Dialogic®

Dialogic® DSI Protocol Stacks

DTS User Guide

June 2013 **U24SSS**

www.dialogic.com

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Revision History

Issue	Date	Description
10	27-Jun-13	New config.txt commands, DTC store and automatic resend of DTS_CLIENT_REQ, SIU configuration of Routing Requests, Statistics messages and Route on Billing ID.
9	10-Apr-12	DTS Local Subsystem heartbeat configuration added. Updated references to SS7G4x and removed SS7G2x.
8	06-Oct-09	Addition of MAP, INAP and IS41 above DTS for SS7G3x
7	25-Mar-09	Rebranded to Dialogic Changes to support Dialogic® DSI SS7G3xSignaling Server
6	16-Feb-07	Clarification on use of sequence numbers
5	26-Jul-06	Corrections to state handling for RSI
4	31-Jan-06	Further Network Context information and update references to include Dialogic® SS7G2x Signaling Gateway in SIU mode.
3	20-Oct-05	Addition of Network Context based routing.
2	16-Jun-03	Branding changed: Septel PCI now SPCI4/SPCI2S, Septel cP now CPM8 and Septel ISA now PCCS6.
1	07-Sep-01	Initial release

Note: Current software and documentation supporting Dialogic® SS7 protocols is available at: http://www.dialogic.com/support/helpweb/signaling

Contents

Figures

1 Introduction

The Distributed Transaction Server (DTS) is a system for providing the user with a distributed and scalable platform for access to non-circuit related protocols such as MAP, INAP, IS41 or TCAP.

DTS has two modes of operation. These modes are described in this document as Mode A and Mode B for clarity. It is not necessary to specify a mode when using DTS.

Mode A: DTS operates between the SCCP and TCAP layers and distributes SCCP traffic to multiple TCAP hosts (Figure 1: Distributed Transaction Server Architecture).

Mode B: DTS operates above a TCAP-User Module, such as MAP, INAP or IS41, and distributes traffic directly to the application hosts (Figure 2: Distributed Transaction Server Architecture, with MAP traffic distribution).

Each of the hosts may be brought into service or taken out of service without affecting the whole node. Similarly, it is also possible to shutdown and restart one of the server platforms.

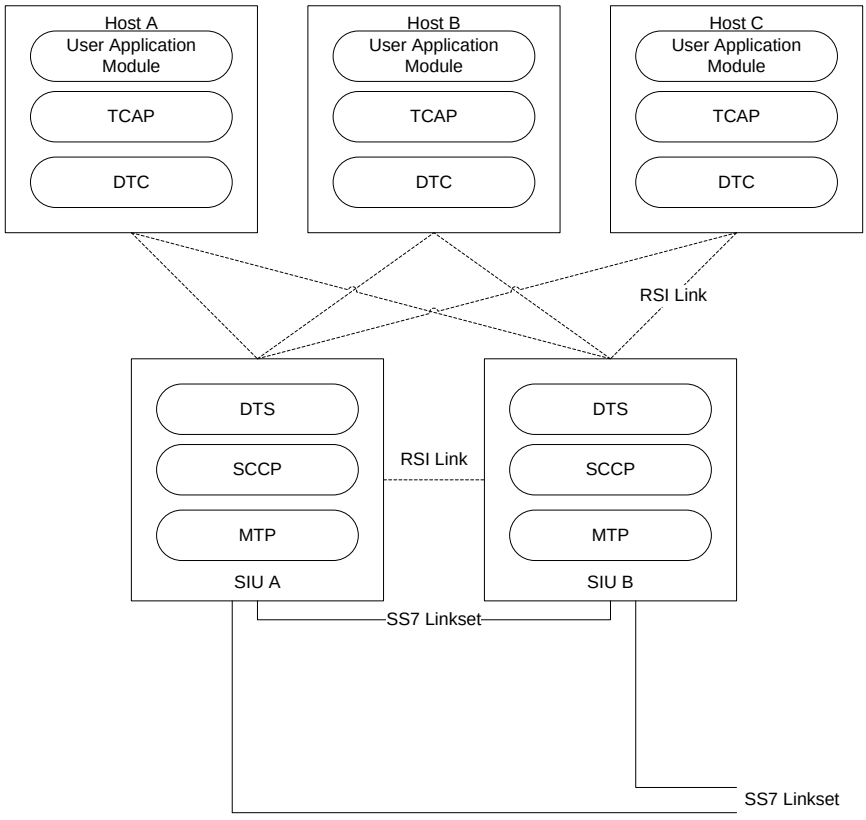

Figure 1: Distributed Transaction Server Architecture, DTS above SCCP (Mode A)

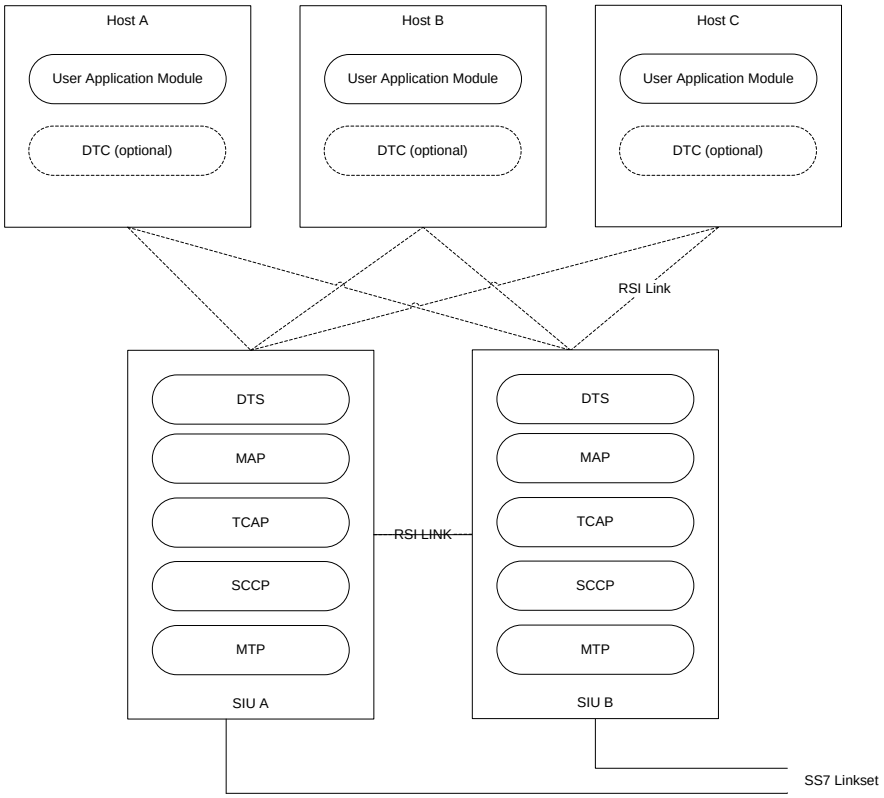

Figure 2: Distributed Transaction Server Architecture, with MAP traffic distribution (Mode B)

The servers are implemented using Dialogic® DSI Signaling Servers in Signaling Interface Unit (SIU) mode, which can be configured to run as a resilient pair.

The system adds two new modules, the Distributed Transaction Server (DTS) and Distributed Transaction Client (DTC). These combine with the SIUs and existing functionality to provide the architecture shown above in Figure 1. When DTS is used in Mode B, as shown by Figure 2, the DTC module is optional.

1.1 Related Documentation

[1] TCAP Programmer's Manual
[2] SCCP Programmer's Manual
[3] INAP Programmer's Manual
[4] Software Environment Programmer's Manual
[5] Dialogic® DSI Signaling Servers SIU Mode User Manual

1.2 Abbreviations

DTC	Distributed Transaction Client
DTS	Distributed Transaction Server
PC	Point Code
RSI	Resilient Socket Interface
SCCP	Signaling Connection Control Part
SIU	Signaling Interface Unit
SSN	Subsystem Number
TCAP	Transaction Capabilities Application Part
TCAP-User	Module which operates above TCAP, such as MAP, INAP or IS41
UDT	SCCP Unit Data Message

2 Distributed Transaction Server

The DTS module is necessary to distribute messages to multiple hosts on behalf of SCCP, (Mode A) or a TCAP-User layer module, such as MAP, INAP or IS41 (Mode B). It appears to SCCP or the TCAP-User module to be a single module above it.

An incoming message from the network to DTS that is the beginning of a new dialog will be sent to a client selected from those that are active. A further step may be taken where a suitable client is selected depending on the called party address within the message. Subsequent messages for existing dialogs will be sent to the same client as long as it is still available.

