
         TMR_23_64K_UNREST
         TMR_25_64K_UNREST
         ...
         TMR_29_64K_UNREST
      */

      unsigned char destination_number_type;
      /*
          SS7_UNKNOWN_NUMB_TYPE    - spare
          SS7_SUBSCRIBER_NUMBER    - Subscriber number (national use)
          SS7_UNKNOWN_NATIONAL     - Unknown (national use)
          SS7_NATIONAL_NUMBER      - National (significant) number
          SS7_INTERNATIONAL_NUMBER - International number
          SS7_NETWORK_SPECIFIC     - Network-specific number (national use)
       */

       unsigned char destination_number_plan;
       /*
          SS7_UNKNOWN_NUMB_PLAN    - Unknown plan
          SS7_ISDN_NUMB_PLAN       - ISDN numb. plan E.164
          SS7_DATA_NUMB_PLAN       - Data numb. plan X.121
          SS7_TELEX_NUMB_PLAN      - Telex numb. plan F.69
       */

       unsigned char internal_network_number;
       /*
          INN_ALLOWED          - routing to internal network allowed
          INN_NOT_ALLOWED      - routing to internal network not allowed
       */

       unsigned char origination_number_type;
       /*
          SS7_UNKNOWN_NUMB_TYPE    - spare
          SS7_SUBSCRIBER_NUMBER    - Subscriber number (national use)
          SS7_UNKNOWN_NATIONAL     - Unknown (national use)
          SS7_NATIONAL_NUMBER      - National (significant) number
          SS7_INTERNATIONAL_NUMBER - International number
          SS7_NETWORK_SPECIFIC     - Network-specific number (national use)
       */
```

```
unsigned char origination_number_plan;
/*
   SS7_UNKNOWN_NUMB_PLAN    - Unknown plan
   SS7_ISDN_NUMB_PLAN       - ISDN numb. plan E.164
   SS7_DATA_NUMB_PLAN       - Data numb. plan X.121
   SS7_TELEX_NUMB_PLAN      - Telex numb. plan F.69
*/

char origination_phone_number[MAXPHONENUM];

unsigned char origination_present_restrict;
 /*
   PRESENTATION_ALLOWED
   PRESENTATION_RESTRICTED
   PRESENTATION_NOT_AVAILABLE
 */

unsigned char origination_screening;
 /*
   SCREEN_USER_PROVIDED
   SCREEN_USER_PROVIDED_VERIFIED
   SCREEN_USER_PROVIDED_FAILED
   SCREEN_NETWORK_PROVIDED
 */

 unsigned short calling_party_category;
 /*
   SS7_UNKNOWN_CATEGORY
   SS7_FR_OPERATOR_CATEGORY
   SS7_EN_OPERATOR_CATEGORY
   SS7_GE_OPERATOR_CATEGORY
   SS7_RU_OPERATOR_CATEGORY
   SS7_SP_OPERATOR_CATEGORY
   SS7_RESERVED_CATEGORY
   SS7_ORDINARY_SUBS_CATEGORY
   SS7_PRIORITY_SUBS_CATEGORY
   SS7_DATA_CATEGORY
   SS7_TEST_CATEGORY
   SS7_PAYPHONE_CATEGORY
 */
 unsigned short forward_call_indicators;

 /* bitmask - see defines below */
  void *usrinfo_bufp;   /* RFU */

 unsigned char satellite_indicator;
 /*
   SI_NOSATELLITES
   SI_1SATELLITE
   SI_2SATELLITES
 */

 unsigned char echo_device_indicator;
 /*
   EDI_ECHOCANCEL_NOTINCLUDED
   EDI_ECHOCANCEL_INCLUDED
 */

 unsigned char continuity_check_indicator;
 /*
   CCI_CC_NOTREQUIRED
   CCI_CC_REQUIRED
   CCI_CC_ONPREVIOUS
 */
```

```
        unsigned char user_to_user_indicators;

