Ruckus Wireless™
SmartCell Gateway™ **200**

HLR Interface Reference Guide for
SmartZone 3.4

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About This Guide

This *SmartCell Gateway™ (SCG) 200 HLR Interface Reference Guide* describes the interface between the SCG and multiple Home Location Registers (HLRs) in terms of managing an SCG for authentication/authorization and for unsolicited authorization changes. This guide lists all the interface messages used between the SCG and the HLR.

This guide is written for service operators and system administrators who are responsible for managing, configuring, and troubleshooting Ruckus Wireless devices. Consequently, it assumes a basic working knowledge of local area networks, wireless networking, and wireless devices.

NOTE If release notes are shipped with your product and the information there differs from the information in this guide, follow the instructions in the release notes.

Most user guides and release notes are available in Adobe Acrobat Reader Portable Document Format (PDF) or HTML on the Ruckus Wireless Support Web site at https://support.ruckuswireless.com/contact-us.

Document Conventions

Table 1 and Table 2 list the text and notice conventions that are used throughout this guide.

Table 1.   Text conventions

Convention	Description	Example
`monospace`	Represents information as it appears on screen	`[Device name]>`
`monospace bold`	Represents information that you enter	`[Device name]>` **`set ipaddr 10.0.0.12`**
default font bold	Keyboard keys, software buttons, and field names	On the **Start** menu, click **All Programs**.
italics	Screen or page names	Click **Advanced Settings**. The *Advanced Settings* page appears.

Table 2.   Notice conventions

Notice Type	Description
NOTE	Information that describes important features or instructions
CAUTION!	Information that alerts you to potential loss of data or potential damage to an application, system, or device
WARNING!	Information that alerts you to potential personal injury

Terminology

Table 3 lists the terms used in this guide.

Table 3. Terms used in this guide

Term	Description
AAA	Authentication, Authorization, and Accounting
APN	Access Point Name
DPC	Destination Point Code
EPS	Evolved Packet System
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
GSN	GPRS Support Node
HLR	Home Location Register
IMSI	International Mobile Subscriber Identity
LCS	Location Services
MAP	Mobile Application Part
MSISDN	Mobile Subscriber Integrated Services Digital Network Number
MSU	Message Single Unit
MTP	Media Termination Point
MWSG	Metro Wireless Security Gateway
OPC	Originating Point Code
PDP	Packet Data Protocol
QoS	Quality of Service
SCCP	Signaling Connection Control Part
SCTP	Stream Control Transmission Protocol
SGSN	Serving GPRS Support Node
SIF	Signaling Information Field
SIO	Service Information Octet
SLS	Signaling Link Selection
SS7	Signaling System 7

Table 3.   Terms used in this guide

Term	Description
SSN	Sub System Number
STP	Signal Transfer Point
TCAP	Transaction Capabilities Application Part
TEID	Tunnel End Point Identifier
TSN	Transmission Sequence Number
UDT	Unit Data Message
UE	User Equipment
VLR	Visitor Location Register
XUDT	Extended Unit Data Message

References

Table 4 lists the specifications and standards that are referred to in this guide.

Table 4.   References used in this guide

No.	Reference	Description
1	3GPP TS 23.234	3GPP system to WLAN inter-working
2	3GPP TS 33.234	Wireless Local Area Network (WLAN) inter-working security
3	3GPP TS 29.002	3rd Generation Partnership Project: Mobile Application Part (MAP) specification
4	Q.773	Specifications of Signaling System No. 7 – Transaction capabilities application part (TCAP)
5	Q.713	Specifications of Signaling System No. 7 – Signaling connection control part (SCCP)
6	Q.704	Specifications of Signaling System No. 7 – Message transfer part
7	RFC 4960	Stream Control Transmission Protocol
8	RFC 4666	Signaling System 7 (SS7) Message Transfer Part 3 (MTP3) - User Adaptation Layer (M3UA)

Legend

Table 5 lists the legend/presence code used in this guide.

Table 5.   Legends/presence code used in this guide

Legend / Presence	Description
M	Mandatory
O	Optional
C	Conditional
U	Indicates that inclusion of the parameter is the choice of service-user

Related Documentation

For a complete list of documents that accompany this release, refer to the Release Notes.

Online Training Resources

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- Document title
- Document part number (on the cover page)
- Page number (if appropriate)

For example:

- Ruckus Wireless Administrator Guide for SmartZone 3.4
- Part number: 800-71105-001
- Page 88

MAP Messages

1

In this chapter:

- Overview
- MAP Authentication Messages
- MAP Location Update Messages

Overview

This reference guide describes the interface between SmartCell Gateway (SCG-200) and multiple Home Location Registers (HLRs) in the context of managing a wireless services gateway (the SCG) for performing authentication/authorization and for unsolicited change of authorization. This guide lists all the interface messages used between the SCG and HLR.