Messages from the client are passed down transparently to SCCP or TCAP-User layer from DTS.

In order for the server to identify the available clients, a set of management messages have been developed specifically for DTS. These are:

- A message from the client to the server indicating that it is available to receive new dialogs.
- A message from the client to the server indicating that a client is able to receive messages intended for any subsystem in a particular network context.
- A message from the client to the server indicating that a client is able to receive the messages intended for a particular subsystem and network context.
- A message from the client to the server indicating that although active, no new dialogs should be sent to it but existing dialogs should be maintained.
- A message from the client to the server indicating that the client has instantly become unavailable.

For details of these messages refer to section 7.1

2.1 Active Client Selection

This method simply selects a client from the list of active clients in ascending order to handle each new dialog received.

A DTS_CLIENT_REQ message (section 7.1.1) is needed to inform DTS the client is active. This can be sent by S7_MGT or the user application if required. This is all that is required to enable Active Client Selection.

2.2 Client Specific Routing

This method selects clients depending on the Subsystem Number (SSN) and / or Network Context (NC) in the incoming message called party address, as well as the client state.

A DTS_CLIENT_REQ message (section 7.1.1) is needed to inform DTS the client is active.

By using DTS_ROUTING_REQ messages (section 7.1.3), DTS can be configured to direct all incoming messages for a specified NC or NC plus SSN combination to a particular client or group of clients, called a Client Selection Group. The DTS_ROUTING_REQ parameters and options are described in the following sections, followed by an example (see Figure **3**: Client Specific Routing)

2.2.1 Route Enabling and Disabling

The Request Type Octet in the DTS_ROUTING_REQ provides the ability to enable or disable routing to a particular client within a selection group. Routing can only be disabled if it is already enabled by a previous request.

If routing to a client within a selection group is disabled, then no incoming messages with the particular routing key shall be directed to that client. The next client in the group will be selected instead. If it is re-enabled by a DTS_ROUTING_REQ message, then it will be included again.

2.2.2 Client Sequence Number

Whenever a DTS_ROUTING_REQ message is received, the message must include a sequence number. This number will determine the position of the client in the selection group. The sequence number **must** be unique within the group (i.e. different for each client)

Clients will usually send DTS_ROUTING_REQ messages at startup but they can be sent or re-sent at any time, allowing existing requests to be updated. Therefore DTS can receive DTS_ROUTING_REQ in any order from any client. Sequence numbers must be unique but may be received in any order.

2.2.3 Routing Options

DTS has two methods to select a client from a Client Selection Group:

Strict Rotation
The method is round-robin selection of the clients in instance order.

Preferred Order
This method works by always selecting the first available client in the selection group. The same client will always be selected as long as it remains active and enabled. If heartbeats are enabled then the subsystem must also be active (i.e. heartbeats being received) in order for the client to be selected.

This selection method creates an active/standby system whereby if there is a problem with the current initial active client, the next active client in the selection group will be used.

2.2.4 Default Routing Key

The DTS_ROUTING_REQ message can also be used to configure a default routing key. This works in one of two ways, depending upon the other routing requests that exist for the same NC:

- When there are no routing requests with a SSN specified then all incoming messages for the NC will be sent to the particular client or group of clients.
- When there are routing requests with a SSN specified then received messages with a different or missing SSN will be sent to the client or group of clients.

A default routing key is configured by sending a DTS_ROUTING_REQ message without a SSN parameter or with an SSN of 0. A default routing key may be configured for each NC.

Note: For a NC, if there are no default routing keys but there are routing requests with SSN configured, then any messages received that do not match the SSN will not be routed and will be discarded.

2.2.5 DTS User-in-Service Heartbeats

When heartbeats are enabled for a client a heartbeat message for each subsystem must be sent to DTS at least once every 30 seconds (every 15 seconds is recommended). If the heartbeat is not received DTS will consider the subsystem on that client to be inactive and routing decisions will be affected accordingly. New dialogs will not be directed to inactive subsystems, however existing dialogs will still be sent to the same client subsystem.

If a default routing key is defined and heartbeats are enabled, then a heartbeat for any SSN from the client will act as the heartbeat to keep default routing active. The SCCP User In Service (UIS) request, which is sent to SCCP via DTS is used as the heartbeat message (see message reference section 7.1.6)

2.2.6 Client Specific Routing Example

Figure 3 shows an example of 3 routing keys. The first key will select clients in strict order; the remaining 2 keys will select clients in preferred order.

The clients within each selection group are selected in sequence number order and not by the client Id.

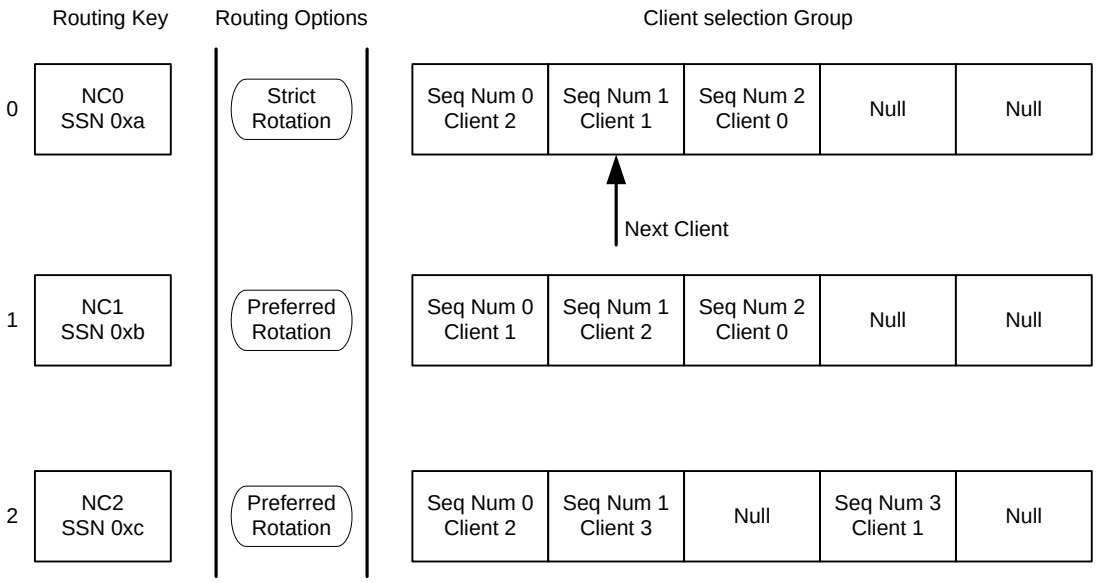

Figure 3: Client Specific Routing

3 Distributed Transaction Client

The Distributed Transaction Client module (DTC) is required when using DTS to distribute SCCP traffic to multiple TCAP hosts (Mode A).

When distributing MAP/INAP/IS41 traffic (Mode B), use of DTC is optional but recommended since it will monitor the RSI indications to detect RSI recovery (a likely SIU restart) and automatically resend the DTS client request.

3.1 General Operation

DTC runs on the host and works in conjunction with the DTS module on the SIU. One DTC is required on each client host machine.

The server status is determined by the state of the RSI link to that server so the DTC module requires the RSI link status indications to be sent to it. It also allows these status messages to be forwarded on to another module.

The DTC module has command-line options to display the messages it sends and receives which can be useful for checking its operation.

3.1.1 Operation in Mode A

In mode A DTC runs on the host below the TCAP module, allowing TCAP to be restarted independently of the lower layers. There are no issues with dialog id ranges in this mode, since each host runs its own TCAP and uses transaction ids in the SCCP messages sent to DTS on the server.

In Mode A DTC maintains a map of server states in order to ensure messages are only sent to active servers and it also balances the load between them. TCAP sends messages to DTC which are then forwarded to DTS on an available server and then DTS forwards the message to SCCP.

3.1.2 Operation in Mode B

In Mode B DTC optionally runs on the host, although traffic bypasses DTC and is sent directly to the DTS module. In this mode it is up to the application to determine which server to send traffic to, based upon the RSI and/or DTS_CLIENT_CONF indications. It is also important to configure specific outgoing dialog id ranges for each protocol (MAP, INAP or IS41) in use on each host so that the outgoing dialog ids are always unique.

3.2 DTC Distribution

The DTC module required for each host is distributed as part of the DSI Development Package for the specific host operating system.
Included are the following files:

- DTC binary module (e.g. dtc.exe)
- DTS include file (dts_inc.h)

4 Configuration

4.1 System Configuration

The following system configuration assumes the use of dual resilient SIUs with two or more connected host systems.