        long rfu[6];          /* RFU */

    } ss7;
} S7_MAKECALL_BLK,  *S7_MAKECALL_BLK_PTR;
```

Note: The comment /* bitmask - see defines below */ in the preceding code listing refers to the fact that the bitmask is created using an OR operation on the defines from the header file.

■ Description

The S7_MAKECALL_BLK union contains SS7-specific parameter values for a specific call.

■ Field Descriptions

The fields of the S7_MAKECALL_BLK union are described as follows:

trans_medium_req

Specifies the format of the transmission medium requirement. Possible values are:

- TMR_SPEECH – speech
- TMR_64K_UNREST – 64 kbps unrestricted
- TMR_3DOT1K_AUDIO – 3.1 KhZ audio
- TMR_64K_PREFERRED – 64 kbps preferred
- TMR_2_64K_UNREST – 2x 64 kbps unrestricted
- TMR_386K_UNREST – 386 kbps unrestricted
- TMR_1536K_UNREST – 1536 kbps unrestricted
- TMR_1920K_UNREST – 1920 kbps unrestricted
- TMR_3_64K_UNREST – 3x 64 kbps unrestricted
- TMR_4_64K_UNREST – 4x 64 kbps unrestricted
- TMR_5_64K_UNREST – 5x 64 kbps unrestricted
- TMR_7_64K_UNREST – 7x 64 kbps unrestricted
- TMR_8_64K_UNREST – 8x 64 kbps unrestricted
- TMR_9_64K_UNREST – 9x 64 kbps unrestricted

  …
- TMR_23_64K_UNREST – 23x 64 kbps unrestricted
- TMR_25_64K_UNREST – 9x 64 kbps unrestricted

  …
- TMR_29_64K_UNREST – 9x 64 kbps unrestricted

destination_number_type

Specifies the destination number type. Possible values are:

- SS7_UNKNOWN_NUMB_TYPE – spare
- SS7_SUBSCRIBER_NUMBER – Subscriber number (national use)
- SS7_UNKNOWN_NATIONAL – Unknown (national use)
- SS7_NATIONAL_NUMBER – National (significant) number
- SS7_INTERNATIONAL_NUMBER – International number
- SS7_NETWORK_SPECIFIC – Network-specific number (national use)

destination_number_plan

Specifies the destination number plan. Possible values are:

- SS7_UNKNOWN_NUMB_PLAN – Unknown plan
- SS7_ISDN_NUMB_PLAN – ISDN number plan E.164

- SS7_DATA_NUMB_PLAN – Data number plan X.121
- SS7_TELEX_NUMB_PLAN – Telex number plan F.69

internal_network_number
Specifies whether routing is allowed to an internal network. Possible values are:
- INN_ALLOWED – Routing to internal network allowed
- INN_NOT_ALLOWED – Routing to internal network not allowed

origination_number_type
Specifies the origination number type. Possible values are:
- SS7_UNKNOWN_NUMB_TYPE – Spare
- SS7_SUBSCRIBER_NUMBER – Subscriber number (national use)
- SS7_UNKNOWN_NATIONAL – Unknown (national use)
- SS7_NATIONAL_NUMBER – National (significant) number
- SS7_INTERNATIONAL_NUMBER – International number
- SS7_NETWORK_SPECIFIC – Network-specific number (national use)

origination_number_plan
Specifies the origination number plan. Possible values are:
- SS7_UNKNOWN_NUMB_PLAN – Unknown plan
- SS7_ISDN_NUMB_PLAN – ISDN number plan E.164
- SS7_DATA_NUMB_PLAN – Data number plan X.121
- SS7_TELEX_NUMB_PLAN – Telex number plan F.69

origination_phone_number [MAXPHONENUM]
Specifies the calling party address. If not specified, default to the address set using **gc_SetCallingNum( )** or **gc_SetParm( )**.

origination_present_restrict
Specifies the calling party address presentation restrictions. Possible values are:
- PRESENTATION_ALLOWED – Presentation allowed.
- PRESENTATION_RESTRICTED – Presentation restricted.
- PRESENTATION_NOT_AVAILABLE – Address not available.

origination_screening
Specifies calling party address screening. Possible values are:
- SCREEN_USER_PROVIDED – Address is user provided, not verified (National use only).
- SCREEN_USER_PROVIDED_VERIFIED – Address is user provided, verified and passed.
- SCREEN_USER_PROVIDED_FAILED – Address is user provided, verified and failed (Notional use only).
- SCREEN_NETWORK_PROVIDED – Address is network provided.

calling_party_category
Information sent in the forward direction indicating the category of the calling party and, in case of semi-automatic calls, the service language to be spoken by the incoming, delay and assistance operators. Possible values are:
- SS7_UNKNOWN_CATEGORY – unknown category
- SS7_FR_OPERATOR_CATEGORY – French language operator
- SS7_EN_OPERATOR_CATEGORY – English language operator
- SS7_GE_OPERATOR_CATEGORY – German language operator
- SS7_RU_OPERATOR_CATEGORY – Russian language operator
- SS7_SP_OPERATOR_CATEGORY – Spanish language operator

- SS7_RESERVED_CATEGORY – Reserved
- SS7_ORDINARY_SUBS_CATEGORY – Ordinary subscriber
- SS7_PRIORITY_SUBS_CATEGORY – Priority subscriber
- SS7_DATA_CATEGORY – specifies a data call using voice-band data.
- SS7_TEST_CATEGORY – Specifies a test call.
- SS7_PAYPHONE_CATEGORY – Specifies a pay phone call.

forward_call_indicators
: Specifies forward call indicators. Bitmask built by “ORing” defines from the header file.

satellite_indicator
: Specifies the presence of satellites along the voice path. Possible values are:
- SI_NOSATELLITES – No satellite.
- SI_1SATELLITE – One satellite.
- SI_2SATELLITES –

echo_device_indicator
: Specifies whether echo cancellation devices are being used or not. Possible values are:
- EDI_ECHOCANCEL_NOTINCLUDED – Echo cancellation devices not being used.
- EDI_ECHOCANCEL_INCLUDED – Echo cancellation devices are being used.

continuity_check_indicator
: Specifies whether a continuity check should be performed on the circuit as part of the call, if it is being performed on a previous circuit, or if it is not requested at all. Possible values are:
- CCI_CC_NOTREQUIRED – Continuity check is not required.
- CCI_CC_REQUIRED – Continuity check is required.
- CCI_CC_ONPREVIOUS – Continuity check being performed on the previous circuit.

user_to_user_indicators
: Specifies the type of user-to-user service that is supported in the outbound call. Possible values are:
- UUI_UUS1_REQ_NE – Service 1, request, non-essential
- UUI_UUS1_REQ_E – Service 1, request, essential
- UUI_UUS2_REQ_NE – Service 2, request, non-essential
- UUI_UUS2_REQ_E – Service 2, request, essential
- UUI_UUS3_REQ_NE – Service 3, request, non-essential
- UUI_UUS3_REQ_E – Service 3, request, essential
- UUI_UUS1_RSP_P – Service 1, response, provided
- UUI_UUS2_RSP_P – Service 2, response, provided
- UUI_UUS3_RSP_P – Service 3, response, provided
- UUI_UUSx_RSP_P – Service 1, 2, and 3, response, provided

S7_SIGINFO_BLK