The SCG product has the MAP Gateway module to provide the interface to multiple HLRs. in order to perform authentication/ authorization and for unsolicited change of authorization. The MAP Gateway is responsible for initiating MAP queries with the UE's home HLR. Since the MAP Gateway may interface with multiple HLRs, the route to the home HLR is selected based on the realm information found in the attribute, *User-Name(1)* in RADIUS Access-Request messages received at the RADIUS server.

The interface between the SCG (MAP Gateway process) and the HLR uses the GSM MAP protocol ((3GPP TS 29.002 Release 6) over TCAP/SCCP over Sigtran M3UA as described in RFC 4666.

Figure 1 shows the MAP message flow between the SCG and HLR. The SCG can connect to HLR directly or through STP (Signal Transfer Point) based on the configuration settings in the user interface. It is not mandatory that the SCG connects to HLR through STP. The SCG allows for a direct connection.

Figure 1. MAP message flow between the SCG and HLR
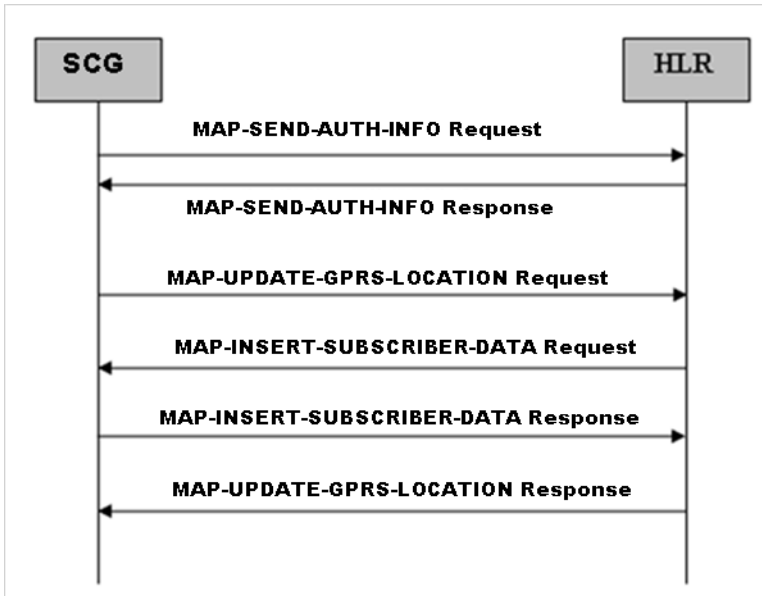
NOTE: This guide does not provide design details of either the SCG or HLR for handling interface requirements

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NOTE: Refer to About This Guide for the conventions used in this guide.

MAP Authentication Messages

This section covers the following topics:

- MAP-SEND-AUTH-INFO Request
- MAP-SEND-AUTH-INFO Response

MAP-SEND-AUTH-INFO Request

This message is sent from the SCG to HLR for retrieving the authentication information. HLR returns the authentication triplets as a response to this request. Table 6 lists the MAP message attributes.

Table 6.   MAP-SEND-AUTH-INFO request attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
IMSI	M	Maximum 15 digit value	International Mobile Subscriber Identity (IMSI) of the subscriber.
Number of Requested Vectors	C	Integer	This parameter specifies the number of minimum vectors required to perform authentication for the client, HLR may return more than requested. For EAP-SIM user, it is set to 3 and for EAP-AKA it is 1. Note: This parameter is applicable for MAP version 3. The value of this attribute will be sent only if the EAP-SIM version is set to 3 while configuring the HLR service profile in the SCG Web interface.

MAP-SEND-AUTH-INFO Response

This message is sent from HLR to the SCG as a response to MAP-SEND-AUTH-INFO request. HLR returns the authentication triplets in this response. Table 7 lists the MAP message attributes.

Table 7.   MAP-SEND-AUTH-INFO response attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
Authentication Set List	C	Octet String	This attribute is a set of 01 to 05 authentication vectors, which are transferred from HLR to SGSN, provided the outcome of the service is successful.
User Error	C	Integer	In case of unsuccessful outcome of the service, any one of the following error messages is sent by the user. Error messages are based on the following failure reasons: • Unknown subscriber • Unexpected data value • System failure • Data missing

MAP Location Update Messages

This section covers the following topics:

- MAP_UPDATE_GPRS_LOCATION Request
- MAP_UPDATE_GPRS_LOCATION Response
- MAP-INSERT-SUBSCRIBER-DATA Request
- MAP-INSERT-SUBSCRIBER-DATA Response
- MAP_CANCEL_LOCATION Request
- MAP_CANCEL_LOCATION Response
- MAP_DELETE_SUBSCRIBER_DATA Request
- MAP_DELETE_SUBSCRIBER_DATA Response

MAP_UPDATE_GPRS_LOCATION Request

This message is sent from the SCG to HLR for updating the location information stored in the HLR. Table 8 lists the MAP message attributes.