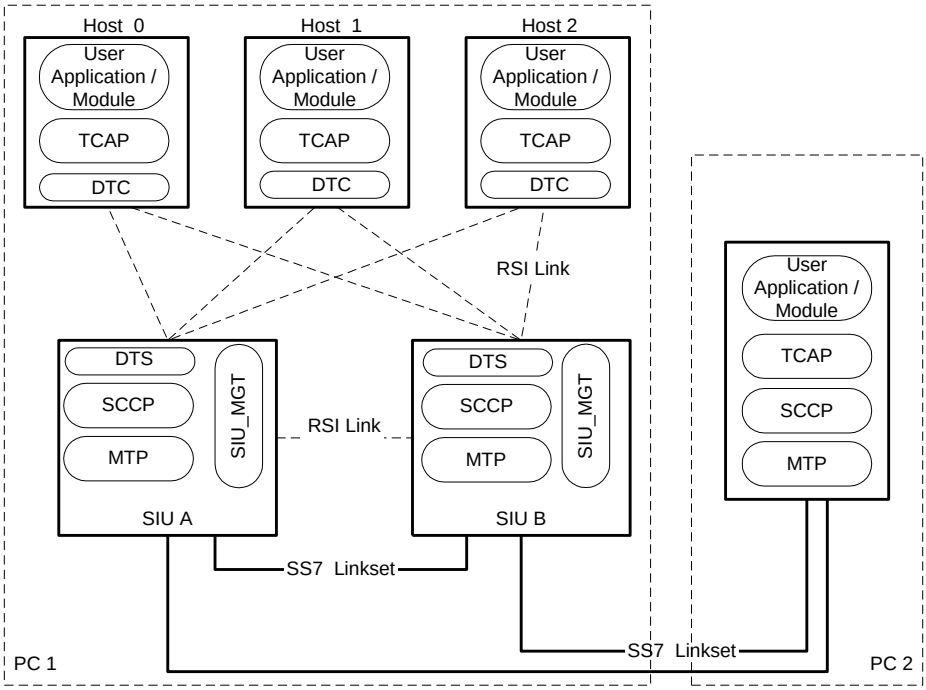

Figure 4: Example DTS System Configuration (Mode A – DTS above SCCP)

4.2 SIU Configuration

DTS will function correctly with a single SIU or as a dual resilient pair. For further information on this configuration, see the appendix *SIU Resilience* in the Dialogic® DSI Signaling Servers SIU Mode User Manual.

The SIU must be appropriately licensed to allow the use of SCCP in Mode A, and SCCP, TCAP and the required TCAP-User protocol(s) (MAP/INAP/IS41) in Mode B.

4.3 Host RSI Configuration

As for all SIU hosts, the Resilient Socket Interface (RSI) is used to handle message passing to and from the SIU. In both Mode A and Mode B DTC (module id 0x0d) should be used as the concerned module ID in the *rsicmd* command-line used to initialize RSI in the system.txt file.

In Mode B if DTC is not used, the concerned module ID should be that of the user application.

The <rem_port> parameter must be set correctly for the host,
i.e. 9000 + host id
The host id should also be used as the TCAP instance ID (see section 4.6.1).

Syntax

rsicmd <siu_id> <conc_id> <link_type> <rem_addr> <rem_port>

Example

SIU A – IP address 123.123.123.100

SIU B – IP address 123.123.123.101

Host 0

FORK_PROCESS ./rsicmd 0 0x0d 0 123.123.123.100 9000

FORK_PROCESS ./rsicmd 1 0x0d 0 123.123.123.101 9000

Host 1

FORK_PROCESS ./rsicmd 0 0x0d 0 123.123.123.100 9001

FORK_PROCESS ./rsicmd 1 0x0d 0 123.123.123.101 9001

Parameters

<siu_id>

The local logical identifier to identify each link from the host to each SIU,
i.e. 0 for SIU A and 1 for SIU B.

<conc_id>

Specifies a module ID that will receive a status message whenever the RSI link state changes (see section 7.1.5).

<link_type>

Must be set to 0.

<rem_addr>

Specifies the IP address of the SIU, as specified in the SIU configuration.

<rem_port>

Specifies the TCP/IP socket port that is used to communicate with the SIU. Each host uses a different port number, starting at 9000 for the first host (host id 0) and incrementing by one for each additional host.

Hence host id 4 uses port 9004. If there is only one host, port 9000 should be used.

4.4 DTC Configuration Commands

The DTC configuration commands to use in config.txt on the host are:

- **DTC_CONFIG** – Configure DTC
- **DTC_SSR** – DTC Subsystem Resource
- **DTS_SERVER** - Send DTS_CLIENT_REQ to DTS

S7_MGT processes config.txt and sends the configuration messages to DTC and DTS. This method should be used in preference to sending the configuration messages to the modules, as required for earlier releases.

4.4.1 DTC_CONFIG – Configure DTC

Synopsis

The DTC_CONFIG command supplies the global configuration parameters for the DTC protocol and sets the user module to receive RSI indications.

This command may be used in Mode A and Mode B.

Syntax

DTC_CONFIG <num_servers> <server_selection> <host_number> <rsi_status_user_id> <options>

Example

DTC_CONFIG 2 0 0 0xef 0x0003

Parameters

The DTC_CONFIG command includes the following parameters:

<num_servers>

Number of servers in the system.

<server_selection>

The selection mechanism used by DTC to select which server to be used. The defined values for server selection mechanism are:

Value	Mnemonic	Description
0	**DTC_SELECT_SEQ**	Selects available servers in a sequential order
1	**DTC_SELECT_REV_SEQ**	Selects available servers in a reverse sequential order

<host_number>

The host number, which should be unique across hosts.

<rsi_status_user_id>

Module ID to forward RSI link status messages to (i.e. the user application)

<options>

16 bit options field to configure DTC run time options as shown below:

Option	Value	Description
DTC_ROUTE_MSG_VIA_DTS	0x0001	Set this bit to 1 for backwards compatibility. When set to 0 routes messages to SCCP directly (not recommended).
DTC_AUTO_RESEND	0x0002	DTC to store the latest client request and resend to DTS automatically on RSI recovery.

4.4.2 DTC_SSR – 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.

This command is applicable to Mode A only.

Syntax

DTC_SSR <ssr_id> LSS <local_ssn> <module_id> <reserved> <protocol>

Example

DTC_SSR 1 LSS 0x07 0x1d 0 TCAP

Parameters

The DTC_SSR command includes the following parameters:

<ssr_id>

A unique ID for the SSR.

<local_ssn>

The local subsystem number as defined by the SCCP protocol.

<module_id>

The module identifier of the user application on the host computer that implements the local subsystem.

<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.

4.4.3 DTS_SERVER – Send DTS_CLIENT_REQ to DTS

Synopsis

This command removes the need for the user application to send a DTS_CLIENT_REQ (0x776a) message to DTC (which it forwards to DTS).

Existing applications and scripts that send the DTS_CLIENT_REQ may still be used instead, but for new installations it is recommended that the DTS_SERVER command be used, causing S7_MGT to send the DTS_CLIENT_REQ, with the request octet set to DTS_CLIENT_STARTUP.

When the DTC_AUTO_RESEND option is specified in the DTC_CONFIG options, DTC will store the latest DTS_CLIENT_REQ sent to each server.

If the RSI link or SIU should fail, when it recovers DTC will resend the saved DTS_CLIENT_REQ automatically. This removes the need for the user application to monitor the RSI link and perform this action.

This command may be used in Mode A and Mode B

Syntax

DTS_SERVER <server> <options>

Example

```
DTS_SERVER      0       0x0000
DTS_SERVER      1       0x0000
```

Parameters

The DTS_SERVER command includes the following parameters

<server>

The server parameter maps to the message Instance and is the id of the server

<options>

The options parameter maps directly to options field of the DTS_CLIENT_REQ message:

Option	Value	Description
DTS_CRO_REQUIRE_UIS	0x0001	Enable DTS UIS Heartbeats for this client

4.5 DTC Command Line Arguments

The module takes a number of run time options, which are summarized below. These include options for tracing the program as it progresses.

Option	Default	Notes
-m	0x0d	DTC module ID.
-d	0x001f	Display Options Add together required values for tracing options.

The value for the display options should be the sum of the values given below:

Display Option	Value	Notes
DTC_DISP_TX	0x0001	Trace messages sent
DTC_DISP_RX	0x0002	Trace messages received
DTC_DISP_ERROR	0x0004	Trace errors
DTC_DISP_MGMT	0x0008	Trace client management requests and confirmations
DTC_DISP_STATUS	0x0010	Trace messages sent

Example

FORK_PROCESS ./dtc –m0x0d –d0x001c

4.6 Host Protocol Configuration

4.6.1 TCAP

When TCAP is present on the host system (Mode A), the module should follow the normal configuration as described, with the following exceptions.