```
typedef struct {
  short  length;           /* length of SigInfo block plus 1 */
  unsigned char prim;      /* ISUP primitive */
  S7_IE  data;             /* First IE of the message (there may be more) */
} S7_SIGINFO_BLK, *S7_SIGINFO_BLK_PTR;
```

Description

The S7_SIGINFO_BLK data structure contains ISUP messages as returned by the **gc_GetSigInfo( )** function. This structure should not be used to allocate storage space for message parameters because its value field is defined as a single byte, whereas an actual parameter value may be multiple bytes. The S7_IE_BLK structure can be used to allocate storage for a block of parameters.

Field Descriptions

The fields of the S7_SIGINFO_BLK data structure are described as follows:

length
: Block length, including the “primitive” byte (prim) and the parameters (data), plus 1 for the NULL character.

prim
: ISUP primitive (IAM, ANM, REL…)

data
: Message parameters, one after the other.

SS7-Specific Error Codes and Event Cause Codes — 10

This chapter lists the supported SS7-specific error codes and event cause codes and provides a description of each code. The codes are defined in the *cc_s7.h* header file, that is included by including the *Libgcs7.h* in the application.

10.1 SS7-Specific Error Codes

When a function fails, the **gc_ErrorInfo( )** function, or the **gc_ErrorValue( )** function (deprecated), can be used to retrieve error code information.

When the **gc_ErrorInfo( )** function is used, the **a_Infop** parameter is a pointer to a GC_INFO structure that contains both the standard Global Call error value (gcValue field), and an SS7-specific error value (ccValue field).

When the **gc_ErrorValue( )** function is used, function parameters point to a standard Global Call error code (**gc_errorp** function parameter), and an SS7-specific error code (**cclib_errorp** function parameter).

The SS7-specific error codes are presented in hex code value order. A dagger symbol (†) next to an error code indicates that the error code is **not** currently supported.

S7ERR_NO_SESSION (0x8001)
: No session was established with SS7 server

S7ERR_UNSUPPORTED (0x8002)
: Function or function parameter not supported. The code is returned when a user calls:
 - **gc_CallAck( )** with GC_CALLACK_BLK->type=GCACK_SERVICE_INFO and GC_CALLACK_BLK->service.info.info_type=ORIGINATION_ADDRESS
 - **gc_CallAck( )** with GC_CALLACK_BLK->type=GCACK_SERVICE_PROC
 - **gc_ReqMoreInfo( )** with info_id=ORIGINATION_ADDRESS
 - **gc_SendMoreInfo( )** with info_id=ORIGINATION_ADDRESS
 - **gc_Extension( )** with any ext_id that is not supported by the SS7 call control library
 - **gc_GetCallInfo( )** with any info_id that is not supported by the SS7 call control library

S7ERR_INV_PARM (0x8003)
: Invalid parameter

S7ERR_INV_INFO_ID (0x8004)
: Invalid Call Info ID

S7ERR_INV_PARM_ID (0x8005)
: Invalid Parameter ID (in Set/GetParm)

S7ERR_INV_SIGINFO_SIZE (0x8006) †
: Invalid SigInfo buffer size

S7ERR_LDEV_RELATED (0x8007)
Event is related to a LineDevice (therefore no CRN, no SigInfo)

S7ERR_NO_SIGINFO (0x8008)
No SigInfo was associated with the event

S7ERR_NO_SCBUSCONNECTOR (0x8009)
Device does not support routing functions

S7ERR_INV_DEVNAME (0x800A)
Invalid Device Name

S7ERR_INV_STATE (0x800B)
Invalid State (Call/LineDev)

S7ERR_INV_CRN (0x800C)
Invalid CRN

S7ERR_INV_CID (0x800D)
Internal Error

S7ERR_INV_LINEDEV (0x800E)
Invalid LineDevice

S7ERR_INV_TRUNKDEV (0x800F) †
Invalid TrunkDevice

S7ERR_INV_CHANNEL (0x8010) †
TrunkDevice has no such channel (ts)

S7ERR_NO_BASE_TS (0x8011) †
BaseTimeSlot not defined for the Trunk

S7ERR_TLS_NULL (0x8012) †
ThreadLocalStorage is NULL

S7ERR_PING_EVENT (0x8013) †
System Error

S7ERR_MSGQ_FULL (0x8014) †
Internal Error

S7ERR_INV_PARM_SIZE (0x8015) †
Internal Error

S7ERR_SRL (0x8016) †
SRL Error

S7ERR_SRL_PUTEVT (0x8017) †
SRL PutEvt Error

S7ERR_DTI_GENERIC (0x8018) †
Unspecified DTI error

S7ERR_DTI_OPEN (0x8019)
Error opening DTI device

S7ERR_DTI_GETXMIT (0x801A) †
Error getting DTI TX time slot

S7ERR_DTI_LISTEN (0x801B)
Error listening on DTI device

S7ERR_DTI_UNLISTEN (0x801C) †
Error unlistening on DTI device

S7ERR_LOG_ATTACH (0x801D) †
Error attaching file to logger

S7ERR_NOMEM (0x801E) †
Out of memory

S7ERR_GCT_SYSTEM (0x801F) †
Error in GCT System

S7ERR_COM_SYSTEM (0x8020) †
Error in COM system

S7ERR_TIMER_INIT (0x8021) †
Error initializing Timer sub-system

S7ERR_TIMER_ACTIVE (0x8022) †
Attempt to start an already active timer

S7ERR_NO_MORE_CRN (0x8023) †
Too many CRNs allocated on the LineDevice

S7ERR_ISUP_CODING (0x8024) †
Generic error while coding ISUP message

S7ERR_ISUP_DECODING (0x8025) †
Generic error while decoding ISUP message

S7ERR_INV_MODE (0x8026)
SYNC/ASYNC Mode not supported

S7ERR_OPEN_VOICE (0x8027)
Error opening voice device (in gc_OpenEx)

S7ERR_NO_VOICE (0x8028) †
No voice resource attached

S7ERR_VOX_LISTEN (0x8029)
Error in routing voice resource (dx_listen function failed)

S7ERR_VOX_GETXMIT (0x802A)
Error in routing voice resource (dx_getxmitslot function failed)

S7ERR_INIT_EVTMSK (0x802B) †
Internal error

S7ERR_CIRCUIT_IN_USE (0x802C)
Circuit is already in use in another process

S7ERR_SERVICE_NOT_READY (0x802D) †
SS7 server is not running or not correctly initialized

S7ERR_NOT_ATTACHED (0x802E) †
Internal error

S7ERR_WATCHDOG_FAIL (0x802F) †
Internal error

S7ERR_NO_MORE_DIGITS (0x8030)
No additional digit can be obtained

S7ERR_GC_CME (0x8031) †
Internal error

S7ERR_GC_DB (0x8032)
Internal error

S7ERR_SRL_DEPOSIT (0x8033) †
Internal error

S7ERR_UNKNOWN (0x80FF)
Unknown error

10.2 SS7-Specific Event Cause Codes

When an event is received, the **gc_ResultInfo( )** function, or the **gc_ResultValue( )** function (deprecated), can be used to retrieve event cause code information.

When the **gc_ResultInfo( )** function is used, the **a_Info** parameter is a pointer to a GC_INFO structure that contains both the standard Global Call event cause code (gcValue field), and an SS7-specific event cause code (ccValue field).

When the **gc_ResultValue( )** function is used, function parameters point to a standard Global Call event cause code (**gc_resultp** function parameter), and an SS7-specific event cause code (**cclib_resultp** function parameter).

The SS7-specific event cause codes are presented below in hex code value order. A dagger symbol (†) next to an event cause code indicates that the event cause code is **not** currently supported.

S7RV_SUCCESS (0x4000)
Success, no error

S7RV_TIMEOUT (0x4001) †
A timeout has occurred, for example, in a **gc_MakeCall( )**

S7RV_SIU_TRANSFER (0x4002) †
SIU Failure

S7RV_GLARE (0x4003) †
Indicates a glare condition

S7RV_BLK_LOCAL_MAINT (0x4004) †
Circuit is locally maintenance blocked

S7RV_BLK_LOCAL_HARD (0x4005) †
Circuit is locally hardware blocked

S7RV_BLK_REMOTE_MAINT (0x4006) †
Circuit is remotely maintenance blocked

S7RV_BLK_REMOTE_HARD (0x4007) †
  Circuit is remote hardware blocked

S7RV_BLK_MTP (0x4008) †
  Blocked at MTP level (DPC not available)

S7RV_BLK_SIU_DOWN (0x4009) †
  Blocked because of SIU failure

S7RV_MGMT (0x400A) †
  Event caused by management operation

The following event cause codes relate to the GCEV_EXTENSION event, where the extension ID (ext_id) is S7_EXT_CONTCHECK:

S7RV_CC_INBOUND (0x4080) †
  Inbound continuity check; must apply loopback.

S7RV_CC_OUTBOUND (0x4081)
  May proceed with the outbound continuity check

The following event cause codes relate to the GCEV_EXTENSION event, where the extension ID (ext_id) is S7_EXT_CONTCHECK_END:

S7RV_CCEND_INBOUND_FAILURE (0x4090) †
  Inbound continuity check failed

S7RV_CCEND_INBOUND_SUCCESS (0x4091)
  Inbound continuity check succeeded

S7RV_CCEND_OUTBOUND_ERROR (0x4092) †
  Outbound continuity check encountered an error

S7RV_CCEND_OUTBOUND_GLARE (0x4093) †
  Outbound continuity check ended due to glare with incoming IAM or CCR

S7RV_CCEND_OUTBOUND (0x4094)
  Outbound continuity check ended by the S7_EXT_SENDCONTCHECKRESULT

The following event cause codes relate to the GCEV_MOREDIGITS and GCEV_MOREINFO events:

S7RV_INFO_PRESENT_ALL (0x40a0)
  The requested information is available

S7RV_INFO_PRESENT_MORE (0x40a1)
  The requested information is available. More information can be requested.

S7RV_INFO_SOME_TIMEOUT (0x40a2)
  The requested information is not yet available. Only some of the information is present.

S7RV_INFO_SOME_NOMORE (0x40a3)
  The requested information is not yet available. No more information is coming in.

S7RV_INFO_NONE_TIMEOUT (0x40a4)
  The requested information is not available. No information came in.

S7RV_INFO_NONE_NOMORE (0x40a5)
  The requested information is not available. No information came in and none is expected.

S7RV_INFO_SENT (0x40a6) †
The information has been sent successfully

S7RV_DESTINATION_ADDRESS_REQ (0x40a7) †
The destination information has been requested by the remote side

S7RV_ORIGINATION_ADDRESS_REQ (0x40a8) †
The origination information has been requested by the remote side

Supplementary Reference Information 11

This chapter lists references to publications about SS7 technology and includes some samples of configuration files as follows:

11.1 References to More Information

The following publications provide information about SS7 fundamentals:

- Common-Channel Signaling, Richard J. Manterfield, IEEE Telecommunications Series 26
  1991, Peter Peregrinus Ltd. on behalf of the IEEE
  ISBN 0 86341 240 8
- Signaling System #7, Travis Russel
  1995, McGraw-Hill
  ISBN 0-07-054991-5
- ISDN - Concepts, Facilities and Services, Gary C. Kessler, Peter V. Southwick, (Chapter 10)
  1997, McGraw-Hill, 3rd Edition
  ISBN 0-07-034249-0
- ISDN & SS7 - Architectures for Digital Signaling Networks, Uyless Black
  1997, Prentice Hall
  ISBN 0-13-259193-6
- High-Speed Networks: TCP/IP and ATM Design Principles,
  William Stallings
  1997, Prentice Hall
  ISBN: 0135259657
- SS7 Basics, Toni Beninger
  1991, Telephony Division of Intertec Publishing Corp.

The following web sites provide background information on SS7 fundamentals when SS7 signaling is used over a circuit-switched network:

- Microlegend SS7 Tutorial - *http://www.pt.com/tutorials/ss7/*
- Web ProForums - *http://www.iec.org/online/tutorials/ss7/*
- CellStream SS7 online tutorial - *http://www.cellstream.com/prod01.htm*

The following web site provides more information on SS7:

- Intel® Telecom Solutions web page for SS7 solutions - *http://www.intel.com/network/csp/solutions/ngn/7194web.htm*

All URLs and site content were verified at the time of writing.

11.2 Sample gcss7.cfg Configuration File

The following is an example of a *gcss7.cfg* file:

```
#
# Intel (Dialogic) GlobalCall SS7 Configuration File (gcss7.cfg)
#
#    for Windows
#


################################
# Type of System Configuration #
################################

# Leave commented out or set to "None" when not using Dialogic SS7.
# Depending on the value of this parameter, the sections below, that
# are specific to some configurations (SeptelCard, SIU, SIU.Dual) will be
# used or not.
# Format: String - ["None", "Card", "SIU", "DualSIU"]
System.Configuration = "None"

##########################################################
# Parameters for the GlobalCall SS7 Call Control Library #
##########################################################

# If defined, this parameter will cause the library logging to be
# activated at the first gc_Open() of an SS7 ciruit and the trace
# file will have the specified name.
# Format: String
Library.LogFile = "ss7.log"

# Logging Level for the library
# Format: String - ["None", "Errors", "All"]
# Default: "Errors" (and Warnings)
Library.LogLevels = "All"

# Maximum size of the library log in kilobytes
# Format: Integer, Default: 200
#Library.LogMaxSize = 200

##################################################
# Parameters for the Dialogic SS7 service/deamon #
##################################################

# Logging Level for the service (DlgcS7.log)
```

```
# Format: String - ["None", "Errors", "All"]
# Default: "Errors" (and Warnings)
Service.LogLevels = "All"

# Maximum size of the service log in kilobytes
# Format: Integer, Default: 200
#Service.LogMaxSize = 200

# Does the service need to start GCTLOAD automatically?
# Format: String - ["Yes", "No"]
Service.GCTLOAD_Control = "No"

# Path to GCTLOAD (Used only if GCTLOAD_Control is set to "Yes")
# For Setpel Cards, the parameter defaults to the same path as ConfigDir
# Format: String
#Service.GCTLOAD_Path = "c:\septel"

# GCT-environment module id used by the service
# Format: Integer, Default: 0x4d
Service.ModuleID = 0x4d

# Maximum timeout (in seconds) for server-application keep-alive mechanisme
# (NOT SUPPORTED IN THIS RELEASE)
# Format: Integer
#Service.WatchDogMaxTime = 8

# Time (in ms) during which to accumulate Circuit Group Supervision Requests
# (reset, block, unblock) for a circuit group.
# Format: Integer - Default: 500
#Service.GroupCommandTimer = 500

#########################################
# Configuration for Septel Card Systems #
#########################################

# Path to the config.txt file
# Format: String
SeptelCard.ConfigDir = "c:\septel"

# Should MTP links be activated automatically?
# Format: String - ["None", "All"]
SeptelCard.Auto_Links_Activation = "All"

#################################
# Configuration for SIU Systems #
#################################

# ID of this host - Use 0 if only one host accessing the SIU(s)
# Format: Integer
SIU.HostID = 0

# SIU A - IP Address
# Format: String
#SIU.A.IP_Address = "111.112.113.114"

# SIU A - Account to use to connect to SIU when using FTP
# Format: String
#SIU.A.FTP_Account = "ftp"

# SIU A - Password for the FTP account
# Format: String
#SIU.A.FTP_Password = "ftp"

# SIU A - Directory to which to change (in FTP session) in order to get config.txt
# Format: String
#SIU.A.RemoteConfigDir = "."
```

```
# Maximum time (in seconds) to wait at startup for an SIU to come on-line before
# considering it as being down.
# Format: Integer, Default: 10
#SIU.InitTimeout = 10


# Max time (in seconds) to wait for FTP connection while getting config.txt from SIU
# Format: Integer - Deault: 5
#SIU.FTP_Timeout = 5

# Max number of FTP retries while getting config.txt from SIU
# Format: Integer, Default: 2
#SIU.FTP_Retries = 2

#############################################################
# Parameters specific to Dual-Resilient SIU Configurations #
#############################################################

# SIU B Parameters - See the same parameters for SIU.A
#SIU.B.IP_Address = "111.112.113.114"

#SIU.B.FTP_Account = "ftp"

#SIU.B.FTP_Password = "ftp"

#SIU.B.RemoteConfigDir = "."

