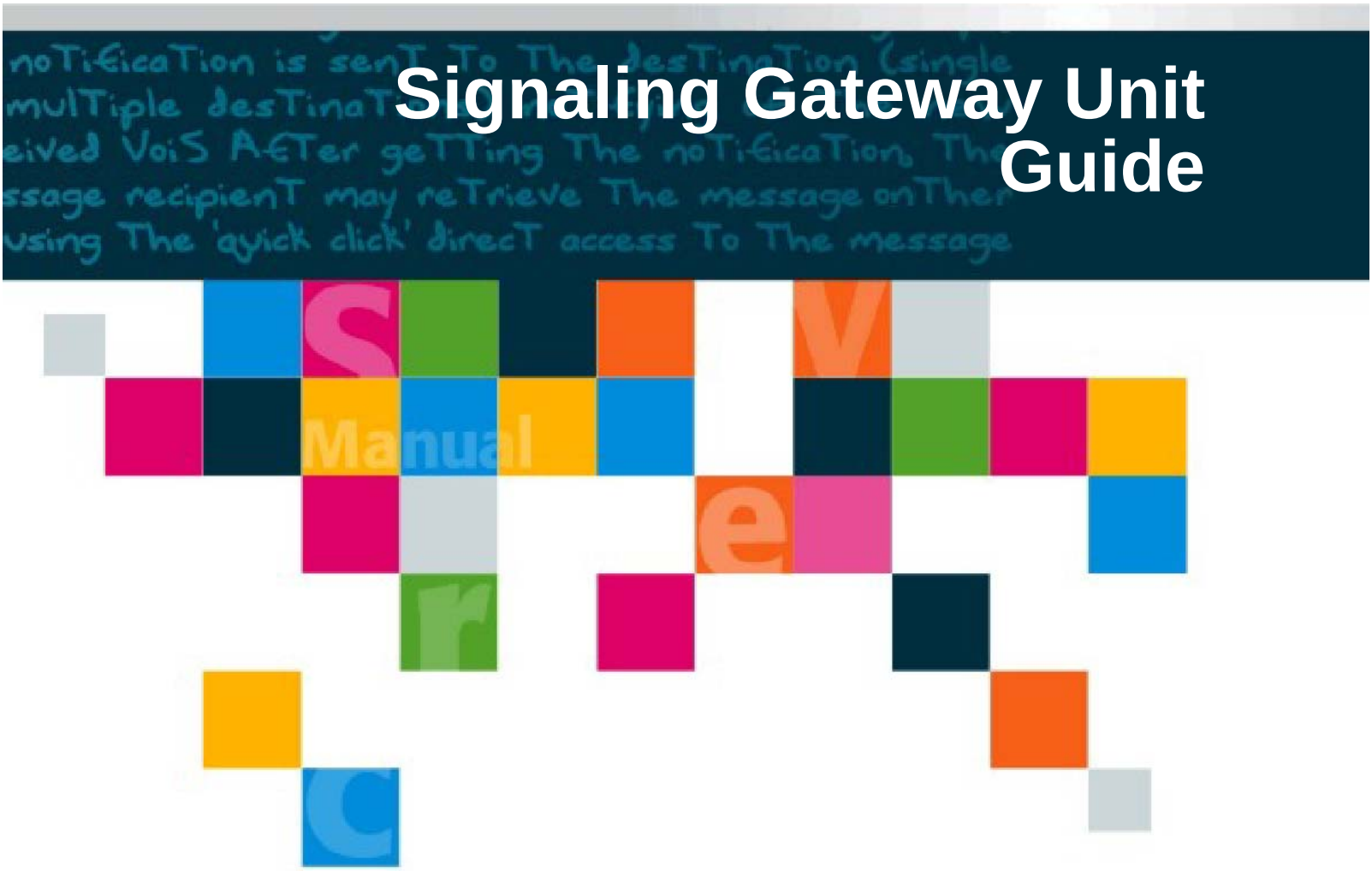
COMVERSE

ComverseONE™

3.5.50

Signaling Gateway Unit Guide



ComONE-3.5.50-SGUG-2010-10-15

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Revision History

The following table lists the document changes since the initial publication:

Date	Chapter	Description
10/15/2010		Initial publication.

Contents

Figures

Tables

Notational Conventions

Useful information appears in this format.

Provides direction to important information

Important information appears in this format.

Indicates possible risk of damage to data, software, or hardware.

Indicates serious risk of damage to data, software, or hardware.

Table 1 Notational Conventions

Notation	Explanation of Convention
References to printed documents	*Helvetica italic* **Example:** See *Database Reference Volume 2*.
<KEYS>	UPPERCASE HELVETICA, in angle brackets **Example:** Press <CTRL><Q><SHIFT><P> to create an em dash.
`User-entered text`	**`Courier bold`** **Example:** Enter **`Total Charges`** in the field.
`Placeholders for user-determined text`	*`Courier italic`*, in angle brackets **Example:** Enter your <*`password`*>.
`Code samples, TABLE_NAMES, field_names, file and directory names, file contents, user names, passwords, UNIX ENVIRONMENT_VARIABLES`	`Courier`
Placeholders for system-generated text	*Helvetica italic* **Example:** Messages appear in this form: *timestamp messageID >> text.*
Buttons, Icon Names, and Menu items	**Helvetica bold** **Example:** Choose **Reports** from the main menu.

Special Markers

The Comverse ONE Billing and Active Customer Management solution has the three derivatives shown in Table 2, "Labels in Markers." For user convenience, any content that is specifically included in a derivative is highlighted with special markers so that it can readily be distinguished.

Table 2 Labels in Markers

Derivative	Label Shown in Markers
Comverse ONE Converged Billing derivative	**Converged only**
Comverse ONE Real-Time Charging derivative	**Real Time only**
Comverse ONE Postpaid Billing derivative	**Postpaid only**

Each derivative has a set of three color-coded markers, as shown in Table 3, "Types of Markers." The markers are used individually or in combination to highlight derivative-specific content by:

- Entire chapters
- Selected portions of chapters
- Tables, either entire or partial

Table 3 Types of Markers

Marker	Example	Description
Alert	Converged only — This entire chapter pertains to Converged only. Real Time only — This entire chapter pertains to Real Time only. Postpaid only — This entire chapter pertains to Postpaid only.	■ Placed at the beginning of an entire chapter that pertains only to a specific derivative. ■ Placed just before a table that partially or entirely pertains only to a specific derivative.
Block	Converged only Text goes here. Real Time only Text goes here. Postpaid only Text goes here.	A shaded box that encloses sections of documentation that pertain only to a specific derivative.
Flag	Converged only Real Time only Postpaid only	■ Designates a shaded table row whose contents pertain only to a specific derivative. ■ In a bulleted list, designates an item that pertains only to a specific derivative.

Comverse ONE Documentation List

this is a comprehensive list. As such, it may include documentation for products which you have not licensed.

The documents described below reference the Comverse ONE solution products. All documentation available with the Comverse ONE solution is described in the following pages, organized by the following categories:

- Infrastructure Domain
- Rating, Charging, and Promotions Domain
- Billing and Financials Domain (Converged only)
- Customer and Order Management Domain (Converged only)
  - Customer Relationship Management
    (Sale Force Automation, Case Management, Campaign Management)
- Mediation and Roaming Solutions Domain
- Self-Service Solutions Domain

Read the relevant Solution Description first to get an overview of your Comverse ONE solution. It gives an overview of the functionality in each product domain and also includes cross-references to the user documentation that provides more detailed information about the functionality.
There are two such documents and they are listed under the Infrastructure Domain heading below.

- *Converged Billing & Active Customer Management Solution Description*
- *Real-Time Billing & Active Customer Management Solution Description*

Infrastructure Domain

Download every document in the Infrastructure domain if you purchase the Comverse ONE solution. Documentation for this domain includes the following (in alphabetical order):

- *Alarms Reference*
  Contains tables of alarm IDs, descriptions, likely causes, and recommended resolutions for systems and components.

- *Back Office Administration GUI Guide*
  Provides information about the BackOffice subsystems for Inventory Administration, Address Management and Bulk Operations.
- *Converged Billing & Active Customer Management Solution Description*
  General overview of the Comverse ONE Converged Offer and the functionality available in each domain.
- *Database Reference*
  Describes all database tables and fields in detail.
- *Disaster Recovery Operations Guide* (Optional Module)
  The Disaster Recovery Operations Guide serves as both a technical overview of the optional Disaster Recovery solution and as a guide which details the operational procedures for failover, switchover and switchback provided by the solution.
- *Glossary*
  Provides a list of terms used specifically for the Comverse ONE solution
- *Investigation Units and Financial GUIs Guide*
  Describes the GUI-based tools used for investigating and troubleshooting various financials related processes: payments, bill invoices, refunds, and incomplete data work entries
- *Operation Reference*
  Describes the processes in the Comverse ONE solution.
- *Platform Operations Guide*
  Describes the back-end operations and maintenance functionality of the core Comverse ONE solution components. Includes AIX/HACMP platform and cluster operations, Linux/Veritas platform and cluster operations, backup/recovery, shared storage and fiber switch operations, and tape backup operations.
- *Product Catalog Overview*
  Provides a high-level description of the Comverse ONE solution Product Catalog, which is the primary mechanism for creating, configuring, managing, and propagating Product Catalog versions.
- *Product Catalog User Guide*
  Instructions on using the Product Catalog application to define and manage all aspects of Service provisioning.
- *Real-Time Billing & Active Customer Management Description*
  General overview of the Comverse ONE Real-Time Offer and the functionality available in each domain.
- *Schedulable Entity Reference Manual*
  Documents all the jobs, monitors, and workflows, for each component.
- *Security Platform Operations Guide*
  Technical overview of the security platform and information on how to provision and administer the platform.
- *Security Server API Guide*
  Provides an overview of the interfaces exposed by the Java-based Security SDK API, which client applications can leverage to access various security services, such as authentication, authorization, auditing, key management, and credentials management. Also provides information on the Security Web Services API, which provides interfaces to a subset of Security Server commands (Identity Management commands).
- *Signaling Gateway Unit Guide*
  Describes the hardware, installation, configuration, and maintenance of the Signaling Gateway Unit (SGU) used to connect Comverse real-time systems to the SS7 signaling network using either traditional SS7 protocols or Sigtran (SS7 over IP).
- *System Measurements Guide*
  The Comverse ONE Solution automatically collects statistical data from the Service Logic Unit (SLU) and the Service Gateway Unit (SGU). This includes service statistics on the SLF layer and

platform data on the IPF layer.
This guide describes the format and location of this measurement information and provides a description of the meaning of the data.The measurement data can be used to create reports. It can also be imported into other applications (such as Excel) to be viewed.

- *Unified API Guide*
  General overview of the Unified API, a brief description of its architecture, and information about:
  - Framework classes and the functionality they provide
  - Two standard interfaces provided with the Unified API (client SDK and web services)
  - A subset of Unified API business methods most commonly used
- *Unified Platform Guide*
  Technical overview of the Unified Platform and information on the procedures to manage core systems operations in the Comverse ONE solution.

Rating, Charging, and Promotions Domain

Documentation for this domain includes the following (in alphabetical order):

- *Batch Provisioning Utility Guide*
  - The *CC Batch* utility enables bulk creation of recharge vouchers and subscribers.
  - The *Bulk Provisioning* Utility enables bulk creation of anonymous accounts to support the pre-activation of pre-paid SIM cards.
- *Call Flows Reference*
  Call flows detail the logic flow of specific scenarios. Multiple access numbers can map to the same call flow. Different resellers have the option to publish different numbers but share the same logic.
- *Charging Interfaces Guide*
  Describes the four interfaces that enable external services to support real-time authorization, rating, and charging for transactional usage: (1) the Event Charging Interface, a simple TCP/IP-based interface, (2) Open Services Access (OSA), (3) a Diameter-based interface version enhanced to take advantage of features of the Comverse ONE solution, and (4) a Diameter-based interface packet-switched version.
- *Customer Care Client Provisioning Guide* — Real-Time
  Detailed task-oriented instructions for using Customer Care Client.
- *Diameter Gateway Unit Guide*
  Describes the hardware, installation, configuration and maintenance of the Diameter Gateway Unit (DGU) used to connect Comverse real-time systems to external services, using the diameter protocol over IP.
- *Network Interfaces and Notifications Guide*
  Describes the operation, features, and provisioning of notifications, CAMEL-enabled services, and USSD-enabled services.
- *Network Self-Care Guide*
  Describes the configuration, structure, and features.
- *Rating Technical Reference*
  Describes the Unified Rating Engine, which is the subsystem responsible for gathering incoming CDRs and processing them for billing.
- *Reports and Data Extracts Guide* — Real-Time
  Describes the real-time Operational Reports Interface (ORI) and the Data Warehouse Extract Utility.
- *Recurring–Non-Recurring Charges Server Guide*
  Describes all processes commonly available through the Recurring —Non-Recurring Charges Server.
- *Voucher and Recharge Guide*
  Describes the process by which subscribers add funds to accounts using recharge vouchers through IVR, interaction with Customer Service, and other methods. Provides details of the Recharge Control

Table, which allows resellers to provision the effects of recharges so that bonuses, discounts, and other changes to offers can result from a successful recharge. Also describes the Card Generator software used to create batches of vouchers and calling cards.

Billing and Financials Domain (*Converged* only)

Documentation for this domain includes the following (in alphabetical order):

- *Advanced Statement Numbering Guide*
  Describes how to configure and use Advanced Statement Numbering.
- *Billing Reports and File Layouts User Guide*
  Describes control reports and other file formats.
- *Billing Technical Reference*
  High-level descriptions of billing architecture, administration, bill generation and formatting, and system parameters
- *Collections Guide*
  Contains information on configuring Collections database tables, running the Collections module, and using the Collections interface.
- *Configurator Guide*
  Describes how to install and use the Configurator.
- *Invoice Designer Strings and Filters Reference*
  Describes the static strings, dynamic strings, and filters in the Invoice Designer.
- *Invoice Designer Technical Reference*
  Describes how to configure and run Invoice Designer.
- *Invoice Designer User Guide*
  Describes the Invoice Designer and how to perform the tasks needed to create an invoice template.
- *Journals Guide*
  Describes the theory, configuration, and running of Journals processes.
- *Miscellaneous Configurable Entities*
  Instructions for configuring late fees, adjustments, and several other database entities used in postpaid and converged billing.
- *Process Workflow Orchestration Guide*
  Describes the command-line entries and the default queries for running billing-related processes via the Unified Platform.
- *Taxation Guide*
  Describes the configuration, operation, structure, and features of Taxation.

Customer and Order Management Domain (*Converged* only)

Documentation for this domain includes the following (in alphabetical order):

- *Application Integrator Adapter Developer Kit User Guide*
  Provides information necessary for the development of custom Application Integrator adapters.
- *Application Integrator Add/Copy Header User Guide*
  Describes the adapter that adds or copies header information in messages.
- *Application Integrator Aggregator Adapter User Guide*
  Describes the adapter that aggregates multiple input messages as a single composite output message.
- *Application Integrator File Adapter User Guide*
  Describes the configuration process and rules for the file adapter.
- *Application Integrator CORBA Adapter (JacORB) User Guide*
  Describes the elements and uses of the Application Integrator client and server Common Object Request Broker Architecture (CORBA) adapters for JacORB.
- *Application Integrator Filemover Adapter User Guide*
  Describes the use and configuration of the adapter, which is used to copy or move files from one machine to another.
- *Application Integrator Generic Services User Guide*
  Describes the Null adapter, Trash adapter, and Initiator adapter generic services.
- *Application Integrator HTTP Adapter User Guide*
  Describes the use and configuration of the adapter which provides an interface between HTTP clients and the ApplicationIntegrator.
- *Application Integrator IPDR Adapter User Guide*
  Describes use and configuration of the I adapter which converts the “compact encoding” form of IPDR billing record documents into a form easily parsed by the ApplicationIntegrator message broker.
- *Application Integrator JMS Adapter User Guide*
  Describes the use and configuration of the adapter, which is used with edge systems that transmit or receive JMS messages.
- *Application Integrator KSI Adapter User Guide*
  Describes the use and configuration of the adapter, which is used with edge systems that transmit or receive data formatted according to the Kenan Standard Interface (KSI) protocol.
- *Application Integrator Operator Guide*
  Describes the commands that operate the Application Integrator at creation and runtime.
- *Application Integrator Python Adapter User Guide*
  Describes the use and configuration of the adapter, which enables a user to run a *Python* script from within an integration.
- *Application Integrator Retry Adapter User Guide*
  Describes the use of the a dapter to resend messages in case of failed transmissions.
- *Application Integrator SAS Adapter User Guide*
  Describes the use and configuration of the adapter, which is used with edge systems that transmit or receive data formatted according to the *Comptel* Mediation Device Solutions/Subscriber Administration System (MDS/SAS) protocol.
- *Application Integrator Sequence Adapter User Guide*
  Describes the use of the adapter to generate unique sequence numbers for messages.
- *Application Integrator System Administrator Guide*
  Outlines installation, sizing, operation, and administration of the Application Integrator and logging. Describes configuration of the user environment and commands for creation and operation of the Application Integrator.

- *Application Integrator Unified API Client Adapter User Guide*
  Describes the adapter which is used for interfaces based on the Unified API Client.
- *Application Integrator Unified API Server Adapter User Guide*
  Describes the adapter ehich is used for interfaces based on the Unified API Server.
- *Application Integrator URL Client Adapter User Guide*
  Describes the use and confoguration of the adapter which makes it possible for a client to gain access to many kinds of network-accessible resources that are identified by a URL.
- *Application Integrator User Guide*
  Describes creating integration specifications, creating instances of the Application Integrator, and commands for operation of the Application Integrator. Provides a complete user guide for the iMaker compiler.
- *Application Integrator XSLT User Guide*
  Describes the use and configuration of the adapter which is usedwith applications (sometimes called edge systems) that transmit or receive XML- formatted data.
- *Customer Center User Guide*
  Detailed task-oriented instructions for using Customer Center.
- *Inventory Guide*
  Describes the configuration, operation, structure, and features of Inventory.
- *Inventory Replenishment Guide*
  Describes the operation, structure, and features of Inventory Replenishment.
- *Orders Services Guide*
  Describes the structure and features of Orders Services.
- *Request Handling and Tracking and Service Fulfillment User Guide*
  Describes the configuration, operation, structure and features of Request Handling and Tracking and Service Fulfillment.
- *Workflow Developers Guide*
  Helps new users understand the rules-based business process management system so users can create solutions and integrate Workpoint within those solutions.
- *Workflow User Guide*
  Describes the configuration, operation, structure, and features of Workpoint.

Customer Relationship Management

- *Billing Reports and File Layouts User Guide*
  Describes control reports and other file formats.
- *Campaign Management Data Mapping Reference*
  Describes how the data in DataMart is mapped to information in the Comverse ONE Customer database, the Comverse ONE ODS, and the Comverse ONE Sales and Service database.
- *Campaign Management DataMart Reference*
  Contains in-depth technical information on how to configure and populate the data mart used by all Campaign Management applications.
- *Campaign Management Outbound Marketing Manager Reference*
  Describes how to use the Campaign Management Outbound Marketing Manager features and guides you through the program's basic functionality.
- *Campaign Management Quick Implementation Guide*
  Helps novice users get started with implementing Campaign Management. It contains an overview of the product architecture, information on data mart design and creation, an explanation of how extraction works, and procedures for creating web pages, reports, lists, and campaigns.
- *Campaign Management Topic Implementation Guide*
  Provides information for implementers and professional services personnel who are creating applications that will run on an Campaign Management EpiCenter. Summarizes the Campaign Management functionality, architecture, and administration and contains in-depth technical information for configuring the Campaign Management topics required for Campaign Management and analysis.
- *Campaign Management User Guide*
  Provides you with basic information about the Campaign Management applications.
- *Case Management User and Administration Guide*
  Contains detailed information about GUI screens and form fields that appear in the Case Management application. Also provides information on performing general procedures in the GUI and administrative tasks.
- *Customer Center User Guide*
  Detailed task-oriented instructions for using Customer Center.
- *Sales and Service Admin Console User Guide*
  Provides supervisors, managers, and executives with the information to use the Case Management and Sales Force Automation Admin Console application.
- *Sales and Service Application Reference* Contains technical reference information relevant to implementers involved in implementing and customizing CRM applications at customer sites. This book provides the reference context for the procedural information available in the Implementation Guide.
- *Sales and Service Architecture Reference*
  Provides technical information relevant to individuals involved in implementing the Open Architecture and the applications built on the architecture
- *Sales and Service Data Dictionary Reference*
  Includes a listing and description of the tables and columns used to store CRM operational business data. It also includes a description of the naming conventions for the tables. The target audience includes database administrators, application developers, and implementers.
- *Sales and Service IBR Designer User Guide*
  Describes how to use the IBR Designer to create Intelligent Business Rules, which can be used to implement rule-based behavior within your CRM applications.
- *Sales and Service Implementation Guide*
  Provides procedural information relevant to individuals involved in implementing and customizing the core and the Sales and Service applications built on the core.

- *Sales and Service Integration Guide*
  Provides overview and configuration information for the set of tools used to exchange data with a variety of back-end data sources, including generic SQL sources, Java and EJB-based sources, Web services, and other database types.
- *Sales and Service Workflow Designer*
  Explains how to use Workflow Designer, a web-based graphical tool for defining and editing workflows
- *Sales Force Automation User and Administration Guide*
  Contains detailed information about GUI screens and form fields that appear in the Sales Force Automation application. Also provides information on performing general procedures in the GUI and administrative tasks.

Mediation and Roaming Solutions Domain

Documentation for this domain is subdivided into Mediation/Roaming and Revenue Settlements.

Mediation and Roaming

Mediation and Roaming documentation includes the following (in alphabetical order):

- *Collection API Guide*
  Provides the concepts and functions for the Collection Application Programming Interface (CAPI).
- *Data Manager GUI Reference*
  Contains detailed information about GUI screens and form fields that appear in the Data Manager interface
- *GRID Mapping Language Developer Guide*
  Describes the mediation feature components, semantics, and general syntax of the GRID Mapping Language (GML).
- *Installation Guide for HP*
  Describes how to install and configure the application, components, and some third-party applications associated with the HP platform.
- *Installation Guide for HP Itanium*
  Describes how to install and configure the application, components, and some third-party applications associated with the HP Itanium platform.
- *Installation Guide for HP PA-RISC*
  Describes how to install and configure the application, components, and some third-party applications associated with the HP PA-RISC platform.
- *Installation Guide for IBM*
  Describes how to install and configure the application, components, and some third-party applications associated with the IBM platform.
- *Installation Guide for SUN*
  Describes how to install and configure the application, components, and some third-party applications associated with the SUN platform.
- *Mediation and Roaming User Guide*
  Provides information on how to use the GUI interface, including information on using the Data System Manager application pages.
- *Mediation API Guide*
  Contains reference information on using the Mediation API.
- *Roaming Database Reference*
  Provides reference information on the Roaming database.

- *Roaming Setup Guide*
  Describes how to configure the Roaming Setup application pages. It also provides information on working with TAP, RAP, and CIBER statistics.
- *Scripts Guide*
  Provides information on script files, which contain additional instructions on functions for data collection and transmission.
- *Socket-Based API Guide*
  Explains the building applications using the Socket-Based Record Transmission API. Programmers can use the guide to use the records received from the Data system for their own customized downstream application solutions.
- *System Manager GUI Reference*
  Contains detailed information about GUI screens and form fields that appear in the System Manager interface
- *Variable-Length GRID Guide*
  Provides information on how to configure the control files for variable-length GRID.

Revenue Settlements

Revenue Settlements documentation includes the following (in alphabetical order):

- *Comverse Revenue Settlements Billing System Adapter Guide*
  Describes the configuration, operation, and installation for the Billing System adapter.
- *Comverse Revenue Settlements Data Model Guide*
  Overview of data model entities (such as partners, accounts, revenue sharing, and rate schedules) and how to configure them in the database.
- *Comverse Revenue Settlements Database Reference*
  Detailed descriptions of fields and tables in the database.
- *Comverse Revenue Settlements Technical Reference*
  Instructions for installing and operating Revenue Settlements. Also contains processing descriptions.
- *Comverse Revenue Settlements User Guide*
  Instructions for using the Revenue Settlements GUI.

Self-Service Solutions Domain

The Comverse ONE Self-Service Solutions domain consists of the core products plus the optional separately licensed premium products. The core products consist of the following:

- Self-Service Solutions Platform
- Self-Service Solutions Applications

Self-Service Solutions Platform Documentation

The Self-Service Solutions Platform has a comprehensive set of documentation covering the installation, configuration, and use of our products. The documentation set is divided into the following categories:

- **Manuals**: These manuals cover installing and using the platform.
- **Reference**: These reference documents contain information about APIs, databases, configuration files, and so on. These documents are delivered in HTML.

Self-Service Solutions Platform Manuals

Self-Service Solutions Platform manuals include the following (in alphabetical order):

- *Administration Guide*
  Provides operations and maintenance instructions for Web applications using the Self-Service Solutions Platform.
- *Communications Billing and Usage Reference*
  Provides detailed descriptions of the data models and structure of the Self-Service Solutions Platform Communications Billing and Usage (CBU) database.
- *Connectors Development Guide*
  Provides instructions for developing and customizing Connectors of the Self-Service Solutions Platform.
- *Core Module Development Guide*
  Provides instructions for configuring and developing features of the core module of the Self-Service Solutions Platform.
- *Customer Interaction Datastore Reference*
  Provides detailed descriptions of the data models and the structure of the Self-Service Solutions Platform Customer Interaction Datastore (CID).
- *Database Modules Development Guide*
  Provides instructions for configuring, customizing, and developing features of the database module of the Self-Service Solutions Platform.
- *Platform Installation Guide*
  Provides installation and configuration instructions for the Self-Service Solutions Platform.
- *Platform Services Guide*
  Provides instructions for configuring, customizing, and developing features that use the services provided by the Self-Service Solutions Platform.
- *Processors Development Guide*
  Provides instructions for developing and customizing Processors of the Self-Service Solutions Platform.
- *Reports Development Guide*
  Provides instructions for developing and customizing Reports of the Self-Service Solutions Platform.
- *Self-Service Solutions Overview Guide*
  Provides a high-level architectural and functional description of the Comverse ONE Self-Service Solutions. It also includes a detailed description of the concepts and development process to create and deploy Self-Service Solutions.
- *Web Applications Development Guide*
  Provides instructions for configuring, developing, and deploying Web applications that use the Self-Service Solutions Platform.

Self-Service Solutions Platform Reference

Self-Service Solutions Platform reference documentation includes the following (in alphabetical order):

- *Base Logic Manager Reference*
  Describes usage syntax and configuration files for the Base Logic Manager (BLM) APIs. These APIs are the core services of the Self-Service Solutions Platform.
- *CID2CBU Object Mapping Reference*
  Describes the default mapping of Customer Interaction Datastore (CID) and Communications Billing and Usage (CBU) objects.
- *Communications Billing and Usage Reference*
  Provides detailed descriptions of fields and tables in the Communications Billing and Usage (CBU) database.

- *Customer Interaction Datastore Reference*
  Provides detailed descriptions of fields and tables in the Customer Interaction Datastore (CID).
- *Integration Services Framework API Reference*
  Describes usage syntax of the set of APIs to program connectors and other components of the Intelligent Synchronization Framework (ISF).
- *Integration Services Framework Message Cache Reference*
  Provides detailed descriptions of fields and tables in the Intelligent Synchronization Framework (ISF) Message Cache.
- *Integration Services Framework Script API Reference*
  Describes usage syntax of the Intelligent Synchronization Framework (ISF) script APIs to program the ISF connectors.
- *JavaServer Page Framework for Internet Application API Reference*
  Describes usage syntax for the JavaServer Page Framework for Internet Application (JFN) APIs. These APIs are used to build JSPs using the JFN. This framework provides basic application functions and services as the foundation of user interfaces.
- *Logger Message Reference*
  Provides detailed descriptions of the Self-Service Solutions Platform log messages.
- *QRA API Reference*
  Describes usage syntax for the Query, Reporting, and Analysis (QRA) Engine APIs. These APIs are used to build reports.
- *UTIL API Reference*
  Describes usage syntax for the UTIL package used by different components of the Self-Service Solutions Platform. This package contains a set of utilities including the logger.Self-Service Solutions Applications Documentation

Each Self-Service Solutions Application comes with a comprehensive set of documentation covering the installation, configuration, and use of the product. The application documentation expands and complements the Self-Service Solutions Platform documentation.

The documentation set is divided into the following categories:

- **Manuals**: These manuals cover installing and using the application.
- **Reference**: These reference documents contain information about APIs, databases, configuration files, and so on. These documents are delivered in HTML.

Self-Service Solutions Application Manuals

A full set of these manuals is available for each Self-Service Solutions Application. The documentation set includes the following (in alphabetical order):

- *Business Objects Model Reference*
  Provides a detailed description of the models and entities that make up the Self-Service Solutions Application.
- *Catalog Loader Reference*
  Provides information about the Catalog Loader, including a functional description as well as installation, configuration, and use instructions.
- *Configuration and Development Guide*
  Provides instructions for configuring and developing Self-Service Solutions Application features.
- *Feature Reference*
  Describes the logic and provides use cases for the functional domains of the application.
- *Out-of-the-Box Reference Guide*
  Describes the Self-Service Solutions Application Out-of-the-Box release.
- *Self-Service Installation Guide for Comverse ONE*
  Provides detailed installation, configuration, and deployment instructions for the Self-Service Solutions Application alongside other elements of the Comverse ONE solution.

- *Self-Service Installation and Deployment Guide*
  Provides detailed installation, configuration, and deployment instructions for the Self-Service Solutions Application.
- *Introduction*
  Provides a high-level architectural and functional description of the Self-Service Solutions Application. It covers common features, order management, account management, and bill presentment.

Self-Service Solutions Application References

A full set of these references is available for each Self-Service Solutions Application.The reference documentation set includes the following (in alphabetical order):

- *API Reference*
  Describes usage syntax for the Self-Service Solutions Application APIs. These APIs are used to program the user interface and manage data.
- *Invoice Schema Reference*
  Describes the invoice schema reference of the Self-Service Solutions Application.
- *Presentation Layer Page Flow Reference*
  Describes the page flows of the Self-Service Solutions Application.
- *Specification Entity Relationship Diagrams*
  Provides diagrams describing the actors, use cases, user activity, and storyboard in IBM Rational Rose format.

Self-Service Solutions - Separately Licensed Products

Documentation available with optional, separately-licensed premium products in the Comverse Self-Service Solutions is listed below.

Online Catalog Manager

Online Catalog Manager (OCM) documentation includes the following (in alphabetical order):

- *Introduction to the Online Catalog Manager*
  Provides a high-level architectural and functional description of the Online Catalog Manager.
- *Online Catalog Manager Getting Started Guide*
  Describes the best way to build product catalogs in the Online Catalog Manager. This manual is a template for creating end-user documentation.
- *Online Catalog Manager Installation and Configuration Guide*
  Provides installation and configuration instructions for the Online Catalog Manager.
- *Online Catalog Manager User Documentation Template*
  Describes the use of the Online Catalog Manager. This manual is a template for creating end-user documentation. This manual covers many common concepts and procedures of the OCM.
- *Online Catalog Manager User Guide*
  Provides a detailed description of the concepts and use of the Online Catalog Manager. The topics include:
  - Managing Media Files
  - Managing Offers
  - Managing Prices
  - Managing Products
  - Managing Properties
  - Managing Reference Data
  - Publishing

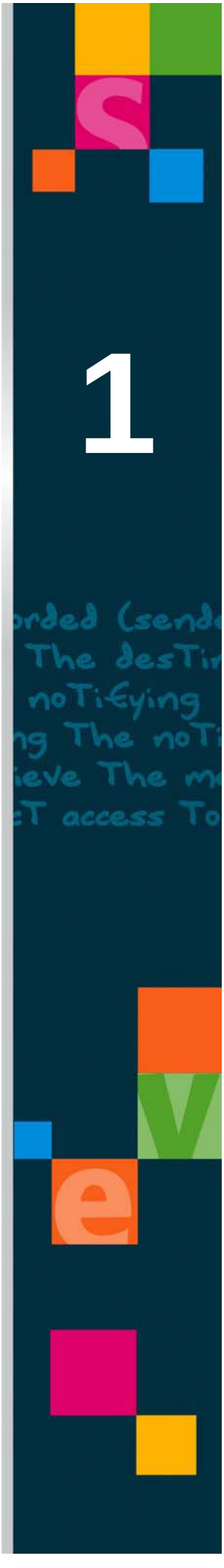
CSR Portal

The CSR Portal product includes the standard Application documentation, plus the following manual:

- *CSR Portal User Guide*
  A guide to using the CSR Portal UI.

Chapter 1

Signaling Gateway Unit Platform Overview



New Features for This Release

There are no new features in the Comverse ONE 3.5.50 release that impact the Signaling Gateway Unit Guide.

Overview

The Signaling Gateway Unit (SGU) is a major component of the Comverse ONE solution. The SGU is a signaling point in the Signaling System 7 (SS7) network, and provides the SS7 front-end for the Comverse ONE solution. All Intelligent Networking (IN) signaling traffic in or out of the Comverse ONE solution that is carried on SS7 passes through the SGU.

The Comverse ONE solution is an implementation of an IN Service Control Point (SCP). The SGU transfers call signaling information from the SS7 network to the Service Logic Units (SLUs) of the Comverse ONE solution over the High Speed Backbone Network (HSBN). The messages distributed by the SGU to the SLUs carry information that is extracted by SLU applications that support real time billing. Call processing logic is executed in the SLU.

The SS7 network is an internationally standardized telephony network for advanced telephony signaling. It is a packet-switched network protocol that separates the signaling channel from the voice channel to provide a secure, reliable communications infrastructure.

The SGU connects to the SS7 network via adjacent signaling points. In a wireless telephony application, these adjacent signaling points are typically Mobile Switching Centers (MSCs) or Signaling Transfer Points (STPs).

The SGU provides signaling connectivity to the SS7 network via a Time-Division Multiplexed (TDM) interface (T1 or E1), a serial interface, or an Internet Protocol (IP) interface, enabling the system to support the following application layer protocols:

- In ANSI networks:
  - Wireless Intelligent Network (WIN)
- In ITU networks:
  - Customized Application for Mobile Enhanced Logic (CAMEL)
  - Intelligent Network Application Part (INAP)
  - Unstructured Supplementary Service Data (USSD)
  - General Packet Radio Service (GPRS)

The SGU 5.1 platform is a scalable, Linux-based platform capable of processing thousands of signaling requests per second and providing full SS7 and LAN connectivity.

The SGU 5.1 platform runs OMNI 7.12 software and is implemented as a dual computing element (CE) loadsharing configuration in OMNI clusters of up to two CEs.

OMNI is a middleware platform supplied by Comverse. The operation of the SGU depends on correct configuration of the OMNI middleware. Contact your Comverse technical support representative for detailed information regarding OMNI.

In the dual-CE configuration, two copies of all management and service-related data are maintained within a cluster, thus protecting IN services (including persistent applications) from local hardware and software failures and guaranteeing a high level of availability.

SGU Hardware Configurations

The SGU Computing Element (CE) is the SGU component that provides the platform for the Linux operating system, the OMNI middleware, and the SGU applications and processes. Each CE carries a copy of all SGU processes and distributed files. The main purpose of the CE is to facilitate SGU service delivery.

Each SGU CE uses a Dual Processor Module 2 (DPM2) or Dual Processor Module 3 (DPM3) board.

For traditional SS7 configurations using TDM (T1/E1) or serial connections, each DPM works in conjunction with one or two Signaling Link Modules (SLMs). SLMs are interface cards that each provide a single T1/E1 TDM connection and eight V.35 serial ports. The TDM connection provides the equivalent of 31 64-Kbps signaling link connections (HSL mode) and up to 16 LSL links for each SLM. All SGU modules are shelf-mounted in a DCP6 or DCP10 chassis.

For IP (SIGTRAN / M3UA) SS7 connections, SLM boards are not required. The DPM 2 board provides three 100Mbps / 1000Mbps Ethernet connections. One connection is reserved for connection to the internal HSBN. The other two connections are available for external links. The DPM 3 board provides five 100Mbps / 1000Mbps Ethernet connections, four of which are available for external links.

SLM cards are not used for SS7 over IP (SIGTRAN / M3UA) signaling.

SGU SS7 Protocol Configuration

The following sections assume a basic understanding of the SS7 network model, layered protocols, IN network architecture, and the OMNI software platform.

The SGU constitutes a logical node in an SS7 network and functions as a terminating signaling point (SP). It is assigned a unique point code (PC) for its site location. It has no transit exchange capabilities and is not a Signaling Transfer Point (STP). It receives incoming calls that are directed to it but cannot transfer signaling messages that are directed to another destination point code (DPC).

Figure 1, “SS7 Stacks for Traditional SS7”depicts the SGU in a traditional SS7 network.