When configuring TCAP using S7_MGT, the TCAP_CONFIG <tcap_inst> parameter should be set to match the host number, and the <max_instance> parameter should be set to the total number of TCAP systems.

TCAP_CONFIG <base_ogdlg_id> <nog_dialogues> <base_icdlg_id> <nic_dialogues> <options> <dlg_hunt>[[<addr_format>] <partner_id> **<tcap_inst>** [**<max_instance>**]]

Note: When configuring using messages, the field **nsap_id** which would normally contain the module ID for SCCP should contain the module ID defined for the DTC module (usually 0x0d). The field **tcap_instance** should be set to match the host number. The instance value must be unique across hosts. If more than 16 hosts are used, the **tid_ninst**, **tid_ndref** and **tid_nseq** should be set to 8, 16 and 8 respectively.

4.6.2 TCAP User Layers

No changes to existing configuration of the protocol modules such as MAP, INAP and IS41 are required.

4.7 SIU Protocol Configuration

The following configuration guidelines show how the SIU(s) should be configured.

4.7.1 MTP/M3UA

The configuration of the MTP/M3UA layer should be performed via the config.txt file in accordance with the normal procedures for a dual resilient configuration. See the *Dialogic® DSI Signaling Servers SIU Mode User Manual* for more information.

4.7.2 SCCP

The configuration of the SCCP layer is also performed in the config.txt file. In Mode A (DTS above SCCP), the local subsystems configuration should define each subsystem as using the DTC module id (0x0d) and <protocol> as DTS even though TCAP, and MAP/INAP/IS41 are running on the host system.

Syntax

SCCP_SSR [<nc_id>] <ssr_id> LSS <local_ssn> <module_id> <lss_flags> <protocol>

Example (Mode A)

SCCP_SSR 1 LSS 0x08 0x0d 0x0000 DTS

SCCP_SSR NC1 2 LSS 0x0a 0x0d 0x0000 DTS

If DTS is distributing TCAP-User Layer messages (Mode B), the <protocol> parameter should indicate the type and be prefixed by 'DTS-'
The <module_id> parameter should reflect the module ID of the user application on the host.

Note: Module ids for host based user application need to be '0x*n*d' where n is in the range 1 to f. DTC (if used) is usually 0x0d.

Example (Mode B)

SCCP_SSR 2 LSS 0x08 0x1d 0x0000 DTS-MAP

SCCP_SSR 3 LSS 0xfc 0x2d 0x0000 DTS-INAP

SCCP_SSR 4 LSS 0x09 0x3d 0x0000 DTS-IS41

Note: In Mode B the module id of the first local subsystem declared shall be used as the host module id for traffic routed by the default routing key (e.g. in the above case default routing key traffic will be sent to 0x1d on the host and is expected to be MAP traffic). If multiple network contexts are used the first module id for each network context will be used for this purpose.

4.7.3 TCAP and TCAP-User Module Configuration

When DTS distributes TCAP-User messages (Mode B), modules above SCCP should be configured in the normal manner. The SIU will configure the relevant TCAP-User module to route traffic through DTS.

4.8 DTS Configuration

The DTS module is configured automatically by the SIU whenever the config.txt file includes an SCCP_LSS command with the <protocol> parameter set to an appropriate DTS value.

However, the number of DTS hosts and module options may be specified with the optional DTS_CONFIG command.

Synopsis

The DTS_CONFIG command provides the ability to control the parameters of the DTS module.

Syntax

DTS_CONFIG <num_hosts> <options>

Example

DTS_CONFIG 32 0x0001

Parameters

<num_hosts>

The maximum number of DTS hosts which will receive traffic from DTS. When this command is omitted this value defaults to 16 hosts.

Note: When routing by Billing ID the number of the hosts should be set accurately to optimize the routing algorithm. Specifying a larger value than the actual number of hosts used will result in more dialogs being sent to a different host when the number of available hosts is changing.

<options>

Set bit 0 to enable routing by Billing ID (DTS_OPT_RT_ON_BILLINGID)

4.8.1 DTS Routing Request Configuration

The config.txt command CNDRI enables the configuration of routing requests on the SIU rather than (or in addition to) those sent by the clients.
This enables all routing requests to be configured centrally on the SIU and in the case of the SIU restarting the requests will be present and do not have to be resent by the clients, making the host application simpler.

Synopsis

Command to configure a DTS Routing Request

Syntax

CNDRI:drid=,hostid=,[nc=,][ssn=,][clseq=,][options=,][label=];

Examples

CNDRI:drid=0,hostid=0;
CNDRI:drid=1,hostid=1,nc=NC1,ssn=8;
CNDRI:drid=2,hostid=1,ssn=6,clseq=1,options=0x0001,label=User App 1;

Parameters

drid
A DTS routing request id to uniquely identify a particular DTS routing request. An integer in the range 0-4095

NC
SS7 Network Context. This parameter identifies the SS7 network in which the SSN exists. Supported values are: NC0, NC1, NC2 or NC3.
When the parameter is omitted, a value of NC0 is assumed.

hostid
Logical identifier to identify each link from the SIU to a Client Host. Host 0 is on Link 0 and so on. An integer in the range 0-127.

SSN
Subsystem Number to match in called party address of incoming message. If unspecified (or zero) then this configures a default routing key, used when no match occurs with any other SSN defined. An integer in the range 0-255.

clseq
The client sequence number within a client selection group (all routing requests that have the same NC+SSN combination). MUST be unique within the client selection group. An integer in the range 0-127.

options
Routing options for the DTS routing request – this is used to select 'strict routing' or 'preferred order'.

label
A text string up to 32 character long.

5 Application Considerations

5.1 Mode A Applications

When using Mode A (distributing SCCP traffic) DTC monitors the RSI indications to track of the state of each SIU. This is used along with the server selection method to determine which SIU to send traffic to.

Note: All messages received by the user application (including RSI indications and DTS_CLIENT_CONF messages below) must be released back to the GCT environment.

5.1.1 RSI Indications

User applications can receive the RSI status indications from DTC by setting the <rsi_status_user_id> parameter in the DTC_CONFIG command. For outgoing dialogs the user application can use the RSI indications to determine when one or more servers are available and therefore when to send traffic to DTC. When handling incoming dialogs only, this is not necessary since in order to receive a dialog, the RSI link must be UP.

For details of the RSI status indications see section 7.1.5

5.1.2 DTS_CLIENT_REQ message

The user application or S7_MGT can send the DTS_CLIENT_REQ to DTC, which forwards the message to DTS. DTC can be configured to store the message and resend it to DTS on RSI link recovery, so the user application need not perform this operation. In summary the following configurations are possible, with the first option recommended:

- S7_MGT sends DTS_CLIENT_REQ to DTC which has been configured to store the message and resend it to DTS on RSI link recovery.
- User application sends initial DTS_CLIENT_REQ to DTC which has been configured to store the message and resend it to DTS on RSI link recovery.
- User application must monitor RSI indications and send DTS_CLIENT_REQ to DTC each time the RSI state changes to UP.

5.1.3 DTS_CLIENT_CONF message

DTS responds to the DTS_CLIENT_REQ with a DTS_CLIENT_CONF message which in Mode A is sent back to DTC which forwards it to the configured management module.

The user application can be configured as the management module using the MGMT_MOD_ID command in config.txt. The user application could use this DTS_CLIENT_CONF indication to initiate sending of outgoing dialogs to DTC.

5.2 Mode B Applications

When using Mode B (distributing MAP/INAP/IS41 traffic), the application has additional responsibilities, including selection of server to send traffic to and dialog id ranges used.

Note: All messages received by the user application (including RSI indications and DTS_CLIENT_CONF messages below) must be released back to the GCT environment.

5.2.1 RSI Indications

Where DTC is used, user applications can receive the RSI status indications from DTC by setting the <rsi_status_user_id> parameter in the DTC_CONFIG command. If DTC is not used, RSI indications can be sent to the user application by configuring the module id in the *rsicmd* (see section 4.3)

The user application should use the RSI indications to determine if the SIU is available prior to sending traffic. For details of the RSI status indications see section 7.1.5

5.2.2 DTS_CLIENT_REQ message

In Mode B the use of DTC is optional so users can configure any of the following, with the first option recommended:

- **DTC present** – S7_MGT sends DTS_CLIENT_REQ to DTC which has been configured to store the message and resend it to DTS on RSI link recovery.
- **DTC present** – User application sends initial DTS_CLIENT_REQ to DTC which has been configured to store the message and resend it to DTS on RSI link recovery.
- **DTC not present** – User application must monitor RSI indications and send DTS_CLIENT_REQ to DTS each time the RSI state changes to UP.