# Max time (in seconds) to wait for group (de)activation command
# responses from SIU.
# Format: Integer, Default: 5
#SIU.Dual.SiuCommandTimeout = 5

# Debounce time (in seconds) for SIU Down indications
# Format: Integer, Default: 8
#SIU.Dual.SiuUpDebounceTime = 8

# Maximum number of retries for SIU group (de)activation commands
# Format: Integer, Default: 5
#SIU.Dual.MaxCmdRetries = 5

##############################################
# Parameters that are related to config.txt #
##############################################

# MTP Link source, link ID must match the value in config.txt.
# MtpLink <link_id> <"link_source">

# Circuit Group configuration, Group ID must match the value in config.txt.
# CGrp <gid> <"trunk_name"> [<base_TS> [<"Pref_SIU">]]

#
# End of gcss7.cfg
#
```

11.3 Sample system.txt File for a System with SS7 Boards

The following is an example of a *system.txt* file for a system that includes an Intel NetStructure® SS7 board, in this case, the SS7SPCI4 board:

```
*
* Sample system.txt for Dialogic GC/SS7 on SS7SPCI4 system
*
* Modules running on the host:
*
LOCAL 0x00 * Timer Task
LOCAL 0x20 * ssd - Board Interface task
LOCAL 0x4d * Global Call SS7 Service
LOCAL 0xcf * s7_mgt
LOCAL 0xef * s7_log
*
* Modules running on the board (all redirected via ssd):
*
REDIRECT 0x10 0x20 * PCM/SCbus/Clocking control module
REDIRECT 0x71 0x20 * MTP2 module
REDIRECT 0x22 0x20 * MTP3 module
REDIRECT 0x23 0x20 * ISUP module.
REDIRECT 0x4a 0x20 * TUP/NUP module
REDIRECT 0x8e 0x20 * On-board management task
*
* Redirection of status:
*
REDIRECT 0xdf 0x4d * LIU/MTP2 status messages to DlgcS7
*
* Now start-up all local tasks:
*
FORK_PROCESS .\SSDS.EXE -d
FORK_PROCESS .\TIM_NT.EXE
FORK_PROCESS .\TICK_NT.EXE
FORK_PROCESS .\S7_MGT.EXE -d
FORK_PROCESS .\S7_LOG.EXE -m0xef
*
* End of file
*
```

11.4 Sample config.txt File for a System with Circuits and Signalling on an SS7 Board

The following is an example of a *config.txt* file for a system that terminates trunks containing SS7 links and ISUP circuits on an Intel NetStructure SS7 board, in this example, the SS7SPCI4 board:

```
*
* Sample SS7SPCI4 Protocol configuraiton file (config.txt)
* for Dialogic GC/SS7.
* - 1 SS7SPCI4 in CTBus master mode
* - 2 circuit groups on the first 2 SS7SPCI4 trunks.
* - one SS7 link on timeslot 16 of each trunk
*
*
* Configure individual boards:
* For SS7SPCI4 / SS7SPCI2S boards:
* SEPTELPCI_BOARD <board_id> <flags> <code_file> <run_mode>
SEPTELPCI_BOARD  0  0x0043  ss7.dc3 ISUP
*
*
* Configure individual E1/T1 interfaces:
* LIU_CONFIG <board_id> <liu_id> <liu_type> <line_code> <frame_format> <crc_mode>
LIU_CONFIG 0 0 5 1 1 1
LIU_CONFIG 0 1 5 1 1 1
*
*
* MTP Parameters :
```

```
* MTP_CONFIG <reserved> <reserved> <options>
MTP_CONFIG 0 0 0x00000000
*
* Define linksets :
* MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
MTP_LINKSET 0 1 2 0x0000 2 0x8
*
* Define signaling links :
* MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <board_id> <blink>
*          <stream> <timeslot> <flags>
MTP_LINK 0 0 0 0 0 0 0 16 0x0006
MTP_LINK 1 0 1 1 0 1 1 16 0x0006
*
* Define a route for each remote signaling point:
* MTP_ROUTE <dpc> <linkset_id> <user_part_mask>
MTP_ROUTE 1 0 0x0020
*
*
* ISUP Parameters:
*
* Configure ISUP module:
* ISUP_CONFIG <reserved> <reserved> <user_id> <options> <num_grps> <num_ccts>
ISUP_CONFIG  0  0  0x4d  0x0474  4  64
*
* Configure ISUP circuit groups:
* ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
*                       <user_inst> <user_id> <opc> <ssf> <variant> <options2>
ISUP_CFG_CCTGRP  0  1  0x01  0x01  0x7fff7fff  0x001c  0  0x4d  2  0x8  0  0x00
ISUP_CFG_CCTGRP  1  1  0x21  0x21  0x7fff7fff  0x001c  0  0x4d  2  0x8  0  0x00
*
* End of file
*
```

Note: The accompanying *gcss7.cfg* file should contain lines that correspond to the ISUP_CFG_CCTGRP commands above, for example:

```
CGrp 0 dkB1
CGrp 1 dkB2
```

11.5 Sample config.txt File for a System with Circuits and Signaling on DTI Trunks

The following is an example of a *config.txt* file for a system that includes an Intel NetStructure SS7 board, in this case the SS7SPCI4 board, and that terminates trunks contain SS7 signaling and ISUP circuits on the DTI trunks of an Intel® Dialogic® digital interface card:

```
*
* Sample SS7SPCI4 Protocol configuraiton file (config.txt)
* for Dialogic GC/SS7.
* - 1 SS7SPCI4 in CTBus slave mode
* - 2 circuit groups on Intel Dialogic DTI trunks (e.g. DM/V1200-E1-PCI)
* - 2 SS7 links routed over the CTBus from timeslot 16 of Dialogic DTI trunks
* (a clear channel load is required for this, e.g. ml1_qs_ts16.pcd)
*
*
* Configure individual boards:
* For SS7SPCI4 / SS7SPCI2S boards:
* SEPTELPCI_BOARD <board_id> <flags> <code_file> <run_mode>
SEPTELPCI_BOARD  0  0x00c2  ss7.dc3 ISUP
*
*
* MTP Parameters :
```