Figure 1 SS7 Stacks for Traditional SS7

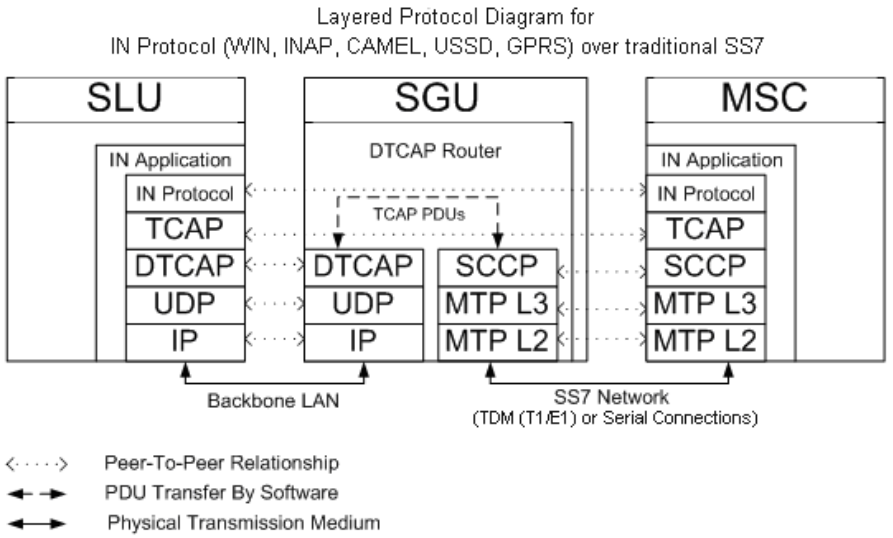
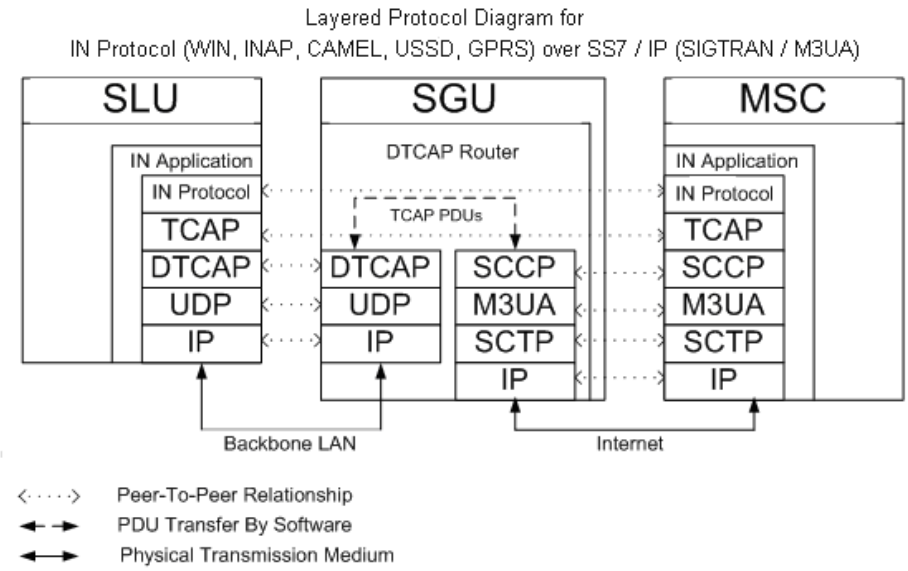


Figure 2, “SS7 Stacks for SIGTRAN” shows an SGU as a component of a SIGTRAN SS7 network.

Figure 2 SS7 Stacks for SIGTRAN



The SGU supports the following SS7 stack configurations:

- <Any ITU Application Protocol> over <ITU TCAP> over <ITU Lower Layers>
- <WIN> over <ANSI TCAP> over <ANSI Lower Layers>
- <WIN> over <ANSI TCAP> over <ITU Lower Layers>
- <WIN> over <ITU TCAP> over <ITU Lower Layers>

The following sections describe how signaling information from the SS7 network is received by the SGU and distributed to multiple SLUs for processing.

SGU - SS7 Communications Interface

SGU - SS7 communication is based on the OMNI platform. The SGU implements the SS7 stack up to and including the Signaling Connection Control Part (SCCP) layer. SCCP is an end-to-end protocol between the SGU and peer protocol entities at Mobile Switching Centers and other kinds of STPs.

Signaling information from the SS7 network is transported to the SGU in the form of Message-Signaling Units (MSUs). This information exchange is supported by the Transaction Capabilities Application Part (TCAP) protocol, which resides at the application layer of SS7, and uses the underlying services of SCCP. The TCAP protocol carries various IN protocols (CAMEL, USSD, GPRS, and INAP in ITU networks, and WIN in ANSI networks) that are later extracted by IN applications at the SLUs.

Inbound from SS7, the SGU distributes the SCCP content to multiple TCAP protocol entities at the SLUs. In the outbound direction, the SGU accepts data from these Distributed TCAP protocol entities and passes this data outbound to SS7 as the SCCP content.

Links Sets and Links

The primary unit of connectivity for traditional SS7 implemented over TDM or serial connections is the signaling link. Physically, an traditional SS7 signaling link is a 64kbps channel implemented over a twisted pair serial connection or multiplexed on a multiple channel T1 or E1 connection.

Signaling links are organized into link sets. A link set groups multiple signaling links that all terminate at the same adjacent signaling point.

The SGU connects to each adjacent signaling point via one or more link sets. To achieve redundant connectivity, the individual signaling links in each link set must be distributed across both SGU CEs.

Association Sets and Associations

The primary unit of physical connectivity for SS7 over IP (SIGTRAN) is the association. Logically, an association set is equivalent to a link set.

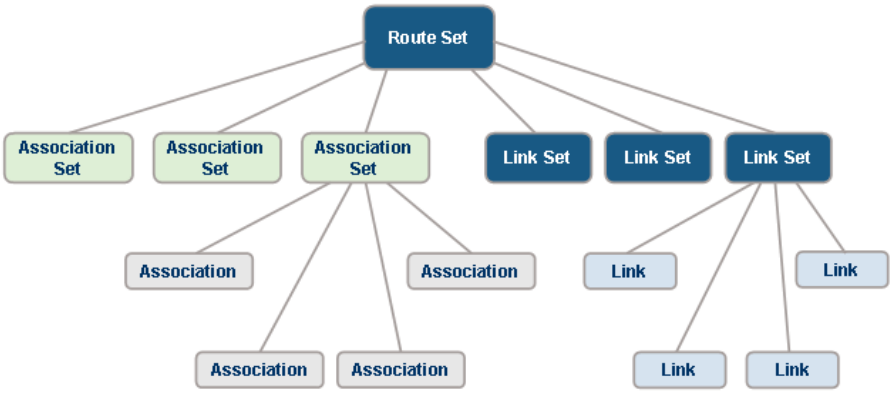
Associations are organized into association sets. An association set groups multiple associations that all terminate at the same adjacent signaling point. The SGU connects to each adjacent signaling point via one or more association sets. To achieve redundant connectivity, the individual associations in each association set must be distributed across both SGU CEs.

Route Sets and Routing

To determine outbound SS7 routing, the SGU maintains a set of hierarchical tables. The route set table is at the top of the hierarchy, the link set or association set tables are in the middle and the signaling link or association tables are at the bottom.

The routing logic only selects a link set from a route set. If a link set or association set does not belong to at least one route set, it is not available for routing. All possible destination point codes must be included in at least one route set, even if these point codes are adjacent.

Figure 3 SGU Routing Hierarchy



Transaction Control Application Part (TCAP)

The TCAP is an application layer protocol of SS7. The TCAP protocol resides in the layered network model directly over the Signaling Connection Control Part protocol and directly beneath the IN protocols (CAMEL, INAP, WIN, and so on). It provides a set of tools in a connectionless environment that an application at one node uses to execute a procedure at another node and then exchanges the results.

This part of the SS7 network includes any application-layer protocols, as well as any transport, session, and presentation layer services and protocols that support TCAP. In a typical SS7 application, TCAP uses the

services of the SCCP, which in turn uses the services of the MTP (in traditional SS7 netowrks), or M3UA (in IP / SIGTRAN networks).

SGU - SLU Communications Interface: DTCAP Protocol

DTCAP is a Comverse proprietary protocol inserted between TCAP and the SCTP protocol that connects the SLU and SGU. The DTCAP protocol distributes TCAP traffic across multiple SLUs. It is a multiplexer/demultiplexer between the single SCCP protocol entity at the SGU and multiple TCAP protocol entities at the SLUs. It makes the multiple, distributed TCAP protocol entities appear to the SCCP layer as one, unified TCAP protocol entity.

The SGU sends messages in the form of DTCAP Protocol Data Units (PDUs) to the SLUs. The DTCAP protocol carries the TCAP protocol, which in turn carries the IN protocols (CAMEL, WIN, and INAP, and others). IN applications at the SLUs extract IN PDUs from the TCAP content.

DTCAP is carried over the Stream Control Transport Protocol (SCTP) on the HSBN. The SCTP protocol is implemented between two or more DTCAP protocol entities, one at the SGU and one or more at each SLU that supports a TCAP application. At the SGU, the DTCAP protocol receives TCAP messages from the SCCP layer, then distributes them in a round robin manner to the SLUs. The DTCAP protocol is also responsible for detecting SLU failure, recovery, and overload.

Distributed OMNI Environment: Redundancy and Loadsharing

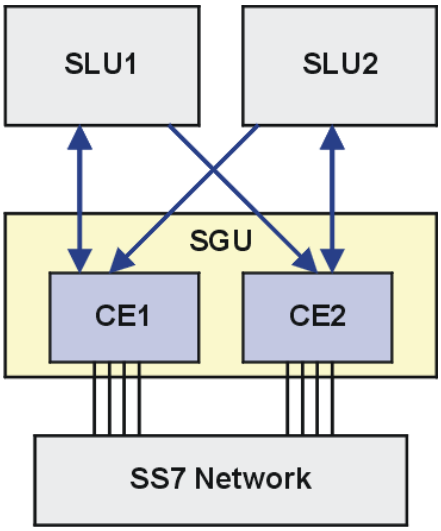
The SGU dual CE configuration is an implementation of a distributed OMNI environment, also known as an OMNI cluster, that provides a loadsharing configuration with operating redundancy. Each SGU communicates with multiple SLUs. Each CE of a an SGU typically operates at 40 percent link utilization.

The SGU CEs start up without any knowledge of the SLUs. They recognize the SLUs via the DTCAP protocol registration. Each SGU CE is identified to the SLU by an SCTP socket number, and the SLUs are constantly polling them. If any SGU CE is unresponsive, the SLU considers it non-operational.

The dual CE SGU configuration (shown in Figure 4, “Dual CE SGU Loadsharing Configuration”) consists of two redundant, loadsharing CEs. All critical processes, utilities, and configuration files are duplicated on each CE and the SS7 signaling links or associations that belong to the same link set or association set are distributed evenly between both CEs. When SS7 message signal units are received from the network, the physical signaling link termination determines which CE receives the MSUs.

Redundant CE operation enables the system to survive complete failure of either one of the CEs without loss of service. Because the SS7 links or associations are distributed across two CEs, each sharing 40 percent of the traffic load, when a failure occurs, the running CE can assume the additional traffic load from the failed CE and operate alone at 80 percent link utilization.

Figure 4 Dual CE SGU Loadsharing Configuration



Redundancy at the SGU

The SGU provides both redundant processor capacity and a redundant means of routing traffic between the SS7 network and the redundant processors.

Processor Redundancy: Active and Standby DTCAP Routers

The SGU is configured with two Computing Elements. Each CE is capable of processing all SS7 traffic inbound to and outbound from the SGU. If both CEs are operational, each CE processes half of the total traffic. If one CE fails, the remaining CE is capable of processing all traffic.

The DTCAP Router is the connectivity application of the SLU. It connects the various IN Applications on the SLU to the SS7 networkvia the Signaling Point implemented at the SGU.

Under OMNI's distributed processing, the DTCAP Router on the SGU actively processes traffic on both CEs. OMNI designates the DTCAP Router on one CE as Active and the DTCAP Router on the other CE as Standby. This can be easily misinterpreted. The Active and the Standby DTCAP processes are both fully operational at all times and process SS7 traffic simultaneously and identically.

When both SGU CEs are operational, the Active and Standby DTCAP processes share equally in processing SS7 traffic on the signaling links connected to the SGU.

If either the Active or the Standby DTCAP process fails, then the remaining DTCAP entity can assume the full load and process all traffic between the SGU and its adjacent signaling points.

SS7 Connection Redundancy

Connection redundancy is achieved by establishing redundant logical and physical paths between the two SGU CEs and each adjacent signaling point via one or more SS7 signaling links (in traditional SS7 networks) or associations (in SS7 IP (SIGTRAN) networks).

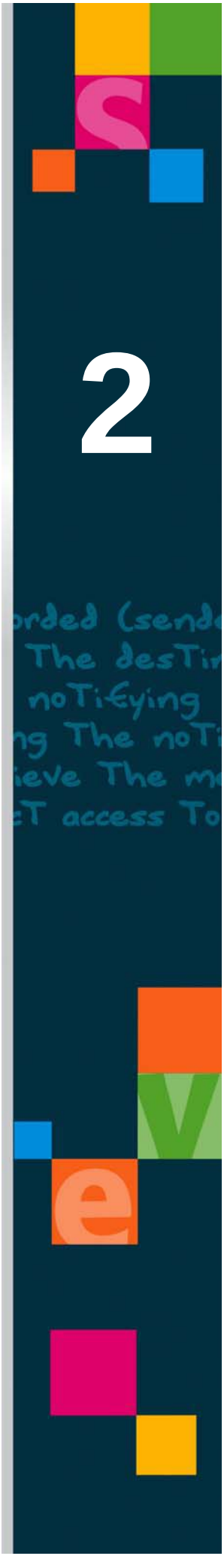
One or more link sets or association sets is established between both CEs of an SGU and each adjacent signaling point. An even number of links or associations must be defined in each link set or association set. Half of the associations in each set are terminated at SGU CE A and half at SGU CE B.

If one SGU CE fails, all SS7 signaling points adjacent to that SGU determine that the associations terminating at that CE have failed and therefore direct all inbound traffic to the Comverse ONE solution and the remaining good associations (on the other SGU CE).

The IN applications at the SLUs make a similar determination (an SGU CE has failed) and direct all outbound traffic to the remaining SGU CE.

Chapter 2

SGU Hardware



Overview

This chapter provides SGU 5.1 maintenance information and procedures for the SGU 5.1 DPM-based platform.

SGU 5.1 DPM-Based Platform Maintenance

Maintenance procedures for the DPM-based SGU consist of performing preventive maintenance and replacement procedures, monitoring and alarm resolution, and performing troubleshooting procedures when a failure occurs. This section describes:

- SGU 5.1 Components
- Module LED Indicators and Connectors
- Module Replacement

SGU 5.1 Components

SGU 5.1 components are mounted in a DCP-6 or DCP-10 chassis and can include the following:

- Dual Processor Module 2 (DPM 2) and associated Rear Transition Module (DPM2-RTM)
- Dual Processor Module 3 (DPM 3) and associated Rear Transition Module (DPM3-RTM)
- Signaling Link Modules (SLM) and associated Rear Transition Module (SLM-RTM)

Chassis Configurations

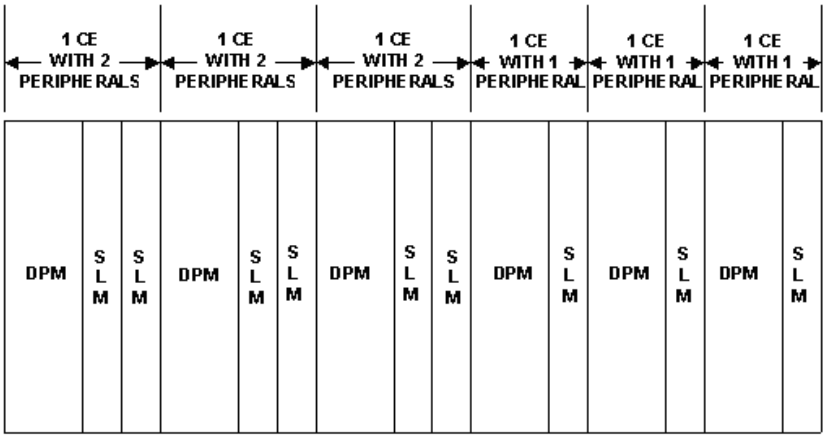
The SGU 5.1 DPM platform is configured in the DCP chassis. The DCP chassis implements exactly 21 slots distributed over multiple Compact PCI busses. The 21 slots on the DCP chassis are partitioned into contiguous groups and each group is associated with one PCI bus. Supporting boards include up to two SLMs for each DPM and the power supply module.

Figure 5, “DCP Chassis Configurations,” shows the six DPM and ten DPM configurations. The DCP chassis implements one Compact PCI Bus for each DPM supported. No slots are allocated for hard drive bays or the power supply. The hard drive mounts directly to the DPM board. The power supply is located within the fan units below the chassis.

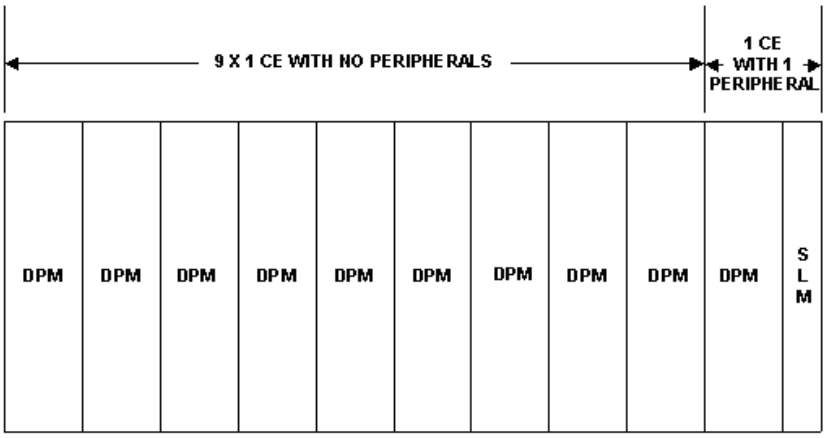
The six DPM variant of the chassis is partitioned from left to right into three 4-slot Compact PCI busses, followed by three 3 slot busses. As shown in Figure 6, “SGU Modules in DCP-6 Chassis (Rear View),” the leftmost three DPMs can each support two single card peripherals (SLMs), while the rightmost DPMs only support one peripheral.

In the ten DPM variant, the leftmost nine support no peripherals. The rightmost DPM supports only one peripheral.

Figure 5 DCP Chassis Configurations



6 CE Variant

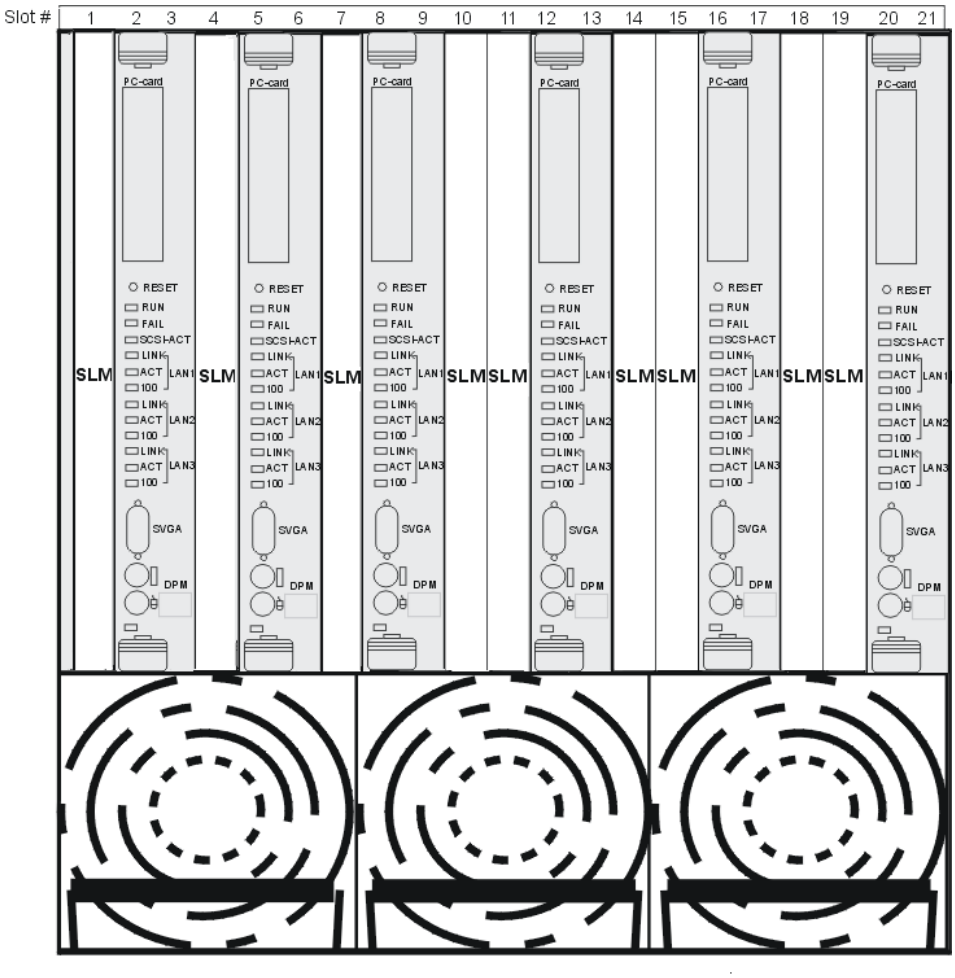


10 CE Variant

Internal sensors in the DCP chassis continually monitor the unit's internal temperature. The sensor output regulates the speed of the internal fans.

Figure 6, "SGU Modules in DCP-6 Chassis (Rear View)" shows a DCP-6 chassis with six DPM 2 cards.

Figure 6 SGU Modules in DCP-6 Chassis (Rear View)



NOTE SLM cards are not used for SS7 over IP (M3UA) signaling.

Dual Processor Module Variants (DPM 2, DPM 3)

There are two variants of the Dual Processor Module:

- Dual Processor Module 2 (DPM 2)
- Dual Processor Module 3 (DPM 3)

Each DPM consists of two modules: the DPM itself and the Rear Transition Module (RTM). The RTM supports the array of connectors required for I/0 for DPM I/O connections: SGVA, keyboard and mouse, two COM ports, three (DPM 2) or five (DPM 3) LAN connectors, USB port, and SCSI connector (DPM 2).

NOTE The DPM 2 occupies two slots in the DCP chassis. The DPM 3 occupies only a single slot.

DCP-6 Chassis

A single DCP-6 chassis shelf accommodates one dual-CE SGU configuration consisting of two DPM 2 boards and two to four SLM modules. Three self-regulating fans are included in the DCP-6 chassis to cool and ventilate the platform.

Module LED Indicators and Connectors

This section describes the connectors, controls, and LED indicators on the SGU module panels.

Dual Processor Module 2 (DPM 2) Front Panel

Table 4, “DPM 2 Front Panel Controls, Connectors, and LED Indicators” describes the DPM 2 front panel RESET button, LED indicators, and connectors. Figure 7, “DPM 2 Front Panel Controls, Connectors, and LED Indicators” shows the DPM 2 front panel.

Table 4 DPM 2 Front Panel Controls, Connectors, and LED Indicators

LED	Purpose
RESET	Push the button with the tip of a pencil to reset the hardware.
RUN	Lights green when power is supplied to the drawer.
FAIL	Lights amber when a failure is detected.
SCSI-ACT	Lights green when SCSI drive is active.
SCSI-IDE	Lights green when IDE drive is active.
LINK	Lights green to indicate LAN 1, 2 or 3 is up.
ACT	Activity indicator for LAN 1, 2 or 3.
100	100 Mbps indicator for LAN 1, 2 or 3.
1000	1000 Mbps indicator for LAN 1 or 2
USB	USB connector for keyboard.
HS	Hot Swap indicator; lights blue when module is safe to be swapped.

Figure 7 DPM 2 Front Panel Controls, Connectors, and LED Indicators

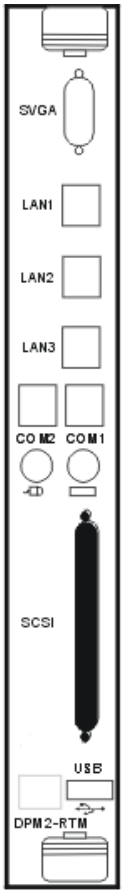
DPM 2 Rear Transition Module

Table 5, “DPM 2 Rear Transition Module (DPM2-RTM) Connectors” describes the DPM2-RTM connectors. Figure 8, “DPM 2 Rear Transition Module (DPM2-RTM) Connectors” shows these connectors.

Table 5 DPM 2 Rear Transition Module (DPM2-RTM) Connectors

Connector	Purpose
SVGA	Connector for monitor
LAN1-LAN3	LAN connectors 1, 2, and 3 (RJ-45)
COM1-COM2	Two serial port connectors
Keyboard	Connector for keyboard
Mouse	Connector for mouse
SCSI	68 pin SCSI connector for external disk drive
USB	USB port

Figure 8 DPM 2 Rear Transition Module (DPM2-RTM) Connectors



DPM 3 Front Panel

Table 6, “DPM 3 Front Panel Controls, Connectors, and LED Indicators” describes the DPM 3 front panel RESET button, LED indicators, and connectors. Figure 9, “Dual Processor Module 3 (DPM 3) Front Panel” shows the DPM 3 front panel.

Table 6 DPM 3 Front Panel Controls, Connectors, and LED Indicators

LED	Purpose
RESET	Push the button with the tip of a pencil to reset the hardware.
RUN	Lights green when power is supplied to the drawer.
FAIL	Lights amber when a failure is detected.
ACT / LINK	Lights green when floppy or CD drive is active.
HDD	Lights green when hard disk drive is active.
LAN 1-5 ACT / LINK	Activity indicator. Lights green to indicate LAN 1-5 is up.
LAN 1-5 100 / 1000	100 / 1000 Mbps indicator for LAN 1 - 5.
USB	USB connector for keyboard.

Figure 9 Dual Processor Module 3 (DPM 3) Front Panel

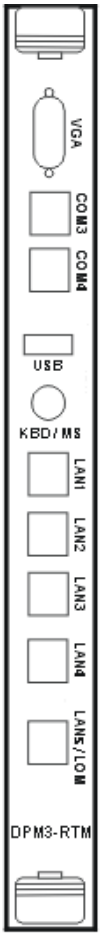
DPM 3 Rear Transition Module

Table 7, “DPM 3 Rear Transition Module (DPM3-RTM) Connectors” describes the DPM3-RTM connectors. Figure 10, “DPM 3 Rear Transition Module (DPM3-RTM) Connectors” shows these connectors.

Table 7 DPM 3 Rear Transition Module (DPM3-RTM) Connectors

Connector	Purpose
VGA	Connector for monitor
COM3-COM4	Two serial port connectors
KBD / MS	Connector for keyboard or mouse
USB	USB port
LAN1-LAN4	LAN connectors 1 - 4 (RJ-45)
LAN5 / LOM	LAN 5 and Lights Out Monitor Connector (RJ-45)

Figure 10 DPM 3 Rear Transition Module (DPM3-RTM) Connectors



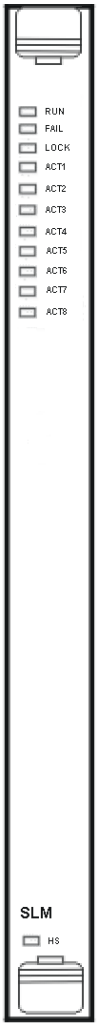
Serial Link Module (SLM) Front Panel

Table 8, “Serial Link Module (SLM) Front Panel” describes the Serial Link Module (SLM) front panel LED indicators. Figure 11, “Serial Link Module (SLM) Front Panel” shows the SLM front panel.

Table 8 Serial Link Module (SLM) Front Panel

Connector	Purpose
RUN	Lights green when power is supplied to the drawer.
FAIL	Lights amber when a failure is detected.
LOCK	
ACT1 - ACT8	Activity indicators for Serial Links 1 - 8.
HS	USB Connector

Figure 11 Serial Link Module (SLM) Front Panel



NOTE SIGTRAN configurations do not require the SLM or SLM-RTM cards.

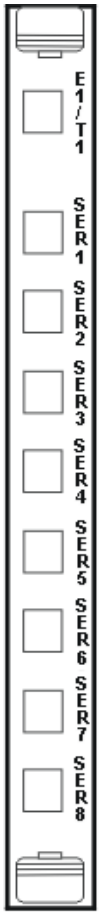
SLM Rear Transition Module

Table 9, “SLM Rear Transition Module (SLM-RTB) Connectors” describes the SLM-RTM connectors. Figure 12, “SLM Rear Transition Module (SLM-RTB) Connectors” shows these connectors.

Table 9 SLM Rear Transition Module (SLM-RTB) Connectors

Connector	Type	Purpose
E1 / T1	One 8-pin RJ-45 connector	High Speed Link E1 / T1 Connection
SER1-LAN8	Eight 10-pin RJ45/48 connectors	Low Speed Link Serial Connections 1 - 8

Figure 12 SLM Rear Transition Module (SLM-RTB) Connectors



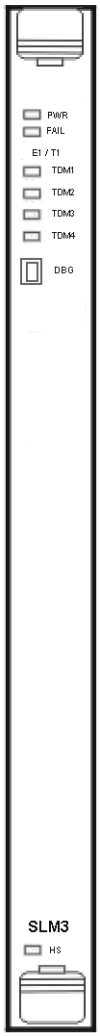
Serial Link Module 3 (SLM3) Front Panel

Table 10, “Serial Link Module 3 (SLM3) Front Panel” describes the Serial Link Module 3 (SLM3) front panel LED indicators. Figure 13, “Serial Link Module 3 (SLM3) Front Panel” shows the SLM3 front panel.

Table 10 Serial Link Module 3 (SLM3) Front Panel

Connector	Purpose
PWR	Lights green when power is supplied to the drawer.
FAIL	Lights amber when a failure is detected.
TDM1 - TDM4	Activity indicators for Time Division Multiplexed links 1 - 4.
DBG	Enables attachment of a monitor for debugging purposes.
HS	USB Connector

Figure 13 Serial Link Module 3 (SLM3) Front Panel



NOTE SIGTRAN configurations do not require the SLM3 or SLM3-RTM cards.

SLM3 Rear Transition Module

Table 11, “SLM3 Rear Transition Module (SLM3-RTM) Connectors” describes the SLM3-RTM connectors. Figure 14, “SLM3 Rear Transition Module (SLM3-RTM) Connectors” shows these connectors.

Table 11 SLM3 Rear Transition Module (SLM3-RTM) Connectors

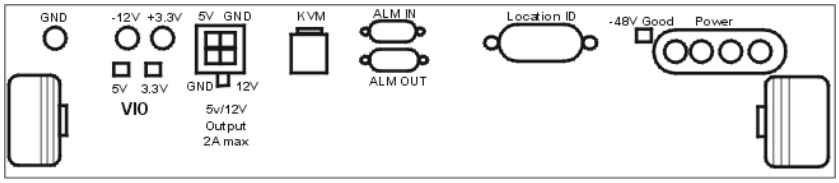
Connector	Type	Purpose
E1 / T1	Four 8-pin RJ-45 connectors	High Speed Link E1 / T1 Connection

Figure 14 SLM3 Rear Transition Module (SLM3-RTM) Connectors

Power Supply Module

The power supply module is located at the lower portion of the DCP-6 chassis behind the fan units. Typically, there is a main power supply (A) and a backup (B). The power supply panel is accessible from the rear of the chassis. It contains interface connectors, power supply jacks, and LED voltage status indicators. Figure 15, “SGU Power Supply Panel” shows the power supply panel and its connectors.

Figure 15 SGU Power Supply Panel



Power Supply Panel Jacks and LED Indicators

Table 12, “Power Supply Rear Panel Connectors and LEDs” describes the power supply rear panel connectors and LED indicators.

Table 12 Power Supply Rear Panel Connectors and LEDs

LED	Purpose
GND	Chassis ground jack
-12	-12V test jack
+3.3V	+3.3V test jack
+12V	+12V output jack
+5V	+5V output jack
5V LED	5V LED Indicator
3.3V LED	3.3V LED Indicator
KVM	Mini-Console Bus connector
ALM IN	Alarm circuit input connector (for customer use)
ALM OUT	Alarm circuit output connector (for customer use)
Location ID	KVB Location ID jack (for thumbwheel card)
-48V Good LED	-48V LED indicator. Lights green to indicate -48V input power is available and in the correct input range.
POWER	Input power connector

Table 13, “PSM Front Panel LED Indicators”describes the Power Supply Module front panel LED indicators. The power supply LEDs are located on the front panel of each of the three fan assemblies and indicate the status of the main (A) and backup (B) power supplies.

Table 13 PSM Front Panel LED Indicators

LED	Purpose
-48VA[1]	Lights green to indicate -48V input power is available and in the correct input range.
-48VB[1]	Lights green to indicate -48V input power is available and in the correct input range.
RUN[2]	Lights green to indicate that power is supplied to the unit and no faults have been detected.
FAIL[2]	Lights amber when a PSM failure is detected.

1. A: designates power supply on the right side of the chassis (viewed from the rear). B: designates power supply on the left side of the chassis (viewed from the rear).
2. Fail (Amber) and Run (Green) LEDs are ON for 1 second after power turn on to indicate proper status of the LEDs and indicated PSM status.

Module Replacement

The DPM and SLM modules are secured in the DCP shelf by screws and latches. Perform the following procedure to replace modules in the SGU shelf:

There is an Electrical Shock Hazard when servicing this system. Switch off the power before opening system cabinets or attempting to remove or adjust boards, components or other electrical subassemblies.

These modules contain Electrostatic Discharge (ESD) sensitive components. Improper handling can damage components. When working with modules, always attach an ESD wrist strap.

Do not remove a module from its protective wrapper from the module drawer unless you have taken ESD precautions. When installing or removing modules, place them component-side up, on a grounded, static-free surface. Put the modules on a special ESD foam pad if available. Do not slide the modules over a surface of any kind.

During disassembly procedures, be careful to retain all hardware for later use during reassembly procedures.

Before installing a disk or board or other electrical component, always verify that required jumpers and DIP switches have been properly set. Refer to the following sections for relevant information.

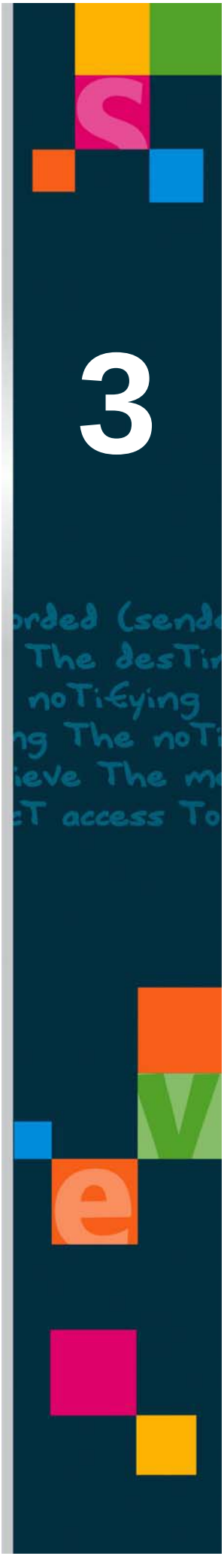
To replace a faulty SGU board in the DCP shelf:

1. Perform an orderly shutdown of the operating system.
2. Turn off the appropriate switch on the distribution panel.
3. Unscrew the screws on the top and bottom latches that secure the module to the shelf frame.
4. Unlatch the top and bottom handles by pushing in on the red buttons and then pulling on the latches.
5. Gently pull the board out of the chassis shelf.
6. Insert the replacement board.
7. Push the card back into the shelf and press the two top and bottom latches to secure the card in place.

8. Turn on the appropriate switch on the distribution panel.

Chapter 3

SGU Configuration



Overview

This chapter contains SGU configuration procedures for the multi-CE, DPM2- or DPM3-based SGU 5.1 platform, which runs OMNI 7.12 software.

SGU configuration procedures are performed after software installation is complete. Configuration includes logical node definition and activation.

Installation of the SGU software must be performed by qualified Comverse service personnel with broad-based Linux knowledge, familiarity with SS7 and telecommunications, and a solid understanding of the SGU architecture and its components. It is recommended that all the concepts discussed in the introductory chapters be thoroughly understood before proceeding to system configuration.

The following general configuration procedures must be performed:

- Establishing an SLAN Ring in Redundant Systems
- Configuring the SGU Network
- Configuring Traditional SS7 (non-IP) Signaling Links
- Configuring SIGTRAN (SS7 Over IP) Associations
- SGU Sizing Requirements

Establishing an SLAN Ring in Redundant Systems

Establishing an SLAN ring enables a distributed environment and ensures redundancy in a multi-CE SGU system.

The COM ports on the rear panel for an SGU 5.1 DPM/DPM2 platform with a dual CE are connected as follows:

- Serial port 1 of System A to serial port 2 of System B
- Serial port 2 of System A to serial port 1 of System B

Configuring the SGU Network

This section describes the post-installation configuration of the OMNI SGU system and network. The SGU system components to be configured are the SGU software platform and the SS7 boards. For the SGU 5.1 DPM2- or DPM3-based platform, SS7 board configuration is done automatically by the software.