5.2.3 DTS_CLIENT_CONF message

DTS_CLIENT_CONF is sent back to the module that sent the DTS_CLIENT_REQ, which can be the user application or DTC (see above).

This relies upon a redirects within the SIU system.txt so a user application module id needs to be '0x*n*d' where n is 1 to f (DTC is usually 0x0d).

The user application can be configured as the management module using the MGMT_MOD_ID command in config.txt. The user application could use this DTS_CLIENT_CONF indication to initiate sending traffic to DTS.

5.2.4 Sending/Receiving Traffic

In Mode B even when DTC is present traffic must be sent directly to DTS (module 0x30) on the selected SIU rather than directly to the MAP/INAP/IS41 module.

The message is directed to a particular SIU by setting the Instance field in the message header. The user application should call GCT_set_instance() to set the server number prior to sending the message.

The user application host module ids are configured on the SIU in config.txt, so incoming messages from DTS will arrive at the user application directly, not via DTC. On reception of a message from an SIU a call to GCT_get_instance() will retrieve the Instance field, identifying which SIU the message came from.

5.2.5 Use of Dialog IDs

In Mode B when DTS distributes traffic to more than one Host system, care should be taken when initiating new dialogs from the user application. Multiple hosts must not attempt to use the same Dialog ID. Using separate, non-overlapping dialog ranges is recommended.

5.2.6 Default routing key

In Mode B where a default routing key is defined the module id from the first SCCP_LSS declared in the config.txt file on the SIU shall be used as the host module id for traffic routed by the default routing key. If multiple network contexts are used the module id of the first SCCP_LSS defined for each network context will be used for this purpose.

5.3 DTS Routing Requests

For both modes DTS_ROUTING_REQ may be sent by the user application or script. On RSI link recovery the DTS_ROUTING_REQ need to be resent since a host cannot easily tell the difference between an RSI link failure and a full SIU restart, when routing requests will have been lost.

To simplify user applications, all DTS_ROUTING_REQ can be configured centrally on the SIU using CNDRI (see section 4.6). These requests will then be present and ready for routing traffic as soon as the SIU starts and DTS_CLIENT_REQs are received.

6 Operation

6.1 Startup Sequence

The following section describes a recommended startup sequence for DTS-based systems.

- Restart SIU units
- On each host
  - Start host GCT environment (including Host protocol modules and DTC)
  - Send DTS_CLIENT_REQ (or sent by S7_MGT)
  - Optionally send DTS_ROUTING_REQ messages (or pre-configure on SIU with CNDRI)
  - Begin traffic operation

6.2 DTS/DTC Message Handling

6.2.1 Mode A protocol messages

In Mode A, the following protocol messages are handled:

- SCCP Messages

SCP_MSG_TX_REQ	0xc740
SCP_MSG_SCMG_REQ	0xc744
SCP_MSG_RX_IND	0x8742
SCP_MSG_SCMG_IND	0x8745

6.2.2 Mode B protocol messages

In Mode B, the following protocol messages are handled:

- INAP Messages

INAP_MSG_SRV_REQ	0xc7f0
INAP_MSG_DLG_REQ	0xc7f2
INAP_MSG_SRV_IND	0x87f1
INAP_MSG_DLG_IND	0x87f3

- MAP Messages

MAP_MSG_SRV_REQ	0xc7e0
MAP_MSG_DLG_REQ	0xc7e2
MAP_MSG_SRV_IND	0x87e1
MAP_MSG_DLG_IND	0x87e3

- IS41 Messages

IS41_MSG_SRV_REQ	0xc7b0
IS41_MSG_DLG_REQ	0xc7b2
IS41_MSG_SRV_IND	0x87b1
IS41_MSG_DLG_IND	0x87b3

6.2.3 Messages from the Client

- **Mode A**: SCCP messages from the client are passed through DTS transparently to SCCP for the specified NC, the message source remaining unchanged.
- **Mode B**: MAP/INAP/IS41 messages from the client are passed through DTS transparently to the respective protocol module, the module source remaining unchanged. DTS maintains a table of dialog ids so that the client that initiates a new outgoing dialog will be the receiver of incoming responses for the same dialog id.

6.2.4 Messages to the Client

New Dialogs

- **Active Client Selection**
  The message will be sent to an active client selected simply by client availability.
- **Route on Billing ID**
  If Route on Billing ID is enabled and the message passes specific checks (originating SSN=8 and Billing ID present) then the client will be selected based upon the Billing ID only. This is so that multiple dialogs containing the same Billing ID are processed by the same host.
- **Client Specific Routing**
  If there are routing requests in effect then the called party address is extracted from the incoming message and if there is a match against a routing key then an active client from the client selection group for the routing key will be selected, according to the method configured (strict or preferred).
- **Mode B:** the selected host is stored against the dialog id in the dialog id table.

Existing Dialogs

- **Mode A**: the destination transaction id can be extracted from the message of which the low order bits will contain the host id.
- **Mode B**: the dialog id will be used to look up the host id in the dialog id table.

6.2.5 SCCP Management Messages

the SCP_MSG_SCMG_IND (0x8745) indication is passed up to all clients in the "startup" or "shutdown-prepare" state.

6.3 Summary of DTS message handling

The tables below summarize the information provided in the previous sections with reference to how messages received by the DTS module are handled. Where it is stated that a message is ignored, the message may still be traced if this is activated via the message/MMI/web interface.

For messages to be routed to clients using Client Specific Routing, the clients must be in the "startup" state and routing must be enabled for the clients in the selection groups. If the clients in the selection group are enabled, but have not been put in the "startup" state by way of a DTS_CLIENT_REQ message, then new dialogs will not be routed to the clients.

If client is in "startup" state:

Incoming message to Server	Result
STARTUP message from client	Client already at “startup” – the message is ignored.
SHUTDOWN_PREPARE from client	Client set to “shutdown-prepare” state – no new dialogs.
SHUTDOWN from client	Client set to “shutdown” state – no messages will be sent to the client, nor will any be accepted from the client by the server.
DTS_ROUTING_REQ from client	Message accepted
SCCP management request from user	Passed transparently to SCCP.
SCCP management indication from SCCP	Passed up to client with the next instance ID that is not in the “shutdown” state.
Link status message from RSI – link down	Client is assumed to be in “shutdown-prepare” state and will remain so until a startup message is received.
Link status message from RSI – link up	No effect in server – waiting for startup message.

If client is in "shutdown-prepare" state:

Incoming message to Server	Result
STARTUP message from client	Client is available to receive new dialogs.
SHUTDOWN_PREPARE from client	Client already set to “shutdown-prepare” state – message is ignored.
SHUTDOWN from client	Client set to “shutdown” state – no messages will be sent to the client, nor will any be accepted from the client by the server.
SCCP management request from user	Passed transparently to SCCP.
SCCP management indication from SCCP	Passed up to client with the next instance ID that is not in the “shutdown” state.
Link status message from RSI – link down	Client already at “shutdown-prepare” – the message is ignored.
Link status message from RSI – link up	No effect in server – waiting for startup message.

If client is in "shutdown" state:

Incoming message to Server	Result
STARTUP message from client	Client is available to receive new dialogs.
SHUTDOWN_PREPARE from client	Client set to “shutdown-prepare” state – no new dialogs.
SHUTDOWN from client	Client already set to “shutdown” state - the message is ignored.
SCCP management request from user	Server will not accept messages from clients in “shutdown” state – the message is ignored.
SCCP management indication from SCCP	Passed up to client with the next instance ID that is not in the “shutdown” state.
Link status message from RSI – link down	Client already set to “shutdown” state - the message is ignored.
Link status message from RSI – link up	No effect in server – waiting for startup message.

6.3.1 DTS Routing Request Message Handling

The tables below summarize the processing of DTS_ROUTING_REQ messages. Any subsystem numbers used are for example only.

If no routing keys exist:

Incoming DTS_ROUTING_REQ message to Server	Result
Enabled, strict routing, routing request message	New key created, strict routing, with single client in selection group.
Enabled, preferred order, routing request message	New key created, preferred order, with single client in selection group.
Disabled, strict routing, routing request message	No key created
Disabled, preferred order, routing request message	No key created
Any other message	Result as specified in section 6.3

If strict routing, default routing key (SSN = 0) exists:

Incoming DTS_ROUTING_REQ message to Server	Result
Enabled, strict routing, routing request message (SSN = 0)	New client added to selection group.
Enabled, preferred order, routing request message (SSN = 0)	Client not added to group – mismatched routing option.
Disabled, strict routing, routing request message (SSN = 0)	Client disabled within selection group.
Disabled, preferred order, routing request message (SSN = 0)	Client will not be disabled within group – mismatched routing option.
Incoming messages for TCAP	Will be routed via enabled clients within selection group of default routing key.
Any other message	Result as specified in section 6.3.