```
* MTP_CONFIG <reserved> <reserved> <options>
MTP_CONFIG 0 0 0x00000000
*
* Define linksets :
* MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
MTP_LINKSET 0 1 2 0x0000 2 0x8
*
* Define signaling links :
* MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <board_id> <blink>
*          <stream> <timeslot> <flags>
MTP_LINK 0 0 0 0 0 0 0x83 0 0x0006
MTP_LINK 1 0 1 1 0 1 0x83 1 0x0006
*
* Define a route for each remote signaling point:
* MTP_ROUTE <dpc> <linkset_id> <user_part_mask>
MTP_ROUTE 1 0 0x0020
*
*
* ISUP Parameters:
*
* Configure ISUP module:
* ISUP_CONFIG <reserved> <reserved> <user_id> <options> <num_grps> <num_ccts>
ISUP_CONFIG  0  0  0x4d  0x0474  4  64
*
* Configure ISUP circuit groups:
* ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
*                       <user_inst> <user_id> <opc> <ssf> <variant> <options2>
ISUP_CFG_CCTGRP  0  1  0x01  0x01  0x7fff7fff  0x001c  0  0x4d  2  0x8  0  0x00
ISUP_CFG_CCTGRP  1  1  0x21  0x21  0x7fff7fff  0x001c  0  0x4d  2  0x8  0  0x00
*
* End of file
*
```

Note: The accompanying *gcss7.cfg* file should contain lines that correspond to the MTP_LINK commands above, for example:

```
MtpLink 0 dtiB1T31
MtpLink 1 dtiB2T31
```

and lines that correspond to the ISUP_CFG_CCTGRP commands above, for example:

```
CGrp 0 dtiB1
CGrp 1 dtiB2
```

11.6 Sample system.txt File for a Single-SIU and Dual-SIU System

The following is an example of a *system.txt* file for a single or a dual Intel NetStructure SIU520 system application host:

```
*
* Multiple application hosts can use the same system.txt file when connecting to a single
* SIU unit
* Module Id's running locally on the host machine:
*
LOCAL 0x00 * timer Module Id
LOCAL 0xb0 * rsi Module Id
LOCAL 0x4d * Global Call SS7 Service
*
* Redirect modules running on the SIU to RSI:
*
REDIRECT 0x20 0xb0 * SSD module Id
REDIRECT 0xdf 0xb0 * SIU_MGT module Id
```

```
REDIRECT 0x22 0xb0 * MTP3 module Id
REDIRECT 0x32 0xb0 * RMM module Id
REDIRECT 0x23 0xb0 * ISUP module Id
REDIRECT 0x4a 0xb0 * TUP/NUP module Id
*
REDIRECT 0xef 0x4d * s7_log to DlgcS7.log
*
* Now start-up the Host tasks ....
*
FORK_PROCESS tim_nt.exe
FORK_PROCESS tick_nt.exe
FORK_PROCESS .\rsi.exe -r.\rsi_lnk.exe -l1
*
* End of file
*
```

11.7 Sample config.txt File for a Single SIU System with One Host

The following is an example of a *config.txt* file for a single Intel NetStructure SIU520 system with one application host:

```
*
* SIU520 Protocol Configuration File (config.txt)
* Refer to the SIU520 Developer's Manual.
*
*
* SIU commands:
*
* Define the number of hosts that this SIU will connect to:
* SIU_HOSTS <num_hosts>
SIU_HOSTS 1
*
*
* Set physical Interface Parameters:
* SS7_BOARD <bpos> <board_type> <flags>
SS7_BOARD 1 SPCI2S 0x0041
*
* LIU_CONFIG <port_id> <pcm> <liu_type> <line_code> <frame_format> <crc_mode> <syncpri>
LIU_CONFIG 0 1-3 5 1 1 1 1
LIU_CONFIG 1 1-4 5 1 1 1 2
*
*
* MTP Parameters:
* MTP_CONFIG <reserved1> <reserved2> <options>
MTP_CONFIG 0x0 0x0 0x0000
*
* Define linksets:
* MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
MTP_LINKSET 0 2 2 0x0000 1 0x8
*
* Define signaling links:
* MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <bpos> <blink>
*         <bpos2> <stream> <timeslot> <flags>
MTP_LINK 0 0 0 0 1 0 1 2 16 0x0006
MTP_LINK 1 0 1 1 1 1 1 3 16 0x0006
*
* Define a route for each remote signaling point:
* MTP_ROUTE <dpc> <linkset_id> <user_part_mask> [<flags> <second_ls> <pc_mask>]
MTP_ROUTE 2 0 0x0020
*
*
```

```
* ISUP Parameters:
* Configure ISUP module:
* ISUP_CONFIG <local_pc> <ssf> <user_id> <options> <num_grps> <num_ccts>
ISUP_CONFIG 1 0x08 0x4d 0x0474 2 64
*
* Configure ISUP circuit groups:
* ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
*                 <host_id> <user_id> <opc> <ssf> <variant> <options2>
ISUP_CFG_CCTGRP 0 2 0x01 0x01 0x7fff7fff 0x0003 0 0x4d 1 0x08 0 0
ISUP_CFG_CCTGRP 1 2 0x21 0x21 0x7fff7fff 0x0003 0 0x4d 1 0x08 0 0
*
* End of file
*
```

Note: The accompanying *gcss7.cfg* file should contain lines corresponding to the ISUP_CFG_CCTGRP commands above, for example:

```
CGrp 0 dtiB1
CGrp 1 dtiB2
```

11.8 Sample config.txt File for a Single-SIU System with Two Host

The following is an example of a *config.txt* file for a single Intel NetStructure SIU520 system with two application hosts:

```
*
* SIU520 Protocol Configuration File (config.txt)
* Refer to the SIU520 Developer's Manual.
*
*
* SIU commands:
*
* Define the number of hosts that this SIU will connect to:
* SIU_HOSTS <num_hosts>
SIU_HOSTS 2
*
*
* Set physical Interface Parameters:
* SS7_BOARD <bpos> <board_type> <flags>
SS7_BOARD 1 SPCI2S 0x0041
*
* LIU_CONFIG <port_id> <pcm> <liu_type> <line_code> <frame_format> <crc_mode> <syncpri>
LIU_CONFIG 0 1-3 5 1 1 1 1
LIU_CONFIG 1 1-4 5 1 1 1 2
*
*
* MTP Parameters:
* MTP_CONFIG <reserved1> <reserved2> <options>
MTP_CONFIG 0x0 0x0 0x0000
*
* Define linksets:
* MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
MTP_LINKSET 0 2 2 0x0000 1 0x8
*
* Define signaling links:
* MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <bpos> <blink>
*          <bpos2> <stream> <timeslot> <flags>
MTP_LINK 0 0 0 0 1 0 1 2 16 0x0006
MTP_LINK 1 0 1 1 1 1 1 3 16 0x0006
*
* Define a route for each remote signaling point:
```