Do not attempt SGU configuration without extensive knowledge of the SGU file structure and the SGU utilities. Refer to Chapter 4, “SGU Operation and Maintenance” for detailed information on these topics.

The network configuration components are the SGU/SS7/Comverse ONE solution and IN SCP/IP logical node. The logical node configuration includes the MTP or M3UA element that provides communication between Comverse ONE solution and IN SCP/IP and signaling points (switches).

Configuration Tasks

SGU OMNI7 platform and network configuration is performed after installation of the SGU platform software is completed. It consists of the following tasks:

1. Edit the sguPlatform file. The hostname, IP addresses, link board type and configuration parameters, and SCTP port parameters must be entered.
2. Run the configurePlatform script. This automated process reads the sguPlatform file and configures the SGU based on the information it contains.
3. Provision the network using the MML commands (refer to Chapter 5, “MML Commands”) to define the following:
   - Own Signaling Points (OSP)
   - Association sets/ Associations (for SIGTRAN configurations)
   - Link Sets / Signaling Links (for traditonal SS7 configurations)
   - Route Sets
   - Signal Connection Control Point (SCCP) definition
   - Display configuration information
   - Network components activation
   - Link alignment

The configureSGU Utility

The configureSGU utility builds the configuration files needed for system startup. It is run after the physical SS7 connections (whether implemented as twisted pair, TDM or IP) are set up. The configureSGU utility calls the configurePlatform and configureNodes processes to create the shared memory (SHM) configuration files.

The configureSGU utility reads the site-specific sguPlatform.<CE> file and configures the SGU based on the information in the file.

Merging sguPlatform Files

When a new release of the SGU software is installed, configureSGU compares and merges the generic sguPlatform file of the newly installed release with the previous site-specific sguPlatform.<CE> file, producing a new site-specific sguPlatform file on the CE. It does not overwrite any previous SGU configuration files.

Some manual editing could be necessary to resolve conflicts produced by the merge function and to insert values (other than defaults) for new parameters.

The merge process uses three files as input:

- The new generic sguPlatform file ($OMNI_HOME/ipf/conf/sguPlatform).
- The customer-specific sguPlatform file ($OMNI_HOME/ipf/conf/sguPlatform.<CE>). This file contains the user settings of the sguPlatform file, created for the previous release. Because this file also contains the results of the merge process, when configureSGU starts up, it creates a backup copy called ($OMNI_HOME/ipf/conf/sguPlatform.<REVISION>).
- The generic sguPlatform file from the previous release ($OMNI_HOME/UPDATE/ipf.conf.sguPlatform.RESTORE.IPF.<V>). This file generated the current sguPlatform.<CE> file.

In the above filenames, <V> represents the version number, <REVISION> represents revision number, and <CE> represents the SGU ID.

Running configureSGU

The configureSGU procedure must be run after each initial installation or upgrade.

To run configureSGU:

1. Enter superuser mode using “su –“
2. Enter the following commands:

   export OMNI_HOME=/home/omni

   export SHM=204

   $OMNI_HOME/ipf/conf/configureSGU <CEname>

   Where <CEname> is the Linux name of this processor. This should be the same as the name specified in the sguPlatform file parameter CE1_NAME or CE2_NAME, whichever applies.

sguPlatform File Parameters

The sguPlatform file is a template that contains a list of parameters initialized to default values and is used to create the sguPlatform**.**<CEname> file. The sguPlatform**.**<CEname> file is the primary input to configureSGU and contains all of the parameters from sguPlatform with the individual variable values adjusted to reflect the configuration parameters required for a specific SGU CE.

The sguPlatform file is delivered with the SGU OMAP package. It is installed in /home/omni/ipf/conf. To run configureSGU, the user must understand sguPlatform and its use. The user deals with sguPlatform in two contexts:

1. **Initial installation of SGU**: In this case, the user copies the content of sguPlatform to sguPlatform**.**<CEname>. The user must then inspect all parameters in sguPlatform**.**<CE name> and adjust their values to properly configure the specific SGU CE.
2. **Upgrade from a previous SGU major or minor release**: In this case, a pre-merge must be performed on sguPlatform.

Basic Parameters

Table 14, “sguPlatform file Basic Parameters” shows the basic parameters of the sguPlatform file.

Table 14 sguPlatform file Basic Parameters

Parameter	Definition	Default	Legal Values
HSBN_CLASS_C_NETID	Class C network ID portion of the IP address for HSBN	192.9.200.xxx	
HSBN_NETMASK	network mask	255.255.0.0	
HSBN_GATEWAY	Gateway for HSBN	Null	
SS7LAN1_CLASS_C_NETID	Class C network ID portion of the IP address for the first SS7 LAN	192.9.202.xxx	
SGU_TZ	Specifies the UNIX time zone setting. All possible settings can be located in /usr/share/zoneinfo directory.	America/New_ York	
CE1_NAME	Host name of the first (a) SGU CE.	sgu1a	

Table 14 sguPlatform file Basic Parameters (Continued)

Parameter	Definition	Default	Legal Values
CE2_NAME	Host name of the second (b) SGU CE.	sgu1b	
SGU_UNAME	The host name of *this* SGU CE.	$CE1_NAME	$CE1_NAME $CE2_NAME
NETDUMP_SERVER	Defines the IP address of the netdump server for a single CE SGU. When the IP address is defined and there is a kernel panic, the kernel panic dump is sent to the server over the HSBN.	NULL	Any valid IP address in the form xxx.xxx.xxx.xxx

For a dual CE SGU, set NETDUMP_SERVER with the IP address of the other SGU CE.

SLM Parameters

Table 15, “SLM Basic Parameters” shows the basic configuration parameters for the SLM line card.

Table 15 SLM Basic Parameters

Parameter	Definition	Default	Legal Values
CE1_BOARDS	Number of SLM boards for CE 1. When no board is configured (for an SGU with SIGTRAN only), must be set to zero.	1	0, 1, 2, 3, 4
CE2_BOARDS	Number of SLM boards for CE 2. When no board is configured (for an SGU with SIGTRAN only), must be set to zero.	1	0, 1, 2, 3, 4
PC_CARD_TYPE	Specifies SLM board type. For SGU 5.1, CC0205 is supported.	CC0205	CC0205
SERIAL_LINE_TYPE	Line protocol for the serial links. Significant only if serial links are defined.	RS530A	V35 RS449 RS530 RS530A

Table 15 SLM Basic Parameters (Continued)

Parameter	Definition	Default	Legal Values
NON_SERIAL_LINE_ TYPE	**Definition:** Specifies the TDM (T1/E1) link type.	LT_HSL_12	LT_NON_HSL – The TDM link supports 1 – 16 low speed links LT_HSL_7, LT_HSL_12 – The TDM link supports one High Speed Link. For T1, this link comprises all 24 T1 time slots. For E1, this link is comprised of 31 of the E1 time slots.The distinction between LT_ HSL_7 and LT_HSL_12 is an issue of the bandwidth of an internal HSL sequence number. For HSL, LT_HSL_7 or LT_ HSL_12 must be programmed in bilateral agreement with the setting of the remote STP. In practice, LT_HSL_12 is always configured.
SLM_BOARD_ CONFIGURATION	Specifies whether the SLM terminates serial or TDM lines.	TDM_only	Serial_only, TDM_only
SS7_LINE_PROTOCOL	Specifies the protocol of the TDM line. Only significant if SLM_BOARD_ CONFIGURATION = TDM_ only.	T1	T1, E1, J1
E1_FRAME_FORMAT	E1 frame format. Only significant if SS7_LINE_ PROTOCOL = E1.	Multi-frame	Multi-frame, double-frame. Must match the frame format configured on the remote STP. In practice, it must always be multi-frame.
E1_IMPEDANCE	Specifies the E1 impedance. Only significant if SS7_LINE_ PROTOCOL = E1.	Unbalanced	Unbalanced, Balanced. Must match the impedance configured on the remote STP.
T1J1_FRAME_FORMAT	Specifies the T1 or J1 frame format. Only significant if SS7_ LINE_PROTOCOL = T1 or J1.	ESF	D4, ESF. Must match the frame format configured on the remote STP. In practice, it must always be ESF.
T1J1_LINE_CODE	T1 or J1 line code. Only significant if SS7_LINE_ PROTOCOL = T1 or J1.	B8ZS	AMI, B8ZS. Must match the line code configured on the remote STP. In practice, it must always be B8ZS.

SS7 Parameters

Table 16, “SS7 Parameters” describes the Signaling System 7 parameters for the SGU.

Table 16 SS7 Parameters

Parameter	Definition	Default	Legal Values
SS7_PROTOCOL_TYPE	SS7 protocol type.	C7	A7 (ANSI), C7 (ITU).
CONGESTION_ STRATEGY	Specifies the SS7 protocol type of the second SS7 node.	IGNORE_PDU	■ IGNORE_PDU: drop TCAP BEGIN and don't send ABORT outbound ■ ABORT_IF_CONGESTED: drop TCAP BEGIN and send ABORT outbound ■ ROUTE_ROUND_ROBIN.
OPT_WIN	Specifies the IN protocol type. If yes, the protocol is ANSI (WIN). If no, the protocol is ITU.	yes	yes, no.
WIN_OVER_ITU_TCAP	This parameter is only relevant if OPT_WIN is set to yes. If OPT_WIN = yes, this parameter specifies whether WIN is carried over ITU TCAP or ANSI TCAP.	no	yes (ITU TCAP) no (ANSI TCAP)
WIN_CONTEXT_ CAPACITY_VALUE	Specifies the capacity of WIN context. It is used to configure dtcap.cfg.$SHM file.	60000	
WIN_MAX_ HEARTBEAT_PERIOD_ VALUE	Specifies the DTCAP heartbeat period. It is used to configure the dtcap.cfg.$SHM file.	3	

NTP Parameters

Table 17, "NTP Parameters" shows the Network Time Protocol (NTP) parameters that must be configured for the SGU.

Table 17 NTP Parameters

Parameter	Definition	Default	Legal Values
CONF_NTP	Specifies whether Network Time Protocol Server is configured. When NTP is configured, the IP addresses provided by XNTP_SERVER_A, XNTP_SERVER_B, and XNTP_SERVER_C are used to connect to the NTP servers. For effective use of the NTP,at least two of the three time servers must be configured. On startup, the ntpdate utility runs and obtains the current time and date in the order XNTP_SERVER_A, XNTP_SERVER_B, and XNTP_SERVER_C.	yes	yes, no
XNTP_SERVER_A	Specifies the first NTP server.	TRM A	valid IP address to an NTP Server host
XNTP_SERVER_B	Specifies the second NTP server.	TRM B	valid IP address to an NTP Server host
XNTP_SERVER_C	Specifies the third NTP server.	NULL	valid IP address to an NTP Server host

Alarm Parameters

Table 18, “Alarm Parameters” defines the parameters for disk and memory utilization threshold alarms.

Table 18 Alarm Parameters

Parameter	Definition	Default	Legal Values
ALARM_DISK_CRITICAL	Specifies the disk usage percentage that results in a critical threshold alarm.	90	1-99
ALARM_DISK_MAJOR	Specifies the disk percentage that results in a major threshold alarm.	80	1-99
ALARM_DISK_MINOR	Percentage that results in a minor threshold alarm.	70	1-99
ALARM_MEM_CRITICAL	Percentage of the number of free memory pages that results in a critical threshold alarm.	10 percent of the physical memory	1-99
ALARM_MEM_MAJOR	Percentage of the number of free memory pages that causes a major threshold alarm.	20 percent of the physical memory	1-99
ALARM_MEM_MINOR	Percentage of the number of free memory pages that causes a minor threshold alarm.	30 percent of physical memory	1-99
MAX_PROC_USAGE	Maximum percentage of the CPU utilization a process can use. Usage beyond this maximum causes a critical alarm.	75	1-99

Provisioning the Measurement Manager

The measurement manager is initially configured by the parameters in the sguPlatform file. Further provisioning is performed with MML commands entered via termhandler. The commands are entered in any order. This section presents the commands for provisioning call control.

CHANGE-MEAS, CHG-MEAS

Definition: CHANGE-MEAS:PURGE=dd,FILE={Y|N},MODULAR={Y|N}; CHG-MEAS:PURGE=dd,FILE={Y|N},MODULAR={Y|Y}; Defines the measurement file using the following specifications:

- **PURGE**: Number of days after which a file is purged.
- **FILE**: Enables or disables the output of the measurement data to the DFfile. This option must not be used unless there is a client application registered as a copy client that receives measurement data from the Measurement Manager and forwards them to other destination.
- **MODULAR**: Determines whether the end time of a measurement set period is 5, 10, 20, 30, 60 minutes after the hour (Yes), or not (No). For example, when set to Yes, the period is 5, the start time of a set is 2:02 then the end time is set to 2:05. If the period is 30 and the start time is 2:02 then the end time is 2:30.

Legal Values: Purge: 2-7 File: Yes, No

Default: Purge: 5

Example: To purge billing files after two days: CHG-MEAS:PURGE=2; To disable output to the OMNI distributed file: CHG-MEAS:FILE=N;

If a measurement threshold is defined then the ALARM_THRESHOLD field must be set to **Yes**.

The following additional parameters are not included in the default sguPlatform file but they can be included at this point and are incorporated in the DF file:

CHANGE-MEAS-THRESHOLD, CHG-MEAS-TH

Definition: Allows a user to enable or disable the generation of threshold alarms based upon the threshold values specified by the user for a known SIMPLE measurement counter. The user can change the critical, major or minor alarm threshold to the value suitable for the operating environment.

There are three alarm severity levels (from high to low): CRITICAL, MAJOR, and MINOR. The order of the threshold value is ascending or descending. The ascending order implies that the CRITICAL alarm threshold is assigned with the largest value and the MINOR alarm threshold is assigned with the smallest value.

The descending order implies that the CRITICAL alarm threshold has the smallest value.

SET=n,SCOPE={A|P|C|N},MEAS=c, \ ORDER={A|D},CRITICAL=t1, MAJOR=t2, MINOR=t3;

SET=n – The name of the measurement set enclosed in double quotes.

SCOPE={A|P|C|N} – The scope of the set. A: Application; P: Platform; C: CE; N: Node.

MEAS=c – The name of the measurement counter enclosed in double quotes.

ORDER={A|D} – The order of the threshold values (A = Ascending, D=Descending). The command is rejected if this parameter is not specified.

CHANGE-MEASSET-PERIOD, CHG-MEASSET-PERIOD

Definition: Sets the collection period of a measurement set. If the measurement set is not registered when the command is issued, an alarm is generated. A clear alarm is sent if the measurement set is registered later. If the measurement set is invalid, the command is accepted and an alarm is generated.

CHG-MEASSET-PERIOD:SET=n,SCOPE={A|P|C|N},PERIOD=p; where:

SET=n: The name of the measurement set enclosed in double quotes.

SCOPE={A|P|C|N}: The scope of the set. A: Application; P: Platform; C:CE; N: Node.

PERIOD=p: The collection period of the set in minutes. The valid range is from 5 to 60. The default is 60 minutes.

Example: To change the collection period to 30 minutes: CHANGE-MEASSET-PERIOD:SET="CE SGUa", SCOPE=C, PERIOD=30;

SS7 Connectivity

SS7 and the SGU support two types of SS7 connectivity:

- For SIGTRAN, SS7 connectivity is achieved through associations and association sets.
- For traditional serial SS7 signaling links, SS7 connectivity is achieved through links and link sets.

Both SIGTRAN and traditional serial SS7 signaling links are defined for one Local Point Code at the SGU.

The connectivity between the SGU and any adjacent signaling point must be defined in terms of associations (SIGTRAN) or serial SS7 signaling links, but not both. That is:

- Connectivity to adjacent signaling point A can be via SIGTRAN.
- Connectivity to adjacent signaling point B can be via serial SS7 signaling links.
- The connectivity to any single Adjacent Signaling point cannot be defined with both associations and serial SS7 signaling links.

For SIGTRAN:

- A maximum of 255 associations are configured at any one SGU. These associations are distributed across the two SGUs in an arbitrary manner. Assuming symmetrical configuration of the SGU, each SGU CE supports a maximum of 127 associations.
- A maximum of 127 association sets are configured at any one SGU CE.
- A maximum of 32 associations are configured in any one association set.

For Serial SS7 Links:

- The software supports a maximum of 255 signaling links per SGU. These links are distributed across the two CEs in an arbitrary manner. Assuming symmetrical configuration of the SGU, each SGU CE supports a maximum of 127 signaling links.
- The software supports a maximum of 127 links at any one SGU CE.
- The software supports a maximum of 16 signaling links in any one link set.

The maximum number of physical signaling links per CE is 32. The maximum number of links configured for a specific site depends on the configuration of the external network .

The SGU is always implemented with two CEs, using DPM 2 or DPM 3 boards. Each CE is configured to handle 100 percent of the rated traffic of the SGU. Physical SS7 connectivity is obtained through Ethernet connections on the DPM 2 or DPM 3 board or the T1/E1 or serial ports on the SLM boards.

- Each CE must be configured with the same number of SLM cards.
- Corresponding SLM cards on each CE are both configured for either serial connections or T1/E1 connections.
- If corresponding SLM cards on each CE are configured for serial connections, they must be configured for the same number of serial connections.
- If corresponding SLM cards on each CE are configured for T1/E1, they must be identically configured. That is, if one is HSL, the other must be HSL. If the corresponding SLM cards are not configured for HSL, they must each demultiplex the same number of signaling links from their T1/E1 circuits.
- For SIGTRAN, each CE must assign the same number of Ethernet connections.

Physical SS7 Connection Types

The SGU supports three types of physical SS7 connections:

- Each SLM card implements eight physical connections for 64 kbps serial voice circuits.
- Each SLM card implements one physical connection for T1/E1.
- Each DPM 2 and DPM 3 card implements physical Ethernet connections.
  - Each DPM 2 card implements three physical Ethernet connections.
  - Each DPM 3 card implements five physical Ethernet connections.

One Ethernet must be used to connect the DPM 2 or DPM 3 to the HSBN. The remaining Ethernet connections are available for SIGTRAN.

Physical SS7 Connection Constraints

The following constraints pertain to the connection types listed in the preceding section:

- One SLM card supports either TDM (T1/E1) or non-TDM (64 kbps serial voice circuits), but not both.
- One SGU CE supports both TDM and non-TDM but only if the TDM and non-TDM connections are implemented on different SLM cards.
- Subject to the constraints listed in the preceding two bullets, one SGU CE supports both Ethernet and circuit based (TDM/non-TDM) connections to SS7.
- The connections between the SGU and any adjacent signaling point must be either SIGTRAN or circuit based. A combination of the two is not allowed.

Multiplexing TDM Signaling Links

Time Division Multiplexed (TDM) circuits are configured as High Speed Link (HSL) or as non-HSL.

A TDM circuit configured as HSL implements one wide bandwidth signaling link:

- For T1, all 24 timeslots are multiplexed into one 24 x 64 kbps signaling link.
- For E1, 31 of the timeslots are multiplexed into one 31 x 64 kbps signaling link.

For a non-HSL TDM circuit, a maximum of 16 timeslots in the TDM channel (T1 or E1) are multiplexed into the same number of 64 kbps signaling links.

Number of SLM Cards per SGU CE

The SGU is limited to either one or two SLM cards per CE, depending on the DCP chassis variant in which it is installed. Refer to Chapter 2, “SGU Hardware” for details on SGU hardware configurations.

The SGU software is capable of supporting a maximum of 16 SLM cards per CE, so the hardware limitation predominates.

SS7 Node Configuration

The Message Transfer Part (MTP/M3UA) of the SGU has a configuration database, which contains information about the SS7 network entities, as well as provisional information for proper handling of the SS7 protocol.

The MTP/M3UA database includes information about the SGU’s own identity as well as for the other signaling points for which MTP/M3UA must maintain status information.

Protocol-related provisional parameters default to values that are specified in the proper SS7 protocol specification, if available (such as parameters for timers). Implementation-dependent parameters (such as congestion thresholds) default to the value matching the architecture for common applications and traffic. Unless there are special requirements, these parameters do not need to be changed. The SS7 node configuration procedure formats the .SCCP and .MTP files.

SS7 Network Configuration

SS7 network configuration defines the existing external network for SGU MTP/M3UA communication. The SS7 functionality in the message management system complies with two basic standards:

- ITU Blue/White book
- ANSI

The relevant ITU recommendations are:

- Message Transfer Part (MTP)-Q.701-Q.704, Q.706, Q.707

The relevant ANSI standards are:

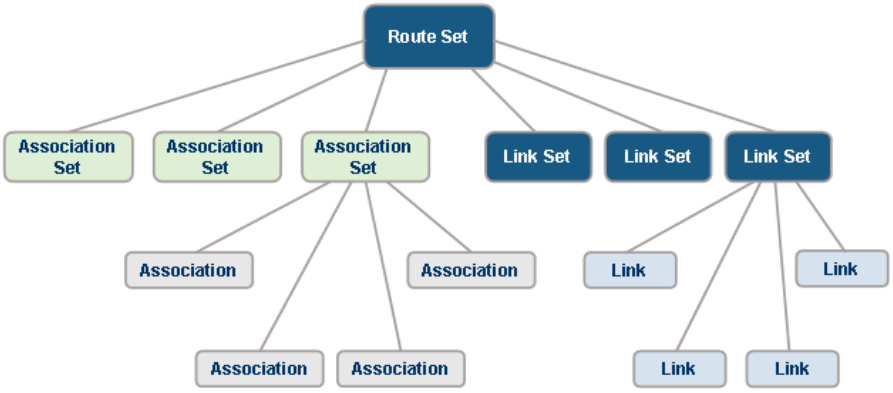
- SS7 General-T1.110
- Message Transfer Part (MTP)-T1.111

The message management system currently does not support any functionality related to Transaction-Capability (TC), Operations, Maintenance, Administration, and Provisioning (OMAP), or any other SS7 functionality not included in the list above.

The SGU maintains a set of hierarchical tables to determine outbound routing. The route set table is at the top of the hierarchy, the link set or association set tables are in the middle, and the signaling link or association tables are at the bottom.

The routing logic only selects a link set from a route set. If a link set or association set does not belong to at least one route set, it is not available for routing. All possible destination point codes must be included in at least one route set, even if these point codes are adjacent.

Figure 16 SGU Routing Hierarchy



SS7 Node: Configuration Limits

Table 19, “Configuration Limits for an SS7 Node” presents the platform configuring limits for an SS7 node.

Table 19 Configuration Limits for an SS7 Node

SS7 Layer	Limits
MTP/M3UA	127 association sets
	255 Links
	256 DPCs
	8 Possible Route Sets per DPC
	8 Combined Association Sets (A7 only)
	16 associations per association set
SCCP	25254 Signaling Subsystem Numbers (6 DPCs)
TCAP	32,000 Simultaneous Dialogues per process instance
	32,000 Invoke Timers per process instance

In a C7 SGU environment, the point code must be in the range 0 to 16383. In an A7 SGU, the point code is constructed as a set of three three-digit numbers indicating a network-cluster-member.

SS7 Node: Configuration Sequence

Provisioning a ITU (C7) or ANSI (A7) SS7 node establishes the configurations of the MTP/M3UA, SCCP, and TCAP associated with the logical node.

Provisioning Order of Node Configuration

The SS7 logical node must be configured, modified or de-configured in specific sequences. Flowcharts showing an overview of these sequences are shown in Figure 17, “Ordering SS7 Node Configurations,” Figure 18, “Modifying SS7 Node Configurations,” and Figure 19, “Removing SS7 Node Configurations.”

Figure 17 Ordering SS7 Node Configurations

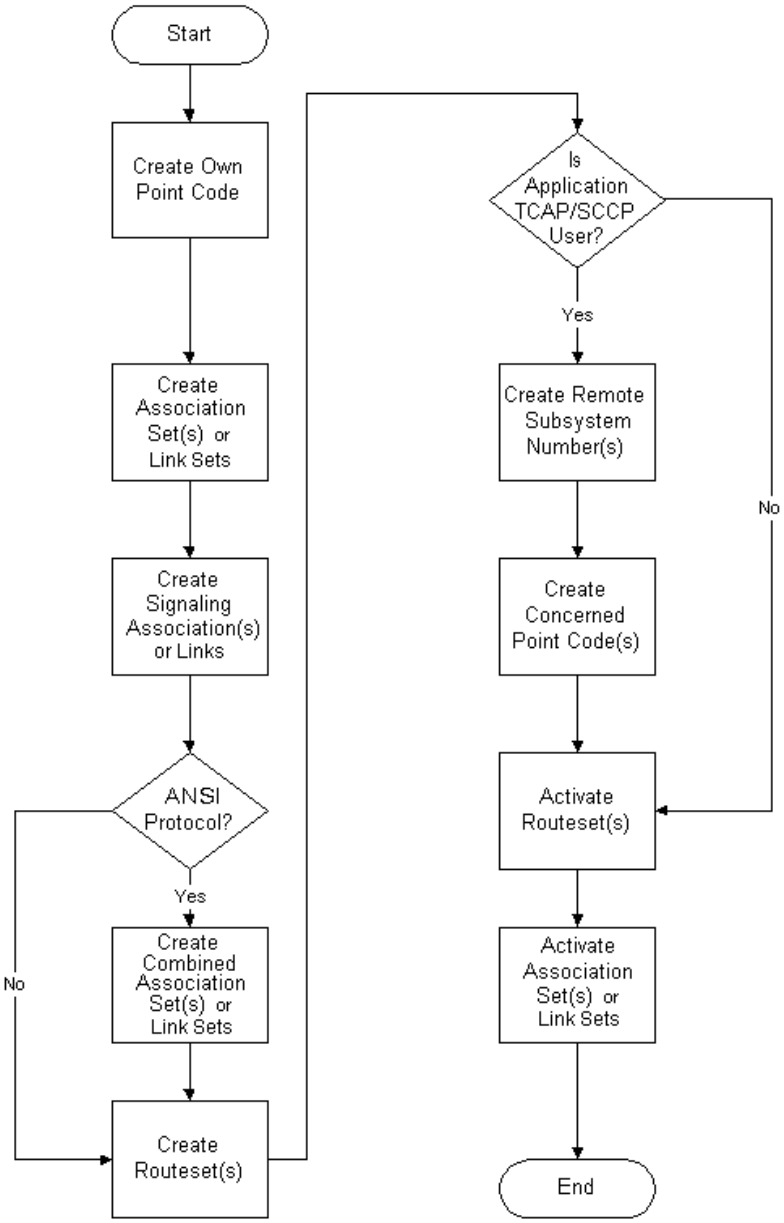


Figure 18 Modifying SS7 Node Configurations

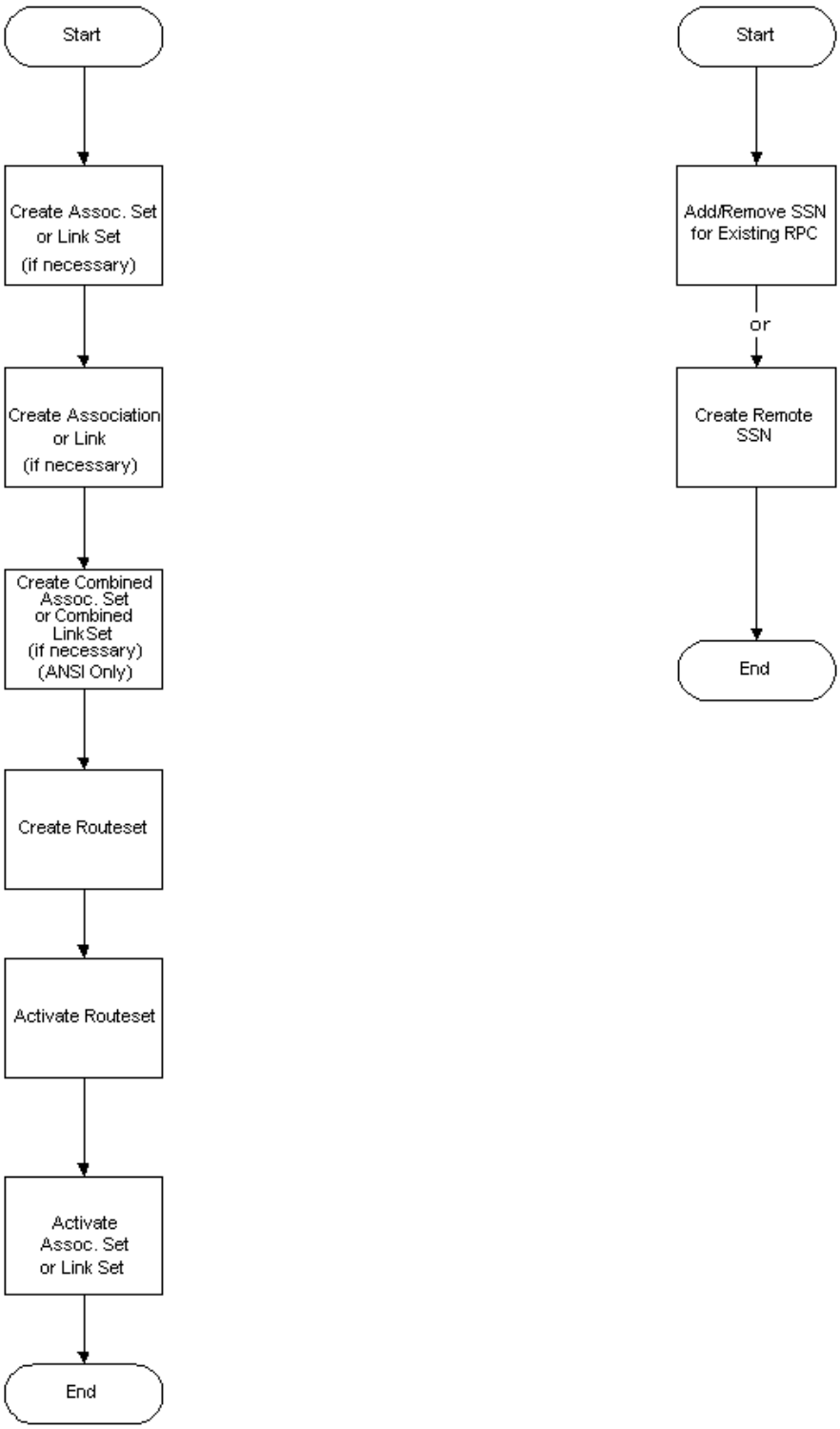
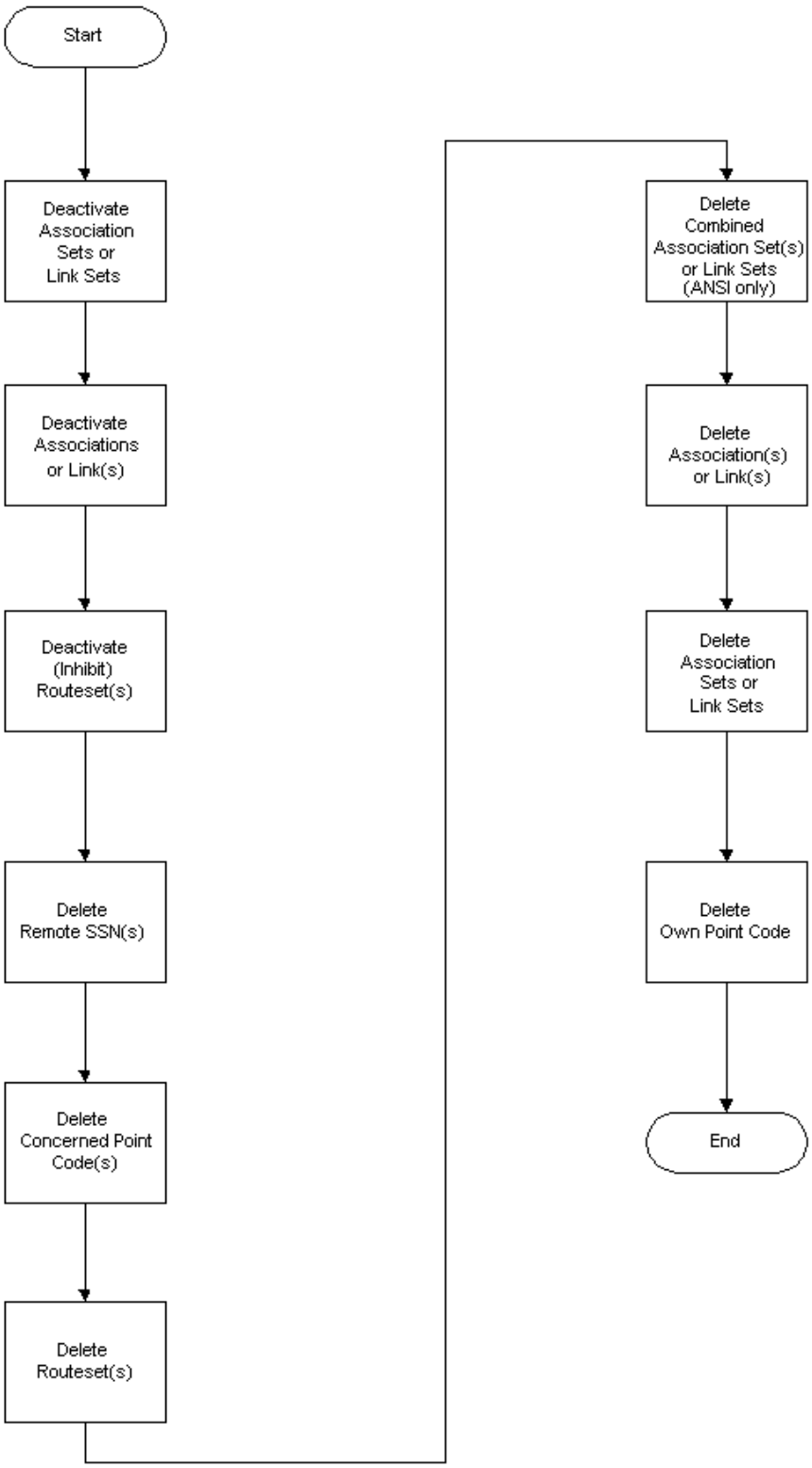


Figure 19 Removing SS7 Node Configurations



Configuring SS7 Connectivity

SS7 connectivity is configured by MML commands submitted through termhandler. MML commands are submitted to termhandler in one of two modes:

- **Batch Mode**: Typically used when provisioning the SS7 links after initial installation. In this mode, multiple commands are submitted simultaneously to termhandler through a batch file. The batch file can have any name. When provisioning SS7 links, the batch file is, by convention, named ss7.conf. To submit a batch file to termhandler:

  1. submit:

     termhandler -node A7

     or

     termhandler -node C7
  2. Enter the batch file name and path followed by semicolon (;), for example, /ss7.conf;

  A non-null path must prefix the batch file name. This is how termhandler recognizes a batch file, as opposed to a single MML command.
- **Single Command Mode**: Typically used when incrementally changing the SS7 link configuration on an operational SGU. In this mode, MML commands are submitted to termhandler one at a time. To submit a single MML command to termhandler:

  1. submit:

     termhandler -node A7

     or

     termhandler -node C7
  2. Enter the full MML command followed by semicolon (;)

Ports, Signaling Links, and Link Sets

A port is a serial connection, or a TDM channel, or a group of TDM Channels (HSL) at the SGU that terminates a signaling link.

A signaling link is a 48k to 64K bps signaling channel.

A link set is a group of signaling links.

Ports

The SLM card implements the SGU's physical ports. The SLM supports the following physical SS7 connections:

- Each SLM card has eight serial connectors that each terminate one 64K (or lower) serial SS7 signaling channel.
- Each SLM also has one TDM connector that terminate one E1 or T1 circuit.

OMNI allows several modes for port configuration. However, ports are configured at the SGU in only one of three modes:

- **Serial Only**: SLM_BOARD_CONFIGURATION == "Serial_only"
- **High Speed Link (HSL)**: SLM_BOARD_CONFIGURATION == "TDM_only"

  NON_SERIAL_LINK_TYPE="LT_HSL_12"

  or

  NON_SERIAL_LINK_TYPE="LT_HSL_7"
- **TDM, non HSL**: SLM_BOARD_CONFIGURATION == "TDM_only"

NON_SERIAL_LINK_TYPE="LT_NON_HSL"

In Serial Only mode, port numbers are assigned as follows:

- First CE:
  - The first port on the first SLM board on the first CE is assigned port number 0. The remaining ports on that board are numbered 1–7.
  - If the first CE has two SLM boards, the ports on the second board are assigned port numbers 8–15.
- Second CE:
  - If the first CE has one SLM board, then the ports on the first board of the second CE are assigned port numbers 8–15.
  - If the first CE has two SLM boards, then the ports on the first board of the second CE are assigned Port numbers 16–23.

In Serial Only mode, not all of the serial connectors have to terminate an actual SS7 signaling link. For example, if an SGU is configured with a total of four SLM boards but only three SS7 signaling links are terminated at each board, five serial connectors are empty at each board. Eight port numbers are still assigned for each board however. The SGU, as described, terminates 12 signaling links, but a total of 32 Port numbers are assigned.

In High Speed Link (HSL) mode, each board supports only one port, comprising all available channels on the single TDM connection (24 channels for T1, 31 channels for E1). Only one port number is assigned per SLM board, as opposed to eight port numbers for Serial Only.

