Dialogic® Distributed Signaling Interface Components -
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1 Introduction

Dialogic® Distributed Signaling Interface (DSI) Components is a range of hardware and software components for realization of SS7, SIGTRAN and Diameter signaling nodes and applications for use in a service provider environment. The range includes Dialogic® DSI Protocol Stacks, which are software implementations of standards-based signaling protocol layers. DSI Protocol Stacks are available for specific Dialogic® products and are suitable for use under standard commercially available operating systems including Linux, Solaris, and Windows\(^1\) operating systems.

In a signaling node built from DSI Components (the "system"), each module in the system is implemented as a separate task within the chosen operating environment. A module implements either a layer within the DSI Protocol Stack, a User Part, or some other functional entity within the system. In general, a module supports multiple internal instances within a single process (for example multiple links, multiple circuits, or multiple transactions). The architecture supports multi-processor operation with modules being distributed between different processors.

For increased flexibility, the protocol implementation is abstracted from the underlying operating system. Each module makes a minimum demand on the host operating system using a common set of functions for all inter-process communication and resource allocation. This approach means that different layers of the DSI Protocol Stack can easily be run on different processors or machines as required.

This document is the base reference material applicable to all Dialogic® DSI board based and SIGTRAN based deployments. It introduces the fundamental architectural concepts of modules, messages and message queues and the mechanisms for inter process communication. It provides details of all the host-based utilities used to configure and maintain an operational system including full definitions of all configuration file commands and messages.

This manual also provides full installation and configuration details for use of the Development Packages for Linux, Solaris (SPARC and x86) and Windows Operating Systems.

1.1 Applicability

This manual is applicable to the following software:

- Dialogic® DSI Development Package for Linux – Release 6.6.1 or later
- Dialogic® DSI Development Package for Solaris – Release 5.4.0 or later
- Dialogic® DSI Development Package for Windows – Release 6.5.0 or later

1.2 Related Documentation

Current software and documentation supporting Dialogic® DSI products is available at:

http://www.dialogic.com/support/helpweb/signaling

1.2.1 Dialogic® DSI SS7 Protocol Manuals

- Dialogic® SS7 Protocols MTP2 Programmer’s Manual

\(^1\) Note: Throughout this document, the term “Windows” is used to refer to the Windows Server 2008, Windows Server 2008 R2, and Windows 7 operating systems.
• Dialogic® SS7 Protocols MTP3 Programmer’s Manual
• Dialogic® SS7 Protocols ISUP Programmer’s Manual
• Dialogic® SS7 Protocols SCCP Programmer’s Manual
• Dialogic® SS7 Protocols TCAP Programmer’s Manual
• Dialogic® SS7 Protocols TUP Programmer’s Manual
• Dialogic® SS7 Protocols MAP Programmer’s Manual
• Dialogic® SS7 Protocols IS41 Programmer’s Manual
• Dialogic® DSI Protocol Stacks - Host Licensing User Guide
• Dialogic® DSI Protocol Stacks - SNMP User Manual

1.2.2 Dialogic® DSI SIGTRAN Protocol Manuals
• Dialogic® SS7 Protocols SCTP Programmer’s Manual
• Dialogic® SS7 Protocols M3UA Programmer’s Manual
• Dialogic® SS7 Protocols M2PA Programmer’s Manual
• Dialogic® SS7 Protocols SUA Programmer’s Manual

1.2.3 Dialogic® DSI Diameter Stack Manuals
• Dialogic® DSI Diameter Stack – DMR Programmer’s Manual
• Dialogic® DSI Diameter Stack - Diameter Functional API Manual

1.2.4 Dialogic® DSI Network Interface Boards Manuals
• Dialogic® DSI SPCI Network Interface Boards Programmer’s Manual
• Dialogic® DSI SS7HD Network Interface Boards Programmer’s Manual
• Dialogic® DSI SS7MD Network Interface Boards Programmer’s Manual
• Dialogic® DSI SS7LD Network Interface Boards Programmer’s Manual

1.2.5 Dialogic® DSI Signaling Servers Manuals
• Dialogic® DSI Signaling Servers SS7G41 SIU Developers Manual
• Dialogic® DSI Signaling Servers SS7G41 Operators Manual
• Dialogic® DSI Signaling Servers SS7G41 SWS Developers Manual
• Dialogic® DSI Signaling Servers SS7G41 Hardware Manual
• Dialogic® DSI Signaling Servers SNMP User Manual
2 Basic Concepts

This section introduces basic concepts and terminology that will be used throughout the remainder of the manual.

2.1 Modules

A module is an implementation of a particular layer in the Dialogic® DSI Protocol Stack (e.g., Dialogic® DSI MTP3 Layer), a particular user part (e.g., Dialogic® DSI ISUP Layer), or a collection of other functionality which fits together as a logical entity. A module may be a Dialogic® DSI Component or a User-supplied module.

Each module in the system runs as a separate task, process, or program (depending on the type of operating system). The module is identified by a Module Identifier and communicates with other modules in the system by sending Messages to a Message Queue belonging to the destination module. A set of Library Functions is used by the module to interact with the operating system.

A module handles multiple internal instances of the functional entity associated with the module (e.g., Dialogic® DSI MTP2 Layer handles multiple Signaling links, the Dialogic® DSI MTP3 Layer handles multiple link sets and multiple routes and the Dialogic® DSI ISUP Layer handles multiple circuits).

2.2 Module Identifiers

Each module has a module identifier (module_id), which is a logical number in the range 0 to 254, and is used to identify modules within the system for the purposes of inter-process communication. To send a message to another process, the sending module uses the module identifier of the destination process. To receive a message from a module’s own message queue, it uses its own module identifier.

Some modules operate with a fixed module identifier, whereas others allow the module identifier to be specified at run-time.

The module identifiers of other modules with which a module will communicate is usually a run-time configuration option.

The module identifier is a logical value; it is not the same as an Operating System’s task id or process id (pid), which are usually allocated automatically when a process is created.

In addition to modules that are physically implemented, it is possible to use virtual module_ids that are redirected within the software environment to an actual module. This re-direction mechanism is used when messages need to be transferred to another board or module in the system or to a separate host. Messages for all processes that run on separate boards are redirected to a special local module that handles inter-board message passing. Other modules within the system do not need to know whether the modules with which they communicate are running locally or not.

A list of default module identifiers used by the Dialogic® Distributed Signaling Interface (DSI) software is given in 9.10.

2.3 Messages

Modules communicate by sending messages to other modules in the system.
The MSG message is a ‘C’ data structure containing a fixed format header field and a buffer for variable length parameter data.

Each hardware product in the Dialogic® Distributed Signaling Interface (DSI) Components range has a manual that details the messages appropriate for that particular product. In addition, each Dialogic® DSI Protocol Stack has a supporting Programmer’s Manual, which describes the messages appropriate to that protocol.

A detailed description of the message structure is given in 5.1 Message Format.

2.4 Message Queues
Each module in the system has a single message queue that is used by other modules to send messages to the module. A message queue is a system buffer which stores messages (usually by reference) in first-in, first-out order.

Messages are read out of the message queue by the receiving module, which typically uses a blocking function call to wait until there is a message available before returning, it then processes the message and blocks until the next message is available. Input to the module is through its message queue.

2.5 Distributed Modules
Some systems require the functional entity implemented by a module to be distributed across several processors in a system. For example, a module may run on several separate boards in a single computer, each board interacting with a single module running on the computer. Alternatively, a user’s application may be distributed across several host computers where each host interacts with a protocol module running on a single protocol server.

In both cases, there is a ‘one too many’ relationship between the distributed processors and the adjacent layer in the DSI Protocol Stack. There is a clear requirement for the single module to be able to determine from which of the distributed processors a message has been received and to which of the distributed processors a message should be sent to. This is achieved using the concept of a module Instance.

The module Instance is a number in the range of 0 to one less than the number of distributed processors. The module instance is used by the inter-board message passing process to determine which board to send the message to. When messages are received from other boards, the inter-board message passing process inserts the module instance of the board from which the message was received.

The module instance is not directly accessible as a field in the message; instead, a functional interface is provided to read and write instance information to the message. By default, the instance number is initialized to zero.

2.6 Library Functions
Host modules and user applications make use of the following set of ‘system’ library functions:

- **getm**: Function to allocate a message (MSG).
- **relm**: Function to release MSG back to the system.
- **GCT_send**: Function to send a message to another module.
The syntax for each of these functions is described in the following section. Their usage is described below.

A module wishing to send a message to another module will first allocate a MSG structure using the `getm` function. At this stage, it is necessary to decide whether or not a confirmation message will be required and initialize the `rsp_req` field accordingly. Once all the message parameters have been entered into the MSG, the module calls `GCT_send` to send the message to the destination module. If the `GCT_send` function fails to send the message, the sending module must release the message back to the system using the `relm` function (although this will only happen when the system is incorrectly configured). When multiple destination processors are used, the module sending the message must call `GCT_set_instance` prior to calling `GCT_send` in order to write the destination module instance into the message.

The destination module will receive the message from its own message queue using either the `GCT_receive` or `GCT_grab` functions (depending on whether it wishes to block or not if no messages are available). It then processes the message. When multiple source processors are used, the module receiving the message should call `GCT_get_instance` after calling `GCT_receive` or `GCT_grab` in order to read the source module instance from the message.

When the receiving module has finished processing the message, it carries out one of two possible courses of action depending on whether or not a confirmation is required. If no confirmation is required, then the message is released back to the system using the `relm` function. If a confirmation is required, then a status value is written into the message header, the message type is changed (bit 14 is cleared), and the message is sent back to the original sending module using the `GCT_send` function. On receipt of the confirmation, the original sending module (after inspecting the status) releases the message back to the system using the `relm` function.

**Note:** `confirm_msg()` is a useful library function that can be called once the application has finished with a message. It determines whether or not a confirmation is required, modifies the message header accordingly, and finally calls either `GCT_send()` or `relm()` as appropriate.

In this way it is ensured that each message will eventually be released back to the system.

**Example Code**
- Allocating and Sending a Message
*/
* Base DSI headers.
*/
#include "system.h"
#include "msg.h"
#include "sysgct.h"
/*
 * DSI protocol headers.
 */
#include "mtp_inc.h"

/* MACROS for sending and receiving requests. */
#define NO_RESPONSE (0)
#define RESPONSE(mod_id) (1 << ((mod_id) & 0x0f))
#define CONF(i) ((i) & ~REQUEST)
#define EXAMPLE_MODULE_ID (0x1d)

int allocate_and_send_example(void)
{
    MSG *m;
    u8 *pptr;

    /*
     * Allocate a MSG from the message pool.
     * In this example, a MTP3 Linkset Configuration Message.
     * The rsp_req field is set to request a response from the
     * destination module Id.
     */
    if ((m = getm(MTP_MSG_CNF_LINKSET, (u16)(<LINKSET ID> << 8), (u16)RESPONSE(EXAMPLE_MODULE_ID), MTPCFLS_LENGTH)) != 0)
    {
        /*
         * getm() succeeds and returns a pointer to a MSG from the
         * global message pool.
         * This process now 'owns' the MSG and is responsible for
         * sending it (GCT_send) to another module, or releasing it
         * (relm).
         */
        m->hdr.src = EXAMPLE_MODULE_ID;
        m->hdr.dst = MTP_TASK_ID;

        /*
         * Initialise a memory pointer to the start of the MSG's
         * parameter area.
         */
        pptr = get_param(m);

        /*
         * Reset the MSG's parameter area to 0.
         */
        memset(pptr, 0, m->len);

        /*
         * Initialise the MSG's parameter values:
         */
rpackbytes(pptr, MTPCFLS_adj_pc_OFF, (u32)<ADJACENT POINT_CODE>, MTPCFLS_adj_pc_SIZ);
rpackbytes(pptr, MTPCFLS_num_links_OFF, (u32)<NUMBER OF LINKS>, MTPCFLS_num_links_SIZ);
/*
 * MSG parameter initialization continues . . .
 */

/*
 * Set the MSG instance.
 */
GCT_set_instance(<INSTANCE ID>, &mhdr);

/*
 * Send the MSG
 */
if (GCT_send(msg->hdr.dst, &msghdr) != 0) {
    /*
     * GCT_send() has failed.
     * Sending process retains ownerships of the MSG.
     * Release the MSG.
     */
    relm(&msghdr);
}
• Receiving and Processing a Message

```c
int receive_and_process_msg(void)
{
    MSG *m;

    if ((msg = (MSG *)GCT_receive(EXAMPLE_MODULE_ID)) != 0)
    {
        /*
         * GCT_receive() succeeds and returns a MSG.
         * The MSG is now owned by the receiving program.
         */
        switch (msg->hdr.type)
        {
            case CONF(MTP_MSG_CNF_LINKSET):
                /*
                 * Process MTP3 Configure Linkset request's response.
                 */
                . . .
                break;
            case . . .
        }
        /*
         * Release received MSG back to the system pool.
         */
        relm(&m->hdr);
    }
```

Section 2 Basic Concepts

16
2.7 System Initialization

System initialization requires first that a pool of message buffers is created for subsequent inter-process communication. Secondly, a message queue is created for each module that will run and that any message re-direction for modules that are running remotely is initialized. Then the process can be started.

A program `gctload` exists to handle this initialization sequence. It reads input from a text file called system.txt, carries out all system initialization and starts up the processes. It then remains dormant until it receives a signal from the operating system to shutdown. Then, it terminates the processes that it started and releases any system resources back to the system in a controlled manner.

The basic operation of the `gctload` program, and the format of the text file it uses, is described in section 7.1. The `gctload` utility is available for a number of operating systems including Linux, Solaris (Sparc and x86) and Windows.

2.8 Attaching to the DSI environment

Normally, the `gctload` module, which establishes message queues and pre-allocates memory from the system for the messages used by all tasks is used to initiate all user modules. These structures are released on termination of `gctload`, hence the tasks that communicate using these mechanisms and the user tasks are also terminated.

If the user chooses to run applications independently, then it is necessary to confirm that the system is available before using any system resources. The `GCT_link` library function can be used to obtain this confirmation. See section 6.1.8 for details.

The user must also ensure that the application does not attempt to access system resources after the GCT environment has been terminated. The `GCT_unlink` library function can be used to release all system resources. See section 6.1.9 for details.

If the user wishes to terminate and re-start an application, this can be achieved by calling `GCT_unlink` from the old instance of the application prior to termination and the calling `GCT_link` from the new application before using system resources.
2.9 System Congestion

When the host software is first run, a specified number of messages (as configured in the NUM_MSGS command in the system.txt file) are allocated from host system resources. These messages are available for inter-task communication.

User applications should read messages from their own input queue, extract the information from these messages, then release the original message structure back to the system. Hence, under normal operating conditions, the host application works to ensure that its queue is almost empty, and that all the messages are available.

If, however, more messages are received than the system can handle, then a backlog of messages in input queues will build up. Possible causes include input being received at a faster rate than can be processed by the output device or the system being unable to process received input in at the required rate.

The message handling environment monitors the number of allocated messages available as a percentage of the total message pool. If this percentage exceeds a configurable congestion onset threshold, the host is said to be in a congested state.

When the number of allocated messages available as a percentage of the total message pool returns to a configurable congestion abatement threshold, the host is said to leave the congested state.

On entering or leaving a congested state, the software environment generates a congestion notification message (SYS_MSG_CONGESTION), which is sent to a nominated congestion-handling module. This module is responsible for taking actions to slow down the source of system congestion.

The congestion handling parameters are set using the CONG_MSG command in the system.txt file.

The current system congestion status may also be obtained on demand using the GCT_partition_congestion function as detailed in section 6.1.10.
3 Installation

3.1 Introduction

This manual covers the installation and use of the software contained in the following distributions:

- Development Package for Linux
- Development Package for Solaris (x86 and SPARC)
- Development Package for Windows®

Each Development Package contains the device drivers, library functions, and header files for use by an application, a number of executables to create and maintain the DSI software environment, utilities and configuration files to configure the protocol software, the User Part Development (UPD) Package, the DSI Protocol Stacks, MIBs and the DSI Network Interface Boards code files. The installation of each package type is described in the following sections.

The UPD contains example source code to illustrate the techniques used for interfacing with the protocol modules and protocol-specific header files for use when building an application.

The DSI Network Interface Boards Code Files contain the operating software for the DSI Network Interface Boards. The appropriate code file must be downloaded by the host, to the board, at run-time. Code files have a file suffix which denotes which board product they are used in conjunction with.

<table>
<thead>
<tr>
<th>Dialogic® DSI Network Interface Board Family</th>
<th>Code File Extension</th>
<th>Software License Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPCI</td>
<td>dc3</td>
<td>License Button</td>
</tr>
<tr>
<td>SS7HD</td>
<td>dc4</td>
<td>License Button</td>
</tr>
<tr>
<td>SS7MD</td>
<td>dc6</td>
<td>Host License</td>
</tr>
<tr>
<td>SS7LD</td>
<td>dc7</td>
<td>Host License</td>
</tr>
</tbody>
</table>

The code file must be licensed; two mechanisms exist to support licensing dependant on the board family in use:

- License Button
  
  The board is used in conjunction with a software license button, which is purchased and installed on the board to determine the protocols that the user is authorized to run. The types of license buttons available are described in the appropriate DSI Network Interface Board Programmer’s Manual. The license button is subsequently downloaded onto the board at run time.

- Host License
  
  As indicated in the table above, some of the boards require a Host License; details on how to use a Host License are given in the Dialogic® Distributed Signaling Interface Components Host Licensing User Guide.
Some SS7 protocols also optionally may be run as Host Protocol Binaries subject to the purchase of appropriate licenses, which may be run above boards or above M2PA creating a software only architecture with SIGTRAN. refer to Section 4.1.4 Protocol Modules for further details.

The Development Package may be obtained by downloading it from the Dialogic website, see Section 1.1 Related Documentation, and must be copied onto the target host machine maintaining binary file integrity; possible transfer methods include copying using transferable media and ftp.
3.2 Software Installation for Linux

The Development Package for Linux is distributed electronically. The distribution is in the form of a single compressed file called dpklnx.Z.

The Development Package for Linux includes, in a single distribution, the software required by users of the Dialogic® DSI SS7 Boards and Dialogic® DSI Protocol Stacks.

The Development Package includes the host protocol binaries, board code files and the example software from the User Part Development Package. This allows users to update multiple components within a single installation cycle.

The host-based software uses a three part release number in the form “Release x.y.z” to uniquely identify the software version. Furthermore, the host-based binaries that form part of this distribution have the same release number.

For example:

DSI gctload Release 6.5.0 (Build 1121)
Part of the Dialogic(R) DSI Development Package for Linux
Copyright (C) 1994-2012 Dialogic Inc. All Rights Reserved.

The DSI shared objects are located in sub-directories, ‘32’ for the 32 bit libraries and ‘64’ for the 64 bit libraries.

Installation of the software is described in more detail in the following topics:

- Installing Development Package for Linux
- Installing the DSI Source Device Drivers
- Support for Native SCTP
- Removing the Development Package for Linux
- RPM Creation

3.2.1 Installing Development Package for Linux

Install the Development Package as follows:

1) Remove any existing Development Package installation referring to Section 3.2.6 Removing the Development Package for Linux on page 27.

2) Login and switch to a user account with root privileges.

3) Create a new directory on the development system to act as the root directory for the software. This directory is referred to as the install directory.

```bash
mkdir /opt/DSI
cd /opt/DSI
```

4) Copy the dpklnx.Z file to the install directory. Take care to retain the Z extension (which identifies the file as a compressed file) and ensure binary file integrity is maintained.

5) Extract the files using the command:
The following files (or similar) are extracted into the current working directory.

### Table 2. Files Installed on a System Running Linux

<table>
<thead>
<tr>
<th>Sub-Directory</th>
<th>File name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>example_system.txt</td>
<td>Example system configuration file</td>
</tr>
<tr>
<td></td>
<td>example_config.txt</td>
<td>Example protocol configuration file</td>
</tr>
<tr>
<td></td>
<td>dsictrl, dsisat, dsitrace, gctload, rsi, rsi_link, nsicmd s7_log, s7_mgt, s7_play, scip, sctpd, scipn, ssch, ssdl, ssdm, ssds, tempmon, tick, tim, etc</td>
<td>General purpose DSI host utilities documented within this manual</td>
</tr>
<tr>
<td></td>
<td>dsa, dtc, hstmgr, mm., ss, etc</td>
<td>Specialized host utilities documented elsewhere</td>
</tr>
<tr>
<td></td>
<td>ctu, intu, istr, istu, mtr, mtu, ttu, upe, etc</td>
<td>Ready built versions of the examples contained in the User Part Development Package.</td>
</tr>
<tr>
<td></td>
<td>dsi-mibs.zip</td>
<td>Dialogic DSMI SNMP MIBs distributed as a compressed ZIP file</td>
</tr>
<tr>
<td>32</td>
<td>libgctjni.so, libgctlib.so, libgctlib.so.1.49.0, libin_api.so</td>
<td>Sub-directory containing 32 bit shared object libraries</td>
</tr>
<tr>
<td>64</td>
<td>libgctjni.so, libgctlib.so, libgctlib.so.1.49.0, libin_api.so</td>
<td>Sub-directory containing 64 bit shared object libraries</td>
</tr>
<tr>
<td>DC</td>
<td>monitor.dc3, ss7.dc3, ss7.dc4, ss7.dc6, ss7.dc6ams, ss7.dc7, ss7mdc.dc6 etc</td>
<td>Sub-directory containing downloadable Code Files</td>
</tr>
<tr>
<td>HSTBIN</td>
<td>dmr, inap, is41, isup, m2pa, m3ua, map, mst, mtp3, sccp, sua, tcap, tup etc</td>
<td>Sub-directory containing Host Protocol Binaries</td>
</tr>
<tr>
<td>INC</td>
<td></td>
<td>Sub-directory containing header files for use with user's application.</td>
</tr>
<tr>
<td>JAVA</td>
<td>dmrApi.jar, dmtrCmds.jar, dms.jar, gctApi.jar, etc</td>
<td>Sub-directory containing Java files.</td>
</tr>
<tr>
<td>SPCI_GPM_DRIVER</td>
<td></td>
<td>Sub-directory containing driver source code and makefiles for SPCI boards.</td>
</tr>
<tr>
<td>SS7HD_DRIVER</td>
<td></td>
<td>Sub-directory containing driver source code and makefiles for SS7HD boards.</td>
</tr>
<tr>
<td>SS7LD_DRIVER</td>
<td></td>
<td>Sub-directory containing driver source code and makefiles for SS7LD boards.</td>
</tr>
<tr>
<td>SS7MD_DRIVER</td>
<td></td>
<td>Sub-directory containing driver source code and makefiles for SS7MD boards.</td>
</tr>
<tr>
<td>UPD</td>
<td></td>
<td>Sub-directory containing the User Part Development package.</td>
</tr>
</tbody>
</table>
6) Add the following lines to the file /etc/ld.so.conf indicating the path to the shared object:

```
/opt/DSI/32
/opt/DSI/64
```

7) Run ldconfig to configure the dynamic linker's run time configuration.

```
ldconfig -v
```

A series of links will be configured, similar to the following example (the name of libgctjni.so will reflect the current version number of the shared object library):

```
/opt/DSI/32:
libgctjni.so -> libgctjni.so
libin_api.so -> libin_api.so
libgctlib.so.1 -> libgctlib.so.1.49.0

/opt/DSI/64:
libgctjni.so -> libgctjni.so
libin_api.so -> libin_api.so
libgctlib.so.1 -> libgctlib.so.1.49.0
```

8) When using Java-based APIs to connect into the GCT environment then the location of the libgctjni.so can optionally be set using the LD_LIBRARY_PATH environment variable. The syntax of the command to set this variable will vary depending on the system.

```
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/opt/DSI/32
```

The user can alternatively set the library path each time the java command is run. For example, to run the example jar file /opt/DSI/JAVA/dtr.jar:

```
java -Djava.library.path=/opt/DSI/32 -jar /opt/DSI/JAVA/dtr.jar
```

Note: For 64 bit systems replace /opt/DSI/32 with /opt/DSI/64.

9) Before proceeding, verify that the shared object is installed correctly using the gctload command with the –v option to print out version information.

Note: The DSI binaries require the 32 bit run-time libraries (libc.so), to be installed. Some 64 bit Linux distributions only install 64 bit run-time libraries by default. Refer to your distribution's documentation for instructions on how to install the 32 bit run-time libraries.

```
gctload -v
```

If the shared object is not correctly installed then an error message will be printed out instead. E.g:
10) If SIGTRAN software is going to be used then see section 3.2.3 Support for SIGTRAN SCTP under Linux for further details.

If using the SCTPD binary then change the privileges for the binary as follows:

```bash
chown root sctpd
chmod +s sctpd
```

If using the MST binary then, change the privileges as follows:

```bash
chown root ./HSTBIN/mst
chmod +s ./HSTBIN/mst
```

11) To reserve sufficient system resources, the Linux kernel parameters should be set as detailed in section 3.2.4 Adjusting Linux Kernel Parameters on page 26.

### Building Device Drivers for DSI boards

Once the Development Package is installed, the device drivers for all DSI boards are contained in a per-board folder. If using a DSI board it is first necessary to build the device driver in your target environment.

Build scripts and installation scripts are supplied in the following locations:

<table>
<thead>
<tr>
<th>Dialogic® DSI Network Interface Board Family</th>
<th>Sub-directory</th>
<th>Build Script</th>
<th>Install Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPCI</td>
<td>SPCI_CPM_DRIVER</td>
<td>build_spci_cpm.sh</td>
<td>install_spci_cpm.sh</td>
</tr>
<tr>
<td>SS7HD</td>
<td>SS7HD_DRIVER</td>
<td>build_ss7hd.sh</td>
<td>install_ss7hd.sh</td>
</tr>
<tr>
<td>SS7LD</td>
<td>SS7LD_DRIVER</td>
<td>build_ss7ld.sh</td>
<td>install_ss7ld.sh</td>
</tr>
<tr>
<td>SS7MD</td>
<td>SS7MD_DRIVER</td>
<td>build_ss7md.sh</td>
<td>install_ss7md.sh</td>
</tr>
</tbody>
</table>

To build the driver, run the appropriate script. The build script assumes that a suitable environment for building Kernel modules is available. This must include the appropriate Kernel include files being found at: `/usr/src/linux-` `uname -r` `/include` (e.g., `/usr/src/linux 2.6.5/include`). If these are not found, the build will fail.

**Note:** When installing the Development Package in systems that include a DNIXxxTEPE2HMP board it is important NOT to install the SS7LD device driver. The driver from the Dialogic® PowerMedia™ HMP 4.1 Linux (SU 151 or later) release includes a driver that also supports the SS7LD).

Some Linux installations do not create a system source directory with the required name; for example, some SMP kernels do not create a directory with the required smp suffix. If this is the case, then a softlink needs to be created to give an appropriate path to the system header files. For example:
cd /usr/src
ln -s linux-2.6.5 linux-2.6.5 smp

Some later versions of Linux use a revised format for the remap_page_range parameters (for example, Red Hat Linux Kernel Versions greater than 2.4.20 require this revised format). The build script supports an optional new_remap parameter. If this parameter is set, the compile uses the revised format.

The build script supports an optional clean parameter that removes the driver and all intermediate files.

Under some versions of Linux a warning similar to the following is generated which can safely be ignored:

`warning: changing search order for system directory.`

Once the driver has been successfully built, the appropriate install script should be invoked. This installs the device driver, automatically allocates the major device numbers, and creates the four appropriate device nodes.

Driver installation must be performed by a user with root privileges.

Correct loading of the device driver can be confirmed by looking in the system log. The system log is displayed using the command:

`dmesg | more`

Successful installation of the driver is indicated by the allocation of a device id. (Note that a Device Id will only be allocated if the target DSI board is present in the system when the driver is built).

Example output, using the SPCI board, is:

`DSI SPCI Release 6.3.3 (Build 1071)
Part of the Dialogic(R) DSI Development Package for Linux
Copyright (C) Dialogic Corporation 2000-2011. All Rights Reserved.
Build options: NEW_DDK
Using major device number 253.
sptpci[0]: DPM offset adjustment 0x0
ACPI: PCI Interrupt 0000:08:02.0[A] -> GSI 18 (level, low) -> IRQ 185
    sptpci Device Id 0 @ Bus: 8 Device: 2 Function: 0`

The install script supports an optional remove parameter. This causes the device driver to be removed and the device nodes to be deleted. For example:

`install_*.*.sh remove`

### 3.2.3 Support for SIGTRAN SCTP under Linux

The Development Package for Linux supports two different SCTP configurations:

The SCTP binary (in conjunction with the SCTPD binary) provides a complete implementation of the SIGTRAN SCTP protocol suitable for use with pre-2.6.16 kernels which do not support Native SCTP within the kernel.
The SCTPN binary (in conjunction with the native SCTP capability within Linux) provides a complete implementation of the SIGTRAN SCTP stack suitable for use on kernels that do support the Native SCTP capability.

Operation of the SCTPN binary in conjunction with the kernel SCTP implementation requires versions 2.6.16 or greater of the Linux kernel and 1.0.6 or greater of the lksctp-tools package. Please note that the lksctp-tools package may not be installed by default on some Linux distributions, in which case it must be installed manually.

Linux systems using (Security Enhanced Linux) SELinux or other firewalls may require further configuration to allow SCTP traffic to be sent and received.

To make use of the Native SCTP capability, the user should use the SCTPN binary instead of the binaries SCTP and SCTPD which are usually found in the SS7 Development Package installation directory (the recommended location is /opt/DSI).

Before starting the system, the sctp loadable kernel module will usually need to be inserted into the system. This can be done using the modprobe command:

```
modprobe sctp
```

On systems with Linux kernel version 2.6.16 or greater, adding the following lines to /etc/modprobe.conf will cause the system to insert the kernel module automatically on demand:

```
alias net-pf-10-proto-132 sctp
alias net-pf-2-proto-132 sctp
```

### 3.2.4 Adjusting Linux Kernel Parameters

To reserve sufficient system resources for the DSI inter-process communication mechanism to function correctly it is important to adjust certain kernel parameters to suitable values.

For Linux, the `kernel.msgmnb` parameter usually needs to be adjusted.

`kernel.msgmnb` should be set to at least 12 times the total number of messages configured in the system.txt file (in addition to any requirements of other software making use of these resources).

Once system.txt is written, add together `NUM_MSGS` and `NUM_LMSGS` and multiply the result by 12. Add on any requirements from other software to determine the required setting for `kernel.msgmnb`.

Edit the `/etc/rc.local` (or distribution-specific equivalent) file to add the following line:

```
sysctl -w kernel.msgmnb=62400
```

For Linux, the `kernel.msgmni` parameter controls the number of message queues supported.

The `kernel.msgmni` parameter should be set to the number of module queues defined in system.txt with the LOCAL command (in addition to any requirements of other software making use of these resources).

Edit the `/etc/rc.local` (or distribution-specific equivalent) file to add the following line:
sysctl -w kernel.msgmni=256

When run, GCTLOAD will attempt to allocate the maximum number of system resources in order to verify, as far as possible, that the kernel parameters have been correctly adjusted.

### 3.2.5 Using 64-bit Linux Applications

The Development Package includes both 32-bit and 64-bit GCTLIB shared object files, allowing 64-bit user applications to co-exist with 32-bit DSI software. Both libraries share the same naming convention (libgctlib.x.y.z.), with the 32-bit library stored in the 32 directory and the 64-bit library stored in the 64 directory.

**Note:** The `x.y.z` of `libgctlib.so.x.y.z` refers to the GCTLIB shared object’s major, minor and release version numbers.

Users should update the target system’s run-time linker’s shared object search paths to include the paths to the 32-and 64-bit GCTLIB shared libraries as required.

To create a 64-bit application, users must ensure that their application code does not access the 'next' field in the HDR structure of a message. This field is called 'hdr.next' in a 32-bit environment and 'hdr.next_ref' in a 64-bit environment. Any existing application code that made use of this field needs to be removed.

To build a 64-bit application, all Makefiles and/or IDE configurations need to be modified to define DSI_64BIT, for example, by editing the User Part Development Package’s makdefs.mak to:

```bash
DKDEFINES = -DLINT_ARGS -DIN_LMSGS -DDSI_64BIT
```

All 64 bit user applications should be linked against the 64 bit version of GCTLIB which is installed by default in the following location:

```
64/gctlib.so.x.y.z.
```

### 3.2.6 Removing the Development Package for Linux

Prior to installing a new version of the Development Package for Linux, the previous version should be removed. This can be achieved using the following procedure (assuming the user logs on as root):

1) Back-up any license files and user configuration files (eg. system.txt, config.txt, *.ms7 scripts etc) so that these may be re-installed after the new installation has been completed.

2) Delete both the installed files and the directory /opt/DSI.

3) The file /etc/ld.so.conf should be edited and the line indicating the path to the shared object should be removed

   For 32 bit systems this should be: /opt/DSI/32

   For 64 bit systems this should be: /opt/DSI/64

4) Then ldconfig should be run to re-configure the dynamic linker’s run time configuration.
5) Reboot the target machine.

### 3.2.7 RPM Creation

The Development Package provides support for the generation of RPM (RedHat Package Management) packages for Linux kernels from V2.6.

**RPM Creation Instructions**

Note: The 'rpmbuild' package must be installed before the following steps can be performed.

A number of RPM packages will be created from the Development Package. The RPM packages are created by executing the following steps:

1. Select a directory to be used when creating the RPM packages.
   
   For this example, "/var/tmp/dpk/rpm" is used.

2. Create a file called ".rpmmacros" in the user account's home directory and enter the location of the directory from step 1:

   
   %_topdir /var/tmp/dpk/rpm

3. Prepare the RPM directory:

   
   mkdir -p /var/tmp/dpk/rpm/{BUILD,RPMS,SOURCES,SPECS,SRPMS}

4. Copy the dpklnx.Z file to the user account's home directory. Take care to retain the Z extension (which identifies the file as a compressed file) and ensure binary file integrity is maintained.

5. Execute rpmbuild:

   
   rpmbuild -tb dpklnx.Z

6. For 32bit operation systems, the RPM packages are stored in:

   
   /var/tmp/dpk/rpm/RPMS/i386/.

   For example:

   
   ls /var/tmp/dpk/rpm/RPMS/<ARCH>/
   ss7dpk-5.08-1.<ARCH>.rpm
   ss7dpk-devel-5.08-1.<ARCH>.rpm
   ss7dpk-debuginfo-5.08-1.<ARCH>.rpm
   ss7dpk-kmod-5.08-1.2.6.9_34.EL.<ARCH>.rpm

   Where <ARCH> is i386 for 32bit operation and x86_64 for 64 bit operation systems.

Note: Device driver binaries will be built as rpmbuild is run. Therefore, it is necessary for the machine on which rpmbuild is run to share the same kernel version as the machine on which the RPM packages will be installed.

**RPM Packages**

The following packages are created:

ss7dpk-<DPK>.<ARCH>.rpm  Run-time files, including binaries, GCT run-time shared library and system.txt and config.txt configuration files.
ss7dpk-devel-<DPK>.<ARCH>.rpm Development Package development files, including header files and GCT link-time shared library.

ss7dpk-kmod-<DPK>-<KERNEL>.<ARCH>.rpm Signaling boards device drivers binaries.

ss7dpk-debuginfo-<DPK>.<ARCH>.rpm RPM build artifact, not required.

**Using the RPM Management Tool**

The RPM management tool, "rpm", is used to maintain packages on a target system. Documentation on how to use the "rpm" tool is available from www.rpm.org.

Common tasks using the rpm utility include:

1. Installation of an RPM package:

   ```
   rpm -i <package_name>
   ```

2. Removal of an installed RPM package:

   ```
   rpm -e <package_name>
   ```

3. Upgrading an installed RPM package:

   ```
   rpm -U <package>
   ```

4. List all RPM packages on a system:

   ```
   rpm -qa
   ```
3.3 **Software Installation for Solaris**

Installation of the software is described in more detail in the following topics:

- Installing the Development Package for Solaris
- Removing the Development Package for Solaris
- Solaris 9 - Interface Name Checking
- Solaris 10 - Additional Commands
- Choice and configuration of SCTP module
- Non-serviced interrupts reports

The Development Package for Solaris includes, in a single distribution, the software required by users of the Dialogic® DSI SS7 Boards and Dialogic® DSI Protocol Stacks.

The Development Package now includes the host protocol binaries, board code files and the example software from the User Part Development Package. This allows users to update multiple components within a single installation cycle.

The host-based software uses a three part release number in the form "Release x.y.z" to uniquely identify the software version. Furthermore, the host-based binaries that form part of this distribution have the same release number.

For example:

```
DSI gctload Release 6.2.9 (Build 1055)
Part of the Dialogic(R) DSI Development Package for Solaris(SPARC)
Copyright (C) Dialogic Corporation 1994-2010. All Rights Reserved.
```

The consolidated Development Packages for Solaris are distributed within two compressed 'tar' archive files:

- `dpksparc.tar.gz` - Solaris Packages for Solaris-SPARC
- `dpkx86.tar.gz` - Solaris Packages for Solaris-x86

Each distribution contains two Solaris packages:

- `dsidpk` - DSI Development Package
- `dsidrv` - DSI Network Interface Board Driver Package

All users need to install the 'dsidpk' package, whereas only users of signaling boards will need to install the 'dsidrv' package. Both packages contain support for 32 bit and 64 bit systems and the installation process selects the appropriate package for the target system.

These files can be downloaded from the Dialogic website. See Section 1.1 Related Documentation.

### 3.3.1 Installing the Development Package for Solaris

The Solaris package installation steps are:

1. Backup any license files and user generated configuration files (e.g. system.txt, config.txt, *.ms7 scripts etc) so that they may be re-installed after the new installation is complete.
2) Remove any existing Development Package installation referring to Section 3.3.9
Removing the Development Package for Solaris on page 35.

3) Select the correct Solaris distribution and extract the Solaris package files:
   For SPARC systems:
   ```
gzip -d dpksparc.tar.gz
tar -xf dpksparc.tar
   ```
   For x86 systems:
   ```
gzip -d dpkx86.tar.gz
tar -xf dpkx86.tar
   ```

4) While logged-on as 'root', install the extracted Solaris packages:
   ```
pkgadd -d dsidrv
pkgadd -d dsidpk
   ```

Note: ‘dsidrv’ is only necessary for users requiring board-level drivers.
The following files (or similar) are transferred into the root installation directory (/opt/DSI).

Table 3. Files Installed on a System Running Solaris

<table>
<thead>
<tr>
<th>Sub-Directory</th>
<th>File name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>example_config.txt</td>
<td>Example protocol configuration file.</td>
</tr>
<tr>
<td></td>
<td>example_system.txt</td>
<td>Example system configuration file.</td>
</tr>
<tr>
<td></td>
<td>dsictrl, dsistat, dsitrace, gctload, s7_log,</td>
<td>General purpose DSI host utilities documented within this manual</td>
</tr>
<tr>
<td></td>
<td>s7_mgt, s7_play, rsi, rsi_link, rscmd, sctp,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sctdp, sctpn, ssdh, ssdl, ssdm, ssds,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tempmon, tick, tim, etc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dsa, dtc, hstmgr, mbm, rmm, etc</td>
<td>Specialized host utilities documented elsewhere</td>
</tr>
<tr>
<td></td>
<td>ctu, intu, istr, mtr, mtu, ttu, upe, etc</td>
<td>Ready built versions of the examples contained in the User Part Development Package.</td>
</tr>
<tr>
<td></td>
<td>dsi-mibs.zip</td>
<td>Dialogic® DSMI SNMP MIBs distributed as a compressed ZIP file</td>
</tr>
<tr>
<td>32</td>
<td>libgctjni.so, libgctlib.so, libgctlib.so.1,</td>
<td>Sub-directory containing 32 bit shared object libraries</td>
</tr>
<tr>
<td></td>
<td>libgctlib_nomco.so.1, libgctlib.so.1.49.0,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>libgctlib_nomco.so.1.49.0, libin_api.so</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>libgctlib.so, libgctlib.so.1, libgctlib.so.1,</td>
<td>Sub-directory containing 64 bit shared object libraries</td>
</tr>
<tr>
<td></td>
<td>libgctlib.so.1.49.0, libgctlib_nomco.so.1.49.0,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>libin_api.so</td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>monitor.dc3, ss7.dc3, ss7.dc4, ss7.dc6, ss7</td>
<td>Sub-directory containing downloadable Code Files</td>
</tr>
<tr>
<td></td>
<td>dc7, ss7mcd.dc6, etc</td>
<td></td>
</tr>
</tbody>
</table>
### Sub-Directory | File name | Description
--- | --- | ---
HSTBIN | dmr, inap, is41, isup, m2pa, m3ua, map, mst, mtp3, scoop, sua, lcapi, tup etc. | Sub-directory containing Host Protocol Binaries
INC | | Sub-directory containing header files for use with user’s application.
JAVA | dmrApi.jar, dmtrCmds.jar, dms.jar, gctApi.jar, etc | Sub-directory containing Java files.
UPD | | Sub-directory containing the User Part Development package.

Note: To reserve sufficient system resources, the Solaris System Resource parameters should be set as detailed in Section 3.3.5 Tuning Solaris System Resource Parameters.

### 3.3.2 Solaris 9 - Interface Name Checking
To use the package under Solaris 9, interface name checking must be disabled. (otherwise the device driver may not start correctly) This is achieved by adding the following line to the /etc/system file:

```
set sunddi_netifname_constraints=0
```

Three Solaris resources parameters need to be set (the names of these parameters differ between Solaris 9 and Solaris 10 - both naming conventions are shown for clarity) as follows, although users should also take into account other applications that may require these resources:

<table>
<thead>
<tr>
<th>Solaris 10 Solaris Resource Name</th>
<th>Solaris 9 Old /etc/system name</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>process.max-msg-messages</td>
<td>msginfo_msgtql</td>
<td>Set to a value greater than or equal to the sum of NUM_MSGS + NUM_LMSGS</td>
</tr>
<tr>
<td>process.max-msg-qbytes²</td>
<td>msginfo_msgmnb</td>
<td>Set to a value greater than or equal to the number of NUM_MSGS + NUM_LMSGS multiplied by 12.</td>
</tr>
<tr>
<td>project.max-msg-ids</td>
<td>msginfo_msgmni</td>
<td>Set to a value greater than or equal to the number of LOCAL message queues.</td>
</tr>
</tbody>
</table>

### 3.3.6 Creating a Solaris ‘project’ to tune System Resource parameters

Solaris projects provide a mechanism for grouping multiple configuration options. They also provide an administrative identifier for related work.

1) The following example creates a new project (gctenv), adds the user (gctuser) to the project, and modifies the projects attributes. Create a new project, gctenv

```
projadd gctenv
```

2) Add the user, gctuser, to the project:

```
projmod -a -U gctuser gctenv
```

3) Modify the projects’ attributes according to the size of the GCT resources.