Table 8.   MAP_UPDATE_GPRS_LOCATION request attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
IMSI	M	Maximum 15 digit value	International Mobile Subscriber Identity (IMSI) of the subscriber.
SGSN Number	M	Variable	This attribute is the ISDN number of SGSN.
SGSN Address	M	Variable	This attribute is the IP address of the SCG node.

MAP_UPDATE_GPRS_LOCATION Response

This message is sent from HLR to the SCG. Table 9 lists the MAP message attributes.

Table 9.   MAP_UPDATE_GPRS_LOCATION response attributes

Attribute	Presence	Type	Description
HLR-Number	M	Integer	This parameter refers to the ISDN number of an HLR.
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. This attribute is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
User error	C	Integer	In case of unsuccessful outcome of the service, any one of the following error messages is sent by the user. Error messages are based on the following failure reasons. • Unknown subscriber • Unexpected data value • System failure • Data missing

MAP-INSERT-SUBSCRIBER-DATA Request

This message is sent from HLR to the SCG. Table 10 lists the MAP message attributes.

Table 10.   MAP-INSERT-SUBSCRIBER-DATA request attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
IMSI	M	Max 15 digit value	International Mobile Subscriber Identity (IMSI) of the subscriber.
MSISDN	C	Variable	This attribute is included either during location updates or when it is modified. The MSISDN sent is the basic MSISDN of length - 9.

Table 10.   MAP-INSERT-SUBSCRIBER-DATA request attributes (Continued)

Attribute	Presence	Type	Description
Category	O	Integer	The SCG ignores this attribute if receives it.
Subscriber Status	O	Integer	The SCG ignores this attribute if receives it.
Bearer Service List	O	Variable	The SCG ignores this attribute if receives it.
Teleservice List	O	Variable	The SCG ignores this attribute if receives it.
GPRS Subscription Data	C	Integer	This attribute contains a list of PDP-contexts that a user has subscribed.
The following PDP Context IE descriptions are a part of GPRS Subscription Data.			
PDP Context	C	Octet String	This attribute is the PDP context for the subscriber.
PDP Context ID	C	Integer	This parameter is used in identifying a PDP context for the subscriber.
PDP Address	C	Octet String (16)	This parameter indicates the address of the data protocol.
QoS Subscribed	C	Octet String (3)	This parameter indicates the quality of service subscribed for a certain service.
APN	C	Octet String	This parameter refers to the DNS name of a GGSN

MAP-INSERT-SUBSCRIBER-DATA Response

This message is sent from the SCG to HLR. Table 11 lists the MAP message attributes.

Table 11.   MAP-INSERT-SUBSCRIBER-DATA response attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.

MAP_RESTORE_DATA Request

This message is sent from the SCG to HLR for restoring the location information stored in the HLR. Table 12 lists the MAP message attributes.

Table 12.   MAP_RESTORE_DATA request attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
IMSI	M	Maximum 15 digit value	International Mobile Subscriber Identity (IMSI) of the subscriber.

MAP_RESTORE_DATA Response

This message is sent from HLR to the SCG as response to restore data request. Table 13 lists the MAP message attributes.

Table 13.   MAP_RESTORE_DATA response attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
HLR Number	M	Variable	This attribute refers to the ISDN number of the HLR. The attribute is mandatory provided the HLR has been successfully updated.

MAP_CANCEL_LOCATION Request

This message is sent from HLR to SCG to cancel a subscriber record/session from SCG. Table 14 lists the MAP message attributes.

Table 14.   MAP_CANCEL_LOCATIION request attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
IMSI	M	Maximum 15 digit value	International Mobile Subscriber Identity (IMSI) of the subscriber.
Cancellation-Type	M	Variable	This attribute indicates the reason for location cancellation. The user data session will not be deleted if the SCG receives this attribute as an initial attach. The user data session will be deleted if the SCG receives this attribute as *subscription Withdraw(1)* or *updateProcedure(0)*. This attribute is mandatory for the SCG to process the cancellation procedure.

MAP_CANCEL_LOCATION Response

This message is sent from the SCG to HLR, a response for MAP cancel location from HLR. Table 15 lists the MAP message attributes.

Table 15.   MAP_CANCEL_LOCATION response attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
User error	C	Integer	This attribute is triggered in case of failure to cancel the subscriber from HLR. The following error messages are displayed: • Unidentified subscriber • Data missing

MAP_DELETE_SUBSCRIBER_DATA Request

This message is sent from HLR to the SCG to delete/terminate a subscriber record/ session from SCG. Table 16 lists the MAP message attributes.