```
* MTP_ROUTE <dpc> <linkset_id> <user_part_mask> [<flags> <second_ls> [<pc_mask>]]
MTP_ROUTE 2 0 0x0020
*
*
* ISUP Parameters:
* Configure ISUP module:
* ISUP_CONFIG <local_pc> <ssf> <user_id> <options> <num_grps> <num_ccts>
ISUP_CONFIG 1 0x08 0x4d 0x0474 2 64
*
* Configure ISUP circuit groups:
* ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
*                 <host_id> <user_id> <opc> <ssf> <variant> <options2>
ISUP_CFG_CCTGRP 0 2 0x01 0x01 0x7fff7fff 0x0003 0 0x4d 1 0x08 0 0
ISUP_CFG_CCTGRP 1 2 0x21 0x21 0x7fff7fff 0x0003 1 0x4d 1 0x08 0 0
*
* End of file
*
```

Note: The accompanying *gcss7.cfg* file for host 0 should contain the following lines:

```
SIU.HostID = 0
CGrp 0 dtiB1
```

and the accompanying gcss7.cfg file for host 1 should contain the following lines:

```
SIU.HostID = 1
CGrp 1 dtiB1
```

11.9 Sample config.txt File for SIU A in a Dual-Resilient SIU System with a Single Host

The following is an example of a *config.txt* file for SIU A in a dual-resilient Intel NetStructure SIU520 system with a single host:

```
*
* SIU520 Protocol Configuration File (config.txt)
* Refer to the SIU520 Developer's Manual.
*
*
* SIU commands:
*
* Define the number of hosts that this SIU will connect to:
* SIU_HOSTS <num_hosts>
SIU_HOSTS 1
*
* Define the network address of the partner SIU (dual operation only):
* SIU_REM_ADDR <remote_address>
SIU_REM_ADDR 192.168.0.2
*
*
* Set physical Interface Parameters:
* SS7_BOARD <bpos> <board_type> <flags>
SS7_BOARD 1 SPCI4 0x0041
*
* LIU_CONFIG <port_id> <pcm> <liu_type> <line_code> <frame_format> <crc_mode> <syncpri>
LIU_CONFIG 0 1-1 5 1 1 1 1
LIU_CONFIG 0 1-2 5 1 1 1 0
LIU_CONFIG 1 1-4 5 1 1 1 2
*
*
* MTP Parameters:
* MTP_CONFIG <reserved1> <reserved2> <options>
MTP_CONFIG 0x0 0x0 0x0000
*
```

```
* Define linksets:
* MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
MTP_LINKSET 0 2 1 0x0000 1 0x8
* Inter-SIU linkset:
MTP_LINKSET 1 1 1 0x8000 1 0x8
*
* Define signaling links:
* MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <bpos> <blink>
*          <bpos2> <stream> <timeslot> <flags>
MTP_LINK 0 0 0 0 1 0 1 0 16 0x0006
MTP_LINK 1 1 0 0 1 1 1 3 16 0x0006
*
* Define a route for each remote signaling point:
* MTP_ROUTE <dpc> <linkset_id> <user_part_mask> [<flags> <second_ls> [<pc_mask>]]
MTP_ROUTE 2 0 0x0020 0x0001 1
MTP_ROUTE 1 1 0x0020
*
*
* ISUP Parameters:
* Configure ISUP module:
* ISUP_CONFIG <local_pc> <ssf> <user_id> <options> <num_grps> <num_ccts>
ISUP_CONFIG 1 0x08 0x4d 0x0474 2 64
*
* Configure ISUP circuit groups:
* ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
*                 <host_id> <user_id> <opc> <ssf> <variant> <options2>
ISUP_CFG_CCTGRP 0 2 0x01 0x01 0x7fff7fff 0x0003 0 0x4d 1 0x08 0 0
ISUP_CFG_CCTGRP 1 2 0x21 0x21 0x7fff7fff 0x0003 0 0x4d 1 0x08 0 0
*
*
* Cross Connections (control the connection of voice channels through
* the SIU):
* STREAM_XCON <bpos> <stream_a> <stream_b> <mode>
*             <ts_mask> <pattern>
STREAM_XCON 1 0 1 3 0xfffefffe 0
*
* End of file
*
```

Note: The accompanying *gcss7.cfg* file should contain lines corresponding to the ISUP_CFG_CCTGRP commands above, for example:

```
CGrp 0 dtiB1 1 SIUA
CGrp 1 dtiB2 1 SIUB
```

11.10 Sample config.txt File for SIU B in a Dual-Resilient SIU System with a Single Host

The following is an example of a *config.txt* file for SIU B in a dual-resilient Intel NetStructure SIU520 system with a single host:

```
* SIU520 Protocol Configuration File (config.txt)
* Refer to the SIU520 Developer's Manual.
*
*
* SIU commands:
*
* Define the number of hosts that this SIU will connect to:
* SIU_HOSTS <num_hosts>
SIU_HOSTS 1
*
* Define the network address of the partner SIU (dual operation only):
```

```
* SIU_REM_ADDR <remote_address>
SIU_REM_ADDR 192.168.0.1
*
*
* Set physical Interface Parameters:
* SS7_BOARD <bpos> <board_type> <flags>
SS7_BOARD 1 SPCI4 0x0041
*
* LIU_CONFIG <port_id> <pcm> <liu_type> <line_code> <frame_format> <crc_mode> <syncpri>
LIU_CONFIG 0 1-1 5 1 1 1 1
LIU_CONFIG 0 1-2 5 1 1 1 0
LIU_CONFIG 1 1-4 5 1 1 1 2
*
*
* MTP Parameters:
* MTP_CONFIG <reserved1> <reserved2> <options>
MTP_CONFIG 0x0 0x0 0x0000
*
* Define linksets:
* MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
MTP_LINKSET 0 2 1 0x0000 1 0x8
* Inter-SIU linkset:
MTP_LINKSET 1 1 1 0x8000 1 0x8
*
* Define signaling links:
* MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <bpos> <blink>
*          <bpos2> <stream> <timeslot> <flags>
MTP_LINK 0 0 0 1 1 0 1 0 16 0x0006
MTP_LINK 1 1 0 0 1 1 1 3 16 0x0006
*
* Define a route for each remote signaling point:
* MTP_ROUTE <dpc> <linkset_id> <user_part_mask> [<flags> <second_ls> [<pc_mask>]]
MTP_ROUTE 2 0 0x0020 0x0001 1
MTP_ROUTE 1 1 0x0020
*
*
* ISUP Parameters:
* Configure ISUP module:
* ISUP_CONFIG <local_pc> <ssf> <user_id> <options> <num_grps> <num_ccts>
ISUP_CONFIG 1 0x08 0x4d 0x0474 2 64
*
* Configure ISUP circuit groups:
* ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
*                 <host_id> <user_id> <opc> <ssf> <variant> <options2>
ISUP_CFG_CCTGRP 0 2 0x01 0x01 0x7fff7fff 0x0003 0 0x4d 1 0x08 0 0
ISUP_CFG_CCTGRP 1 2 0x21 0x21 0x7fff7fff 0x0003 0 0x4d 1 0x08 0 0
*
*
* Cross Connections (control the connection of voice channels through
* the SIU):
* STREAM_XCON <bpos> <stream_a> <stream_b> <mode>
*             <ts_mask> <pattern>
STREAM_XCON 1 0 1 3 0xfffefffe 0
*
* End of file
*
```

Note: The accompanying *gcss7.cfg* file should contain lines corresponding to the ISUP_CFG_CCTGRP commands above, for example:

```
CGrp 0 dtiB1 1 SIUA
CGrp 1 dtiB2 1 SIUB
```

Glossary

CT Bus: A time division multiplex (TDM) bus that provides 1024, 2048, or 4096 time slots for exchanging voice, fax, or other network resources on a PCI (H.100) or CompactPCI (H.110) backplane. The Enterprise Computer Telephony Forum (ECTF) developed the H.100 hardware compatibility specification that defined the CT Bus, a high-performance mezzanine bus. The CT Bus works with both SCbus and Multivendor Integration Protocol (MVIP) compatible products. The ECTF implementation of the CT Bus for CompactPCI bus is called the H.110 standard.

Intel® Dialogic® configuration manager: A Windows* application the enables the configuration of Intel Dialogic products.

Global Call SS7 Software: The software and libraries that implement Global Call on SS7.

DPC: Destination Point Code. Identifies the address (point code) of the SS7 network node to which a Message Signal Unit (MSU) should be directed.

DTI: A generic term for an Intel Dialogic network interface card, such as, DM/V960-4T1, DM/V1200-4T1, etc.

E-1: A digital transmission link that carries information at the rate of 2,048 Mbps. This is the rate used by European carriers to transmit thirty 64 Kbps digital channels for voice or data calls, plus one 64 Kbps channel for signaling, and one 64 Kbps channel for framing (synchronization) and maintenance.

IPC: Inter Process Communication. In the SS7 system software environment, IPC refers to the method by which modules communicate with each other using messages.

ISUP: ISDN User Part. A layer in the SS7 protocol stack. Defines the messages and protocol used in the establishment and tear down of voice and data calls over the public switched network, and to manage the trunk network on which they rely.

ISDN: Integrated Services Digital Network. A service that offers simultaneous digital data and voice communication over a single copper pair wire in residential and business phone connections. There are two basic flavors, BRI (Basic Rate Interface) which is 144 Kbps and designed for the desktop, and PRI (Primary Rate Interface) which is 1.544 Mbps and designed for telephone switches, computer telephony and voice processing systems.

Message Transfer Part: Layers 1 to 3 of the SS7 protocol stack equivalent to the Physical, Data Link and Network layers in the OSI protocol stack. See also MTP 1, MTP 2 and MTP 3.

MTP1: Message Transfer Part Level 1. Defines the physical and electrical characteristics of the signaling links of the SS7 network. Signaling links use DS0 channels and carry raw signaling data at a rate of 56 Kbps or 64 Kbps (56 Kbps is currently the more common implementation).

MTP2: Message Transfer Part Level 2. Provides link-layer functionality. Ensures that two end points of a signaling link can reliably exchange signaling messages. It provides error checking, flow control and sequence checking.

MTP3: Message Transfer Part Level 3. Provides network-layer functionality. Ensures that messages can be delivered between signaling points across the SS7 network regardless of whether the signaling points are directly connected. It provides node addressing, routing, alternate routing and congestion control.

OPC: Originating Point Code. Identifies the address (point code) of the SS7 network node from which a Message Signal Unit (MSU) originated.

PSTN: Public Switched Telephony Network. The worldwide voice telephone network accessible to all those with telephones and access privileges.

PCCS6: An Intel NetStructure SS7 ISA board solution.

SCbus: The standard bus for communicating within an SCSA node. The SCbus features a hybrid bus architecture consisting of a serial message bus for control and signaling, and a 16-wire TDM data bus.

SCCP: Signal Connection Control Part. A layer in the SS7 protocol stack that allows a software application at a specific node in an SS7 network to be addressed. It also supports Global Title Translation which frees an originating signaling point from having to know every possible destination to which a message may have to be routed.

SCP: Service Control Point. Databases that provide information necessary for advanced call-processing capabilities.

Signaling Link: A signaling data link is a bidirectional transmission path for signaling, comprising two data channels operating together in opposite directions at the same data rate.

SIU: The Intel NetStructure SS7 server solution.

SP: Signaling Point. Any point in a signaling network capable of handling SS7 control messages. Examples of Signaling Points are: SSP (Signal Switching Point), STP (Signal Transfer Point), and SCP (Signal Control Point).

SS7: Signaling System Number 7. A common channel signaling standard that defines the procedures and protocols required for the connection of network elements in the Public Switched Telephone Network (PSTN).

SS7 System Software Environment: A collective name for the software modules that make up SS7 system environment.

SSP: Signal Switching Point. Telephone switches (end offices or tandems) equipped with SS7-capable software and terminating signaling links. They generally originate, terminate or switch calls.

STP: Signal Transfer Point. A signaling point capable of routing control messages to another signaling point. STPs receive and route incoming signaling messages towards the proper destination and perform specialized routing functions.

RSI: Remote Socket Interface.

T-1: A digital transmission link with a capacity of 1.544 Mbps (mega bits per second). T-1 uses two pairs of normal twisted wires and can handle twenty-four voice conversations, each one digitized at 64 Kbps.

TCAP: Transaction Capabilities Part. A layer in the SS7 protocol stack that defines the messages and protocol used to communicate between applications (deployed as subsystems) in SS7 nodes. TCAP is used for database services such as calling card, 800, and AIN, as well as switch-to-switch services including Repeat Dialing and Call Return.

TUP: Telephone User Part. The predecessor to ISUP (Integrated Services User Part). TUP was employed for call control purposes within and between national networks, both wireline and wireless. ISUP adds support for data, advanced ISDN, and IN (Intelligent Networks). See also ISUP.

User Part: A generic name given to an SS7 stack protocol at layer 4 or above, such as, ISUP, TUP, ICAP, MAP etc.

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