In this example, the target system will use 20 message queues (20 instances of LOCAL in system.txt) and 10000 messages and 1000 long messages – giving a total of 11000 messages. A 10% ‘margin of error’ has been added to each resource value:

```
projmod -a -K "process.max-msg-messages=(priv,12100,deny)" gctenv
projmod -a -K "project.max-msg-ids=(priv,22,deny)" gctenv
projmod -a -K "process.max-msg-qbytes=(priv,145200,deny)" gctenv
```

**Note:** Each projmod command is a single line.

4) Make the project gctenv the default project for user gctuser. As root, edit /etc/user_attr and add:

```
/etc/user_attr and add:
```

² The process.max-msg-qbytes/msginfo_msgmnb values specified are the System V (SYS V) Interprocess Communications (IPC) values required for the correct operation of DSI Software Environment. Other application software may use the SYSV IPC resources and, therefore, their configuration requirements must be added to the process.max-msg-qbytes/msginfo_msgmnb total.
gctuser:::project=gctenv

Note: There are four (4) colons between 'gctuser' and 'project'.

5) Login as gctuser and verify the correct default project

id -p
uid=100(gctuser) gid=1(others) projid=100(gctenv)

### 3.3.7 Using 64-bit Solaris Applications

The Development Package includes both 32-bit and 64-bit GCTLIB shared objects (shared libraries), allowing 64-bit user applications to co-exist with 32-bit DSI software. Both libraries share the same naming convention (libgctlib.x.y.z) with the 64-bit library stored in the 64-directory.

Note: The 'x.y.z' of 'libgctlib.so.x.y.z' refers to the GCTLIB shared object’s major, minor and release version numbers.

To create a 64-bit application, users must ensure that their application code does not access the 'next' field in the HDR structure of a message. This field is called 'hdr.next' in a 32-bit environment and 'hdr.next_ref' in a 64-bit environment.

To build a 64-bit application, all Makefiles and/or IDE configurations need to be modified to define DSI_64BIT, for example, edit the User Part Development Package's makdefs.mak to:

```
DKDEFINES = -DLINT_ARGS -DIN_LMSGS -DDSI_64BIT
```

64 bit user applications should be linked against the 64 bit version of GCTLIB. This is installed by default in the following location:

```
/opt/DSI/64/gctlib.so.x.y.z.
```

### 3.3.8 Avoiding “Non-serviced interrupt” reports

Some systems exhibit issues due to non-serviced interrupts being reported by the system. The issue can result in large numbers of event reports that can impact the system performance.

The DSI Board drivers included in this package include an optional work-around to eliminate these issues.

To enable this functionality, the following line must be added to the /etc/system file:

```
DSI Network Interface Board

| SPCI2S or SPCI4 | set septel:spt_claimint=1 |
| SS7HD          | set ss7hd:ss7hd_claimint=1 |
| SS7MD          | No change required |
```

Note: The system has to be rebooted to force the change to take effect.
3.3.9 Removing the Development Package for Solaris

Before removing the Development Package users should take a back-up of any user configuration files (e.g. system.txt and config.txt) so that these may be re-installed after the new installation has been completed.

The Development Package for Solaris can be removed using the package removal utility as follows Removal must be performed by a user with Administrator privileges:

```
pkgrm dsidpk
pkgrm dsidrv
```

The Solaris package removal utility (pkgrm) then prompts for further input.

On successful completion of the procedure, the following message is displayed and the user should reboot the system:

```
Removal of <dsidpk / dsidrv> was successful.
```
3.4 Software Installation for Windows

The Development Package for Windows is distributed electronically as a download from the Dialogic website. See Section 1.1 Related Documentation. The distribution is in the form of a single self extracting binary named DPKWIN.EXE. This binary can be run directly from a hard disk.

Installation and removal of the software is described in more detail in the following topics:

- Installing Development Package for Windows
- Starting the Windows Device Driver
- Removing Development Package for Windows

3.4.1 Installing Development Package for Windows

If the development package is to be used with a Dialogic® DSI Network Interface Board, then the board must be installed before installation of the Development Package such that the driver is correctly loaded.

1) Backup any user generated configuration files (e.g. system.txt, config.txt, *.ms7 scripts etc) so that they may be re-installed after the new installation is complete.

2) Remove any existing Development Package installation referring to section 3.4.6 Removing Development Package for Windows on page 41.

3) The installation must be performed by a user with Administrator privileges. Before performing the installation, close all other applications.

4) To perform the installation, run the self-extracting binary DPKWIN.EXE. The installation procedure will ask you to select the driver to be installed; select the required driver. You may also select an installation directory. The default directory is C:\DSI. If required, the default directory can be modified.

Note: When installing the Development Package in systems that include a DNIxxxxTEPE2HMP board it is important NOT to install the SS7LD device driver. The driver from the Dialogic® PowerMediaTM HMP 3.0 Windows (SU 347 or later) release includes a driver that also supports the SS7LD).

The following files (or similar) are transferred to the installation directory.

<table>
<thead>
<tr>
<th>Sub-Directory</th>
<th>File name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>example_system.txt</td>
<td>Example system configuration file</td>
<td></td>
</tr>
<tr>
<td>example_config.txt</td>
<td>Example protocol configuration file</td>
<td></td>
</tr>
<tr>
<td>ddinst.exe</td>
<td>Device driver installer (common between SPCI and SS7HD).</td>
<td></td>
</tr>
<tr>
<td>gctload.exe, gctserv.exe, servcfg.exe,.tick.exe, tim.exe, s7_mgt.exe, s7_log.exe, s7_play.exe, dsictrl.exe, dsitrace.exe, dsistat.exe, scrp.exe, scptpd.exe, ssdh.exe, ssds.exe, etc</td>
<td>General purpose DSI host utilities documented within this manual</td>
<td></td>
</tr>
<tr>
<td>Sub-Directory</td>
<td>File name</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>dtc.exe, mm.exe, rsi.exe, rsi.png.exe, rsicmd.exe, txa.exe, etc.</td>
<td>Specialized host utilities documented elsewhere</td>
</tr>
<tr>
<td></td>
<td>ctu, intu, istr, istu, mtr, tlu, upe, etc</td>
<td>Ready built versions of the examples contained in the User Part Development Package.</td>
</tr>
<tr>
<td></td>
<td>dsi-mibs.zip</td>
<td>Dialogic® DSMI SNMP MIBs distributed as a compressed ZIP file</td>
</tr>
<tr>
<td>32</td>
<td>gctlib.dll, gctlib.lib</td>
<td>Sub-directory containing 32 bit shared object libraries</td>
</tr>
<tr>
<td>64</td>
<td>gctlib.dll, gctlib.lib</td>
<td>Sub-directory containing 64 bit shared object libraries</td>
</tr>
<tr>
<td>DC</td>
<td>ss7.dc3, ss7.dc4, etc</td>
<td>Sub-directory containing downloadable Code Files</td>
</tr>
<tr>
<td>HSTBIN</td>
<td>Inap.exe, is41.exe, isup.exe, m2pa.exe, m3ua.exe, map.exe, mst.exe, mtp3.exe, sccp.exe, sua.exe, tcp.ex, tnp.exe, etc.</td>
<td>Sub-directory containing Host Protocol Binaries</td>
</tr>
<tr>
<td>INC</td>
<td></td>
<td>Sub-directory containing header files for use with user's application.</td>
</tr>
<tr>
<td>UPD</td>
<td></td>
<td>Sub-directory containing the User Part Development package.</td>
</tr>
<tr>
<td>SPCIDVR</td>
<td></td>
<td>Sub-directory containing 32 and 64 bit device drivers for DSI SPCI boards</td>
</tr>
<tr>
<td>SS7HDDVR</td>
<td></td>
<td>Sub-directory containing 32 and 64 bit device drivers for DSI SS7HD boards</td>
</tr>
<tr>
<td>SS7LD</td>
<td></td>
<td>Sub-directory containing 32 and 64 bit device drivers for DSI SS7LD boards.</td>
</tr>
</tbody>
</table>

The setup program may request a reboot of the target machine when it has finished installing the package. If requested, then the machine should be allowed to reboot.

The files the user needs to use have been installed in the installation directory. It is recommended that the user not modify any files in this directory, but instead create a working directory into which all the necessary files are copied.

### 3.4.2 Starting the Windows Device Driver

Under Windows, a plug and play driver will be installed for DSI boards when the new development package is installed on the system. The system will automatically detect any of the DSI Network Interface Boards and configure the driver for these boards.

To confirm the correct behavior, proceed as follows:

1) Choose Start -> Control Panel to open the Control Panel dialog.

2) Double-click on the Administrative Tools icon, then double-click the Computer Management icon to open the Computer Management window.
3) Click on the Device Manager tree item to display a tree of devices in the right window pane.

4) Check for the appropriate Board device under Dialogic DSI SS7 Boards. If the driver is not correctly installed, there will be a question mark (?) or an exclamation mark (!) before the SS7 Board item.

3.4.3 Additional steps using Windows 7
For Windows 7 users, the following additional steps are necessary to configure the DSI software environment:

1) Open up the <DPK> folder (normally ‘c:\DSI’ on a Windows system) so that you have access to the root of the installation where "gctload.exe" etc is located

2) Right click on "gctload.exe" and select ‘properties’

3) A new window will pop-up

4) Select the ‘Compatibility’ tab

5) Now click on the "Run as Administrator option"

6) Click on Apply / OK and then close

3.4.4 Running software as a Windows Service
The Development Package for Windows can be configured to allow it to be automatically executed at system initialization. This is achieved by running it via a Windows Service. Running as a Service allows for the automatic invocation of gctload at system boot; it also allows the stopping and restarting of gctload via a standard programming interface and additionally provides a mechanism for remote restarting of the DSI software.

This functionality utilizes the following two executables which are part of the Development Package for Windows.

`gctserv.exe` - Service executable.

`servcfg.exe` - Service configuration and installation tool.

Installing a Service

Note: For Windows 7, all commands must be run from a command shell (cmd.exe) which has been run with ‘Administrator’ privileges. To select ‘Administrator’ privileges run Windows Explorer, find the ‘cmd.exe’ file, right click on ‘cmd.exe’ and select ‘Run as administrator’.

Before the Service can be installed, the executable must be copied to the appropriate directory of the Windows installation.

For 32-bit Windows:

```
copy C:\DSI\gctserv.exe %WINDIR%\system32
```

For 64-bit Windows:
copy C:\DSI\gctserv.exe %WINDIR%\syswown64

For 32-bit operating systems the 32-bit gctlib.dll file must also be copied to the %WINDIR%\system32 directory.

copy C:\DSI\32\gctlib.dll %WINDIR%\system32

For 64-bit operating systems copy the 32-bit gctlib.dll into the SYSWOW64 directory as follows (this DLL will be used by the WOW emulator when running any of the standard (32-bit) binaries that are part of the development package):

copy C:\DSI\32\gctlib.dll C:\%WINDIR%\SYSWOW64

The installation is performed using the executable servcfg.exe. This installation must be performed by a user with Administrator privileges.

When installed, the Service is identified by the name "Dialogic® DSI Startup Service" within the 'services' utility.

The command line format for Service installation are:

32-bit Windows:

ersvcfg.exe install %WINDIR%\system32\gctserv.exe <gctload> <system.txt> <start_dir>

64-bit Windows:

ersvcfg.exe install %WINDIR%\syswow64\gctserv.exe <gctload> <system.txt> <start_dir>

Where

<gctload> is the full pathname for the gctload executable, and

<system.txt> is the pathname for the system configuration file.

<start_dir> is the directory in which the Service is started. All files referenced by the gctload executables (including the system.txt and all executables specified within) must be specified with pathnames relative to this directory (or as absolute path names).

For example, if system.txt is present in the c:\DSI directory, the following command would be used to configure the Service:

32-bit Windows:

ersvcfg.exe install %WINDIR%\system32\gctserv.exe c:\DSI\gctload.exe system.txt c:\DSI

64-bit Windows:

ersvcfg.exe install %WINDIR%\syswow64\gctserv.exe c:\DSI\gctload.exe system.txt c:\DSI
When the Service is installed, by default, the startup mode is set to 'manual'. To cause the Service to be automatically invoked at boot time it must be explicitly configured to 'automatic' mode. This is achieved by running the Services tool and setting the startup option to "automatic".


Under the Windows® 7 operating system the Services tool is located under Control Panel -> System and Security -> Administrative Tools -> Services.

Uninstalling a Service
The Windows Service is also removed using the executable servcfg.exe using the syntax given below and can be removed from the system32 directory as follows:

```
servcfg.exe remove
del servcfg.exe
```

Running the Service manually
The Service is started manually using the "Services" tool.

Select the required Service ("Dialogic DSI Startup Service") and start the Service using the start icon. When the Service has been successfully started, the displayed status of the Service is "started".

The Service is stopped manually using the "Services" tool (using the button labeled "stop" or the stop icon). When the Service has been successfully stopped, the displayed status of the Service is "stop".

3.4.5 Using 64-bit Windows Applications
The Dialogic® DSI Development Package for Windows offers support for both 32-bit and 64-bit applications. For 32-bit applications, users should use the gctlib.dll library whilst for 64-bit applications the gctlib.dll library (which is shipped in the DSI\64 directory of the distribution) should be used.

Having installed the DSI Development Package for Windows, users wishing to use 64-bit applications need to perform the following additional steps (which assume the default installation path, C:\DSI).

Copy the (32-bit) gctlib.dll into the SYSWOW64 directory as follows (this DLL will be used by the WOW emulator when running any of the standard (32-bit) binaries that are part of the development package):

```
Copy C:\DSI\32\gctlib.dll C:\WINDOWS\SYSWOW64
```

Copy the (64-bit) gctlib.dll file into the system32 directory as follows. This DLL will be used by the user’s (64-bit) application (the system32 directory is the default location for 64-bit binaries in a 64-bit system, despite its name).
For correct operation of 64-bit applications, it is essential that the user does not access the 'next' field in the HDR structure of a message. This field is called ‘hdr.next’ in a 32-bit environment and ‘hdr.next_ref’ in a 64-bit environment. Any existing application code that made use of this field needs to be removed.

All Makefiles and/or IDE configurations need to define DSI_64BIT, for example, edit the User Part Development Package’s makdefs.mnt to:

```
DKDEFINES = -DLINT_ARGS -DIN_LMSGS -DDSI_64BIT
```

All 64 bit user applications should be linked against the 64 bit version of GCTLIB. This is installed by default in the following location:

```C:\DSI\64\gctlib.lib```

### 3.4.6 Removing Development Package for Windows

Prior to installing a new version of the Development Package for Windows, the previous package must be removed as follows. This procedure requires a user with Administrator privilege.

1) Back-up any license files and user configuration files (eg. system.txt and config.txt) so that these may be re-installed after the new installation has been completed.

2) Select the Control Panel (Start → Settings → Control Panel).

3) Select "Add/Remove Programs".

4) Scroll down the devices and select "Dialogic® DSI SS7 Development Package" and select "Remove".

5) When package removal is confirmed, restart the target machine.
4 Configuration and Operation

Before attempting software configuration, you should gain an understanding of the flexibility of the protocol stack, the run-time options that exist and the mechanisms that are used to select specific features. This Section gives an overview of these options. You should also read Section 2 Basic Concepts that describes the basic principles of modules and message passing.

This section provides information about:

- Selecting the System Architecture
- Creating the System Configuration File (system.txt)
- Creating the Protocol Configuration File (config.txt)
- Executing the Software
- Developing a User Application

4.1 Selecting the System Architecture

This section describes both board-based systems and SIGTRAN software-based systems. Both types of systems are supported by the Dialogic® DSI Protocol stack and the choice will usually be determined by the application and type of connection required.

4.1.1 TDM Board Systems

The Dialogic® DSI Protocol Stack software running on the board communicates with an application running on the host computer. The physical interface to the board uses the PCI bus. Communication with the board is handled by a device driver and message passing to and from the board is managed by the board management and interface process (ssdx, sometimes generically referred to as ssd) that runs on the host computer.

In addition to running the application on the host, the user may, depending on the Dialogic® DSI Network Interface Board, the size of the overall system and the network topology, choose to run some of the SS7 protocol modules on the host. See Section 4.1.4 Protocol Modules for more information. In such cases, the interface between the application and the SS7 protocol software remains identical. This allows for easy migration from a small system contained on a single board to a large system distributed over many boards with minimal changes to the application.

Table 5. Practical System Configurations for Telephony Systems

<table>
<thead>
<tr>
<th></th>
<th>Small System</th>
<th>Medium System</th>
<th>Large System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board Support</td>
<td>SPCI (see note), SS7HD</td>
<td>SPCI, SS7HD</td>
<td>SPCI, SS7HD and SS7MD</td>
</tr>
<tr>
<td>Software running on board</td>
<td>MTP2 MTP3 ISUP / TUP / SCCP / TCAP / MAP / INAP / IS41</td>
<td>MTP2 MTP3</td>
<td>MTP2</td>
</tr>
<tr>
<td>Software running on Host CPU</td>
<td>User Application</td>
<td>ISUP / TUP / SCCP / TCAP / MAP / INAP / IS41 User Application</td>
<td>MTP3 ISUP / TUP / SCCP / TCAP / MAP / INAP / IS41 User Application</td>
</tr>
<tr>
<td>Number of boards</td>
<td>Small System</td>
<td>Medium System</td>
<td>Large System</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Single</td>
<td>Single board with signaling (although additional boards may be used to support voice only)</td>
<td>Suitable for single board solutions where the user wishes to make use of a high performance host to improve system throughput. Can also be used to support more complex protocol configurations.</td>
<td>Suitable for systems requiring larger numbers of links and systems that require distribution of MTP over multiple boards.</td>
</tr>
</tbody>
</table>

Note: The SPCI board only supports the use of MTP2, MTP3, ISUP and TUP protocols running on the board.

In board-based systems, the board management and interface process (ssd) is required to run on the host machine. The ssd process handles message transfer between the host and the board using the device driver.

### 4.1.2 SIGTRAN Systems

A software-only architecture may be configured using the appropriate Dialogic® DSI SIGTRAN modules in place of MTP2 and/or MTP3. These modules provide the same interface to upper protocol modules and use the services of SCTP to transport SS7 signaling reliably over IP.

SS7 Hosts may connect to SIGTRAN M3UA or M2PA Signaling Gateways such as the Dialogic® DSI Signaling Servers. Peer to peer connections between hosts using M2PA or M3UA are also supported.

The common interfaces presented to the upper layers enable applications to be easily ported between hardware and software-only architectures. The product designations are as follows:

- Dialogic® DSI M2PA – MTP2 Peer to Peer Adaptation Layer
- Dialogic® DSI M3UA – MTP3 User Adaptation Layer
- Dialogic® DSI SUA – SCCP User Adaptation Layer

As described in the installation section there are two choices of SCTP module – SCTP (used with SCTPD) and SCTPN which utilizes the 'native' SCTP stack provided by the host Operating System kernel.
Table 6. System Configurations for SIGTRAN Telephony Systems

<table>
<thead>
<tr>
<th>Software running on Host CPU</th>
<th>M2PA System</th>
<th>M3UA System</th>
<th>SUA System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Usage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suitable for SIGTRAN solutions where MTP2 and below are replaced with an IP based solution. Useful when migrating an existing TDM system to IP</td>
<td>Provides the ability to connect the Host Application to 8 Signaling Gateways or Remote Point Codes.</td>
<td>Provides the ability to connect the Host Application to 256 Signaling Gateways or IPSPs (remote hosts) and route to 256 remote Point Codes.</td>
<td>Provides the ability to connect the Host Application to 4 Signal Signaling Gateways or 32 IPSPs (remote hosts) and route to 256 remote Point Codes.</td>
</tr>
<tr>
<td><strong>Software running on Host CPU</strong></td>
<td><strong>Description</strong></td>
<td><strong>Usage</strong></td>
<td><strong>Software running on Host CPU</strong></td>
</tr>
<tr>
<td>SCTP / SCTPN M2PA MTP3 ISUP / TUP / SCCP / TCAP / MAP / INAP / IS41 User Application</td>
<td>suitable for SIGTRAN solutions where MTP3 and below are replaced with an IP based solution. M3UA provides the same interface as MTP3 to the upper layer modules.</td>
<td></td>
<td>SCTPN DMR (Diameter Module) User Application</td>
</tr>
</tbody>
</table>

4.1.3 Diameter Systems
Diameter systems may be set-up using the software-only architecture in the Dialogic DSI Diameter Stack in conjunction with the SIGTRAN SCTP layer all of which are included in the DSI Development Package for Linux or Solaris. The Dialogic DSI Diameter Stack includes a Diameter Module (DMR) implementing the core base protocol functionality and is supported by a Functional API library to aid application development.

Table 7. System Configurations for Diameter Systems

<table>
<thead>
<tr>
<th>Software running on Host CPU</th>
<th>Diameter System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Usage</strong></td>
</tr>
<tr>
<td>suitable for Diameter solutions in either client or server configurations.</td>
<td>provides the ability to connect the Host Application to Peer Diameters nodes.</td>
</tr>
</tbody>
</table>

4.1.4 Protocol Modules
The selection of which protocol modules to run on the host is made by editing the system.txt configuration file.
Some SS7 protocol modules can be run on either the host machine or on DSI Network Interface Boards. The options available for each individual board are described in the appropriate Programmer’s Manual.

The user then runs the gctload program that reads the system configuration parameters from the system.txt configuration file and starts the selected processes bringing the system into operation. For further details on the operation of the gctload program, refer to 7.1 gctload.

Table 8 shows processes and utilities for use on the host that are included in the distribution.

Note: s7_mgt, s7_log and s7_play are optional utilities. A user may choose to implement the functionality provided by these utilities in their own applications.

### Table 8. System Host Utilities

<table>
<thead>
<tr>
<th>Process or Utility</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>gctload</td>
<td>Process to initialize the system environment and start all other related processes running on the host, deriving the configuration from a text file (system.txt).</td>
</tr>
</tbody>
</table>
| s7_log             | Utility process to allow messages received from the protocol stack to be logged to a text file. 
                      This is useful for diagnostic purposes when getting started. Refer to “s7_log” for more information. |
| s7_mgt             | Process to perform one time protocol configuration for all protocol modules, deriving the configuration parameters from a text file (config.txt). This process is optional. As an alternative to using it, the user may elect to perform protocol configuration by sending messages directly to the other modules in the system. Refer to the appropriate Programmer’s Manual for information on configuration using discrete messages. |
| s7_play            | Utility process used to generate messages from a text file and send them into the system. 
                      This is useful for diagnostic purposes when getting started. Refer to “s7_play” for more information. |
| ssdx               | Process to interface with the device driver for passing messages to and from the board(s) and for downloading software to the board(s). Only required for TDM systems. 
                      Note: This process is referred to in a generic manner as ‘ssd’. |
| rsi                | Process to provide message passing over TCP/IP between DSI environments running on different machines. |
| rsi_link           | Per link process created by rsi. |
| rsicmd             | Configuration utility to configure individual RSI links. |
| tick               | Protocol timer process to send periodic tick notification to the tim process that in turn handles protocol timers. |
| tim                | Process to receive periodic tick notification from tick and handle protocol timers for all other processes. |
4.2 Creating the System Configuration File (system.txt)

System configuration is handled by the gctload program that reads system configuration data from a file called system.txt. System initialization requires:

- First, that a pool of message buffers is created for subsequent inter-process communication.
- Second, that a message queue is created for each process that will run and that any message redirection for modules that are running remotely is initialized.
- Finally, that all processes can be started.

The gctload program handles this initialization sequence and creates the inter-process communication environment. The program reads input from the system.txt configuration file, carries out all system initialization and starts all processes.

The system.txt configuration file is a user-configurable file containing details of all the module identifiers known to the system, details of whether they are local modules or remote modules accessed by a local module (message redirection) and include the command line for all processes to be started by the gctload program.

The gctload program creates a message queue for each of the local module identifiers. The program subsequently expects a process to service its message queue, otherwise messages written to that queue will never be read causing eventual loss of system messages.

The gctload program initializes the message queue look-up table so that messages destined for modules that do not exist locally are redirected to a message queue for a module that does exists locally.

Having created the system environment, the gctload program proceeds to spawn all processes listed in the system.txt configuration file in the order listed.

Note: Prior to running the gctload program, the system.txt configuration file must be edited to reflect the requirements of your system.

4.2.1 System Configuration File Syntax

The system.txt configuration file is a text file used by the gctload program to configure the software environment. The file syntax permits the use of comments to improve the readability of the file. Comments are inserted into the file by using an asterisk (*). All characters on the line following the asterisk are ignored.

Numbers can be entered in either decimal or hexadecimal format. Hexadecimal numbers should be prefixed with 0x. For example, the value 18 can be entered in either of the following formats:

- 0x12 *(Hexadecimal)
- 18 *(Decimal)

The system configuration file can contain the following commands:

- LOCAL commands to allow the gctload program to generate message queues for modules running locally
- REDIRECT commands to cause messages generated for modules not running locally to be redirected via a module that is running locally.
FORK_PROCESS commands advising the gctload program of any processes that need to be started locally.

The full syntax of each command is listed in 7.1.1 System Configuration File (system.txt).

An example system.txt configuration file is shown in section 9.1.

### 4.2.2 Generating the system.txt Configuration File

This section describes the procedure for generating a system.txt configuration file and details operating system specific differences in behavior among the development packages.

First, the file must contain LOCAL declarations for modules that are to run on the host computer. For a board-based system, this must include the ssd module and the timer module. For a SIGTRAN system, ssd is not required:

```
LOCAL 0x20 * ssdh - Board interface task
LOCAL 0x00 * tim - Timer task
```

LOCAL declarations are also required for optional modules running on the host. Typically, this includes the s7_mgt protocol configuration utility and the user's own application module. It may also include any host-based protocol modules and the s7_log utility. For example:

```
LOCAL 0xcf * s7_mgt - Management/config task
LOCAL 0x2d * upe - Example user part task
LOCAL 0x3d * s7_log - Prints messages to screen/file
```

Additionally, a SIGTRAN system using M3UA requires LOCAL definitions for the SCTP and M3UA protocols. (the SCTPD module is only used when for systems that do not make use of the Native SCTP implementation).

```
LOCAL 0xd0 * SCTPD module (not required if SCTPN is being used)
LOCAL 0xd1 * SCTP or SCTPN module
LOCAL 0xd2 * M3UA module
```

Once all the LOCAL declarations are in place, REDIRECT commands should be added for modules that are running on the board so that messages destined for these modules are transported via ssd (module_id = 0x20) and the device driver to the board.

The following REDIRECT commands are always required for TDM-based systems:

```
REDIRECT 0x10 0x20 * CT Bus/Clocking control module
REDIRECT 0x8e 0x20 * On-board management module
```

For boards running MTP2 protocol layer a redirect command is required for all MTP2 module_id in use by the board. Usually this is just module_id=0x21 but for the SS7HD board there is a separate MTP2 module_id for each signaling processor. As follows:
If ATM support is required (SS7MD boards only), then the following REDIRECT commands are also required:

REDIRECT 0x31 0x20 * ATM Module
REDIRECT 0x41 0x20 * Q.SAAL Module

For SIGTRAN systems using SCTPN the following REDIRECT is required:

REDIRECT 0xd0 0xd1 * required for SCTPN usage

For SIGTRAN systems using M3UA, the following REDIRECTS are required:

REDIRECT 0x22 0xd2 * redirect MTP3 to M3UA
REDIRECT 0xc2 0xd2 * mbm task now handled by M3UA

When using M3UA with multiple local AS, each additional local AS requires a redirect:

REDIRECT 0xd6 0xd2 * M3UA LAS2/NC1
REDIRECT 0xd7 0xd2 * M3UA LAS3/NC2
REDIRECT 0xd8 0xd2 * M3UA LAS4/NC3

In addition, REDIRECT commands are required for protocols running on the board. This typically includes MTP3 and one or more user parts. Examples of these commands are given below:

REDIRECT 0x22 0x20 * MTP3 module
REDIRECT 0x23 0x20 * ISUP module
REDIRECT 0x4a 0x20 * TUP module
REDIRECT 0x33 0x20 * SCCP module
REDIRECT 0x14 0x20 * TCAP module

Having provided that modules running on the board are accessible, it is then necessary to provide that status indications issued from the board successfully arrive at a module running on the host. If this does not happen, the system quickly runs out of available messages for inter-process communication.

Two module_id's (0xdf and 0xef) require redirection to a suitable process running on the host. Initially, these messages should be redirected to the s7_log utility that prints out a line for each message received. Ultimately, the user's own application will expect to receive these notifications.
It is next necessary to include FORK_PROCESS commands for modules running on the host computer. All systems require tick and tim binaries to be run; therefore:

The mandatory FORK_PROCESS commands are:

FORK_PROCESS tim
FORK_PROCESS tick

Systems containing signaling boards require the appropriate ssdx process to be started:

FORK_PROCESS ssdx

For SIGTRAN implementations using the Native SCTP (SCTPN) and M3UA the following processes should be started:

FORK_PROCESS sctp
FORK_PROCESS m3ua

For SIGTRAN implementations that use SCTP & SCTPD and M3UA the following processes should be started:

FORK_PROCESS sctp
FORK_PROCESS m3ua

Finally, FORK_PROCESS commands should be added for any other modules running on the host, such as, protocol modules, user applications or diagnostic utilities. For example:

FORK_PROCESS s7_mgt
FORK_PROCESS upe
FORK_PROCESS s7_log
4.3 Creating the Protocol Configuration File (config.txt)

The `s7_mgt` protocol configuration utility performs initialization of the protocol software modules. It reads the protocol configuration data from a text file, called `config.txt`, and provides a quick and flexible method of configuring the protocol modules without the need to write software for that purpose.

Alternatively, the protocol stack may be configured by sending the individual configuration messages documented in the per-module Programmer's Manuals for each protocol module. This approach can be of particular use when the application needs to make dynamic changes to protocol configuration without stopping the application program.

The command line syntax for `s7_mgt` is detailed in section 7.5. By default `s7_mgt` runs with `module_id=0xcf` and uses the filename "config.txt" for the Protocol Configuration File. Typically `s7_mgt` is started up from within `system.txt` using a `FORK_PROCESS` command. On completion of the single shot configuration sequence, `s7_mgt` will issue a notification message which can be used by an application as the indication that configuration is complete. The following example extract from `system.txt` starts `s7_mgt` so that it uses the default configuration file, and `module_id` and sends a notification to `module_id` 0xef:

```
FORK_PROCESS s7_mgt -i0xef
```

To assist diagnosis of issues, `s7_mgt` can be run using the `-d` option that generates additional diagnostic output.

The user should generate the `config.txt` file by reference to section 8 of this manual which details the syntax of all protocol configuration commands. In some cases it will also be necessary to refer to the Programmer's Manual for the specific protocols.

An example `config.txt` file is supplied as part of the DSI Development Package and this is repeated in section 9.2 of this manual. The example file shows typical usage of most commands although many of the commands are commented out by the use of `'*'` as the first character on the line.
4.4 Executing the Software

This section describes how to start the software running. It assumes that the software has already been installed and operating system adjustments have been made as detailed in section 3.

Ensure that device drivers for any boards have been installed and the system configuration file (system.txt) has been modified according to the system requirements.

Ensure that the location of any code file is consistent with the SS7_BOARD entry in config.txt (or the message based configuration parameters).

Ensure that the location of any host protocol binaries is consistent with the FORK_PROCESS entries in the system.txt file.

If using s7_mgt, ensure that the protocol configuration file config.txt has been edited to provide the correct protocol configuration. Typically s7_mgt is started using a FORK_PROCESS command in system.txt).

To start the software running, change to the directory containing the gcetload binary and run gcetload, optionally specifying the system configuration file. To run the system in the background, enter:

```
gcetload -csystem.txt &
```

For Windows users, gcetload can be run in the background using:

```
start gcetload -csystem.txt
```

The gcetload program initializes the system environment and starts up other processes. The s7_mgt process configures the protocol modules. A banner confirms that the system is running.

To shutdown the DSI software environment, run gcetload using the -x parameter (or if gcetload was run in the foreground simply use CTRL-C). All modules that have been started by gcetload are terminated automatically, for example:

```
gcetload -x
```

The command line management utility dsictbl can be used to activate signaling links, for example:

```
dsictbl MTPL ACT 0-0
ndsictbl MTPL ACT 0-1
```

Once gcetload is running they status of the system can be observed by running a second instance of gcetload using the -t1 parameter.

4.5 Developing a User Application

The development package, with the User Part Development Package, contains the files to allow the user to develop applications. These consist of makefile definitions, C header files (.h), and libraries.
A single definitions file is supplied (for each operating system) containing the definitions relating to the user's own development environment. This file is then included in the make files for all other processes. The user may need to modify this definitions file to ensure correct paths etc are set up.

Some simple example programs are supplied to illustrate techniques for interfacing to the protocol stack, although they are not intended to show a real application. Before starting to develop an application, you can familiarize yourself with the example programs and how they are built.

The example programs are contained in the User Part Development Package.

upe is a framework for a User Part module and contains a worked example of exchanging messages with the MTP3 module. It loops back any MTP-TRANSFER-INDICATIONS messages that it receives and reports other MTP indications to the user.

mtpsl is an example of how to send messages to MTP3 to activate and deactivate signaling links. It can be used as a command line tool for this purpose initially. It is intended that the user build the example code into the management application.

ctu is an example of how a user application can interface with telephony user parts, e.g., ISUP or TUP.

A makefile is included to allow users to build the application programs. To build the programs, change to the appropriate directory and enter (to build ctu):

nmake /f ctu.mak  
make -f ctu.mak  
make -f ctu.mak
5 Message Reference

5.1 Message Format

5.1.1 MSG Message Structure
A message consists of a fixed header field and a variable length parameter field:

```c
typedef struct msg {
    HDR hdr;
    u16 len;
    u32 param[80]
} MSG;
```

- **hdr**: The message header
- **len**: This field indicates the number of bytes in the parameter area of the message. Some messages do not contain any data in the parameter area, in which case **len** is set to zero.
- **param**: The parameter area of the message. The contents of this field are dependent on the message type. This field is normally accessed via a pointer obtained using the macro `get_param()`, which returns an unsigned character pointer to the param field.

The meaning of each field for a given message type is described in the individual application message specification. (See Programmer’s Manual for each module).

The size of the **param** array is 320 bytes for a normal length message (ie as shown above) or 4200 bytes for a long message.

*Note*: Users of systems where the structure 'MSG' is already defined for other purposes should use the alternative definition 'MSF'.

5.1.2 Header Fields
The application messages start with a common header, which is used to determine the message type, the source and destination module identities, and status information. This header structure is defined as follows:

```c
typedef struct hdr {
    /* type of message */
    u16 type;
    /* module instantiation */
    u16 id;
    /* sending module ID */
    u8 src;
    /* destination module ID */
    u8 dst;
    /* response required */
    u16 rsp_req;
    /* generic MSG type */
    u8 hclass;
    /* returned status */
    u8 status;
    /* status information */
    u32 err_info;
    #ifdef DSI_64BIT
    u32 next_ref; /* reserved for internal use only */
    #else
    struct hdr *next; /* reserved for internal use only */
    #endif
} HDR;
```
**type**: The type field is used to distinguish between different messages. It uniquely identifies the format of the remainder of the message and in particular the format of the message parameter area.

**id**: The id field allows modules, which handle multiple internal instances of a single entity (such as a circuit or signaling link) to distinguish the entity for which the message is destined.

**src**: The src field contains the module identity of the module that issued the message.

**dst**: The dst field contains the module identity of the module for which the message is destined.

**rsp_req**: The rsp_req field is used by the originator of a message to indicate whether or not it requires confirmation from the receiving module that the message has been received.

If the sending module requires confirmation, it sets a bit in the rsp_req field prior to sending the message. Which bit to set is determined by the value of the least significant nibble of the module's own module id (as written in the src field) For example, if the module id is 0x36 and message confirmation is required, the least significant nibble value of 0x6 indicates that the user would set bit 6 in the rsp_req field, so rsp_req would equal 0x0040.

If message confirmation is not required, then the rsp_req field should be set to zero.

The confirmation message takes the same format as the request message but uses a different **type** value. The **type** value for a confirmation message is derived from the **type** value in the request message by clearing bit 14.

**hclass**: This field is assigned by getm() and must not be modified.

**status**: This field is used for confirmation messages and indications to indicate the status associated with the message. A value of zero in a confirmation message usually indicates success.

**err_info**: This field is used in some confirmation and indication messages to supplement the status field and provide additional information

**next**: This field is reserved for internal use and must not be used.

### 5.1.3 Parameter Field

The parameter field for the standard MSG can contain 0 to 320 bytes of data. The data is stored in the parameter field in a host independent format. The contents and format of messages parameter field are defined in the various Programmer’s Manuals. In order to support longer payload messages associated with some protocols, in addition to the standard MSG a ‘long message’ is supported, which offers up to 4,200 bytes in the parameter area. Long messages co-exist with the standard MSG and are only used as needed based on payload size.

When the message is allocated the length parameter specified in the getm() function call is used to determine whether to allocate a normal message (length <= 320) or a ‘Long Message’ (length > 320).

Internally two partitions are created, the first for standard 320 octet messages and the second for 4200 octet messages. The use of the second partition is optional and is enabled by the use the NUM_LMSGS command in the system.txt file which takes a single parameter representing the number of ‘Long Messages’ required in the system. This should be in the range 1 to 65,000.
5.2 Common Message Specifications

This section defines the inter process messages that are of generic use within the DSI software environment. Messages for individual protocol modules are specified in the appropriate protocol Programmer’s Manual and control messages for specific boards are contained in the Programmer’s Manual for the board.

This section defines the following message types:

- GEN_MSG_MOD_IDENT - Module Identification Request
- SYS_MSG_CONGESTION - Congestion Status Indication
- MGT_MSG_TRACE_EV - Trace Event Indication
- API_MSG_CNF_IND - Configuration Completion Status Indication
5.2.1 GEN_MSG_MOD_IDENT - Module Identification Request

Synopsis
Message issued to any module to read the module type and core revision number.

Format

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>GEN.MSG_MOD_IDENT (0x6111)</td>
</tr>
<tr>
<td>id</td>
<td>0</td>
</tr>
<tr>
<td>src</td>
<td>Sending module's ID</td>
</tr>
<tr>
<td>dst</td>
<td>Destination module ID</td>
</tr>
<tr>
<td>rsp_req</td>
<td>Used to request a confirmation.</td>
</tr>
<tr>
<td>hclass</td>
<td>0</td>
</tr>
<tr>
<td>status</td>
<td>0</td>
</tr>
<tr>
<td>err_info</td>
<td>0</td>
</tr>
<tr>
<td>len</td>
<td>28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
<td>Reserved</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>maj_rev</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>min_rev</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>text</td>
</tr>
</tbody>
</table>

Description
This message can be issued to any module to determine the module type and the core revision number of the internal software.

The confirmation message contains the major and minor revision numbers and a text string identifying the module.

Parameters

**maj_rev**
Major revision identifier for the object being queried.

**min_rev**
Minor revision identifier for the object being queried.

**text**
Null terminated string giving textual module identity (for example, "ss7.dc6").
5.2.2 **SYS_MSG_CONGESTION - Congestion Status Indication**

**Synopsis**
Message sent to the designated congestion handling module on change of system congestion state.

**Format**

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>SYS_MSG_CONGESTION (0x0001)</td>
</tr>
<tr>
<td>id</td>
<td>Partition._id</td>
</tr>
<tr>
<td></td>
<td>0 - Indication relates to pool of standard length messages</td>
</tr>
<tr>
<td></td>
<td>1 - Indication relates to pool of 'long' messages.</td>
</tr>
<tr>
<td>src</td>
<td>0</td>
</tr>
<tr>
<td>dst</td>
<td>congestion-handling module</td>
</tr>
<tr>
<td>rsp_req</td>
<td>0</td>
</tr>
<tr>
<td>hclass</td>
<td>0</td>
</tr>
<tr>
<td>status</td>
<td>congestion_status</td>
</tr>
<tr>
<td>err_info</td>
<td>0</td>
</tr>
<tr>
<td>len</td>
<td>0</td>
</tr>
</tbody>
</table>

**Description**
When, as a result of allocating or releasing a message the system congestion status changes, this message is sent to the designated congestion handling module.

**Parameters**

*congestion_status*
The current congestion state of the DSI software environment. A value of zero indicates no congestion and non-zero values indicate various levels of congestion. Currently only 1 level of congestion is supported.
5.2.3 MGT_MSG_TRACE_EV - Trace Event Indication

Synopsis
Message issued by a module to trace a message sent to or received by the module.

Format

<table>
<thead>
<tr>
<th>MESSAGE HEADER</th>
<th>Meanings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Name</td>
<td>Meaning</td>
</tr>
<tr>
<td>type</td>
<td>MGT_MSG_TRACE_EV (0x0003)</td>
</tr>
<tr>
<td>id</td>
<td>0</td>
</tr>
<tr>
<td>src</td>
<td>module_id of module generating the trace event</td>
</tr>
<tr>
<td>dst</td>
<td>management module id</td>
</tr>
<tr>
<td>rsp_req</td>
<td>0</td>
</tr>
<tr>
<td>hclass</td>
<td>0</td>
</tr>
<tr>
<td>status</td>
<td>0</td>
</tr>
<tr>
<td>err_info</td>
<td>Timestamp</td>
</tr>
<tr>
<td>len</td>
<td>18 + length of traced data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PARAMETER AREA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset</td>
<td>Size</td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>0 to 280</td>
</tr>
</tbody>
</table>

Description
For diagnostic purposes, each protocol module has the ability to trace messages sent, and received and certain management events. When a message is traced a copy of the message is embedded within the MGT_MSG_TRACE_EV message and sent to the appropriate trace or management module. The user can dynamically change the configuration of which messages are traced using the per-module message to set the appropriate trace masks. Typically the trace messages are sent to the message queue of the s7_log utility which logs them to a rolling log file.
5.2.4 API_MSG_CNF_IND - Configuration Completion Status Indication

Synopsis
Message issued by s7_mgt protocol configuration utility on completion of initial configuration sequence.

Format

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>API_MSG_CNF_IND (0x0f09)</td>
</tr>
<tr>
<td>id</td>
<td>0</td>
</tr>
<tr>
<td>src</td>
<td>s7_mgt module_id (0xcfl)</td>
</tr>
<tr>
<td>dst</td>
<td>Notification module (see below)</td>
</tr>
<tr>
<td>rsp_req</td>
<td>0</td>
</tr>
<tr>
<td>hclass</td>
<td>0</td>
</tr>
<tr>
<td>status</td>
<td>completion_status (see below)</td>
</tr>
<tr>
<td>err_info</td>
<td>Reserved for future use.</td>
</tr>
<tr>
<td>len</td>
<td>0</td>
</tr>
</tbody>
</table>

Description
This message is issued by the s7_mgt protocol configuration utility on completion of the configuration sequence and indicates either success (status=0) or an error condition that occurred during configuration. The message is only issued when s7_mgt is run with the –i command line option specifying the module ID of the Notification Module to which the message should be sent.

It is recommended that the user invoke this option, then wait for an API_MSG_CNF_IND message to provide that the application does not attempt to send messages until initial configuration is complete.

Parameters

completion_status
The result of initial configuration. The following table shows the possible values and their meanings.

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Success</td>
</tr>
<tr>
<td>1</td>
<td>Error opening the config.txt protocol configuration file</td>
</tr>
<tr>
<td>2</td>
<td>Syntax or value error in the config.txt protocol configuration file</td>
</tr>
<tr>
<td>3</td>
<td>Error during configuration (invalid parameters)</td>
</tr>
<tr>
<td>4</td>
<td>Error during configuration (no response)</td>
</tr>
</tbody>
</table>
5.3 RSI Messages

RSI messages allow RSI links to be configured, activated and deactivated by the user. Once established they may also be used to gather the status and statistics on the link.

The following message types are defined:

- RSI_MSG_CONFIG – RSI Link Configuration Request
- RSI_MSG_UPLINK – RSI Link Activate Request
- RSI_MSG_DOWNLINK – RSI Link Deactivate Request
- RSI_MSG_LNK_STATUS – RSI Link Status Indication
- RSI_MSG_R_LNK_STATS – RSI Link Statistics Request
- RSI_MSG_READ_LINK – RSI Read Link Status

5.3.1 RSI_MSG_CONFIG – RSI Link Configuration Request

Synopsis

Message sent to the rsi module to configure an individual RSI link.

Format

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>reserved – must be set to zero</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>conc_id</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>flags</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>local_port</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>remote_port</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
<td>reserved – must be set to zero</td>
</tr>
<tr>
<td>28</td>
<td>20</td>
<td>remote_addr</td>
</tr>
<tr>
<td>48</td>
<td>2</td>
<td>reserved – must be set to zero</td>
</tr>
<tr>
<td>50</td>
<td>80</td>
<td>peer_addr</td>
</tr>
</tbody>
</table>
### Description

The RSI_MSG_CONFIG message is used to configure an RSI link. For correct operation one end of the link must be configured as a client and the other as a server. The link is initialized in the out of service (inactive) state and can subsequently be brought into service using the RSI_MSG_UPLINK message.

Network addresses can be specified as DNS hostname, IPv4 or IPv6 addresses. All addresses are specified as null terminated ASCII strings.

For example:

IPv4 address: 123.124.125.126
IPv6 link local address via eth0: fe80::20d:60ff:feb7:d751%eth0
IPv6 global address: 19a9:8cf0:0:20d:60ff:feb7:d751
DNS address: dpkbuild.lab.yourcompany.com

### Parameters

#### rsi_link_id

The local logical RSI link identifier in the range 0 to one less than the number of links supported.

#### conc_id

The concerned module_id to which RSI link status indications will be sent.

#### flags

A 16-bit value specifying additional run-time configuration options.

<table>
<thead>
<tr>
<th>flags</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Client / Server setting. This bit should be set to 0 for the Client end of the link and set to 1 for the Server end or the link.</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Reserved for future use and should be set to zero.</td>
</tr>
<tr>
<td>Bit 2</td>
<td>This bit should be set to 1 on system that support 'long' messages.</td>
</tr>
<tr>
<td>Bits 3 to 15</td>
<td>All other bits are reserved for future use and should be set to zero.</td>
</tr>
</tbody>
</table>

#### local_port

The local port number for a server link. (This should be set to zero for client links).

#### remote_port

The remote port number for a client link. (This should be set to zero for server links).

#### remote_addr

Retained for backwards compatibility only.

#### peer_address

Holds either the peer’s Network Address, or an IPv4 or IPv6 address as null terminated ASCII string.
5.3.2 RSI_MSG_UPLINK – RSI Link Activate Request

Synopsis
Message sent to the RSI module to activate an individual RSI link.

Format

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>RSI_MSG_UPLINK (0x7f81)</td>
</tr>
<tr>
<td>id</td>
<td>rsi_link_id</td>
</tr>
<tr>
<td>src</td>
<td>Sending module ID</td>
</tr>
<tr>
<td>dst</td>
<td>RSI module ID (0xb0)</td>
</tr>
<tr>
<td>rsp_req</td>
<td>Used to request a confirmation</td>
</tr>
<tr>
<td>hclass</td>
<td>0</td>
</tr>
<tr>
<td>status</td>
<td>0</td>
</tr>
<tr>
<td>err_info</td>
<td>0</td>
</tr>
<tr>
<td>len</td>
<td>0</td>
</tr>
</tbody>
</table>

Description
The RSI_MSG_UPLINK message is sent to RSI to activate a previously configured rsi link. The rsi process attempts to establish the link on receipt of this message. In the event that the link subsequently fails, the RSI module will automatically attempt to restore it.

5.3.3 RSI_MSG_DOWNLINK – RSI Link Deactivate Request

Synopsis
Message sent to the RSI module to deactivate an individual RSI link.

Format

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>RSI_MSG_DOWNLINK (0x7f82)</td>
</tr>
<tr>
<td>id</td>
<td>rsi_link_id</td>
</tr>
<tr>
<td>src</td>
<td>Sending module ID</td>
</tr>
<tr>
<td>dst</td>
<td>RSI module ID (0xb0)</td>
</tr>
<tr>
<td>rsp_req</td>
<td>Used to request a confirmation</td>
</tr>
<tr>
<td>hclass</td>
<td>0</td>
</tr>
<tr>
<td>status</td>
<td>0</td>
</tr>
<tr>
<td>err_info</td>
<td>0</td>
</tr>
<tr>
<td>len</td>
<td>0</td>
</tr>
</tbody>
</table>
Description

The RSI_MSG_DOWNLINK message is sent to RSI to take an RSI link out of service.

5.3.4 RSI_MSG_LNK_STATUS – RSI Link Status Indication

Synopsis

Message issued by RSI to indicate changes in status of the RSI link.

Format

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Meaning</th>
<th>Message Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>RSI_MSG_LNK_STATUS (0x0f83)</td>
<td></td>
</tr>
<tr>
<td>id</td>
<td>link_id</td>
<td></td>
</tr>
<tr>
<td>src</td>
<td>RSI module ID (0xb0)</td>
<td></td>
</tr>
<tr>
<td>dst</td>
<td>Concerned ID</td>
<td></td>
</tr>
<tr>
<td>rsp_req</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>hclass</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>status</td>
<td>Link State</td>
<td></td>
</tr>
<tr>
<td>err_info</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>len</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Description

The RSI_MSG_LNK_STATUS message is issued by RSI to the concerned module (as configured at RSI link configuration) whenever the RSI link goes in service or out of service.

Parameters

Link State

The status of the RSI link as follows:

<table>
<thead>
<tr>
<th>Value</th>
<th>Link state</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Link established (In Service)</td>
</tr>
<tr>
<td>2</td>
<td>Link failed (Out of Service)</td>
</tr>
</tbody>
</table>
5.3.5  **RSI_MSG_R_LNK_STATS – RSI Link Statistics Request**

**Synopsis**
Message sent to RSI to read (and optionally reset) statistics for an individual RSI link.

**Format**

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MESSAGE HEADER</strong></td>
<td></td>
</tr>
<tr>
<td>type</td>
<td>RSI_MSG_R_LNK_STATS (0x6f87)</td>
</tr>
<tr>
<td>id</td>
<td>rsi_link_id</td>
</tr>
<tr>
<td>src</td>
<td>Sending module ID</td>
</tr>
<tr>
<td>dst</td>
<td>RSI module ID (0xb0)</td>
</tr>
<tr>
<td>rsp_req</td>
<td>Used to request a confirmation</td>
</tr>
<tr>
<td>hclass</td>
<td>0</td>
</tr>
<tr>
<td>status</td>
<td>Set to 0 to read statistics, Set to 1 to read and reset statistics</td>
</tr>
<tr>
<td>err_info</td>
<td>0</td>
</tr>
<tr>
<td>len</td>
<td>36</td>
</tr>
<tr>
<td><strong>PARAMETER AREA</strong></td>
<td></td>
</tr>
<tr>
<td>Offset</td>
<td>Size</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>32</td>
<td>4</td>
</tr>
</tbody>
</table>

**Description**
The RSI_MSG_R_LNK_STATS message is used to read back statistics from the rsi link. The sending module should set the 'version' parameter to zero and should ensure that a confirmation is requested. The RSI module will populate the remaining parameters in the parameter area in the confirmation message. The statistics can optionally be reset by setting the 'status' to 1.

**Parameters**

**period**
The time period over which the statistics have been gathered (in multiples of 100ms).

**tx_msgs**
Number of messages transmitted over the link within the measurement period.
**rx_msgs**
Number of messages received over the link within the measurement period.

**tx_kbytes**
Number of octets transmitted in messages over the link within the measurement period. Excludes the message header.

**rx_kbytes**
Number of octets received in messages over the link within the measurement period. Excludes the message header.

**oos_duration**
The total amount of time the link was out of service during the measurement period (in multiples of 100ms).

**oos_count**
The number of times the link went out of service during the measurement period.

**tx_discards**
The number of messages due to be transmitted on the link that were discarded during the measurement period.

### 5.3.6 RSI_MSG_READ_LINK – RSI Read Link Status

**Synopsis**
Message used to read the current status and parameters of an RSI link.

**Message Format:**

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>RSI_MSG_READ_LINK (0x6f84)</td>
</tr>
<tr>
<td>id</td>
<td>rsi_link_id</td>
</tr>
<tr>
<td>src</td>
<td>Sending module ID</td>
</tr>
<tr>
<td>dst</td>
<td>RSI module ID (0xb0)</td>
</tr>
<tr>
<td>rsp_req</td>
<td>Used to request a confirmation</td>
</tr>
<tr>
<td>hclass</td>
<td>0</td>
</tr>
<tr>
<td>status</td>
<td>0</td>
</tr>
<tr>
<td>err_info</td>
<td>0</td>
</tr>
<tr>
<td>len</td>
<td>130</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
<td>reserved – must be set to zero</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>lport</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>reserved – must be set to zero</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>fport</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>tcpstate</td>
</tr>
<tr>
<td>14</td>
<td>18</td>
<td>host_addr</td>
</tr>
<tr>
<td>32</td>
<td>18</td>
<td>peer_addr</td>
</tr>
</tbody>
</table>
**Parameters**

**lport**
Local port

**fport**
Peer port

**tcpstate**
State of the underlying TCP connection

**host_addr**
Holds the local IPv4 or IPv6 address of the connection. The message supports both IPv4 and IPv6 addresses.

For an IPv4 connection, the first byte is set to 1 followed by a 32 bit IPv4 address.

For an IPv6 connection, the first byte is set to 2 followed by a 128 bit IPv6 address and in the case of a link local address the scope (or 0xff for a non link local address).

**peer_addr**
Holds the remote IPv4 or IPv6 address of the connection. The message supports both IPv4 and IPv6 addresses.

For an IPv4 connection, the first byte is set to 1 followed by a 32 bit IPv4 address.

For an IPv6 connection, the first byte is set to 2 followed by a 128 bit IPv6 address and in the case of a link local address the scope (or 0xff for a non link local address).

**peer_name**
For client end, this parameter is the name used at configuration time. For server end this parameter is set to a null string.
6 Library Functions

6.1 Inter-Process Communications Functions

6.1.1 GCT_send

Synopsis
Function to send a message to the specified module_id.

Prototype

```
int GCT_send(unsigned int module_id, HDR *h);
```

Return Value
Returns zero on success, non-zero otherwise.

Parameters

- **module_id** - The destination module id. This will usually be the same as the value contained in the `hdr.dst` field of the message.
- **h** - A pointer to the HDR structure at the start of the MSG to be sent. This parameter should always point to a buffer allocated using `getm()`.

Description
This function uses `module_id` to determine which message queue the message should be sent to and sends the message. A success return value implies that the message has been sent to the message queue belonging to the destination process.

If the call is successful, the calling program no longer owns the message and must no longer access it. If the function does not return success, then the calling program is responsible for the release of the message back to the system using `relm()`.

6.1.2 GCT_receive

Synopsis
Function to wait until the next message for `module_id` is available and return a pointer to the message.

Prototype

```
HDR *GCT_receive(unsigned int module_id);
```

Return Value
A pointer to the received message on success or zero on failure (in which case the user should retry the call).
Parameters

*module_id* - The module's own module id.

Description

This function uses *module_id* to determine from which message queue to receive. If the message queue contains a message, then a pointer to the first message is returned. Otherwise, the function suspends the calling task until a message is available.

After processing, the message returned by the GCT_receive function must either be sent back to the sending module (as a confirmation message), released back to the system using relm() or forwarded to a third module.

The only difference between GCT_receive and GCT_grab is whether to block or not when no messages are available.

### 6.1.3 GCT_grab

**Synopsis**

Function to determine whether there is a message ready for *module_id* and return a pointer to the message. If no message is ready, then the function returns immediately.

**Prototype**

```
HDR *GCT_grab(unsigned int module_id);
```

**Return Value**

A pointer to the received message on success or zero if there are no messages waiting.

**Parameters**

*module_id* - The module's own module id.

**Description**

This function uses *module_id* to determine from which message queue to receive. If the message queue contains any messages, then a pointer to the first message is returned. Otherwise the function immediately returns zero.

After processing, the message returned by the GCT_grab function must either be sent back to the sending module (as a confirmation message) or released back to the system using relm() or forwarded to a third module.

The only difference between GCT_receive and GCT_grab is whether to block or not when no messages are available.

### 6.1.4 GCT_set_instance

**Synopsis**

Function to write the module *instance* into the message pointed to by *h*.
Prototype

```
int GCT_set_instance(unsigned int instance, HDR *h);
```

**Return Value**

Returns zero on success, non-zero otherwise (currently no failure conditions are defined).

**Parameters**

- `instance` - The destination module instance.
- `h` - A pointer to the HDR structure at the start of the MSG.

**Description**

Writes the destination module instance into the message. This function should be called prior to calling GCT_send by the module sending the message.

The destination module instance is used when messages are sent from one processor to another processor. It determines the destination processor to which the message is sent.

Examples of the use of this function are as follows:

a) When sending messages to one of several boards. In this case, the module instance is the board_id.

b) When sending messages to one or other Dialogic® DSI Signaling Interface Unit (SIU) from an SIU pair. In this case, the module instance is 0 (SIUA) or 1 (SIUB).

### 6.1.5 GCT_get_instance

**Synopsis**

Function to recover the module instance from the message pointed to by `h`.

**Prototype**

```
unsigned int GCT_get_instance(HDR *h);
```

**Return Value**

Returns the module instance read from the message.

**Parameters**

- `h` - A pointer to the HDR structure at the start of the MSG.

**Description**

Recovers the source module instance from a received message. This function should be called after return from GCT_receive or GCT_grab.

The source module instance is used when messages are received from a number of processors by the local module. It identifies the source processor at which the message originated.
Examples of the use of this function are as follows:

a) When receiving messages from one of several boards. In this case, the module instance is the board_id.

b) When receiving messages from one or other Signaling Interface Unit (SIU) in an SIU pair. In this case, the module instance is 0 (SIUA) or 1 (SIUB).

### 6.1.6 getm

**Synopsis**
Function to allocate an MSG and initialize given fields in the message header.

**Prototype**

```c
MSG *getm(unsigned short type, unsigned short id,
          unsigned short rsp_req, unsigned short len);
```

**Return Value**
A pointer to the allocated message, or zero if no message available.

**Parameters**

- **type** - The message type, this is written to the `hdr.type` field of the message before the function returns.

- **id** - The id value; this is written to the `hdr.id` field of the message before the function returns.

- **rsp_req** - The rsp_req value; this is written to the `hdr.rsp_req` field of the message before the function returns (Refer to 5.1.2 Header Fields).

- **len** - The number of bytes that the user wishes to place in the parameter area of the message. This is written to the `len` field of the message before the function returns. This field is used to determine whether to allocate a standard message or a long message. If `len` is less than or equal to 320, then a standard message is allocated. If `len` is between 321 and 4200 inclusive, then a long message is allocated.

**Description**
This function allocates a message buffer from the buffer pool and initializes the type, id, rsp_req and len fields of the message to the specified values.

The function is used to allocate a message for subsequent inter-process communication, where it will be sent to the destination process. On return from the function, it is the calling functions responsibility to initialize the `hdr.src` and `hdr.dst` fields and the parameter area of the message prior to calling GCT_send().
6.1.7 relm

Synopsis
Function to release a message that has previously been allocated by getm(), back to the system.

Prototype

int relm(HDR *h);

Return Value
Zero on success; non-zero otherwise.

Parameters
h - A pointer to the HDR structure at the start of the MSG.

Description
Returns a message buffer allocated by getm() to the system buffer pool. Each message allocated must be returned once (and only once) to the system. It does not need to be returned by the same process that allocated it.

6.1.8 GCT_link

Synopsis
Function optionally used to attach an application to the DSI software environment, and detect the existence of the environment.

Prototype

int GCT_link(void);

Return Value
Returns zero on success. Non zero is returned on failure, indicating that gctload is not running (GCT environment is not available).

Description
This optional function is called by an application that wishes to confirm the existence of the DSI software environment in advance of using it. Refer to section 2.8 for further details.

Typically this function is not needed. The first call by an application to GCT_grab, GCT_receive or getm will automatically attach to the DSI environment.
6.1.9 GCT_unlink

**Synopsis**
Function optionally used to force an application to detach from the DSI software environment.

**Prototype**

```c
int GCT_unlink(void);
```

**Return Value**
Always returns zero.

**Description**
This optional function is called by an application that wishes to forcibly unlink from the DSI software environment (for example to allow the DSI software environment to be restarted without needing to restart the application). Refer to section 2.8 for further details.

Prior to calling GCT_unlink() the application must ensure that all messages have been released back to the environment.

Typically this function is not needed. When a module terminates it automatically unlinks from the DSI software environment.

6.1.10 GCT_partition_congestion

**Synopsis**
Function used to determine the congestion status of the DSI software environment.

**Prototype**

```c
int GCT_partition_congestion (int partition_id);
```

**Parameters**
The `partition_id` identifies the particular message pool. It should be set to 0 for the pool of standard MSGs and 1 for the pool of ‘Long’ messages.

**Return Value:**
The return value is set to the current congestion state of the DSI software environment. A value of zero indicates no congestion and non-zero values indicate various levels of congestion. Currently only 1 level of congestion is supported.
Description
The congestion status is determined by the number of messages currently allocated as a percentage of the total number of messages within the message pool. When a system is under heavy load there may be insufficient CPU power to process the incoming messages as fast as they are received so the number of messages queued within the environment starts to increase. Usually this is a transient condition and the load over time balances out and the congestion clears. A second cause of congestion is when messages are sent to a message queue which is not being serviced by an active process. A further cause of congestion is when modules do not release messages back into the environment. If the number of messages currently allocated increases above a threshold the congestion status will be set to 1. This function allows an application to determine the current congestion status of the system.

See also gctload -t1 which provides similar information from the command line.

6.1.11 confirm_msg

Synopsis
Function to confirm a message once it has been handled.

Prototype

```c
int confirm_msg(MSG *message);
```

Parameter

The message is a pointer to the message to be confirmed.

Return Value

The function always returns 0.

Description

This function is called when a module has finished processing a message. If the sending layer’s response required bit is set, then the message is converted to a confirmation message and sent back using GCT_send() to the sending module. If no confirmation was requested then the message is released back to the software environment using the relm().

A confirmation message is generated by swapping the hdr.src and hdr.dst fields, clearing bit 14 in the hdr.type field and clearing the sending layer’s bit in the hdr.rsp_req field.

The confirm_msg() function is the preferred way for an application to release a message back to the system once it has finished processing the content. It takes care of inspecting the rsp_req field to determine whether a confirmation is required, and it adjusts the type field if necessary and calls either relm or GCT_send simplifying the application code and reducing the risk of errors.
6.2 General Library Functions

This section details other useful functions that are built into the gctlib library.

6.2.1 rpackbytes

Synopsis
Function to pack bytes into machine independent format.

Prototype

```c
void rpackbytes(unsigned char *dest, int dest_byte_offset,
    unsigned long value, int bytecount);
```

Return Value
None.

Parameters
- `dest` - pointer to the destination buffer
- `dest_byte_offset` - offset from the start of the destination buffer to store data
- `value` - the value to be put into the buffer
- `bytecount` - the number of significant bytes to take from value.

Description
Packs the requested number of bytes into a buffer in a machine-independent manner for sending to another module, regardless of byte ordering on either processor. Typically this function is used to populate configuration messages with the appropriate data.

Example

```c
rpackbytes(dest, 10, value, 2);
```

This call will use the least significant 2 bytes of the value and store the resulting data starting at location `dest + 10`. The least significant byte of value will be written to `dest + 11` and the next significant byte to `dest + 10`.

6.2.2 runpackbytes

Synopsis
Function to extract bytes from machine-independent format.
Prototype

```c
unsigned long runpackbytes(unsigned char *src, int src_byte_offset, int bytecount);
```

Return Value

The numeric value unpacked from the buffer. The user should cast this to the required type (u8, u16, u32 etc).

Parameters

- `src` - pointer to the source buffer
- `src_byte_offset` - offset from the start of the message buffer to retrieve data
- `bytecount` - the number of bytes to take from the message

Description

Unpacks the requested number of bytes from a buffer, regardless of byte order on the processor.

Example:

```c
result = (u16)runpackbytes(src, 10, 2);
```

This call will retrieve the least two significant bytes from the buffer `src` and return the value as a u16. The u16 will be formed by `src` + 11 as the least significant byte and `src` + 10 as the most significant byte.
6.3 Java Inter-Process Communications

As an alternative to the C library functions discussed in section 6.1 the DSI Development Package includes a set of Java classes that provide equivalent functionality for use in a Java environment. The classes are included in the `gctApi.jar` within the JAVA sub-directory of the Development Package.

There are two key classes in this package.

### GctMsg

<table>
<thead>
<tr>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>+getParam()</td>
</tr>
<tr>
<td>+getType()</td>
</tr>
<tr>
<td>+setType()</td>
</tr>
<tr>
<td>+getId()</td>
</tr>
<tr>
<td>+setId()</td>
</tr>
<tr>
<td>+getSrc()</td>
</tr>
<tr>
<td>+setSrc()</td>
</tr>
<tr>
<td>+getDst()</td>
</tr>
<tr>
<td>+setDst()</td>
</tr>
<tr>
<td>+getRspReq()</td>
</tr>
<tr>
<td>+setRspReq()</td>
</tr>
<tr>
<td>+getStatus()</td>
</tr>
<tr>
<td>+setStatus()</td>
</tr>
<tr>
<td>+getInstance()</td>
</tr>
<tr>
<td>+setInstance()</td>
</tr>
</tbody>
</table>

### GctLib

<table>
<thead>
<tr>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>+getm()</td>
</tr>
<tr>
<td>+relm()</td>
</tr>
<tr>
<td>+send()</td>
</tr>
<tr>
<td>+grab()</td>
</tr>
<tr>
<td>+link()</td>
</tr>
<tr>
<td>+unlink()</td>
</tr>
<tr>
<td>+isPartitionCongested()</td>
</tr>
<tr>
<td>+getPartitionInfo()</td>
</tr>
<tr>
<td>+pendingMsgs()</td>
</tr>
</tbody>
</table>

This class controls the access into the Message-Passing environment. It provides methods equivalent to the functions listed in section 6.1 Inter-Process Communications Functions.

**Allocating a message:**

```java
GctMsg txMsg = GctLib.getm(MessageLength);
```

**Sending a message:**

```java
GctLib.send(DestModId, txMsg);
```
Receiving a message:

```java
GctMsg rxMsg = GctLib.receive(LocalModuleId);
```

**GctMsg**

This class provides a wrapper around a C message structure to allow it to be used in an alternative language.

The full list of classes and methods for the package are listed in Appendix C - GCTLIB Javadoc.

Example Code to display a message:

```java
try {
    System.out.print(prefix
        + "M-t" + String.format("%04x", gctmsg.getType())
        + "-i" + String.format("%04x", gctmsg.getId())
        + "-f" + String.format("%02x", gctmsg.getSrc())
        + "-d" + String.format("%02x", gctmsg.getDst())
        + "-s" + String.format("%02x", gctmsg.getStatus()));

    ByteBuffer buf = gctmsg.getParam();
    if (buf.hasRemaining()) {
        System.out.print("-p");
        while (buf.hasRemaining()) {
            System.out.print(String.format("%02x", BBUtil.getU8(buf)));
        }
    }
    System.out.print("\n");
} catch (GctException gctEx) {
    System.out.println("Problem with message: " + gctEx.getMessage());
}
```

This example shows the message body being read via the use of the ByteBuffer class. The ByteBuffer can also be used to manipulate the message body to add parameters.
7 Host Utilities

7.1 gctload

Description
The DSI software environment is created and maintained using the gctload utility. All DSI implementations use gctload.

gctload reads user supplied system configuration parameters from the System Configuration File. The filename of this file by default is "system.txt" although an alternative filename can be used if the –c option is specified. Within this manual it is often simply referred to as system.txt.

The system.txt file details the number and type of all messages to allocate, it lists all the module identifiers known to the system (including details of whether they are local modules or remote modules accessed through message redirection) and lists the command lines for all processes to be started by gctload. The file also contains configuration parameters for congestion management and a number of optional commands.

gctload uses the **NUM_MSGS** and **NUM_LMSGS** commands to build pools of message buffers for subsequent use by the getm() and relm() functions.

gctload creates a message queue for each of the **LOCAL** module identifiers. It subsequently expects a process to service each message queue; otherwise, messages will be written to message queues and never read causing a loss of messages.

gctload uses the **REDIRECT** commands to initialize the message queue look-up table so that messages destined for remote modules can be re-directed via the appropriate **LOCAL** module.

gctload uses the **CONG_MSG** command to initialize congestion reporting parameters and thresholds.

Having created the system environment, gctload uses the **FORK_PROCESS** commands to spawn all processes listed in the system configuration file. It then remains dormant until it receives a signal from the user (using gctload –x) to shutdown the system.

To shut down the system, it terminates any processes that it created and releases all system resources back to the operating system.

The gctload utility can also be run a second time with one of the options (-t1, -t2, -t3 or –t4) in order to retrieve status information relating to the DSI software environment.
**Syntax**

```
gctload -v
gctload [-c<system config file> -d]
gctload -x
gctload -t1
gctload -t2
gctload -t3
gctload -t4
```

**Parameters**

- **-v**
  Show version information.

- **-c<system config file>**
  The system configuration file contains full details of message queues, module_ids and local processes. This parameter is the filename of that file which by default is "system.txt". The format of the system configuration file is detailed fully in section 7.1.1, System Configuration File (system.txt) on page 81.

- **-d**
  Enables additional diagnostic output during creation of the DSI software environment.

- **-x**
  This option is used to terminate an existing gctload session. It ensures that the environment is shutdown in a controlled manner and that all processes forked within the system.txt file are also shutdown. This is the preferred way to shutdown the DSI software environment.

- **-t1**
  - **-t1r**
    The -t1 option is used to obtain a report on the current status of the DSI software environment. gctload should already have been run (without the -t1 option) so the DSI software environment is operational, running gctload a second time using the -t1 option will interrogate the current status.

    The status output shows the key configuration parameters and current status values and is intended as a diagnostic tool to monitor the health of the system. The example below shows typical usage.

    The -t1r form of the option additionally resets certain measurements ('Max alloc since reset' and 'Cong count since reset') and the associated time stamps.

```
gctload -t1
```

```
GCTLOAD System Status: 2012-03-06 16:52:46.112
Congestion module Id: 0x21
GCTLIB library: V1.44
Internal system error: 0
GCTLIB Atomic: Enabled
Timed licenses in use: No
```
Section 7 Host Utilities

Partition[0]
Parameter size: 320
MSGs in partition: 5000
MSGs allocated: 0
MSGs free: 5000
Maximum MSGs allocated: 13
Max alloc since reset: 12
Time of last max: 2012-03-06 16:52:46.112
Out of MSG count: 10
Congestion onset: 2500
Congestion abate: 500
Congestion status: 0
Congestion count: 2
Cong count since reset: 1
Last congestion onset: 2012-03-06 16:52:46.112

Partition[1]
Parameter size: 4200
MSGs in partition: 10
MSGs allocated: 0
MSGs free: 10
Maximum MSGs allocated: 8
Max alloc since reset: 7
Time of last max: 2012-03-15 13:02:23.178
Out of MSG count: 10
Congestion onset: 5
Congestion abate: 1
Congestion status: 0
Congestion count: 2
Cong count since reset: 1
Last congestion onset: 2012-03-15 13:02:23.178

-t2
The –t2 option displays a list of all the currently allocated messages to the console. These messages are shown in the same format as described for the s7_log and s7_play programs. Typically the –t2 option is used after having identified (using the –t3 option) that unexpected messages are queued within the environment in order to understand which message types are involved. Example output is shown below:

```
gctload –t2
GCTLOAD Allocated MSGs:  2012-03-06 16:52:46.112
M-10000-t7680-10000-fcf-d20-s00
M-10001-t7681-10000-fcf-d20-s00
M-10000-t7203-10000-fcf-d71-s00-p(9)112233445566778899
```

-t3
The –t3 option displays the current message queue status for all local message queues. This includes the number of messages currently queued and the process id (pid) of the last process to read from the message queue. To use the option the user should run a second instance of gctload using the –t3 option.

Under normal operation, the message queues for destination tasks should either be empty or contain a small number of messages. If this is not the case, this may be due to one of the following reasons:
- No active task has been set to read messages for the listed destination
- The destination task may have stopped reading from its message queue or may have stopped running.
- There may be a missing REDIRECT statement in the hosts’ system.txt file to redirect messages from the listed destination to a running task.

```
gctload -t3
GCTLOAD Message Queue Status: 2012-03-06 16:52:46.112
LOCAL=0x00, MSGs queued=6, last read by pid=1167
LOCAL=0xef, MSGs queued=0, last read by pid=1182
```

-t4
The –t4 option displays the license status of all active DSI host software licenses and, in the case of time limited licenses, shows the expiry date for the license.

```
gctload -t4
GCTLOAD License Status: 2012-03-06 16:52:46.112
pid     Token         Expires
123456   MTP3_LNX      29-Feb-2012
120      MTP2MD256_LNX -
```

7.1.1 System Configuration File (system.txt)
The system configuration file (system.txt) is used by gctload to configure the DSI software environment. The system.txt file is tailored by the user to include the appropriate set of protocols and utilities. This section details the format of the system.txt file and defines the commands and parameters that can be used in the file.

The file syntax permits the use of comments to improve readability. Comments are inserted into the file by using an asterisk (*); all characters on the line after the asterisk are ignored.

Numbers can be entered in either decimal or hexadecimal format. Hexadecimal numbers should be prefixed with 0x. For example the value eighteen can be entered in either of the following formats:

```
0x12  * (Hexadecimal)
18    * (Decimal)
```

The System Configuration File commands allow local modules to be declared (each local module requires a message queue), messages for remote modules to be redirected via the appropriate interface module (eg ssd, rsi etc) and command lines for processes to be started up to be listed. The syntax of each command is listed in the following sections.
7.1.2 NUM_MSGS / NUM_LMSGS Commands

Synopsis
Configure the number of messages in the standard and large message pools.

Syntax

```
NUM_MSGS <nummsgs>
NUM_LMSGS <numlmsgs>
```

Example

```
NUM_MSGS 5000
NUM_LMSGS 200
```

Description
This command configures the number of messages globally allocated for use within the DSI software environment. All systems need to have a pool of 'standard' messages configured using the NUM_MSGS command. Optionally, systems may also have a pool of 'long' messages configured using the NUM_LMSGS command. Long messages are typically required for the use of transaction-based protocols where SCCP is performing segmentation and reassembly.

7.1.3 CONG_MSG Command

Synopsis
Configures the congestion parameters for the DSI software environment.

Syntax

```
CONG_MSG <moduleId> <onset threshold> <abatement threshold>
```

Example

```
CONG_MSG 0x21 50 10
```

Description
This command configures the behavior of the congestion reporting system, as detailed in section 2.9. The following parameters can be configured using this message.

The congestion module Id specifies the module to which a congestion notification message is to be sent in the event of system congestion onset or abatement.

The congestion onset threshold specifies the percentage of the total number of available messages that must be allocated before the system will start congestion procedures.

The congestion abatement threshold specifies the percentage of the total number of messages that must be available before the system will terminate congestion procedures.
7.1.4 LOCAL Command

**Synopsis**
Command to create a message queue for a given module identifier that will be serviced by a local module.

**Syntax**

```
LOCAL <module_id>
```

**Example**

```
LOCAL 0x20  * Create message queue for module_id 0x20
```

**Description**
This command causes gctload to create a message queue and associate the queue with the given module_id.

These commands should appear prior to any redirect commands. One entry should appear for each local module that will run in the system. The module identifier, `<module_id>`, must be in the range 0x00 to 0xFE and must not have already been declared. Usually, the module_id is entered in hexadecimal format.

7.1.5 REDIRECT Command

**Synopsis**
Command to cause messages for a given module identifier to be redirected to an alternative message queue.

**Syntax**

```
REDIRECT <new_module_id> <existing_module_id>
```

**Example**

```
REDIRECT 0x22 0x20  * Redirect messages for 0x22 to module 0x20
```

**Description**
This command causes messages destined to `<new_module_id>` to be redirected to `<existing_module_id>`. The `<existing_module_id>` must have already been declared as a local module.

Messages for many module identifiers may be re-directed to a single module. A separate command line should be used in each case.

Typical use for this command is to redirect messages intended for processes that are running on a remote board via a local process which is responsible for transferring the message to the remote board.
7.1.6 DEFAULT_MODULE Command

Synopsis
Command to cause messages for any module identifier not explicitly defined to be redirected to an alternative message queue.

Syntax
```
DEFAULT_MODULE <default_module_id>
```

Example
```
DEFAULT_MODULE 0xef    * Redirect messages by default to module 0xef
```

Description
This command saves using several REDIRECT commands and allows messages for any unspecified module_id to be redirected to a single default module_id. It is good practice to always include the DEFAULT_MODULE command to ensure that all module identifiers are serviceable.

7.1.7 FORK_PROCESS Command

Synopsis
Command to start up processes within the DSI software environment.

Syntax
```
FORK_PROCESS  <process_path_name> { <parameters> }
```

Example
```
FORK_PROCESS  /mydir/BIN/myproc     * Startup my process
```

Description
This command causes the specified process to be spawned once the system environment has been created. Command line parameters for the process can also be specified, although there may be some limitations to the symbols that are permitted.

The maximum number of FORK_PROCESS commands supported in a system.txt configuration file is 64. A process does not have to be spawned in the configuration file, provided it is run after gctload and its module identifier has been declared as local. An advantage of using the configuration file is that the processes spawned by gctload automatically get shutdown when using gctl –x to shutdown the DSI software environment.
7.1.8 Example system.txt File

The following example of a generic system.txt file creates and assigns a message queue to module_ids 0x10, 0x20 and 0x30, and redirects messages for module_id 0x40 to module_id 0x20. It then starts up processes to service the message queues for the local modules. An example real-world system.txt file is shown in section 9.1.

```
* Example System Configuration File - system.txt
*
* NUM_MSGS 5000
* CONG_MSG 0x21 50 10
* LOCAL 0x10 * Process_A’s Module ID
LOCAL 0x20 * Process_B’s Module ID
LOCAL 0x30 * Process_C’s Module ID
*
REDIRECT 0x40 0x20 * Redirect msgs for Module ID 0x40 to Process_B
*
DEFAULT_MODULE 0x30 * Send messages for any unspecified Module ID to Process_C
*
NUM_MSGS 5000 * Number of standard size messages in the environment
NUM_LMSGS 200 * Number of ‘long’ messages (used for certain TCAP based applications)
*
FORK_PROCESS Process_A
FORK_PROCESS Process_B
FORK_PROCESS Process_C
```
7.2 s7_log

Synopsis
The s7_log utility services a specified message queue, receiving all messages and generates text based output either to the screen or to a log file. Maintenance and status events are interpreted as text; other messages are displayed in raw hexadecimal format. All entries in the log file are timestamped with date and time.

The utility is able to generate rolling, size limited log files and is suitable for real-time logging of messages to disk. Typically one or more instances of s7_log will be present in a system. For example one instance might log management events and status indications whilst other instances could be used to log measurements or to log traces protocol messages.

Syntax

```
s7_log [ -v -m<module_id> -o<options> -f<filename> -n<num_log_files>
       -s<logfile_size> -p<PCAP_filename> -t<timestamp> -q -r -w -x]
```

Parameters

- **-v**
  Show version information.

- **-m<module_id>**
  The module identifier assigned to the s7_log process. If not specified, s7_log will use a module ID of 0xef. The module ID assigned to s7_log must have a corresponding LOCAL entry in the system.txt file and must not be in use by other processes.

- **-o<options>**
  A 16 bit value that specifies the type of message reporting that will occur. If not specified, a value of 0xaf0d is used. Each bit set to 1 enables reporting of a particular message group or parameter field as described in the following table:

<table>
<thead>
<tr>
<th>Bit</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Enable text interpretation of all recognized messages.</td>
</tr>
<tr>
<td>1</td>
<td>Display ALL received messages (including those interpreted as text) as hexadecimal.</td>
</tr>
<tr>
<td>2</td>
<td>Decode and display Management trace messages.</td>
</tr>
<tr>
<td>3</td>
<td>Decode and display Management Trace Event 'time stamp' field.</td>
</tr>
<tr>
<td>4</td>
<td>Decode message header src and dst fields as text if recognized.</td>
</tr>
<tr>
<td>5</td>
<td>Enables the decoding of timestamps included in API_MSG_RX_INDT messages received from DSI SS7 Boards. Setting bit 5 to 1 specifies the timestamp values taken from the internal board clock should be displayed in short form (time only). The timestamp information is displayed after the &quot;BRD:&quot; label in the log. Note: This timestamp is different and more precise than the timestamp derived from the host clock, enabling usage of the -t[d] option as described below.</td>
</tr>
<tr>
<td>6</td>
<td>As for bit 5, it enables the decoding of timestamps included in API_MSG_RX_INDT messages received from DSI SS7 Boards. Bit 6 differs from bit 5 by displaying the timestamp values taken from the internal board clock in long format (date and time). Setting bit 6 to 1 overrides the value of bit 5 and always results in the display of timestamps in the long format. If both bits 5 and 6 are set to 0, the timestamp is not displayed.</td>
</tr>
<tr>
<td>7</td>
<td>Not used. Must be set to zero.</td>
</tr>
<tr>
<td>8</td>
<td>Display message type field.</td>
</tr>
<tr>
<td>Bit</td>
<td>Function</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Display message id field.</td>
</tr>
<tr>
<td>10</td>
<td>Display message src field.</td>
</tr>
<tr>
<td>11</td>
<td>Display message dst field.</td>
</tr>
<tr>
<td>12</td>
<td>Display message rsp_req field.</td>
</tr>
<tr>
<td>13</td>
<td>Display message status field.</td>
</tr>
<tr>
<td>14</td>
<td>Display message err_info field.</td>
</tr>
<tr>
<td>15</td>
<td>Display message parameter field.</td>
</tr>
</tbody>
</table>

-f<filename>
Optionally specifies a text file to which the output from s7_log will be written. s7_log will create a backup of the existing log file, if one exists, with the filename <logfile_name>.old. When operating with rolling log files using the -s and -n options s7_log will not create the backup file.

-n<num_log_files>
Optionally allows multiple log files to be created in a rolling log format to prevent filling the hard drive. This parameter should be set to a value between 2 and 99 to control how many log files are created. The filenames of the log files will be in the following form. Each time the latest file is full, each file is renamed.

log.txt (most recent file),
log.txt.1 (second most recent file)
...
log.txt.[n-1] (oldest file)

-s<logfile_size>
Use in conjunction with the -n option to specify the maximum file size (in kbytes) for a rolling log file. The valid range is from 1 to 100,000 representing log file sizes from 1kbytes to 100,000kbytes.

-p<PCAP_filename>
The -p option causes a PCAP formatted log file with the given filename to be created. s7_log will log the following message types in the PCAP format file: API_MSG_RX_IND, API_MSG_RX_INDT and API_MSG_TX_REQ.

When running in terminated mode, the user needs to activate tracing of MTP3 TX_REQ in the output event trace mask and RX_IND in the input trace mask and these trace messages will be logged into the PCAP format log file.

-tt, -td, -tp
The -tt, -td and -tp options cause each entry created by s7_log to contain a timestamp.

<table>
<thead>
<tr>
<th>Option</th>
<th>Output</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>-tt</td>
<td>Displays time only</td>
<td>hh:mm:ss:ddd</td>
</tr>
<tr>
<td>-td</td>
<td>Displays date and time</td>
<td>YYYY-MM-DD hh:mm:ss.dddd</td>
</tr>
<tr>
<td>-tp</td>
<td>Displays date and higher precision timestamps to micro-second granularity</td>
<td>YYYY-MM-DD hh:mm:ssdddddd</td>
</tr>
</tbody>
</table>

87
-q
Optional quiet mode which prevents output being sent to the display console. The use of this option is highly recommended for all systems under load as the impact of writing lots of messages to the screen can seriously impact system throughput.

-r
An option for use when rolling log files are enabled to cause a new file to be started the first time a new event is logged each day. This functionality is enabled by adding the -r option (in conjunction with the -n option). This behavior applies to both text and PCAP format log files.

-x
This option is used to modify the filename format for rotating log files. By default the sequence number is appended at the end of the filename (eg. maint.log.2) but if the -x option is used the sequence number is placed before the file extension (eg. maint.2.log).

Examples
For example, the command line to run s7_log as module ID 0xef with rolling logs enabled would be:

```
s7_log -q -td -n20 -s1000 -m0xef -o0xff87 -f maint.log
```

Typical output from s7_log is shown below:

```
S7L:2012-04-13 14:34:28.105 I0000 M t06a0 i0000 f20 def s60 p00100000
S7L:2012-04-13 14:34:28.187 I0000 LIU Status : id=0 SYNC LOSS
S7L:2012-04-13 14:34:28.187 I0000 LIU Status : id=0 AIS
S7L:2012-04-13 14:34:28.187 I0000 LIU Status : id=0 PCM LOSS
S7L:2012-04-13 14:34:28.313 I0000 LIU Status : id=1 SYNC LOSS
S7L:2012-04-13 14:34:28.313 I0000 LIU Status : id=1 AIS
S7L:2012-04-13 14:34:28.313 I0000 LIU Status : id=1 PCM LOSS
S7L:2012-04-13 14:34:28.313 I0000 LIU Status : id=1 REMOTE ALARM
S7L:2012-04-13 14:34:28.516 I0000 LIU Status : id=0 OUT OF SERVICE
S7L:2012-04-13 14:34:28.527 I0000 Level 2 State : id=0 OUT OF SERVICE
S7L:2012-04-13 14:34:28.805 I0000 LIU Status : id=0 AIS CLEARED
S7L:2012-04-13 14:34:29.004 I0000 LIU Status : id=1 AIS CLEARED
S7L:2012-04-13 14:34:29.504 I0000 Level 2 State : id=0 INITIAL ALIGNMENT
S7L:2012-04-13 14:34:29.505 I0000 Level 2 State : id=1 INITIAL ALIGNMENT
S7L:2012-04-13 14:34:30.006 I0000 Level 2 State : id=1 IN SERVICE
S7L:2012-04-13 14:34:30.006 I0000 Level 2 State : id=0 IN SERVICE
S7L:2012-04-13 14:34:30.008 I0000 MTP Event : linkset_id/link_ref=0100 Changeback
S7L:2012-04-13 14:34:30.008 I0000 MTP Event : linkset_id=01 Link set recovered
S7L:2012-04-13 14:34:30.008 I0000 MTP Event : linkset_id=01 Adjacent SP accessible
S7L:2012-04-13 14:34:30.008 I0000 MTP Event : point code=00000002 Destination available
```
Each line of text corresponds to a received message. The parameter prefixed I is the instance recovered from the message. In an SIU host environment, the instance identifies the SIU (by the siu_id value) that originated the message. Instance 0 refers to SIUA and instance 1 refers to SIUB.

Messages that are not interpreted as text are displayed in hexadecimal format as follows:

```
M t<type> i<id> f<src> d<dst> s<status> e<err_info> p<param>
```

Each field contains the value of the corresponding message field in hexadecimal format.


7.3 s7_play

**Description**

s7_play is a utility, primarily intended for diagnostic purposes, which takes text based representation of messages and sends them to the DSI software environment. It can optionally wait for a response to a message, insert a delay between messages or pause until a specific message type is received.

Typically s7_play is used to prototype configuration sequences, or to generate status requests or statistics gathering messages from a live system.

**Syntax**

```
s7_play -v -m<module_id> -f<filename>
```

**Parameters**

- **-v**
  Show version information.

- **-m<module_id>**
  Set the module_id that s7_play will use. By default this is 0x5d but may need to be changed depending on the manner in which s7_play is being used. If s7_play is simply generating messages then it can run with the default module_id. If it is also receiving responses then it is important that there is a corresponding LOCAL entry in the system.txt file and that module_id is not in use by other processes. Also it is important that the correct module_id is entered in the src field of messages in the command file so that the responses come back to the correct message queue.

- **-f<filename>**
  The filename of the text file containing the commands to be executed by s7_play. Optionally a space may be inserted between -f and the file name. By convention the filename suffix .ms7 is used.

**Example**

For example, to run s7_play as module ID 0x2d and take commands from a file cmd.ms7.