Table 16. MAP_DELETE_SUBSCRIBER_DATA request attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
IMSI	M	Maximum 15 digit value	International Mobile Subscriber Identity (IMSI) of the subscriber.
GPRS Subscription Data Withdraw	C	Octet String	This attribute is mandatory for the SCG to delete the subscriber data. It receive two options: • AllGPRSData - The SCG deletes the subscriber session • ContextIDList - The SCG deletes the subscriber session only if the context ID matches

MAP_DELETE_SUBSCRIBER_DATA Response

This message is sent from the SCG to HLR, response for MAP delete from HLR. Table 17 lists the MAP message attributes.

Table 17. MAP_DELETE_SUBSCRIBER_DATA response attributes

Attribute	Presence	Type	Description
Invoke ID	M	Integer	This attribute identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and is unique for each service-user/ service-provider interface.
User error	C	Integer	This attribute is triggered in case of failure to delete the subscriber from HLR. The error message is displayed, when the IMSI subscriber is not found is, *Unidentified subscriber.*

TCAP, SCCP, and MTP3 Messages

2

In this chapter:

- TCAP Messages
- SCCP Message
- MTP3 Message

TCAP Messages

Each information element within a TCAP message consists of three fields, which always appear in the order - tag, length and value.

- Tag distinguishes one type from another and governs the interpretation of the contents.

- Length specifies the length of the contents.

- Contents are the substance of the element, containing the primary information the element is intended to convey. The contents of each element are either one value (primitive) or one or more information elements (constructor), as seen in Figure 2 below.

Figure 2. TCAP messages
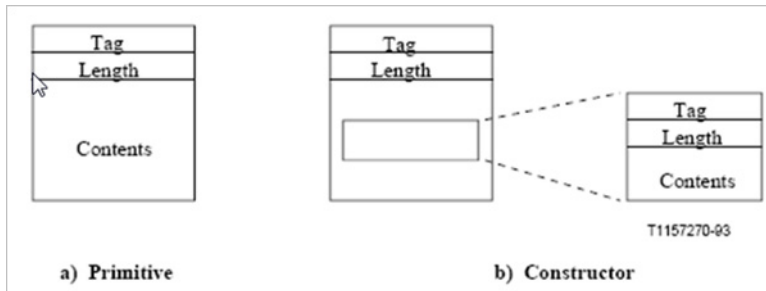
This section covers the following topics:

- MAP-SEND-AUTH-INFO Request/MAP_UPDATE_GPRS_LOCATION Request
- MAP-SEND-AUTH-INFO Response/MAP_UPDATE_GPRS_LOCATION Response
- MAP-INSERT-SUBSCRIBER-DATA Request/Response
- RESTORE DATA Request/Response

MAP-SEND-AUTH-INFO Request/ MAP_UPDATE_GPRS_LOCATION Request

This message is sent from the SCG to HLR. Table 18 lists the TCAP message attributes.

Table 18. MAP-SEND-AUTH-INFO request/MAP_UPDATE_GPRS_LOCATION request attributes

Attributes	Presence	Type	Description
TR Begin	M	Variable	The beginning of a transaction between two TR-users creates a *Transaction ID* to be allocated to this transaction, and permits sending TR-user information to the destination TR-user. In response to transaction begin, the destination TR-user can continue or terminated the transaction.
Transaction ID	M	Variable	A transaction is identified by a separate *Transaction ID* at the end of each transaction. Each TR-user identifies a transaction by a separate *Transaction ID*.
Dialogue Request	M	Variable	The Dialogue Request (AARQ) APDU is used by the initiating TC-user at the start of a transaction to convey the application context name. As an option, it could also convey the user information (i.e. data, which are not components) to the peer TC-user.
Protocol Version	M	Variable	The protocol version information element indicates the versions of the dialogue attribute that it supports.
Application Context Name	M	Variable	The application context is the identifier of the application context, which is proposed by the dialogue initiator or by the dialogue responder
User Information	M	Variable	This attribute is the information, which is exchanged between TCAP users independently from a remote operation service.
Component Portion	M	Variable	This attribute contains components.
Component Type	M	Variable	This attribute is included by the SCG as invoke ID.
Invoke ID	M	Integer	This attribute identifies an operation invocation and its result.

Table 18.   MAP-SEND-AUTH-INFO request/MAP_UPDATE_GPRS_LOCATION request attributes (Continued)

Attributes	Presence	Type	Description
Operation Code	M	Variable	This attribute indicates the local operation code such as 56 for *SendAuthenticationInfo* and 23 for *UpdateGPRSLocation.*
Parameter	M	Variable	This attribute indicates the sequence tag. This can either be a primitive/constructor and can contain multiple parameters.