LT_HSL_12 and LT_HSL_7 specify the maximum number of unacknowledged sequence numbers in HSL mode. LT_HSL_12 is preferred because LT_HSL_7 tends to be bursty For either one, the value specified in sguPlatform for NON_SERIAL_LINK_TYPE must be defined in bilateral agreement with the appropriate adjacent point code.

In TDM, non HSL mode, the SLM can demultiplex a maximum of 16 channels from the single TDM connection. Sixteen port numbers are assigned per SLM board compared to eight port numbers for Serial Only.

In TDM, non HSL mode, not all of the possible 16 TDM channels have to carry a signaling link, but 16 port numbers are assigned per SLM board (per TDM connection), regardless of usage.

Signaling Links

Signaling links are defined with a CREATE-SLK command of the form:

```
CREATE-SLK:SLK=LNK0,LSET=LSET1,SLC=0,SPEED=64K,PORT=0;
```

This particular command is as presented in “Sample ss7.conf for ITU (C7) Node (serial or TDM connections),” on page 49, line 3.

The CREATE-SLK command shown above is sufficient to define a signaling link in Serial Only mode and HSL mode.

- **SLK=LNK0**: The signaling link name.
- **LSET=LSET1**: The parent link set. Refer to "Link Sets," on page 48.
- **SLC=0**: A unique signaling link ID for the use of the SS7 protocol.

The SLC must be assigned in bilateral agreement with the adjacent point code terminating the other side of the link.

- **SPEED=64K**: The bandwidth of the link. C7 links are 64K. A7 links are typically 56K. This setting must match the speed configured at the adjacent point code terminating the other side of the link. If a mismatch exists, the link will not operate.
- **PORT=0**: The port number that specifies a serial connection or a TDM channel. Port numbers are assigned as described in the section "Ports," on page 46.

For TDM, non-HSL mode, the following optional parameter must also be submitted with the CREATE-SLK command:

- **CHANNEL=<num>**: The TDM timeslot carrying the signaling link. For T1, it is supplied in the range of 1–24. For E1 it is supplied in the range of 2–31.

Link Sets

A link set is a group of signaling links between the SGU and one adjacent point code. If an SGU has more than one CE, the signaling links in a link set are distributed across all CEs for redundancy. As an example:

- The SGU has two CEs.
- The traffic between the SGU and adjacent point code A requires a signaling bandwidth of 2 X 64Kbit.
- Four signaling links, comprising one link set, are connected between the SGU and adjacent point code A.
- Two of these signaling links terminate at SGU CE1 and the other two links terminate at SGU CE2.
- The link set is configured with twice the capacity required between the SGU and adjacent point code A.
- If both SGU CEs are online, adjacent point code A routes half of its traffic to SGU CE1 and half to SGU CE2.
- If one of the SGU CEs goes offline, adjacent point code A sees the two links terminated at that CE go down.
- Adjacent point code A now routes all of its traffic on the two remaining links, terminating at the SGU CE that is still running.
- Because the link set is sized for 100 percent overcapacity, the remaining two links now carry all traffic at full capacity.

Link sets are a part of, and are defined by, the SS7 protocol. SS7 imposes the following constraints on link sets:

- All signaling links in a link set must be between the same pair of adjacent point codes.
- Only one link set can be defined between any pair of adjacent point codes.
- A link set can contain no more than 16 signaling links.

These rules effectively limit the signaling bandwidth between any two adjacent point codes. Specifically, for non-HSL signaling links, a link set is limited to 16 X 64K channels. This is no longer adequate. Traditional SS7 configurations can cause a bottleneck on signaling between adjacent point codes.

HSL was introduced specifically to remove this bottleneck. Depending on the TDM protocol (T1 or E1), an HSL signaling link has a bandwidth of 24 to 31 times the traditional 64K SS7 signaling link. For example, putting 16 HSL links in a link set increases the signaling bandwith potential by a large multiple without exceeding the link set limits traditional SS7 imposes.

The following sections give examples of specific provisioning scenarios. These paragraphs do not attempt to show all, or even most, MML command variations. For a complete list, consult the OMNI man pages.

Configuring Traditional SS7 (non-IP) Signaling Links

The section "Sample ss7.conf for ITU (C7) Node (serial or TDM connections)" shows a sample ss7.conf file. The line numbers at the start of each line are not included in the actual file. They are provided here to support references from the section "Annotations to ss7.conf for ITU (C7) Node Configuration," on page 50 .

The file ss7.conf is used to submit multiple MML commands to termhandler in batch mode.

The MML commands in this section are for an ITU (C7) Node. There are significant differences in the various MML commands between ITU (C7) and ANSI (A7). The most obvious difference is the notation for specifying point codes. The section "Configuring SIGTRAN (SS7 Over IP) Associations," on page 51 specifies commands for an A7 Node.

For C7, the point code is expressed as a simple decimal integer. A7 uses an N-C-M notation, as shown in the section "Configuring SIGTRAN (SS7 Over IP) Associations," on page 51. Notation aside, the C7 point code also decomposes to three atomic values. However, for the purpose of the current discussion, the meaning of these component values is unimportant.

Sample ss7.conf for ITU (C7) Node (serial or TDM connections)

```
0001 CRTE-OSPC:PC=2057
0002 CRTE-LSET:LSET=LSET1,PC=4115;
0003 CRTE-SLK:SLK=LNK0,LSET=LSET1,SLC=0,SPEED=64K,PORT=0;
0004 CRTE-SLK:SLK=LNK1,LSET=LSET1,SLC=1,SPEED=64K,PORT=1;
0005 CRTE-SLK:SLK=LNK2,LSET=LSET1,SLC=2,SPEED=64K,PORT=2;
0006 CRTE-SLK:SLK=LNK3,LSET=LSET1,SLC=3,SPEED=64K,PORT=3;
0007 CRTE-RSET:RSET=RSET1,PC=4115,RTES=LSET0&LSET1&LSET2&LSET3[, LOADSHR=YES];
```

LSET2, LSET3, LSET4 are logical link set names defined by CRTE-LSET as for LSET1, above.The additional CRTE-LSET commands are not shown. The CRTE-LSET command for PC=4116 is also not shown.

```
0008 ALW-RSET:RSET=RSET1;
0009 ACTV-LSET:LSET=LSET1;
0010 CREATE-CPC:PC=4115,SSN=8;
0011 CREATE-REMSSN:PC=4115,SSN=5&25&8&20;
0012 BACKUP-NODE;
```

Annotations to ss7.conf for ITU (C7) Node Configuration

The following bullets discuss each line in the sample file presented above:

- Line 1 – CRTE-OSPC:PC=2057;

  Specifies the local point code of the SGU. The address that uniquely identifies a specific SGU in the SS7 network.

- Line 2 – CRTE-LSET:LSET=LSET1,PC=4115;

  Creates a link set with logical name LSET1 connected to adjacent point code 4115. A link set is established between the Own Signaling Point Code and one adjacent point code. A link set contains a maximum of 16 SS7 signaling links. In the case of a multiple CE SGU, the individual links in a link are distributed across all CEs.

- Line 3 – CRTE-SLK:SLK=LNK0,LSET=LSET1,SLC=0,SPEED=64K,PORT=0;

  Each line creates an SS7 signaling link; line 3 creates LNK0. The MML command CRTE-SLK is described in detail in signaling links. Lines 4 - 6 create LNK1, LNK2, and LNK3. The four links created here populate LSET1.

- Line 7 – CRTE-RSET:RSET=RSET1,PC=4115, RTES=LSET0&LSET1&LSET2&LSET3[, LOADSHR=YES];

  Creates a route set named RSET1. A route set specifies the link set, or link sets, that provide a route to the destination point code specified by the PC= parameter in the CRTE-RSET command.

  RSET1 specifies the outbound paths from the SGU to destination point code 4115. The RTES= parameter specifies four link sets. (The CREATE-LSET commands for link sets LNK1, LNK2, and LNK3 are not shown.)

  The RTES= parameter can specify from one to eight link sets. In this case, it specifies four link sets, (LNK0, LNK1, LNK2, and LNK3), that all terminate at adjacent point codes that have routes to point code 4116.

  If multiple link sets are specified, the optional LOADSHR= parameter controls whether traffic is distributed over multiple link sets. The operation of this parameter is different for A7 and C7. Consult the OMNI man page for details.

- Line 8 - ALW-RSET:RSET=RSET1

  Activates (unblocks) route set RSET1, defined in line 7 by the CRTE-RSET command. By default, CRTE-RSET leaves the defined route set in the blocked state, so ALLOW-RSET must be submitted before the route set can be used.

- Line 9 ACTV-LSET:LSET=LSET1;

  The ACTV-LSET command puts all signaling links in the specified link set in service. This single command is the equivalent of specifying ACTV-SLK separately for each signaling link in the link set. By default, the CREATE-SLK command creates the signaling link in out of service state. ACTV-LSET or ACTV-SLK must be submitted after creating the signaling links.

- Line 10 - CREATE-CPC:PC=4115,SSN=8;

  Creates a Concerned Point Code (CPC). A CPC is always a remote point code. In this case, it is point code 4115. A list of up to ten CPCs are specified. If more than one point code is specified, list entries are separated by ampersands (&).

  The specified SSN is an SSN local to the SGU. The CRTE-CPC command enables automatic reporting of any change of state in the local point code (User In Service, User Out Of Service) to all point codes in the list following PC=.

- Line 11 - CREATE-REMSSN:PC=4115, SSN=5&25&8&20;

  Creates one or more remote SSNs. The CREATE-REMSSN command specifies one remote point code plus one to ten SSNs available at that point code. If more than one SSN is specified, they are separated by ampersands (&).

  Except when routing on Global Title, the SGU cannot route to a combination of remote point code and SSN unless that point code, SSN pair has been specified in a CREATE-REMSSN command.
- Line 12 - BACKUP-NODE;

  Saves the MML commands previously entered in the SCCP and MTP DF files. This makes the configuration persistent.

Configuring SIGTRAN (SS7 Over IP) Associations

This section describes the configuration of a SIGTRAN connection for SS7 over Internet Protocol (IP) connections. Refer to the sample ss7.conf file in "Sample ss7.conf for ANSI (A7) Node (LAN connections)" below. The line numbers at the start of each line are not included in the actual file. They are provided here to support references from the section "Annotations to ss7.conf for ANSI (A7) Node Configuration," on page 52.

Associations

Associations are defined with a CREATE-ASSOC command of the form:

```
CRTE-ASSOC:ASSOC=ASSOC1,ASET=ASET1,CE="sgu1a",RADDR=172.16.90.43;
```

This particular command is as presented in "Sample ss7.conf for ANSI (A7) Node (LAN connections)," on page 52.

The CREATE-ASSOC command shown above is sufficient to define an association in LAN mode.

- **ASSOC=ASSOC1**: The signaling link name.
- **ASET=ASET1**: The parent association set. Refer to "Association Sets," on page 51.
- **CE="sgu1a"**: A unique signaling link ID for the use of the SS7 protocol.

The SLC must be assigned in bilateral agreement with the adjacent point code terminating the other side of the link.

- **RADDR=172.16.90.43**: The Internet Protocol (IP) address of the adjacent signaling point to which this CE is associated.

For TDM, non-HSL mode, the following optional parameter must also be submitted with the CREATE-SLK command:

- **CHANNEL=<num>**: The TDM timeslot carrying the signaling link. For T1, it is supplied in the range of 1–24. For E1 it is supplied in the range of 2–31.

Association Sets

An association set is a group of associations between the SGU and one adjacent point code. If an SGU has more than one CE, the associations in an association set can be distributed across all CEs for redundancy.

ss7.conf is used to submit multiple MML commands to termhandler in Batch Mode.

The MML commands in this section are for an ANSI (A7) Node. There are significant differences in the various MML commands between ITU (C7) and ANSI (A7). The most obvious difference is the notation for specifying point codes. "Sample ss7.conf for ITU (C7) Node (serial or TDM connections)," on page 49 specifies commands for a C7 Node.

For A7, the point code is expressed as N-C-M, where N is the network number, C is the cluster number, and M is the member number.

Sample ss7.conf for ANSI (A7) Node (LAN connections)

```
0001 CRTE-OSPC:PC=10-20-60
0002 CRTE-ASET:ASET=ASET1,PC=10-20-70,TYPE=F;
0003 CRTE-ASSOC:ASSOC=ASSOC1,ASET=ASET1,CE="sgu1a",RADDR=172.16.90.43;
0004 CRTE-ASSOC:ASSOC=ASSOC2,ASET=ASET1,CE="sgu1b",RADDR=172.16.90.43;
0005 CRTE-RSET:RSET=RSETM3UA,PC=10-20-70,RTES=ASET1;
0006 CRTE-CPC:PC=10-20-70,SSN=40;
0007 CRTE-REMSSN:PC=10-20-70,SSN=50;
0008 ALW-RSET:RSET=RSETM3UA;
0009 ACTV-ASET:ASET=ASET1;
```

Annotations to ss7.conf for ANSI (A7) Node Configuration

- Line 1 – CRTE-OSPC:PC=10-20-60

  Command: CREATE-OSPC | CRTE-OSPC

  Specifies the local point code of the OMNI logical SS7 node (the point code of the SGU), the address that uniquely identifies a specific SGU in the SS7 network.

- Line 2 – CRTE-ASET:ASET=ASET1,PC=10-20-70,TYPE=F;

  Creates an association set. It is the SIGTRAN corollary to the traditional SS7 link set. The traditional SS7 link set is composed of discrete signaling links (circuits). The association set is composed of one to sixteen SCTP associations. An association set is established between Own Signaling Point Code and one remote point code.

  The current command establishes an association set between Own Point Code and PC=10-20-70. The name of the association set is ASET1.

  The TYPE parameter is not specified for C7. For A7, it specifies the following values:

  - **A**: The association set connects to a home STP. That is, the STP is adjacent to the association set and is reached by one hop through the SS7 network. (The IP path to the home STP can be of any length.)
  - **E**: The association set connects to a remote STP. That is, the STP is reached by multiple hops through the SS7 network.
  - **F**: The association set connects directly to an End Signaling Point. That is, the signaling point is adjacent in the SS7 network and is reached by one hop through the SS7 network.

- Line 3 – 4 CRTE-ASSOC:ASSOC=ASSOC1,ASET=ASET1,CE="sgu1a",RADDR=172.16.90.43;

  CRTE-ASSOC:ASSOC=ASSOC2,ASET=ASET1,CE="sgu1bb",RADDR=172.16.90.43;

Create SCTP associations and populate them in ASET1, created immediately above. The associations are named ASSOC1 and ASSOC2. They terminate locally at sgu1a and sgu1b, the two CEs of sgu1. The same IP Address (RADDR) is specified for both associations. This is the address for the IP host that implements the SS7 node at point code 10-20-70 (the point code terminating ASET1).

- Lines 5 and subsequent

  These commands are all identical, or corollary to, the corresponding material presented in "Sample ss7.conf for ITU (C7) Node (serial or TDM connections)," on page 49.

Configuring Multihoming

To create a multihomed association, separate the two IP addresses with an ampersand (&). For example:

```
CRTE-ASSOC:ASSOC=ASSOC1,ASET=ASET0,CE="sgu15a",RADDR=90.150.4.5&90.150.4.1,
LADDR=212.220.23.73&212.220.23.74,LPORT=2022,RPORT=2022;
```

To configure multiple Own Point Codes, include the following line in the /home/omni/conf/omni_conf_info.<SHM> file:

MOPC_GR

To create multiple Own Point Codes, use the MML command CREATE-OSPC twice:

CREATE-OSPC:OSPC=1000;

CREATE-OSPC:OSPC=1001;

For further information about the MOPC_GR command, refer to the OMNI Documentation Manpages, Files and Data Structures (5q) under omni_conf_info(5q).

Configuring Stream Control Transport Protocol (SCTP)

Table 20, "SCTP Configuration Data Descriptions" shows the values for the Stream Control Transport Protocol (SCTP) Retransmit Time Out (RTO) and associated timers and parameters.

Table 20 SCTP Configuration Data Descriptions

RFC Name	Description	RFC Recommended Default Value	Comverse SGU Default Value	Comverse SGU Configurable ?	Comverse SGU Ranges
RTO.initial	Initial RTO Value	3 seconds	3 seconds	Yes	100-60000ms
RTO.max	Upper limit of RTO	60 seconds	60 seconds	Yes	100-60000ms
RTO.min	Lower limit of RTO	1 second	1 second	Yes	100-60000ms
Max.Init. Retransmits	Maximum Init Retransmit Attempts	8 attempts	8 attempts	No	Not configurable
Association. max.retrans	Maximum Association Data Retransmit Attempts	10 attempts	10 attempts	No	Not configurable
Path.max. retrans	Maximum Data Retransmit attempts per destination (used for multi-homing only)	5 attempts	5 attempts	No	Not confiurable

Table 20 SCTP Configuration Data Descriptions (Continued)

RFC Name	Description	RFC Recommended Default Value	Comverse SGU Default Value	Comverse SGU Configurable ?	Comverse SGU Ranges
Acknowledgement timer	SACK Transmit Timer	User Configurable not to exceed 500ms	200 ms	Yes	0-500 ms
T3-rtx	Data Retransmit Timer	RTO (see RTO.initial for initial value)	RTOinit: 3000 RTOmin: 1000 ms	Yes.	100 ms – 1 min.
T1-init	Init retransmit timer	Initially 3 seconds RTO thereafter	Same as T3	No	100 ms – 1 min.
HB.Interval	Heart Beat Interval	30 seconds	5 seconds	Yes	100-60000ms
Shutdown timer	Shutdown timer t2	RTO	Same as T3	No	100 ms – 1 min
Cookie Timer	Cookie-t1 – Cookie Echo retransmit timer	Initially 3 seconds RTO thereafter	1 second	Yes	100-10000ms
Cookie Life	Cookie Life	60 seconds	60 seconds	Yes	100-120000ms

Additional Considerations for SGU Configuration

SGU Sizing Requirements

A dual CE SGU must be sized to handle twice the rated peak hour traffic for that SGU.

Each CE in a dual CE SGU must be sized to handle the entire rated peak hour traffic for that SGU.

This means that the processor, memory, and I/O capacity of each individual CE must be sufficient to handle the maximum rated load for the entire SGU. In practice, the SGU is processor bound. That is, processor capacity is the limiting factor.

Architecture for Redundant Operation of the SGU

To provide hardware and software redundancy, the SGU is implemented as a dual CE OMNI cluster. OMNI implements an SS7 signaling point that is distributed across both SGU CEs. OMNI, and the DTCAP Router running over it, cooperate with the adjacent signaling points to provide redundant operation. The two SGU CEs are designated CE A and CE B.

On failure of SGU CE A, or any of its critical components, the adjacent signaling points quickly determine that the SS7 links to that CE are no longer responsive. The adjacent signaling points redirect all traffic addressed to the SGU to the remaining good links, which terminate at SGU CE B.

The general scheme will not work unless the signaling links between the SGU and its adjacent signaling points are configured to support it. Specifically, these signaling links must be configured for "balanced" operation. “Configuring the SGU with Balanced Connectivity,” on page 54 specifies the requirements for balanced connectivity. It is also necessary to understand OMNI's Distributed Processing Paradigm and the SGU capacity issues involved.

Configuring the SGU with Balanced Connectivity

SGU redundancy is achieved by implementing a dual CE system sized to handle twice the rated load for the SGU. If either CE fails, the remaining CE handles all SS7 traffic directed through the SGU.

Connectivity to the SS7 network must be fully redundant, so that if either CE fails, no adjacent signaling point is isolated from the SGU. Each adjacent signaling point must have a physical connection to each SGU CE.

The connection bandwidth between each adjacent signaling point and each SGU CE must be able to carry the maximum rated traffic between the signaling point and the entire SGU. To avoid configuring unneeded bandwidth, the SS7 connection bandwidth between the signaling point and CE A must be identical to the connection bandwidth between the signaling point and CE B. The SS7 connection bandwidth between the signaling point and either CE must individually be able to accommodate the maximum rated throughput between the signaling point and SGU1.

The requirement for balanced connectivity is achieved by configuration. SS7 connectivity is configured in one of two ways, depending on whether the SGU is configured for traditional SS7 operation or for SIGTRAN. In either case, the concepts are similar.

Configuring Balanced Connectivity for Traditional SS7

The primary unit of physical connectivity for traditional SS7 is the signaling link. SS7 signaling links were originally implemented over 64 kbps serial channels. The SS7 protocol has since been enhanced to allow multiple such channels to be multiplexed into n x 64 kbps signaling links. Signaling links are organized into link sets. A link set groups multiple signaling links that all terminate at the same adjacent signaling point.

The SGU connects to each adjacent signaling point via one or more link sets. To achieve redundant connectivity, the individual signaling links in each link set must be distributed across both SGU CEs. To achieve balanced connectivity, for each link set:

- The link set must contain an even number of signaling links
- Half of the signaling links must terminate at each of the two SGU CEs

If n x 64 kbps signaling links are implemented, the total bandwidth of each link set must also be evenly distributed across the two SGU CEs. This is accomplished by defining all links in a link set as the same bandwidth.

Configuring Balanced Connectivity for SIGTRAN

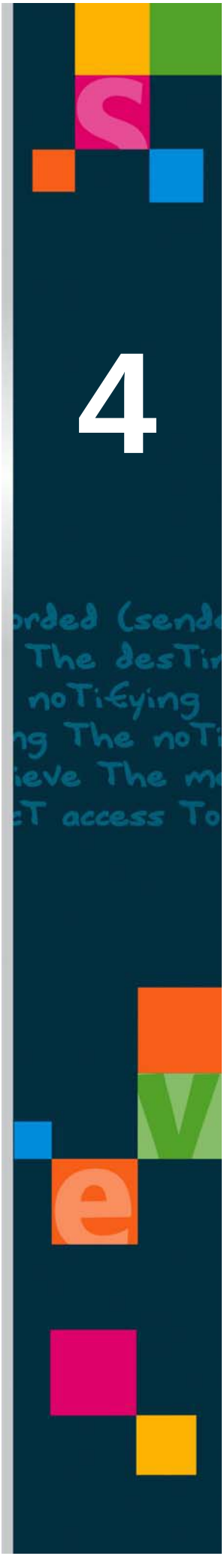
Since the SIGTRAN protocol suite is implemented over IP, connectivity cannot be specified in terms of the known bandwidth of physical links. For SIGTRAN, we can only balance logical IP network connections. Other than this, the issues of balanced connectivity for SIGTRAN exactly parallel the issues presented above for traditional SS7.

The primary unit of physical connectivity for SIGTRAN is the association. Associations are organized into association sets. An association set groups multiple associations that all terminate at the same adjacent signaling point. The SGU connects to each adjacent signaling point via one or more association sets. To achieve redundant connectivity, the individual associations in each association set must be distributed across both CEs. To achieve balanced connectivity, for each association set:

- The association set must contain an even number of associations.
- Half of the associations must terminate at each of the two SGU CEs.

Chapter 4

SGU Operation and Maintenance



Overview

This chapter provides the relevant tools for operating the SGU. The chapter includes descriptions of the man pages (the Linux online help facility), utilities, main processes, node management, Man Machine Language (MML) commands, file structure, and Linux commands.

The following topics are covered:

SGU Startup and Shutdown

OMNI starts automatically on booting Linux.

To stop OMNI, enter the following command as root:

/sbin/service omni stop

If OMNI is stopped, start it by entering the following command as root:

/sbin/service omni start

The service command must always be entered as root.

Backup and Restore Procedures

For SGU backup and restore procedures, refer to the LNXScore 1.2.3 Release Description Document (RDD).

SGU File Structure

This section describes the SGU files in relation to their structure and location.

Distributed File System

The SGU distributed files (DFs) are located in **/home/omni/<CE name>/dffile**. Network File System (NFS) mounted SGU distributed file systems must be mounted with the interruptible setting on, allowing recovery during CE failure. Special DF utilities and processes are provided to handle DF files.

To use the SGU distributed file system, login as sguuser and use the DF utilities to access the DF system.

Setting the environmental variables requires the /home/omni/conf/df.conf.204 file.

The SGU DF system is highly fault tolerant. This is achieved by keeping identical copies of a file on multiple CEs. Each CE's DF directory is mounted via NFS to all other CEs.

Not applicable to single-CE configurations, except as noted.

DF Utilities

DF utilities are provided to manage distributed files. Configuration files are located in the distributed file system /home/omni/<CE name>/dffile/ directory.

Access files on the DF system using DF utilities only. Do not use ordinary Linux tools for this purpose under any circumstances.

When executed, DF commands affect files in the distributed file system. MML commands are used to change DF files.

Table 21, “DF Utilities” describes the set of DF utilities.

Table 21 DF Utilities

DF Utility Name	Description
DFcat	DF cat routine
DFls	DF system directory list routine
DFconvert	Converts files to DF system files
DFcopy	DF system copy routine
DFunlink	DF system delete routine
DFdir	DF directory of files providing a file listing containing file status and route set

Refer to the relevant man pages for more information about these commands.

Distributed Files

Common data files, used by all CEs, are typically stored in the distributed file system. The distributed files are located in the /home/omni/<CE name>/dffile directory.

To display distributed files:

1. Log in as sguuser.
2. From the dffile directory, enter DFls to display the list of files.

Executable Files

The executable files and utilities are located in the /home/omni/bin directory. There are four executable files:

- c7dtcap
- a7dtcap
- c7WinDtcap
- ituA7Dtcap

For any SGU configuration, one of the executables is always running. This file is listed in the file cestart.204. To determine which file is running, issue the DFcat command as follows:

```
DFcat cestart.204
```

To display executable files and utilities:

1. Log in as sguuser.
2. From the bin directory, enter ls to display the list of files.

Node Configuration Files

The SGU logical node configuration files are located in the /home/omni/conf directory. These configuration files are used for setting up the SGU. There are two node configuration files:

- db.<nodename>.sccp.$SHM.pri
- db.<nodename>.mtp.$SHM.pri

To display SGU logical node configuration files:

1. Login as sguuser.
2. From the conf directory, enter ls to display the list of files.

Log and Alarm Files

The log and alarm files are located in the /home/omni/Logs directory.

To display log and alarm files:

1. Go to the SGU: <CE name> prompt.
2. From the Logs directory, enter ls to display the list of files.

MML Configuration File

Copies of the MML SS7 configuration file, relevant to MTP/M3UA, are located in the /home/omni/conf directory. The file ss7.conf can be modified and run as a script file for batch configuration.

Linux Files for OMNI and SGU Setup

The following Linux files are used for OMNI and SGU setup:

- /etc/hosts (Hosts IP address file)
- /etc/services (TCP/IP services file)
- /etc/sysconfig/network
- /etc/sysconfig/network-scripts/ifefg-eth0, . . . 1, . . . 2 . . .

SGU Utilities

This section describes the various utilities for SGU configuration, management, maintenance, and monitoring, found within the SGU.

termhandler

The termhandler is an online terminal interface that enables the operator to enter MML commands to perform any of the following functions:

- Own node configuration
- Network configuration (MTP/M3UA)
- Service Connection Control Protocol (SCCP) definition
- Display configuration information
- Network component activation
- Link alignment

The termhandler provides an interactive interface for operator input, and accepts and forwards MML commands to the appropriate process. When a response is returned, termhandler displays the result.

MML commands are executed as follows:

- Through direct operator input from the console
- Through input from command files created offline with an editor
- From a recorded session
- From a network administration control point

MML commands are stored as a recent changes (rc) files. When all the commands are entered and verified, BackupNode is run. BackupNode causes the NodeManager to tell each process to perform its own BackupNode and create its own DF files. The resulting filenames are of the form db.<protocolID>.xxx.$SHM.pri where xxx identifies the target process. The DF structure ensures that there is an identical file on both CEs in the dual-CE environment.

To launch termhandler issue the following command:

```
termhandler -node NODETYPE
```

where NODETYPE indicates the SGU node type (A7 or C7).

Using the Man Pages

The man pages are the Linux online help pages for the MML commands and are accessed using a web browser. The man pages are located in the following directories:

- /home/omni/man/generic/manual.man
- /home/omni/man/<protocol>/manual.man

Detailed information about MML commands is also available online:

1. Go to http://www.scg.comverse.com.
2. Click **OMNI 7 manpages** to view the table of contents.
3. Click **Category 8 Man-Machine Interface**.
4. Scroll to a command and click the corresponding hyperlink to view a detailed explanation of the command and of its syntax.

Entering MML Commands in termhandler

To enter MML commands in termhandler:

1. Using a text editor, create and save a batch file containing the MML commands.
2. From the command line, open the file by specifying the complete path.
3. Observe the output to ensure the command file executed properly.

MML Commands

This section describes the rules for entering MML commands, including the format, syntax, and conventions; it also details the responses received after executing a command. The available MML commands used for SGU and SCCP configuration are listed in tables according to their function.

MML Command Syntax

MML commands take the form:

COMMAND-NAME:PARAM1-NAME=<value1>,PARAM2-NAME=<value2>...;

MML commands observe the following rules:

- **Command Name**: Capital letters must be followed by a colon (:)
- **Parameter Name**: All capital letters followed by an equal sign (=)
- Parameters are separated by commas (,)
- Commands are always terminated by a semicolon (;)

MML Syntax Conventions

In addition to the rules for the commands, command syntax in this chapter is shown using the following conventions:

- **Values to be supplied**: Surrounded by angle brackets (< and >)
- **Optional parameters**: Surrounded by square brackets ([and])
- **Parameter choice or value choice**: Surrounded by curly brackets ({ and }) and separated by a vertical bar (|)
- Actual command names are shown in the first line of the section. Any abbreviations are shown in parentheses following the command name.
- Abbreviations for parameters are shown in parentheses following the parameter name.

Common Parameter Terms

Following are several of the common parameter names used in the MML command syntax:

- <time> is always entered as HH:MM with the 2 digits HH for the hour (00 to 23) and the last 2 digits MM as the minutes within the hour (00 to 59).
- <date> is always entered (or displayed) as YY-MM-DD with YY equal to the last 2 digits of the year (92 for 1992), MM as the month (01-12), and DD as the 2- digit day of the month (01-31).
- PRT={YES | NO | <printerID>} some commands allow for a hard copy report to be generated along with the screen output. The PRT keyword allows for the output to be sent to the Linux default printer with the parameter value of YES. The YES command can be alternately phrased to send the display to a particular printer expressed as a STRING, for example, PRT='LASER'. The value of NO for the parameter inhibits printing the report. If the PRT parameter is omitted, the report is not printed.

MML Command Response

An MML command response includes a header and a response.

MML Command Response Header

Each command's response header takes the form:

<CTAGNumber>^<LogicalNodeId>^<Date>^<Time>

where:

- <CTAGNumber> is a number assigned on input to the command and echoed in the response to allow the operator to correlate the two actions.
- ^ is a single space.
- <LogicalNodeId> is the identity of the node entity.
- <Date> is the current date in YY-MM-DD format.
- <Time> is the current time in HH:MM:SS format.

MML Command Normal Response

```
M COMPLETED
<ResponseOutput>
```

where:

ResponseOutput is an optional field for the output of the command.

MML Command Error Code Response

```
M DENY
<ErrorCode>
<ResponseOutput>
```

where:

The ErrorCode can be one of the following:

- **ENEQ**: Equipment not equipped
- **ICNV**: Input command not valid
- **IDNV**: Input data not valid
- **IDRG**: Input data with invalid range
- **IIFM**: Invalid data format
- **IISP**: Input invalid syntax
- **SROF**: Status requested operation failed

ResponseOutput is an optional field, which echoes the output of the command from the element of the logical node. The text, if present, is in a freeform format.

Command Parameters

MML command parameters determine how the command is applied to the object.

- **Character Parameter**: Sets the range of printable characters of the ASCII or ITU International Reference Alphabet No. 5 (IRA5), which is used as the character set for node management. All alphanumeric characters are usable. Arithmetic expressions are not accepted. For example, 2*3 is not accepted for 6.

- **Numeric Parameter**: A numeric argument is shown in the command syntax descriptions as <num>. The default numeric base is decimal. Non-decimal numbers are preceded by a special character combination indicating the numeric base as follows:
  - **H' (H apostrophe)**: Denotes that the following numeric characters are in hexadecimal notation (0-9ABCDEF).
  - **O' (O apostrophe)**: Denotes that the following numeric characters are octal notation (0-7).
  - **B' (B apostrophe)**: Denotes that the following numeric characters are binary notation (0 and 1 exclusively).
- **Point Code**: An SS7 point code is shown in the command syntax descriptions as <pc>. For ANSI (A7) networks, a point code consists of three numbers (network, cluster, and member), each in the range 0 to 255, separated by hyphens, for example, 10-20-30. For ITU (C7) networks, a point code consists of a single number in the range 0 to 16383, for example, 4096.
- **String**: Text strings must start and end with quotation marks, for example, “/dev/ss7/mtp-2/slk1.”

A string must not contain a semicolon.

- **Identifier**: A series of alphanumeric characters starting with an alphabetic character only, for example, AB123 or ABLEBAKER. Shown in the command-syntax descriptions as <identifier>.
- **Grouping of Parameter Arguments**: A series of items is denoted by the continuation of the item preceded by an & (ampersand) as in:

  CRTE-CPC:SSN=253,PC=908&909&910&888

  where the PC ParameterName has the value 908, 909, 910, and 888. Depending on the command, up 10 parameter arguments are entered per Parameter Block.

Event Messages

The SGU platform provides detection and reporting events (alarms, errors, warnings, and informational messages) relating to communication and platform management. All events have an event number associated with them.

Events are categorized by event type and severity level to support operator and external management interfaces. Severity levels are critical, illogical, error or information and the severity level for an event type is changed by an MML command during operation.

All events are counted (by event type) and measurements of the number of each type of event emitted are stored in the measurements file at fixed intervals. The interval is a parameter that is set from 1 to 1440 minutes.

Here is a list of generic events:

- Client Attachment and Binding
- Client Errors and Failures
- Client Usage Errors
- Interface Board Error/Failure
- Link Congestion
- Link Error/Failure/Establish
- Local Subsystem Available/Unavailable
- Local or Remote Link Inhibit
- MTP/M3UA Client Errors

- Operator initiated actions
- Point Code Inaccessible
- Process Management Events
- Protocol Errors/Violations
- Queue Backlog Events
- Remote Subsystem Available/Unavailable
- Resource Allocation Errors
- SCCP Client Errors
- TCP failure/establish
- SLAN failure/establish

Refer to the relevant man pages: MANPGS:CHG-SEVERITY(8q), CHGEFILTER(8q), omni_events(8q).

Events and Error Notice Distribution

Events are written to a daily log file. This log file is closed and a new log file is opened once a day. Given sufficient storage resources, 24 hours worth of events are stored in each log file. Displays of the log file, printed reports or both can be requested. The log files are retained on disk for an operator-specified number of days and then automatically purged.

A process or an operator at a terminal can query the log file for alarms, errors, and warnings, based on a filter specification.

An event is composed of the following information (left-to-right fields separated by a space):

- dd.mmm.yr
- hh.mm.ss
- CE name
- process name (The process logical name or executable name is enclosed in parentheses.)
- Severity level (info, error, illog or critical)
- type (Event type)
- ID (Event ID)
- Text (Free form)

Visual and Audible System Alarms

Critical Alarms are automatically output to a terminal or printer (providing a visual indication as well as an audible signal).

Troubleshooting

The first step in SGU troubleshooting is to determine the level of the problem from the following categories: configuration, signaling integration, voice integration, single call failure, and load sharing. Secondly, the point of failure must be determined. Only then can any action be taken.

Troubleshooting must be performed in the following order:

1. Verify configuration
2. Verify signaling
3. Verify single calls

Always use maintenance tools to monitor a failure before taking action. Be aware that certain commands can adversely affect the system. Some commands (especially configuration commands) make changes to the system and others (such as displaying loggers) affect system performance.

The event-logger tool provides much useful information for debugging any system malfunction such as software failing to run, configuration problems, and alarms. Other tools for general troubleshooting are the ISUP/IC debuggers.

Commands that affect system performance must not be used in a live system.

Troubleshooting Tools

At the MTP level, a protocol analyzer is the most important tool. Other useful tools are the LEDs on the SLM board and the MML Display commands.

The slandisp Utility

The slandisp utility presents statistics on the ports between the CEs. If numbers appear in the sent and received entries, the system is working. All the values must be similar for ports 0 and 1. The following example presents typical slandisp output.

slandisp

Slan-Mom queue ID 0x20001

MOM Messages

0 Sent

9 Received

Port 0 (/dev/ttyS0) statistics

11 Sent

0 Received

0 Corrupted

0 Passing

Status: FAILURE

Port 1 (/dev/ttyS1) statistics

11 Sent

0 Received

0 Corrupted

0 Passing

Status: FAILURE

The omnimon Utility

omnimon [*-dir <parent directory name>* **]**

where a *<parent directory name>* specifies where to create the *debug.<MMDD>* subdirectory. If no *<parent directory name>* is specified, the user's home directory is used.

omnimon tries to gather as much debugging information as possible about the user's system and Signalware configurations and execute some of the most common debugging tools. Output is captured into 12 or more separate files, grouped logically by category of data. The component files are written to a single tar formatted file for easy delivery to technical support. To facilitate multiple invocations of the utility, the filenames of each of the files begin with the time that the utility was invoked (HHMM). The program generates some of the files which have timing delays as background tasks.