```
s7_play -m0x2d -f cmd.ms7
```

7.3.1 s7_play Command File Format

The s7_play utility takes commands from a user-supplied text file and generates messages into the DSI software environment. This section details the format of the file and the syntax of all commands used within the file.

The s7_play command file is a text file with each line in the file representing a single command. The first character on the line determines the command type. Inserting a * or # character as the first character of a line causes the remainder of the line to be ignored by s7_play.

The following commands are supported:
The command file can be made self executing (within a Linux or Solaris environment) by using a feature of the Unix environment and including the following text (or similar) in the first line of the file and changing the file permissions to be executable. (Note however that this technique does not allow the module_id to be changed):

```
#!/opt/DSI/s7_play -f
```

### M Command – Send Message

The send message command causes s7_play to allocate a message and populate it in accordance with the values contained within the file. S7_play then calls the GCT_send() function to send the message into the DSI software environment. The command format allows all fields of the message header, the parameter area and the message instance to be populated. Any fields not specified in the command are set by default to zero. As soon as the message has been sent, s7_play continues with the next command.

* The format for individual parameters is as follows:
  * -I0000 specifies the instance value for the message
  * -t0000 specifies the hdr->type value for the message
  * -i0000 specifies the hdr->id value for the message
  * -f00 specifies the hdr->src value for the message
  * -d00 specifies the hdr->dst value for the message
  * -r0000 specifies the hdr->rsp_req value for the message
  * -e00000000 specifies the hdr->err_info value for the message
  * -s00 specifies the hdr->status value for the message

* The param field is variable length up to 320 octets
  * -p0000..0000 specifies the param value for the message

* The following command sends a GEN_MSG_MOD_IDENT message to board_id=1
  * NOTE: the message is a single line which wraps to fit the document!
  * M-10001-t6111-10000-fef-d8e-r8000-p00000000000000000000000000000000 0000000000000000

### W Command – Send Message and Wait for Response

The wait command causes s7_play to allocate and send a message (as for the send message command). s7_play then reads messages from its own input message queue until it receives a response to the message it has just sent before continuing with the next command. When using this mode it is important that the src module_id is set (using the –f parameter) to the module_id of s7_play and that the appropriate bit in the rsp_req field is set so that a response is received. In addition it is important that the module_id in use by s7_play is not in use by another module.
The following sends message type-0x1234 and waits for a response
W-t1234-i0000-sef-d8e-r8000-p000000

**P Command – Pause until specific message received**
The pause command causes s7_play to wait until a specific message type (as specified in the command) is received before continuing to the next command. The message type is a two byte hexadecimal value using the -t parameter.

The following line pauses until message type 0x1234 is received
P-t1234

**D Command – Delay for fixed interval**
The delay command causes s7_play to delay for a (nominal) fixed interval before continuing to the next command. It takes two forms, one allowing the delay to be specified in seconds (using the -s parameter) and the other allowing the delay to be specified in milliseconds (using the -m parameter). The value of the delay is coded as a two byte hexadecimal value.

The following line implements a 3 second delay
D-s0003
The following line implements a 20ms delay
D-m0014

**R Command – Change the Receive Message Queue**
The "R" command causes s7_play to change the module_id that it uses for subsequent reads of its own message queue. The command takes a single 16 bit parameter designated -m as follows:

The following line changes the s7_play module_id to 0x2d
R-m002d
7.4 tick and tim

Description
The tick and tim utilities are essential to the correct operation of any DSI deployment and both should always be started using the FORK_PROCESS command in the system.txt file.

The tick utility generates a periodic timing reference and sends it to the tim utility. The tim utility handles the timer mechanism for all other processes in the system, in most cases issuing a periodic timer tick message to the module every 100ms.

Syntax

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tick</td>
<td>[-v]</td>
<td></td>
</tr>
<tr>
<td>tim</td>
<td>[-v]</td>
<td></td>
</tr>
</tbody>
</table>

Parameters

-v
Show version information.

Example

The following example shows the typical use of the tick and tim utilities as commands within the system.txt file:

```
FORK_PROCESS tim
FORK_PROCESS tick
```
7.5  s7_mgt

Description
The s7_mgt utility is the primary tool for configuring a DSI software stack. It is a single-shot configuration utility that takes configuration commands from a text file (config.txt by default).

The full set of configuration commands are detailed in section 8.16 of this manual.

As an alternative to using s7_mgt, experienced users can build their own configuration utilities using messaged-based configuration. In this case users should refer to the definitions of individual messages in the appropriate Programmer’s Manuals.

Syntax

```
s7_mgt [-v -k<config_file> -m<module_id> -i<notify_id> -d -f<filename>]
```

Parameters

- **-v**
  Show version information.

- **-k<config file>**
  Specifies the filename of the user generated text file that contains all the protocol configuration commands. The default is config.txt.

- **-m<module id>**
  Run using an alternative specified module_id to the default. By default s7_mgt uses module_id=0xcf and typically this does not need to be changed.

- **-i<notify module id>**
  On completion of the single-shot configuration sequence, s7_mgt is able to generate a API_MSG_CNF_IND message to a user application indicating the completion status. The user application may use this indication to start up its own operation. This option is used to specify the module_id to which the notification message is sent. By default no notification is issued.

- **-d**
  Enables additional diagnostic output to assist diagnosis of configuration problems.

- **-f<filename>**
  Optionally specifies a text file to which the output from s7_mgt will be written. s7_mgt will overwrite existing log files.

Example
The following example uses the configuration file “my_config.txt” and on completion will issue notification to module_id=0xef.

```
s7_mgt -kmy_config.txt -i0xef
```
7.6 ssd

ssd is the generic name for the process that interfaces with the per-board device driver for passing messages to and from the board. It also controls resetting and downloading software onto the board.

ssd also provides the ability to configure the addressing mode for the board, this is particularly important where multiple boards of the same type are in use in a single server to ensure that the board_id always refers to the same board.

Each board type has its own version of ssd as follows:

- ssds for SPCI4/SPCI2S boards
- ssdl for SS7LD boards
- ssdh for SS7HD boards
- ssdm for SS7MD boards

7.6.1 ssds (for SPCI4/SPCI2S boards)

Description

The ssds utility interfaces with the device driver for passing messages to and from the SPCI4 and SPCI2S boards and controls the downloading software to the board. ssds also controls geographic addressing for all boards in a system which can be based on either the PCI bus enumeration or the ADDR switch setting on the board.

Syntax

```
ssds [-v -o <addressing mode> -a <address>]
```

Parameters

- `-v`
  Show version information.

- `-o <addressing mode>`
  This parameter specifies the Geographic Addressing mode of operation. Geographic Addressing allows the logical position of a board (or board_id) in a system to remain the same irrespective of the addition or removal of other boards on the PCI bus. It can take the following values:
  - `-o1` - PCI address mode where address is determined by enumerating boards on the PCI bus at boot time (i.e., the default order found by the operating system).
  - `-o3` - Switch address mode where address is determined by a 16 position ADDR switch on the board. The switch must be set to a different value for each board. If the parameter is omitted then operation defaults to PCI address mode.

- `-a <address>`
  For Switch address mode it is necessary to specify a second command line parameter containing a list of the addresses for each logical board position (or board_id) derived from the ADDR switch setting. Each entry in the list (up to a maximum of 16) is separated by a comma as follows:
  `-a6,4,2,3,12,14`
If using Switch address mode, board_id=0 would be the board with ADDR switch set to 6, board_id=1 would be the board with ADDR switch set to 4 and so on. It is not necessary for all boards listed in this option to physically exist in a system.

-d
Enables additional diagnostic output to provide feedback on progress of code file download and initialization to help resolve configuration issues.

-m<module id>
Run using an alternative specified module_id to the default. By default ssds uses module_id=0x20.

7.6.2 ssdl (for SS7LD boards)

Description
The ssdl utility interfaces with the device driver for passing messages to and from the SS7LD board and controls the downloading software to the board. ssdl can be configured to handle different modes of addressing for each board within a system. This can be based on either the PCI bus enumeration or board serial number.

Syntax

```
ssdl [-v -o -a -d -m -Lp -Lt -t]
```

Parameters

-v
Show version information.

-o<addressing mode>
This parameter specifies the Geographic Addressing mode of operation. Geographic addressing allows a board’s logical position in a system to remain the same irrespective of the addition or removal of other boards on the PCI bus. Two different schemes of addressing DSI SS7LDH4Q boards are supported:

-01 - PCI address mode, as supplied by enumerating boards on the PCI bus at boot time

-03 - Switch address mode based addressing, determined by a 16-position rotary switch (SW1) on the board. Note that any changes to the ADDR switch setting will not be recognized by the system until the system is power cycled.

If the parameter is omitted, then operation defaults to PCI address mode.

-a<address>
For Switch address mode, it is necessary to specify a second command line parameter containing a list of the switch settings for each logical board position (or board_id). Each entry in the list (up to a maximum of 16) is separated by a comma as follows:

-a6,4,2,3
If using Switch address mode, board_id=0 would be the board with ADDR switch set to 6, board_id=1 would be the board with ADDR switch set to 4, and so on. It is not necessary for all boards listed in this parameter to actually exist in a system. A board that is listed, but missing, would result in a gap in the logical board_id sequence.

-d
Enables additional diagnostic output to provide feedback on progress of code file download and initialization to help resolve configuration issues.

-m<module id>
Run using an alternative specified module_id to the default. By default ssdl uses module_id=0x20.

-Lp<license path>
Specifies the path to the license file.

-Lt
License test mode option used to check that the specified license is valid. The result is displayed to the console.

-t
Permits the module to run without a license in ‘trial mode’ for one hour after which the binary will terminate.

7.6.3 ssdh (for SS7HD boards)

Description
The ssdh utility interfaces with the device driver for passing messages to and from the SS7HD board and controls the downloading software to the board. ssdh handles different modes of addressing for boards within a system. This can be based on either PCI bus enumeration or the ADDR switch setting on the board.

Syntax

```
ssdh [-v -o -a -d -m]
```

Parameters

-v
Show version information.

-o<addressing mode>
Select geographic address mode. Geographic addressing allows a board’s logical position in a system to remain the same irrespective of the addition or removal of other boards on the PCI bus. The following addressing schemes are supported:

-o1 - PCI address mode as supplied by enumerating boards on the PCI bus at boot time
-o3 - ADDR switch-based addressing, determined by a 16-position rotary switch on the board

If the parameter is omitted then operation defaults to PCI address mode.
For switch based addressing, it is necessary to specify a second option that provides a list of the switch settings to be used for each logical board position (or board_id).

\[-a6,4,2,3,12,14\]

Up to a maximum of 16 addresses can be specified in this list. In the example above, board_id = 0 would be the board with the ADDR rotary switch set to position 6, board_id = 1 would be the board with the rotary switch set to position 4 and so on.

It is not necessary for all boards listed in this option to physically exist in a system.

\[-d\]

Enables additional diagnostic output to provide feedback on progress of code file download and initialization to help resolve configuration issues.

\[-m<module id>\]

Run using an alternative specified module_id to the default. By default ssdh uses module_id=0x20.

**Example**

The following example shows the use of a three-board system using the hardware switch mode where the switches would be set to 1 for board_id=0, 2 for board_id=1 and 5 for board_id=2.

\[ssdh -o3 -a1,2,5\]

### 7.6.4 ssdm (for SS7MD boards)

**Description**

The ssdm utility interfaces with the device driver for passing messages to and from the SS7MD board and controls the downloading software to the board. ssdm can be configured to handle different modes of addressing for each board within a system. This can be based on either the PCI bus enumeration or board serial number.

**Syntax**

\[ssdm [-v -o -a -d -m -Lp -Lt -t]\]

**Parameters**

\[-v\]

Show version information.

\[-o<addressing mode>\]

Select geographic address mode. Geographic addressing allows a board’s logical position in a system to remain the same irrespective of the addition or removal of other boards on the PCI bus. Two different addressing schemes are supported:

\[-o1 – PCI address mode, as supplied by enumerating boards on the PCI bus at boot time\]
-o2 - Board serial number, determined by the board unique serial number
If the parameter is omitted then operation defaults to PCI address mode.

-a<address>
For serial number based addressing, it is necessary to specify a second option that
provides a list of the serial numbers of the board to reside at each logical board
location. Up to a maximum of eight addresses can be specified in the following format:

```
aPX800020, PX800015, PX800015, PX801000
```

It is not necessary for all boards listed in this option to physically exist in a system. In
board serial number address mode, if a board does not have a valid entry in the
address list, that board will be inaccessible to the system.

To leave a logical board id unused then a dummy entry (e.g. PX800000) should be
included in that position in the address list.

Under certain circumstances (for example to determine the serial number of a new
board added to the system which, as yet, does not have a valid mapping in the
system.txt file), the user may require access to all the boards in a system irrespective
of the address mode or any address list specified in the system.txt file.

To retrieve a board's serial number under these conditions, the
SSD_MSG_BOARD_INFO message allows each board to be addressed either via its
logical address (as determined by the address list mapping) or via its physical address
(as determined via its discovery order in the platforms PCI bus enumeration). To
access the board under its physical address, the most significant bit of the
SSD_MSG_BOARD_INFO ID field is set.

-d
 Enables additional diagnostic output to provide feedback on progress of code file
download and initialization to help resolve configuration issues.

-m<module id>
Run using an alternative specified module_id to the default. By default ssdm uses
module_id=0x20.

-Lp<license path>
Specifies the path to the license file.

-Lt
License test mode option used to check that the specified license is valid. The result is
displayed to the console.

-t
Permits the module to run without a license in ‘trial mode’ for one hour after which the
binary will terminate.

**Example**
The following example is for a two-board system using the board serial number
address mode where serial numbers PX800007 and PX800046, map to board identifiers
0, and 1, respectively:
| ssdm -o2 -aPX800007,PX800046 -Lpc:/opt/LIC |
7.7 rsi

Description
The RSI utility allows two DSI environments operating on separate platforms to extend the message passing mechanism to work between the two platforms over TCP/IP. The RSI utility includes mechanisms to detect link failure and manage link restoration. The RSI utility creates one instance of the rsi_lnk process for each RSI link that is created up to a maximum of 32 links.

RSI is the primary means by which user applications interface with the Dialogic® DSI Signaling Interface Unit, in this case the SIU is the server end of the RSI link. RSI can also be used for generic communication between two host based DSI environments.

Syntax
rsi -v
rsi -m -p<pipe> -l<link_selection>-r<link_process> -nl

Parameters
-v
Show version information.

-m<module id>
Run using an alternative specified module_id to the default. By default rsi uses module_id=0xb0.

-p<pipe>
Specifies the pipe used for communication between rsi and rsi_lnk. If not specified, rsi attempts to use /tmp/pipe.

This parameter is not used when operating under Windows.

-l<link_selection>
Specifies the algorithm to be used by RSI to select which RSI link to use for sending a message. Messages are routed according to their Instance value (which is set by the sending module using the GCT_set_instance() function) and the link selection algorithm. The following algorithms are supported:

<table>
<thead>
<tr>
<th>Value</th>
<th>RSI Selection Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Messages are routed by Instance value contained within the message. This allows the sending application to directly select which link will be used to send a message. It is the default and most widely used algorithm.</td>
</tr>
<tr>
<td>2</td>
<td>All messages are routed to rsi_link_id=0.</td>
</tr>
<tr>
<td>3</td>
<td>The message is sent on the lowest available (and in service) rsi_link_id.</td>
</tr>
</tbody>
</table>

-r<link_process>
Specifies the location of the rsi_lnk binary. If not specified, rsi assumes that the rsi_lnk binary is located in the current directory.

-nl
Enables transmission of long messages.
Example

Example rsi entry in the system.txt file:

```
FORK_PROCESS ../BIN/rsi -r ../BIN/rsi_lnk -l1
```
7.8 rsicmd

Description
The rsicmd utility is a command line utility to configure an individual RSI link.

Syntax

```
rsicmd <link_id> <conc_id> <link_type> <IP_addr> <port_number>
```

Parameters

**<link_id>**
The local logical RSI link identifier in the range 0 to one less than the number of links supported.

When connecting from a host to a pair of SIUs in a dual redundant configuration, rsi_link_id=0 should be used to communicate with SIUA and rsi_link_id=1 should be used to communicate with SIUB.

**<conc_id>**
The concerned module_id to which RSI link status indications will be sent.

**<link_type>**
Client / Server setting. This bit should be set to 0 for the Client end of the link and set to 1 for the Server end of the link. All SIU Host links to an SIU must be created as Client link types.

**<IP_addr>**
The IP address (IPv4 and IPv6 address formats are supported). For the Client end of the link this should be set to the IP address of the remote machine. For the Server end of the link this should be set to the machine's local IP address.

**<port_number>**
Specifies the TCP/IP port number used for the RSI link. For SIU Hosts the first host (host_id=0) should connect to port number 9000. Subsequent hosts connect to ports 9001, 9002 etc.

Examples

For example, to start a link to SIUA with an IPv4 address 123.124.125.126 as host 0, nominating a module whose ID is 0xef to receive RSI status information, the command line is:

```
rsicmd 0 0xef 0 123.124.125.126 9000
```

The following IPv6 address formats, as specified by RFC4291 and RFC4007, are supported:
* IPv6 link local address via eth0
  rsicmd 1 Oxef 1 fe80::20d:60ff:feb7:d751%eth0 9000

* IPv6 global address
  rsicmd 1 Oxef 1 fd77:19a9:8cf0:0:20d:60ff:feb7:d751 9000

* IPv4 or IPv6 via DNS lookup
  rsicmd 1 Oxef 1 dpkbuild.lab.companynname.com 9000

rsicmd may be run from system.txt by adding the appropriate FORK_PROCESS commands, hence to connect to both SIUA and SIUB as host ID 3, the following commands would be entered in the system.txt file on the host:

FORK_PROCESS ..\RUN\rsicmd 0 Oxef 0 123.234.345.456 9003
FORK_PROCESS ..\RUN\rsicmd 1 Oxef 0 123.234.345.457 9003
7.9 tempmon

Description
The tempmon utility periodically monitors the operating temperature of SS7MD and SS7LD boards to support evaluation of a suitable host chassis for deployment. The utility runs directly above the board driver and does not require or make use of the GCT environment.

The tempmon output which can optionally be sent to file includes date and time of all readings and the serial number of all boards detected.

The tempmon utility can be shut down by pressing <CTRL>C. The application will then close any log file and exit.

Syntax

```
tempmon [-v [-f<filename>] [-t<sample period>] [-b<board mask]]
```

Parameters

- **-v**
  Show version information.

- **-f <filename>**
  Optionally specifies a file to which all output is written.

- **-t <sample period>**
  Period, in seconds, between successive temperature readings. Defaults to 1 second.

- **-b <board mask>**
  A 16 bit bitmap of boards to include (each bit set will display that board). The least significant bit corresponds to board_id=0. If the parameter is omitted a default value of 0x000f is used which will display the temperature for the first 4 boards.

Example

```
tempmon -ftemplog.txt -t5
```

Sample Output

```
tempmon: Temperature monitor (C) 2009 Dialogic Corporation
==========================================================
2009-06-02 10:36:00, PX800007, PX800046, PX800057, PX800023
2009-06-02 10:36:00, 35, 36, 34, 35
2009-06-02 10:36:05, 35, 36, 34, 35
2009-06-02 10:36:10, 35, 36, 35, 36
2009-06-02 10:36:15, 35, 37, 35, 36
2009-06-02 10:36:20, 35, 37, 35, 37
2009-06-02 10:36:25, 35, 37, 35, 37
2009-06-02 10:36:30, 35, 38, 35, 37
2009-06-02 10:36:35, 35, 38, 35, 37
```
7.10 dsictrl

Description

The dsictrl utility is a command line utility that allows the user to perform interactive control to the various elements within a DSI deployment.

dsictrl supports control of the following entities: E1/T1 LIUs, MTP links, SIGTRAN links, Call control circuit groups and RSI links.

MTP links can be Activated, Deactivated, Inhibited & Uninhibited.

Circuit groups can be Reset, Maintenance or Hardware Blocked and Unblocked.

LIUs can be forced to generate alarm conditions (eg RAI, AIS) and put in various loopback modes.

For a full syntax listing run the tool with the –h option.

Each invocation of dsictrl performs an action on a single element. In order to perform operations on multiple elements users should create a script file containing a separate invocation of dsictrl on each line of the file.

Syntax

```
dsictrl <type> <action> <id> [-m -dm -di]
dsictrl -h
```

Parameters

`<type>`

A token indicating the type of entity being acted upon as detailed in the following table:

<table>
<thead>
<tr>
<th>&lt;type&gt;</th>
<th>Description</th>
<th>LIU</th>
<th>MTP</th>
<th>M3UAL</th>
<th>CGRP</th>
<th>RSIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIU</td>
<td>Line Interface Unit.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTPL</td>
<td>MTP Signaling Link</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M3UAL</td>
<td>M3UA SIGTRAN Link</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CGRP</td>
<td>Call Control Circuit Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSIL</td>
<td>RSI Link</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

`<action>`

A token indicating the action to be taken as detailed in the following table:
### Action Description

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
<th>LIU</th>
<th>MTPL</th>
<th>M3UAL</th>
<th>CGRP</th>
<th>RSIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT</td>
<td>Activate</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEACT</td>
<td>Deactivate</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INH</td>
<td>Maintenance Inhibit</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNINH</td>
<td>Maintenance Uninhibit</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRS</td>
<td>Reset Circuit Group</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCGB</td>
<td>Maintenance Block Circuit group</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCGU</td>
<td>Maintenance Unblock Circuit group</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCGB</td>
<td>Hardware Block Circuit Group</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCGU</td>
<td>Hardware Unblock Circuit Group</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIS</td>
<td>Force generate of AIS (Blue Alarm)</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOAIS</td>
<td>Cancel forced generation of AIS (Blue Alarm)</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAI</td>
<td>Force generation of RAI (Yellow Alarm)</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NORAI</td>
<td>Cancel generation of RAI (Yellow Alarm)</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUTORAI</td>
<td>Set RAI (Yellow Alarm) generation to automatic</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLOOP</td>
<td>Activate remote loopback</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLOOP</td>
<td>Activate local loopback</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOLOOP</td>
<td>Cancel all loopbacks</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### <id>

The identifier indicating the instance of the entity to be controlled. The id is formatted according to the following table:

<table>
<thead>
<tr>
<th>Format of &lt;id&gt;</th>
<th>Description</th>
<th>LIU</th>
<th>MTPL</th>
<th>M3UAL</th>
<th>CGRP</th>
<th>RSIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>The liu_id within a board in the range from 0 to one less than the number of LIUs on the board. (Note: When using multiple boards, the board_id must be specified using the –di parameter).</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x-y</td>
<td>The MTP Signaling Link id where x is the linkset_id and y is the link_ref.</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x</td>
<td>The SIGTRAN link_id.</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x</td>
<td>The Circuit Group Identifier (gid) in the range 0 to one less than the number of groups supported.</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x</td>
<td>The RSI link_id.</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### -m<module id>

Run using an alternative specified module_id to the default. By default dsictrl uses module_id=0x3d.
-dm<dest_module_id>
The optional destination module id. Default destination module_ids for each entity can be listed using the -h option.

-di<dest_module_instance>
The optional destination module instance, used for example when communicating with multiple boards to specify the board_id. If not specified, -di defaults to 0.

Examples

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dsictrl MTPL ACT 0-1</td>
<td></td>
</tr>
<tr>
<td>dsictrl MTPL ACT 1-1 -dm0x82</td>
<td></td>
</tr>
</tbody>
</table>
### 7.11 dsistat

**Description**

The dsistat utility is a command line utility that allows the user to request and display status and measurements from the various elements within a DSI deployment. For a full syntax listing run the tool with the `–h` option.

**Syntax**

```sh
dsistat <type> <action> <id> [-r -m -dm -di -sh -sr]
```

**Parameters**

- `<type>`
  A token indicating the type of element for which the status or measurements are to be read. For example: MTPL, MTPR, CGRP, CCTS, LIU, SCTPP, SCTPA, M3UAP, M3UAS, M3UAS, M3UAR, LSS, RSS, RSP, RSIL. For full details run the dsistat with the `–h` option.

- `<action>`
  A token which should be set to STATUS to read back status or STATS to read back measurements.

- `<id>`
  The identifier of the element. For full details of the available options and the format of the parameter run dsistat using the `–h` option.

- `-r`
  An optional parameter to cause the measurements to be reset.

- `-m<module id>`
  Run using an alternative specified module_id to the default. By default dsistat uses module_id=0x3d.

- `-dm<dest_module_id>`
  The optional destination module id. Default destination module_ids for each entity can be listed using the `–h` option.

- `-di<dest_module_instance>`
  The optional destination module instance, used for example when communicating with multiple boards to specify the board_id. If not specified, `-di` defaults to 0.

- `-sh`
  Optional parameter causes the short format of the output to be displayed omitting the header. This is useful when creating a script to read status or measurements from several elements. The header is only needed for the first line and subsequent invocations of dsistat can use the `-sh` option.
-sr
Optional parameter causes the short format of the output to be displayed omitting the status footer. This is useful when creating a script to read status or measurements from several elements. The footer may not be required.

Example
The following are examples of individual commands:

```
dsistat MTPL STATUS 1-0
dsistat MTPR STATS 1232 -r -dm0x82
dsistat RSIL STATS 0
```

An example of a script file which displays a header for the first row and lists status only in subsequent rows is shown below:

```
dsistat rsp status 639 -sr
dsistat rsp status 756 -sh -sr
dsistat rsp status 9064 -sh
```

Example output from the above script is shown below:

```
  SPC    STATE
   639    ALLOWED
   756    PROHIBITED
   9064   ALLOWED
  Executed
```
7.12 dsitrace

Description
The distrace utility is a command line utility that allows the user to conveniently set
the trace masks for individual protocols from the command line.
For a full syntax listing run the tool with the –h option.

Syntax

dsitrace <type> <action> [-ti -to -tm -dm -di]
dsitrace –h

Parameters

<type>
A token indicating the protocol module (eg MTP3, ISUP, SCCP, TCAP, MAP, INAP, IS41,
M3UA, SUA, SCTP, AAL5).

<action>
A token which should be set to TRACE to activate tracing or NOTRACE to deactivate
tracing.

-m<module id>
Run using an alternative specified module_id to the default. By default dsitrace uses
module_id=0x3d.

-dm<dest_module_id>
The optional destination module id. Default destination module_ids for each entity can
be listed using the –h option.

-di<dest_instance>
The optional destination module instance, used for example when communicating with
multiple boards to specify the board_id. If not specified, –di defaults to 0.

-ti<input_event_mask>
The value to use for the input event mask. This parameter is optional and when not
specified dsitrace will select a per-module default value. The default value can be listed
by running dsitrace with the –h option.

-to<output_event_mask>
The value to use for the output event mask. This parameter is optional and when not
specified dsitrace will select a per-module default value. The default value can be listed
by running dsitrace with the –h option.

-tm<mgmt_event_mask>
The value to use for the management event mask. This parameter is optional and
when not specified dsitrace will select a per-module default value. The default value
can be listed by running dsitrace with the –h option.
Examples

<table>
<thead>
<tr>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>dsitrace MTP3 TRACE</td>
</tr>
<tr>
<td>dsitrace MTP3 TRACE -ti0x0000003 -dm0x82</td>
</tr>
</tbody>
</table>
8 Configuration Command Reference

This section describes the commands and parameters used in the protocol configuration file config.txt. These are used by the s7_mgt utility to perform single-shot configuration of the protocol stack at startup.

8.1 Physical Interface Configuration Commands

The physical interface configuration commands are:

- SS7_BOARD Command
- LIU_CONFIG Command
- LIU_SC_DRIVE Command
- SCBUS_LISTEN Command
- STREAM_XCON Command (Cross Connect Configuration)

8.1.1 SS7_BOARD Command

Synopsis
Command to configure an SS7 board in the system

Syntax
SS7_BOARD <board_id> <board_type> <flags> <code_file> <run_mode>

Example
SS7_BOARD 0 SPCI4 0x0043 ./DC/ss7.dc3 ISUP-L

Parameters

<board_id>
The logical identity of the board in the range from 0 to one less than the number of boards supported.

<board_type>
The board type within the system. Possible values are:
SPCI2S, SPCI4,
SS7HDP, SS7HDE,
SS7MD,
SS7LD,
DNI2410, DNI1210, DNI610 and DNI310

<flags>
A 32 bit value that provides additional level 1 configuration for the board. The meaning of each bit may vary with different board types. The bits in the flags field are used as follows (when using a DNIxxxx board the flags should be set to zero):
Bit 0 controls the reference source used for on-board clocks when acting as CT bus Primary Master. If set to 1 then the clock is recovered from one of the line interfaces. If set to zero then the on-board clock oscillator is used.

Bit 1 is reserved for future use and must always be set to 1.

Bit 3 is applicable for the SS7HDP and SS7HDE boards only. It should be set to 1 to enable H.100 bus termination or set to 0 to disable H.100 bus termination. Setting bus termination prevents the bus clock signal from being reflected and must be set for any board at either end of the H.100 bus. For all other board types this bit should be set to 0.

Bit 6 and 7 together select the initial clocking mode for the CT bus as shown in the following table. The clocking mode can subsequently modified dynamically using the MVD_MSG_CNFCLOCK message:

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>CT Bus Clocking Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>The CT bus interface is disabled - In this mode, the board is electrically isolated from the other boards using the CT bus. The CT bus connection commands may still be used, but the connections made are only visible to this board. When using this mode, the on-board clocks are synchronized to the source selected by bit 0 of this flags parameter.</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>Primary Master, Clock set A - The board drives CT bus clock set A using the clock source selected by bit 0 of this flags parameter.</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>Secondary Master, Clock set B - The board is configured to drive clock set B in Secondary Master mode. It automatically switches to become Primary Master if the board driving clock set A fails. While acting as Secondary Master the on-board clocks are synchronized to the CT bus clock set A.</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Slave, initially using Clock set A – The board uses the CT bus clocks, which must be generated by another board on the CT bus. Initially the board recovers from clock set A, though will switch over automatically to recover from clock set B if set A fails.</td>
</tr>
</tbody>
</table>

Bit 9 – Typically this bit is not used and should be set to 0. In dual board fault tolerant configurations where the MTP3 layer is running on the board, Board A must set bit 9 to 0 while Board B must set bit 9 to 1.

### Flag Bit Support

<table>
<thead>
<tr>
<th>Flag Bit</th>
<th>SPCI</th>
<th>SS7HD</th>
<th>SS7MD</th>
<th>SS7LD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>1</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>3</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>7</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>9</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>13</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
</tr>
</tbody>
</table>
Bit 13 causes the board to drive the CT_NETREF1 clocks on the CT bus when set to 1. The highest priority in-sync line interface is used as a clock source. If this bit is set to zero then the CT_NETREF1 clock is not driven. By default, liu_id=0 is the highest priority and liu_id=7 is the lowest. The priority may however be modified using the MVD_MSG_CLOCK_PRI message.

Bit 16 is set to 1 to enable SNMP on a per-board basis. Information provided through this configuration includes board specific data, and all Line Interface Units subsequently configured. For additional information on SNMP support refer to the Dialogic® DSI Protocol Stacks SNMP User Manual.

All other bits are reserved and must be set to zero.

<code file>

The filename of the Code File which gets downloaded to the board when it is reset. To support code file paths the code file name may be up to 49 characters long. Each board family uses a different file suffix as follows:

<table>
<thead>
<tr>
<th>Board Family</th>
<th>Code File Suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPCI</td>
<td>.dc3</td>
</tr>
<tr>
<td>SS7HD</td>
<td>.dc4</td>
</tr>
<tr>
<td>SS7MD</td>
<td>.dc6</td>
</tr>
<tr>
<td>SS7LD</td>
<td>.dc7</td>
</tr>
</tbody>
</table>

All appropriate SS7 protocols for the board are included within the Code File. The selection of which protocols are run is made using the run_mode parameter below.

When using DNIxxxx boards <code_file> is not used and should be set to ‘null’.

<run_mode>

The run_mode determines which protocols are invoked at run time. The different board families have separate run modes. For details on what is supported refer to the Programmer’s Manual for your specific board.

When using SS7LD or DNIxxxx boards, <run_mode> should be set to one of the following values depending on which protocols are required to run as part of the ssdl module. If not running within ssdl then the user can run the protocol as a stand-alone host binary. All protocols that run embedded within ssdl use their own message queue so they require a LOCAL entry in the system.txt file.

<table>
<thead>
<tr>
<th>Run Mode</th>
<th>Protocols running embedded within ssdl</th>
<th>Optional Host Protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTP2</td>
<td>None</td>
<td>MTP3, ISUP, SCCP etc</td>
</tr>
<tr>
<td>MTP</td>
<td>MTP3</td>
<td>ISUP, SCCP etc</td>
</tr>
<tr>
<td>ISUP</td>
<td>MTP3 and ISUP</td>
<td>SCCP etc</td>
</tr>
</tbody>
</table>
8.1.2 LIU_CONFIG Command

Synopsis
This command configures the operating parameters for a T1/E1 Line Interface Unit (LIU).

Syntax
LIU_CONFIG <board_id> <liu_id> <liu_type> <line_code> <frame_format> <crc_mode> [<build_out> <options>]

Example
LIU_CONFIG 0 0 5 1 1 1 0x0000

Parameters
<board_id>
The logical identity of the board in the range from 0 to one less than the number of boards supported.

<liu_id>
The identifier of the T1/E1 Line Interface Unit in the range from 0 to one less than the number of LIUs supported (except for the SPCI2S board where the valid values are 2 and 3).

<liu_type>
The physical type of interface according to the following table:

<table>
<thead>
<tr>
<th>liu_type</th>
<th>Description</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Disabled (used to deactivate a LIU). In this mode the LIU does not produce an output signal.</td>
<td>• • • •</td>
</tr>
<tr>
<td>3</td>
<td>E1 120ohm balanced interface.</td>
<td>• • • •</td>
</tr>
<tr>
<td>4</td>
<td>T1</td>
<td>• • • •</td>
</tr>
<tr>
<td>5</td>
<td>E1 Impedance according to hardware</td>
<td>• • • •</td>
</tr>
<tr>
<td>6</td>
<td>E1 high-impedance (for monitoring applications)</td>
<td>• • • •</td>
</tr>
<tr>
<td>7</td>
<td>T1 high-impedance (for monitoring applications)</td>
<td>• • • •</td>
</tr>
<tr>
<td>8</td>
<td>E1 PMP mode (for monitoring with a Protected Monitoring Point)</td>
<td>• • • •</td>
</tr>
<tr>
<td>9</td>
<td>T1 PMP mode (for monitoring with a Protected Monitoring Point)</td>
<td>• • • •</td>
</tr>
</tbody>
</table>

Note: When using the SS7LD board all four ports must be configured as either T1 or E1.

<line_code>
The line coding technique taken from the following table:
## line_code

<table>
<thead>
<tr>
<th>line_code</th>
<th>Description</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HDB3 (E1 only).</td>
<td>* * * *</td>
</tr>
<tr>
<td>2</td>
<td>AMI with no Zero Code Suppression.</td>
<td>* * * *</td>
</tr>
<tr>
<td>3</td>
<td>AMI with Zero Code Suppression (The appropriate bit in the clear_mask parameter may be set to disable Zero Code Suppression for individual timeslots if required) (T1 only).</td>
<td>* * * *</td>
</tr>
<tr>
<td>4</td>
<td>B8ZS (T1 only).</td>
<td>* * * *</td>
</tr>
</tbody>
</table>

### <frame_format>

The frame format taken from the following table:

<table>
<thead>
<tr>
<th>frame_format</th>
<th>Description</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E1 double frame (E1 only)</td>
<td>* * * *</td>
</tr>
<tr>
<td>2</td>
<td>E1 CRC4 multiframe (E1 only)</td>
<td>* * * *</td>
</tr>
<tr>
<td>3</td>
<td>F4 4-frame multi-frame (T1 only)</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>D3/D4 (Yellow alarm = bit 2 in each channel) (T1 only)</td>
<td>* * * *</td>
</tr>
<tr>
<td>7</td>
<td>ESF (Yellow alarm in data link channel) (T1 only)</td>
<td>* * * *</td>
</tr>
<tr>
<td>8</td>
<td>F72/SLC96 (72-frame multi-frame) (T1 only)</td>
<td>*</td>
</tr>
<tr>
<td>9</td>
<td>J1 frame format. (&lt;liu_type&gt; must be 4; T1)</td>
<td>* *</td>
</tr>
<tr>
<td>10</td>
<td>Unstructured mode (HSL)</td>
<td>*</td>
</tr>
</tbody>
</table>

### <crc_mode>

The CRC mode. The following table shows the permitted values and their meanings.

---

3 Note: The ability to disable Zero Code Suppression on a per timeslot basis is not supported by the SS7LD board.
### Configuration Command Reference

<table>
<thead>
<tr>
<th><strong>crc_mode</strong></th>
<th><strong>Description</strong></th>
<th><strong>Support</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CRC generation disabled</td>
<td>SPCI</td>
</tr>
<tr>
<td>2</td>
<td>CRC4 enabled (frame_format must be set to 2)</td>
<td>SPCI</td>
</tr>
<tr>
<td>3</td>
<td>CRC4 compatibility mode (frame_format must be set to 2)</td>
<td>SPCI</td>
</tr>
<tr>
<td>4</td>
<td>CRC6 enabled (frame_format must be set to 7)</td>
<td>SPCI</td>
</tr>
<tr>
<td>5</td>
<td>CRC4 G.706 mode (frame_format must be set to 2) Note: Out of CRC4-multiframe E-Bits are transmitted as zeroes.</td>
<td>SPCI</td>
</tr>
</tbody>
</table>

### Build Out Type

The build out type. The following table shows the permitted values and their meanings.

<table>
<thead>
<tr>
<th><strong>Value</strong></th>
<th><strong>Description</strong></th>
<th><strong>Valid For</strong></th>
<th><strong>Support</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>E1 setting (default)</td>
<td>liu_type = 3 or 5</td>
<td>SPCI</td>
</tr>
<tr>
<td>1</td>
<td>T1 short haul, 0 to 110 ft. (default)</td>
<td>liu_type = 3 or 5</td>
<td>SPCI</td>
</tr>
<tr>
<td>2</td>
<td>T1 short haul, 0 to 110 ft. (same as value=1)</td>
<td>liu_type = 3 or 5</td>
<td>SPCI</td>
</tr>
<tr>
<td>3</td>
<td>T1 short haul, 110 to 220 ft.</td>
<td>liu_type = 4</td>
<td>SPCI</td>
</tr>
<tr>
<td>4</td>
<td>T1 short haul, 220 to 330 ft.</td>
<td>liu_type = 4</td>
<td>SPCI</td>
</tr>
<tr>
<td>5</td>
<td>T1 short haul, 330 to 440 ft.</td>
<td>liu_type = 4</td>
<td>SPCI</td>
</tr>
<tr>
<td>6</td>
<td>T1 short haul, 440 to 550 ft.</td>
<td>liu_type = 4</td>
<td>SPCI</td>
</tr>
<tr>
<td>7</td>
<td>T1 short haul, 550 to 600 ft.</td>
<td>liu_type = 4</td>
<td>SPCI</td>
</tr>
<tr>
<td>8</td>
<td>T1 long haul LB0 (-0db)</td>
<td>liu_type = 4</td>
<td>SPCI</td>
</tr>
<tr>
<td>9</td>
<td>T1 long haul LB0 (-7.5db)</td>
<td>liu_type = 4</td>
<td>SPCI</td>
</tr>
<tr>
<td>10</td>
<td>T1 long haul LB0 (-15db)</td>
<td>liu_type = 4</td>
<td>SPCI</td>
</tr>
<tr>
<td>11</td>
<td>T1 long haul LB0 (0db, TR82411)</td>
<td>liu_type = 4</td>
<td>SPCI</td>
</tr>
</tbody>
</table>

### Options

A 16 bit value that provides additional per-LIU run-time configuration options. The bits in the **options** field are used as follows:

**Bit 0** set to 1 to prevent the LIU being used as a source of clock recovery. This option is applicable only for the SS7MD board. For SPCI and SS7HD boards this functionality can be achieved by using the LIU priority message.

All other bits are reserved and must be set to zero.
8.1.3 LIU_SC_DRIVE Command

Synopsis
This command is used during initialization to set up a static switch path through the board between the Line Interface Unit (LIU) and the CT bus. It connects selected incoming voice timeslots from an T1/E1 LIU to a sequential block of channels on the CT bus and prepares the outgoing timeslots for subsequent use by the MVD_MSG_SC_LISTEN message.

Note: This command is only supported for SPCI and SS7HD product families.

Syntax
LIU_SC_DRIVE <board_id> <liu_id> <sc_channel> <ts_mask> {<mode>}

Example
LIU_SC_DRIVE 0 0 512 0xfff

Parameters
<board_id>
The logical identity of the board in the range from 0 to one less than the number of boards supported.

<liu_id>
The identifier of the T1/E1 Line Interface Unit in the range 0 to one less than the number of LIUs supported (except for the SPCI2S board where the valid values are 2 and 3). This parameter can also be set to special values which are board specific.

For SPCI boards, value 0x83 selects the signaling processor instead of an LIU. In this case timeslots 0 … 3 in the ts_mask correspond to signaling processor 0…3.

For SS7HD boards, this parameter can also be set to one of the special values 0x90, 0x91, 0x92, and 0x93, depending on the number of signaling processors. In these cases, the timeslots 0 to 31 in the <ts_mask> parameter correspond to the signaling processor's signaling links.

<sc_channel>
The channel number of the first channel to be used on the CT bus. This must be in the range from 0 up to one less than the total number of channels on the CT bus.

<ts_mask>
A 32 bit timeslot mask where each bit position is set to 1 if the corresponding timeslot on the T1/E1 interface is required to be connected to the CT bus. The least significant bit (bit 0) represents timeslot 0. Each timeslot for which the corresponding bit is set in ts_mask is connected up to the CT bus; other timeslots are not affected in any way.

Timeslots containing SS7 signaling that are processed by the signaling processor on the board should not be included in the timeslot mask. Usually the mask should be set to include all bearer (voice) timeslots but no signaling timeslots. Bit 0 (corresponding to timeslot 0 on the LIU) must not be set.
As an example, for an E1 interface with SS7 signaling on timeslot 16, and the remaining 30 timeslots used for voice circuits, ts_mask should be set to the value 0xfffefffe. For a T1 interface with signaling on timeslot 24, ts_mask should be set to the value 0x00fffffe.

<mode>
This parameter allows the user to select how the CT bus channels are allocated. Usually (mode=1) the first timeslot connected to the CT bus is connected to sc_channel and each subsequent timeslot that is selected is connected to the next CT bus channel. This allows maximum utilization of channels on the CT bus.

An alternative mode (mode=2) (only used if there is a specific requirement for it) associates (but does not necessarily connect) timeslot 0 on the LIU with sc_channel and subsequent timeslots on the LIU with subsequent CT bus channels. Connections are only made when the corresponding bit in the timeslot mask is set to 1. This mode of operation preserves the spacing between timeslots that was originally found on the T1/E1 interface but does result in a number of CT bus channels being not used.

The mode parameter is optional and may be omitted altogether. This has the same effect as setting it to 1.

8.1.4 SCBUS_LISTEN Command

Synopsis
This command establishes a connection from the CT bus to an outgoing timeslot on the Line Interface Unit (LIU).

Dynamic modification of voice paths can only be performed by issuing messages directly to the board. The MVD_MSG_SC_LISTEN message is recommended for this purpose.

Note: This command is only fully supported for SPCI and SS7HD product families. For the SS7MD board this command can be used to switch between timeslots between LIUs on the same board. Refer to SS7MD Programmer’s Manual for full details.

Syntax
SCBUS_LISTEN <board_id> <liu_id> <timeslot> <sc_channel>

Example
SCBUS_LISTEN 0 0 31 23

Parameters

<board_id>
The logical identity of the board in the range from 0 to one less than the number of boards supported.

<liu_id>
The identifier of the T1/E1 Line Interface Unit in the range 0 to one less than the number of LIUs supported (except for the SPCI2S board where the valid values are 2 and 3). This parameter can also be set to special values which are board specific.
For SPCI boards, value 0x83 selects the signaling processor instead of an LIU. In this case timeslots 0 ... 3 in the ts_mask correspond to signaling processor 0...3.

For SS7HD boards, this parameter can also be set to one of the special values 0x90, 0x91, 0x92, and 0x93, depending on the number of signaling processors. In these cases, the timeslots 0 to 31 in the <ts_mask> parameter correspond to the signaling processor's signaling links.

<timeslot>
The timeslot number on the T1/E1 line interface unit on which the data from the CT bus is transmitted. The valid ranges for timeslot are 1 to 31 for an E1 interface, 1 to 24 for a T1 interface and 0 to 31 when referring to the signaling processor on the SS7HD board.

<sc_channel>
The channel number on the CT bus to which the LIU listens. This must be in the range from 0 up to one less than the total number of channels on the CT bus.

8.1.5 STREAM_XCON Command (Cross Connect Configuration)

Synopsis
The STREAM_XCON command controls the cross connect switch on the signaling boards, enabling the cross connection of timeslots between two Line Interface Units (LIUs) on each signaling board. The LIUs on a board are referenced by a fixed logical stream number.

This command is supported for SPCI, SS7HD and SS7LD boards.

Syntax
STREAM_XCON <bpos> <stream_a> <stream_b> <mode> <ts_mask> <pattern>

Example
STREAM_XCON 3 2 3 3 0xffffefffe 0

Parameters
<bpos>
The board position of the cross connect switch to be controlled. There must be a valid board at this position (previously defined by an SS7_BOARD command).

<stream_a>
Reference to the 2 Mb/s stream for the output of the connection. There must be a valid LIU at this position (previously defined by a LIU_CONFIG command). Valid values are:
<stream_b>
A reference to the 2 Mb/s stream for the input of a simplex connection (mode 2) or one half of a duplex cross connection (mode 3). In other modes, this field should be set to 0. There must be a valid LIU at this position (previously defined by a LIU_CONFIG command). For valid values, see the table in the <stream_a> parameter description above.

<mode>
Indicates the requested cross connect switch function according to the following table.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not supported</td>
</tr>
<tr>
<td>2</td>
<td>Connect the input timeslot to the output timeslot</td>
</tr>
<tr>
<td>3</td>
<td>Duplex cross-connect the input and output timeslot</td>
</tr>
</tbody>
</table>

<ts_mask>
A 32-bit mask specifying the timeslots to which the cross connect is applied to. Each bit corresponds to a timeslot in the input/output stream. Bit 0 (the least significant bit) corresponds to timeslot number 0. To apply this command to a timeslot, the corresponding bit must be set to one.

— E1 interfaces have 32 timeslots numbered 0 to 31. Timeslot 0 is used for frame alignment and timeslot 16 is generally used for signaling or is empty. Hence the normal configuration is to cross connect timeslots 1 to 15 and 17 to 31 between the two ports on each signaling board by setting the <ts_mask> value to 0xfffefffe.

— T1/J1 interfaces have 24 timeslots, numbered 1 to 24. To cross connect all the timeslots on a T1 interface between the two PCM ports on a signaling board, the <ts_mask> value 0x1fffffe should be used.

In duplex mode both PCM ports should have been previously configured under the same type of PCM connector T1, E1 or J1.

<pattern>
This parameter should be set to zero.
8.2 Maintenance Module Commands

The maintenance module commands are:

- MGMT_MOD_ID, MAINT_MOD_ID & TRACE_MOD_ID Commands

8.2.1 MGMT_MOD_ID, MAINT_MOD_ID & TRACE_MOD_ID Commands

Synopsis

These commands are used to modify the default module_ids used by the s7_mgt utility to configure the Management ID, Maintenance ID and Trace ID for Protocol modules; this permits the user to specify the separate destinations to be used for trace, maintenance and management messages.

Syntax

MGMT_MOD_ID <mgmt_id>
MAINT_MOD_ID <maint_id>
TRACE_MOD_ID <trace_id>

Examples

MGMT_MOD_ID 0xcf
MAINT_MOD_ID 0xdf
TRACE_MOD_ID 0xef

Parameters

<mgmt_id>, <maint_id>, <trace_id>

The user may specify the module_ids to use for mgmt_id, maint_id and trace_id respectively. The table below shows how these apply to specific protocols.

If the command is not used then the module_ids take the default value 0xef.

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Management ID</th>
<th>Maintenance ID</th>
<th>Trace ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTP2</td>
<td>mgmt_id</td>
<td>-</td>
<td>trace_id</td>
</tr>
<tr>
<td>Q.SAAL</td>
<td>mgmt_id</td>
<td>-</td>
<td>trace_id</td>
</tr>
<tr>
<td>MTP3</td>
<td>mgmt_id</td>
<td>-</td>
<td>trace_id</td>
</tr>
<tr>
<td>ISUP</td>
<td>ISUP user id</td>
<td>ISUP user id</td>
<td>trace_id</td>
</tr>
<tr>
<td>TUP</td>
<td>TUP user id</td>
<td>TUP user id</td>
<td>-</td>
</tr>
<tr>
<td>SCCP</td>
<td>mgmt_id</td>
<td>maint_id</td>
<td>trace_id</td>
</tr>
<tr>
<td>TCAP</td>
<td>mgmt_id</td>
<td>maint_id</td>
<td>trace_id</td>
</tr>
<tr>
<td>MAP</td>
<td>mgmt_id</td>
<td>maint_id</td>
<td>trace_id</td>
</tr>
<tr>
<td>INAP</td>
<td>mgmt_id</td>
<td>maint_id</td>
<td>trace_id</td>
</tr>
<tr>
<td>IS41</td>
<td>mgmt_id</td>
<td>maint_id</td>
<td>trace_id</td>
</tr>
<tr>
<td>SCTP/SCTPD</td>
<td>mgmt_id</td>
<td>-</td>
<td>trace_id</td>
</tr>
<tr>
<td>M2PA</td>
<td>mgmt_id</td>
<td>-</td>
<td>trace_id</td>
</tr>
<tr>
<td>Protocol</td>
<td>Management ID</td>
<td>Maintenance ID</td>
<td>Trace ID</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>----------------</td>
<td>---------</td>
</tr>
<tr>
<td>M3UA</td>
<td>mgmt_id</td>
<td>maint_id</td>
<td>trace_id</td>
</tr>
<tr>
<td>SUA</td>
<td>mgmt_id</td>
<td>-</td>
<td>trace_id</td>
</tr>
</tbody>
</table>
8.3 Monitor Configuration Commands

The monitor configuration commands are:

- MONITOR LINK Command (for HSL/LSL Links)
- MONITOR LINK Command (for ATM Links)

8.3.1 MONITOR LINK Command (for HSL/LSL Links)

Synopsis

This command is used to configure a signaling link to operate in receive only mode so that received signaling messages are passed directly to the user application without further processing.

Note: For the SPCI boards the ss7.dc3 code file does not support the use of the MONITOR_LINK command. When using the SPCI board for monitoring applications users must select the mon.dc3 code file.

Note: Often, applications that use MONITOR_LINK also require the line interfaces to operate in high impedance or Protected Monitoring Point mode. When using SS7HD, SS7MD or SS7LD boards high impedance and PMP modes can be selected for a particular LIU using the <liu_type> parameter in the LIU_CONFIG command.

Syntax

MONITOR_LINK <link_id> <board_id> <blink> <stream> <timeslot> <user_module> <reserved1> <flags> <reserved2> [<data_rate>]

Example

MONITOR_LINK 0 0 0-0 0 16 0x0d 0 0 0x00

Parameters

<reserved1>, <reserved2>
These parameters are reserved for future use and should be set to zero.

<link_id>
The unique logical identity of the link. It must be in the range 0 to one less than the total number of signaling links supported.

<board_id>
The ID of the board that will process the incoming signaling.

<blink>
For SPCI, SS7MD and SS7LD Boards
This is the index of the signaling link. It must be in the range 0 to one less than the number of signaling links licensed on the board.
For SS7HD boards

This is a compound parameter that indicates the signaling processor and the channel on the signaling processor that will be monitored. It is represented in the form sp_id - sp_channel where:

— sp_id is the identifier of the signaling processor with a value in the range 0 to one less than the number of processors on the board.

— sp_channel is the identifier of the channel on the signaling processor with a value in the range 0 to one less than the number of links supported per signaling processor.

The MONITOR_LINK and MTP_LINK commands cannot be used on the same sp_id/sp_channel resource.

For HSL operation, only one link per signaling processor is supported so sp_channel must be set to 0.

<stream>
When the <timeslot> parameter is set to a non-zero value, the <stream> parameter is the logical identity of the T1/E1 LIU (liu_id) containing the signaling link. It should be in the range 0 to one less than the number of LIUs.

Set both the <stream> and <timeslot> parameters to 0 to disable automatic configuration. The signaling path should be set up manually using the switch control messages.

<timeslot>
The timeslot used for signaling in the range 0-31. The valid range for an E1 interface is 1 to 31 and for a T1 interface 1 to 24.

To disable automatic configuration both <stream> and <timeslot> should be set to zero. The signaling path should then be set up manually using the switch control messages.

For HSL operation <timeslot> should be set to 0xff and the Data rate is set using the optional data rate parameter, if not present data rate defaults based on LIU type (T1/E1).

</user_module>
The module ID of the process that will receive the incoming signaling messages, passed as API_MSG_RX_IND messages.

<flags>
Per-link flags for monitoring operation.

— Bit 0 - Reserved, should be set to zero.

— Bit 1 - Enable Fill In Signal Units (FISUs) monitoring.

— Bit 10 - Set to the same value as in the MTP_LINK command.

— Bit 11 - Set to the same value as in the MTP_LINK command.

— Bit 12 - Set to the same value as in the MTP_LINK command.

— All other bits should be set to 0.

<data_rate>
An optional parameter used for SS7HD and SS7MD boards as follows:
For SS7HD boards used to specify the HSL format as follows:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1_HSL</td>
<td>unstructured E1 HSL operation</td>
</tr>
<tr>
<td>T1_HSL</td>
<td>unstructured T1 HSL operation</td>
</tr>
<tr>
<td>E1_FRAMED</td>
<td>structured 31 slot E1 operation</td>
</tr>
<tr>
<td>T1_FRAMED</td>
<td>structured 24 slot T1 operations</td>
</tr>
<tr>
<td>E1_PCM</td>
<td>structured 30 slot E1 operation (where timeslots 0 and 16 are not used for signaling)</td>
</tr>
</tbody>
</table>

For SS7MD boards used to differentiate between signaling formats as follows:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDM</td>
<td>single timeslot SS7 LSL (default)</td>
</tr>
<tr>
<td>E1_FRAMED</td>
<td>HSL structured 31 slot E1 operation</td>
</tr>
<tr>
<td>T1_FRAMED</td>
<td>HSL structured 24 slot T1/J1 operations</td>
</tr>
<tr>
<td>E1_PCM</td>
<td>HSL structured 30 slot E1 operation (where timeslots 0 and 16 are not used for signaling)</td>
</tr>
<tr>
<td>ATM</td>
<td>The command follows the syntax for ATM links</td>
</tr>
</tbody>
</table>

### 8.3.2 MONITOR LINK Command (for ATM Links)

**Synopsis**

This command is used to configure an ATM link to operate in receive only mode for monitoring purposes. This functionality is only supported on the SS7MD board. The command is differentiated based on the data rate parameter. Received signaling messages are passed directly to a user application without further processing. If an ATM link is specified, multiple MONITOR_LINK commands may reference the same ATM cell stream provided the cell stream VPI-VCI combination is unique.

**Syntax**

```
MONITOR_LINK <link_id> <board_id> <blink> <atm_stream> <vpi-vci> <user_module> <reserved1> <flags> <reserved2> [<data_rate>]
```

**Example**

```
MONITOR_LINK 0 0 0 8-100 0x0d 0x0000 0x06 ATM
```

**Parameters**

- `<reserved1>, reserved2>`
  These parameters are reserved for future use and should be set to zero.

- `<board_id>`
  The logical identity of the board in the range from 0 to one less than the number of boards supported. This must be the same value as used in the ATM_STREAM command.
<blink>
The index of the signaling link. It must be in the range 0 to one less than the number of signaling links licensed on the board.

<atm_stream>
This defines the logical id of the cell stream over which the link runs.

<vpi-vci>
This is a compound parameter that identifies the vpi and vci of the ATM link to be monitored. It is represented in the form vpi-vci where:

— vpi is the Virtual Path Indicator of the signaling link within the ATM cell stream.
— vci is the Virtual Channel Indicator of the signaling link within the ATM cell stream.
8.4 MTP Configuration Commands

The MTP configuration commands are:
- MTP_CONFIG Command
- MTP_LINKSET Command
- MTP_LINK Command (for HSL/LSL Links)
- MTP_LINK Command (for ATM Links)
- MTPROUTE Command
- MTP_USER_PART Command
- MTP_TRACE Command

8.4.1 MTP_CONFIG Command

Synopsis
This command sets the global configuration parameters for the Message Transfer Part (MTP).

Syntax
MTP_CONFIG <reserved1> <reserved2> <options>

Example
MTP_CONFIG 0 0 0x00040f00

Parameters
<reserved1>, <reserved2>
These parameters are reserved for backwards compatibility and should be set to zero.

<options>
A 32 bit value containing run-time options for the operation of the MTP as follows:

Bit 0 is set to 1 to disable the MTP3 message discrimination function (allowing the signaling point to receive all messages irrespective of the destination point code contained in the message) or zero to allow the discrimination function to function normally.

Bit 1 is set to 1 to disable sub-service field (SSF) discrimination. If this bit is set to zero, received MSUs whose ssf value does not match the configured ssf value for that link set are discarded.

Bit 3 is set to 1 to cause MTP3 to generate a UPU (User Part Unavailable) message to the network on receipt of a message containing a Service Indicator value that has not been configured. If set to zero the message is discarded without sending UPU.

Bit 8 is set to 1 to select ANSI operation; otherwise it must be set to zero.

Bits 9 and 20 are used to select the point codes used in the MTP routing label as defined below:
### Configuration Command Reference

<table>
<thead>
<tr>
<th>Bit 9</th>
<th>Bit 20</th>
<th>Point Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>14-bit</td>
<td>ITU</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>16-bit</td>
<td>Japan</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>24-bit</td>
<td>ANSI</td>
</tr>
</tbody>
</table>

**Bit 10** is set to 1 for ANSI operation; otherwise it is set to zero.

**Bit 11** is set to 1 for ANSI operation; otherwise it is set to zero.

**Bit 18** is used to control MTP functionality in the event of detection of RPO (Remote Processor Outage). If set to 1, RPO is handled in accordance with the ITU-T 1992 (and later) recommendations. If set to zero, on detection of RPO the signaling link is taken out of service and restoration commenced. This bit is usually set to 1.

**Bit 20** used in conjunction with bit 9 to select point codes (see above).

**Bit 21** is set to 1 for use in Japanese networks; otherwise it must be set to zero.

All other bits are reserved for future use and must be set to zero.

**Note:** For correct ANSI operation bits 8, 9, 10, 11, and 18 must all be set to 1. This gives a typical options field value of 0x00040f00.

---

### 8.4.2 MTP_LINKSET Command

**Synopsis**

This command configures a link set to an adjacent signaling point.

**Syntax**

```
MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
```

**Example**

```
MTP_LINKSET 0 321 2 0x0000 456 0x8
```

**Parameters**

* <linkset_id>*
  The logical identity of the link set, in the range 0 to one less than the number of link sets supported. The linkset_id is used in other commands for reference.

* <adjacent_spc>*
  The signaling point code of the adjacent signaling point.

* <num_links>*
  The number of links to be allocated to the link set.

* <flags>*
  A 16 bit value containing run-time options for the link set as follows:
### Table: Bit Meanings

<table>
<thead>
<tr>
<th>Bit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>This bit is used to determine whether or not the user has supplied a per-link set local point code for this link set. If not, the point_code parameter from the global configuration message is used instead.</td>
</tr>
<tr>
<td></td>
<td>• 0 - Use the per module (default) point_code as the local point code</td>
</tr>
<tr>
<td></td>
<td>• 1 - Use the local_pc parameter as the local point code for this link set</td>
</tr>
<tr>
<td>1</td>
<td>This bit is used to determine whether or not the user has supplied a per-link set subservice-field (SSF) for this link set. If not, the ssf parameter from the global configuration message is used instead.</td>
</tr>
<tr>
<td></td>
<td>• 0 - Use the per-module (default) SSF for this link set</td>
</tr>
<tr>
<td></td>
<td>• 1 - Use the per-link set ssf parameter for this link set</td>
</tr>
<tr>
<td>2</td>
<td>This bit must be set to 1 when the message is being used to modify the existing link set configuration.</td>
</tr>
<tr>
<td></td>
<td>• 0 – Normal setting; used when link set is first configured</td>
</tr>
<tr>
<td></td>
<td>• 1 – Reconfiguration; used when the link set is being modified</td>
</tr>
<tr>
<td>3</td>
<td>This bit is used to enable restart procedures on a link set.</td>
</tr>
<tr>
<td></td>
<td>• 0 - Normal setting</td>
</tr>
<tr>
<td></td>
<td>• 1 - Restart procedures enabled</td>
</tr>
<tr>
<td></td>
<td>Note: Use of MTP Restart is recommended for all link sets including the inter-chassis link set on a dual system.</td>
</tr>
<tr>
<td>4</td>
<td>This bit is used to enable SNMP indications for this link set</td>
</tr>
<tr>
<td></td>
<td>• 0 - SNMP disabled</td>
</tr>
<tr>
<td></td>
<td>• 1 - SNMP enabled</td>
</tr>
<tr>
<td>11</td>
<td>This bit is used to automatically activate the links in this linkset</td>
</tr>
<tr>
<td></td>
<td>• 0 – Auto-activate disabled</td>
</tr>
<tr>
<td></td>
<td>• 1 – Auto-activate enabled</td>
</tr>
<tr>
<td>15</td>
<td>This bit is used to indicate that the link set is the inter-MTP3 link set connecting together the two halves when operating in a dual MTP3 configuration.</td>
</tr>
<tr>
<td></td>
<td>• 0 – Normal setting</td>
</tr>
<tr>
<td></td>
<td>• 1 – This link set is the inter-MTP3 link set in a dual configuration</td>
</tr>
<tr>
<td></td>
<td>Note: Use of MTP Restart is recommended for all link sets including the inter-chassis link set on a dual system.</td>
</tr>
<tr>
<td>Other bits</td>
<td>All other bits are reserved for future use and must be set to zero.</td>
</tr>
</tbody>
</table>

**<local_spc>**

The signaling point code of the signaling point itself.

**<ssf>**

The value to be used in the sub-service field of all level 3 messages and checked for by the discrimination function in all received messages. This is a 4 bit value.

Note: For ANSI operation both of the two least significant bits must be set to 1.

Note: For correct operation the adjacent point code must also have its own MTP_ROUTE declaration.
8.4.3 MTP_LINK Command (for HSL/LSL Links)

Synopsis
This section describes the MTP_LINK command format used to configure an MTP signaling link for Low Speed Link (LSL) or High Speed Link (HSL) operation. All boards support LSL operation but HSL operation is only supported on SS7HD and SS7MD boards.

Syntax
MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <board_id> <blink> <stream> <timeslot> <flags> [data rate]

Examples
For SPCI, SS7MD and SS7LD: MTP_LINK 0 0 2 2 0 1 0 16 0x0006 TDM
For SS7HD: MTP_LINK 0 0 2 2 0 1-4 0 16 0x0006 TDM

Parameters
<link_id>
The link's unique logical link identity. It must be in the range 0 to one less than the total number of signaling links supported.

<linkset_id>
The logical identity of the link set to which the link belongs. The linkset must already have been configured using the MTP_LINKSET command.

<link_ref>
The logical identity within the link set of the signaling link. It must be in the range 0 to one less than the number of links in the link set.

<slc>
The signaling link code for the signaling link. This must be unique within the link set and is usually the same as the <link_ref>. The valid range is 0 to 15.

<board_id>
The board id of the signaling processor allocated for this signaling link.

<blink>
For SPCI, SS7MD and SS7LD Boards
This is the index of the signaling link. It must be in the range 0 to one less than the number of signaling links licensed on the board.

For SS7HD boards
This is a compound parameter that indicates the signaling processor and the channel on the signaling processor that will be monitored. It is represented in the form sp_id - sp_channel where:
— sp_id is the identifier of the signaling processor with a value in the range 0 to one less than the number of processors on the board.
sp_channel is the identifier of the channel on the signaling processor with a value in the range 0 to one less than the number of links supported per signaling processor.

The MONITOR_LINK and MTP_LINK commands cannot be used on the same sp_id/sp_channel resource.

For HSL operation, only one link per signaling processor is supported. Therefore sp_channel must be 0.

<stream>
When the <timeslot> parameter is set to a non-zero value, the <stream> parameter is the logical identity of the T1/E1 line interface (liu_id) containing the signaling link. It must be in the range 0 to one less than the number of line interfaces.

Note: For SPCI2S. Stream identifiers for the PCM interfaces are implemented on streams 2 and 3.

Note: For SS7HD. If set to 0x90, 0x91, 0x92, or 0x93, depending on the number of signaling processors, specifies the use of a specific signaling processor. In these cases, the timeslot should be the signaling processor's signaling link in the range 0 to 31.

<timeslot>
The timeslot used for signaling in the range 1 ... 31. For an E1 interface the valid range is 1 ... 31. For a T1 interface the valid range is 1 ... 24. When set to zero the signaling path through the board must be set up manually using the switch control messages.

For HSL operation <timeslot> should be set to 0xff and the Data rate is set using the optional data rate parameter, if not present data rate defaults based on LIU type (T1/E1).

<flags>
A 32 bit value containing additional run-time options.

Bit 0 is set to 1 to force the use of the emergency proving period during link alignment or zero to use the appropriate proving period according to the MTP3 recommendations.

Bit 1 is set to 1 to cause a signaling link test (in accordance with ITU-T Q.707 / ANSI T1.111.7) to be carried out before a link is put into service, or zero if a test is not required.

Bit 2 is set to 1 to cause a signaling link test (in accordance with ITU-T Q.707 / ANSI T1.111.7) to be carried out every 30 seconds. This bit is ignored unless bit 1 is also set to 1.

Bit 8 is used to select the MTP2 error correction mode. It is set to 1 to select PCR (Preventive Cyclic Retransmission) operation or zero for the Basic Method of Error Correction.

Bits 10 and 11 together select the appropriate operating bit rate for the link. The table below specifies the appropriate values for 48, 56 or 64 kb/s.
<table>
<thead>
<tr>
<th>Bit 11</th>
<th>Bit 10</th>
<th>Data Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>64 kb/s</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>48 kb/s¹</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>56 kb/s¹</td>
</tr>
</tbody>
</table>

Notes:
1. When using a serial port (SPCI2S only), 48kbit/s or 56kbit/s operation is only supported when the clock is applied externally.
2. For unstructured HSL operation (SS7HD only), these bits should be set to 0.
3. For framed HSL operation (SS7HD and SS7MD), these bits select the bit rate for each slot of the HSL link.

**Bit 12** is used to select 12- or 7-bit sequence numbers for HSL only. This bit should be set for 12-bit sequence numbers, clear otherwise.

**Bit 13** is only used when the link has been configured to run over a serial port. If set to 1 an external clock is used (Receive clock). If set to zero an internal clock (Transmit clock) is used. If the link has not been configured to run over a serial port, this bit must be set to zero. This bit is only applicable for SPCI2S boards and should otherwise be set to zero.

**Bit 14** is set to 1 to use a serial port rather than a PCM timeslot for this link. In this mode the stream and timeslot parameters for this link are ignored (and must be set to zero). If this bit is set to zero, the link uses the specified stream and timeslot. This bit is only applicable for SPCI2S boards and should otherwise be set to zero. The serial port used by the signaling processors for each link is fixed, according to the following table:

<table>
<thead>
<tr>
<th>Blink</th>
<th>Serial Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>B</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>Cannot be used for a serial port.</td>
</tr>
<tr>
<td>3</td>
<td>Cannot be used for a serial port.</td>
</tr>
</tbody>
</table>

**Bit 15** is set to 1 to disable the link or zero to enable the link.

**Bit 30** is set to 1 to enable SNMP indications for individual MTP links.

**Bit 31** is set to 1 to denote the link as using the M2PA protocol. If selected, then blink identifies the Snlink to be used. Board_id, timeslot and stream should be set to 0.

All other bits are reserved for future use and must be set to zero.

**<data_rate>**
An optional parameter to specify link parameters, required for HSL or ATM operation. The valid values are:
8.4.4 MTP_LINK Command (for ATM Links)

Synopsis

This command configures an ATM signaling link. ATM operation is only supported on the SS7MD board.

Syntax

MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <board_id> <blink> <atm_stream> <vpi-vci> <flags> ATM

Example

MTP_LINK 0 0 0 0 3 0 0 8-100 0x0006 ATM

Parameters

The parameters <link_id>, <linkset_id>, <link_ref> and <slc> are common to the MTP_LINK command for HSL/LSL links (refer to section 8.4.3).

<board_id>

The logical identity of the board in the range from 0 to one less than the number of boards supported. This should be the same value as used in the ATM_STREAM command. If the value selected is different, then the configuration will be rejected.

<blink>

The index of the signaling link. It must be in the range 0 to one less than the number of signaling links licensed on the board.

<atm_stream>

This defines the logical id of the cell stream over which the link runs. It must be in the range 0 to one less than the combined number of ATM Cell Streams supported by all the SS7MD boards in the system.
This is a compound parameter that identifies the vpi and vci of the ATM link. It is represented in the form vpi-vci where:
— vpi is the Virtual Path Indicator of the signaling link within the ATM cell stream.
— vci is the Virtual Channel Indicator of the signaling link within the ATM cell stream.

Note: Users should normally select a vpi/vci combination, with vpi in the range 0 to 15 and a vci in the range 0-511 (0, 3 and 4 are reserved). The vpi/vci combination associated with the link must not be the same as the default vpi/vci combination on the underlying cell stream and must be unique within the cell stream.

<flags>

A 32 bit value reserved for future use and must be set to zero.

8.4.5 MTP_ROUTE Command

Synopsis
This command configures the route to a remote point code.

Syntax
MTP_ROUTE <dpc> <norm_ls> <user_part_mask> <flags> <second_ls>

Example
MTP_ROUTE 567 0 0x0020 0x0000 0

Parameters
<dpc>
The point code of the remote signaling point for which this command is configuring routing data. It may be either an adjacent point code or a point code accessible via an adjacent Signaling Transfer Point (STP).

<norm_ls>
The linkset_id of the normal link set used to reach the specified destination. The norm_ls must be a linkset_id that has already been configured using the MTP_LINKSET command. The normal link set may be any of the following:
- The only link set used to reach the destination.
- The preferred link set used to reach the destination.
- One of a pair of links sets forming a combined link set.
In the latter two cases a second link set (second_ls) must also be specified.
Within a link set messages are automatically load-shared across links using the Signaling Link Selection (SLS) field in the message.

<second_ls>
The linkset_id of an optional second link set used to reach the specified destination. This may be either of the following options:
• The secondary link set used to reach the destination only on failure of the preferred link set.
• One of a pair of links sets forming a combined link set over which load-sharing takes place. (in this case bit 1 must also be set in the <flags> parameter of the command).

When a second link set is specified the user must also set bit 0 in the <flags> field of this command.

$user_part_mask$
This is a 16 bit field used to identify the user parts that are supported over this route. The bits are labelled 0 to 15 and for each user part supported the bit corresponding to the Service Indicator for that user part must be set. (e.g., To support just ISUP messages, the ISUP Service Indicator is 5 so bit 5 should be set. Therefore a value of 0x0020 would be appropriate).

<flags>
A 16 bit field containing run-time configuration options for the route as follows:

Bit 0 is set to 1 to indicate that a second link set is specified within the command. If zero the second_ls parameter is ignored.

Bit 1 is used to determine whether or not to load-share messages across the two link sets. It is only used when two link sets are specified for the route. When set the MTP3 module load-shares messages for the destination equally across each of the two specified link sets. Otherwise the MTP3 module considers the normal link set to be the preferred link set and only uses the second link set in the event of failure of the normal link set. The bit may be set to 1 to enable load-sharing across the two link sets, or zero to disable load-sharing and use preferred and secondary link sets.

Bit 2 is used to indicate this is a default route permitted to carry traffic for any unknown DPC

Bit 3 is used to enable Pseudo DPC operation - used in conjunction with bit 2 to control the behavior of default routes. When set the route is considered available to carry traffic as soon as either link set is accessible. MTP3 does not generate Route Set Test messages or expect Transfer Allowed messages for this “default” route

Bit 4 is used to enable timer T103 – buffering of messages for up to 10 seconds in the event that the destination becomes inaccessible, allowing for recovery of the route.

Bit 5 is used to disable route-set-test for this route

Bit 6 is used to activate SNMP indications for the route

All other bits are reserved for future use and must be set to zero.

8.4.6 MTP_USER_PART Command

Synopsis
This command is used to configure a local user part module in situations when the user part does not already have its own configuration in the config.txt protocol configuration file.

Syntax
MTP_USER_PART [NC] <si> <module_id>
Example

MTP_USER_PART 0x03 0x2d
MTP_USER_PART NC1 0x05 0x3d

Parameters

[NC]
Optional Network Context parameter (if not present defaults to NC0).
The use of the NC parameter is only required for M3UA Multiple LAS configurations,
where NC0 corresponds to LAS1, NC1 corresponds to LAS2 and so on.

<si>
The service indicator.

<module_id>
The module id of the user process.

Note: This command must not be used when the corresponding configuration commands are used
(ISUP_CONFIG, TUP_CONFIG, SCCP_CONFIG, etc) as these commands automatically
perform the function of the MTP_USER_PART command for the default NC (NC0).

8.4.7 MTP_TRACE Command

Synopsis
This command sets the MTP3 trace masks.

Syntax
MTP_TRACE <op_evt_mask> <ip_evt_mask>

Example
MTP_TRACE 0x0001 0x0001

Parameters

<op_evt_mask>
Output event trace mask. For full description of use refer to the MTP3 Programmer’s Manual.

<ip_evt_mask>
Input event trace mask. For full description of use refer to the MTP3 Programmer’s Manual.
8.5 ATM Configuration Commands

ATM configuration is only supported on the SS7MD board. The ATM configuration commands are:

- ATM_CONFIG Command
- ATM_STREAM Command (Configure ATM Cell Stream)
- ATM_TIMER Command (Configure Timers for Q.SAAL Links)

8.5.1 ATM_CONFIG Command

Synopsis
Global configuration of the ATM Module.

Syntax
ATM_CONFIG <options> <num_streams>

Example
ATM_CONFIG 0x0000 4

Parameters
<option>
A 16-bit value containing additional run-time options. The bit significance is as follows:
— Bit 0 - Use ATM Forum Idle cell format rather than ITU.

<num_streams>
The maximum number of cell streams per board this module will be asked to simultaneously support. For an IMA bundle, each TDM stream within the bundle is counted separately.

8.5.2 ATM_STREAM Command (Configure ATM Cell Stream)

Synopsis
Configures an ATM Cell Stream.

Syntax
ATM_STREAM <id> <board_id> <cellstream_id> <liu_id> <options> <ima_frame_len> <max_frame_len> <def_vpi> <def_vci> <timeslot>

Example
ATM_STREAM 3 0 3 3 0x06 0 280 12 10 0xfffefff
Parameters

<id>
The logical Cell Stream ID from the user’s perspective.

<board_id>
The board ID of the signaling processor allocated for this ATM link.

<cellstream_id>
The Layer 2 ID of the cell stream within the board. In the range of 0 to one less than the number of cell streams supported per board.

<liu_id>
Line Interface Units (LIUs) to be used by the cell stream. If IMA is active (Bit 3 of the <options> parameter), the parameter is a bitmap of the LIUs to be used by the bundle (bit 0 = LIU 0, etc.). If IMA is not active, the parameter identifies the LIU to be used.

/options>
A 16-bit value containing additional options for the ATM link. The bit significance is as follows:
— Bit 0 - Enable payload scrambling
— Bit 1 - Use ATM coset in HEC calculation. When terminating Q.SAAL links on the cell stream this bit must be set. When monitoring links values of 0 or 1 are permitted.
— Bit 2 - Autocorrect invalid cells if possible
— Bit 3 - Configuration describes an IMA bundle

Note: Either Payload Scrambling or ATM Coset mode, or both, must be enabled for correct operation.

<ima_frame_len>
The length of the IMA frame (for IMA use only).

<table>
<thead>
<tr>
<th>Value</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32 cells per IMA frame</td>
</tr>
<tr>
<td>2</td>
<td>64 cells per IMA frame</td>
</tr>
<tr>
<td>3</td>
<td>128 cells per IMA frame</td>
</tr>
<tr>
<td>4</td>
<td>256 cells per IMA frame</td>
</tr>
</tbody>
</table>

Note: For non IMA streams this field is reserved and should be set to zero.

<max_frame_len>
The maximum length of a reassembled (AAL) frame. Frames longer than this will be discarded by the ATM layer. Recommended value is 280.

<def_vpi>
A default AAL5 link will be configured for the cell stream to signal incoming active connections. This is the VPI that will be used for this connection.
<def_vci>
A default AAL5 link will be configured for the cell stream to signal incoming active connections. This is the VCI that will be used for this connection. Values 0, 3, and 4 are reserved and should not be used.

Note: The default VPI/VCI combination configured here must not be specified for any AAL5 link on this cell stream.

<timeslot>
Bitmap of active timeslots within the above TDM streams. Typically the timeslot bitmap for E1 will be 0xfffeffe and for T1/J1 will be 0x01fffffe.

8.5.3 ATM_TIMER Command (Configure Timers for Q.SAAL Links)

Synopsis
This command allows specific timer values to be set for STM links. Otherwise default values are used.

Syntax
ATM_TIMER <reserved> <timer_id> <value>

Example
ATM_TIMER 0 T1 10

Parameters
<reserved>
This parameter is reserved for future use and should be set to zero.

<timer_id>
The identifier of the timer to be changed. It should be set to one of the following tokens: CC, KEEP_ALIVE, NO_RESP, POLL, IDLE, T1, T2, T3.

<value>
The timer value in milliseconds. Any timers not explicitly configured use the default values shown.

<table>
<thead>
<tr>
<th>Timer ID</th>
<th>Default Value (ms)</th>
<th>Range (min - max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC</td>
<td>1,500</td>
<td>15 - 2,500</td>
</tr>
<tr>
<td>KEEP_ALIVE</td>
<td>300</td>
<td>15 - 2,500</td>
</tr>
<tr>
<td>NO_RESP</td>
<td>1,500</td>
<td>100 - 10,000</td>
</tr>
<tr>
<td>POLL</td>
<td>100</td>
<td>20 - 600</td>
</tr>
<tr>
<td>IDLE</td>
<td>100</td>
<td>20 - 600</td>
</tr>
<tr>
<td>T1</td>
<td>5,000</td>
<td>1,000 - 20,000</td>
</tr>
<tr>
<td>T2</td>
<td>120,000</td>
<td>10,000 - 300,000</td>
</tr>
<tr>
<td>T3</td>
<td>10</td>
<td>1 - 30</td>
</tr>
</tbody>
</table>
8.6 ISUP Configuration Commands

The ISUP configuration commands are:

- ISUP_CONFIG Command
- ISUP_CFG_CCTGRP Command (Circuit Group Configuration)
- ISUP_TIMER Command (ISUP Timer Configuration)

8.6.1 ISUP_CONFIG Command

Synopsis

This command sets the global configuration parameters for the ISUP module.

Syntax

ISUP_CONFIG <res1> <res2> <user_id> <options> <num_grps> <num_ccts> [<partner_id>]

Example

ISUP_CONFIG 0 0 0x2d 0x0435 4 128

Parameters

- <res1>, <res2>
  Reserved for backwards compatibility. These fields should be set to zero.

- <user_id>
  The module_id of the application running on the host that uses the ISUP module.

- <options>
  A 16 bit value containing global run-time options for the operation of the ISUP module. The meaning of each bit is as defined for the 'options' parameter in the ISUP Configure Request message as detailed in the ISUP Programmer's Manual.

- <num_grps>
  The maximum number of ISUP circuit groups that the user intends to use. This must not exceed the maximum number of circuit groups supported otherwise module configuration will fail. Typically <num_grps> would be set to the maximum number of circuit groups supported.

- <num_ccts>
  The maximum number of ISUP circuits that the user intends to use. This must not exceed the maximum number of circuits supported otherwise module configuration will fail. Typically <num_ccts> is set to 32 times the number of groups for E1 operation and 24 times the number of circuit groups for T1 operation.

Note: The valid range for the circuit identifier (cid) is from zero up to one less than the maximum number of circuits (<num_ccts>).
<partner_id>
Optional parameter for use when operating in dual resilient configuration. This parameter is the module_id of the ‘partner’ ISUP module (equivalent to the ‘module_id field in the ISUP Configure Request message as documented in the ISUP Programmer’s Manual).

### 8.6.2 ISUP_CFG_CCTGRP Command (Circuit Group Configuration)

**Synopsis**
This command sets the configuration parameters for a group of ISUP circuits. Usually a group is all the circuits on a single E1 or T1 interface.

**Syntax**
```
ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options> <user_inst> <user_id> <opc> <ssf> <variant> <options2>
```

**Example**
```
ISUP_CFG_CCTGRP 0 3 1 1 0xfffffff 0x00000003 0 0x2d 2 0x8 4 0x00000000
```

**Parameters**

- **<gid>**
The group id of the circuit group in the range 0 to one less than the number of groups supported.

- **<dpc>**
The destination point code for all circuits in the circuit group.

- **<base_cic>**
The Circuit Identification Code (CIC) that is allocated to the first circuit in the circuit group.

- **<base_cid>**
The logical id for the first circuit in the circuit group. It must lie in the range 0 to one less than the number of circuits supported.

- **<cic_mask>**
A 32 bit mask with bits set to indicate which circuits are to be allocated to the circuit group. Bit zero must always be set as it represents the base_cic/base_cid. Subsequent bits represent the subsequent circuits.

**Note:** ANSI circuit groups are not permitted to contain more than 24 circuits.

- **<options>**
A 32 bit value containing run-time options for the ISUP circuit group (see “Configure Circuit Group Request” section of the ISUP Programmer’s Manual). Bits 0 through 15 are equivalent to the “options” field and bits 16 through 31 represent the “ext_options” field as detailed in the ISUP Programmer’s Manual.
8.6.3 ISUP_TIMER Command (ISUP Timer Configuration)

**Synopsis**
This command provides the ability to configure the ISUP protocol timers from the config.txt file.

**Syntax**
```
ISUP_TIMER <reserved> <timer_id> <value>
```

**Example**
```
ISUP_TIMER 0 T4 550
```

**Parameters**
- `<reserved>`
  Must be set to 0. Reserved for future use.
- `<timer_id>`
  The text identifier for the timer to be configured as shown below in Table 9.
- `<value>`
  The timer value in seconds, except T29 and T30 which are in multiples of tenths of a second (100 ms). Any timers not explicitly set are set to their default values, as shown below in Table 9.
### Table 9. ISUP Default Timer Values

<table>
<thead>
<tr>
<th>Timer Mnemonic</th>
<th>Default Value (Seconds)</th>
<th>Timer Mnemonic</th>
<th>Default Value (Seconds)</th>
<th>Timer Mnemonic</th>
<th>Default Value (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>10</td>
<td>T15</td>
<td>60</td>
<td>T28</td>
<td>10</td>
</tr>
<tr>
<td>T2</td>
<td>180</td>
<td>T16</td>
<td>10</td>
<td>T29</td>
<td>0.5</td>
</tr>
<tr>
<td>T3</td>
<td>180</td>
<td>T17</td>
<td>60</td>
<td>T30</td>
<td>8</td>
</tr>
<tr>
<td>T4</td>
<td>300</td>
<td>T18</td>
<td>10</td>
<td>T33</td>
<td>14</td>
</tr>
<tr>
<td>T5</td>
<td>60</td>
<td>T19</td>
<td>60</td>
<td>T34</td>
<td>3</td>
</tr>
<tr>
<td>T6</td>
<td>180</td>
<td>T20</td>
<td>10</td>
<td>T35</td>
<td>20</td>
</tr>
<tr>
<td>T7</td>
<td>25</td>
<td>T21</td>
<td>60</td>
<td>T36</td>
<td>13</td>
</tr>
<tr>
<td>T8</td>
<td>13</td>
<td>T22</td>
<td>10</td>
<td>T38</td>
<td>150</td>
</tr>
<tr>
<td>T9</td>
<td>45</td>
<td>T23</td>
<td>60</td>
<td>T39</td>
<td>10</td>
</tr>
<tr>
<td>T10</td>
<td>5</td>
<td>T24</td>
<td>2</td>
<td>T103</td>
<td>20</td>
</tr>
<tr>
<td>T12</td>
<td>10</td>
<td>T25</td>
<td>5</td>
<td>T104</td>
<td>3</td>
</tr>
<tr>
<td>T13</td>
<td>60</td>
<td>T26</td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T14</td>
<td>10</td>
<td>T27</td>
<td>240</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.7 TUP Configuration Commands

The TUP configuration commands are:

- TUP_CONFIG Command (Global TUP Configuration)
- TUP_CFG_CCTGRP Command (Circuit Group Configuration)

8.7.1 TUP_CONFIG Command (Global TUP Configuration)

**Synopsis**
This command sets the global configuration parameters for the TUP module.

**Syntax**
```
TUP_CONFIG <res1> <res2> <user_id> <options> <num_grps> <num_ccts> <partner_id>
```

**Example**
```
TUP_CONFIG 0 0 0x2d 0x8541 4 128
```

**Parameters**

- `<res1>`, `<res2>`
  Reserved for backwards compatibility. These fields should be set to zero.

- `<user_id>`
  The module_id of the application running on the host that uses the TUP module.

- `<options>`
  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 Configure Request message as detailed in the TUP Programmer's Manual.

- `<num_grps>`
  The maximum number of TUP circuit groups that the user intends to use. This must not exceed the maximum number of circuit groups supported otherwise module configuration will fail. Typically `<num_grps>` would be set to the maximum number of circuit groups supported.

- `<num_ccts>`
  The maximum number of TUP circuits that the user intends to use. This must not exceed the maximum number of circuits supported otherwise module configuration will fail. Typically `<num_ccts>` is set to 32 times the number of groups for E1 operation and 24 times the number of circuit groups for T1 operation.

**Note:** The valid range for the circuit identifier (cid) is from zero up to one less than the maximum number of circuits (num_ccts).
Optional parameter for use when operating in dual resilient configuration. This parameter is the module_id of the "partner" TUP module (equivalent to the "ucic_id" field in the TUP Configure Request message as documented in the *TUP Programmer’s Manual*).

### 8.7.2 TUP_CFG_CCTGRP Command (Circuit Group Configuration)

**Synopsis**

This command sets the configuration parameters for a group of TUP circuits. Usually a group is all the circuits on a single E1 or T1 interface.

**Syntax**