MAP-SEND-AUTH-INFO Response/ MAP_UPDATE_GPRS_LOCATION Response

This message is sent from HLR to the SCG. Table 19 lists the TCAP message attributes.

Table 19.   MAP-SEND-AUTH-INFO response/MAP_UPDATE_GPRS_LOCATION response attributes

Attribute	Presence	Type	Description
TR End	M	Variable	Releases the associated *Transaction ID*, and terminates the exchange of messages within the transaction. Either of the TR-users can decide to terminate the transaction. There are three methods for a TR-user to terminate the transaction.
Transaction ID	M	Variable	A transaction is identified by a separate *Transaction ID* at the end of each transaction. Each TR-user identifies a transaction by a separate *Transaction ID*.
Dialogue Response	O	Variable	This attribute is optional if the SCG receives and checks for its contents.
Protocol Version	O	Variable	This attribute is a sub-attribute of the dialogue response. The SCG ignores the contents of this attribute.
Application Context Name	M	Variable	This attribute is a sub-attribute of the dialogue response. The SCG checks the application context received in the response message.

Table 19. MAP-SEND-AUTH-INFO response/MAP_UPDATE_GPRS_LOCATION response attributes (Continued)

Attribute	Presence	Type	Description
User Information	O	Variable	This attribute is a sub-attribute of the dialogue response. The SCG ignores the contents of this attribute.
Component Type	O/M	6C	This attribute is a sub-attribute of the dialogue response. This will contain type as *Return Result (Last).*
Invoke ID	M	Integer	This attribute identifies an operation invocation and its result.
Operation Code	M	Variable	This attribute indicates the local operation code such as 56 for *SendAuthenticationInfo* and 23 for *UpdateGPRSLocation.*
Parameter	O	Variable	The SCG ignores this attribute.

MAP-INSERT-SUBSCRIBER-DATA Request/Response

The request message is sent from HLR to the SCG and the response messages are sent from SCG to HLR. Table 20 lists the TCAP message attributes.

Table 20. MAP-INSERT-SUBSCRIBER-DATA request/response attributes

Attribute	Presence	Type	Description
TR Continue	M	Variable	This attribute indicates the continuation of the transaction. TC-user indicates if he wants to continue an established dialogue.
Transaction ID	M	Variable	A transaction is identified by a separate *Transaction ID* at the end of each transaction. Each TR-user identifies a transaction by a separate *Transaction ID*.
Dialogue Request/ Response	O	Variable	The Dialogue Request (AARQ) APDU is used by the initiating TC-user at the start of a transaction to convey the application context name. As an option, it could also convey the user information (i.e. data, which are not components) to the peer TC-user. The Dialogue Response (AARE) APDU is used by the responding TC-user in the first backward message informing the originating TC-user on the acceptance or the rejection of the dialogue.

Table 20.   MAP-INSERT-SUBSCRIBER-DATA request/response attributes (Continued)

Attribute	Presence	Type	Description
Protocol Version	O	Variable	The protocol version information element indicates the versions of the dialogue attribute that is supported.
Application Context Name	M	Variable	The application context is the identifier of the application context, proposed by the dialogue initiator or by the dialogue responder.
User Information	O	Variable	This attribute is the information, which is exchanged between TCAP users independently from a remote operation service.
Component Portion	O/M	Variable	This attribute contains components.
Invoke ID	M	Integer	This attribute identifies an operation invocation and its result.
Operation Code	M	Variable	This attribute indicates the local operation code of the insert subscriber data.
Parameter	O	Variable	This attribute indicates the sequence tag. This can either be primitive/constructor and can contain multiple parameters.

RESTORE DATA Request/Response

The restore data request message is sent from the SCG to HLR and the response messages is sent from the HLR to the SCG. Table 21 lists the TCAP message attributes.

Table 21.   RESTORE-DATA request/response attributes

Attribute	Presence	Type	Description
TR Begin	M	Variable	This attribute indicates the beginning of the transaction. TC-user indicates if he wants to begin an established dialogue.
Transaction ID	M	Variable	A transaction is identified by a separate *Transaction ID* at the end of each transaction. Each TR-user identifies a transaction by a separate *Transaction ID*.