The filename suffixes and their contents are as follows:

- **<HHMM>.sysgen**: system generic information system time, **uname -a** output, list of installed packages, filesystem free space, contents of log files defined in **/etc/syslog.conf**, list of core files in **OMNI_HOME/bin** less than 5 days old, **ps -elf** output (done twice, with 5 second delay between), **sar -wrp 10 10** output, **netstat -ain** output, **ifconfig** output for each interface defined, listing of **/etc/services** which contain "omni", contents of **/etc/conf/cf.d/sdevice**
- **<HHMM>.omnigen**: Signalware generic information output of **dmp**, output of **muxdum**, output of **lomstat**, **slandisp** output (listed twice with a 3 second delay), output of **tap_print**, **Qstat** output for each queue (listed twice with a 5 second delay), output of **portMonDump**
- **<HHMM>.omniconf.tar**: Tar of Signalware configuration files most recent: **$OMNI_HOME/conf/archive.*.$SHM**, **$OMNI_HOME/conf/ce.conf.$SHM**, **$OMNI_HOME/conf/df.conf.$SHM**, **$OMNI_HOME/conf/nodeConf.*.$SHM**, **$OMNI_HOME/conf/nodestart.*.$SHM**, **$OMNI_HOME/conf/options.GENERIC**, **$OMNI_HOME/conf/portConf.$SHM**, **$OMNI_HOME/conf/start.$SHM**, **$OMNI_HOME/conf/omni_conf_info.*** , **$OMNI_HOME/conf/mtp_conf_info.*** , **$OMNI_HOME/conf/scmg_conf_info.*** , **$OMNI_HOME/<cename>/dffile/db.*.$SHM.pri**, **$OMNI_HOME/<cename>/dffile/rc.*.$SHM**, **$OMNI_HOME/<cename>/dffile/cestart.$SHM**, **$OMNI_HOME/<cename>/dffile/tapdes.$SHM**, **$OMNI_HOME/<cename>/dffile/pmdb.$SHM**, **$OMNI_HOME/<cename>/dffile/tap.$SHM.log**.
- **<HHMM>.scmg.tar**: Tar of SCMG configuration files: **$OMNI_HOME/<cename>/tmp/<ALL>.gttInbound.$SHM**, **$OMNI_HOME/<cename>/tmp/<ALL>.gttOutbound.$SHM**, **$OMNI_HOME/<cename>/tmp/<ALL>.scmgInvertedTable.$SHM**, **$OMNI_HOME/<cename>/tmp/<ALL>.scmgNStateTable.$SHM**, **$OMNI_HOME/<cename>/tmp/<ALL>.scmgPcStateTable.$SHM**, **$OMNI_HOME/<cename>/tmp/<ALL>.DFbuffer.$SHM**.
- **<HHMM>.msevt.tar**: Tar of Event and Message files: **$OMNI_HOME/<cename>/tmp/Event.$SHM.*.<MMDD>**, **$OMNI_HOME/<cename>/dffile/Event.$SHM.*.<MMDD>**, **$OMNI_HOME/<cename>/dffile/Meas.*..$SHM.<MMDD>**, **$OMNI_HOME/logs/Event.$SHM.diag.<MMDD>**, **$OMNI_HOME/logs/Event.$SHM.diag.<previous MMDD>**.
- **<HHMM>.<NODE NAME>.ic**: **x7ic**: Output, one file per node. This file contains the captured output for the followong x7ic commands: **#l3,dt; #l3,rat; #l3,rst; #l3,lst; #l3,lnk; #l3,srst; #l3,slst; #l3,slnk; #l3,fep,all, #l3,dmp; #l3,gb; #l3,tm; #l3,tq; #l3,usr; #l3,meas; #l3,ripc; #l3,tipc; #l3,bind; #l3,tr; #ort,dt; #ort,rst; #ort,lst; #ort,meas; #l2,status; #portmon**. The following commands are repeated five times: **#ft,q; #l3,gb; #wait,1**.

- **<HHMM>.<NODE NAME>.debugout**: **x7debug** output, one file per node. This file contains the captured output of all the commands that **x7debug** has available.
- **<HHMM>.<NODE NAME>.sccpout**: **x7sccp_dump** output, one per node. This file contains the captured output of menu items 1 to 7.
- **<HHMM>.<NODE NAME>.scmgout**: **x7scmgdmp** output, one per node. This file contains the captured output of menu items 1 to 7.
- **<HHMM>.<NODE NAME>.tcmgout**: **x7tcmgdmp** output, one per node This file contains the captured output of menu items 2 to 8.
- **<HHMM>.<NODE NAME>.ic**: **x7ic** output, one file per node. This file contains the captured output for the followong x7ic commands: **#is,dt; #is,rat; #is,rst; #is,cicm; #is,but; #is,ait; #is,gb; #is,tm; #is,usr; #ort,dt; #ort,rat; #ort,rst; #ort,cicm; #ort,cic**.
- **<HHMM>.<NODE NAME>.ic**: **x7ic** output, one file per node. This file contains the captured output for the following **x7ic** commands: **#tc,apiaq; #tc,apifq; #tc,api; #tc,gb; #tc,tq; #tc,ripc; #tc,tipc; #tc,bind**.

omnimon exits unsuccessfully if either of the environment variables SHM or OMNI_HOME are undefined. Otherwise, it provides as much information as possible then exits successfully, even if individual tools invoked by **omnimon** fail or individual files cannot be found.

Various per-platform and per-node files, as described above, are written to the data files. **/etc/services**, **/etc/syslog.conf** are parsed for pertinent data.

Logical Node Startup Failures and Retries

The Platform Manager abandons the startup of a logical node if:

- It cannot find the node startup file for the node.
- It cannot find the executable file for a process given in the node startup file or encounters some other error starting the process.
- The node startup file contains no Node Manager.
- The Node Manager fails to start and establish an active copy of itself within 30 seconds.

In any case, any of the node's processes started thus far by the Platform Manager are stopped. If any of these conditions happens in response to the STARTNODE MML command, the command is rejected with an appropriate error message. If any of these conditions happens in the other two cases of node startup, the Platform Manager invokes its automatic restart logic as described below.

For further information, refer to the relevant man pages: MANPGS:START-NODE(8q).

The Node Manager stops its operation when:

- An MML command from a database recovery file or the recent change log file, sent as part of a requested configuration load, is rejected by the MTP/M3UA or SCCP protocol manager.
- The MTP/M3UA or SCCP protocol manager has not started up and has not established an active copy within a number of seconds.
- Some other unrecoverable error associated with startup is encountered.

In the first instance, the Node Manager changes the contents of the RecoveryOptions.xxx(5q) file so that the next attempt to restart the logical node uses a previous version of the configuration database.

In any of these instances, the Node Manager stops all processes in the node including itself. These processes are detected by the health check logic of the Platform Manager.

If the Platform Manager's automatic restart of a node fails, or if a periodic health check by the Platform Manager on each node's Node Manager fails, the Platform Manager terminates any remaining processes in the node and pauses for a few seconds, after which it attempts another restart of the node. Each automatic restart is counted and no further restarts are attempted after the fourth try. After the node remains operational for up for 120 seconds, the failures counter is reset to zero.

For further information, refer to the relevant man pages: MANPGS:RecoveryOptions.xxx(5q).

Monitoring

The monitoring function allows traces of messages between client processes, streams-based protocol modules, and logical node associated communications links.

Monitoring commands must only be executed with the cooperation of Tier 4 support.

Trace information is recorded in a monitor log by the monitor process. In addition to message traces, continuing status information can be concurrently recorded in the monitor log.

Monitor data is recorded in a version-independent manner. This allows analysis of monitor log data recorded in old software versions with any data interpreter.

The SGU monitor function is part of the operational platform but when disabled, the function has no effect on platform performance. The function is enabled by sufficiently privileged operators or by application software that has detected a situation that requires recording.

To monitor a streams process

1. Go to the Linux prompt.
2. Enter monitor -ln <logical stream name> -m <mask>, where:
   - logical stream name: <nodename>.<stream logical name>
   - nodename is either A7 or C7
   - stream logical name:
   - L3RT
   - SCCP
   - lom
   - Mask: 4 bit mask can have value from 0-15. 0 turns off monitoring. 15 turns monitoring on at all four monitoring points within a module.

For further information, refer to the relevant man pages: MANPGS:mon(1f), MonControl(1f).

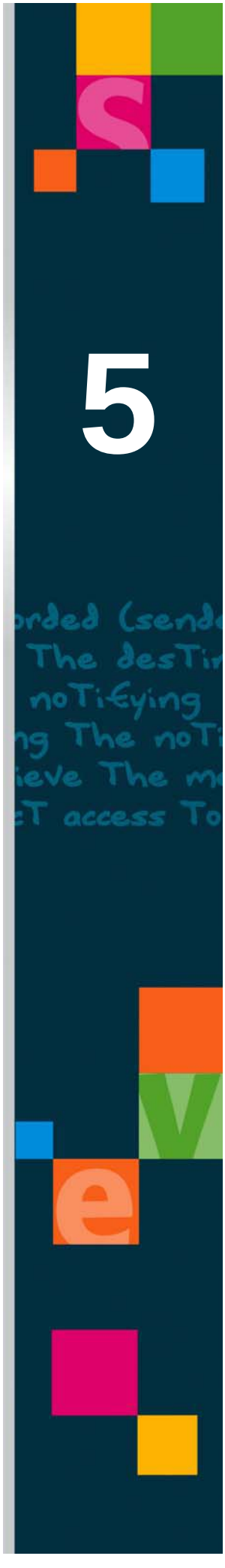
Shutdown Capabilities

The platform supports various forms of shutdown of its parts, client service applications, and the collection of elements resident on a CE. Shutdown capabilities include:

- Complete multiple CE platform and application shutdown.
- Single CE platform and application shutdown.
- Service application shutdown.
- Individual process shutdown.

Chapter 5

MML Commands



Overview

This chapter presents the Man Machine Language (MML) commands used to configure the SGU. The information in this section is based on the man pages, which are the Linux online help facility. The name of the relevant man page is indicated within each section.

Each section in this chapter describes the actions performed by each command and contains the name of the command, abbreviation, the syntax of the command, alternative abbreviated formats, examples, and the name of the man page for the command and for other related topics.

Man pages for MML commands are always in Section 8 of the man page directory tree. Man pages for related topics are found in other sections of the man page directory tree. The sections are identified by the q number following the reference. For example, ipcbm(1q). For general information on MML, refer to the Section 7 Man Page MML_Intro (7q).

MML commands take the form:

```
COMMAND-NAME:PARAM1-NAME=<value1>, PARAM2-NAME=<value2>...;
```

MML commands observe the following rules:

- **Command Name**: Uppercase letters, must be followed by colon (:).
- **Parameter Name**: All uppercase letters followed by an equal sign (=). Parameters are separated by commas (,).
- **End of Command**: Commands are always terminated by a semicolon (;).

In addition to the rules for the commands, command syntax in this chapter is shown using the following conventions:

- **Values to be supplied**: Surrounded by angle brackets (< and >).
- **Optional parameters**: Surrounded by square brackets ([and]).
- **Parameter choice or value choice**: Surrounded by curly brackets ({ and }) and separated by a vertical bar (|).
- **Actual command names**: Shown in the first line of the section. Any abbreviations are shown in parentheses following the command name.
- **Abbreviations for parameters**: Shown in parentheses following the parameter name.

Issuing SGU configuration commands through MML requires binding to an A7 node or a C7 node using termhandler to enter MML commands.

Example: termhandler -node C7 -destname PM

MTP/M3UA Provisioning

The MTP/M3UA maintains the following:

- **SS7 logical node's own point code**: This node's own point code.
- **Association Set/Link Set Table**: Contains the name and adjacent point code of every association set or link set for this logical node.
- **Link Table**: Contains the name, CE name, and remote address of every signaling association for this logical node.

- **Association Table**: Contains the name, CE name, and remote address of every signaling association for this logical node.
- **Route Set Table for every Destination Point Code (DPC)**: Contains the route set name, destination point code, and all routes (association sets or link sets) over which every Destination Point Code (DPC) is reachable from this logical node.

Own Signaling Point Code Commands

Table 22, “MML Commands for Own Signaling Point Code” describes typical MML commands related to the Own Signaling Point Code (OSPC).

Serious system impact can result when events are changed. Therefore, personnel must thoroughly understand these impacts before making any changes.

Table 22 MML Commands for Own Signaling Point Code

Command	Description and Use
CREATE-OSPC or CRTE-OSPC_s	Creates a Point Code, called an Own Signaling Point Code (OSPC), for this logical node. The OSPC must be entered before any additional configuration of either the MTP/M3UA or the SCCP can take place.
DISPLAY-OSPC or DISPL-OSPC	Displays the OSPC associated with the logical node.
DELETE-OSPC or DLT-OSPC	Deletes the assigned OSPC from the logical node. All signaling associations/links, association sets/link sets, and route sets for the logical node must be deleted before can be executed.

Create Own Signaling Point Code (OSPC)

```
CREATE-OSPC:PC=<pc>[,NI=<ni>];
or
CRTE-OSPC:PC=<pc>[,NI=<ni>];
```

Assigns anOSPC and the network indicator for the logical node.

The Signaling Point Code is used as the identity of the logical node in the network.

PC

The required PC must be in the range 0 to 16383.

Network Indicator

The network indicator is optional. If it is not specified, NAT0 is assigned. The string NI can be:

- **INT0**: International network 00
- **INT1**: International network 01
- **NAT0**: National network 10
- **NAT1**: National network 11

Example

```
CREATE-OSPC:PC=555,NI=NAT0;
```

Assigns the Point Code 555 (OSPC) as the identity of this node to the network (network indicator=2).

Man Page

- CRTE-OSPC(8q)

Display Own Signaling Point Code (OSPC)

```
DISPLAY-OSPC[:PRT=<print_choices>];
```

or

```
DISPL-OSPC[:PRT=<print_choices>];
```

Displays the Own Signaling Point Code. The command optionally prints the Own Signaling Point Code on the requested system printer. Refer to MML_Intro(7q) for details on specifying print choices.

Example

```
DISPL-OSPC;
```

Display

- OWN SIGNALING POINT CODE
  - <pc>

where:

- <pc> = Own Signaling Point Code

Man Page

- DISPL-OSPC(8q)

Delete Own Signaling Point Code (OSPC)

```
DELETE-OSPC;
```

or

```
DLT-OSPC;
```

Deletes the assigned Own Signaling Point Code from this logical node. All signaling links, link sets, associations, association sets, and route sets for the logical node must be deleted before the OSCP is deleted.

Example

```
DELETE-OSPC;
```

Man Page

- DLT-OSPC(8q)

Signaling Link and Link Set Commands

The signaling link and link set commands are used to create, manage, and delete traditional SS7 connections implemented over individual (V.35) or multiplexed (T1/E1) serial lines.

Link Set Commands

Link set commands display the available, congested or unavailable status of the node's link set. Table 23, “MML Commands for Link Sets” describes typical MML commands related to link sets.

Table 23 MML Commands for Link Sets

Command	Description and Use
CREATE-LSET or CRTE-LSET	Creates a link set. Every signaling link must belong to a link set and such a link set must be created before the signaling link are created. The Adjacent Point Code associated with the link set is specified in this command.
DISPLAY-LSET or DISPL-LSET	Displays configuration and status data for a single link set or for all link sets.
ACTIVATE-LSET or ACT-LSET	Activates a link set.
DEACTIVATE-LSET or DEACT-LSET	Deactivates all the signaling links in a link set and prevents MTP/M3UA routing from using this LSET.
DELETE-LSET or DLT-LSET	Deletes a link set. Before doing this, all signaling links in the link set must first be deleted and the link set must be removed from all route sets of which it is a member.

Create Link Set

For ANSI (A7) nodes;

CREATE-LSET:LSET=<*identifier*>**,PC=**<*pc*>**,TYPE=**<*type*>**;**

or

CRTE-LSET:LSET=<*identifier*>**,PC=**<*pc*>**,TYPE=**<*type*>**;**

For C7 nodes;

CREATE-LSET:LSET=<*identifier*>**,PC=**<*pc*>**;**

or

CRTE-LSET:LSET=<*identifier*>**,PC=**<*pc*>**;**

Creates a link set (LSET).

The new LSET is named by the identifier (up to eight characters) entered by the operator. The Point Code (PC) indicates the adjacent node at the opposite end of the LSET created.

A7 Nodes

PC is in the format of N-C-M, where:

- N is the network number
- C is the cluster number
- M is the member number

The TYPE parameter specifies the link set type, where:

- A indicates the link set connects to a home STP.
- E indicates the link set connects to a remote STP.
- F indicates the link set connects directly to an end signaling point.

C7 Nodes

The range of a PC is from 0 to 16383.

Examples

For A7 Nodes:

```
CRTE-LSET:LSET=ABCDEFG,PC=10-20-0,TYPE=A;
```

Creates a link set named ABCDEFG that connects to a home STP with Point Code 10-20-0.

For C7 Nodes:

```
CRTE-LSET:LSET=ABCDEFG,PC=4096;
```

Creates a link set named ABCDEFG that connects the destination Point Code 4096.

Man Page

- CRTE-LSET(8q)

Display Link Set

DISPLAY-LSET[:LSET={<*identifier*> **| ALL}] [,PRT=**<*print_choices*>**];**

or

DISPL-LSET[:LSET={<*identifier*> **| ALL}] [,PRT=**<*print_choices*>**];**

Displays either the link set (LSET) indicated by the identifier parameter or ALL LSETs. Optionally, the operator requests the display to print on the system printer or at a selected device. Refer to MML_Intro(7q) for details on specifying print choices.

The absence of the LSET parameter assumes a value of ALL for the parameter and displays all link sets.

Examples

```
DISPL-LSET;
```

Displays the status of all link sets.

Display

ANSI (A7) Output

--- LINK SET ---

```
   Name          Nbr     Type     ADPC  Status     Active Links  PC count
<identifier>  <num1>  <A/E/F>  <pc>  <legend1>  <num2>        <num3>
```

--- SIGNALING LINKS ---

Name Number SLC Status

<ident> <num4> <num5> <legend2>

Output for other variants

--- LINK SET ---

```
   Name   NumberADPCStatus   Active Links       PC count
<identifier><num1><pc>    <legend1>   <num2>     <num3>
```

--- SIGNALING LINKS ---

Name Number SLC Status

<ident> <num4> <num5> <legend2>

WHERE

<identifier>	Link set name
<num>	Link set number
<pc>	Adjacent Node Point Code number
<legend1>	Link set status legend: a=active, A=not active
<num2>	Number of active links in the link set
<num3>	PC count
<ident>	Link name
<num4>	Link number
<num5>	Signaling Link Code (SLC) number
<legend2>	Signaling link status legend: a=available, A= not available

When the operator requests ALL, the display or printout is repeated for all LSETs.

Man Page

- DISPL-LSET(8q)

Activate Link Set

```
ACTIVATE-LSET:LSET=<identifier>;
```

or

```
ACTV-LSET:LSET=<identifier>;
```

Activates all the signaling links in a link set (LSET).

LSET

Required parameter that identifies the LSET for which all the signaling links are activated. This identifier is defined by the CRTE-LSET command.

Example

```
ACTV-LSET:LSET=ABCD;
```

Activates every signaling link in the link set ABCD.

Man Page

- ACTV-ASET(8q)

Deactivate Link Set

```
DEACTIVATE-LSET:LSET=<identifier>;
```

or

```
DEACT-LSET:LSET=<identifier>;
```

Deactivates all the signaling links in a link set (LSET) and stops MTP/M3UA routing from actively using this LSET. The identifier is the LSET in which the signaling links are deactivated. This identifier is defined by the CRTE-LSET command.

The signaling links are activated again with the ACTV-LSET(8q) command or activated individually by the ACTV-SLK(8q) command.

Example

```
DEACT-LSET:LSET=ABCD;
```

Deactivates all signaling links in the link set ABCD.

Man Page

- DEACT-LSET(8q)

Delete Link Set

DELETE-LSET:LSET=<*identifier*>**;**

or

DLT-LSET:LSET=<*identifier*>**;**

Deletes the link set (LSET) indicated by the identifier.

Before deleting an LSET, all signaling links in the LSET must be deleted (refer to DLT-SLK(8q)), and the LSET must be removed from all route sets of which it is a member (refer to CHG-RSET(8q)).

Examples

```
DLT-LSET:LSET=ABCD;
```

Deletes the link set ABCD from the system.

Man Page

- DLT-LSET(8q)

Combined Link Set Commands

Table 24, “MML Commands for Combined Link Sets” describes typical MML commands related to combined link sets.

Table 24 MML Commands for Combined Link Sets

Command	Description and Use
CREATE-CLSET or CRTE-CLSET	Creates combined link set. Allows grouping link sets.
DISPLAY-CLSET or DISPL-CLSET	Displays the identifier, number, type, and link set names for a single combined link set or for all combined link sets.
DELETE-CLSET or DLT-CLSET	Deletes combined link sets.

Create Combined Link Set

Combined Link Sets are only supported in ANSI (A7) SS7 networks.

CREATE-CLSET:CLSET=<*identifier*>**,LSET=**<*identifier*>**&**<*identifier*>**;**

or

CRTE-CLSET:CLSET=<*identifier*>**,LSET=**<*identifier*>**&**<*identifier*>**;**

Creates a Combined Link Set from two linksets. The linksets specified must be of the same type. The type of a linkset can be A, E or F. Only types A or E are used to form a Combined Link Set.

Example

```
CRTE-CLSET:CLSET=COMLAB,LSET=LSETAC&LSETBC;
```

Creates a Combined Link Set COMLAB using link sets LSETAC and LSETBC.

Man Page

- CRTE-CLSET(8q)

Display Combined Link Set

DISPLAY-CLSET[:CLSET={<*identifier*> **| ALL}][,PRT=**<*print_choices*>**];**

or

DISPL-CLSET[:CLSET={<*identifier*> **| ALL}][,PRT=**<*print_choices*>**];**

Displays either a specified Combined Link Set (CLSET) or ALL Combined LSETs as indicated by the entered identifier parameter. Optionally, the operator requests the display to print on the system printer or at a selected device. Refer to MML_Intro(7q) for details on specifying print choices.

The absence of the CLSET parameter assumes a value of ALL for the parameter and displays all combined link sets.

Example

```
DISPL-CLSET;
```

Displays the status of all Combined Link Sets.

Display

```
--- COMBINED LINK SET ---

Name    Nbr Type LSET1 NameLSET2 Name

<identifier><num><><identifier1>    <identifier2>
```

where:

<identifier>	Combined Link Set name
<num>	Combined Link Set number
<>	Combined Link Set type
<identifier1>	Link Set name 1
<identifier2>	Link Set name 2

When the operator requests ALL, the display or printout is repeated for all CLSETs.

Man Page

- DISPL-CLSET(8q)

Delete Combined Link Set

DELETE-CLSET:CLSET=<*identifier*>**;**

or

DLT-CLSET:CLSET=<*identifier*>**;**

Deletes the Combined Link Set indicated by the identifier. The CLSET identifier indicates the Combined Link Set to be deleted. CLSET is specified using the identifier assigned by a Create Combined Link Set command (CRTE-CLSET).

Example

```
DLT-CLSET:CLSET=COMLAB;
```

Deletes a Combined Link Set COMLAB.

Combined Link Sets are only supported in ANSI (A7) SS7 networks.

Man Page

- DLT-CLSET(8q)

Signaling Link Commands

Table 25, “MML Commands for Signaling Links” describes typical MML commands related to signaling links.

Table 25 MML Commands for Signaling Links

Command	Description and Use
CREATE-SLK- or CRTE-SLK	Creates a signaling link as a member of a link set.
DISPLAY-SLK or DISPL-SLK	Displays configuration and status data for a single signaling link or for all signaling links.
CHANGE-SLK or CHG-SLK	Enables modification of signaling links.
ACTIVATE-SLK or ACTV-SLK	Activates signaling links.
DEACTIVATE-SLK or DEACT-SLK	Deactivates signaling links and causes link misalignment and an inability to carry traffic.
DELETE-SLK or DLT-SLK	Deletes a single signaling link from the configuration.

Create Signaling Link

CREATE-SLK:SLK=<*identifier*>,LSET=<*identifier*>,SLC=<*num*>,SPEED=<*num*>,
PORT=<*num*>[,CHANNEL=<*num*>];

or

CRTE-SLK:SLK=<*identifier*>,LSET=<*identifier*>, SLC=<*num*>,SPEED=<*num*>,
PORT=<*num*>[,CHANNEL=<*num*>];

Creates a signaling link as a member of a previously defined link set. An LSET is composed of up to 16 (for other protocol variants) signaling links.

Associates an identifier for an SLK with one of the many physical links in the system. The physical link was assigned a port number in a configuration file. The PORT parrameter of the CRTE-SLK command assigns a logical identifier name to the port. The port number cannot have been previously assigned to a signaling link identified within this logical node or another logical node in the system.

If the physical link is a T1 or E1 line, the CHANNEL parameter specifies the T1 or E1 time slot. For a T1 link, the channel number ranges from 1 to 24. For an E1 link, the channel number ranges from 2 to 31. The channel parameter is mandatory for T1 or E1 links and is not used with V.35 links.

The SLK is assigned as a member of an LSET. The LSET must have been previously created for this logical node. An LSET is assigned a Destination Point Code when it is created and this association (Destination Point Code to LSET to SLK members of the LSET) enables routing of messages between the logical node and the Destination Point Code.

The SLC is the Signaling Link Code assignment for the SLK being created within the LSET. This assignment is a decimal number in the range 0 to 15.

The parameter SPEED assigns the speed of the SLK in bits per second (bps). The SPEED parameter is a number in the range of 4800 to 64000 bps (full duplex). SPEED rates in the thousands is specified with a trailing K, as in 56K or 64K.

Example

```
CRTE-SLK:SLK=A01,LSET=LB23,SLC=0,SPEED=56K,PORT=10,CHANNEL=2;
```

Creates a signaling link named A01, in link set LB23, with an SLC code of zero, a link speed of 56000 bps, assigned to Port 10, and channel 2.

Man Page

- CRTE-SLK(8q)

Display Signaling Link

DISPLAY-SLK[:SLK={<*identifier*> | ALL}] [,PRT=<*print_choices*>];

or

DISP-SLK[:SLK={<*identifier*> | ALL}] [,PRT=<*print_choices*>];

Displays the status of a signaling link. If the SLK parameter is omitted from the command line or the keyword ALL is used as the identifier for SLK parameter name, the command reports the status of all signaling links.

If automatic printing of displays and reports is not enabled, using the parameter name PRT with the appropriate print choice (refer to MML_Intro(7q)), the display report is also printed in hard copy on the selected printer.

Example

```
DISPLAY-SLK;
```

Displays the status of ALL SLKs.

```
DISPL-SLK:SLK=A01,PRT=YES;
```

Displays the status of signaling link A01. The status report is also printed on the default printer. Refer to MML Intro(7q) for details on specifying print choices.

Display

- SIGNALING LINKS
  - Name-<ident>
  - Number-<num1>

- Lset-<ident1>
- Lset-<num2>
- SLC-<num3>
- Port-<pn>
- SPEED-<spd>
- ADPC-<pc>
- State-<state>
- Status-<legend>

where:

- <ident> = Link Name
- <num1> = Link Number
- <ident1> = Link Set Name
- <num2> = Link Set Number
- <num3> = Signaling link code
- <pn> = Link port number
- <spd> = Link line speed (bps)
- <state> = ACTIV or INACT for active or inactive state
- <legend> = The following is the signaling link status legend

- SIGNALING LINK STATUS LEGEND
  - i-installed
  - I-not installed
  - n-link normal
  - F-link failed
  - b-not locally blocked
  - B-locally blocked

Man Page

- DISPL-ASSOC(8q)

Activate Signaling Link

```
ACTIVATE-SLK:SLK=<identifier>;
```

or

```
ACTV-SLK:SLK=<identifier>;
```

Activates a signaling link and enables alignment of the link. A signaling link is in the deactivated state when it is created.

The signaling link may be deactivated and is prevented from aligning or carrying traffic, either autonomously, or by an operator command, DEACT-SLK.

SLK

The required SLK parameter identifies the signaling link to be activated. SLK is assigned when the signaling link is created with the CRTE-SLK command.

Example

```
ACTIVATE-SLK:SLK=A01;
```

Activates the signaling link A01.

Man Page

- ACTV-SLK(8q)

Deactivate Signaling Link

```
DEACTIVATE-SLK:SLK=<identifier>;
```

or

```
DEACT-SLK:SLK=<identifier>;
```

Takes a signaling link out of alignment so that it stops carrying traffic. The signaling link was activated for carrying traffic previously by the command ACTV-SLK(8q).

The parameter SLK is the identifier assigned when the signaling link was created.

Example

```
DEACTIVATE-SLK:SLK=A01;
```

Deactivates the signaling link A01.

Man Page

- DEACT-SLK(8q)

Change Signaling Link

```
CHG-SLK:SLK=<identifier>[,SLT={YES | NO}][,PER={YES | NO}];
```

or

```
CHANGE-SLK:SLK=<identifier>[,SLT={YES | NO}][,PER={YES | NO}];
```

Changes the Signaling Link Test (SLT) options for a signaling link after the link is created.

The SLT parameter specifies whether the link initiates SLT upon alignment completion and the PER parameter specifies whether periodic SLT is enabled. The SLT parameter does not affect the current link operation and is effective only after the next alignment is completed. If SLT is enabled and the signaling link fails the test, it is not put in service .

Example

```
CHANGE-SLK:SLK=A01,SLT=YES;
```

Informs signaling link management to send a Signaling Link Test message when link A01 is aligned.

Man Page

- CHG-SLK(8q)

Delete Signaling Link

```
DELETE-SLK:SLK=<identifier>;
```

or

```
DLT-SLK:SLK=<identifier>;
```

Deletes a signaling link from the logical node.

The parameter SLK identifies the signaling link created by the CRTE-SLK(8q) command.

Example

```
DLT-SLK:SLK=A01;
```

Deletes the signaling link A01.

Man Page

- DLT-SLK(8q)

Association and Association Set Commands

The association and association set commands are used to create, delete, and manipulate SIGTRAN SS7 connections implemented over IP networks.

Association Set (ASET) Commands

Association set commands display the available, congested or unavailable status of the node's association set. Table 26, “MML Commands for Association Sets” describes typical MML commands related to association sets.

Table 26 MML Commands for Association Sets

Command	Description and Use
CREATE -ASET or CRTE-ASET	Creates an association set. Every signaling association must belong to an association set and the association set must be created before the signaling association is created. The Adjacent Point Code associated with the association set is specified in this command.
DISPLAY-ASET or DISPL-ASET	Displays configuration and status data for a single association set or for all association sets.
CHANGE-ASET or CHG-ASET	Enables modification of an association set.
ACTIVATE-ASET or ACT-ASET	Activates all associations in an association set.
DEACTIVATE-ASET or DEACT-ASET	Deactivates all associations in an association set and prevents MTP/M3UA routing from using this ASET.
DELETE-ASET or DLT-ASET	Deletes an association set. Before doing this, all signaling associations in the association set must first be deleted and the association set must be removed from all route sets of which it is a member.

Create Association Set

For ANSI (A7) nodes;

CREATE-ASET:ASET=<*identifier*>**,PC=**<*pc*>**,**

or

CRTE-ASET:ASET=<*identifier*>**,PC=**<*pc*>**,**

Optional parameters:

TYPE=<*type*>**,**

MODE=<CLIENT/SERVER>,RCNTX=<*identifier*>**,**

M3UATACK=<*value*>*{M|S|MS}*,

M3UATLACK=<*value*>*{M|S|MS}*,

M3UATAU=<*value*>*{M|S|MS}*,

SCTPTIHB=<*value*>*{M|S|MS}*,

SCTPTIR=<*value*>*{M|S|MS}*,

SCTPTMNR=<*value*>*{M|S|MS}*,

SCTPTMXR=<*value*>*{M|S|MS}*,

SCTPTCP=<*value*>*{M|S|MS}*,

SCTPTMSD=<*value*>*{M|S|MS}*,

SCTPTCL=<*value*>*{M|S|MS}*;

Other protocol variants;

CREATE-ASET:ASET=<*identifier*>**,PC=**<*pc*>**,**

or

CRTE-ASET:ASET=<*identifier*>**,PC=**<*pc*>**,**

Optional parameters:

MODE=<CLIENT/SERVER>,RCNTX=<*identifier*>**,**

M3UATACK=<*value*>*{M|S|MS}*,

M3UATLACK=<*value*>*{M|S|MS}*,

M3UATAU=<*value*>*{M|S|MS}*,

SCTPTIHB=<*value*>*{M|S|MS}*,

SCTPTIR=<*value*>*{M|S|MS}*,

SCTPTMNR=<*value*>*{M|S|MS}*,

SCTPTMXR=<*value*>*{M|S|MS}*,

SCTPTCP=<*value*>*{M|S|MS}*,

SCTPTMSD=<*value*>*{M|S|MS}*,

SCTPTCL=<*value*>*{M|S|MS}*;

Creates an association set. An association set differs from a link set because it is composed of SCTP associations rather than signaling links (SLK).

The new ASET is named by the identifier (up to eight characters). The Point Code indicates the adjacent node at the opposite end of the ASET being created.

The optional MODE parameter indicates whether the associations within the ASET operate as Clients or Servers. If omitted, the default is Client mode. When operating in the Client mode, the association is initiated when the association is activated. When operating in the Server mode, the association is not initiated. Server mode associations listen for incoming Client requests to establish an association.

The optional RCNTX parameter specifies a previously created Routing Context for the ASET. If omitted, no Routing Context is included in the M3UA ASP Active message. If a Routing Context parameter is specified for a non-zero Routing Context, then this value is used in the Routing Context parameter for M3UA protocol messages. If a Routing Context of zero is assigned, then M3UA dynamic registration procedures are used during association activation.

The M3UA and SCTP timer parameters are optional parameters.

Table 27, “M3UA Timer Properties” shows the M3UA timer identifiers, defaults, and ranges in milliseconds.

Table 27 M3UA Timer Properties

identifier	Default	Range (ms)	Description
M3UATACK	3000	1000-20000	Interval to wait for M3UA acknowledgment before retry,
M3UATLACK	30000	25000-60000	Long interval for waiting for M3UA acknowledgment. The long interval takes effect after 5 failed attempts using the normal interval.
M3UATAU	30000	1000-60000	Periodic Audit Timer for sending DAUD messages for inaccessible point codes.

Table 28, “SCTP Timer Properties” shows the SCTP timer identifiers, defaults, and ranges in milliseconds.

Table 28 SCTP Timer Properties

Identifier	Default	Range (ms)	Description
SCTPTIHB	5000	100-60000	Initial HeartBeat interval in ms.
SCTPTIR	3000	100-60000	Initial Retransmission timeout in ms.
SCTPTMNR	1000	100-60000	Minimun Retransmission timeout in ms.
SCTPTMXR	60000	100-60000	Maximum Retransmission timeout in ms.
SCTPTCP	1000	100-10000	Cookie Preservation value in ms.
SCTPTMSD	200	0-500	Maximum SACK Delay timer in ms.
SCTPTCL	60000	100-120000	Cookie Lifetime timer in ms.

For A7 Nodes

PC is in the format N-C-M, where N is the network number, C is the cluster number, and M is the member number. The optional TYPE parameter specifies the association set type and can be:

- **A**: Connects to a home STP.
- **E**: Connects to a remote STP.
- **F**: Connects directly to an end signaling point.

For C7 Nodes

The range of a PC is from 0 to 16383.

Example

For A7 Nodes:

```
CRTE-ASET:ASET=ABCDEFG,PC=10-20-0,TYPE=A;
```

Creates an association set named ABCDEFG operating in client mode and connected to a home STP of point code 10-20-0.

For C7 Nodes:

```
CRTE-ASET:ASET=ABCDEFG,PC=4096,RCNTX=RCNTX01;
```

Creates an association set named ABCDEFG operating in client mode and connected to destination point code 4096. The Routing Context specified in RCNTX01 is used for M3UA protocol procedures.

Man Page

- CRTE-ASET(8q)

Display Association Set

DISPLAY-ASET[:ASET={<*identifier*> **| ALL}][,PRT=**<*print_choices*>**];**

Displays either an association set (ASET) or ALL ASETs as indicated by the entered identifier parameter. Optionally, the operator requests the display to print on the system printer or at a selected device. Refer to MML_Intro(7q) for details on specifying print choices.

The absence of the ASET parameter assumes a value of ALL for the parameter and displays all association sets.

Example

```
DISPL-ASET;
```

Displays all association sets.