```
TUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options> <user_inst> <user_id> <opc> <ssf> <variant> <options2>
```

**Example**

```
TUP_CFG_CCTGRP 0 3 1 1 0x7fff7fff 0x00000003 0 0x2d 123 0x8 0 0x0
```

**Parameters**

- `<gid>`
  The group id of the circuit group in the range 0 to one less than the number of groups supported.

- `<dpc>`
  The destination point code for the circuits in the circuit group.

- `<base_cic>`
  The Circuit Identification Code (CIC) that is allocated to the first circuit in the circuit group.

- `<base_cid>`
  The logical id for the first circuit in the circuit group. It must lie in the range 0 to one less than the number of circuits supported.

- `<cic_mask>`
  A 32 bit mask with bits set to indicate which circuits are to be allocated to the circuit group. Bit zero must always be set as it represents the base_cic/base_cid. Subsequent bits represent the subsequent circuits.

- `<options>`
  A 32 bit value containing run-time options for the TUP circuit group (see "Configure Circuit Group Request" section of the TUP Programmers Manual).

- `<user_inst>`
  The instance number of the user application. Typically only a single user application exists so this field would be set to zero.
<user_id>
The module_id of the user application.

<opc>
Originating Point Code. The local point code for all circuits in the group.

<ssf>
The value to be used in the sub-service field of all TUP messages for this circuit group.

<variant>
This field is reserved for future use and must be set to zero.

<options2>
This field is reserved for future use and must be set to zero.
8.8 SCCP Configuration Commands

The SCCP configuration commands are:

- SCCP_CONFIG Command
- SCCP_SSR Command (Configure SCCP Sub-System Resource)
- SCCP_CONC_SSR Command (Configure Concerned SSR)
- SCCP_TRACE Command
- SCCP_GTT_PATTERN Command (Define Global Title Pattern)
- SCCP_GTT_ADDRESS Command (Define Global Title Address)
- SCCP_GTT Command (Add Entry in GTT Table)

8.8.1 SCCP_CONFIG Command

Synopsis

The SCCP_CONFIG command supplies the global configuration parameters for the SCCP protocol, activating the SCCP and TCAP protocols.

Syntax

```
SCCP_CONFIG <local_spc> <ssf> <options> [ <options2> [ <partner_id> <instance> <smb_flags> ] ]
```

Example

```
SCCP_CONFIG 123 8 0
```

Parameters

- `<local_spc>`
  The local point code.

- `<ssf>`
  The sub-service field value that SCCP uses when exchanging messages with the MTP. This value must always be set so that the Network Indicator bits (the two most significant bits of the 4-bit ssf value) match those set in the MTP_LINKSET command.

- `<options>`
  A 32-bit value containing run-time configuration options for the SCCP module. The 16 least significant bits provide the 'options' parameter and the 16 most significant bits provide the 'ext_options' parameter, as defined in the SCCP Programmer's Manual.

  **Bit 0** must always be set to zero.

- `<options2>`
  Additional 32 bit run time options for the configuration and operation of SCCP. Bits 0 and 31 are used by s7_mgt during configuration as detailed below. The remaining bits map directly to the 'ext2_options' parameter as documented in the Module Configuration Request section of the SCCP Programmer's Manual.
Bit 0 Send_User In Service (UIS). When set to 1 this bit causes s7_mgt to automatically generate and send UIS messages to SCCP for all configured local subsystems. By default the bit is 0 and the user application is responsible for generating UIS messages.

Bit 31 is used to activate SCCP Connection Oriented operation. When set to zero s7_mgt configures SCCP for Connectionless operation. When set to 1 s7_mgt configures SCCP for Connection Orientated operation using the fixed configuration parameter values shown below. Note that for SCCP operation two license types are available: SCCP-CL which only permits connectionless operation and SCCP-CO which supports both connectionless and connection oriented (Class 2 only) operation.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUM_UC</td>
<td>2048</td>
</tr>
<tr>
<td>UC_ONSET</td>
<td>1536</td>
</tr>
<tr>
<td>UC_ABTM</td>
<td>1024</td>
</tr>
<tr>
<td>BASE_ID</td>
<td>1024</td>
</tr>
<tr>
<td>TOP_ID</td>
<td>2047</td>
</tr>
<tr>
<td>MIN_ID</td>
<td>0</td>
</tr>
<tr>
<td>MAX_ID</td>
<td>2047</td>
</tr>
</tbody>
</table>

<partner_id>
Specifies the module_id of the partner SCCP module.

<instance>
Value in the range 0 - 15 which specifies the instance of SCCP running on this system.

The <partner_id> and <instance> parameters provide the capability to configure dual chassis fault tolerant systems that appear to the network as a single point code. For further details refer to the Application Note: Enabling Dual Chassis Fault Tolerance with Dialogic® Signaling Boards.

<smb_flags>
Flags relating to the SCCP management broadcast mechanism. For full details refer to the Module Configuration Request section of the SCCP Programmer’s Manual.

8.8.2 SCCP_SSR Command (Configure SCCP Sub-System Resource)

Synopsis
The SCCP_SSR command supplies the global configuration parameters for SCCP.

Syntax
SCCP_SSR <ssr_id> RSP <remote_spc> <flags> <pc_mask> [<ssf> [<mtp_module_id>]]
SCCP_SSR <ssr_id> LSS <local_ssn> <module_id> <flags> <protocol>
SCCP_SSR <ssr_id> RSS <remote_spc> <remote_ssn> <flags>
Examples
SCCP_SSR 1 RSP 1236 0
SCCP_SSR 2 LSS 0x07 0x0d 1 TCAP
SCCP_SSR 3 RSS 1236 0x67 0

Parameters
<ssr_id>
Unique ID for the SSR.

<remote_spc>
The point code of the remote signaling point, which may be either an STP or an SCP. For correct operation, <remote_spc> must always have its own RSP entry in addition to any RSS entries. There must also be an MTP_ROUTE defined for this signaling point.

<local_ssn>
The local sub-system number as defined by the SCCP protocol.

<flags>
A 16-bit value, where each bit enables or disables additional features of the RSP, RSS, or LSS. The meaning for each bit is as defined for the options parameter described in the Configure Sub-System Resource Request section of the SCCP Programmer’s Manual.

<module_id>
The module identifier of the user application that implements the local sub-system.

<remote_ssn>
The remote sub-system number as defined by the SCCP protocol.

<pc_mask>
A 32-bit value specifying the part of a destination point code that must match the <remote_spc> value for a SCCP transmit message to be sent down to this destination sub-system. Bits set to 0 indicate that the corresponding bit position in the transmit message destination point code must match the bit position of the <remote_spc>, bits set to 1 indicate bit positions in the message destination point code that do not need to match the <remote_spc> set for this RSP. This allows configuration of default destination sub-systems (for example, to a gateway SCP).

<protocol>
Should be set to SCCP, TCAP, MAP, INAP or IS41 according to the layer of the protocol stack to which the user application interfaces. Note there can be at most one LSS for each of the MAP, INAP and IS41 protocols.

<ssf>
The SSF (Sub-Service Field) for use in messages sent to this RSP. If <ssf> is not present or is set to 0xff, then the default SSF value configured in the SCCP_CONFIG command will be used. The SSF value should always be configured to match the value used within MTP3 for the corresponding link set(s).
The mtp_module_id field allows SCCP to optionally send messages to a different MTP3 module on a per-RSP basis. If omitted or set to zero the MTP3 module_id will be used.

**8.8.3 SCCP_CONC_SSR Command (Configure Concerned SSR)**

**Synopsis**

This command marks the specified sub-system (which was declared by SCCP_SSR) as requiring notification of changes in the accessibility of another sub-system. Notification is given in the form of an SCCP management indication.

**Syntax**

```
SCCP_CONC_SSR <id> <cssr_id> <ssr_id>
```

**Example**

```
SCCP_CONC_SSR 1 2 3
```

**Parameters**

- `<id>`
  A unique value of local significance in the range 0 to 8191 used to identify the concerned sub-system resource.

- `<cssr_id>`
  The ID of the subsystem that will receive the notifications.

- `<ssr_id>`
  The ID of the sub-system for which state changes will be issued.

**8.8.4 SCCP_TRACE Command**

**Synopsis**

This command sets the SCCP trace masks. Refer to SCCP Programmer’s Manual for full details.

**Syntax**

```
SCCP_TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>
```

**Example**

```
SCCP_TRACE 0x1 0x1 0x1
```

**Parameters**

- `<op_evt_mask>`
  Output event trace mask.

- `<ip_evt_mask>`
  Input event trace mask.
8.8.5 SCCP_GTT_PATTERN Command (Define Global Title Pattern)

Synopsis
The SCCP_GTT_PATTERN command defines a global title pattern to be matched for a global title translation.

Syntax
SCCP_GTT_PATTERN <pattern_id> <addr_indicator> <pc> <ssn> <global_title> [<gtai_pattern>]

Example
SCCP_GTT_PATTERN 5 0x10 0x0000 0x001104 44/+  

Parameters
<pattern_id>
A unique ID identifying the pattern.

<addr_indicator>
The address indicator octets, formatted according to the point-code format specified in the SCCP_CONFIG <options> parameter (see "Called Party Address", Q.713 or ANSI T1.112).

<pc>
The point code. This is ignored if bit 0 of <addr_indicator> is not set.

<ssn>
The subsystem number. This is ignored if bit 1 of <addr_indicator> is not set.

<global_title>
The global title, excluding the global title address information, specified as a string of hexadecimal octets starting with 0x.

<gtai_pattern>
The pattern of global title address information to match, specified as a string of hexadecimal digits in left-to-right order (that is, the pairs of digits are not swapped as is the case for a BCD string). In addition to hexadecimal digits, this string can contain the following characters:

<table>
<thead>
<tr>
<th>Character</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Padding (ignored).</td>
</tr>
<tr>
<td>+</td>
<td>Wildcard - matches any number of digits. The “+” wildcard matches the shortest possible string of digits for example a pattern such as “12+57” matches “1234567”, but does not match “1236757”.</td>
</tr>
<tr>
<td>?</td>
<td>Wildcard - matches exactly one digit.</td>
</tr>
<tr>
<td>/</td>
<td>Separator used to split the pattern into sections. Each section can be processed differently, as specified by the &lt;mask&gt; parameter in the SCCP_GTT command.</td>
</tr>
</tbody>
</table>
8.8.6 SCCP_GTT_ADDRESS Command (Define Global Title Address)

Synopsis
This command defines a global title to be used as the primary or backup destination of a translation. The global title address information of this command is combined with the global title being translated by examining the mask provided in the SCCP_GTT command.

Syntax
SCCP_GTT_ADDRESS <address_id> <addr_indicator> <pc> <ssn> <global_title> [ <gtai_replacement> ]

Example
SCCP_GTT_ADDRESS 9 0x11 0x1234 0 0x001104 0-

Parameters
<address_id>
A unique ID identifying the address.

<addr_indicator>
The address indicator octet, formatted according to the point-code format specified in the SCCP_CONFIG <options> parameter (see "Called Party Address", Q.713 or ANSI T1.112).

<pc>
The point code. This is ignored if bit 0 of <addr_indicator> is not set.

<ssn>
The subsystem number. This is ignored if bit 1 of <addr_indicator> is not set.

<global_title>
The global title, excluding the global title address information, specified as a string of hexadecimal octets starting with 0x.

<gtai_replacement>
The global title address information to translate to, specified as a string of hexadecimal digits in left-to-right order (that is, the pairs of digits are not swapped as is the case for a BCD string). In addition to hexadecimal digits, this string can contain the following characters:

<table>
<thead>
<tr>
<th>Character</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Padding (ignored).</td>
</tr>
<tr>
<td>/</td>
<td>Separator used to split the address into sections. Each section can be processed differently, as specified by the &lt;mask&gt; parameter in the SCCP_GTT command.</td>
</tr>
</tbody>
</table>
8.8.7  SCCP_GTT Command (Add Entry in GTT Table)

Synopsis
The SCCP_GTT command adds a translation to the SCCP global title translation table. This command must be specified after the SCCP_GTT_PATTERN and SCCP_GTT_ADDRESS commands. The pattern, mask, primary and backup addresses referenced by this command must all have an identical number of sections.

Syntax
SCCP_GTT <pattern_id> <mask> <primary_address_id> [ <backup_address_id> ]

Example
SCCP_GTT 5 R-/K 9

Parameters
<pattern_id>
Identifies the pattern specified by the SCCP_GTT_PATTERN command. This value is also used to index the translation within the SCCP/SUA module.

<mask>
An expression detailing the operation to be applied to each section of the global title pattern. The format is exactly one operation per section and must contain exactly the same number of sections as the <gtai_pattern> parameter of the associated SCCP_GTT_PATTERN command and the <gtai_replacement> parameter of the associated SCCP_GTT_ADDRESS command. The mask can contain the following:

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Padding (ignored).</td>
</tr>
<tr>
<td>/</td>
<td>Separator used to split the mask into sections.</td>
</tr>
<tr>
<td>K or KEEP</td>
<td>The digits in the corresponding section of the global title address information undergoing translation will be preserved.</td>
</tr>
<tr>
<td>R or REPLACE</td>
<td>The digits in the corresponding section of the global title address information undergoing translation will be replaced with digits in the corresponding section of the primary (or backup) address.</td>
</tr>
</tbody>
</table>

<primary_address_id>
Identifies the SCCP_GTT_ADDRESS command to use as the primary translation.

<backup_address_id>
Identifies the SCCP_GTT_ADDRESS command to use as the backup translation.
8.9 DTC Configuration Commands

The DTC configuration commands are:
- DTC_CONFIG Command
- DTC_SSR Command (Configure DTC Sub System Resource)

8.9.1 DTC_CONFIG Command

Synopsis
The DTC_CONFIG command supplies the global configuration parameters for the DTC protocol, activating DTC and higher protocols.

Syntax
DTC_CONFIG <num_servers> <server_selection> <host_number> <rsi_status_user_id>

Example
DTC_CONFIG 2 0 0 0xef

Parameters

<num_servers>
Number of servers in the system.

<server_selection>
The selection mechanism used by DTC to determine which server to be used taken from the following values:

<table>
<thead>
<tr>
<th>Value</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>DTC_SELECT_SEQ</td>
<td>Selects available servers in a sequential order</td>
</tr>
<tr>
<td>1</td>
<td>DTC_SELECT_REV_SEQ</td>
<td>Selects available servers in a reverse sequential order</td>
</tr>
<tr>
<td>2 - 255</td>
<td>Reserved for future use.</td>
<td></td>
</tr>
</tbody>
</table>

<host_number>
The host number, which should be unique across hosts.

<rsi_status_user_id>
Module ID to forward RSI link status messages to.

8.9.2 DTC_SSR Command (Configure DTC Sub System Resource)

Synopsis
The DTC_SSR command configures a local subsystem using DTC. The command works in a similar way to the SCCP_SSR LSS command but configures the subsystem to run on top of DTC instead of SCCP. DTC and SCCP cannot be used at the same time, so the SCCP_SSR and DTC_SSR commands are incompatible with each other.
Syntax
DTC_SSR <ssr_id> LSS <local_ssn> <module_id> <reserved> <protocol>

Example
DTC_SSR 1 LSS 0x07 0x0d 0 TCAP

Parameters

<ssr_id>
A unique ID for the SSR.

<local_ssn>
The local sub-system number as defined by the SCCP protocol.

<module_id>
The module identifier of the user application on the host computer that implements the local sub-system.

<reserved>
Must be set to 0.

<protocol>
Should be set to TCAP, MAP, INAP or IS41 according to the layer of the protocol stack to which the user application interfaces.

Note: There can be at most one LSS for each of MAP, INAP and IS41.
8.10 TCAP Configuration Commands

The TCAP configuration commands are:
- TCAP_CONFIG Command
- TCAP_CFG_DGRP Command (Dialog Group Configuration)
- TCAP_TRACE Command

8.10.1 TCAP_CONFIG Command

Synopsis
The TCAP_CONFIG command provides the TCAP operating parameters and, when used, must appear after the SCCP_SSR or DTC_SSR commands. This command should only be used when an SCCP_CONFIG or DTC_CONFIG command is present. The use of the TCAP_CONFIG command is not required and TCAP is configured with default values if the TCAP_CONFIG command is not present.

By default, TCAP is configured with 32k incoming and 32k outgoing dialogs. The TCAP_CONFIG command must be used to change these parameters for systems requiring a different number of dialogs.

Syntax
TCAP_CONFIG <base_ogdlg_id> <nog_dialogues> <base_icdlg_id> <nic_dialogues> <options> <dlg_hunt> [[<addr_format>] <partner_id> <tcap_inst>[[<max_instance>]]]

Example
TCAP_CONFIG 0x0000 8192 0x8000 8192 0x0000 0

Parameters

<base_ogdlg_id>
The dialogue_id for the first outgoing dialog.

<nog_dialogues>
The number of outgoing dialogs to support. The valid range is 0 to 65535.

<base_icdlg_id>
The dialogue_id for the first incoming dialog.

<nic_dialogues>
The number of incoming dialogs to support. The valid range is 0 to 65535.

Note: The total number of dialogs (<nog_dialogues> + <nic_dialogues>) must not exceed 65535.

<options>
Specifies TCAP protocol options as defined for the TCAP Configuration Request message in the TCAP Programmer’s Manual.
The hunt mode used in the case of multiple TCAP hosts to determine which TCAP group is selected whenever a new incoming dialog arrives. It should be set to 0, 1 or 2 for the following hunt modes:

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Cyclic Selection. Each new incoming dialog is allocated to the next TCAP group.</td>
</tr>
<tr>
<td>1</td>
<td>Load Balanced Selection. Each new incoming dialog is allocated to the group with the least number of active incoming dialogs.</td>
</tr>
<tr>
<td>2</td>
<td>Sequential Selection. Each new incoming dialog is allocated to the group containing the first inactive incoming dialogue_id.</td>
</tr>
</tbody>
</table>

Defines how TCAP should interpret address information from messages received from SCCP in order to direct received TCAP primitives to unique SCCP sub-systems (TCAP user applications). It should be set to 0, 1, 2, 3 or 4 for the following options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>If configured to use ITU-T PDU formats (options bit 1 not set), use the ITU-T Q.713 SCCP address format. If configured to use ANSI PDU formats (options bit 1 set), use the ANSI T1.112 SCCP address format.</td>
</tr>
<tr>
<td>1</td>
<td>Use the ITU-T Q.713 SCCP address format (14-bit point codes).</td>
</tr>
<tr>
<td>2</td>
<td>Use the ITU-T Q.713 SCCP address format modified for 24-bit point codes.</td>
</tr>
<tr>
<td>3</td>
<td>Use the ANSI T1.112 SCCP address format modified for 14-bit point codes.</td>
</tr>
<tr>
<td>4</td>
<td>Use the ANSI T1.112 SCCP address format (24-bit point codes).</td>
</tr>
</tbody>
</table>

Specifies the module_id of the partner TCAP module.

Value in the range 0 - 15 which specifies the instance of TCAP running on this system.
The <partner_id> and <tcap_inst> parameters provide the capability to configure dual chassis fault tolerant systems that appear to the network as a single point code. See the Application Note: Enabling Dual Chassis Fault Tolerance with Dialogic® Signaling Boards for a description of how such a configuration can be used.

Specifies the maximum number of hosts considered to make up the system, in the range 0-128. When used in conjunction with an SIU using DTS this value must also be present in the DTS_CONFIG command on the SIU(s).

### 8.10.2 TCAP_CFG_DGRP Command (Dialog Group Configuration)

#### Synopsis

This command allows the user to configure TCAP dialog groups, each group handling a subset of the total available dialogs. This allows each group to reside on a separate host computer that in turn allows the application using TCAP to be distributed over several machines. If the TCAP_CFG_DGRP command is omitted, the complete range of dialog identifiers defined by the TCAP_CONFIG command is assigned.
The TCAP_CONFIG command must exist before this command in the config.txt file.

Syntax

```
TCAP_CFG_DGRP <gid> <base_ogdlg_id> <nog_dialogues> <base_icdlg_id> <nic_dialogues> <options> <reserved>
```

Example

```
TCAP_CFG_DGRP 0 0x0000 1024 0x8000 1024 0 0
```

Parameters

- `<gid>`
  A logical identifier for this group. The valid range is 0 to 31.

- `<base_ogdlg_id>`
  The first outgoing dialog ID assigned to this dialog group.

- `<nog_dialogues>`
  The number of outgoing dialogs assigned to this group, hence outgoing dialog IDs base_ogdlg_id to base_ogdlg_id + nog_dialogues-1 are assigned to this group.

- `<base_icdlg_id>`
  The first incoming dialog ID assigned to this dialog identifier group.

- `<nic_dialogues>`
  The number of incoming dialogs assigned to this group, therefore, outgoing dialog IDs base_ogdlg_id to base_icdlg_id + nic_dialogues-1 are assigned to this group.

- `<options>`
  Reserved for future use, set to 0.

- `<reserved>`
  Must be set to 0.

### 8.10.3 TCAP_TRACE Command

**Synopsis**

This command sets the TCAP trace masks. Refer to *TCAP Programmer’s Manual* for full details.

**Syntax**

```
TCAP_TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>
```

**Example**