Table 21.   RESTORE-DATA request/response attributes (Continued)

Attribute	Presence	Type	Description
Dialogue Request/ Response	O	Variable	Attribute is optional. Mandatory if the attribute is present. This attribute should not be present in *RestoreData* response message (second continue) but should be present in the *RestoreData* request message.
Protocol Version	O	Variable	This attribute is mandatory if protocol version is configured in the user interface. The default Hex value 80 is used for protocol version 1.
Application Context Name	M	Variable	The application context is the identifier of the application context, proposed by the dialogue initiator or by the dialogue responder
User Information	O	Variable	This attribute is the information, which is exchanged between TCAP users independently from a remote operation service.
Component Portion	O	Variable	This attribute is optional and becomes mandatory if the attribute is configured in the user interface.
Component Type	M	Variable	This attribute identifies an operation invocation and its result.
Invoke ID	M	Integer	This attribute identifies an operation invocation and its result.
Linked ID	O	Integer	This attribute is used for linked services and it takes the *Invoke ID* value of the service it is linked to.
Operation Code	M	Variable	This attribute indicates the local operation code and restore data.
Parameter	O	Variable	This attribute indicates the sequence tag. This can either be primitive/constructor and can contain multiple parameters.

SCCP Message

This section covers the following topics:

- Address Indicator
- Global Title Encoding
- SCCP UDT Message
- SCCP XUDT Message

Address Indicator

The "address indicator" indicates the type of address information as seen in Figure 3. It could consist of one or a combination of the following elements.

- Signaling point code
- Global title (example, dialed digits)
- Subsystem number

Figure 3. Address indicator

Global Title Encoding

Table 22 lists the encoding for global title.

Table 22.   Global title indicator

Encoding	Description
0 0 1 0	Global title includes only the translation type.
0 1 0 0	Global title includes translation type, numbering plan, encoding scheme and the address indicator.

SCCP UDT Message

The SCCP message structure (UDT) applies to all MAP messages with length <=255 octets. Table 23 lists the attributes for SCCP UDT messages.

Table 23.   SCCP UDT message attributes

Attribute	Presence	Type	Description
Message Type Code	M	Variable	This attribute uniquely defines the function and format of each SCCP message. 09 indicates the message type as UnitData (UDT)
Called Party Address Indicator	M	Variable	This attribute can have a total >=3 octets. It indicates the address type information contained in the address field. Refer to Address Indicator.
Address – Point Code/SSN/GT	M	Variable	The address could contain the following in the same order, when it is also present in the *address indicator* attribute: • Point code • Subsystem number • Global title
Global Title Indicator – Translation Type	M	Variable	Based on the *Address Indicator* attribute, Global Title Indicator (GTI) parameters such as Nature of Address, Translation Type, Numbering Plan and Encoding scheme parameters are included. Since GTI value is 0010, only translation type is shown in the example.
Calling Party Address Indicator	M	Variable	This attribute can have a total >=3 octets. It indicates the address type information contained in the address field. Refer to Address Indicator.
Address – Point Code	M	Variable	Point Code of the calling party. This parameter becomes mandatory only if it is present in GTI.
Address – SSN	M	Variable	Sub System Number (SSN) where: • 5 indicates Mobile Application Part • 6 indicates HLR This attribute becomes mandatory only if it is present in GTI.

Table 23.   SCCP UDT message attributes (Continued)

Attribute	Presence	Type	Description
Data	M	Variable	This attribute has a variable length field containing <= 255 octets of SCCP-user data to be transferred transparently between the SCCP user functions.

SCCP XUDT Message

The SCCP message structure (XUDT) applies to any MAP message that exceeds 255 octets. Table 24 lists the attributes for SCCP XUDT messages.

Table 24.   SCCP XUDT message structure

Attribute	Presence	Type	Description
Message Type Code	M	Variable	This attribute uniquely defines the function and format of each SCCP message. 11 indicates the message type as Extended UnitData (XUDT)
Hop Counter	M	Integer	This attribute is the value of the hop counter, which is decremented on each global title translation. It should be in the range 15 to 1.
Called Party Address Indicator	M	Variable	This attribute can have a total >=3 octets. It indicates the address type information contained in the address field. Refer to Address Indicator.
Address – Point Code/SSN/GT	M	Variable	Address may contain the following in the same order, when it is also present in the *address indicator* attribute. • Point code • Subsystem number • Global title
Global Title Indicator – Translation Type	M	Variable	Based on the *Address Indicator* attribute, Global Title Indicator (GTI) parameters such as Nature of Address, Translation Type, Numbering Plan and Encoding scheme parameters are included. Since GTI value is 0010, only translation type is shown in the example.
Calling Party Address Indicator	M	0B	This attribute can have a total >=3 octets. It indicates the address type information contained in the address field. Refer to Address Indicator.

Table 24.   SCCP XUDT message structure (Continued)

Attribute	Presence	Type	Description
Address – Point Code	M	Variable	Point Code of the calling party. This attribute becomes mandatory only if it is present in GTI.
Address – SSN	M	Variable	Sub System Number (SSN) where: • 5 indicates Mobile Application Part • 6 indicates HLR This attribute becomes mandatory only if it is present in GTI.
Data	M	Variable	This attribute is a variable length field containing <= 255 octets of SCCP-user data to be transferred transparently between the SCCP user functions.
Segmentation	O	Variable	This attribute is not present in case of a single XUDT message
Importance	O	Variable	This attribute Indicate the importance of the messages.
End of Optional Parameter	O	Octet	This attribute consists of a single octet containing all zeros.