Display

ANSI (A7) Output

```
    --- ASSOCIATION SET ---

    Name          Nbr     Type    ADPC  RCNTX   Mode     Status     Active Links  PC
count

    <identifier>  <num1>  <A/E/F> <pc>  <num2>  <mode>   <legend1>  <num3>
<num4>

         --- M3UA TIMERS ---

    M3UA Ack Timer = <tim>
    M3UA Long Ack Timer = <tim>
    M3UA Audit Timer = <tim>
    M3UA heart beat Timer = <tim>

         --- SCTP TIMERS ---

    SCTP Init Heartbeat = <tim>
    SCTP Init Retrans = <tim>
    SCTP Min Retrans = <tim>
    SCTP Max Retrans = <tim>
    SCTP Cookie Persv = <tim>
    SCTP Max. Sack Delay Timer = <tim>
    SCTP Cookie Life Timer = <tim>

         --- Associations ---

         Name    Nbr     Status

       <ident>  <num>    <legend2>
```

Output for other variants

```
    --- ASSOCIATION SET ---

    Name          Nbr     ADPC  RCNTX   Mode     Status     Active Links  PC count

    <identifier>  <num1>  <pc>  <num2>  <mode>   <legend1>  <num3>        <num4>

         --- M3UA TIMERS ---

    M3UA Ack Timer = <tim1>
    M3UA Long Ack Timer = <tim2>
    M3UA Audit Timer = <tim3>
    M3UA heart beat Timer = <tim4>

         --- SCTP TIMERS ---
```

```
SCTP Init Heartbeat = <tim5>
SCTP Init Retrans = <tim6>
SCTP Min Retrans = <tim7>
SCTP Max Retrans = <tim8>
SCTP Cookie Persv = <tim9>
SCTP Max. Sack Delay Timer = <tim10>
SCTP Cookie Life Timer = <tim11>

    --- Associations ---

    Name    Nbr     Status

  <ident>  <num>    <legend2>
```

where:

<identifier>	Association Set name
<num1>	Association Set number
<pc>	Adjacent Node Point Code number
<num2>	Routing Context value
<mode>	CLIENT or SERVER
<legend1>	The following is the association set status legend

```
                --- ASSOCIATION SET STATUS LEGEND ---

              a - active              A - not active
```

<num3> <num4> <tim>	= Number of active associations in the association set = PC count = Timer Value in milliseconds
<ident> <num> <legend2> = The following is the signaling link status legend	= Association Name = Association Number

```
              --- ASSOCIATION STATUS LEGEND ---

              a - available           A - not available
```

When the operator requests ALL, the display or printout is repeated for all ASETs.

Man Page

- DISPL-ASET(8q)

Change Association Set

CHANGE-ASET:ASET=<*identifier*>,
M3UATACK=<*value*>*{M|S|MS}*,
M3UATLACK=<*value*>*{M|S|MS}*,
M3UATAU=<*value*>*{M|S|MS}*,
SCTPTIHB=<*value*>*{M|S|MS}*,
SCTPTIR=<*value*>*{M|S|MS}*,
SCTPTMNR=<*value*>*{M|S|MS}*,
SCTPTMXR=<*value*>*{M|S|MS}*,
SCTPTCP=<*value*>*{M|S|MS}*,
SCTPTMSD=<*value*>*{M|S|MS}*,
SCTPTCL=<*value*>*{M|S|MS}*;

Changes a parameter for an existing association set, identified by the ASET parameter.

The M3UA and SCTP timer parameters are optional parameters. Refer to CRTE-ASET(8q) for timer default and ranges.

Example

```
CHANGE-ASET:ASET=ABCDEFG,SCTPIHB=15000MS;
```

Modifies the association set named ABCDEFG. The initial SCTP heartbeat value is set to 15 seconds.

Man Page

- CHNG-ASET(8q)

Activate Association Set

ACTIVATE-ASET:ASET=<*identifier*>;

or

ACTV-ASET:ASET=<*identifier*>;

Activates all the associations in an association set.

The identifier is the name of the ASET for which all the associations are activated. This identifier is defined using the CRTE-ASET(8q) command.

Example

```
ACTV-ASET:ASET=ABCD;
```

Activates every association in the association set ABCD.

Man Page

- ACTV-ASET(8q)

Deactivate Association Set

DEACTIVATE-ASET:ASET=<*identifier*>;

or

DEACT-ASET:ASET=<*identifier*>;

Deactivates all associations in an association set and stops MTP routing from actively using this ASET. The identifier is the ASET in which the associations are deactivated. This identifier is created using the CRTE-ASET command.

The associations are activated again with the ACTV-ASET(8q) command or activated individually by the ACTV-ASSOC(8q) command.

Example

```
DEACT-ASET:ASET=ABCD;
```

Deactivates all associations and closes off the association set ABCD from traffic.

Man Page

- DEACT-ASET(8q)

Delete Association Set

```
DELETE-ASET:ASET=<identifier>;
```

or

```
DLT-ASET:ASET=<identifier>;
```

Deletes the association set indicated by the operator-entered identifier.

Before deleting an ASET, all associations in the ASET must first be deleted (refer to DLT-ASSOC(8q)) and the ASET must first be removed from all route sets of which it is a member (refer to CHG-RSET(8q)).

Example

```
DLT-ASET:ASET=ABCD;
```

Deletes the association ABCD from the system.

Man Page

- DLT-ASET(8q)

Combined Association Set Commands

Table 29, “MML Commands for Combined Association Sets” describes typical MML commands related to combined association sets.

Table 29 MML Commands for Combined Association Sets

Command	Description and Use
CREATE-CASET or CRTE-CASET	Creates a combined association set. Allows grouping association sets.
DISPLAY-CASET or DISPL-CASET	Displays the identifier, number, type, and association set names for a single combined association set or for all combined association sets.
DELETE-CASET or DLT-CASET	Deletes combined association sets.

Create Combined Association Set

CREATE-CASET:CASET=<*identifier*>**,ASET=**<*identifier*>**&**<*identifier*>**;**

or

CRTE-CASET:CASET=<*identifier*>**,ASET=**<*identifier*>**&**<*identifier*>**;**

Creates a combined association set from two association sets. The association sets specified must be of the same type. The type of association set can be A, E, or F. Only types A or E are used to form a combined association set.

Combined Association Sets are only supported in ANSI (A7) SS7 networks.

Example

`CRTE-CASET:CASET=COMLAB,ASET=ASETAC&ASETBC;`

Creates a combined association set COMLAB using association sets ASETAC and ASETBC.

Man Page

- CRTE-CASET(8q)

Display Combined Association Set

DISPLAY-CASET[:CASET={<*identifier*> **| ALL}][,PRT=**<*print_choices*>**];**

or

DISPL-CASET[:CASET={<*identifier*> **| ALL}][,PRT=**<*print_choices*>**];**

Displays either a combined association set or ALL combined ASETs as indicated by the identifier parameter. Optionally, the operator requests the display to print on the system printer or at a selected device. Refer to MML_Intro(7q) for details on specifying print choices.

The absence of the CASET parameter assumes a value of ALL for the parameter and displays all combined association sets.

Combined Association Sets are only supported in ANSI (A7) SS7 networks.

Example

`DISPL-CASET;`

Displays the status of all combined association sets.

Display

```
--- COMBINED ASSOCIATION SET ---

Name    Nbr Type ASET1 NameASET2 Name

<identifier><num><><identifier1>    <identifier2>
```

where:

<identifier>	Combined Association Set Name
<num>	Combined Association Set Number
<>	Combined Association Set Type
<identifier1>	Association Set Name 1
<identifier2>	Association Set Name 2

When the operator requests ALL, the display or printout is repeated for all CASETs.

Man Page

- DISPL-CASET(8q)

Delete Combined Association Set

DELETE-CASET:CASET=<*identifier*>**;**

or

DLT-CASET:CASET=<*identifier*>**;**

Deletes the combined association set indicated by the identifier.

The CASET identifier indicates the combined association set to be deleted. CASET is specified using the identifier assigned by a Create Combined Association Set command (CRTE-CASET).

Example

```
DLT-CASET:CASET=COMLAB;
```

Deletes a combined association set COMLAB.

Man Page

- DLT-CASET(8q)

Association Commands

Table 30, “MML Commands for Associations” describes typical MML commands related to associations.

Table 30 MML Commands for Associations

Command	Description and Use
CREATE-ASSOC or CRTE-ASSOC	Creates a signaling association as a member of an association set. It assigns an identifier to the association, specifies the CE name, and contains from one to four IPv4-dot-decimal addresses for the remote address (RADDR) parameter. Optional parameters are local address (LADDR), local port (LPORT), remote port (RPORT), inbound streams (INSTREAMS), and outbound streams (OUTSTREAMS).
DISPLAY-ASSOC or DISPL-ASSOC	Displays configuration and status data for a single signaling association or for all signaling associations.
ACTIVATE-ASSOC or ACTV-ASSOC	Activates signaling associations.
DEACTIVATE-ASSOC or DEACT-ASSOC	Deactivates signaling associations and causes association misalignment and an inability to carry traffic.
DELETE-ASSOC or DLT-ASSOC	Deletes a single signaling association from the configuration.

Create Association (ASSOC)

```
CREATE-ASSOC:ASSOC=<identifier>,ASET=<identifier>,CE=<name>,RADDR=<num>,
LADDR=<num>,RPORT=<num>,LPORT=<num>,INSTREAMS=<num>,OUTSTREAMS=<num>;
```

or

```
CRTE-ASSOC:ASSOC=<identifier>,ASET=<identifier>,CE=<name>,RADDR=<num>,
LADDR=<num>,RPORT=<num>,LPORT=<num>,INSTREAMS=<num>,OUTSTREAMS=<num>;
```

Creates an SCTP association as a member of a defined association set. An ASET is composed of up to 16 associations.

Assigns an identifier for the created association.

The CE parameter specifies the Computing Element in the cluster where the SCTP association is created.

The RADDR parameter contains at least one and no more than four IPv4 dot-decimal addresses for the remote end of the SCTP association. The order in which the addresses appear dictates how they are used by SCTP for multihoming purposes. The first address is used to establish the primary path to the endpoint. The remaining addresses (up to three) are used in order, as backup paths if the primary path becomes unavailable.

The optional LADDR parameter contains at least one and no more than four IPv4 dot-decimal addresses for the local end of the SCTP association. As with the RADDR parameter, the order of the address list is used for SCTP multihoming. If no LADDR parameter is specified, then the association is established using the IP address in /etc/hosts created with the configureSigtran utility.

The optional LPORT parameter defines the local port for the SCTP association. If not specified, the local port is internally generated.

If the association is created for an ASET running in server mode (MODE=SERVER), then the LPORT is the listening port. For listening associations, each association that uses the same listening port must have a matching local IP address list.

The optional RPORT parameter defines the remote port number for the SCTP association. If not specified, the remote port number is internally generated.

The optional INSTREAMS parameter defines the number of inbound streams for the SCTP association. Defaults to 2 if this parameter is omitted.

The optional OUTSTREAMS parameter defines the number of outbound streams for the SCTP association. Defaults to 2 if this parameter is omitted.

Example

```
CRTE-ASSOC:ASSOC=A01,ASET=ASETSG,CE="alpha",RADDR=10.1.1.1;
```

Creates an association named ASSOC01 for association set ASETSG on CE alpha to the remote IP address 10.1.1.1. The local address is derived from the IP address in /etc/hosts, which must be set up using the configureSigtran utility.

```
CRTE-ASSOC:ASSOC=A02,ASET=ASETSG,CE="alpha",RADDR=10.1.1.1,LADDR=10.1.1.2;
```

Creates an association named ASSOC01 for association set ASETSG on CE alpha to the remote IP address 10.1.1.1, using the local address 10.1.1.2.

Man Page

- CRTE-ASSOC(8q)

Display Association

```
DISPLAY-ASSOC[:ASSOC={<identifier> | ALL}][,PRT=<print_choices>];
```

or

```
DISPL-ASSOC[:ASSOC={<identifier> | ALL}][,PRT=<print_choices>];
```

Displays the status of an association.

Optionally, all associations are reported if the ASSOC parameter is omitted from the command line or the keyword ALL is used as the identifier for ASSOC parameter name.

If automatic printing of displays and reports is not enabled, the displayed report is printed on the selected printer using the parameter name PRT with the appropriate print choice (refer to MML_Intro(7q)).

Example

```
DISPLAY-ASSOC;
```

Displays the status of ALL ASSOCs.

```
DISPL-ASSOC:ASSOC=A01,PRT=YES;
```

Displays an association named A01. There is also a printout to the system printer. Refer to MML Intro(7q) for details on specifying print choices.

Display

- SIGNALING LINKS
  - Name-<ident>
  - Number-<num1>
  - Lset-<ident1>
  - Lset-<num2>
  - SLC-<num3>
  - Port-<pn>
  - SPEED-<spd>
  - ADPC-<pc>
  - State-<state>
  - Status-<legend>

where:

  - <ident> = Link Name
  - <num1> = Link Number
  - <ident1> = Link Set Name
  - <num2> = Link Set Number
  - <num3> = Signaling link code
  - <pn> = Link port number
  - <spd> = Link line speed (bps)
  - <state> = ACTIV or INACT for active or inactive state
  - <legend> = The following is the signaling link status legend

- SIGNALING LINK STATUS LEGEND
  - i-installedI-not installed
  - n-link normalF-link failed
  - b-not locally blockedB-locally blocked

Man Page

- DISPL-ASSOC(8q)

Activate Association

```
ACTIVATE-ASSOC:ASSOC=<identifier>;
```

or

```
ACTV-ASSOC:ASSOC=<identifier>;
```

Activates an SCTP association and allows establishment of the association to the remote endpoint via protocol exchange.

The parameter ASSOC uses the identifier created with the CREATE-ASSOC command.

An association is in the deactivated state when it is created.

Examples

```
ACTIVATE-ASSOC:ASSOC=ASSOC01;
```

Activates the association ASSOC01.

Man Page

- ACTV-ASSOC(8q)

Deactivate Association

```
DEACTIVATE-ASSOC:ASSOC=<identifier>;
```

or

```
DEACT-ASSOC:ASSOC=<identifier>;
```

Deactivates an association and thus stops it from carrying traffic.

The association was activated by the command ACTV-ASSOC(8q).

The parameter ASSOC uses the identifier created with the CREATE-ASSOC command.

Examples

```
DEACTIVATE-ASSOC:ASSOC=ASSOC01;
```

Deactivates the association ASSOC01.

Man Page

- DEACTV-ASSOC(8q)

Delete Association

```
DELETE-ASSOC:ASSOC=<identifier>;
```

or

```
DLT-ASSOC:ASSOC=<identifier>;
```

Deletes an association from the logical node.

The parameter ASSOC identifies the association created by the CRTE-ASSOC(8q).

Examples

```
DLT-ASSOC:ASSOC=ASSOC01;
```

Deletes the association ASSOC01.

Man Page

- DLT-ASSOC(8q)

Display Signaling Subsystem Number (SSN)

```
DISPLAY-SSN[:SSN={<num> | ALL}] [,PRT=<print_choices>];
```

or

```
DISPL-SSN[:SSN={<num> | ALL}] [,PRT=<print_choices>];
```

Displays the Signaling Subsystem Number, which is the Signaling Connection Control Part (SCCP) representation of a subsystem within the logical node.

The display of a subsystem shows the current state of the SSN as allowed or prohibited. Because the range of application subsystems in the logical node is from 2 to 254, only application subsystems known by SCCP to be active (allowed or unprohibited) are within its scope.

The value <num> entered for the parameter SSN is a signaling subsystem number in the range of 2 to 254 decimal or the identifier ALL to display the entire range of signaling subsystem numbers. If the command is issued without the SSN = <num> parameter, it also returns all signaling subsystem numbers.

The optional parameter PRT prints a copy of the SSN display on the default printer or on another selected device. Refer to MML Intro(7q) for details on specifying print choices.

Example

```
DISPL-SSN:SSN=ALL;
```

or

```
DISPLAY-SSN;
```

Displays the Signaling Subsystem Numbers and states for all subsystems.

```
DISPL-SSN:SSN=254;
```

Displays the SSN for number 254.

Display

```
Local Subsystem:
local ssn=<num> state=<st>
all others are UNEQUIPPED
```

where:

- <num> = signaling subsystem number
- <st> = Current state either ALLOWED or UNEQUIPPED

When the operator requests a single SSN for display, only the state of the indicated SSN is displayed.

Man Page

- DISPL-SSN(8q)

Remote Signaling Subsystem Commands

Table 31, “MML Commands for Remote Signaling Subsystems” describes typical MML commands related to remote signaling subsystems.

The Remote Point Code must have a route set associated with it that was created with the CRTE RSET command.

Table 31 MML Commands for Remote Signaling Subsystems

Command	Description and Use
CREATE-REMSSN or CRTE-REMSSN	Creates a Remote Signaling Subsystem Number. Associates one or more REMSSNs with a single Remote Point Code.
DISPLAY-REMSSN or DISPL-REMSSN	Displays all REMSSNs associated with a single Remote Point Code or with all Remote Point Codes. When this command is entered, the typical display is: Point Code:-12576-[0x3120]-A Remote SSNs[1]:-8-[0x8]-A The output is a list of pairs: pc+ssns. Each pair contains a point code number (in decimal and hexadecimal) and a list of signaling subsystem numbers (in decimal and hexadecimal). The letter A of the point code indicates if it is available or not. A = Available P = Prohibited The value for the Remote SSN is always A, even when the Remote SSN is not equipped.
CHANGE-REMSSN or CHG-REMSSN	Changes an REMSSN. Adds or deletes up to 10 REMSSNs for a given Remote Point Code to SCCP.
DELETE-REMSSN or DLT-REMSSN	Deletes all the REMSSNs associated with a given Remote Point Code.

Create Remote Signaling Subsystem Number

```
CREATE-REMSSN:PC=<pc>,SSN=<num>;
```

or

```
CRTE-REMSSN:PC=<pc>,SSN=<num>;
```

Creates an REMSSN that contains the entered PC and the SSN in the range 2 to 254. The Point Code must already have been defined by a CRTE-RSET command when the CRTE-REMSSN command is entered.

A list of up to ten SSNs, separated by ampersands (&), can be specified.

Example

ANSI (A7) Nodes:

```
CRTE-REMSSN:PC=10-20-30,SSN=128&129&130;
```

Creates REMSSNs 128, 129, and 130, connected to PC 10-20-30.

C7 Nodes:

```
CRTE-REMSSN:PC=4097,SSN=128&129&130;
```

Creates REMSSNs 128, 129, and 130, connected to PC 4097.

Man Page

- CRTE-REMSSN(8q)

Display Remote Signaling Subsystem Number

```
DISPLAY-REMSSN[:PC={<pc> | ALL}][,PRT=<print_choices>];
or
DISPL-REMSSN[:PC={<pc> | ALL}][,PRT=<print_choices>];
```

For the entered PC, displays the REMSSN and state or the REMSSNs and states for ALL remote SSNs.

The optional PRT parameter specifies a printer on which to output the displayed information. Refer to MML_Intro(7q) for details on specifying print choices.

When PC is not specified in the command, ALL is assumed for the value of the Point Code.

Example

ANSI (A7) Nodes:

```
DISPL-REMSSN:PC=10-20-30,PRT=NO;
```

Displays all the REMSSNs connected to PC 10-20-30 and does not print at the system printer.

C7 Nodes:

```
DISPL-REMSSN:PC=16382,PRT=NO;
```

Displays all the REMSSNs connected to the PC 16382 and does not print at the system printer.

Display

```
Remote SSN:
Point Code = <pc> <state>
Remote SSNs: <num> <state>....... <num-x> <state>
```

where:

- <pc> = Point Code Requested
- <num> = Remote Signaling Subsystem Numbers through <num-x>
- <state> = A=Allowed, P=Prohibited

When the operator requests ALL, the Remote SSN display is for each assigned Point Code.

Man Page

- DISPL-REMSSN(8q)

Change Remote Signaling Subsystem Number

```
CHANGE-REMSSN:PC=<pc>,{ADD | DEL}=<num>;
```

or

```
CHG-REMSSN:PC=<pc>,{ADD | DEL}=<num>;
```

Adds (ADD) or deletes (DEL) an REMSSN in the range 2 to 254 to the indicated PC.

The required PC parameter specifies the PC to be modified. The PC must already have been created using CRTE-REMSSN. If it has not, use the CRTE-REMSSN command.

The required Add/Del parameter specifies whether the REMSSNs are added or deleted. Up to ten SSNs, separated by ampersands (&), can be listed for the <num>. Adding and deleting are mutually exclusive and cannot be combined into a single command.

Example

ANSI (A7) Nodes:

```
CHG-REMSSN:PC=20-30-41,ADD=129&139&149&159;
```

Adds REMSSNs 129, 139, 149, and 159 to PC 20-30-41.

C7 Nodes:

```
CHG-REMSSN:PC=4097,ADD=129&139&149&159;
```
Adds REMSSNs 129, 139, 149, and 159 to PC 4097.

Man Page

- CHG-REMSSN(8q)

Delete Remote Signaling Subsystem Number

```
DELETE-REMSSN:PC=<pc>;
or
DLT-REMSSN:PC=<pc>;
```

Deletes the REMSSN from the indicated PC.

Example

ANSI (A7) Nodes:

```
DLT-REMSSN:PC=10-20-30;
```
Deletes the REMSSN from PC 10-20-30.

C7 Nodes:

```
DLT-REMSSN:PC=10000;
```
Deletes the REMSSN from PC 10000.

Man Page

- DLT-REMSSN(8q)

Route Set Commands

Route set commands show the accessible, congested or inaccessible status of the node's route sets. Table 32, “MML Commands for Route Sets” describes typical MML commands related to route sets.

Priority of routes is determined by the order in which the routes are listed. Priority can be changed using the CHG command. A route set must be inhibited before entering the CHG command.

Table 32 MML Commands for Route Sets

Command	Description and Use
CREATE-RSET or CRTE-RSET	Creates a route set associated with a single Point Code and defines one or more association sets or link sets as routes within that route set. Once so defined, the associations or signaling links within these association sets or link sets are candidates for reaching the given PC. In addition, this command specifies the load sharing indicators for the route set.
DISPLAY-RSET or DISPL-RSET	Displays configuration and status data for a single route set or for all route sets.
CHANGE-RSET or CHG-RSET	Changes route set contents. Adds or deletes an association set or link set to or from a given route set. When adding, the priority of the association set or link set within the route set is specified. Loadsharing is also enabled or disabled with this command.

Table 32 MML Commands for Route Sets (Continued)

Command	Description and Use
ALLOW-RSET or ALW-RSET	Unblocks a single route set.
INHIBIT-RSET or INH-RSET	Disables outgoing signaling before deleting the route set. Before using this command, the system must be configured so that no incoming or outgoing traffic is carried on the trunks handling this route set. This prevents loss of calls.
DELETE-RSET or DLT-RSET	Deletes a route set. Before issuing this command, the PC associated with the route set must be removed from the SCCP Configuration whether or not it is a Concerned Point Code or a Remote Point Code.

Create Route Set

A7 Nodes

CREATE-RSET:RSET=<*identifier*>**,PC=**<*pc*>**,RTES=**<*identifier*>**;**

or

CRTE-RSET:RSET=<*identifier*>**,PC=**<*pc*>**,RTES=**<*identifier*>**;**

Other variants

CREATE-RSET:RSET=<*identifier*>**,PC=**<*pc*>**,RTES=**<*identifier*>**,**[LOADSHR={YES | NO}];

or

CRTE-RSET:RSET=<*identifier*>**,PC=**<*pc*>**,RTES=<,[LOADSHR={YES | NO}];**

Establishes a relationship between an RSET and existing LSET, CLSET, ASET or CASET. In addition, specifies the Destination PC and the load sharing indicators for the route set.

Parameter RSET specifies the route set to create. RSET is a user-generated identifier from one to eight characters.

PC specifies the Destination Point Code for this route set. The PC is a numeric value that comprises three parts: network, cluster, and member. The PC is specified as N-C-M, where N, C, and M are decimal values for the network, cluster, and member. Network ranges from 1 to 253, and cluster and member range from 0 to 255. In addition, cluster zero is invalid for network 1 to 5. For a network routed destination, the PC is specified as N-X-X. For a cluster routed destination, the PC is specified as N-C-X. For an STP or member routed destination, the PC is specified as N-C-M. The point code N-C-0 is reserved for an STP but an STP is not required to have 0 as a member.

A destination is provisioned as an STP if the point code is N-C-M and the destination is an adjacent node with A or E type of link set connected.

The parameter RTES specifies the routes used to reach the Destination Point Code. Routes are link set, Combined Link Set, association set, or combined association set identifiers previously assigned during the creation of a link set, a Combined Link Set, an association set or a combined association set. A list of up to four identifiers, separated by ampersands (&) can be specified, for example, LSET1&CLSET2&CLSET3).

The order of the RTES also indicates priority, with the first entry having the highest priority, next entry the next lower priority, and so forth.

When a link set is specified as a route, the link set must be of type F and it must be the first route specified. If a combined link set E type is used as a route, it must be specified before the A type combined link set.

For cluster or member routing, OMNI supports up to 32 different networks. For member routing, OMNI supports up to 128 different network-cluster combinations.

Other (Non-A7) Variants

Establishes a relationship between a route set and existing link sets or association sets. In addition, specifies the Destination PC and the load sharing indicators for the route set.

Parameter RSET specifies the route set to create. RSET is a user-generated identifier from one to eight characters.

PC is a numeric value that specifies the Destination Point Code for this route set. For ITU (C7) the range is 0 to 16383.

The parameter RTES specifies the routes used to reach the Destination Point Code. Routes are link set identifiers assigned during link set creation or association set identifiers that have been previously assigned during association set creation. A list of up to 8 identifiers, separated by ampersands (&) can be specified, for example, ASET1&LSET1&LSET2.

The order of the RTES also indicates priority, with the first entry having the highest priority, next entry the next lower priority, and so forth.

The optional LOADSHR parameter enables the operator to specify if load sharing between two routes in the route set is enabled. By default (omission), the route set does not load share. A YES identifier enables load sharing.

A route set is blocked (inhibited) when it is created. The ALLOW-RSET command puts the route set in service.

Examples

A7 Nodes

```
CRTE-RSET:RSET=WHPLNY,RTES=LSET1&CLSET1,PC=10-20-30;
```

Creates a route set named WHPLNY from the link set LSET1 and the Combined Link Set CLSET1. The route set is member routed and the Point Code is 10-20-30.

CRTE-RSET:RSET=MTLAURL,RTES=LSET1&CLSET1,PC=10-20-X;

Creates a route set named MTLAURL from the link set LSET1 and the Combined Link Set CLSET1. The route set is cluster 20 of network 10.

C7 Nodes

CRTE-RSET:RSET=WHPLNY,RTES=ASET1&ASET2,PC=4023;

For C7 creates a route set named WHPLNY from the association sets ASET1 and ASET2 using Point Code 4023.

Establishes a relationship between a route set and existing link sets. In addition, it specifies the Destination PC and the load sharing indicators for the route set.

Parameter RSET specifies the route set to create. RSET is a user-generated identifier from one to eight characters.

PC specifies the Destination PC for this route set. The PC is a numeric value from 0 to 16383.

The parameter RTES specifies the routes used to reach the Destination Point Code. Routes are link set identifiers that have previously been assigned during link set creation (CRTE-ASET). A list of up to 8 identifiers, separated by ampersands (&) are specified, for example, ASET1&ASET2&ASET3. The order of the RTES also indicates priority, with the first entry having the highest priority, next entry the next lower priority, and so forth.

The optional parameter LOADSHR enables the operator to specify if load sharing between two routes in the route set must be enabled or disabled. By default (omission), the route set does not load share. A YES identifier enables load sharing.

A route set is blocked (inhibited) when it is created, the ALLOW-RSET command actually puts the route set in service.

Man Page

- CRTE-RSET(8q)

Display Route Set

```
DISPLAY-RSET[:PC={<pc> | ALL}][,PRT=<print_choices>];
```

or

```
DISPL-RSET[:PC={<pc> | ALL}][,PRT=<print_choices>];
```

or

```
DISPLAY-RSET[:RSET={<identifier> | ALL}] [,PRT=<print_choices>];
```

or

```
DISPL-RSET[:RSET={<identifier> | ALL}][,PRT=<print_choices>];
```

Displays the current configured information for a route set (RSET) based on the route set identifier (assigned when the RSET is created using the CRTE-RSET(8q) command) or the destination Point Code (PC) of the route set. When the parameter PC is used the destination Point Code of the route set is specified as a number (0 to 16,383). Alternatively, the operator can specify the identifier ALL for all PCs.

When the parameter RSET is used, the route set identifier must be entered. Alternatively, the operator can specify the identifier ALL for all RSETs.

PRT is an optional parameter name that specifies whether a copy of the route set display is printed on the system printer or a selected device. Refer to MML_Intro(7q) for details on specifying print choices.

When the parameter PC or RSET is omitted an identifier of ALL is assumed and all route sets are displayed.

Example

```
DISPL-REST:RSET=ALL,PRT=NO;
```

Displays all route sets. The displayed data is not automatically printed on the system device.

```
DISPLAY-RSET:PC=11848;
```

Displays the route set for the Destination Point Code 11,848 and uses the system definition for any possible printing on the system device.

Display

- ROUTE SET
  - NameDPCStateStatusLoad sharing
  - <identifier><pc><state><legend1><Y/N>
- ROUTES
  - NameStatus
  - <ident><legend2>

where

- <identifier> = Route Set Name
- <pc> = Destination Point Code
- <state> = ACTIVE or BLOCKED
- <legend1> = The following is the legend for Route Set Status
- Route Set Status Legend
  - a-PC accessible A-PC inaccessible
  - b-route set allowed B-route set inhibited
  - c0-route set not congested Cx-route set congested to level x
  - <Y/N> = YES or NO
  - <ident> = Link Set Name
  - <legend1> = The following is the legend for route status

- Route Status Legend
  - a-link set available A-link set not available
  - x-transfer allowed X-transfer prohibited

The legends are printed following the data printouts.

The route set label is followed by all route names in the set.

Each route set is printed with all its route names when requested.

Man Page

- DISPL-RSET(8q)

Allow Route Set

```
ALLOW-RSET:RSET=<identifier>;
```

or

```
ALW-RSET:RSET=<identifier>;
```

Activates (or unblocks) a route set.

Allows traffic to be routed over the indicated route set previously blocked with an INH-RSET(8q) command.

When a route set is created (by command CRTE-RSET), its default state is blocked. To put the route set in service, the ALLOW-RSET command must be entered. A route set cannot be deleted unless it is in the blocked state.

RSET

The required RSET parameter indicates the route set to be placed into service. Route sets are specified using an identifier assigned by a Create Route Set command.

Example

```
ALW-RSET:RSET=WHPLNY;
```

Allows traffic to be routed over the route set WHPLNY.

Man Page

- ALW-RSET(8q)

Inhibit Route Set

```
INHIBIT-RSET:RSET=<identifier>;
```

or

```
INH-RSET:RSET=<identifier>;
```

Inhibits (blocks) a route set (RSET) so that no outgoing traffic is routed to the RSET.

The RSET identifier indicates the route set to inhibit. Route sets are specified using the identifier assigned by a Create Route Set command (CRTE-RSET(8q)).

Example

```
INH-RSET:RSET=WHPLNY;
```

Blocks the route set WHPLNY.

Man Page

- INH-RSET(8q)

Change Route Set

```
CHANGE-RSET:RSET=<identifier>,ADD=<identifier>,PRIORITY=<num>;
CHANGE-RSET:RSET=<identifier>,DEL=<identifier>;
CHANGE-RSET:RSET=<identifier>,LOADSHR={YES | NO};
or
CHG-RSET:RSET=<identifier>,ADD=<identifier>,PRIORITY=<num>;
CHG-RSET:RSET=<identifier>,DEL=<identifier>;
CHG-RSET:RSET=<identifier>,LOADSHR={YES | NO};
```

Changes the contents of a route set. Routes are added or deleted or load sharing is enabled or disabled. The command syntax consists of different formats depending on the changes to be made to the contents of a route set.

An RSET can be changed only when the RSET is blocked (by the command INH-RSET). When a route is deleted (DEL), only the route (the link set specified by the link set identifier) is removed from the RSET. The actual link set is not deleted. The link set remains operational and is used as a route for other route sets.

When a route is added (ADD) to the route set with a priority higher than the current route for carrying traffic, traffic is rerouted to the newly added route. The parameter RSET specifies the route set to be changed. RSET is a user-generated identifier of up to eight characters assigned during the creation of a route set. The parameter ADD specifies the route to be added to the route set.

The parameter DEL specifies the route to be deleted from the route set.

The parameter PRIORITY specifies the priority of the route being added. Priority is a numeric value from 1 to 8 (1 = highest). If the value specified is greater than the highest numerical value in the route set, then the specified value is reduced, if necessary, to the highest numerical value plus one.

For example, if 5 is entered as a new priority where 3 had been the previous high, 4 is the priority that is actually assigned, rather than the requested 5.

The LOADSHR parameter specifies if load sharing between two of the routes in the route set must be enabled (YES) or disabled (NO).

Example

```
CHG-RSET:RSET=ABCDEFG,ADD=ONEWAY,PRIORITY=3;
CHANGE-RSET:RSET=ABCDEFG,LOADSHR=YES;
```

Adds the link set ONEWAY to the route set ABCDEFG with a priority of 3 and load sharing enabled.

Man Page

- CHG-RSET(8q)

Delete Route Set

```
DELETE-RSET:RSET=<identifier>;
or
DLT-RSET:RSET=<identifier>;
```

Deletes a route set.

The RSET identifier indicates the route set to be deleted. RSET is specified using the identifier assigned by a Create Route Set command.

A route set cannot be deleted if the Destination PC still exists in the Concerned PC table or Remote SSN table.

Example

```
DLT-RSET:RSET=ABCDEFG;
```

Deletes the route set ABCDEFG.

Man Page

- DLT-RSET(8q)

Routing Context Commands

Routing Context commands create, display or delete the node's routing contexts. Table 33, “MML Commands for Routing Contexts” describes typical MML commands related to routing contexts.

Table 33 MML Commands for Routing Contexts

Command	Description and Use
CREATE-RCNTX or CRTE-RCNTX	Creates a Routing Context for use in M3UA protocol messages.
DISPLAY-RCNTX or DISPL-RCNTX	Displays a specific Routing Context or all Routing Contexts.
DELETE-RCNTX or DLT-RCNTX	Deletes a Routing Context.

Create Routing Context

CREATE-RCNTX:RCNTX=<*identifier*>**, CONTEXT=**<*NUM*>**;**

or

CRTE-RCNTX:RCNTX=<*identifier*>**, CONTEXT=**<*NUM*>**;**

The Create Routing Context command is used to configure a Routing Context value to be used for M3UA configuration.

If the CONTEXT parameter is given a value of 0, then when the M3UA ASP is started, it uses dynamic registration with the Signalling Gateway. This means that an additional message exchange is used during ASP startup, REGISTRATION REQUEST and REGISTRATION RESPONSE.

If the CONTEXT parameter is greater than 0, then the Routing Context is considered to be statically configured so that dynamic registration is not used. The value of the CONTEXT parameter is used in M3UA protocol messages.

Example

```
CREATE-RCNTX:RCNTX=RCNTX01,CONTEXT=1;
```

This command creates a Routing Context named RCNTX01, with a Context value of 1.

Display Routing Context

DISPLAY-RCNTX[:RCNTX={<*Identifier*>** | ALL}];**

The Display Routing Context (RCNTX) command displays the Routing Context.

Optionally, if the RCNTX parameter is omitted from the command line or the keyword ALL is used as the identifier for RCNTX parameter name, all Routing Contexts are displayed.

Examples

```
DISPLAY-RCNTX;
```

This command displays the status of ALL RCNTXs.

```
DISPL-RCNTX:RCNTX=RCNTX01;
```

This command creates a Display of RCNTX named RCNTX01.

Display

--- Routing Context --

Name Routing Context

<ident> <num>

Where

<ident>	Routing Context Name
<num>	Routing Context Number

Delete Routing Context

DELETE-RCNTX:RCNTX=<*identifier*>**;**

or

DLT-RCNTX:RCNTX=<*identifier*>**;**

This command deletes a Routing Context used for M3UA configuration.

The parameter RCNTX identifies Routing Context that was created by the CRTE-RCNTX command.

Example

```
DLT-RCNTX:RCNTX=RCNTX01;
```

This command deletes the Routing Context RCNTX01.

SCCP Configuration

Table 34, “MML Commands for Concerned Point Codes” through Table 49, “DTCAP MML Commands” describe the MML commands for SCCP configuration.

Concerned Point Code Commands

Table 34, “MML Commands for Concerned Point Codes” describes typical MML commands related to a Concerned Point Code (CPC).

Table 34 MML Commands for Concerned Point Codes

Command	Description and Use
CREATE-CPC or CRTE-CPC	Creates CPCs. Associates one or more CPC(s) with a single SSN.
DISPLAY-CPC or DISPL-CPC	Displays CPCs associated with a single SSN or with all SSNs.
CHANGE-CPC or CHG-CPC	Adds or deletes up to 10 CPCs for a given SSN.
DELETE-CPC or DLT-CPC	Deletes all the CPCs associated with a given SSN.

Create Concerned Point Code

```
CREATE-CPC:SSN=<num>,PC=<pc>;
```

or

```
CRTE-CPC:SSN=<num>,PC=<pc>;
```

Creates aCPC for the specified SSN (range 2 to 254).

The SSN is correlated to the Point Code(s) entered. A list of up to ten Remote Concerned Point Codes, separated by ampersands (&), are specified. The SSN must not already be present in the configuration. If it is present, use the CHG-CPC command.