If strict routing, specific routing key (SSN = 0x10 and NC = 0) exists:

Incoming DTS_ROUTING_REQ message to Server	Result
Enabled, strict routing, routing request message (SSN = 0x10 and NC = 0)	New client added to selection group.
Enabled, preferred order, routing request message (SSN = 0x10 and NC = 0)	Client not added to group – mismatched routing option.
Disabled, strict routing, routing request message (SSN = 0x10 and NC = 0)	Client disabled within selection group.
Disabled, preferred order, routing request message (SSN = 0x10 and NC = 0)	Client will not be disabled within group – mismatched routing option.
Incoming messages for TCAP (SSN = 0x10 and NC = 0)	Will be routed via enabled clients within selection group of specific routing key.
Incoming messages for TCAP (SSN other than 0x10 and NC = 0)	Will be routed using default routing key if it exists, otherwise message will **NOT** be routed
Any other message	Result as specified in section 6.3.

7 Message Reference

7.1 Client Messages

7.1.1 DTC Configuration Message (DTC_MSG_CONFIG)

Message sent from the user to configure the Distributed Transaction Client module.

Note: It is recommended that DTC configuration be performed with the DTC_CONFIG command in config.txt (see section 4.4)

Message Format:

MESSAGE HEADER		
Field Name		**Meaning**
type		**DTC_MSG_CONFIG** (0x776c)
id		0
src		**user module**
dst		**DTC_TASK_ID**
rsp_req		May be used to request a confirmation
hclass		0
status		0
err_info		0
len		40
PARAMETER AREA		
Offset	**Size**	**Name**
0	1	**cnf_ver** - must be set to zero
1	1	**sccp_id** – SCCP module ID
2	1	**tcap_id** – TCAP module ID
3	1	**dts_id** – Distributed Transaction Server module ID
4	1	**mgmt_id** – Management module ID
5	1	**rsi_status_id** – Module ID to which RSI link status messages are forwarded
6	1	**num_servers** – Number of servers in system
7	1	**server_selection** - Server selection mechanism
8	2	**options** – Run time options
10	30	**reserved** – set to zero

Description:

This message is used to configure each DTC module for correct operation with the DTS modules on the SIUs. It should be the first message sent to the DTC module and should precede the starting of the RSI link.

Parameter area contents:

cnf_ver

The version of the client configuration message. Currently, only version 0 is defined.

sccp_id
Module identifier defining the destination module ID for messages to the SCCP task.

tcap_id
Module identifier defining the destination module ID for messages to the TCAP task.

dts_id
Module identifier defining the module ID for the DTS module (typically 0x30).

mgmt_id
Module identifier defining the module ID to which module status and error messages are sent.

rsi_status_id
Module identifier defining the module ID to which RSI link status messages received should be sent.

server_selection
Set to indicate what kind of selection mechanism should be used by the DTC module in determining which server to use. The defined values for server selection mechanism are:

Value	Mnemonic	Description
0	**DTC_SELECT_SEQ**	Selects available servers in a sequential order
1	**DTC_SELECT_REV_SEQ**	Selects available servers in a reverse sequential order
2 - 255	**reserved**	Not currently defined.

options

This field is a 16 bit field used to convey various run-time options to the module as shown in the following table:

Bit	Meaning
0	This bit decides where to route messages from TCAP to either DTS or SCCP. 0 – Route messages to SCCP. 1 – Route messages to DTS. **Note:** It is recommended to set this bit to one for the normal operation; however, this bit must be set to one for Network Context / multiple local point operation.
1	DTC to store the latest client request and resend to DTS automatically

7.1.2 Client Management Request (DTS_CLIENT_REQ)

Synopsis:

Sent from the client to the DTS module to inform it of changes to the client state. This message may also be sent via the DTC module.

Note: It is recommended that client requests be sent by using the DTS_SERVER command in config.txt (see section 4.4)

Message Format:

MESSAGE HEADER	
Field Name	**Meaning**
type	**DTS_CLIENT_REQ** (0x776a)
id	0
src	**Client module id**
dst	**DTS_TASK_ID or DTC_TASK_ID**
rsp_req	Used to request a confirmation
hclass	0
status	0
err_info	0
len	3

PARAMETER AREA		
Offset	**Size**	**Name**
0	1	Request type octet.
1	2	Options

Description:

This message is used by the client to inform the server that it wishes to startup or shutdown.

The instance field of the message is used to identify the SIU.
Senders of this message should use GCT_set_instance to identify the SIU to which the message is addressed. On reception of the message the procedure GCT_get_instance can be used to retrieve the instance field, which will identify the SIU the message is from.

Parameter area contents:

The request type octet is coded as follows:

Request	Mnemonic	Value (Decimal)	Value (Hex)
Client Startup Request	DTS_CLIENT_STARTUP	1	0x1
Client Shutdown Prepare	DTS_CLIENT_SHUT_PRE	2	0x2

Client Shutdown Request	DTS_CLIENT_SHUTDOWN	3	0x3

Startup Messages

Before messages can be sent to a client and before a client sends messages to a server, a startup message must have been sent from the client to the server. This message indicates to a server that the server should expect to receive dialogs from the client and that the client is available to receive new dialogs from the server. This message also identifies the instance of the client that the server uses as a unique ID for that particular client. The state of a client that has sent this message is considered to be in the "startup" state. If a valid startup message is received, it will be acknowledged by the server in a separate message (DTS_CLIENT_CONF) to the client.

Shutdown-Prepare Messages

These messages indicate to the server that no new dialogs should be sent to the client that sent the shutdown-prepare message. Although no new dialogs will be sent to the client, existing dialogs will be maintained. The server will mark this client as being in the "shutdown-prepare" state. If a valid shutdown-prepare message is received an acknowledgement will be sent back to the client in a separate message (DTS_CLIENT_CONF). New dialogs should be accepted by the client until it has received an acknowledgement from the server.

Shutdown Messages

A shutdown message will immediately prevent any message being sent from the server to the client that sent the shutdown message. No further messages will be accepted by the server from a client that is in the "shutdown" state. A valid shutdown message will be acknowledged by a DTS_CLIENT_CONF message.

Options

Option	Value	Description
DTS_CRO_REQUIRE_UIS	0x0001	Enable DTS UIS Heartbeats for this client

Heartbeat option

When set a SCCP User In Service (UIS) request for each SSN on the host must be sent to DTS. If UIS not received at least once every 30 seconds (15 seconds is recommended) then the application handling that SSN is assumed to be offline. Where a default routing key is configured any UIS received from the client will keep the default routing active. The UIS must be sent after each DTS_CLIENT_REQ is sent.

7.1.3 Client Request Confirmation (DTS_CLIENT_CONF)

Synopsis:

Sent from the DTS module to the DTC module (in Mode B sent back to the source of the DTS_CLIENT_REQ) to acknowledge client management requests.

Message Format:

MESSAGE HEADER		
Field Name		**Meaning**
type		**DTS_CLIENT_CONF** (0x076b)
id		0
src		**DTS_TASK_ID**
dst		**DTC_TASK_ID or source of DTS_CLIENT_REQ (Mode B)**
rsp_req		0
hclass		0
status		0
err_info		0
len		1
PARAMETER AREA		
Offset	**Size**	**Name**
0	1	Indication type octet.

Description:

This message is used confirm client management request messages (DTS_CLIENT_REQ) on client startup/shutdown.

The instance field of the message is used to identify the SIU.
Senders of this message should use GCT_set_instance to identify the SIU to which the message is addressed. On reception of the message the procedure GCT_get_instance can be used to retrieve the instance field, which will identify the SIU the message is from.

Parameter area contents:

The management indication type is coded as follows:

Request	Mnemonic	Value (dec)	Value (hex)
Client Startup Acknowledgement	DTS_CLIENT_STARTUP	1	0x1
Client Shutdown Prepare Acknowledgement	DTS_CLIENT_SHUT_PRE	2	0x2

Client Shutdown Acknowledgement	DTS_CLIENT_SHUTDOWN	3	0x3

Message Acknowledgements

The startup, shutdown-prepare, and shutdown messages all have a single message sent back in acknowledgement. The message type is the same for all acknowledgements, with a single octet in the parameter area that indicates whether it is an acknowledgement for a startup, shutdown-prepare, or a shutdown message.