```
TCAP_TRACE 0x7 0xf 0x0
```
Parameters

<op_evt_mask>
Output event trace mask.

<ip_evt_mask>
Input event trace mask.

<non_prim_mask>
Non-primitive trace mask.
8.11 MAP Configuration Commands

The MAP configuration commands are:
- MAP_CONFIG Command
- MAP_TRACE Command

8.11.1 MAP_CONFIG Command

Synopsis
The MAP_CONFIG command provides the MAP operating parameters and, if used, must appear after the SCCP_SSR commands in the config.txt file. The use of this command is not required and MAP is configured with default values if the MAP_CONFIG command is not present.

Syntax
MAP_CONFIG <options>

Example
MAP_CONFIG 2

Parameters
<options>
Specifies MAP protocol options as defined for the MAP Configuration Request message in the MAP Programmer’s Manual.

8.11.2 MAP_TRACE Command

Synopsis
This command sets the MAP trace masks. Refer to MAP Programmer’s Manual for full details.

Syntax
MAP_TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>

Example
MAP_TRACE 0xf 0xf 0x4

Parameters
<op_evt_mask>
Output event trace mask.

<ip_evt_mask>
Input event trace mask.
<non_prim_mask>
Non-primitive trace mask.
8.12 INAP Configuration Commands

The INAP configuration commands are:
- INAP_CONFIG Command
- INAP_FE Command (Configure INAP Functional Entity)
- INAP_AC Command (Configure INAP Application Context)
- INAP_TRACE Command

8.12.1 INAP_CONFIG Command

Synopsis

The INAP_CONFIG command provides the INAP operating parameters and, if used, must appear after the SCCP_SSR commands in the config.txt file. The use of this command is not required and MAP is configured with default values if the INAP_CONFIG command is not present.

Syntax

INAP_CONFIG <options>

Example

INAP_CONFIG 2

Parameters

<options>

Specifies INAP protocol options as defined for the INAP Configuration Request message in the INAP Programmer’s Manual.

8.12.2 INAP_FE Command (Configure INAP Functional Entity)

Synopsis

This command is used to configure the INAP functional entity records for operation. These allow the user application to refer to Functional Entities (FEs) in the network via a local reference rather than providing the full SCCP address. The user may subsequently use this reference in the “Destination FE” or “Originating FE” parameters of the INAP_OPEN_DLG primitive or in the “IN_dialogue_open” API function. This reference is used instead of the destination or origination address parameter.

Syntax

INAP_FE <fe_ref> <options> <sccp_address>

Example

INAP_FE 0x00000007 0x00000001 0x00000000
Parameters

<fe_ref>
A logical identifier for this Functional Entity (FE).

'options>
A 16-bit options value. Bit 0, when set to 1 identifies a local FE. Other bits should be set to 0.

<sccp_address>
The SCCP address of the local FE, in Q.713 format commencing with the address indicator, as a string of hex characters, up to 18 characters in length. The SIU supports up to 32 functional entities.

8.12.3 INAP_AC Command (Configure INAP Application Context)

Synopsis
This command is used to configure the INAP Application Context (AC) records for use. These control the application context negotiation that the module conducts during dialog establishment. The supported application contexts must be individually configured using this message. The module only accepts incoming dialogs with configured Application Contexts. If a dialog request with an unconfigured context is received, a dialog abort message is returned to the requesting Functional Entity. If no supported Application Contexts are configured, the application context negotiation is disabled. The module accepts all incoming dialogs.

Syntax
INAP_AC <ac_ref> <ac>

Example
INAP_AC 0x00 0xa109060704000101010000

Parameters

<ac_ref>
A logical identifier for this Application Context (AC).

<ac>
Application context. Specified as hexadecimal characters, prefixed by "0x". An application context may be up to 32 octets (character pairs) in length. The SIU supports up to 32 application contexts.

8.12.4 INAP_TRACE Command

Synopsis
This command sets the INAP trace masks. Refer to INAP Programmer’s Manual for full details.

Syntax
INAP_TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>

Example
INAP_TRACE 0xf 0xf 0x7f

Parameters

<op_evt_mask>
Output event trace mask.

<ip_evt_mask>
Input event trace mask.

<non_prim_mask>
Non-primitive trace mask.
8.13 IS41 Configuration Commands

The IS41 configuration commands are:

- IS41_TRACE Command

8.13.1 IS41_TRACE Command

**Synopsis**

This command sets the IS41 trace masks. Refer to IS41 Programmer’s Manual for full details.

**Syntax**

`IS41_TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>`

**Example**

`IS41_TRACE 0xf 0xf 0xff`

**Parameters**

- `<op_evt_mask>`
  Output event trace mask.

- `<ip_evt_mask>`
  Input event trace mask.

- `<non_prim_mask>`
  Non-primitive trace mask.
8.14 SIGTRAN Protocol Configuration Overview

This section gives an overview of the SIGTRAN configuration model and defines the configuration parameters.

8.14.1 SIGTRAN M3UA ASP, Host to SGP Configuration Model

M3UA SIGTRAN hosts use the IETF SIGTRAN M3UA protocol to carry SS7 MTP3 traffic to and from M3UA Signaling Gateways (SG). The host connects to one or more Signaling Gateways using SIGTRAN SCTP Associations. The host can then send MTP3 messages generated by an MTP3 User Part to a remote SS7 point code via the SG. M3UA will select which SG to send these messages to depending on the Destination Point Code (DPC) of the message.

Each SG the host connects to will be configured using the SIGTRAN Link Initiate ‘SNSLI’ command. This identifies details of the IP link connecting the host and SG, with the host end always marked as ‘client’. This command also identifies the type of SS7 traffic (e.g. ITU14). There may be up to four SNLINKs to the same SG, allowing for loadsharing of traffic.

Each DPC to which the host sends traffic must be configured using a SIGTRAN Route Initiate ‘SNRTI’ command. This defines a route to the DPC which must then be added to the specific Signaling Gateways that provide that route using the SIGTRAN Route List Initiate ‘SNRLI’ command.

M3UA uses the term Application Server (AS) to identify a host application processing SS7 traffic. The SIGTRAN Application Server Initiate ‘SNAPI’ command is used to configure a Local AS. Up to four Local AS are supported per host, each may be individually managed and controlled. Each LAS can be active across one or more associations or multiple LAS may share the same association, in which case Routing Context parameters must be used.

The SG maintains a 1:1 mapping of Routing Key to LAS and optionally a 1:1 mapping of Routing Key to Routing Context (RC). The Routing Key may be predefined on the SG or may be configured by the host when the link is established using Routing Key Management procedures (RKM). The SIGTRAN Routing Key Initiate ‘SNRKI’ command is used to define the Routing Key and the SIGTRAN Local AS Bind Initiate ‘SNLBI’ command is used to bind the LAS to the SG, optionally with the Routing Key id, or RC.

When establishing communication with the SG, if RKM procedures are enabled the Routing Key will be registered with the SG which will return a RC to use in traffic for that LAS-SG relationship. When going active, the local ‘Traffic Mode’ is used to tell the SG how to distribute traffic across multiple hosts or multiple LAS.

The system can be made to automatically audit Signaling Gateways to ensure that route status is kept synchronized with the Signaling Gateways. Auditing happens on recovery of the Signaling Gateway connection, and every 30 seconds thereafter until all destinations are available and uncongested.
8.14.2 SIGTRAN M3UA IPSP, Peer to Peer Configuration Model

M3UA can be used to allow remote end points to exchange MTP3 messages directly using SCTP Associations without using a Signaling Gateway. One or more Remote Application Servers (RAS) can be configured, each of which will have a different Point Code. M3UA will select the RAS to send the MTP3 message to depending on the Destination Point Code (DPC) of the message.

One or more SIGTRAN Links can be created with the ‘SNSLI’ command identifying the IP details and SS7 traffic type (e.g. ITU14). One end of the association should be marked as 'client' and the other as 'server'.

Each Remote Application Server (RAS) is defined using the SIGTRAN Remote AS Initiate ‘SNRAI’ command and will have a DPC and an optional Routing Context (RC).

The SIGTRAN links are attached to the RAS with the SIGTRAN AS List initiate 'SNALI' command. Up to four SNLINKs may be attached to the same RAS allowing traffic to be load shared across the associations. Alternatively one SNLINK may be attached to multiple RAS allowing them to share the association.

The SIGTRAN Application Server Initiate ‘SNAPI’ command is used to configure a Local AS. Up to four Local AS are supported per host, each may be individually managed and controlled. Each LAS can be active across one or more associations or multiple LAS may share the same association.

SIGTRAN Local AS Bind Initiate 'SNLBI' command is used to bind the LAS to the RAS with an optional RC to use for that LAS-RAS relationship. Where multiple LAS or RAS use the same association, the RC parameter must be used to differentiate traffic.

8.14.3 SIGTRAN M3UA User Parts

The default LAS1 (NC0) is configured with user parts and service indicators according to the protocols configured in the config.txt file or explicitly by using the MTP_USER_PART NC0 command. For each additional LAS configured the MTP_USER_PART NCx command must be used to connect the LAS to its user part which may be configured in a separate config.txt or externally with DSI messages.

8.14.4 M2PA Configuration Model

M2PA SIGTRAN hosts use MTP3 as normal. Instead of using SS7 Signaling Boards they use IP and SIGTRAN SCTP to carry SS7 traffic. Each M2PA link is configured using a ‘SNSLI’ command and an MTP_LINK command.

A single M2PA link may carry the same load as a number of MTP2 links. This means a typical Link Set should only require a single M2PA link.

8.14.5 SIGTRAN SUA IPSP, Peer to Peer Configuration Model

SUA SIGTRAN hosts use the IETF SIGTRAN SUA protocol to carry SS7 SCTP traffic to a Remote Application Server. Signaling links to a RAS are instantiated using the SNSLI command. This gives details of the IP link connecting the host to the RAS. This command also identifies the type of SS7 traffic to be used (e.g. ITU14). This command is used once for each Signaling link that is to be supported.

Each LAS is identified with a SNAPI command. A maximum of four LASs are supported. Each RAS must be identified with a SNRAI command. A maximum of 32 RASs are supported.
The SNLBI command is used to bind a LAS to a RAS or RSG. The SNALI command is used to bind an RAS to a specific link.

The SNRTI command is used to define a route. Each route is bound to a specific RAS or RSG by an SNRLI command. A maximum of 64 routes and route bind commands are supported.

The DPC must either be defined in the SNRAI command which defines the RAS or in any route which is subsequently bound to the RAS.

8.14.6 SIGTRAN SUA ASP, Host to SGP Configuration Model

SUA SIGTRAN hosts use the IETF SIGTRAN SUA protocol to carry SS7 SCTP traffic to SUA Remote Signaling Gateways. Links to the RSG are declared using the SNSLI command. This gives details of the IP link connecting the host to the RSG and declares the presence of an RSG by including an SG parameter.

Each LAS is identified with a SNAPI command. A maximum of four LASs are supported. RSGs do not have to be explicitly declared – they are set up implicitly by the SNSLI command.

The SNLBI command is used to bind a LAS to an RSG. The SNALI command is not required as the RSG is bound to a specific link by the SNSLI command.

As in IPSP configurations, the SNRTI command is used to define a route and routes are bound to a specific RSG by an SNRLI command. A maximum of 64 routes and route bind commands are supported.

For SG connections, the DPC must be included in any routes which are bound to the RSG.

8.14.7 SIGTRAN Parameters

The Configuration of SCTP, SCTPD, SCTPN, M3UA and SUA uses Man Machine Interface (MMI) format commands. MMI commands start with a 5 character command name; if parameters are included, then the command name is followed by a colon and then the parameters. Parameters are of the format ‘parameter name’=‘parameter value’ and are separated by a comma. The command line is terminated with a semi-colon.

The following parameters are supported:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS</td>
<td>Application Server</td>
<td>1:4</td>
<td></td>
</tr>
<tr>
<td>AUTOACT</td>
<td>Automatic activation of SIGTRAN associations</td>
<td>Y, N</td>
<td>Y</td>
</tr>
<tr>
<td>CIC_RANGE</td>
<td>Range of circuits for use with ISUP/TUP. This is a compound parameter comprising the CIC of the first circuit ('base') and the number of consecutive circuits included ('range').</td>
<td>&lt;base&gt;-&lt;range&gt;</td>
<td></td>
</tr>
<tr>
<td>DAUD</td>
<td>Destination Audit</td>
<td>Y, N</td>
<td>N</td>
</tr>
<tr>
<td>DPC</td>
<td>Destination Point Code</td>
<td>0:16777215</td>
<td></td>
</tr>
<tr>
<td>DUAL</td>
<td>Dual resilient configuration host identifier</td>
<td>A,B</td>
<td></td>
</tr>
<tr>
<td>HPORT</td>
<td>Host SCTP Port (M3UA) (SUA)</td>
<td>1:65535</td>
<td>290514001</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td>Range</td>
<td>Default</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------</td>
<td>--------------------</td>
<td>---------</td>
</tr>
<tr>
<td>HIPADDR1</td>
<td>First per-link (local) host IP address.</td>
<td>IPv4 addresses using dot notation: \text{w.x.y.z}</td>
<td></td>
</tr>
<tr>
<td>HIPADDR2</td>
<td>Second per-link (local) host IP address.</td>
<td>Or</td>
<td></td>
</tr>
<tr>
<td>HIPADDR3</td>
<td>Third per-link (local) host IP address.</td>
<td>IPv6 addresses using colon notation A:B:C::E:F.</td>
<td></td>
</tr>
<tr>
<td>HIPADDR4</td>
<td>Fourth per-link (local) host IP address.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPADDR</td>
<td>IP address of Host or SG or RAS.</td>
<td>IPv4 addresses using dot notation: \text{w.x.y.z}</td>
<td></td>
</tr>
<tr>
<td>IPADDR2</td>
<td>Second IP address of Host or SG or RAS.</td>
<td>Or</td>
<td></td>
</tr>
<tr>
<td>IPADDR3</td>
<td>Third IP address of Host or SG or RAS.</td>
<td>IPv6 addresses using colon notation A:B:C::E:F.</td>
<td></td>
</tr>
<tr>
<td>IPADDR4</td>
<td>Fourth IP address of Host or SG or RAS.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2PA</td>
<td>Logical reference for an M2PA Link</td>
<td>1:8</td>
<td></td>
</tr>
<tr>
<td>M2PA_VER</td>
<td>Version of M2PA Protocol to support RFC, 9</td>
<td>RFC</td>
<td></td>
</tr>
<tr>
<td>M3UHB</td>
<td>M3UA Heartbeats enable</td>
<td>Y,N</td>
<td></td>
</tr>
<tr>
<td>MAXSIF</td>
<td>Max Signaling Information Field accepted in API_MSG_TX_REQ</td>
<td>5:4199</td>
<td>272</td>
</tr>
<tr>
<td>MODULE</td>
<td>Name of module to configure</td>
<td>DMR, DTC, DTS, INAP, IS41, ISUP, M2PA, M3UA, MAP, MTP3, SCCP, SCTP, SCTPD, SUA, TCAP</td>
<td></td>
</tr>
<tr>
<td>MOD_ID</td>
<td>Module ID</td>
<td>0:255</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>Network Appearance</td>
<td>0:4294967295</td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>Network Context (maps to LAS)</td>
<td>0:3</td>
<td>0</td>
</tr>
<tr>
<td>NASP</td>
<td>Minimum number of ASPs required to fully resource the AS.</td>
<td>0:64</td>
<td>0</td>
</tr>
<tr>
<td>OPC</td>
<td>Originating Point Code</td>
<td>0:16777215</td>
<td></td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Run-time options used in SNRLI, SNRTI CNNCI and CNOPS commands</td>
<td>0: \text{0xffffffff}</td>
<td></td>
</tr>
<tr>
<td>PER</td>
<td>Personality Configuration</td>
<td>0:255</td>
<td>0</td>
</tr>
<tr>
<td>PPORT</td>
<td>Peer SCTP Port (M3UA) (SUA)</td>
<td>1:65535</td>
<td>2905 14001</td>
</tr>
<tr>
<td>RAS</td>
<td>Remote Application Server</td>
<td>1:64</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>SIGTRAN Routing Context</td>
<td>0:4294967295</td>
<td></td>
</tr>
<tr>
<td>RTXB</td>
<td>Max SCTP heartbeat retransmissions (max_retx_heartbeat)</td>
<td>0:20, 0 = use SCTP default</td>
<td>2</td>
</tr>
<tr>
<td>RTXD</td>
<td>Max SCTP data retransmissions (max_retx_data)</td>
<td>0:20, 0 = use SCTP default</td>
<td>2</td>
</tr>
<tr>
<td>RTXI</td>
<td>Max SCTP init retransmissions (max_retx_init)</td>
<td>0:20, 0 = use SCTP default</td>
<td>5</td>
</tr>
<tr>
<td>RTXP</td>
<td>Number of consecutive init retransmissions on a path</td>
<td>0:20, 0 = use SCTP default</td>
<td>1</td>
</tr>
<tr>
<td>SG</td>
<td>Logical reference for a Signaling Gateway</td>
<td>1:64</td>
<td></td>
</tr>
</tbody>
</table>
### 8.14.8 IP address scope

The IPv4 address space is divided into four different scopes:

- **Global** – these are the globally unique addresses used on the public Internet.
- **Site-local** – there are three site-local networks which are defined by RFC 1918. These are 10.0.0.0/8, 172.16.0.0/12 and 192.168.0.0/16. Site-local addresses are only unique within the local network and are therefore meaningless to systems outside of the local network.
- **Link-local** – there is one link-local network, 169.254.0.0/16, which is defined by RFC 3927. Link-local addresses are only unique within the link and are therefore meaningless to external systems.
- **Loopback** – the loopback network, 127.0.0.0/8, is defined by RFC 1700 and is only valid within the local host.

The IPv6 address space is divided into three different scopes:

- **Global** – these are the globally unique addresses used on the public Internet.
• Link-local – for uniquely identifying interfaces within (i.e., attached to) a single link only. Link-local addresses are only unique within the link and are therefore meaningless to external systems.

• Loopback – The IPv6 unicast loopback address, ::1, is treated as having link-local scope within an imaginary link to which a virtual "loopback interface" is attached. When communicating with a host, addresses from a more restrictive scope must never be transmitted since it is likely that such an address would be meaningless (or even harmful) to the remote system. Since this behavior is enforced on some SCTP implementations, it is recommended that addresses of different scopes not be mixed within a single multi-homed association.
8.15 SIGTRAN Configuration Commands

The SIGTRAN configuration commands are:

- SNAPI Command - SIGTRAN Local AS
- SNSLI Command - SIGTRAN Signaling Link Initiate
- SNRTI Command - SIGTRAN Route
- SNRLI Command - SIGTRAN Route List
- SNRKI Command - SIGTRAN Routing Key Initiate
- SNALI Command - SIGTRAN AS List Initiate
- SNLBI Command - SIGTRAN Local AS Bind Initiate
- CNSYS Command - Configuration System Set
- CNOPS Command - Configuration Module Options Set
- CNNCI Command - Configuration Network Context Initiate
- CNTOS Command - Configuration Timeout Set

8.15.1 SNAPI Command - SIGTRAN Local AS Initiate

**Synopsis**

This command initiates a Local Application Server (LAS). A LAS is a logical entity representing an SS7 end point that can process circuit-related and or non-circuit-related signaling. Communication with a SG or Remote Application Server may use the Routing Context to identify the LAS.

SS7MD defaults to ITU14 and the local traffic mode (how peer should route traffic to this LAS) defaults to loadshare. Optional OPC is for information only.

TID parameters are for SUA only and if any TID parameter is present they must all be present.

For M3UA the Routing Context parameter is optional and then only used when connecting to a remote SG. When connecting to a Remote AS the Routing Context parameter can be configured by SNRAI. In most cases it is recommended that the Routing Context parameter be configured by SNLBI.

**Syntax**

SNAPI:LAS=,[RC=,][SS7MD=,][TRMD=,][SNTYPE=,][OPC=,] [TID_START=,][TID_END=,][TID_VALUE=,][SSR_ID=];

**Example**

SNAPI:LAS=1,OPC=123;
SNAPI:LAS=2,SS7MD=ITU16,TRMD=OR;

**Prerequisites**

The RC, if specified, must not already be associated with another local AS.
8.15.2 SNSLI Command - SIGTRAN Signaling Link Initiate

**Synopsis**

This command initiates a SIGTRAN link. A SIGTRAN link provides an SCTP association to a Signaling Gateway or Remote Application Server Process or between two M2PA nodes, or Diameter nodes.

If two IP addresses are specified, then the first IP address will be used until it proves unreliable in which case the second will be used.

SS7MD defaults to ITU14 if not specified.

SNTYPE defaults to M3UA if not specified.

For M3UA, M3UAHBT (Heartbeat) and SNMP indications may be enabled.

SG must be specified for a link to a Signaling Gateway, otherwise this is an IPSP link.

If no M2PA Version is specified and the link type is M2PA, then it will default to the RFC version.

**Syntax**

SNSLI:SNLINK=,IPADDR=,[SG=,][SS7MD=,][IPADDR2=,][IPADDR3=,][IPADDR4=,][HIPADDR1=,][HIPADDR2=,][HIPADDR3=,][HIPADDR4=,][HPORT=,][PPORT=,][SNEND=,][SNTYPE=,][M2PA=,][M2PA_VER=,][NA=,][M3UAHBT=,][SNMP=,][RTXI=,][RTXP=,][RTXD=,][RTXB=];

**Example**

SNSLI:SNLINK=1,SNEND=C,IPADDR=192.168.0.1,SG=2,IPADDR2=192.168.1.1;

SNSLI:SNLINK=2,IPADDR=192.168.0.10,HPORT=2906,PPORT=2906,SNEND=S,SNTYPE=M3UA;

SNSLI:SNLINK=3,IPADDR=192.168.0.20,SNEND=C,SNTYPE=M2PA,M2PA=3,PPORT=3567;

SNSLI:SNLINK=1,IPADDR=2001:DB8::1234:5678,HIPADDR1=2001:DB8::1234:ABCD,SNEND=S,SNTYPE=DMR,PPORT=3868,HPOR T=3868;

**Prerequisites**

SS7MD must be the same throughout the system.

For security reasons, the user must explicitly specify the IP addresses the link is connected to. The Peer is not allowed to respond or request IP addresses not configured by this command.

An IP address of 0.0.0.0 cannot be specified.
8.15.3 SNRTI Command - SIGTRAN Route Initiate

Synopsis
This command is used to configure a SIGTRAN route to a remote SS7 destination.
For M3UA: if the LAS parameter is not specified the route is attached to LAS1 by default. The DPC is mandatory and SNMP indications are available.
For SUA: if the LAS parameter is not specified then the route is attached to all LASs

Syntax
SNRTI:SNRT=,\[DPC=,\][LAS=,\][SNTYPE=,\][SSN=,\][OPTIONS=,\][SNMP=];

Example
SNRTI:SNRT=1,DPC=130;
SNRTI:SNRT=2,DPC=200,LAS=2,OPTIONS=0x0004;

Prerequisites
Another route cannot exist with the same DPC.

Parameters
\(<OPTIONS>\)
The OPTIONS parameter is a 16 bit field to configure run-time options with values defined below. If omitted, it defaults to 0x0002 for backwards compatibility

<table>
<thead>
<tr>
<th>Bit</th>
<th>Mnemonic</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>M3UOP_ROUTE_ASSUME_AVAIL</td>
<td>Assume route always available</td>
</tr>
<tr>
<td>1</td>
<td>M3UOP_ROUTE_LOADSHARE</td>
<td>Loadshare across all servers in the route</td>
</tr>
<tr>
<td>2</td>
<td>M3UOP_ROUTE_DEFAULT</td>
<td>Default Route</td>
</tr>
<tr>
<td>3</td>
<td>M3UOP_ROUTE_SNMP</td>
<td>Enable SNMP indications for this route (will also be set by specifying SNMP='Y')</td>
</tr>
</tbody>
</table>

8.15.4 SNRLI Command - SIGTRAN Route List Initiate

Synopsis
This command attaches Signaling Gateways to a SIGTRAN Route. A SIGTRAN route will use these adjacent Signaling Gateways to reach an eventual destination Point Code.
For SUA a RAS or a SG must be specified.
For M3UA SG is mandatory and OPTIONS may be specified. Where a route (SNRT) is attached to more than 1 SG, and route loadshare is enabled, this applies to the first 2 active SGs in the SNRL list.

Syntax
SNRLI:SNRL=,SNRT=,\[SG=,\][RAS=,\][OPTIONS=];
**Example**

SNRLI:SNRL=1,SNRT=1,SG=1;

**Prerequisites**

The route has already been initiated.

A SG must have at least one SNLINK associated with it. For SUA if SG is specified the route must contain DPC. If RAS is specified the DPC must be in each route or the RAS.

**Parameters**

<OPTIONS>

The OPTIONS parameter is a 16 bit field to configure run-time options with values defined below. If omitted, it defaults to 0.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Mnemonic</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>M3UOP_ROUTE_SERV_ASSUME_AVAIL</td>
<td>Presume the route is available via the server once the server is available, i.e. without waiting for reception of DAVA</td>
</tr>
</tbody>
</table>

**8.15.5 SNRKI Command - SIGTRAN Routing Key Initiate**

**Synopsis**

This command initiates a Routing Key for use with a Signaling Gateway (ASP Mode).

Once defined the SNRK id may be used in an SNLBI command in place of the RC parameter to add the Routing Key to a Signaling Gateway. At runtime the Routing Key will be registered with the Signaling Gateway which will return the RC to use.

The SNRK parameter is the logical identifier of the Routing Key (in the range 1 to 64).

CIC_RANGE is a compound parameter in the form <base-range> where base is the base CIC and range is the number of contiguous CICs in the range. e.g. CIC_RANGE 10-15 results in cics 10 to 24 inclusive. When CIC_RANGE is specified the OPC parameter is mandatory.

When specifying OPC and DPC they are specified from the Signaling Gateway’s point of view, i.e. OPC is the remote point code that is originating traffic and DPC represents the Local AS which intends to receive the messages.

**Syntax**

SNRKI:SNRK=,DPC=,[SI=,][OPC=,][OPC=,CIC_RANGE=];

**Example**

SNRKI:SNRK=1,DPC=123;
SNRKI:SNRK=2,DPC=123,OPC=567;
SNRKI:SNRK=3,DPC=123,OPC=567,SI=5,CIC_RANGE=64-32;

**Prerequisites**

Can only be used when connecting to a Signaling Gateway (not IPSP mode)
**8.15.6 SNRAI Command - SIGTRAN Remote AS Configuration**

**Synopsis**
This command initiates a Remote Application Server entity. A Remote Server represents a Remote SS7 signaling point. A Remote AS may run on a number of remote hosts. The optional NASP parameter defines the target number of RAS’s required in load sharing mode.

SS7MD defaults to ITU14.

TRMD is the Peer Traffic Mode (ie how traffic is routed towards the peer), it defaults to LS (Loadshare).

For SUA if the DPC is omitted, it must be specified in all SNRTs bound to this RAS.

For M3UA the (optional) Routing Context parameter for use with the RAS is configured by this command, not by the SNAPI command.

**Syntax**

SNRAI: RAS=,[RC=,][DPC=,][NASP=,][TRMD=,][SNMP=,][LAS=,];

**Example**

SNRAI: RAS=1,RC=1,DPC=555;

**Prerequisites**
RC must not be associated with any other RAS.

Normally only one RAS or SNRT can be configured with a particular DPC, however for M3UA multiple RAS may be configured with the same DPC providing a different LAS is specified.

A remote application server may only be bound to a single local application server.

---

**8.15.7 SNALI Command - SIGTRAN AS List Initiate**

**Synopsis**
This command is used to attach a SIGTRAN link to a Remote Application Server. It identifies the remote ASPs that the AS is hosted on.

**Syntax**

SNALI: SNAL=,RAS=,SNLINK=;

**Example**

SNALI: SNAL=1,RAS=1,SNLINK=1;

**Prerequisites**
The Remote Application Server has already been initiated.

The specified SIGTRAN link has already been initiated.

The SIGTRAN link must be of type M3UA or SUA and connect to a Remote ASP (IPSP).
For M3UA an SNLINK may be attached to multiple RAS.
The application list id SNAL must not have been used.

For SUA an automatic SNALI will be created for any SNLINK to a SG. The SNAL id will
be the same as the SNLINK id and therefore may not be used for other SNALI
commands.

A RAS must have at least one SNLINK associated with it.

8.15.8 SNLBI Command - SIGTRAN Local AS Bind Initiate

Synopsis
This command initiates a relationship between a Local Application Server and Remote Application Server or Signaling Gateway. The Local Application Server will use the SIGTRAN Links associated with the Remote Application Server or Gateway.

For M3UA IPSP use this command is not required.

For ASP to SG configurations this command will use the RC parameter from the LAS (see SNAPI) and the SG may only be bound to one LAS.

Syntax
SNLBI: SNLB=,LAS=,[RAS=,][SG=,][RC=,][SNRK=];

Example
SNLBI: SNLB=1,LAS=1,RAS=1,SG=1;
SNLBI: SNLB=2,LAS=2,RAS=1,SG=1;
SNLBI: SNLB=3,LAS=3,RAS=2,RC=2;
SNLBI: SNLB=4,LAS=4,SG=2,SNRK=1;

Prerequisites
The LAS and RAS or SG have been initiated.
The RAS or SG is associated with at least one SNLINK.
The RAS or SG is not attached to another LAS.
Routing Keys (SNRK) may only be specified when binding to a SG

8.15.9 CNSYS Command - Configuration System Set

Synopsis
This command allows system wide settings to be configured.
Checksums for SCTP associations default to CRC32. If ADLER is required then PER should be set to 1.
If DAUD is set to 'Y' then each SG will be audited concerning route status.
For Dual Resilient systems using RMM the DUAL parameter must be applied with value 'A' or 'B'. This parameter may be used in non-SIGTRAN configurations.
The AUTOACT parameter can be set to 'N' to disable automatic activation of SIGTRAN associations. For M3UA when set to 'Y' (default) the following 3 steps occur:
1. Association is activated at SCTP level
2. ASP is brought UP (when possible)
3. ASP is made ACTIVE (when possible)

If set to 'N' it is the users responsibility to control the steps as required with GCT
messages. This allows users to activate the association only and have a peer control
the ASPUP and ASPAC stages.

IPADDR is mandatory for SIGTRAN, optional for TDM configurations.

SNMP setting enables SNMP for all objects in the system.

**Syntax**
CNSYS: [IPADDR=,][IPADDR2=,][IPADDR3=,][IPADDR4=,][PER=,]
[DAUD=,][DUAL=,][AUTOACT=,][SNMP=];

**Example**
CNSYS:IPADDR=192.168.1.20;
CNSYS:IPADDR=192.168.1.20,DAUD=Y;
CNSYS:IPADDR=2001:DB8::1234:5678,DUAL=A,AUTOACT=N;

---

### 8.15.10 CNOPS Command - Configuration Module Options Set

**Synopsis**
This command allows per-module settings to be varied from the default settings.
Specifically it allows the default module_id to be set to a different value and, for
certain modules, allows additional run-time configuration options to be set.

**Syntax**
CNOPS: MODULE=,[OPTIONS=,][MOD_ID=,][NC=,];

**Example**
CNOPS: MODULE=M2PA,OPTIONS=0x0123;
CNOPS: MODULE=MTP3,MOD_ID=0x3d;
CNOPS: MODULE=M3UA,MOD_ID=0xfd,NC=1;

**Parameters**

<MODULE>
A token representing the module for which the configuration applies. Possible values are:
DMR, DTC, DTS, INAP, IS41, ISUP, M2PA, M3UA, MAP, MTP3, RMM, SCCP, SCTP,
SCTPD, SUA and TCAP.

<MOD_ID>
The value for the module_id in the range 0x01 to 0xfe. Care should be taken when
selecting module_id value to ensure that the value is not already in use. Typically it is
not necessary to change the default module_id.

<NC>
Network Context. Defaults to 0 if not specified.
<OPTIONS>
This is a 32 bit value used to set the per-module run-time configuration options. This parameter is only valid when used with the following settings for <MODULE>: M2PA, M3UA, RMM, SCTP and SCTPD. Other modules have the ability to set the run-time options in other config.txt commands.

### M2PA Options

<table>
<thead>
<tr>
<th>Bit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Set to 1 to use Multiple Congestion levels</td>
</tr>
<tr>
<td>1</td>
<td>Set to 1 to use 7-bit sequence numbers instead of default 24-bit sequence numbers. Use if MTP3 does not support Extended Changeover Procedures.</td>
</tr>
<tr>
<td>2</td>
<td>Set to 1 to use the (older) Draft Version 9 of the M2PA Specification. Default operation supports the RFC specification.</td>
</tr>
</tbody>
</table>

### M3UA Options

<table>
<thead>
<tr>
<th>Bit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Enable IPSP functionality</td>
</tr>
<tr>
<td>1</td>
<td>Enable Signaling Gateway functionality</td>
</tr>
<tr>
<td>2</td>
<td>Set to 1 to select the lowest bit of the SLS value to determine which Signaling Gateway to route traffic to. If not set, the highest bit of the SLS value is used.</td>
</tr>
<tr>
<td>3</td>
<td>By default, data traffic is load-shared across the SCTP streams based on the SLS value. When set, this option forces the M3UA module to use only stream 1 for transmitting data.</td>
</tr>
</tbody>
</table>

### RMM Options

<table>
<thead>
<tr>
<th>Bit 0</th>
<th>Bit 1</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>14 bit point codes</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>16 bit point codes</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>24 bit point codes</td>
</tr>
</tbody>
</table>
### SCTP Options

<table>
<thead>
<tr>
<th>Bit</th>
<th>SCTP/SCTPD</th>
<th>Meaning</th>
<th>SCTPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Controls the SCTP checksum algorithm. When set to 1 the CRC32 checksum is used otherwise the Adler32 (FRC2960) checksum is used.</td>
<td>When using the native SCTP module (SCTPN) Adler32 checksum is not supported so this bit should always be set to 1.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Module will ignore rather than abort incoming connection attempts for none present SCTP ports.</td>
<td>Reserved for future use and should be set to 0.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Forces retransmits of the data on the same path until it is considered inactive</td>
<td>Reserved for future use and should be set to 0.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>If set the SCTP module will use the preferred path if available. The preferred path uses the first host address set for the association.</td>
<td>If set the SCTPN module will use the preferred path if available. The preferred path uses the first host address set for the association.</td>
<td></td>
</tr>
</tbody>
</table>

---

### 8.15.11 CNNCI Command - Configuration Network Context Initiate

#### Synopsis
This command configures basic network variant and configuration options for a network context.

#### Syntax

```
CNNCI:SS7MD=, [OPTIONS=,][NC=,][MAXSIF=];
```

#### Example

```
CNNCI:SS7MD=ANSI,OPTIONS=0x0003;
CNNCI:SS7MD=NC=1,ITU14,MAXSIF=272;
```

#### Parameters

- `<SS7MD>`
The SS7 network variant. Takes one of the following values: ANSI, ITU14, ITU16 or ITU24. If SS7MD is specified it must be consistent with the setting of this value elsewhere within the same Network Context, e.g. the SNAPI configuration command.

- `<NC>`
Network Context. Defaults to 0 if not specified.

- `<MAXSIF>`
Maximum permitted number of octets in the Signaling Information Field for transmission to the network. If omitted defaults to 272.

- `<OPTIONS>`
The OPTIONS parameter is a 16 bit field to configure run-time options with values defined below. If omitted, it defaults to 0.
### Bit Meaning

<table>
<thead>
<tr>
<th>Bit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Set to 1 to activate M3UA SLS Rotation. Used in conjunction with bit 1 (see below)</td>
</tr>
<tr>
<td>1</td>
<td>When M3UA SLS rotation is enabled (see bit 0) this bit controls the number of SLS bits that are rotated as follows: Set to zero for 4 or 5 bit SLS rotation based on protocol variant. Set to 1 for 8 bit SLS rotation.</td>
</tr>
</tbody>
</table>

### 8.15.12 CNTOS Command - Configuration Timeout Set

**Synopsis**

This command allows the user to set the values of timers to be used in the SCTP, M2PA and M3UA protocols.

**Syntax**

CNTOS:TTYPE=,TO=,{TSEC=|TMSEC=};

**Examples**

CNTOS:TTYPE=SCTP,TO=HBT,TMSEC=500;
CNTOS:TTYPE=M2PA,TO=T4N,TSEC=10;

**Parameters**

**<TTYPE>**

The protocol timer type, SCTP, M2PA or M3UA.

**<TSEC>, <TMSEC>**

The value of the timeout in seconds or milliseconds.

**<TO>**

The token designating a particular timer taken from the following table:

<table>
<thead>
<tr>
<th>TO</th>
<th>Default</th>
<th>Granularity</th>
<th>SCTP Timer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rmin</td>
<td>200ms</td>
<td>1ms</td>
<td>Minimum RTO</td>
</tr>
<tr>
<td>Rmax</td>
<td>1400ms</td>
<td>1ms</td>
<td>Maximum RTO</td>
</tr>
<tr>
<td>Rinit</td>
<td>1000ms</td>
<td>1ms</td>
<td>Initial RTO</td>
</tr>
<tr>
<td>Ck</td>
<td>30000ms</td>
<td>1ms</td>
<td>Cookie lifetime</td>
</tr>
<tr>
<td>Hbt</td>
<td>1000ms</td>
<td>1ms</td>
<td>Time between heartbeats</td>
</tr>
<tr>
<td>T1i</td>
<td>3000ms</td>
<td>1ms</td>
<td>Starting timeout of an INIT chunk</td>
</tr>
<tr>
<td>T2i</td>
<td>3000ms</td>
<td>1ms</td>
<td>Starting timeout of a SHUTDOWN chunk</td>
</tr>
<tr>
<td>SACKD</td>
<td>10ms</td>
<td>1ms</td>
<td>SACK delay timer (Linux only) For Solaris the SACK delay time can be adjusted if required using operating system utilities as follows: ndd --set /dev/sctp sctp_defered_ack_interval 10</td>
</tr>
<tr>
<td>TO</td>
<td>Default</td>
<td>Granularity</td>
<td>M2PA Timer</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>-------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>T1</td>
<td>40s</td>
<td>1s</td>
<td>'Alignment Ready' timer value</td>
</tr>
<tr>
<td>T2</td>
<td>10s</td>
<td>1s</td>
<td>'Not Aligned' timer value</td>
</tr>
<tr>
<td>T3</td>
<td>2s</td>
<td>1s</td>
<td>'Aligned' timer value</td>
</tr>
<tr>
<td>T4n</td>
<td>7s</td>
<td>1s</td>
<td>'Normal Proving' timer value</td>
</tr>
<tr>
<td>T4e</td>
<td>500ms</td>
<td>100ms</td>
<td>'Emergency Proving' timer value</td>
</tr>
<tr>
<td>T6</td>
<td>3s</td>
<td>1s</td>
<td>'Remote Congestion' timer value</td>
</tr>
<tr>
<td>T7</td>
<td>1s</td>
<td>100ms</td>
<td>'Excessive Delay Of Acknowledgement' timer value</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TO</th>
<th>Default</th>
<th>Granularity</th>
<th>M3UA Timer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tack</td>
<td>2000ms</td>
<td>1ms</td>
<td>Peer response timeout</td>
</tr>
<tr>
<td>Tr</td>
<td>1000ms</td>
<td>1ms</td>
<td>Recovery timer for inactive ASPs</td>
</tr>
<tr>
<td>Tdaud</td>
<td>30s</td>
<td>1s</td>
<td>DAUD generation timer</td>
</tr>
<tr>
<td>Tbeat</td>
<td>30s</td>
<td>1s</td>
<td>M3UA heartbeat timer</td>
</tr>
</tbody>
</table>
8.16 Diameter Parameters

Configuration of the Diameter protocol uses Man Machine Interface (MMI) format commands. MMI commands start with a 5 character command name; if parameters are included, then the command name is followed by a colon and then the parameters. Parameters are of the format ‘parameter name’=‘parameter value’ and are separated by a comma. The command line is terminated with a semi-colon.

The following parameters are supported:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPID</td>
<td>The Diameter Application ID AVP value for use in Diameter capability negotiation.</td>
<td>S6a, S13, Rf, NAS, CC, ACCT</td>
<td></td>
</tr>
<tr>
<td>BASEICD</td>
<td>First session ID for incoming sessions</td>
<td>0: 0xffffffff</td>
<td></td>
</tr>
<tr>
<td>BASEOGD</td>
<td>First session ID for outgoing sessions</td>
<td>0: 0xffffffff</td>
<td></td>
</tr>
<tr>
<td>DMAP</td>
<td>Logical ID of a Diameter Application</td>
<td>0: 15</td>
<td></td>
</tr>
<tr>
<td>DMNC</td>
<td>Logical ID of a Diameter Network Context</td>
<td>0: 3</td>
<td></td>
</tr>
<tr>
<td>DMPR</td>
<td>Logical ID of a Diameter Peer</td>
<td>0: 255</td>
<td></td>
</tr>
<tr>
<td>DMRL</td>
<td>Logical ID of a Diameter Route List</td>
<td>0: 2047</td>
<td></td>
</tr>
<tr>
<td>DMRT</td>
<td>Logical ID of a Diameter Route</td>
<td>0: 1023</td>
<td></td>
</tr>
<tr>
<td>HOST</td>
<td>Diameter Host-name AVP value</td>
<td>FQDN</td>
<td></td>
</tr>
<tr>
<td>MOD_INST</td>
<td>Module Instance</td>
<td>0: 255</td>
<td></td>
</tr>
<tr>
<td>NODENAME</td>
<td>Diameter Node-name AVP value. A logical node label string.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POLICYID</td>
<td>Identifier providing a routing policy for the route.</td>
<td>0: 0xffffffff</td>
<td></td>
</tr>
<tr>
<td>REALM</td>
<td>Diameter Realm-name AVP value</td>
<td>FQDN</td>
<td></td>
</tr>
<tr>
<td>VENDORID</td>
<td>The Diameter Vendor ID AVP value for use in Diameter capability negotiation.</td>
<td>0: 0xffffffff</td>
<td></td>
</tr>
</tbody>
</table>
8.17 Diameter Configuration Commands

The Diameter configuration commands are:

- DMNCI Command - Diameter Network Context Initiate
- DMPRI Command - Diameter Peer Initiate
- DMRTI Command - Diameter Route Initiate
- DMRLI Command - Diameter Route List Initiate
- DMAPI Command - Diameter Application Initiate
- DMSYI Command - Diameter System Initiate

8.17.1 DMNCI Command - Diameter Network Context Initiate

Synopsis

Command to initiate a Diameter Network Context. This command allows the node name, origin host and realm as well as additional options to be set for the Diameter Node.

If not specified, the DMNC defaults to zero.

Syntax

DMNCI:DMNC=,[OPTIONS=,]HOST=,REALM=,NODENAME=;

Example

DMNCI:DMNC=0,OPTIONS=0x00,HOST=dmr01.lab.dialogic.com,REALM=dmradmin01.dialogic.com,NODENAME=ExampleMME

Prerequisites

The DMNC value must be unique within the system.

8.17.2 DMPRI Command - Diameter Peer Initiate

Synopsis

Command to configure parameters of the Diameter Peer node to be specified. The SNLINK parameter specifies the SCTP association which will be used to communicate with the Peer. The DMNC parameter indicates which Diameter Network Context should handle traffic for this Peer.

If not specified, the DMNC defaults to zero.

Syntax

DMPRI:DMPR=,[DMNC=],[OPTIONS=],SNLINK=,HOST=,REALM=[,LABEL=];

Example

DMPRI:DMPR=10,DMNC=0,OPTIONS=0x00000000,SNLINK=1,HOST=dmr02.lab.dialogic.com,REALM=dmradmin01.dialogic.com,LABEL=Paris;
Prerequisites
An SNLINK may only be specified by one Peer. DMPR value must be unique.

8.17.3 DMRTI Command - Diameter Route Initiate

Synopsis
Command to initiate a Diameter Route. The Diameter Route defines a final Peer or remote node reachable via a Relay agent.

If not specified, the DMNC, OPTIONS, POLICYID and APPID default to zero. The default route option allows a single route to be identified for use when no specific host or realm is matched. Realm-based routing allows routing to a set of hosts that match a specific realm. Host-based routing will only route to a specific host.

Syntax
Default Routing:
DMRTI:DMRT=,OPTIONS=[,]DMNC=[,]LABEL=;  
Host Routing:
DMRTI:DMRT=,HOST=[,]DMNC=[,]OPTIONS=[,]POLICYID=[,]LABEL=; 
Realm Routing:
DMRTI:DMRT=,REALM=[,]DMNC=[,]OPTIONS=[,]APPID=[,]POLICYID=[,]LABEL=;

Examples
DMRTI:DMRT=1,DMNC=0,OPTIONS=0x00000001,LABEL=DefaultRoute;  
DMRTI:DMRT=5,DMNC=0,HOST=dmr02.lab.dialogic.com,LABEL=HostRoute;  
DMRTI:DMRT=35,DMNC=0,APPID=S6A,REALM=dialogic.com,POLICYID=10,LABEL=RealmRoute;

Prerequisites
DMRT value must be unique. The Route configuration must contain one instance of HOST, REALM or Default Route option.

8.17.4 DMRLI Command - Diameter Route List Initiate

Synopsis
Command to initiate a Diameter Route List entry. The Diameter Route List identifies the Peer which can be used by a Route.

If not specified, the DMNC defaults to zero.

Syntax
DMRLI:DMRL=[,]DMNC=[,]DMPR=[,]DMRT=;

Example
DMRLI:DMRL=5,DMNC=0,DMPR=10,DMRT=5;
Prerequisites
DMRL value must be unique. The DMRT parameter must identify the ID of a configured Route.

8.17.5 DMAPI Command - Diameter Application Initiate

Synopsis
Command to specify the applications which are advertised or accepted during capabilities exchange. This command should be specified for each Diameter Application required, for the specified DMNC.
If not specified, the DMNC defaults to zero.

Syntax
DMAPI:DMAP=[,OPTIONS=],[MOD_ID=],[MOD_INST=],[DMNC=],
APPID=,VENDORID=[,LABEL=];

Example
DMAPI:DMAP=1,OPTIONS=0x00000000,MOD_ID=0x2d,MOD_INST=0,
DMNC=0,APPID=S6a,VENDORID=test,LABEL=Billing;

Prerequisites
DMAP value must be unique.

8.17.6 DMSYI Command - Diameter System Initiate

Synopsis
This command allows diameter module settings to be varied from the default settings. Specifically allows additional run-time configuration options to be set.

Syntax
DMSYI:[BASEICD=],[BASEOGD=],[OPTIONS=,];

Example
DMSYI:BASEICD=0x00,BASEOGD=0x8000;

Parameters

<BASEICD>
<BASEOGD>
Set the value for the base incoming and outgoing session IDs for the Diameter module. If these values are not specified the default values of 0x0000 and 0x8000 will be used. The module will then allow session IDs of <BASEICD> to <BASEOGD> -1 for incoming sessions. And <BASEOGD> to 0xffff for outgoing sessions. Note: the value of 0xffff is reserved.
9 Example Configuration Files

9.1 Example system.txt System Configuration file

*---------------------------------------------------------------------*  
* Example System Configuration File (example_system.txt) for use with  
* the Dialogic(R) DSI Development Package.                           
* Edit this file to reflect your configuration.                      
*---------------------------------------------------------------------*  
* Essential modules running on host:                                 
* LOCAL           0x20      * ssds/ssdh/ssdm - Board interface task  
LOCAL           0x00      * tim - Timer task                        
* Optional modules running on the host:                             
* LOCAL           0xcf      * s7_mgt - Management/config task     
LOCAL           0xef      * s7_log - Display and logging utility  
LOCAL           0x2d      * upe - Example user part task          
* Modules that optionally run on the host:                          
* LOCAL           0x22      * MTP3 module (and SS7LD 'mtp' and 'isup' run-mode) 
* LOCAL           0x23      * ISUP module (and SS7LD 'isup' run-mode)  
* LOCAL           0x4a      * TUP module                            
* LOCAL           0x33      * SCCP module                           
* LOCAL           0x14      * TCAP module                           
* LOCAL           0x15      * MAP module                            
* LOCAL           0x25      * IS41 module                           
* LOCAL           0x35      * INAP module                           
* Essential modules running on the board (all redirected via ssd):  
* REDIRECT      0x71 0x20  * MTP2 module (except SS7HD boards)     
* REDIRECT      0x81 0x20  * MTP2 module_id for SP 0 (SS7HD boards only) 
* REDIRECT      0x91 0x20  * MTP2 module_id for SP 1 (SS7HD boards only) 
* REDIRECT      0xe1 0x20  * MTP2 module_id for SP 2 (SS7HD boards only) 
* REDIRECT      0xf1 0x20  * MTP2 module_id for SP 3 (SS7HD boards only) 
REDIRECT      0x10 0x20  * CT bus/Clocking control module      
REDIRECT      0x8e 0x20  * On-board management module           
* Modules that optionally run on the board (all redirected via ssd):  
* REDIRECT      0x22 0x20  * MTP3 module (except for SS7LD 'mtp' and 'isup' run modes) 
* REDIRECT      0x23 0x20  * ISUP module (except for SS7LD 'mtp' and 'isup' run modes) 
* REDIRECT      0x4a 0x20  * TUP module                            
* REDIRECT      0x33 0x20  * SCCP module                           
* REDIRECT      0x14 0x20  * TCAP module                           
* REDIRECT      0x15 0x20  * MAP module                            
* REDIRECT      0x25 0x20  * IS41 module                           
*---------------------------------------------------------------------*
Example Configuration Files

* REDIRECT 0x35 0x20 * INAP module
*
* SS7MD boards only:
* * REDIRECT 0x31 0x20 * ATM Module
* REDIRECT 0x41 0x20 * Q.SAAL Module
* REDIRECT 0x61 0x20 * Signalling Driver Module
*
* Redirection of status indications:
* REDIRECT 0xdf 0xef * LIU/MTP2 status messages -> s7_log
*
DEFAULT_MODULE 0xef * Redirect messages by default to module 0xef
*
* Dimensioning the Message Passing Environment:
* NUM_MSGS 5000 * Number of standard size messages in the environment
* NUM_LMSGS 200 * Number of 'long' messages (used for certain TCAP based applications)
*
* Now start-up all local tasks:
* for SPCI start-up use ssds
* for SS7HD boards use ssdh
* for SS7MD boards use ssdm
* for SS7LD boards use ssdl
*
* FORK_PROCESS ./ssds
* FORK_PROCESS ./ssdh
* FORK_PROCESS ./ssdm
* FORK_PROCESS ./ssdl
FORK_PROCESS ./tim
FORK_PROCESS ./tick
FORK_PROCESS ./s7_mgt
FORK_PROCESS ./s7_log
FORK_PROCESS ./HSTBIN/mtp3
FORK_PROCESS ./upe
9.2 Example config.txt Protocol Configuration File

Example Protocol Configuration File (example_config.txt) for use with the Dialogic(R) DSI Development Package.

Boards supported are SPCI, SS7MD, SS7HD and the SS7LD range.

Note - Not all boards are supported on all operating system.

This file needs to be modified to suit individual circumstances.
Refer to the relevant Programmer's Manuals for further details.

```
* Configure individual boards:
* SS7_BOARD <board_id> <board_type> <flags> <code_file> <run_mode>
* For SPCI2S boards:
* SS7_BOARD 0 SPCI2S 0x0043 ./DC/ss7.dc3 MTP2
* For SPCI4 boards:
* SS7_BOARD 0 SPCI4 0x0043 ./DC/ss7.dc3 MTP2
* For SS7HD PCI boards:
* SS7_BOARD 0 SS7HDP 0x0043 ./DC/ss7.dc4 MTP2
* For SS7HD PCIe boards:
* SS7_BOARD 0 SS7HDE 0x0043 ./DC/ss7.dc4 MTP2
* For SS7MD boards:
* SS7_BOARD 0 SS7MD 0x0001 ./DC/ss7.dc6 LSL
* For SS7LD boards:
* SS7_BOARD 0 SS7LD 0x0001 ./DC/ss7.dc7 MTP2
* TRACE_MOD_ID 0xef * Set default trace module to 0xef.
```

```
* Configure individual T1/E1 interfaces:
* LIU_CONFIG <board_id> <liu_id> <liu_type> <line_code> <frame_format>
*           <crc_mode> [<build_out>]
* LIU_CONFIG 0 0 5 1 1
```

```
* Configure ATM module (SS7MD boards only):
* ATM_CONFIG <options> <num_streams>
* ATM_CONFIG 0x0000 4
```