The CPC is notified of the changes that just occurred to the local SSN on this logical node, for example, User In Service. Also, the local SSN is informed of changes that occurred at the CPC.

Example

```
CREATE-CPC:SSN=250,PC=1&10;
```

Creates CPCs of 1 and 10 for the Signaling Subsystem Number 250.

Man Page

- CRTE-CPC(8q)

Display Concerned Point Code

```
DISPLAY-CPC[:SSN={<num> | ALL}][,PRT=<print_choices>];
```

or

```
DISPL-CPC[:SSN={<num> | ALL}][,PRT=<print_choices>];
```

Displays the CPCs selected by the operator and indicated by the SSN (range 2 to 254 or ALL). ALL displays all of the SSNs.

The operator optionally selects a printer to generate a report of the display information on the system printer or on a selected device. Refer to MML_Intro(7q) for details on specifying print choices.

If SSN is not entered with the command, then SSNs for all CPCs are displayed.

The Concerned Point Code with the Replicated Signaling Subsystem Number is also displayed, if available.

Example

```
DISPLAY-CPC:SSN=123;
```

Displays the CPCs associated with the SSN 123.

Display

- Concerned Point Code:
- Local SSN = <num-1>
- Replicated PC = <num-2>
- Concerned PCs:
- <num-3> ..... <num-x>

where:

- <num-1> = the local Signaling Subsystem Number.
- <num-2> = any Replicated Point Code (if not assigned equal NONE).
- <num-3> = a list of Concerned Point Codes up to <num-x> or NONE when no Point Codes assigned to the SSN.

When the operator requests ALL SSNs this display is repeated for each assigned SSN.

Man Page

- DISPL-CPC(8q)

Change Concerned Point Code

```
CHANGE-CPC:SSN=<num>,{ADD | DEL}=<pc>;
```

or

```
CHG-CPC:SSN=<num>,{ADD | DEL}<pc>;
```

Adds or deletes the CPC for the specified SSN.

This functionality is associated with the ITU SS7 SCCP package.

SSN

The required SSN parameter specifies the SSN that is being modified. The valid range is 2 to 254. The SSN must have already been entered using the CRTE-CPC command. If it has not, use the CRTE-CPC command instead.

ADD/DEL

The required Add/Delete parameter determines whether the specified PC is being added or deleted. Up to 10 CPCs, separated by ampersands (&), are listed for the <pc>.

Example

```
CHANGE-CPC:SSN=250,ADD=4080&4081&4082&4083&4084&4085& 4086&4087&4088&4089;
```

Adds ten CPCs (4080 through 4089) to the SSN 250.

Man Page

- CHG-CPC(8q)

Delete Concerned Point Codes

```
DELETE-CPC:SSN=<num>;
```

or

```
DLT-CPC:SSN=<num>;
```

Deletes the remote CPCs from a local subsystem. The SSN parameter is the number of the SSN (2 to 254) previously assigned a CPC.

Example

```
DELETE-CPC:SSN=111;
```

Deletes all CPCs from the local SSN 111.

Man Page

- DLT-CPC(8q)

Replicated Concerned Point Code (REPCPC) Commands

Table 35, “MML Commands for Replicated CPCs” describes typical MML commands related to Replicated CPCs.

Table 35 MML Commands for Replicated CPCs

Command	Description and Use
CREATE-REPCPC or CRTE-REPCPC	Associates a single REPCPC with a given SSN.
CHANGE-REPCPC or CHG-REPCPC	Changes the single REPCPC for a given SSN.
DELETE-REPCPC or DLT-REPCPC	Deletes the single REPCPC associated with a given SSN.

The replicated Point Code must already be assigned as a CPC for the subject SSN. If it is already assigned as a REPCPC for another SSN, it must first be deleted as that REPCPC.

Create Replicated Concerned Point Code

```
CREATE-REPCPC:SSN=<num>,PC=<pc>;
```

or

```
CRTE-REPCPC:SSN=<num>,PC=<pc>;
```

Replicates a CPC (which must be a CPC already assigned by means of a CRTE-CPC command) for the operator-entered SSN (range 2 to 254).

This number is then combined with the entered PC to formulate the replicated CPC. Only one PC is entered.

Example

```
CREATE-REPCPC:SSN=130,PC=24;
```

Replicates the PC 24 for SSN 130.

Man Page

- CRTE-REPCPC(8q)

Change the Replicated Concerned Point Code

```
CHANGE-REPCPC:SSN=<num>,PC=<pc>;
```

or

```
CHG-REPCPC:SSN=<num>,PC=<pc>;
```

Changes the indicated REPCPC for the designated SSN.

SSN

The required SSN parameter must be in the range 2 to 254.

PC

The required PC parameter specifies the new REPCPC. The PC used must have already been assigned with the CRTE-CPC command. If the PC used is already assigned as a Replicated Concerned Point Code, it must first be deleted using the DLT- REPCPC command.

Example

```
CHG-REPCPC:SSN=250,PC=4095;
```

Changes the Replicated Point Code to 4095 for the SSN 250.

Man Page

- CHG-REPCPC(8q)

Delete Replicated Concerned Point Code

```
DELETE-REPCPC:SSN=<num>;
```

or

```
DLT-REPCPC:SSN=<num>;
```

Deletes the Replicated Concerned Point Code. The SSN (range 2 to 254) indicates the SSN from which the Replicated Concerned Point Code is to be deleted.

Example

```
DLT-REPCPC:SSN=123;
```

Deletes the Replicated Concerned Point Code from the SSN 123.

Man Page

- DLT-REPCPC(8q)

Timer Commands

Table 36, “MML Commands for Timers” describes typical MML commands related to timers.

Table 36 MML Commands for Timers

Command	Description and Use
DISPLAY-TIMER or DISPL-TIMER_m	Displays the value of a single timer within the MTP/M3UA or SCCP or of all timers within both the MTP/M3UA and SCCP.
CHANGE-TIMER or CHG-TIMER_s	Permits the setting of the value for timers within the MTP and SCCP such as the MTP/M3UA delay time for controlled changeover or the SCCP connection establishment timer.

Display Timer

```
DISPLAY-TIMER[:TIMER=<identifier>][,PRT=<print_choices>];
```

or

```
DISPL-TIMER[:TIMER=<identifier>][,PRT=<print_choices>];
```

Displays the values of the timers in the SCCP, MTP, M3UA, and SCTP system tables.

The TIMER parameter is the SCCP, MTP, M3UA or SCTP system table identifier that specifies which timer to display. The identifiers are described under CHG-TIMER_m(8q).

When the TIMER parameter is not supplied, ALL TIMERs are displayed.

An optional PRT parameter prints the display report on the system printer or on another device. Refer to MML Intro(7q) for details on specifying print choices.

Example

```
DISPL-TIMER:TIMER=L2T4E;
```

Displays MTP Layer 2 Timer T4E.

Display

When the operator requests ALL Timers, there are five displays.

Table 37 SCCP Timer Values

SCCP Timer	Value in seconds
SCT1	aaaaa
SCT2	bbbbb
SCT3	ccccc
SCT4	ddddd
SCT5	eeeee
SCT6	fffff
SCT7	ggggg
SCT8	hhhhh

Table 38 MTP2 Timer Values

L2 Timer	Value in milliseconds
L2T2	aaaaa
L2T3	bbbbb
L2T4	ccccc
L2T5	ddddd
L2T6	eeeee
L2T7	fffff

Table 39 MTP3 Timer Values

L3 Timer	Value in milliseconds
L3T1	aaaaa
L3T2	bbbbb
L3T3	ccccc
L3T4	ddddd
L3T6	eeeee
L3T10	fffff
L3TC	ggggg

Table 40 M3UA Timer Values

M3UA Timer	Value in milliseconds
M3UATACK	aaaaa
M3UATLACK	bbbbb
M3UATAU	ccccc

Table 41 SCTP Timer Values

SCTP Timer	Value in milliseconds
SCTPTIHB	aaaaa
SCTPTIR	bbbbb
SCTPTMNR	ccccc

Table 41 SCTP Timer Values (Continued)

SCTP Timer	Value in milliseconds
SCTPTMXR	ddddd
SCTPTMSD	eeeee
SCTPTCP	fffff
SCTPTCL	ggggg

where:

- aaaaa - hhhhh = the milliseconds value of the timers for MTP and seconds for SCCP

When the operator requests a specific Timer, only that Timer is displayed under the applicable header.

Man Page

- DISPL-TIMER(8q)

Change Timer

```
CHANGE-TIMER:TIMER=<identifier>,TVAL=<num>{M|S|MS};
```

or

```
CHG-TIMER:TIMER=<identifier>,TVAL=<num>{M|S|MS};
```

Changes the timer values (TVAL) in the system tables. These are the protocol-defined timers in the system.

TIMER specifies the MTP or SCCP system table timer to change.

TVAL specifies a timer value in decimal digits followed by a one- or two-character identifier to indicate the type of time units. The time unit indicators are MS, M, and S. For example, 2 minutes is specified as 2M, 30 seconds is specified as 30S, and 1500 milliseconds is specified as 1500MS. No mixed mode timer values (such as 1M10S) are allowed.

The system table and timers are specified by an identifier as follows.

- Items identified with a specified range are adjustable within that range.
- Items identified with a notation of 'no range' are adjustable to any positive value.
- Items identified with a range specification of 'fixed' are not operator adjustable. They are fixed at system compile time.

The CHG-TIMER_s man page contains SCCP change timer information. CHG-TIMER_m man page contains mtp change timer information.

Example

```
CHG-TIMER:TIMER=L3T1,TVAL=1200MS;
```

Sets the MTP Level 3 timer T1 to a value of 1.2 seconds.

Man Page

- CHG-TIMER(8q)

Change Timer_m

```
CHANGE-TIMER:TIMER=<identifier>,TVAL=<num>{M|S|MS};
```

or

```
CHG-TIMER:TIMER=<identifier>,TVAL=<num>{M|S|MS};
```

Changes the timer values (TVAL) in the MTP system tables. These are the protocol-defined timers in the system. (CHG-TIMER_s man page contains SCCP change timer information.)

TIMER specifies the MTP system table timer to change.

TVAL specifies a timer value in decimal digits followed by a one- or two-character identifier to indicate the type of time units. The time unit indicators are M, S, and MS. For example, 2 minutes is specified as 2M, 30 seconds is specified as 30S, and 1500 milliseconds is specified as 1500MS. No mixed mode timer value (such as 1M10S) is allowed.

The system table and timers are specified by an identifier as follows. Timer values are shown below in milliseconds unless otherwise specified.

- Items identified with a specified range are adjustable within that range.
- Items identified with a notation of 'no range' are adjustable to any positive value.
- Items identified with a range specification of 'fixed' are not operator adjustable; they are fixed at system compile time.

MTP Level 3 Timers

Table 42, “MTP Level 3 Timer Identifiers, Defaults, and Ranges” lists MTP Level 3 timer identifiers, defaults, and ranges. Refer to them by name for reporting purposes.

Table 42 MTP Level 3 Timer Identifiers, Defaults, and Ranges

Id	Default	Range	Description
L3T1	1000	500-1200	Delay for time controlled changeover
L3T2	1500	700-2000	Waiting for changeover ACK
L3T3	1000	500-1200	Delay for time controlled changeback
L3T4	1000	500-1200	Waiting for changeback ACK
L3T5	1000	500-1200	Waiting for changeback ACK, 2nd attempt
L3T6	1000	500-1200	Delay for controlled rerouting (TFA)
L3T10	30S	30S-60S	RSET test repeat timer
L3T12	1000	800-1500	Waiting for uninhibit acknowledgement
L3T13	1000	700-1500	Waiting for force uninhibit
L3T14	2500	2000-3000	Waiting for inhibit acknowledgement
L3T15	3000	1000-3000	Waiting to start RSET congestion test
L3T16	2000	1400-2000	Waiting for RSET congestion status update
L3T17	1000	800-1500	Delay to avoid oscillation of alignment failure
L3T22	3M	3M-6M	Local link inhibit test timer
L3T23	3M	3M-6M	Remote link inhibit test timer

MTP Level 2 Timers

Table 43, “MTP Level 2 Timer Values” lists MTP Level 2 timer values. They cannot be changed.

Table 43 MTP Level 2 Timer Values

Id	Default	Range	Description
L2T1	40S	40S-50S	Timer alignment ready
L2T2	40S	5S-50S	Timer not aligned
L2T3	1200	1S-1500	Timer aligned
L2T4n	8200	7500-9500	Proving period (normal) timer

Table 43 MTP Level 2 Timer Values (Continued)

Id	Default	Range	Description
L2T4e	500	400-600	Proving period (emergency) timer
L2T5	100	80-120	Timer sending SIB
L2T6	5S	3S-6S	Timer for monitoring congestion
L2T7	2S	500-2S	Timer for excessive delay of ack

Example

```
CHG-TIMER:TIMER=L3T1,TVAL=1200MS;
```

Sets the MTP Level 3 timer T1 to a value of 1.2 seconds.

Man Page

- CHG-TIMER_m(8q)

Change Timer_s

```
CHANGE-TIMER:TIMER=<identifier>,TVAL=<num>{M|S|MS};
```

or

```
CHG-TIMER:TIMER=<identifier>,TVAL=<num>{M|S|MS};
```

Changes the timer values in the SCCP system tables. These are the protocol-defined timers in the system.

TIMER specifies the SCCP system table timer to change.

TVAL specifies a timer value in decimal digits followed by a one- or two-character identifier to indicate the type of time units. The time unit indicators are M, S, and MS. For example, 2 minutes is specified as 2M, 30 seconds is specified as 30S, and 1500 milliseconds is specified as 1500MS.

Table 44, “SCCP Identifiers” shows the identifiers that specify the system table and timers. Time values are shown milliseconds unless otherwise specified.

- Items identified with a specified range are adjustable within that range.
- Items identified with a notation of 'no limits' are adjustable to any positive value.
- Items identified with a range specification of 'fixed' are not operator adjustable. They are fixed at system compile time.

SCCP Timers

Table 44, “SCCP Identifiers” lists the fixed timers. Refer to them by name for reporting purposes.

Table 44 SCCP Identifiers

ID	Default	Range	Description
SCT1	60S	n>30S	Delay between requests for status info
SCT2	30S	no limits	Coordinate state change
SCT3	30S	no limits	Ignore SST
SCT4	60S	no limits	Connection establishment
SCT5	120S	no limits	Inactivity send
SCT6	360S	no limits	Inactivity receive
SCT7	15S	no limits	Release
SCT8	60S	no limits	Interval
SCT9	360S	no limits	Source local reference freeze time
SCT10	20S	no limits	Segment reassembly timer

Example

```
CHG-TIMER:TIMER=SCT1,TVAL=30S;
```

Sets the SCCP timer SCT1 to a value of 30 seconds.

- DISPL-TIMER
- CHG-TIMER_m

Man Page

- CHG-TIMER_s(8q)

Global Title Translation Commands

Table 45, “MML Commands for Global Title Translation” describes typical MML commands related to global title translation.

Table 45 MML Commands for Global Title Translation

Command	Description and Use
CREATE-GT or CRTE-GT	Creates a global title for a particular translation type.
DISPLAY-GT or DISPL-GT	Displays numbers, point codes, and SSNs associated with a particular translation type. Also displays number, point code, SSN, and backup point code associated with a particular translation type and Number for Global Title.
DELETE-GT or DLT-GT	Deletes point code and SSN associated with a specified number and translation type for Global Title format.

Create Global Title (GT)

```
CREATE-GT:TT=<tt>,[NP=<np>,][NA=<na>,]DIG=<string>, PC=<pc>,SSN=<ssn>[[,RI=<ri>]
[,BKUPPC=<bkuppc>][,BKUPSSN=<bkupssn>][,BKUPRI=<bkupri>];
or
CRTE-GT:TT=<tt>,[NP=<np>,][NA=<na>,]DIG=<string>, PC=<pc>,SSN=<ssn>[[,RI=<ri>]
[,BKUPPC=<bkuppc>][,BKUPSSN=<bkupssn>][,BKUPRI=<bkupri>];
```

Creates a global title for the specified translation type (TT), numbering plan (NP), nature of address (NA) (if permitted), and number (DIG) (digits).

The MML command takes the following parameters:

- **TT:** The Translation Type is in the range from 0 to 254. TT is a required parameter. TT is a required parameter for this MML command.
- **DIG:** Digits is a numeric string in the range of 0 to 9 having a length from 1 to 24 digits.

The Global Title Translation (GTT) function supports Most Significant Digit matching.

For example, when the following entries are provisioned:

TT	DIG	PCSSN
1	123	100250
1	1234	101251
1	12345	102252

- A GTT address of 1236 translates to PC=100, SSN=250.
- A GTT address of 1234 translates to PC=101, SSN=251.
- A GTT address of 12345 translates to PC=102, SSN=252.

- DIG is a required parameter for this MML command.

PC

The primary Point Code is a required parameter.

The PC must be a valid point code. It must already have been provisioned using either the CRTE-RSET or CRTE-OSPC MML command. Otherwise the MML command is rejected.

The primary point code is a numeric value from 0 to 16383.

This parameter does not affect the Signaling Point Code field in the called address if it is present.

The value is placed in the L3 MTP Label.

SSN

The primary Signaling Subsystem Number identifies the subsystem that SCCP uses when attempting to route the message. It is a required parameter and must be in the range 2 to 254, or 0.

If the message is outbound, the SSN must be a valid SSN. It must already have been provisioned using the CRTE-REMSSN MML command. Otherwise, the message is discarded.

If the message is inbound, there must be an in-service application with this SSN. Otherwise, the message is discarded.

If the value of the SSN in the called address of an MSU is zero and the GTT function derives a non-zero value, then this SSN value is written into the SSN field of the called address of the MSU before being routed. Otherwise, the SSN field in the called address is not affected.

NP

The numbering plan (NP) is an optional parameter. The NP parameter is an ASCII string with one of the following values:

- **ISDN-TEL (1)**: ISDN/Telephony Numbering Plan
- **DATA (3)**: Data Numbering Plan
- **TELEX (4)**: Telex Numbering Plan
- **MARI-MOB (5)**: Maritime Mobile Numbering Plan
- **LAND-MOB (6)**: Land/Mobile Numbering Plan
- **ISDN-MOB (7)**: ISDN/Mobile Numbering Plan
- **BT-1 (10)**: British Telecom special 1 NP
- **BT-2 (11)**: British Telecom special 2 NP

The NP parameter is used when searching the GTT table to determine a PC/SSN. The NP parameter is optional. If not supplied, NP defaults to ISDN-TEL.

NA

The NA parameter is used when searching the GTT table to determine a PC/SSN. The NA parameter is optional. If not supplied, NA defaults to NSN.

The nature of address indicator is an ASCII string with one of the following values:

- **SUB (1)**: Subscriber Number
- **UNS (2)**: Unused
- **NSN (3)**: National Significant Number
- **INT (4)**: International Number

RI

The Routing Indicator (RI) is an optional parameter. If the RI is not supplied, it defaults to DEF. In this case, the GTT function does not modify the routing indicator bit (bit 7) in the Address Indicator byte of the called address.

If the RI parameter is supplied, SCCP overwrites the bit in the Address Indicator with the supplied value (GT = 0; PCSSN = 1).

The routing indicator is an ASCII string that can have one of the following values:

- **GT**: Set routing indicator to route on GT
- **PCSSN**: Set routing indicator to route on PC/SSN
- **DEF**: Do not modify the existing routing indicator

BKUPPC

The back-up point code (BKUPPC) parameter is optional and only relevant for outbound MSUs.

BKUPPC is a numeric value in the range from 0 to 16383. If this parameter is provided and the primary point code is not available, the SCCP attempts to route to the back-up point code.

This parameter does not affect the Signaling Point Code field in the called address if it is present. This is the value that is placed in the Level 3 MTP Label.

BKUPSSN

The Back-Up Signaling Subsystem Number (BKUPSSN) parameter is optional.

BKUPSSN is a value in the range of 2 to 254 or 0.

The BKUPSSN requires a BKUPPC parameter. This option is only valid for outbound MSUs. If there is an outbound MSU and the primary point code is not available, then SCCP attempts to route to the back-up point code and back-up SSN. If the back-up SSN is not provisioned (not 0 and not 2-254), then the primary SSN is used.

If zero is the value of the SSN in the called address of an MSU and the GTT function derives a non-zero value for SSN, then this SSN value is written into the SSN field of the called address of the MSU before being routed. Otherwise, the SSN field in the called address is not affected.

BKUPRI

The BKUPRI is an optional parameter. The BKUPRI requires a BKUPPC parameter. This option is only valid for outbound MSUs.

If there is an outbound MSU and the primary point code is not available, then SCCP attempts to route to the back-up point code and back-up SSN if provisioned. If the BKUPRI is present, then SCCP overwrites bit 7 (routing indicator) in the Address Indicator of the called address with the supplied value (GT = 0; PCSSN = 1).

If the BKUPRI is not provided, the routing indicator is not modified.

The back-up routing indicator is an ASCII string with one of the following values:

- **GT**: Set routing indicator to route on GT
- **PCSSN**: Set routing indicator to route on PC/SSN
- **DEF**: Do not modify the existing routing indicator

Example

```
CREATE-GT:TT=1,NP=ISDN-TEL,NA=NSN,DIG="123456789",PC=3003,SSN=252,BKUPPC=3004;
```

Creates a global title for Translation Type: 1, Numbering Plan: ISDN-Telephony, Nature of Address: National Significant Number, digits: 123456789, Point Code: 3003, Subsystem: 252, Backup pointcode: 3004.

Man Page

- CRTE-GT(8q)

Display Global Title (GT)

```
DISPLAY-GT[:TT=<tt>*[,NP=<np>][,NA=<na>]![,DIG=<string>]][,PRT=<print_choices>];
```

or

```
DISPL-GT[:TT=<tt>*[,NP=<np>][,NA=<na>]![,DIG=<string>]][,PRT=<print_choices>];
```

Displays Numbers, Point Codes and Signaling Subsystem Numbers associated with a specified Translation Type (TT) or number. The TT is in the range from 0 to 254. Digits are in the range of 0 to 9 with a length from 1 to 22 digits.

Example

```
DISPL-GT;
```

or

```
DISPL-GT:TT=254;
```

or

```
DISPL-GT:TT=254,NP=ISDN-TEL,NA=NSN,DIG="123456789";
```

The first command displays all Number(s), PC(s), SSN(s), and Back Up PC(s) associated with all the provisioned translation types.

The second command displays all Number(s), PC(s), SSN(s), and Back Up PC(s) associated with TT 254.

The third command displays Number, PC, SSN, and Back Up PC associated with TT 254 and DIG 123456789.

Man Page

- DISPL-GT(8q)

Delete Global Title

```
DELETE-GT:TT=<tt>,[NP=<np>,][NA=<na>,]DIG=<string>;
```

or

```
DLT-GT:TT=<tt>,[NP=<np>,][NA=<na>,]DIG=<string>;
```

Deletes the Point Code and Signaling Subsystem Number associated with a specified number and Translation Type (TT) for Global Title. The Translation Type (TT) is in the range of 1 to 254. Digits are in the range of 0 to 9 with a length from 1 to 22 digits.

Example

```
DELETE-GT:TT=254,NA=NSN,DIG="123456789";
```

Deletes the PC and SSN associated with TT 254 and number 123456789.

Man Page

- DLT-GT(8q)

Generic Measurement Commands

Table 46, “MML Commands for Measurements” describes typical MML commands related to measurements. These commands are generic and not SCCP-specific.

Table 46 MML Commands for Measurements

Command	Description and Use
ALW-MEAS	Allows measurements.
XINH-MEAS	Inhibits measurements.
RTRV-MEAS	Generates a report of either the MTP/M3UA, SCCP, TCAP or system event measurement data collected for a specified 5- or 30-minute time interval. MTP/M3UA measurements are available on 5- and 30-minute intervals. SCCP, TCAP, and system event measurements are available in 30-minute intervals only.

Event Processing Commands

Table 47, “MML Commands for Event Processing” describes typical MML commands related to event processing.

Table 47 MML Commands for Event Processing

Command	Description and Use
CHG-EFILTER	Changes count and time interval for event filtering of the log file.
CHG-EMEAS	Changes the length in minutes of the interval during which events are counted for measurement reports. The default interval is 30 minutes.
CHG-QFILTER	Changes the number of messages that causes an event to be generated during message-queue overflow. The platform causes an event to be generated when the threshold for any message queue is exceeded by the deposit of an inbound message into the queue. From then on, an event is generated during threshold overflow of every n messages.
CHG-SEVERITY	Changes the severity level of a given event to critical, illog, error or info.

Signaling System 7 (SS7) Node Management

OMNI provides an SS7 Node Management process (nm) for startup, shutdown, and maintenance of the node configuration (provisioning); the collection, storage, and retrieval of measurement information; and other items controlled by the operator, rather than the API. Node management is deployed redundantly across the CEs, with one process assuming an active management role at any point in time.

Node Configuration (Provisioning)

The operator is responsible for configuring various tables in the MTP/M3UA and SCCP. This provisioning information is stored for later retrieval as needed and the values are reported at any time.

Node Commands

Table 48, “MML Commands for Nodes” describes typical MML commands related to nodes.

Table 48 MML Commands for Nodes

Command	Description and Use
BKUP-NODE	Backup node. Saves the current configuration of the SCCP, MTP/M3UA, and the logical node manager to disk files.
RST-NODE	Restores the node. Establishes which one of three configuration databases (associated with the last three manual or automatic database backups) are used at the next restart of the logical node. In the case of the most recent backup, the command also gives the option of applying or ignoring the recent changes (entered since the last database backup) when next restarting the logical node. The default uses data from the most recent database backup and applies recent changes.
SCH-BKUP	Schedules the backup day. Changes the number of days between the automatic configuration of the database backups.
SCH-PURGE	Changes the number of days after which measurement and log files are purged from the system.
DISPL-BKUP	Displays the backup day. Displays the number of days between automatic backups of the configuration data and the time of the next automatic backup. Backups are also performed manually by issuing the BKUP-NODE command.
DISPL-PURGE	Displays the current setting for the number of days after which log and measurement files are purged from the system.
DISPL-SSN	Displays signaling subsystem number. Displays the current state (allowed or unequipped) of one or all SSNs.
STOP-NODE	Stops a logical node.

Distributed TCAP MML Commands

The following sections contain information on the Distributed TCAP MML commands. These commands are submitted to the Distributed TCAP router at any time.

DTCAP Commands

Table 49, “DTCAP MML Commands” describes typical MML commands related to Distributed TCAP functions. The following MML commands are submitted to the DTCAP Router at any time. Refer to Chapter 5, “MML Commands,” for additional information and examples.

Table 49 DTCAP MML Commands

Command	Description and Use
DISPLAY-DTCAP:CONFIG	Produces a report that shows Distributed TCAP configuration, including local port, logical node name, and the abort option.
DISPLAY-DTCAP:CLIENT=ALL DISPLAY-DTCAP:CLIENT=⟨DTCAP Client ID⟩	Produces a report that shows basic attributes for the indicated Distributed TCAP client(s). If ALL is specified, all clients are displayed; otherwise only the client specified by the DTCAP Client ID is displayed.
DISPLAY-DTCAP:SSN=ALL DISPLAY-DTCAP:SSN=⟨SSN Number⟩	Produces a report that shows SSNs currently registered by one or more DTCAP clients. If ALL is specified, all SSNs are displayed; otherwise only the SSN specified by the SSN number is displayed.
DISPLAY-DTCAP:MEAS	Produces a report that displays measurements for the Distributed TCAP.
DISPLAY-DTCAP:DISTRIBUTION	Shows the distribution of traffic across the registered SLU DTCAP Entities. Sufficient information is provided to indicate the reason for the reported distribution pattern.
DISPLAY-DTCAP:SHARED_MEM	Produces a report showing the shared memory allocation for the current configuration of the DTCAP Router.
DISPLAY-DTCAP:ALL	Produces a report that contains all Distributed TCAP reports previously described.

Table 49 DTCAP MML Commands (Continued)

Command	Description and Use
DBG:?	Lists a summary of all available MML commands.
DBG:MASK=⟨value⟩	Sets the debug mask: On (0) or 0ff (1).
DBG:OUTPUT="⟨file name⟩"	Redirects terminal output to a specified file. The file name must be specified within quotation marks as shown in the command syntax.
DBG:OUTPUT=DEFAULT	Redirects vterminal output to the terminal.

Set TCAP CONGESTION_STRATEGY

```
SET-DTCAP:CONGESTION_STRATEGY=
```

Sets the action to take if all SLUs are congested on attempting to perform round robin scheduling on TCAP BEGIN.

The default is IGNORE.

Display Distributed TCAP Configuration Report

```
DISPLAY-DTCAP:CONFIG;
```

Produces a report that shows the Distributed TCAP configuration, including the local port, logical node name, and the abort option.

Sample Report

```
***** DISPLAY-DTCAP REPORT ********
BASIC CONFIGURATION DATA:
Local Port     = 10000
Logical Node Name  = C7
ABORT_IF_CONGESTED = FALSE
```

Display Distributed TCAP Client Summary Report

```
DISPLAY-DTCAP:CLIENT=ALL;
DISPLAY-DTCAP:CLIENT="DTCAP Client ID";
```

Produces a report that shows the basic attributes for the indicated Distributed TCAP client(s). If ALL is specified, then all clients are displayed. Otherwise only the client specified by the DTCAP Client ID is displayed.

Sample Report

```
******** DISPLAY-DTCAP REPORT ********
DTCAP CLIENT SUMMARY:
Client ID = 0x0101 (257), IP Addr = 172.016.129.030, Port = 10000, state = Accepting
All, SSNs:   089 212 073 003 197 001 048 073 093 009 215
Client ID = 0x0102 (258), IP Addr = 172.016.129.031, Port = 10000, state =
Congested,  SSNs: 048
Client ID = 0x0201 (513), IP Addr = 172.016.129.032, Port = 10000,  state = Going
Down, SSNs: 048
```

Display Distributed TCAP SSN Summary Report

```
DISPLAY-DTCAP:SSN=ALL;
DISPLAY-DTCAP:SSN="SSN Number";
```

Produces a report that shows SSNs currently registered by one or more DTCAP clients. If ALL is specified, all SSNs are displayed. Otherwise only the SSN specified by the Signaling Subsystem Number is displayed.

Sample Report

```
******** DISPLAY-DTCAP REPORT ********
SSN SUMMARY:
SSN = 001
    Client ID = 0x0101 (257), IP Addr = 172.016.129.030, Port = 10000, state =
Accepting All
SSN = 003
    Client ID = 0x0101 (257), IP Addr = 172.016.129.030, Port = 10000, state =
Accepting All
SSN = 009
    Client ID = 0x0101 (257), IP Addr = 172.016.129.030, Port = 10000, state =
Accepting All
SSN = 048
    Client ID = 0x0101 (257), IP Addr = 172.016.129.030, Port = 10000, state =
Accepting All
    Client ID = 0x0102 (258), IP Addr = 172.016.129.031, Port = 10000, state =
Congested
   Client ID = 0x0201 (513), IP Addr = 172.016.129.032, Port = 10000, state = Going
Down
SSN = 215
    Client ID = 0x0101 (257), IP Addr = 172.016.129.030, Port = 10000, state =
Accepting All
```

Display Distributed TCAP Measurements Report

`DISPLAY-DTCAP:MEAS;`

Produces a report that displays measurements for the Distributed TCAP.

Sample Report

```
******** DISPLAY-DTCAP REPORT ********
   CE = d1ccs1a, Designated State = ACTIVE

BASIC CONFIGURATION DATA:

  Local Port     = 10000
  Logical Node Name  = C7
  CONGESTION STRATEGY = IGNORE_PDU
  MAX_HEARTBEAT_PERIOD = 3
  DTCAP CLIENT SUMMARY:

    Client ID = 0x0602 (1538), IP Addr = 172.016.200.065, Port = 10000,
    state = Accepting All, Heartbeat Period = 2 Seconds, Failure Threshold
    = 30 Timeouts
    SSNs:
           40

SSN SUMMARY:

  SSN =  40:
       Client ID = 0x0602 (1538), IP Addr = 172.016.200.065, Port = 10000,
```

```
      state = Accepting All

MEASUREMENTS:
  Time = Wed Aug 27 10:29:45 2003

  Inbound DTCAP PDUs lost in transit                              : 0
  Failure on Local Port read                                  : 0
  Message received from SS7 not decodable                         : 0
  Invalid message received from SLU                               : 0
  Failure to xmit TCAP BEGIN to SS7                               : 0
  Failure to xmit TCAP CONTINUE to SS7                            : 0
  Failure to xmit TCAP END to SS7                                 : 0
  Failure to xmit TCAP ABORT to SS7                               : 0
  Average hash chain size                                         : 0
  Total count of round robin scheduling samples                   : 0

  TCAP BEGIN received from SS7_040                                : 0
  TCAP CONTINUE received from SS7_040                             : 0
  TCAP END received from SS7_040                                  : 0
  TCAP ABORT received from SS7_040                                : 0
  TCAP BEGIN transmitted to SS7_040                               : 0
  TCAP CONTINUE transmitted to SS7_040                            : 0
  TCAP END transmitted to SS7_040                                 : 0
  Outbound TCAP ABORT generated by SLU_040                        : 0
  TCAP BEGIN from SS7 not fully decodable_040                     : 0
  TCAP CONTINUE from SS7 not fully decodable_040                  : 0
  TCAP END from SS7 not fully decodable_040                       : 0
  TCAP ABORT from SS7 not fully decodable_040                     : 0
  Undeliverable transaction aborted by SGU_040                    : 0
  Undeliverable transaction ignored by SGU_040                    : 0
  TCAP CONTINUE from SS7 not deliverable, transaction aborted_040  : 0
  TCAP END from SS7 not deliverable, message ignored_040          : 0
  TCAP ABORT from SS7 not deliverable, message ignored_040        : 0
  Can't forward valid TCAP msg to SLU for SSN                 : 0
  BEGIN, CONTINUE, END, or ABORT forwarded to SLU_040             : 0
  Total Round Robin Selections of this SSN_040                    : 0

  Number of samples SLU DTCAP Entity is known_602                 : 0
  Number of samples SLU DTCAP Entity is selectable_602            : 0
  Number of samples SLU DTCAP Entity is timed out_602             : 0
  Number of samples SLU DTCAP Entity is congested_602             : 0
  Number of samples SLU DTCAP Entity is going down_602            : 0
  Total round robin selections of this SLU DTCAP Entity_602       : 0
M COMPLETED
```

Display All Distributed TCAP Reports

```
DISPLAY-DTCAP:ALL;
```

Produces a report that contains all the Distributed TCAP reports previously described.

Display All MML Commands

```
DBG:?;
```

Lists a summary of all available MML commands.

Set Debug Mask

```
DBG:MASK=value;
```

Sets the debug mask on or off. Entering a 0 for the value, sets the mask off. Entering a 1 for the value sets the mask on.

Redirect Output to File

```
DBG:OUTPUT="filename"
```

Redirects terminal output to a specified file. The file name must be specified within quotation marks as shown in the command syntax below.

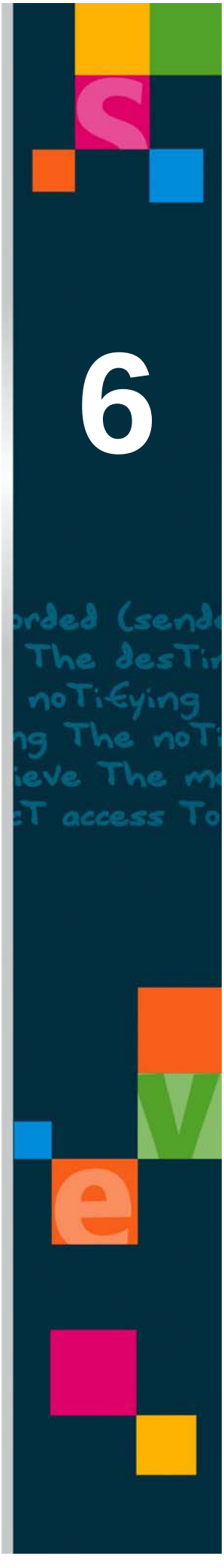
Redirect Output to Terminal

```
DBG:OUTPUT=DEFAULT;
```

Redirects vterminal output to the terminal.

Chapter 6

DTCAP Router Measurements



DTCAP Router Measurements

The DTCAP Router measurements accumulate over one 30-minute measurement period. At the end of each period, all counters are cleared and individual measurements begin accumulating again from zero. The measurement counts accumulated at the end of the measurement period are recorded in the current IPmeas.204… file in the Distributed File System. IPmeas.204… files are maintained for the preceding thirty days of operation.

The current values of the measurement accumulators maintained by the DTCAP Router are displayed by the DISPLAY-DTCAP:MEAS; command. Measurements are listed under one of several categories. All measurements under each of these categories are described in the following subparagraphs.