7.1.4 Configure Routing Request (DTS_ROUTING_REQ)

Synopsis:

Optionally sent from the client or SIU_MGT to the DTS module in order to configure routing at DTS based on subsystem. This message may also be sent via the DTC module.

Note: It is recommended that routing requests be configured directly on the SIU using CNDRI (see section 4.6)

Message Format:

MESSAGE HEADER		
Field Name		**Meaning**
Type		**DTS_ROUTING_REQ** (0x776d)
Id		0
Src		**Client module id or SIU_MGT_TASK_ID**
Dst		**DTS_TASK_ID or DTC_TASK_ID**
rsp_req		Used to request a confirmation
Hclass		0
Status		0
err_info		0
Len		Number of bytes of user data
PARAMETER AREA		
Offset	**Size**	**Name**
0	1	Request type octet.
1	len – 2	Parameters in Name-Length-Data format.
len - 1	1	Set to zero indicating end of message

Description:

This message is used by the client to inform the server that the client wishes to be included in the group of clients which are able to receive messages destined for a particular subsystem.

This message and the DTS_CLIENT_REQ message can be sent in any order. But if Client Specific Routing is to be used, the client must both be in the active state and routing enabled by receipt of a DTS_ROUTING_REQ message.

The instance field of the message is used to identify the SIU.
Senders of this message should use GCT_set_instance to identify the SIU to which the message is addressed. On reception of the message the procedure GCT_get_instance can be used to retrieve the instance field, which will identify the SIU the message is from.

Parameter area contents:

The request type octet is coded as follows:

Request	Mnemonic	Value (dec)	Value (hex)
Enable	CLNT_ROUTING_ENABLE	1	0x1
Disable	CLNT_ROUTING_DISABLE	2	0x2

The value of the request type octet will determine if the client will be able to receive messages that are destined for a particular subsystem. If the value indicates "disabled" then although the client will be part of the group of clients (selection group), messages for the subsystem will be sent to other "enabled" clients in the selection group. The DTS_ROUTING_REQ message can be sent at any time to enable or disable a client in a group.

The following table lists the parameters associated with each DTS routing configuration message:

Parameter	Routing Request	
	ENABLE	DISABLE
SSN	O[1]	O[2]
Sequence number	M	M
Network context	D	D
Routing options	D	D

Note 1: If a parameter value of this type is not present, then a default routing key is assumed. This will be used to route incoming messages that do not match any other routing key. If a routing key for a specific subsystem is defined then the default routing key will **not** be used in situations where all clients in the selection group are unavailable.

Note 2: These parameters must match those used to enable the routing. If the message used to enable the routing contained this parameter, then the message used to disable it must also contain the parameter with a matching value.

Key

M	Mandatory	The parameter will always be included in the message.
O	Optional	The parameter may or may not be included in the message depending on the circumstances in which the message is sent.
D	Default	If not present, default values are assumed.

The following parameter names are defined for use in the DTS routing configuration message:

Parameter	Mnemonic	Value (dec)	Value (hex)
Subsystem number	DTSPN_ssn	1	0x01
Sequence Number	DTSPN_seq_number	2	0x02
Routing Options	DTSPN_routing_opt	3	0x03
Network Context	DTSPN_network_context	5	0x05

The coding for each parameter type is given in the following tables:

Parameter name	DTAPN_ssn
Parameter length	Fixed, length 1
Parameter data	The subsystem number part of the routing key. A value of 0 is considered to be null.

Parameter name	DTSPN_seq_number
Parameter length	Variable, length 1 or 2
Parameter data	This value is used to determine the order of clients in a group determined by routing key. Lower numbered values are considered earlier in the sequence, and numbers **must** be unique within that routing key.

Parameter name	DTSPN_network_context
Parameter length	Variable, length 1 or 2
Parameter data	Network Context Range from 0 to 3 Default is 0.

Parameter name	DTSPN_routing_opt
Parameter length	variable, length 1 or 2
Parameter data	Routing Options Bit 0: 0 – Strict Routing (Default) 1 – Preferred Order Currently, only bit 0 of the options is used; other bits should be set to zero.

7.1.5 RSI status Indication (RSI_MSG_LNK_STATUS)

RSI Link status message sent by RSI to the concerned module id.

MESSAGE HEADER	
Field Name	**Meaning**
type	**RSI_MSG_LNK_STATUS** (0x0f83)
id	0
src	RSI_TASK_ID
dst	RSI concerned module ID
rsp_req	0
status	event type
len	0

Description:

RSI indications are sent to the concerned module id configured in the *rsicmd* command-line (see section 4.3).

Event type can have the following values:

Event	Value	Description
RSI_LINK_UP	0	RSI link is UP
RSI_LINK_DOWN	1	RSI link is Down
RSI_LINK_DEACTIVATED	2	RSI link has been deactivated

7.1.6 User-In-Service message (SCP_MSG_SCMG_REQ)

User-In-Service (UIS) message used for DTS Heartbeats.

MESSAGE HEADER		
Field Name		**Meaning**
type		**SCP_MSG_SCMG_REQ** (0xc744)
id		Local subsystem number
src		Sending module_id
dst		**DTS_TASK_ID**
rsp_req		used to request a confirmation
hclass		0
status		0
err_info		0
len		10
PARAMETER AREA		
Offset	**Size**	**Name**
0	1	Primitive type - **N-STATE-REQ** (1)
1	1	Format id - Subsystem Allowed SSA (1)
2	6	Not used, must be set to zero
8	2	Network context (0 to 3)

7.2 Message Tracing

7.2.1 Set Trace Mask Request (DTS_MSG_TRACE_MASK)

Synopsis:

Message sent to DTS to trace both primitive and non-primitive messages sent to or sent from DTS.

Note: It is recommended that DTS tracing be configured on the SIU – refer to the SIU user manual [5] for details.

Message Format:

MESSAGE HEADER		
Field Name		**Meaning**
type		**DTS_MSG_TRACE_MASK** (0x5769)
id		0
src		**User Module**
dst		**DTS_TASK_ID** (0x30)
rsp_req		Used to request a confirmation
hclass		0
status		0
err_info		0
len		12
PARAMETER AREA		
Offset	**Size**	**Name**
0	4	**op_evt_mask**
4	4	**Ip_evt_mask**
8	4	**non_prim_mask**

This message causes a copy of messages received and sent by DTS to be taken and sent to the trace_id specified in the DTS Configuration request configured by the SIU, facilitating the examination of the messages for diagnostic purposes.

The module is able to trace three types of messages. The mask values op_evt_mask and ip_evt_mask trace data messages sent or received by the DTS module. The non_prim_mask allows tracing of management and configuration messages.

op_evt_mask

The output event trace mask. This is a 32-bit value with bits set to 1 to cause a trace message to be sent to the system trace module when the server module sends the associated protocol message.

31	30	29	28	27	26	25	24
0	0	0	0	0	0	0	0

23	22	21	20	19	18	17	16
0	0	0	0	0	0	0	0

15	14	13	12	11	10	9	8
0	0	0	0	0	0	0	0

7	6	5	4	3	2	1	0
0	0	0	0	IS41	INAP	MAP	SCCP_UDT

SCCP_UDT = SCCP Unit Data messages from SCCP to TCAP

MAP = MAP messages from MAP to the Application

INAP = INAP messages from INAP to the Application

IS41 = IS41 messages from IS41 to the Application

ip_evt_mask

The input event trace mask. This is a 32-bit value with bits set to 1 to cause a trace message to be sent to the system trace module when the server module receives the associated protocol message.

31	30	29	28	27	26	25	24
0	0	0	0	0	0	0	0

23	22	21	20	19	18	17	16
0	0	0	0	0	0	0	0

15	14	13	12	11	10	9	8
0	0	0	0	0	0	0	0

7	6	5	4	3	2	1	0
0	0	0	0	IS41	INAP	MAP	SCCP_UDT

SCCP_UDT = SCCP Unit Data messages from SCCP to TCAP

MAP = MAP messages from the Application to MAP

INAP = INAP messages from the Application to INAP

IS41 = IS41 messages from the Application to IS41

non_prim_mask

The non-primitive trace mask. This is a 32-bit value with bits set to 1 to cause a trace message to be sent to the system trace module when server module receives the associated non-primitive message.