MTP3 Message

This section covers the Message Signal Unit (MSU).

Message Signal Unit (MSU)

Message Signal Unit (MSU) in SS7 carries signaling information (actual messages). All messages are placed in SIF of MSU as seen in Figure 4.

Figure 4. Message Signal Unit
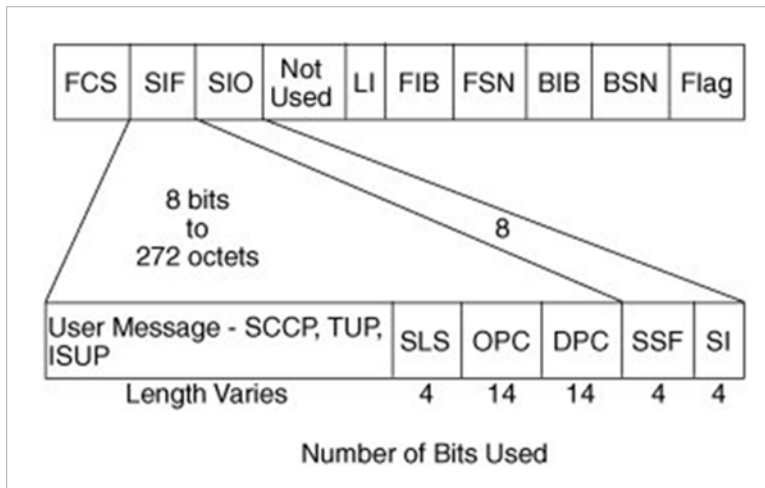
MTP3 message structure applies to all MAP messages that are using the SS7 interface. Table 25 lists the attributes for MTP3.

Table 25. MTP3 message structure

Attribute	Presence	Type	Description
Service Information Octet (SIO)	M	Variable	The SIO identifies the protocol type present in the MSU. It also identifies the version of the SS7 protocol. The SIO is a 8-bit (1-octet) value that is split into two parts, namely: • 4-bit sub service field • 4-bit service indicator field
Routing Label	M	Variable	Routing label consists of DPC, OPC and SLS
User Message	M	Variable	This attribute contains signaling data (for SCCP, TCAP and MAP).

SCTP and M3UA Messages

3

In this chapter:

- SCTP Message
- M3UA Message

SCTP Message

This is applies to all messages in the Sigtran interface as seen in Table 26. This section also covers:

- SCTP Heartbeat Messages

Table 26.   SCTP message structure

Attribute	Presence	Type	Description
Source Port	M	Variable	This is the SCTP sender's port number. It can be used by the receiver in combination with the source IP address, the SCTP destination port, and possibly the destination IP address to identify the association to which this packet belongs. *Note: Port number 0 should not be used.*
Destination Port	M	Variable	This is the SCTP port number to which this packet is destined. The receiving host will use this port number to de-multiplex the SCTP packet to the correct receiving endpoint/application. *Note: The port number 0 should not be used.*
Verification Tag	M	Variable	The receiver of this packet uses this attribute to validate the sender of the SCTP packet.
Checksum	M	Variable	This attribute contains the checksum of the SCTP packet.
Chunk Type	M	0 to 254	This attribute identifies the type of information contained in the chunk value.
Chunk Flag	M	Variable	The usage depends on the Chunk type. Unless otherwise specified, they are set to 0 on transmit and are ignored on receipt. • The (U)nordered bit, if set to '1', indicates that this is an unordered DATA chunk • The (B)eginning fragment bit, if set, indicates the first fragment of a user message • The (E)nding fragment bit, if set, indicates the last fragment of a user message

Table 26.   SCTP message structure

Attribute	Presence	Type	Description
Chunk Length	M	Variable	This value represents the size of the chunk in bytes, including: • Chunk type • Chunk flags • Chunk length • Chunk value
Length	M	Variable	This field indicates the length of the DATA chunk in bytes from the beginning of the type field to the end of the User Data field excluding any padding. A DATA chunk with one byte of user data will have the length set to 17 (indicating 17 bytes).
TSN (Transmission Sequence Number)	M	0 to 4294967295	This value represents the TSN for this DATA chunk.
Stream ID	M	Variable	This attribute identifies the stream to which the user data belongs.
Stream Sequence Number	M	0 to 65535	This attribute value represents the stream sequence number of the user data within the stream.
Payload Protocol ID	M	3	This value represents an application (or upper layer) specified protocol identifier. This value is passed to SCTP by its upper layer and sent to its peer. This identifier is not used by SCTP but can be used by certain network entities, as well as by the peer application, to identify the type of information carried in this DATA chunk. 3 indicates M3UA.
User Data	M	Variable	This attribute is the payload user data.