```
* Define an ATM Cell Stream (SS7MD boards only):
* ATM_STREAM <id> <board_id> <cellstream_id> <liu_id> <options> <ima_frame_len>
*            <max_frame_len> <def_vpi> <def_vci> <timeslot>
* ATM_STREAM 3 0 1 0 0x01 0 280 12 10 0xffefffe
```
* Configure MTP3 module:
  * MTP parameters:
  * MTP_CONFIG <reserved> <reserved> <options>
    MTP_CONFIG 0 0 0x00040000
  *
  * Define linksets:
  * MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
    MTP_LINKSET 0 1 2 0x0000 2 0x0008
  *
  * Define signaling links:
  * MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <board_id> <blink>
  * <stream> <timeslot> <flags>
  *
  * For SPCI4 / SPCI2S, SS7MD and SS7LD boards:
    * MTP_LINK 0 0 0 0 0 0 16 0x0006
    * MTP_LINK 1 0 1 1 1 0 0 1 0x0006
  *
  For SS7HD boards:
    * MTP_LINK 0 0 0 0 0-0 0 16 0x0006
    * MTP_LINK 1 0 1 1 1 0-1 0 1 0x0006
  *
  * Define QSAAL links (SS7MD boards only):
    * MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <board_id> <blink>
    * <atm_stream> <vpi-vci> <flags> ATM
    *
    * MTP_LINK 0 0 0 0 0 0 5-10 0x0006 ATM
    *
  * Define a route for each remote signaling point:
    * MTP_ROUTE <dpc> <linkset_id> <user_part_mask>
      MTP_ROUTE 1 0 0x0020
      *
  * Define any user provided Layer 4 protocol:
    * MTP_USER_PART <service_ind> <module_id>
      MTP_USER_PART 0x0a 0x2d
      *
  *
  * ISUP parameters:
  *
  * Configure ISUP module:
    * ISUP_CONFIG <reserved> <reserved> <user_id> <options> <num_grps> <num_ccts>
      ISUP_CONFIG 0 0 0x1d 0x0435 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 0x1d 2 0x8 0 0x00
      *
  *
  * TUP parameters:
  *
  * Configure TUP module:
    * TUP_CONFIG <reserved> <reserved> <user_id> <options> <num_grps> <num_ccts>
      TUP_CONFIG 0 0 0x1d 0x8141 4 64
      *
  *
  * Define TUP circuit groups:
    * TUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
* TUP_CFG_CCTGRP 0 1 0x01 0x01 0x7fff7fff 0x0030 0 0x1d 2 0x08

* Configure SCCP module:
  * SCCP_CONFIG <local_spc> <ssf> <options> [<send_uis>]
  * SCCP_CONFIG 123 8 0

* Configure SCCP Sub-System Resource
  * SCCP SSR <ssr_id> RSP <remote_spc> <flags> <pc_mask>
  * SCCP SSR 1 RSP 1236 0

  * SCCP SSR <ssr_id> LSS <local_ssn> <module_id> <flags> <protocol>
  * SCCP SSR 2 LSS 0x07 0x0d 1 TCAP

  * SCCP SSR <ssr_id> RSS <remote_spc> <remote_ssn> <flags>
  * SCCP SSR 3 RSS 1236 0x67 0

  * SCCP Concerned Sub-System Resource
  * SCCP CONC_SSR <id> <cssr_id> <ssr_id>
  * SCCP CONC_SSR 1 2 3

* Configure SCCP Trace
  * SCCP TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>
  * SCCP TRACE 0x1 0x1 0x1

* Define Global Title Pattern
  * SCCP GTT_PATTERN <pattern_id> <addr_indicator> <pc> <ssn> <global_title>
    [<gtai_pattern>]
  * SCCP GTT_PATTERN 5 0x10 0x0000 0 0x001104 44/+ 

* Define Global Title Address
  * SCCP GTT ADDRESS <address_id> <addr_indicator> <pc> <ssn> <global_title>
    [<gtai_replacement>]
  * SCCP GTT ADDRESS 9 0x11 0x1234 0 0x001104 0/-

* Add Entry in GTT Table
  * SCCP GTT <pattern_id> <mask> <primary_address_id> [<backup_address_id>]
  * SCCP GTT 5 R-/K 9

* TCAP parameters:

* Configure TCAP
  * TCAP_CONFIG <base_ogdlg_id> <nog_dialogues> <base_icdlg_id> <nic_dialogues> <options>
    <dlg_hunt>
  * TCAP_CONFIG 0x0000 8192 0x8000 8192 0x0000 0

* Define TCAP circuit groups:
  * TCAP CFG_DGRP <gid> <base_ogdlg_id> <nog_dialogues> <base_icdlg_id> <nic_dialogues>
    <options>
  * TCAP CFG_DGRP 0 0x0000 1024 0x8000 1024 0 0

* Configure TCAP Trace
* TCAP_TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>
* TCAP_TRACE 0x7 0xf 0x0
*
* MAP parameters:
* Configure MAP
* MAP_CONFIG <options>
* MAP_CONFIG 2
*
* Configure MAP Trace
* MAP_TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>
* MAP_TRACE 0xf 0xf 0x4
*
* INAP parameters:
*
* Configure INAP
* INAP_CONFIG <options>
* INAP_CONFIG 2
*
* Configure INAP Functional Entities
* INAP_FE <fe_ref> <options> <sccp_address>
* INAP_FE 0x00000007 0x0000000f 0x00000000
*
* Configure INAP Application Context
* INAP_AC <ac_ref> <ac>
* INAP_AC 0x00 0xa109060704000101010000
*
* Configure INAP Trace
* INAP_TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>
* INAP_TRACE 0xf 0xf 0x7f
*
* IS41 parameters:
*
* Configure IS41 TRACE
* IS41_TRACE <op_evt_mask> <ip_evt_mask> <non_prim_mask>
* IS41_TRACE 0xf 0xf 0xff
*
9.3 Example M3UA ASP Config.txt – Multiple SG

* Example config.txt for the SIGTRAN Host Package.
* This example has a single LAS connecting to two SGs with multiple
  associations. Each route is added to both SGs so traffic will be load
  shared between them if availability allows (Load sharing across 2 SGs max).
  Traffic to each SG will also be load shared across two associations.
  (Load share works across max 4 associations to an SG)

* Local IP Address Configuration
  CNSYS:IPADDR=192.168.0.1,IPADDR2=192.168.1.1,DAUD=Y;

* Local AS configuration
  SNAPI:LAS=1,OPC=104,TRMD=LS;

* SCTP Association configuration to Remote SG
  SNSLI:SNLINK=1,IPADDR=192.168.0.2,IPADDR2=192.168.1.2,SNTYPE=M3UA,SNEND=C,SG=1;
  SNSLI:SNLINK=2,IPADDR=192.168.0.3,IPADDR2=192.168.1.3,SNTYPE=M3UA,SNEND=C,SG=1;
  SNSLI:SNLINK=3,IPADDR=192.168.0.4,IPADDR2=192.168.1.4,SNTYPE=M3UA,SNEND=C,SG=2;
  SNSLI:SNLINK=4,IPADDR=192.168.0.5,IPADDR2=192.168.1.5,SNTYPE=M3UA,SNEND=C,SG=2;

* Define routes
  SNRTI:SNRT=1,DPC=101;
  SNRTI:SNRT=2,DPC=102;

* Add routes to SG
  SNRLI:SNRL=1,SNRT=1,SG=1;
  SNRLI:SNRL=2,SNRT=1,SG=2;
  SNRLI:SNRL=3,SNRT=2,SG=1;
  SNRLI:SNRL=4,SNRT=2,SG=2;

* Bind LAS to SG
  SNLBI:SNLB=1,LAS=1,SG=1;

* ISUP parameters for Default NC0/LAS1:
  * Configure ISUP module:
    * ISUP_CONFIG <reserved> <reserved> <user_id> <options> <num_grps> <num_ccts>
      ISUP_CONFIG 0 0 0x1d 0x0435 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 0 101 0x01 0x01 0x7fff7fff 0x001c 0 0x1d 104 0x08 0 0x00
      ISUP_CFG_CCTGRP 1 102 0x21 0x21 0x7fff7fff 0x001c 0 0x1d 104 0x08 0 0x00
9.4 Example M3UA IPSP Config.txt – Multiple RAS

* Example config.txt for the SIGTRAN Host Package.
* This example has a single LAS connecting to multiple RAS.
* The single LAS has an association to each RAS so there are no shared
  associations. Each RAS has an optional RC defined by SNRAI.

* Local IP Address Configuration
  CNSYS:IPADDR=192.168.0.1;

* Local AS configuration
  SNAPI:LAS=1,OPC=104;

* SCTP Association configuration to Remote IPSP
  SNSLI:SNLINK=1,IPADDR=192.168.0.2,HPORT=2905,PPORT=2905,SNTYPE=M3UA,SNEND=S;
  SNSLI:SNLINK=2,IPADDR=192.168.0.3,HPORT=2906,PPORT=2906,SNTYPE=M3UA,SNEND=S;

* Define Remote AS
  SNRAI:RAS=1,DPC=101,RC=1;
  SNRAI:RAS=2,DPC=102,RC=2;

* Add Remote AS to Association
  SNALI:SNAL=1,RAS=1,SNLINK=1;
  SNALI:SNAL=2,RAS=2,SNLINK=2;

* Bind LAS to RAS
  SNLBI:SNLB=1,LAS=1,RAS=1;
  SNLBI:SNLB=2,LAS=1,RAS=2;

* ISUP parameters for Default NC0/LAS1:
  * Configure ISUP module:
    * ISUP_CONFIG <reserved> <reserved> <user_id> <options> <num_grps> <num_ccts>
      ISUP_CONFIG 0 0 0x3d 0x0435 32 1024
  *
  * 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 0 101 0x01 0x7fff7fff 8x001c 0 0x3d 104 0x00 0 0x00
      ISUP_CFG_CCTGRP 1 102 0x21 0x7fff7fff 8x001c 0 0x3d 104 0x00 0 0x00
9.5 Example M3UA ASP Config.txt – Multiple LAS

* Example config.txt for the SIGTRAN Host Package.
* This example has multiple LAS connecting to a single SG with LAS1 handling ISUP traffic and LAS2 handling SCCP traffic.
* In this example the multiple LAS share a single association to the SG.
* This requires the RC parameter to be configured with SNLBI for each LAS-SG relationship, to identify the traffic on the shared association.
* Routes must be configured with each LAS specified (default is LAS1).
* ISUP config is in this file since it is for the default NC0 (LAS1).
* SCCP config must be external to this file for NC1 (LAS2).

* Local IP Address Configuration
CNSYS:IPADDR=192.168.0.1,DAUD=Y;

* Local AS configuration
SNAPI:LAS=1,OPC=104;
SNAPI:LAS=2,OPC=105;

* SCTP Association configuration to Remote SG
SNSLI:SNLINK=1,IPADDR=192.168.0.2,SNTYPE=M3UA,SNEND=C,SG=1;

* Define routes
SNRTI:SNRT=1,DPC=101,LAS=1;
SNRTI:SNRT=2,DPC=102,LAS=1;
SNRTI:SNRT=3,DPC=101,LAS=2;
SNRTI:SNRT=4,DPC=103,LAS=2;

* Add routes to SG
SNRLI:SNRL=1,SNRT=1,SG=1;
SNRLI:SNRL=2,SNRT=2,SG=1;
SNRLI:SNRL=3,SNRT=3,SG=1;
SNRLI:SNRL=4,SNRT=4,SG=1;

* Bind LAS to SG
SNLBI:SNLB=1,LAS=1,SG=1,RC=7;
SNLBI:SNLB=2,LAS=2,SG=1,RC=9;

* ISUP parameters for Default NC0/LAS1:
  * Configure ISUP module:
    * ISUP_CONFIG <reserved> <reserved> <user_id> <options> <num_grps> <num_ccts>
    ISUP_CONFIG 0 0 0x1d 0x0435 4 64
    *
  * Configure ISUP circuit groups:
    * ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask> <options>
    * ISUP_CFG_CCTGRP 0 101 0x01 0x7ff 0x001 0x1d 104 0x08 0x0000
    ISUP_CFG_CCTGRP 1 102 0x21 0x7ff 0x0000 0x1d 104 0x08 0x0000
  *
* External module for SCCP (SI=0x03) for NC1/LAS2:
  * MTP_USER_PART [NC] <service_ind> <module_id>
MTP_USER_PART NC 0x03 0x2d

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## 9.6 Example M3UA IPSP (Client) Config.txt

* Example config.txt for the SIGTRAN Host Package.
* This example has multiple LAS connecting to a single RAS.
* It can be used in conjunction with the following example as the peer.
* The multiple LAS share a single association to the RAS. This requires the RC parameter to be configured for each LAS-RAS relationship, to identify the traffic on the shared association. RC is defined by SNLBI rather than SNRAI.

* Local IP Address Configuration
  CNSYS:IPADDR=192.168.0.1;

* Local AS configuration
  SNAPI:LAS=1,OPC=101;
  SNAPI:LAS=2,OPC=102;

* SCTP Association configuration to Remote IPSP
  SNSLI:SNLINK=1,IPADDR=192.168.0.2,HPORT=2905,PPORT=2905,SNTYPE=M3UA,SNEND=C;

* Define Remote AS
  SNRAI:RAS=1,DPC=103;

* Add Remote AS to Association
  SNALI:SNAL=1,RAS=1,SNLINK=1;

* Bind LAS to RAS
  SNLBI:SNLB=1,LAS=1,RAS=1,RC=5;
  SNLBI:SNLB=2,LAS=2,RAS=1,RC=6;

* Connect to external user parts for NC0/LAS1 and NC1/LAS2
  * for testing use s7_log (0xef) to display traffic
  * MTP_USER_PART [NC] <service_ind> <module_id>
    MTP_USER_PART NC0 0x03 0xef
    MTP_USER_PART NC1 0x05 0xef
9.7 Example M3UA IPSP (Server) Config.txt

* Example config.txt for the SIGTRAN Host Package.
* This example has a single LAS connecting to multiple RAS.
* It can be used in conjunction with the preceding example as the peer.
* The LAS shares a single association to the multiple RAS. This requires the RC
* parameter to be configured for each LAS-RAS relationship, to identify the traffic on
* the shared association. RC is defined by SNLBI rather than SNRAI.

* Local IP Address Configuration
  CNSYS:IPADDR=192.168.0.2;

* Local AS configuration
  SNAPI:LAS=1,OPC=103;

* SCTP Association configuration to Remote IPSP
  SNSLI:SNLINK=1,IPADDR=192.168.0.1,HPORT=2905,PPORT=2905,SNTYPE=M3UA,SNEND=S;

* Define Remote AS
  SNRAI:RAS=1,DPC=101;
  SNRAI:RAS=2,DPC=102;

* Add Remote AS to Association
  SNALI:SNAL=1,RAS=1,SNLINK=1;
  SNALI:SNAL=2,RAS=2,SNLINK=1;

* Bind LAS to RAS
  SNLBI:SNLB=1,LAS=1,RAS=1,RC=5;
  SNLBI:SNLB=2,LAS=1,RAS=2,RC=6;

* Connect to external user parts for NC0/LAS1
  * for testing use s7_log (0xef) to display traffic
  * MTP_USER_PART [NC] <service_ind> <module_id>
  MTP_USER_PART NCO 0x03 0xef
  MTP_USER_PART NCO 0x05 0xef
9.8 Example M2PA Configuration

* Example config.txt for the SIGTRAN Host Package.
* Edit this file to reflect your configuration.

* SYSTEM Parameters
CNSYS:IPADDR=192.168.0.1,PER=0;
SNSLI:SNLINK=1,IPADDR=192.168.0.2,SNEND=C,SNTYPE=M2PA,M2PA=1, HPORT=3565,PPORT=3565;
SNSLI:SNLINK=2,IPADDR=192.168.0.2,SNEND=C,SNTYPE=M2PA,M2PA=2, HPORT=3566,PPORT=3566;
SNSLI:SNLINK=3,IPADDR=192.168.0.2,SNEND=C,SNTYPE=M2PA,M2PA=3, HPORT=3567,PPORT=3567;
SNSLI:SNLINK=4,IPADDR=192.168.0.2,SNEND=C,SNTYPE=M2PA,M2PA=4, HPORT=3568,PPORT=3568;
SNSLI:SNLINK=5,IPADDR=192.168.0.2,SNEND=C,SNTYPE=M2PA,M2PA=5, HPORT=3569,PPORT=3569;
SNSLI:SNLINK=6,IPADDR=192.168.0.2,SNEND=C,SNTYPE=M2PA,M2PA=6, HPORT=3570,PPORT=3570;
SNSLI:SNLINK=7,IPADDR=192.168.0.2,SNEND=C,SNTYPE=M2PA,M2PA=7, HPORT=3571,PPORT=3571;
SNSLI:SNLINK=8,IPADDR=192.168.0.2,SNEND=C,SNTYPE=M2PA,M2PA=8, HPORT=3572,PPORT=3572;

MTP_CONFIG 0 0 0x00000000

* Define linksets:
* MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
MTP_LINKSET 0 10 8 0x0000 100 0x00

* 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 1 0 0 0x80000006
MTP_LINK 1 0 1 1 0 2 0 0 0x80000006
MTP_LINK 2 0 2 2 0 3 0 0 0x80000006
MTP_LINK 3 0 3 3 0 4 0 0 0x80000006
MTP_LINK 4 0 4 4 0 5 0 0 0x80000006
MTP_LINK 5 0 5 5 0 6 0 0 0x80000006
MTP_LINK 6 0 6 6 0 7 0 0 0x80000006
MTP_LINK 7 0 7 7 0 8 0 0 0x80000006

* MTP_ROUTE <dpc> <linkset_id> <user_part_mask>
MTP_ROUTE 10 0 0x0028

* MTP_USER_PART 0x0a 0x1d
9.9 Example GTT Configuration

* Specific Address to PC + SSN
* This example translates a received specific Global Title address (09876543210) into a combination of Point Code (138) and SSN (3).
* SCCP_GTTPATTERN <pattern_id> <addr_indicator> <pc> <ssn> <global_title>
SCCP_GTTPATTERN 1 0x10 0 0 0x001104 09876543210
SCCP_GTTPADDR 1 0x03 138 8 0x00
* Match a 7 digit number starting "123", followed by any three digits, then "7".
* change the first digits to "333" keep the next three digits from the called party address and change the fourth digit to "4", and add a PC & SSN.
SCCP_GTTPATTERN 2 0x10 0 0 0x001104 123/??/7
SCCP_GTTPADDR 2 0x11 138 8 0x001104 333/---/4
SCCP_GTTP 2 R--/K--/R 2

* A Matching Prefix to PC + SSN
* This example translates any global title address matching a pattern consisting of a prefix (441425) following by a suffix of any digits and any length into the digits minus the prefix, and adding a PC (238) and SSN (3).
SCCP_GTTPATTERN 3 0x10 0 0 0x001104 441425/+0x001104
SCCP_GTTPADDR 3 0x13 238 3 0x001104 -/=/
SCCP_GTTP 3 R/K 3

* A Matching Prefix to PC + SSN
* Ignoring any preceding digits, match "1425" followed by any six digits. Remove any digits preceding the "1425", keeping the final six digits from the Input GTAI. Add a PC & SSN.
SCCP_GTTPATTERN 4 0x10 0 0 0x001104 +1425/???????
SCCP_GTTPADDR 4 0x13 128 9 0x001104 1425/-=/
SCCP_GTTP 4 R/K/K 4

* Adding a PC + SSN to any GTAI
* This example matches any GTAI Digits and adds a Point Code and SSN, retaining any GTAI digits.
SCCP_GTTPATTERN 5 0x10 0x0000 0x03 0x001204 +/
SCCP_GTTPADDR 5 0x53 0x3FFF 0x08 0x001204 -e
SCCP_GTTP 5 K/R 5
9.10 Example Configuration of an ATM Terminated Link

Example configuration for a terminated ATM link.

```plaintext
* Example Protocol Configuration File (config.txt) for use with
* Dialogic(R) DSI SS7MD Network Interface Boards.
* This file needs to be modified to suit individual circumstances.
* Refer to the relevant Programmer’s Manuals for further details.
*
* SS7_BOARD <board_id> <board_type> <flags> <code_file> <run_mode>
SS7_BOARD 0 SS7MD 0x0000 ./DC/ss7.dc6 ATM
*
* LIU_CONFIG <board_id> <liu_id> <liu_type> <line_code> <frame_format>
* <crc_mode> [<build_out>]
LIU_CONFIG 0 0 5 1 1 1 1 0
*
* ATM_CONFIG <options> <num_streams>
ATM_CONFIG 0x0000 4
*
* ATM_STREAM <id> <board_id> <cellstream_id> <liu_id> <options> <ima_frame_len> <max_frame_len> <def_vpi> <def_vci> <timeslot>
ATM_STREAM 3 0 1 0 0x01 0 280 12 10 0xffefffe
*
* MTP_CONFIG <reserved1> <reserved2> <options>
MTP_CONFIG 0 0 0x00040000
*
* MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags> <local_spc> <ssf>
MTP_LINKSET 0 1 1 0x0000 2 0x08
*
* MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <board_id> <blink>
* <atm_stream> <vpi-vci> <flags> [<data_rate>]
MTP_LINK 0 0 0 0 0 3 8-100 0x0006 ATM
*
* MTP_ROUTE <dpc> <linkset_id> <user_part_mask>
MTP_ROUTE 1 0 0x0020
```

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9.11 Example Diameter Configuration

The DSI Development Pack includes example applications for the DSI Diameter Stack. A sample configuration file for use with the DTU example application is shown below. This file and the equivalent example configuration file for the partner example application DTR are included in the UPD/RUN sub-directory of the Development Package.

```plaintext
**************************************************************************
* Example protocol configuration file for the Dialogic(R) DSI Diameter Stack *
* Diameter - DTU Basic configuration:                                  *
**************************************************************************
* Local IP Address Configuration                                       *
* CNSYS:IPADDR=192.168.0.2;                                            *
* Set per-module options for Diameter                                  *
* CNOPS:MODULE=DMR,MOD_ID=0x74;                                       *
* Set module-specific options for Diameter                              *
* DMSYI:BASEOGD=0x0000,BASEICD=0x8000;                                *
* Configure an SCTP association                                        *
* SNSLI:SNLINK=1,IPADDR=192.168.0.1,HIPADDR=192.168.0.2,SNEND=C,SNTYPE=DMR,PPORT=3868,HPORT=3868; *
* Configure the Diameter Network Context                               *
* DMNCI:DMNC=0,OPTIONS=0x00000000,HOST=dmr01.lab.dialogic.com,REALM=dialogic.com,NODENAME=ExampleMME,LABEL=London; *
* Configure the Peer, linking the DMNC to the SNLINK                   *
* (Options bit 0 must be set for Server operation)                     *
* DMPRI:DMPR=0,DMNC=0,OPTIONS=0x00000000,SNLINK=1,HOST=dmr02.lab.dialogic.com,REALM=dialogic.com,LABEL=Paris; *
* Configure the Route                                                  *
* DMRTI:DMRT=0,DMNC=0,APPID=S6a,OPTIONS=0x00000000 HOST=dmr02.lab.dialogic.com,LABEL=Primary; *
* Identify the Peers which can be used by a Route                      *
* DMRLI:DMRL=0,DMPR=0,DMRT=0;                                          *
* Configure the Application which uses the DMNC                        *
* DMAPI:DMAP=0,OPTIONS=0x00000000,MOD_ID=0x1d,MOD_INST=0,DMNC=0,APPID=S6a,VENDORID=0,LABEL=Billing; *
* DMAPI:DMAP=1,OPTIONS=0x00000000,MOD_ID=0x1d,MOD_INST=0,DMNC=0,APPID=CC,VENDORID=0,LABEL=CreditCont rol; *
**************************************************************************
```
Appendix A. Default Module Identifiers

The default module identifiers are listed in the following table. In some systems, these default values may be changed at run-time when the system is run up, so care should be taken to understand that the module identifier is not necessarily fixed to the default value.

Module identifiers with a least significant nibble set to 0xd are reserved for user-generated applications. Although the values may also be used in example applications supplied by Dialogic.

Module identifiers with a least significant nibble set to 0xc are reserved entirely for user-generated applications. These 16 module identifiers will not be used in any Dialogic® DSI Components and are therefore available for use by the user in custom applications.

<table>
<thead>
<tr>
<th>Value</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00</td>
<td>TIM_MOD_ID</td>
<td>Timer module</td>
</tr>
<tr>
<td>0x10</td>
<td>MVD_TASK_ID</td>
<td>Physical switch &amp; clock driver (per-board)</td>
</tr>
<tr>
<td>0x20</td>
<td>SSD_TASK_ID</td>
<td>Physical board interface module</td>
</tr>
<tr>
<td>0x80</td>
<td>DVR_SP0_TASK_ID</td>
<td>Driver for SP0</td>
</tr>
<tr>
<td>0x90</td>
<td>DVR_SP1_TASK_ID</td>
<td>Driver for SP1</td>
</tr>
<tr>
<td>0xb0</td>
<td>RSI_MOD_ID</td>
<td>RSI socket based interface</td>
</tr>
<tr>
<td>0xe0</td>
<td>DVR_SP2_TASK_ID</td>
<td>Driver for SP2</td>
</tr>
<tr>
<td>0xf0</td>
<td>DVR_SP3_TASK_ID</td>
<td>Driver for SP3</td>
</tr>
<tr>
<td>0x21</td>
<td>CONG_TASK_ID</td>
<td>Congestion module</td>
</tr>
<tr>
<td>0x31</td>
<td>ATM_TASK_ID</td>
<td>ATM Module</td>
</tr>
<tr>
<td>0x41</td>
<td>QSL_TASK_ID</td>
<td>Q.SAAL Module</td>
</tr>
<tr>
<td>0x61</td>
<td>DVR_ALT_TASK_ID</td>
<td>SS7MD Signaling Driver Module</td>
</tr>
<tr>
<td>0x71</td>
<td>SS7_TASK_ID</td>
<td>MTP2 protocol module</td>
</tr>
<tr>
<td>0x74</td>
<td>DMR_TASK_ID</td>
<td>DMR Diameter Module</td>
</tr>
<tr>
<td>0x81</td>
<td>SS7_SP0_TASK_ID</td>
<td>MTP2 for SP0 (SS7HD only)</td>
</tr>
<tr>
<td>0x91</td>
<td>SS7_SP1_TASK_ID</td>
<td>MTP2 for SP1 (SS7HD only)</td>
</tr>
<tr>
<td>0xb1</td>
<td>MST_TASK_ID</td>
<td>SIGTRAN Monitor task</td>
</tr>
<tr>
<td>0xc1</td>
<td>M2P_TASK_ID</td>
<td>M2PA protocol module</td>
</tr>
<tr>
<td>0xe1</td>
<td>SS7_SP2_TASK_ID</td>
<td>MTP2 for SP2 (SS7HD only)</td>
</tr>
<tr>
<td>0xf1</td>
<td>SS7_SP3_TASK_ID</td>
<td>MTP2 for SP3 (SS7HD only)</td>
</tr>
<tr>
<td>0x22</td>
<td>MTP_TASK_ID</td>
<td>MTP3 protocol module</td>
</tr>
<tr>
<td>0x32</td>
<td>RMM_TASK_ID</td>
<td>RMM module</td>
</tr>
<tr>
<td>0xd2</td>
<td>M3UA_TASK_ID</td>
<td>M3UA protocol module</td>
</tr>
<tr>
<td>0x23</td>
<td>ISP_TASK_ID</td>
<td>ISUP protocol module</td>
</tr>
<tr>
<td>Value</td>
<td>Mnemonic</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>0x33</td>
<td>SCP_TASK_ID</td>
<td>SCCP protocol module</td>
</tr>
<tr>
<td>0xC3</td>
<td>SUA_TASK_ID</td>
<td>SUA protocol module</td>
</tr>
<tr>
<td>0x14</td>
<td>TCP_TASK_ID</td>
<td>TCAP protocol module</td>
</tr>
<tr>
<td>0x15</td>
<td>MAP_TASK_ID</td>
<td>MAP protocol module</td>
</tr>
<tr>
<td>0x25</td>
<td>IS41_TASK_ID</td>
<td>IS41 protocol module</td>
</tr>
<tr>
<td>0x35</td>
<td>INAP_TASK_ID</td>
<td>INAP protocol module</td>
</tr>
<tr>
<td>0x4A</td>
<td>TUP_TASK_ID</td>
<td>TUP protocol module</td>
</tr>
<tr>
<td>0x0D</td>
<td>APP0_TASK_ID</td>
<td>User's application module</td>
</tr>
<tr>
<td>0x1D</td>
<td>APP1_TASK_ID</td>
<td>User's application module</td>
</tr>
<tr>
<td>0x2D</td>
<td>APP2_TASK_ID</td>
<td>User's application module</td>
</tr>
<tr>
<td>0x3D</td>
<td>.</td>
<td>User's application module</td>
</tr>
<tr>
<td>.</td>
<td>0XCD</td>
<td>.</td>
</tr>
<tr>
<td>0XDD</td>
<td>APP13_TASK_ID</td>
<td>User's application module</td>
</tr>
<tr>
<td>0XED</td>
<td>APP14_TASK_ID</td>
<td>User's application module</td>
</tr>
<tr>
<td>0xFD</td>
<td>APP15_TASK_ID</td>
<td>User's application module</td>
</tr>
<tr>
<td>0X8E</td>
<td>MGMT_TASK_ID</td>
<td>General management module</td>
</tr>
<tr>
<td>0xCE</td>
<td>MGMT_SP0_TASK_ID</td>
<td>Management Module for SP0</td>
</tr>
<tr>
<td>0xDE</td>
<td>MGMT_SP1_TASK_ID</td>
<td>Management Module for SP1</td>
</tr>
<tr>
<td>0xEE</td>
<td>MGMT_SP2_TASK_ID</td>
<td>Management Module for SP2</td>
</tr>
<tr>
<td>0xFE</td>
<td>MGMT_SP3_TASK_ID</td>
<td>Management Module for SP3</td>
</tr>
<tr>
<td>0xCF</td>
<td>.</td>
<td>s7_mgt - Management/config task</td>
</tr>
<tr>
<td>0xdf</td>
<td>SIU_MGT_TASK_ID</td>
<td>Internal SIU use</td>
</tr>
<tr>
<td>0xef</td>
<td>REM_API_ID</td>
<td>Remote (users) application</td>
</tr>
<tr>
<td>0xff</td>
<td>.</td>
<td>Invalid module_id - do not use!</td>
</tr>
</tbody>
</table>
Appendix B. Values reserved for Custom Use

In some cases, users may wish to add their own modules and messages to a system. To this end, a range of module identifiers and message types have been reserved for this purpose and will not be used in Dialogic® DSI Components.

B.1 Reserved module identifiers

All module_id values containing 0xc as the least significant nibble are reserved for use in user-generated applications.

B.2 Reserved message types

A total of 1024 message types are reserved exclusively for use in the user's own applications.

The reserved message types are of the following 4 formats, where the nibbles identified by a question mark can be set to any value:

- 0x?cc?
- 0x?cd?
- 0x?ce?
- 0x?cf?

For example, the message types 0x1cc1, 0x2cd2, 0x3ce3 and 0x4cf4 are reserved for use in the user's applications.
Appendix C. GCTLIB Javadoc

This appendix documents the Java class library provided for access to the message passing environment. See section 6.3 Java Inter-Process Communications for further details.

C.1 com.dialogic.signaling.gct - Class BBUtil

```java
public class BBUtil
extends java.lang.Object
```

BBUtil - allows access to unsigned values within a ByteBuffer

### Constructor Summary

<table>
<thead>
<tr>
<th>BBUtil()</th>
</tr>
</thead>
</table>

### Method Summary

<table>
<thead>
<tr>
<th>static int getU16(java.nio.ByteBuffer byteBuffer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>static int getU16(java.nio.ByteBuffer byteBuffer, int offset)</td>
</tr>
<tr>
<td>static int getU24(java.nio.ByteBuffer byteBuffer)</td>
</tr>
<tr>
<td>static int getU24(java.nio.ByteBuffer byteBuffer, int offset)</td>
</tr>
<tr>
<td>static long getU32(java.nio.ByteBuffer byteBuffer)</td>
</tr>
<tr>
<td>static long getU32(java.nio.ByteBuffer byteBuffer, int offset)</td>
</tr>
<tr>
<td>static short getU8(java.nio.ByteBuffer byteBuffer)</td>
</tr>
<tr>
<td>static short getU8(java.nio.ByteBuffer byteBuffer, int offset)</td>
</tr>
<tr>
<td>static void putU16(java.nio.ByteBuffer byteBuffer, int value)</td>
</tr>
</tbody>
</table>
static void putU16(java.nio.ByteBuffer byteBuffer, int offset, int value)
static void putU24(java.nio.ByteBuffer byteBuffer, int value)
static void putU24(java.nio.ByteBuffer byteBuffer, int offset, int value)
static void putU32(java.nio.ByteBuffer byteBuffer, int offset, long value)
static void putU32(java.nio.ByteBuffer byteBuffer, long value)
static void putU8(java.nio.ByteBuffer byteBuffer, int value)
static void putU8(java.nio.ByteBuffer byteBuffer, int offset, int value)

Methods inherited from class java.lang.Object
equals, getClass, hashCode, notify, notifyAll, toString, wait, wait, wait

Constructor Detail

BBUtil
public BBUtil()

Method Detail

getU8
public static short getU8(java.nio.ByteBuffer byteBuffer)

putU8
public static void putU8(java.nio.ByteBuffer byteBuffer, int value)

getU8
public static short getU8(java.nio.ByteBuffer byteBuffer, int offset)
putU8
public static void putU8(java.nio.ByteBuffer byteBuffer,
int offset,
int value)

getU16
public static int getU16(java.nio.ByteBuffer byteBuffer)

putU16
public static void putU16(java.nio.ByteBuffer byteBuffer,
int value)

getU16
public static int getU16(java.nio.ByteBuffer byteBuffer,
int offset)

putU16
public static void putU16(java.nio.ByteBuffer byteBuffer,
int offset,
int value)

getU32
public static long getU32(java.nio.ByteBuffer byteBuffer)

putU32
public static void putU32(java.nio.ByteBuffer byteBuffer,
long value)

getU32
public static long getU32(java.nio.ByteBuffer byteBuffer,
int offset)

putU32
public static void putU32(java.nio.ByteBuffer byteBuffer,
int offset,
long value)
**getU24**

```java
public static int getU24(java.nio.ByteBuffer byteBuffer)
```

**putU24**

```java
public static void putU24(java.nio.ByteBuffer byteBuffer, int value)
```

**getU24**

```java
public static int getU24(java.nio.ByteBuffer byteBuffer, int offset)
```

**putU24**

```java
public static void putU24(java.nio.ByteBuffer byteBuffer, int offset, int value)
```

---

### C.2 com.dialogic.signaling.gct - Class GctException

java.lang.Object
  └─java.lang.Throwable
      └─java.lang.Exception
          └─com.dialogic.signaling.gct.GctException

All Implemented Interfaces:
  java.io.Serializable

public class GctException
  extends java.lang.Exception

See Also:
  Serialized Form

---

**Constructor Summary**

```java
GctException(java.lang.String message)
```

---

**Method Summary**

**Methods inherited from class java.lang.Throwable**

```java
fillInStackTrace, getCause, getLocalizedMessage, getMessage, getStackTrace, initCause, printStackTrace, printStackTrace, printStackTrace, setStackTrace,
```
## toString

**Methods inherited from class java.lang.Object**

equals, getClass, hashCode, notify, notifyAll, wait, wait, wait

## Constructor Detail

### GctException

```java
public GctException(java.lang.String message)
```

## C.3 com.dialogic.signaling.gct - Class GctLib

```java
public class GctLib
extends java.lang.Object
```

## Nested Class Summary

<table>
<thead>
<tr>
<th>static class</th>
<th>GctLib.PartitionInfo</th>
</tr>
</thead>
<tbody>
<tr>
<td>static class</td>
<td>GctLib.StandardMsgSizes</td>
</tr>
</tbody>
</table>

## Field Summary

<table>
<thead>
<tr>
<th>static java.lang.String</th>
<th>GctLibVersionNumber</th>
</tr>
</thead>
</table>

## Constructor Summary

```java
GctLib()
```

## Method Summary

```java
static GctMsg getm(GctLib.StandardMsgSizes size)
Get a new GctMsg object.
```

```java
static GctMsg getm(int len)
```
### Methods

Get a new GctMsg object.

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>static GctMsg <code>getm(int type, int id, int rspReq, int len)</code></td>
<td>Get a new GctMsg object.</td>
</tr>
<tr>
<td>static GctLib.PartitionInfo <code>getPartitionInfo(int partitionId)</code></td>
<td>Gets information about the specified partition.</td>
</tr>
<tr>
<td>static GctMsg <code>grab(short taskId)</code></td>
<td>Non blocking call to receive a new Msg on the identified taskId.</td>
</tr>
<tr>
<td>static boolean <code>isPartitionCongested(int partitionId)</code></td>
<td>Determines whether the native message partition is currently congested.</td>
</tr>
<tr>
<td>static void <code>link()</code></td>
<td>Establishes a link to the GCT environment</td>
</tr>
<tr>
<td>static int <code>pendingMsgs(short taskId)</code></td>
<td>Returns the number of messages queued against the task.</td>
</tr>
<tr>
<td>static GctMsg <code>receive(short taskId)</code></td>
<td>Blocking call waiting to receive a new Msg on the identified taskId.</td>
</tr>
<tr>
<td>static void <code>relm(GctMsg msg)</code></td>
<td>Returns the underlying native Msg resource for reuse.</td>
</tr>
<tr>
<td>static void <code>send(GctMsg msg)</code></td>
<td>Sends the Msg.</td>
</tr>
<tr>
<td>static void <code>send(short taskId, GctMsg msg)</code></td>
<td>Sends the Msg to the identified taskId.</td>
</tr>
<tr>
<td>static void <code>unlink()</code></td>
<td>Closes a link to the GCT environment</td>
</tr>
</tbody>
</table>

**Methods inherited from class java.lang.Object**

`equals`, `getClass`, `hashCode`, `notify`, `notifyAll`, `toString`, `wait`, `wait`, `wait`

### Field Detail

**GctLibVersionNumber**

```java
public static final java.lang.String GctLibVersionNumber
```

**See Also:**

Constant Field Values

### Constructor Detail
GctLib

public GctLib()

### Method Detail

getm

```java
public static GctMsg getm(int type,
                           int id,
                           int rspReq,
                           int len)
   throws GctException
```

Get a new GctMsg object. The returned GctMsg wraps a native GCT message from the nativeGCT message passing environment.

**Parameters:**
- `type` - Set the GctMsg type field to this value
- `id` - Set the GctMsg id field to this value
- `rspReq` - Set the GctMsg rspReq to this value
- `len` - Get a message of at least this length and set the GctMsg len field to this value

**Returns:**
A new GctMsg message wrapping a native Msg

**Throws:**
- `GctException` - If a native Msg could not be allocated

getm

```java
public static GctMsg getm(int len)
   throws GctException
```

Get a new GctMsg object. The returned GctMsg wraps a native GCT message from the native message passing environment. The message parameter area will be at least 'len' bytes long.

**Parameters:**
- `len` - Get a message of at least this length and set the GctMsg len field to this value

**Returns:**
A new GctMsg message wrapping a native Msg

**Throws:**
- `GctException` - If a native Msg could not be allocated

getm

```java
public static GctMsg getm(GctLib.StandardMsgSizes size)
   throws GctException
```

Get a new GctMsg object. The returned GctMsg wraps a native GCT message from the GCT message passing environment. The message parameter area will be at least 320 bytes long.

**Returns:**
A new GctMsg message wrapping a native Msg

Throws:
GctException - If a native Msg could not be allocated

relm

public static void relm(GctMsg msg)
throws GctException

Returns the underlying native Msg resource for reuse. Note: the GctMsg object may be separately disposed of.

Parameters:
msg - The GctMsg to be released

Throws:
GctException - If the underlying native Msg is null or failed to release Msg

send

public static void send(short taskId,
                        GctMsg msg)
throws GctException

Sends the Msg to the identified taskId. Note: This actually sends the underlying native Gct Msg.

Parameters:
taskId - The taskId or moduleId to send the Msg to
msg - The Msg to send

Throws:
GctException - If the native Msg is null or failed to send

send

public static void send(GctMsg msg)
throws GctException

Sends the Msg. The destination taskId is that within the message header Note: This actually sends the underlying native Gct Msg.

Parameters:
msg - The Msg to send

Throws:
GctException - If the native Msg is null or failed to send

receive

public static GctMsg receive(short taskId)

Blocking call waiting to receive a new Msg on the identified taskId. Note: This waits for a native Gct Msg to be received on the given taskId and wraps it in a GctMsg object.
Parameters:
taskId - Task Id to wait for a message on.

Returns:
GctMsg

grab
public static GctMsg grab(short taskId)
Non blocking call to receive a new Msg on the identified taskId. If there are no messages waiting then this function returns immediately. Note: This wraps the native Msg in a GctMsg object.

Parameters:
taskId - Task Id to wait for a message on.

Returns:
GctMsg or null

link
public static void link()
Establishes a link to the GCT environment

unlink
public static void unlink()
Closes a link to the GCT environment

isPartitionCongested
public static boolean isPartitionCongested(int partitionId)
Determines whether the native message partition is currently congested.

Parameters:
partitionId - The message partition to check

Returns:
True if congested, otherwise false.

getPartitionInfo
public static GctLib.PartitionInfo getPartitionInfo(int partitionId)
throws GctException

Gets information about the specified partition.

Parameters:
partitionId - The native message partition for which information is requested.

Returns:
PartitionInfo instance
pendingMsgs

public static int pendingMsgs(short taskId)
Returns the number of messages queued against the task.

Parameters:
taskId - The task Id for which the number of pending messages is requested.

Returns:
The number of pending messages.

C.4 com.dialogic.signaling.gct - Class GctLib.PartitionInfo

java.lang.Object

Enclosing class:
GctLib

public static class GctLib.PartitionInfo
extends java.lang.Object

Field Summary

<table>
<thead>
<tr>
<th>boolean</th>
<th>congStatus</th>
</tr>
</thead>
<tbody>
<tr>
<td>java.lang.Integer</td>
<td>numMsgs</td>
</tr>
<tr>
<td>java.lang.Integer</td>
<td>paramSize</td>
</tr>
<tr>
<td>java.lang.Integer</td>
<td>partitionId</td>
</tr>
</tbody>
</table>

Method Summary

Methods inherited from class java.lang.Object

equals, getClass, hashCode, notify, notifyAll, toString, wait, wait, wait

Field Detail
Dialogic® Distributed Signaling Interface Components - Software Environment Programmer’s Manual Issue 15

partitionId
public java.lang.Integer partitionId

numMsgs
public java.lang.Integer numMsgs

paramSize
public java.lang.Integer paramSize

congStatus
public boolean congStatus

C.5 com.dialogic.signaling.gct -
    Enum GctLib.StandardMsgSizes
java.lang.Object
    java.lang.Enum<GctLib.StandardMsgSizes>
All Implemented Interfaces:
Enclosing class:
GctLib

public static enum GctLib.StandardMsgSizes
extends java.lang.Enum<GctLib.StandardMsgSizes>

<table>
<thead>
<tr>
<th>Enum Constant Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bytes320</td>
</tr>
<tr>
<td>Bytes4200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>static GctLib.StandardMsgSizes.valueOf(java.lang.String name)</td>
</tr>
<tr>
<td>Returns the enum constant of this type with the specified name.</td>
</tr>
</tbody>
</table>
static GctLib.StandardMsgSizes[] values()  
Returns an array containing the constants of this enum type, in the order they are declared.

Methods inherited from class java.lang.Enum
compareTo, equals, getDeclaringClass, hashCode, name, ordinal, toString, valueOf

Methods inherited from class java.lang.Object
getClass, notify, notifyAll, wait, wait, wait

## Enum Constant Detail

**Bytes320**

```java
public static final GctLib.StandardMsgSizes Bytes320
```

**Bytes4200**

```java
public static final GctLib.StandardMsgSizes Bytes4200
```

## Method Detail

**values**

```java
public static GctLib.StandardMsgSizes[] values()
```

Returns an array containing the constants of this enum type, in the order they are declared. This method may be used to iterate over the constants as follows:

```java
for (GctLib.StandardMsgSizes c : GctLib.StandardMsgSizes.values())
    System.out.println(c);
```

**Returns:**
an array containing the constants of this enum type, in the order they are declared

**valueOf**

```java
public static GctLib.StandardMsgSizes valueOf(java.lang.String name)
```

Returns the enum constant of this type with the specified name. The string must match exactly an identifier used to declare an enum constant in this type. (Extraneous whitespace characters are not permitted.)

**Parameters:**
name - the name of the enum constant to be returned.

**Returns:**
the enum constant with the specified name

**Throws:**
java.lang.IllegalArgumentException - if this enum type has no constant with the specified name
java.lang.NullPointerException - if the argument is null

C.6 com.dialogic.signaling.gct - Class GctMsg
java.lang.Object
   └ com.dialogic.signaling.gct.GctMsg
All Implemented Interfaces:
   IMsg

public class GctMsg
extends java.lang.Object
implements IMsg

This class wraps a native Gct Msg and implements the IMsg interface

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<th>Method Summary</th>
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<td>short (dst)</td>
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<td>int (id)</td>
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<td>long (instance)</td>
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<td>java.nio.ByteBuffer (param)</td>
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<tr>
<td>boolean (rspReq)</td>
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<td>short (src)</td>
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<tr>
<td>short (status)</td>
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<tr>
<td>int (type)</td>
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<tr>
<td>void (dst)</td>
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<td>void (id)</td>
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</table>
void `setInstance`(long instance)
Set the instance field value of the message

void `setRspReq`(boolean rspReq)
Set the raw response request field value of the message

void `setSrc`(short src)
Set the source field value of the message

void `setStatus`(short status)
Set the status field value of the message

void `setType`(int type)
Set the type field value of the message

**Methods inherited from class java.lang.Object**
equals, getClass, hashCode, notify, notifyAll, toString, wait, wait, wait

**Method Detail**

`getParam`

public final `java.nio.ByteBuffer` `getParam`() throws GctException
Get parameter area of the message

Specified by:
getParam in interface IMsg

Throws:
GctException

`getType`

public final int `getType`() throws GctException
Get the type field value of the message

Specified by:
getType in interface IMsg

Throws:
GctException

`setType`

public final void `setType`(int type) throws GctException
Set the type field value of the message

Specified by:
setType in interface IMsg

Throws:
GctException

getId

public final int getId()
    throws GctException
Get the id field value of the message
Specified by:
getId in interface IMsg
Throws:
GctException

setId

public final void setId(int id)
    throws GctException
Set the id field value of the message
Specified by:
setId in interface IMsg
Throws:
GctException

getSrc

public final short getSrc()
    throws GctException
Get the source field value of the message
Specified by:
getSrc in interface IMsg
Throws:
GctException

setSrc

public final void setSrc(short src)
    throws GctException
Set the source field value of the message
Specified by:
setSrc in interface IMsg
Throws:
GctException
**getDst**

```java
public final short getDst() throws GctException
```

Get the destination field value of the message

**Specified by:**
getDst in interface IMsg

**Throws:**
GctException

---

**setDst**

```java
public final void setDst(short dst) throws GctException
```

Set the destination field value of the message

**Specified by:**
setDst in interface IMsg

**Throws:**
GctException

---

**getRspReq**

```java
public final boolean getRspReq() throws GctException
```

Get the response request field value of the message

**Specified by:**
getRspReq in interface IMsg

**Throws:**
GctException

---

**setRspReq**

```java
public final void setRspReq(boolean rspReq) throws GctException
```

Set the raw response request field value of the message

**Specified by:**
setRspReq in interface IMsg

**Throws:**
GctException

---

**getStatus**

```java
public final short getStatus() throws GctException
```

Get the status field value of the message

**Specified by:**
getStatus in interface IMsg
Throws:
GctException

setStatus
public final void setStatus(short status)
throws GctException
Set the status field value of the message
Specified by:
setStatus in interface IMsg
Throws:
GctException

getInstance
public final long getInstance()
throws GctException
Get the instance field value of the message
Specified by:
getInstance in interface IMsg
Throws:
GctException

setInstance
public final void setInstance(long instance)
throws GctException
Set the instance field value of the message
Specified by:
setInstance in interface IMsg
Throws:
GctException

C.7 com.dialogic.signaling.gct Interface IMsg
All Known Implementing Classes:
GctMsg

Method Summary

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<td>Type</td>
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<td>void</td>
<td><code>setType(int type)</code></td>
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### Method Detail

**getParam**

```java
java.nio.ByteBuffer `getParam()`
```

**Throws:**
- GctException
```java
int getType() throws GctException

void setType(int type) throws GctException

int getId() throws GctException

void setId(int id) throws GctException

short getSrc() throws GctException

void setSrc(short src) throws GctException

short getDst() throws GctException
```

Throws:
GctException
setDst
void setDst(short dst)
    throws GctException

    Throws:
    GctException

getRspReq
boolean getRspReq()
    throws GctException

    Throws:
    GctException

setRspReq
void setRspReq(boolean rspReq)
    throws GctException

    Throws:
    GctException

getStatus
short getStatus()
    throws GctException

    Throws:
    GctException

setStatus
void setStatus(short status)
    throws GctException

    Throws:
    GctException

getInstance
long getInstance()
    throws GctException

    Throws:
    GctException

getInstance
throws GctException

**Throws:**

GctException