31	30	29	28	27	26	25	24
0	0	0	0	0	0	0	0

23	22	21	20	19	18	17	16
0	0	0	0	0	0	0	0

15	14	13	12	11	10	9	8
0	0	0	0	0	0	0	0

7	6	5	4	3	2	1	0
0	0	0	0	0	SERVER_ ERR	RSI_ STATUS	CLNT_ MGT

CLNT_MGT = Client module management messages

RSI_STATUS = Status messages passed from RSI

SERVER_ERR = Server module error messages

7.3 DTS Statistics Messages

These messages enable collection of statistics from DTS on a per module and per host basis.

7.3.1 Request DTS Module Stats (DTS_MSG_R_MOD_STATS)

Retrieve module statistics from DTS

MESSAGE HEADER		
Field Name		**Meaning**
type		**DTS_MSG_R_MOD_STATS** (0x677b)
id		0
src		User module or SIU_MGT_TASK_ID
dst		DTS_TASK_ID
rsp_req		Used to request a confirmation
status		Set to 1 to reset stats
len		38
PARAMETER AREA		
Offset	**Size**	**Name**
0	2	reserved
2	4	period
6	4	txmsg
10	4	rxmsg
14	4	txdiscard
18	4	rxdiscardnohost
22	4	rxdiscardnokeymatch
26	4	ogdialogs
30	4	icdialogs
34	4	icdialogsbillid

Description
Retrieve module statistics for DTS

Parameters

period
Time period (in ticks) over which these statistics have been gathered. (reset by setting status to 1)

txmsg
Total outgoing data messages from the hosts transmitted

rxmsg
Total incoming data messages sent to the hosts

txdiscard
Total discarded outgoing data messages

rxdiscardnohost
Total discarded incoming data messages due to unavailable hosts

rxdiscardnokeymatch
Total discarded incoming data messages due to no routing key match

ogdialogs
Total outgoing dialog starts transmitted

icdialogs
Total incoming dialog starts sent to the hosts

icdialogsbillid
Total incoming dialog starts routed on BillingID to hosts

7.3.2 Request DTS Host Stats (DTS_MSG_R_HOST_STATS)

Message used to retrieve Host specific statistics from DTS.

MESSAGE HEADER	
Field Name	**Meaning**
type	**DTS_MSG_R_HOST_STATS** (0x677c)
id	Host id
src	User module or SIU_MGT_TASK_ID
dst	DTS_TASK_ID
rsp_req	Used to request a confirmation
status	Set to 1 to reset stats
len	34

PARAMETER AREA		
Offset	**Size**	**Name**
0	2	reserved
2	4	period
6	4	txmsgs
10	4	rxmsgs
14	4	txdiscard
18	4	rxdiscard
22	4	ogdialogs
26	4	icdialogs
30	4	icdialogsbillid

Description
Retrieve statistics on the messages and dialogs routed by DTS for a specified host.

Parameters

period
Time period (in ticks) over which these statistics have been gathered. (reset by setting status to 1)

txmsgs
Number of outgoing data messages from the host transmitted

rxmsgs
Number of incoming data messages sent to the host

txdiscard
Number of outgoing data messages from the host discarded

rxdiscard
Number of incoming data messages destined for this host but discarded

ogdialogs
Number of outgoing dialog starts from the host transmitted

indialogs
Number of incoming dialog starts sent to the host

icdialogsbillid
Number of incoming dialog starts routed on BillingID to the host

7.4 DTS Partner Messages

When used in a dual SIU configuration DTS will send heartbeats to its partner DTS on the other SIU. These heartbeats allow DTS to determine that the partner SIU is available and in cases where a particular host becomes unavailable locally, messages will be passed to the partner DTS to see if it can reach the host that way.

When using Route on Billing ID, passing messages to the partner DTS is done to allow SIU A to process even codes and SIU B to process odd codes.

7.4.1 Partner Heartbeats (DTS_MSG_HEARTBEAT)

Heartbeat message sent periodically between DTS partners in a dual configuration.

MESSAGE HEADER	
Field Name	**Meaning**
type	**DTS_MSG_HEARTBEAT** (0x777d)
id	0
src	**DTSA_TASK_ID or DTSB_TASK_ID**
dst	**DTSB_TASK_ID or DTSA_TASK_ID**
rsp_req	Needs to be set to ensure confirmation sent
status	Must be zero in confirmation message
len	0

Description
Heartbeat message sent periodically between DTS partners in a dual configuration.

At startup, the partner is unavailable and a PARTNER_LOST event will be generated. In this state, on receiving a response to a heartbeat the PARTNER_OK event shall be generated.

Once available, if a response to a heartbeat is not received within a second a MISSED_HEARTBEAT event will be sent to management.

7.4.2 DTS Event indications (DTS_MSG_EVENT_IND)

Message used by DTS to convey events to management.

MESSAGE HEADER	
Field Name	**Meaning**
type	**DTS_MSG_EVENT_IND** (0x777e)
id	0
src	DTS_TASK_ID
dst	mgmt_id
rsp_req	0
status	event type
len	0

Event type can have the following values:

Event	Value	Description
DTSEV_PARTNER_LOST	1	No response from partner DTS – this event is generated initially at startup. If a successful response has been received this event will be generated following 2 missing responses
DTSEV_PARTNER_OK	2	This event is generated once a successful response has been received from DTS partner
DTSEV_MISSED_HBT	3	This event is generated when a single heartbeat response has been missed.

7.5 Internal SIU DTS Messages

The following messages are used internally on the SIU and are documented here for reference purposes.

7.5.1 DTS Configuration Message (DTS_MSG_CONFIG)

Message used to configure DTS at startup.

MESSAGE HEADER		
Field Name		**Meaning**
type		**DTS_MSG_CONFIG** (0x7768)
id		0
src		**Sending module_ID**
dst		**DTS_TASK_ID**
rsp_req		Used to request a confirmation
status		0
len		40
PARAMETER AREA		
Offset	**Size**	**Name**
0	1	version
1	1	sccp_id
2	1	tcap_id
3	1	dtc_id
4	1	trace_id
5	1	clnt_selection
6	2	options
8	1	tid_inst
9	1	addr_format
10	1	map_id
11	1	inap_id
12	1	is41_id
13	1	num_hosts
14	1	local_id
15	1	partner_id
16	1	mgmt_id
17	23	reserved

7.5.2 Request DTS Host Status (DTS_MSG_R_HOST_STATUS)

Message used to request host status from DTS

MESSAGE HEADER		
Field Name		**Meaning**
Type		**DTS_MSG_R_HOST_STATUS** (0x676e)
Id		0 (or index for version 1)
Src		**SIU_MGT_TASK_ID**
Dst		**DTS_TASK_ID**
rsp_req		Used to request a confirmation
Status		0
Len		290
PARAMETER AREA		
Offset	**Size**	**Name**
0	2	version (0 or 1) set by sending module in request
2	2	fields
4	1	ssn
5	4	lpc – not used.
9	2	nc
11	20	reserved – set to zeros
31	1	next_index
32	1	select_order
33	1	num_hosts
34	256	Version 0: host_id (1) state (1) for up to 128 hosts Version 1: host_id (1) state(1) drid (2) for up to 64 hosts

For version 1 only 64 hosts' status can be returned in a single request. An additional request is required for remaining hsots.

The id field is used to specify the index of the first host to be returned. On receiving the confirmation message, the next_index parameter will indicate if there are any further hosts to retrieve. If the value is 0, then there are none, otherwise the value should be used as the id for the next request.

If version is 1 the DRID will be returned if present or 0xffff if it is undefined. If version is 0 then the DRID will not be present and 128 hosts' status can be returned in a single request.

7.5.3 DTS Configure Additional NC (DTS_MSG_NC_CONFIG)

Message used to configure additional Network Contexts in DTS.

MESSAGE HEADER		
Field Name		**Meaning**
Type		**DTS_MSG_NC_CONFIG** (0x7769)
Id		0
Src		**SIU_MGT_TASK_ID**
Dst		**DTS_TASK_ID**
rsp_req		Used to request a confirmation
Status		0
Len		40
PARAMETER AREA		
Offset	**Size**	**Name**
0	1	cnf_ver
1	1	sccp_id
2	2	options
4	1	addr_format
5	35	reserved – set to 0

7.5.4 DTS Configure User IDs (DTS_MSG_S_USER_ID)

Message to configure host module ids for DTS Local Sub-Systems in Mode B.

MESSAGE HEADER		
Field Name		**Meaning**
Type		**DTS_MSG_S_USER_ID** (0x576f)
Id		SSN
Src		**SIU_MGT_TASK_ID**
Dst		**DTS_TASK_ID**
rsp_req		Used to request a confirmation
Status		0
Len		3
PARAMETER AREA		
Offset	**Size**	**Name**
0	1	module_id
1	2	nc