The measurements displayed by the DISPLAY-DTCAP:MEAS; command represent the accumulators maintained in the DTCAP Router. These accumulators reset to zero every 30 minutes. Separate counts are displayed for each measurement as recorded on CEa and CEb. The report generated by DISPLAY-DTCAP:MEAS; actually displays two separate reports, one for each CE. The report for the Active CE is displayed first, immediately followed by the report for the Standby CE. The measurements displayed in the IPmeas.204… file are formed as the sum of the CEa and the CEb counts. To summarize:

- Each individual measurement (for example, TOT_PDUS) is reported twice in the DTCAP Measurements Report, once for CEa and once for CEb.
- Each individual measurement is reported once per measurement interval in the IPmeas.204… files. The counts in IPmeas represent the sum of the CEa and the CEb counts at end of interval.

Measurements are identified in the DTCAP Measurements Report by a descriptive phrase. They are identified in IPmeas with a short, nonintuitive mnemonic. Table 50, “DTCAP Measurements Characteristics” relates these mnemonics to a corresponding description and category of measurement.

Table 50 DTCAP Measurements Characteristics

Mnemonic in IPmeas	Description in DTCAP Measurements Report	Measurements Category
TOT_PDUS	Total Inbound DTCAP PDUs received	Per SGU
LOST_PDUS	Inbound DTCAP PDUs lost in transit	Per SGU
OOS_PDUS	Inbound DTCAP PDUs rcvd out of sequence	Per SGU
DUP_PDUS	Duplicate inbound DTCAP PDUs	Per SGU
CONT_OVR	DTCAP Continuity sequence number overrun	Per SGU
LARGE_DIS	Largest discrepancy for OOS_PDUS	Per SGU
AVG_DIS	Average discrepancy for OOS_PDUS	Per SGU
BAD_MSG_IN	Message received from SS7 not decodable	Per SGU
OINV_IGN	Invalid message received from SLU	Per SGU
OBEGIN_FAIL	Failure to xmit TCAP BEGIN to SS7	Per SGU
OCONT_FAIL	Failure to xmit TCAP CONTINUE to SS7	Per SGU
OEND_FAIL	Failure to xmit TCAP END to SS7	Per SGU
OABORT_FAIL	Failure to xmit TCAP ABORT to SS7	Per SGU
SBY_PDU	Inbound SS7 PDUs refused in Standby Mode	Per SGU
BEGIN_IN	TCAP BEGIN received from SS7 for SSN	Per SSN
CONTINUE_IN	TCAP CONTINUE received from SS7 for SSN	Per SSN
END_IN	TCAP END received from SS7 for SSN	Per SSN
ABORT_IN	TCAP ABORT received from SS7 for SSN	Per SSN
BEGIN_OUT	TCAP BEGIN transmitted to SS7 from SSN	Per SSN
CONT_OUT	TCAP CONTINUE transmitted to SS7 from SSN	Per SSN

Table 50 DTCAP Measurements Characteristics (Continued)

Mnemonic in IPmeas	Description in DTCAP Measurements Report	Measurements Category
END_OUT	TCAP END transmitted to SS7 from SSN	Per SSN
ABORT_OUT	SLU generated TCAP ABORT from SSN	Per SSN
BAD_IBEGIN	Not fully decodable TCAP BEGIN from SS7 for SSN	Per SSN
BAD_ICONT	Not fully decodable TCAP CONTINUE from SS7 for SSN	Per SSN
BAD_IEND	Not fully decodable TCAP END from SS7 for SSN	Per SSN
BAD_IABORT	Not fully decodable TCAP ABORT from SS7 for SSN	Per SSN
IBEGIN_ABRT	Transaction aborted by SGU: Undeliverable to SSN	Per SSN
IBEGIN_IGN	Transaction ignored by SGU: Undeliverable to SSN	Per SSN
ICONT_ABRT	TCAP CONTINUE aborted by SGU: Undeliverable to SSN	Per SSN
IEND_IGN	TCAP END ignored by SGU: Undeliverable to SSN	Per SSN
IABORT_IGN	TCAP ABORT ignored by SGU: Undeliverable to SSN	Per SSN
SLU_SFAIL	Can't forward valid TCAP msg to SLU for SSN	Per SSN
TCAP_TO_SLU	BEGIN, CONTINUE, END or ABORT forwarded to SLU for SSN	Per SSN
TOT_SSN_SEL	Total Round Robin Selections of SSN	Per SSN
SAMP_KNOWN	Number of samples Local DTCAP Dest is known	Per Local DTCAP Destination
SAMP_IS_SEL	Number of samples Local DTCAP Dest is selectable	Per Local DTCAP Destination
SAMP_IS_TO	Number of samples Local DTCAP Dest is timed out	Per Local DTCAP Destination
SAMP_IS_CNG	Number of samples Local DTCAP Dest is congested	Per Local DTCAP Destination
SAMP_IS_GD	Number of samples Local DTCAP Dest is going down	Per Local DTCAP Destination
TOT_DST_SEL	Total round robin selections of this Local DTCAP Dest	Per Local DTCAP Destination

Per SGU Measurements

In the DTCAP Measurements Report, the Per SGU Measurements are presented as a list of lines with the measurement description on the left and the corresponding numeric measurement value on the right.

In IPmeas, measurements in this category are preceded by a line in the form of:

```
/C/DTCAP_PER_SGU/30/00:00/00:30
```

where:

- DTCAP_PER_SGU identifies the following measurements as Per SGU.
- 30 indicates that the measurement interval is 30 minutes.
- 00:00/00:30 indicates the begin and end time of the interval.

In IPmeas, individual measurements in this category are presented as:

```
TOT_PDUS/4537
```

where:

- TOT_PDUS is the measurement mnemonic.
- 4537 is the cumulative measurement value for the entire interval.

All Per SGU Measurements are described following:

- Total Inbound DTCAP PDUs received (TOT_PDUS)

This is the total count of PDUs received from the SS7 network in the reported interval. This count includes TCAP Begin, TCAP Continue, TCAP End, and TCAP Abort.

- Inbound DTCAP PDUs lost in transit (LOST_PDUS)

DTCAP PDUs are transmitted between the SGU and the SLUs over SCTP. This count indicates the number of DTCAP PDUs transmitted from the SLUs that were never received at the SGU.

In general, this count is zero or near zero. If a significant number of lost PDUs are consistently reported, a problem with the HSBN is the most likely cause. The most common problem occurs when the LAN speed is misconfigured on a physical device on the HSBN.

- Inbound DTCAP PDUs received out of sequence (OOS_PDUS)

This measurement tracks the behavior of SCTP. The Linux SCTP stack sorts the order of inbound SCTP PDUs. For this reason, the DTCAP Router accommodates DTCAP PDUs received out of order.

- Duplicate inbound DTCAP PDUs (DUP_PDUS)

This count must not increment. If this count consistently increments, an HSBN problem is indicated. Refer to Inbound DTCAP PDUs lost in transit, above.

- DTCAP Continuity sequence number overrun (CONT_OVR)

This count must not increment. If this count consistently increments, an HSBN problem is indicated. Refer to Inbound DTCAP PDUs lost in transit, above.

- Largest discrepancy for OOS_PDUS (LARGE_DIS)
- Average discrepancy for OOS_PDUS (AVG_DIS)

These two measurements qualify Inbound DTCAP PDUs received out of sequence, described above.

- Message received from SS7 not decodable (BAD_MSG_IN)

This counts malformed or unrecognized messages received from SS7. Ideally, this measurement is zero. If it increments for a significant number of the Total Inbound DTCAP PDUs, there is an interworking problem with the MSC. If it increments occasionally, the SGU is probably receiving messages that are outside of the protocol required to support the registered IN Applications. Bring the issue to the attention of R&D.

- Invalid message received from SLU (OINV_IGN)

This count must always be zero. If it increments, there is a mismatch between the SLU and the SGU software.

- Failure to xmit TCAP BEGIN to SS7 (OBEGIN_FAIL) &
- Failure to xmit TCAP CONTINUE to SS7 (OCONT_FAIL) &
- Failure to xmit TCAP END to SS7 (OEND_FAIL) &
- Failure to xmit TCAP ABORT to SS7 (OABORT_FAIL)

These counts must not increment. If they do start counting, OMNI is compromised. The immediate action must be a CE restart.

- Inbound SS7 PDUs refused in Standby Mode (SBY_PDU)

If the SGU is in Standby Mode, this count increments for every inbound PDU. If the SGU is not in Standby Mode, this count does not increment.

Per SSN Measurements

In the DTCAP Measurements Report, the Per SSN Measurements are presented as a list of lines with the measurement description on the left and the corresponding numeric measurement value on the right. A list of all Per SSN measurements is reported for each registered SSN.

In IPmeas, measurements in this category are preceded by a line in the form of:

```
/C/DTCAP_PER_SSN/30/15:22/15:30
```

where:

- DTCAP_PER_SSN identifies the following measurements as Per SSN.
- 30 indicates that the measurement interval is 30 minutes.
- 15:22/15:30 indicates the begin and end time of the interval. In this case, the SSN was not registered until 22 minutes had already expired in the current measurement interval.

In IPmeas, individual measurements in this category are presented as:

```
BEGIN_IN_146/63953
```

where:

- TOT_PDUS is the measurement mnemonic.
- The reported SSN is appended to the measurement mnemonic as _146
- 63953 is the cumulative measurement value for the entire interval.

All Per SSN Measurements are described as follows

- TCAP BEGIN received from SS7 for SSN (BEGIN_IN)

  TCAP Begin is the first PDU received in a TCAP transaction. For the ITU protocols, this measurement counts the number of customer transactions (for example, phone calls) initiated. For WIN, each customer transaction has many TCAP transactions, so this measurement does not translate directly to a metric for customer transaction volume.
- TCAP CONTINUE received from SS7 for SSN (CONTINUE_IN)

  For ITU, TCAP CONTINUE messages are received following TCAP Begin. For WIN, TCAP CONTINUE is only received in connection with a dialogue with an IS826 External IP.
- TCAP END received from SS7 for SSN (END_IN) &

  TCAP ABORT received from SS7 for SSN (ABORT_IN)

  All transactions are ended by TCAP END or TCAP ABORT. These messages are sent by either the SLU or the MSC. These measurements count these PDUs as transmitted by the MSC.
- TCAP BEGIN transmitted to SS7 from SSN (BEGIN_OUT)
- TCAP CONTINUE transmitted to SS7 from SSN (CONT_OUT)
- TCAP END transmitted to SS7 from SSN (END_OUT)
- SLU generated TCAP ABORT from SSN (ABORT_OUT)

  These measurements count the indicated TCAP PDUs as originated at the SLU and forwarded by the SGU outbound to SS7.
- Transaction aborted by SGU: Undeliverable to SSN (IBEGIN_ABRT)
- Transaction ignored by SGU: Undeliverable to SSN (IBEGIN_IGN)

  One or the other of these measurements increments if the initial PDU in a customer transaction (for example, a phone call) cannot be routed to an SLU. Specifically:
  - If the destination SSN is not registered at the SGU, the DTCAP Router sends outbound Abort and the abort measurement is incremented.
  - If the destination SSN is registered, but all SLU DTCAP Entities registered for that SSN are timed out, congested or in graceful shutdown, then:

- If the congestion strategy is Abort If Congested, the DTCAP Router sends outbound Abort and the abort measurement is incremented.
- If the congestion strategy is Ignore, the DTCAP Router silently drops the unrouteable PDU and the ignore measurement is incremented.

- CONTINUE aborted by SGU: Undeliverable to SSN (ICONT_ABRT TCAP)

  Increments when the SLU assigned for a transaction has gone down at the time that a Continue is received for that transaction.
- TCAP END ignored by SGU: Undeliverable to SSN (IEND_IGN) &
- TCAP ABORT ignored by SGU: Undeliverable to SSN (IABORT_IGN)

  These measurements increment when the SLU assigned for a transaction has gone down at the time that an Abort or End is received for that transaction. Because both of these PDUs end a transaction, the PDU is dropped silently.
- Can't forward valid TCAP msg to SLU for SSN (SLU_SFAIL)

  This measurement must never increment.
- BEGIN, CONTINUE, END or ABORT forwarded to SLU for SSN (TCAP_TO_SLU)

  Counts all PDUs forwarded to any SLU for the indicated SSN.
- Total Round Robin Selections of SSN (TOT_SSN_SEL)

  Counts the number of times an SLU DTCAP Entity is selected to handle a customer transaction.There is a one-to-one correspondence between customer transactions and ITU TCAP transactions. For ITU, if all SLUs are operating normally with no congestion, Total Round Robin Selections of SSN tracks TCAP BEGIN received from SS7 for SSN. For WIN, this correspondence does not apply.

Per Local DTCAP Destination Measurements

The Per Local DTCAP Destination Measurements appear in the DISPLAY-DTCAP report in a specialized format. These measurements are highly interrelated and fall under the following three topics:

- Meaning and Rationale
- DISPLAY-DTCAP Report Format
- IPmeas format

Per Local DTCAP Destination Measurements – Meaning and Rationale

A Local Dtcap Destination is defined by the following triplet:

```
{SLU ID, Entity ID, SSN}
```

where:

- The SLU ID identifies one SLU registered with the SGU.
- The Entity ID identifies one SLU DTCAP Protocol Entity instantiated in the identified SLU.
- The SSN can be qualified with an Application Context.

The round robin distribution lists are formed from the union of all Local DTCAP Destinations for each unique SSN (which can be qualified by an Application Context).

The Per Local DTCAP Destination Measurements show message distribution across the members of the various round robin distribution lists. These measurements show if the distribution is even or uneven. If the distribution is uneven, these measurements show why.

In order to improve the presentation, the DISPLAY-DTCAP report uses neither the short, nonintuitive mnemonics nor the descriptive phrases defined for each mnemonic. Instead, the DISPLAY-DTCAP report uses a one- or two-word phrase that unambiguously identifies the measurement. In subsequent discussion, Per Local DTCAP Destination Measurements are referenced in terms of the DISPLAY-DTCAP report

terminology. Table 51, “Per Local DTCAP Destination Measurement Terminology” correlates this terminology with the mnemonics used in the IPmeas files:

Table 51 Per Local DTCAP Destination Measurement Terminology

Mnemonic	Report Terminology
SAMP_KNOWN	Known
SAMP_IS_SEL	Selectable
SAMP_IS_TO	Timed out
SAMP_IS_CNG	Congested
SAMP_IS_GD	Going down
TOT_DST_SEL	Total Round Robin Selections

These measurements are accumulated for each Local DTCAP Destination. This means they are accumulated for each entry in each round robin distribution list. The distribution of transactions for a given SSN is determined by scanning the Total Round Robin Selections measurement recorded for each DTCAP Destination registered for that SSN. If the distribution is even, all reported Total Round Robin Selections are equal. If there is a divergence in the values displayed for Total Round Robin Selections, then distribution of traffic is unequal. If this is the case, the other Per Local DTCAP Destination Measurements show the reasons for the reported distribution. These other measurements are all accumulated as samples.

All Local DTCAP Destinations are scanned once every second. This scan records the values of certain binary status conditions at the instant of the scan. These values are recorded as counts. Each time a status is observed to be true, its corresponding count is incremented. The counts are:

- **Known**: Counts the number of samples (seconds) in which the indicated Local DTCAP Destination is registered at the SGU.
- **Selectable**: Counts the number of samples (seconds) in which the indicated Local DTCAP Destination is eligible for round robin selection.
- **Timed out**: Counts the number of samples (seconds) in which the indicated Local DTCAP Destination is registered but it has timed out on its heartbeat.
- **Congested**: Counts the number of samples (seconds) in which the indicated Local DTCAP Destination is registered but it is reporting congestion (flow control is on).
- **Going down**: Counts the number of samples (seconds) in which the indicated Local DTCAP Destination is registered but it is in the Graceful Shutdown state.

The individual distribution of traffic to the Local DTCAP Destinations in any round robin list are proportionate to their selectable counts. If selectable is less than the interval reported in the current measurement period, then the other sample counts indicate why the indicated Local DTCAP Destination was not continuously able to accept new traffic.

Per Local DTCAP Destination Measurements – DISPLAY-DTCAP Presentation

The following MML command is submitted to request Per Local DTCAP Measurements for SSN 146 qualified by Application Context CAP2:

```
display-dtcap:distribution,SSN=146,APPLICATION_CONTEXT="CAP2",SAMP;
```

The returned report appears as follows:

```
CE = hsgu3a, Designated State = ACTIVE
DISTRIBUTION FOR SSN = 146, CONTEXT = CAP2, Elapsed Seconds = 1126
    Client ID = 0105, Total Round Robin Selections = 0001671 *** Last Selected By
hsgu3a ***
        known      = 1126
```

```
        selectable = 1126
        timed out  = 0000
        congested  = 0000
        going down = 0000

      ******** DISPLAY-DTCAP REPORT ********
      CE = hsgu3b, Designated State = STANDBY

DISTRIBUTION FOR SSN = 146, CONTEXT = CAP2, Elapsed Seconds = 1126
    Client ID = 0105, Total Round Robin Selections = 0001669 *** Last Selected By
hsgu3b ***
        known      = 1126
        selectable = 1126
        timed out  = 0000
        congested  = 0000
        going down = 0000
M COMPLETED
```

Some important aspects of this report are:

- Only one Local DTCAP Destination is registered for the qualified SSN.
- A separate set of measurements is given for each SGU CE.
- The Last Selected By flag is useful for performing end-to-end system diagnosis when single test messages are being sent one at a time.

Per Local DTCAP Destination Measurements – IPmeas Format

In IPmeas, measurements in this category are preceded by a line of the form:

```
/C/DTCAP_PER_LOCAL_DTCAP_DEST/30/14:00/14:30
```

where:

- DTCAP_PER_LOCAL_DTCAP_DEST identifies the measurements category.
- 30 indicates that the measurement interval is 30 minutes.
- 14:00/14:30 indicates the begin and end time of the interval.

In IPmeas, individual measurements in this category are presented as:

```
SAMP_KNOWN_hsgu3a_0105_SSN_146:CAP2/1800
```

where:

- SAMP_KNOWN is the measurement mnemonic.
- The SLU ID is reported symbolically and numerically as hsgu3a_01
- The Entity ID is 05.
- The reported SSN is appended as _146:CAP2
- 1800 is the measurement value for the entire interval.

Unlike other measurements, the Per Local DTCAP Destination Measurements are not summed from both CEs. They are reported individually in IPmeas for each SGU CE.

Evaluating System Health

The SGU is the single link between an SLU cluster and the SS7 network. The operation of the SGU is highly dependent on the capacity and the correct operation of the SLUs.

Many imputed SGU problems are really issues of SLU behavior. If there is any question of traffic distribution and throughput, a problem at the SLUs is the likely cause. The first thing to consider is the material presented in the section "Per Local DTCAP Destination Measurements," on page 135.

To perform a basic sanity check on the SGU, complete the following steps:

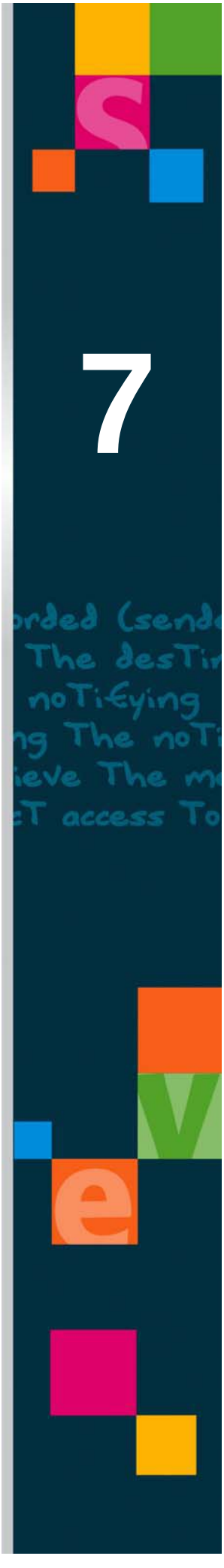
1. Submit the following MML command:

   DISPLAY-DTCAP:ALL;
2. A report for the Active DTCAP Router is returned followed by a report for the Standby DTCAP Router.
3. Insure that all IN Applications at all SLUs have registered at both CEs for the expected SSNs.
4. Record the count reported for Total Inbound DTCAP PDUs received on both CEs. Submit the DISPLAY-DTCAP command again and insure that the counts have incremented. If these counts are not incrementing, there is no connectivity through the SS7 network.
5. In like manner, inspect the counts for Inbound DTCAP PDUs lost in transit. Incrementing counts indicate a problem with the HSBN.
6. If there is a problem with one SSN, determine if the counts for TCAP BEGIN received from SS7 for SSN_<ssn number> are incrementing.
7. For ITU, the counts for Total Round Robin Selections of SSN_<ssn number> track the TCAP BEGIN counts. For WIN, these counts do not track in one-to-one correspondence but Total Round Robin Selections of SSN_<ssn number> must still increment in proportion to the TCAP Begins.
8. The TCAP ABORT received from SS7 for SSN_... counts indicate if transactions are being aborted at the MSC.
9. The SLU generated TCAP ABORT from SSN_... counts indicate if transactions are being aborted at the SLU.
10. Two counts indicate that the SGU cannot forward inbound transactions to the SLUs:
    - Transaction aborted by SGU: Undeliverable to SSN_
    - Transaction ignored by SGU: Undeliverable to SSN_

If traffic is being received from the SS7 network but it is not being forwarded to the SLUs, perform the analysis discussed in the section titled "Per Local DTCAP Destination Measurements – Meaning and Rationale," on page 135. If transactions are being aborted at the SLUs, determine the problem at the SLU.

Chapter 7

SGU Alarms



Overview

The Alarm and Event Monitoring Facility notifies the operator of faults and other events that affect the operation of the Comverse ONE solution.

Alarms are messages that notify the operator of a hardware, software or service fault that adversely affects system operation and for which corrective action is usually necessary.

Alarms are categorized into four priority levels: critical, major, minor, and info.

Critical, major, and minor, alarms indicate to the operator that a corrective action is necessary. After the operator has corrected the condition, the system usually recognizes that the problem is rectified and removes the alarm from the screen.

Alarms with an info priority level require no action. Because info alarms are numerous and often occur in bursts, they are suppressed when duplicated. Because critical, major, and minor alarms are few in number, every alarm message is displayed.

SGU Alarm Messages

Table 52, “SGU Alarms” lists the SGU alarm messages.

For additional details about SGU alarms refer to the Comverse ONE solution Alarm Reference.

Table 52 SGU Alarms

Specific Problem (Alarm ID)	Alarm	Message Text	Severity	Corrective Action/ Instructions
1888005	HOST_CPU_LOAD	Load Average has exceeded warning or critical threshold.	Critical	
1888111	HOST_MEMORY_USE	Memory Utilization has exceeded warning or critical threshold.	Critical	
1888111	HOST_SWAP_USE	Used Swap Space has exceeded warning or critical threshold.	Critical	
1888211	ALERT_FS_<filesystem>	File System(s) Used Space has exceeded warning or critical threshold.	Critical	
1888211	ALERT_MON_<id>	Monitor Alerts	Critical	
1888211	ALERT_JOB_<jobid>	Job Failures	Major	
1888211	ALERT_WKF_<id>	Workflow Failures	Major	
1888311	HOST_PROCESS_<id>	Process Failures		
1888311	APP_PROCESS_<id>	Process Failures		
1887318	FTP_SESSION_STATE	File Transfer connection failure		
1889303	ALERT_IAP_ UNREACHABLE	Alarm Process connection failure		

Table 52 SGU Alarms (Continued)

Specific Problem (Alarm ID)	Alarm	Message Text	Severity	Corrective Action/ Instructions
1889999	ALERT_TEST_<name>	Test Alarm		
1883000	SGU_IPCMEAS_INVMSG	Invalid message type received by measlib.	Info	This is an illogical program condition. Report it to R&D.
1883001	SGU_MM_FOPEN	MEAS_MANAGER has tried to open the indicated measurements file but it is already open.	Info	DNA - This is trace info only.
1883002	SGU_MM_FCLOSE	MEAS_MANAGER has closed the indicated file.	Info	DNA - This is trace info only.
1883003	SGU_MM_FWRITE	MEAS_MANAGER encountered an error in appending to a Dffile.	Info	This is an illogical program condition. Report it to R&D.
1883004	SGU_MM_PURGE	MEAS_MANAGER has purged an old measurements file.	Info	DNA - This is trace info only.
1883005	SGU_OBJSERV_MSG4	A lock is broken and Object Server is unable to notify the process waiting for the lock.	Info	DNA - This is trace info only.
1883006	SGU_OBJSERV_MSG5	A lock is broken and Object Server has notified the process waiting for the lock.	Info	DNA - This is trace info only.
1883007	SGU_OBJSERV_MSG2	FtGetIpc() returns an error in Object Server.	Info	DNA - This is trace info only.
1883008	SGU_OBJSERV_MSG1	Invalid message type received by Object Server.	Info	DNA - This is trace info only.
1883009	SGU_OBJSERV_MSG3	Invalid primitive received by Object Server.	Info	DNA - This is trace info only.
1883010	SGU_OBJSERV_MSG6	Object Server is unable to send primitive to orig process.	Info	DNA - This is trace info only.
1883011	SGU_OBJSERV_MSG9	Object Server is unable to send standby requeues.	Info	DNA - This is trace info only.
1883012	SGU_OBJSERV_MSG7	Object Server is unable to send primitive and error code to originator.	Info	DNA - This is trace info only.
1883013	SGU_OBJSERV_MSG11	Object Server Recovery is complete.	Info	DNA - This is trace info only.

Table 52 SGU Alarms (Continued)

Specific Problem (Alarm ID)	Alarm	Message Text	Severity	Corrective Action/ Instructions
1883014	SGU_OBJSERV_MSG10	Object Server Recovery requested from indicated destination.	Info	DNA - This is trace info only.
1883015	SGU_DTCAP_OOB	DTCAP detects that the Out of Band Channel contains invalid data or it is unparseable.	Info	DNA - This is trace info only.
1883016	SGU_DTCAP_ IPADDRMISMATCH	Two SLUs talking to the reporting SGU are configured with the same SLU ID.	Info	The SLU at the reported SCTP Socket is attempting to register with the SGU. As part of the DTCAP Protocol, the SLU reports its Active CE IP Address and Standby CE IP Address (if configured as Active/Hot Standby). This event is generated if the Originating IP Address in the inbound IP PDU does not match either of the reported addresses. Its occurrence causes the SGU_ INVALID_OOB alarm to be raised.
1883017	SGU_DTCAP_ REGISTRATION	The SGU sees a duplicate or malformed registration from an SGU.	Info	This event must never be reported in the field. If it is seen, report it to Comverse Billing Systems engineering.
1883018	SGU_DTCAP_ HEARTBEATTIMEOUT	The SGU has missed a periodic heartbeat from a registered SLU.	Info	This is trace info only. The condition is not significant until it transitions to SGU_ DTCAP_SluUnresponsive
1883019	SGU_DTCAP_ HEARTBEATSILENT	The SGU has missed a periodic heartbeat from a registered SLU. In addition, no other traffic has been received from the SLU in the heartbeat period.	Info	This is trace info only. The condition is not significant until it transitions to SGU_ DTCAP_SluUnresponsive
1883020	SGU_DTCAP_ HEARTBEATREGAINED	The SLU heartbeat is regained subsequent to reporting SGU_ DTCAP_ HEARTBEATTIME OUT and before reporting SGU_DTCAP_ SLUUNRESPONSIV E	Info	The status has gone back to normal. No action is necessary.
1883021	SGU_DTCAP_SLU_ HASREGISTERED	A new SLU has registered.	Info	DNA - This is trace info only.
1883022	SGU_DTCAP_ SLUUNRESPONSIVE	An SLU that was registered with an SGU has gone down.	Info	The indicated SLU has gone down or the Ethernet has failed. Determine which and fix it.

Table 52 SGU Alarms (Continued)

Specific Problem (Alarm ID)	Alarm	Message Text	Severity	Corrective Action/ Instructions
1883023	SGU_DTCAP_ SLUSWITCHOVER	The CEs at a dual CE SLU have switched over.	Info	
1883024	SGU_DTCAP_ BINDFAILURE	The DTCAP Router cannot bind the indicated SSN.	Info	OMNI is not operating correctly. Restart the CE. If this is a new installation or upgrade, verify the installation and configuration procedures.
1883025	SGU_DTCAP_SSN_BOUND	The DTCAP Router has successfully bound to the OMNI SS7 Stack for the indicated SSN.	Info	This is correct behavior.
1883026	SGU_DTCAP_SSN_ UNBOUND	The DTCAP Router has successfully unbound from the OMNI SS7 Stack for the indicated SSN after all SLUs registered for that SSN have become unresponsive.		This is correct behavior. If the SLU(s) should not have gone down, locate the SLU side or HSBN problem.
1883027	SGU_DTCAP_TERM_ BADCFG	The DTCAP Router has terminated after reading a bad configuration file.	Info	Fix dtcap.cfg.<shm>.

Table 52 SGU Alarms (Continued)

Specific Problem (Alarm ID)	Alarm	Message Text	Severity	Corrective Action/ Instructions
1883028	SGU_DTCAP_ DUPSLUENTITYID	There are two possible causes of this alarm: 1) Two SLUs are configured with the same Client (SLU) ID. This alarm is generated when the second SLU of the pair registers. 2) Two SLU DTCAP Entities on the same SLU are configured with the same Client (SLU) ID and the same Entity ID.	Critical	If the cause of the alarm is Cause 1, take the following actions: Take down the SLU at the indicated IP Address immediately. The alarm clears in 30 seconds to one minute following this action. If more than two SLUs are configured with the same SLU ID, then the alarm is immediately raised again with another SLU IP Address. The offending configuration item occurs in one of the following files in the Distributed File System: db.IP.ina.???.pri db.IP.ind.???.pri db.IP.ussd_ipf.???.pri db.IP.wina.202.pri The offending configuration appears in the respective files as one of the following commands: SET-INA:SLU_ID=?; SET-IND:SLU_ID=?; SET-USSD:SLU_ID=?; SET-WINA:SLU_ID=?; Insure that SLU_ID is identical in all db.IP... files at the same SLU that the values assigned to SLU_ID are different for all SLUs. When all db files are repaired, bring the repaired SLUs online one by one. If the cause of the alarm is Cause 2, take the following actions: Take down the SLU at the indicated IP Address immediately. The alarm clears in 30 seconds to one minute following this action. The offending configuration item occurs in one of the following files in the Distributed File System: db.IP.ina.???.pri db.IP.ind.???.pri db.IP.ussd_ipf.???.pri db.IP.wina.202.pri The offending configuration appears in the respective files as one of the following commands: SET-INA:ENTITY_ID=?; SET-IND:ENTITY_ID=?; SET-USSD:ENTITY_ID=?; SET-WINA:ENTITY_ID=?; Insure that "ENTITY_ID" is different in all db.IP… files at the same SLU.

Table 52 SGU Alarms (Continued)

Specific Problem (Alarm ID)	Alarm	Message Text	Severity	Corrective Action/ Instructions
1883029	SGU_DTCAP_ ALLCLIENTCONGESTED	All SLUs registered for the indicated SSN and Application Context are congested.	Critical	Find out why the SLUs cannot handle the load.
1883030	SGU_LSET_UNAVAILABLE	The indicated link set is unavailable	Major	ACTIVATE-LSET:LSET=<identifier>; If the LSET does not come up, check for problems with the individual links.
1883031	SGU_LSET_CONGESTED	The indicated link set is congested	Minor	Either one or more links in the set are not up or there is a problem in link and link set allocation and configuration.
1883032	SGU_LNK_UNAVAILABLE	The indicated signaling link is unavailable.	Major	ACTIVATE-SLK:SLK=<identifier>; If the link does not come up, determine the problem with the physical circuit (including connections).
1883033	SGU_LNK_CONGESTED	The indicated signaling link set is congested.	Minor	Either one or more links in the set are not up or there is a problem in link and link set allocation and configuration.
1883034	SGU_LSSN_UNAVAILABL	The indicated local SSN is unavailable.	Major	
1883035	SGU_LSSN_CONGESTED	The indicated local SSN is congested.	Minor	This condition must never be reported at the SGU. This alarm simply mirrors the status produced by OMNI. This status should never be displayed.
1883036	SGU_RSSN_UNAVAILABLE	The indicated Remote SSN is unavailable.	Major	Determine the problem at the Remote SSN.
1883037	SGU_RSSN_CONGESTED	The indicated Remote SSN is congested.	Minor	Determine if there is a problem at the Remote SSN.
1883038	SGU_RPC_UNAVAILABLE	The indicated Remote Point Code is unavailable.	Major	Determine the problem at the Remote Point Code.
1883039	SGU_RPC_CONGESTED	The indicated Remote Point Code is congested.	Minor	Determine the problem at the Remote Point Code.
1883040	SGU_RSET_UNAVAILABLE	The indicated route set is unavailable.	Major	Determine the problem for each adjacent signaling point for each route in the set.
1883041	SGU_RSET_CONGESTED	The indicated route set is congested.	Minor	Determine if any routes in the set are not available and why.
1883042	SGU_ASET_ UNAVAILABLE	The indicated association set is unavailable.	Critical	ACTIVATE-ASET:ASET=<identifier>; If the association set does not come up, check for problems in its members.
1883043	SGU_ASSOC_ UNAVAILABLE	The indicated association is unavailable.	Critical	ACTIVATE-ASSOC:ASSOC=<identifier>; If the association does not come up, look for problems in IP Routing. Look first at the physical LAN itself.
1883044	SGU_IPNM_FOPEN_FAIL	IP cannot open the indicated file for readin.g	Info	This event is emitted immediately before restarting OMNI. It indicates a program bug or a damaged system. Check that the file specified by the -f command line argument (to ipcd) exists. Check for directory permission problems for the specified file.

Table 52 SGU Alarms (Continued)

Specific Problem (Alarm ID)	Alarm	Message Text	Severity	Corrective Action/ Instructions
1883045	RSGU_IPNM_ INVALIDFILECONTENT	IP encountered invalid data in the indicated file.	Info	Please report the occurrence of this event along with the circumstances that yielded it to system technical support.
1883046	SGU_IPNM_ SIGEMPTYSETFAIL	A call to sigemptyset() failed in IP.	Info	This is a program diagnostic only. Notify R&D.
1883047	SGU_IPNM_ SIGACTIONFAIL	A call to sigaction failed in IP for the indicated signal.	Info	This is a program diagnostic only. Notify R&D.
1883048	SGU_IP_PROCFAILED	IP has determined that the indicated process has failed.	Critical	Determine why the indicated process failed.
1883049	SGU_IP_PROCCOREDUMP	IP has determined that the indicated process has failed to catch a signal and it has cored.	Critical	Retrieve the core file and transmit it to R&D.
1883050	SGU_IP_PROCSTOPPED			
1883051	SGU_IPNM_ MOMREADFAIL	A MOM Read has failed in IPNM.	Info	Diagnostic trace only
1883052	SGU_IPNM_ MOMWRITEFAIL	A MOM Write of the indicated type and to the indicated destination has failed.	Info	Diagnostic trace only
1883053	SGU_IPNM_OPENFAIL	IPNM cannot open the file of the indicated type and name.	Info	Diagnostic trace only
1883054	SGU_IPNM_ MMLREJECTED	IPNM reports that the indicated process rejects the indicated MML Command.	Critical	Fix the configuration file.
1883055	SGU_IPNM_SHUT	The indicated node is shutting down.	Info	Info only.
1883056	SGU_IPNM_SHUT	Shutdown is complete for the indicated node.	Info	Info only.
1883057	SGU_IPNM_STARTABORT	Startup is aborted for the indicated node.	Info	Info only.
1883058	SGU_IPNM_ BACKUPSTART	Automatic backup is started for the indicated node.	Info	Info only.
1883059	SGU_IPNM_BACKUPFAIL	Automatic backup has failed for the indicated node.	Info	Info only.
1883060	SGU_IPNM_BACKUPEND	Automatic backup is complete for the indicated node.	Info	Info only.
1883061	SGU_IPNM_MMLSYNTAX	IPNM rejects the indicated MML command.	Info	Info only.

Table 52 SGU Alarms (Continued)

Specific Problem (Alarm ID)	Alarm	Message Text	Severity	Corrective Action/ Instructions
1883062	SGU_MM_INVMSG	Measurements Manager has received an invalid message of the indicated type from the indicated originator.	Info	Report to R&D.
1883063	SGU_MM_NOTFOUND	Measurements Manager does not recognize the Measurements Set specified in a CHANGE-MEASSET-PERIOD command.	Info	Info only.
1883064	SGU_CEMEAS_CPUUSAGE	The indicated process is using the indicated percentage of the indicated CPU.	Major	Restart the offending process.
1883065	SGU_XNTPMON_ SYNCHERROR	A clock synchronization error has been detected.	Info	First check whether this CE can communicate with its XNTP server by using the ping command. The IP address of the XNTP server is found in $OMNI_ HOME/xntp/ntp.conf. If the XNTP server is up and running then check the syslog in /usr/adm/syslog for any error logged by xntpd.
1883066	SGU_IPNM_ FAILUREREASON	Reports failure of the indicated MML command as per the indicated failure reason.	Info	
1883067	SGU_DTCAP_ NOCLIENTREGISTERED	No SLU Side Client is currently registered with SLU.		Determine if all SLUs in the indicated SGU Cluster are really down. If so, determine the SLU side problem and correct it. If not, check for problems on the HSBN.
1883067	SGU_DTCAP_ BADIPADDRFROMSLU	The SLU is sending bad IP Addresses in the OOB Channel.		

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