SCTP Heartbeat Messages

This section covers the following topics:

- Heartbeat Request Message (HEARTBEAT)
- Heartbeat Acknowledgment Message (HEARTBEAT ACK)

Heartbeat Request Message (HEARTBEAT)

An endpoint sends this chunk to its peer endpoint to probe the reachability of a particular destination transport address that is defined in the present association. Heartbeat message format is as shown in Table 27.

Table 27.   Heartbeat Request Message (HEARTBEAT) attributes

Attribute	Presence	Type	Description
Source Port	M	Variable	This is the SCTP sender's port number. It can be used by the receiver in combination with the source IP address, the SCTP destination port, and possibly the destination IP address to identify the association to which this packet belongs. Note: Port number 0 should not be used.
Destination Port	M	Variable	This is the SCTP port number to which this packet is destined. The receiving host will use this port number to de-multiplex the SCTP packet to the correct receiving endpoint/application. Note: Port number 0 should not be used.
Verification Tag	M	Variable	The receiver of this packet uses this attribute to validate the sender of this SCTP packet.
Checksum	M	Variable	This attribute contains the checksum of this SCTP packet.
Chunk Type	M	Variable	This attribute identifies the type of information contained in the chunk value field. Type 4 is for Heartbeat message.
Chunk Flag	M	0	This attribute is set to 0 on transmit and ignored on receipt.
Heartbeat Length	M	Variable	This attribute is set to the size of the chunk in bytes, including the chunk header and the *Heartbeat Information* attribute.

Table 27.   Heartbeat Request Message (HEARTBEAT) attributes (Continued)

Attribute	Presence	Type	Description
Heartbeat Information	M	Variable	The Sender-Specific Heartbeat Info field should normally include information about the sender's current time when this HEARTBEAT chunk is sent and the destination transport address to which this HEARTBEAT is sent.

Heartbeat Acknowledgment Message (HEARTBEAT ACK)

An endpoint sends this chunk to its peer endpoint as a response to a HEARTBEAT chunk. Heartbeat Acknowledge message format is as shown in Table 28.

Table 28.   Heartbeat Acknowledgment Message (HEARTBEAT ACK) attributes

Attribute	Presence	Type	Description
Source Port	M	Variable	This is the SCTP sender's port number. It can be used by the receiver in combination with the source IP address, the SCTP destination port, and possibly the destination IP address to identify the association to which this packet belongs. Note: Port number 0 should not be used.
Destination Port	M	Variable	This is the SCTP port number to which this packet is destined. The receiving host will use this port number to de-multiplex the SCTP packet to the correct receiving endpoint/application. Note: Port number 0 should not be used.
Verification Tag	M	Variable	The receiver of this packet uses this attribute to validate the sender of this SCTP packet.
Checksum	M	Variable	This field contains the checksum of this SCTP packet.
Chunk Type	M	Variable	This field identifies the type of information contained in the chunk value field. Type 5 is for heartbeat acknowledgment message.
Chunk Flag	M	0	This attribute is set to 0 on transmit and ignored on receipt.

Table 28.   Heartbeat Acknowledgment Message (HEARTBEAT ACK) attributes (Continued)

Attribute	Presence	Type	Description
Heartbeat Ack Length	M	Variable	This attribute is set to the size of the chunk in bytes, including the chunk header and the heartbeat Information field.
Heartbeat Information	M	Variable	This field must contain the Heartbeat Request to which this Heartbeat acknowledgment responds.

M3UA Message

This is applies to all messages in Sigtran interface. Table 29 lists the attributes for M3UA messages. This section also covers:

- M3UA Heartbeat Message

Table 29.   M3UA Message structure

Attribute	Presence	Type	Description
Version	M	Variable	This attribute contains the version of the M3UA adaptation layer
Reserved	M	Variable	This attribute should be set to '0's and ignored by the receiver.
Message Class	M	Variable	This attribute defines the message type class. 1 indicates *Transfer Message*.
Message Length	M	Variable	This attribute defines the length of the message in octets, including the common header. The message length must include parameter padding octets, if any.
Network Appearance	O	Variable	This attribute identifies the SS7 network context for the message and implicitly identifies the: • SS7 Point Code form used • SS7 Network Indicator value • MTP3 • MTP3-User protocol type/variant/version used within the specific SS7 network
Routing Context	O	Variable	This attribute contains the routing context value associated with the DATA message.

Table 29.   M3UA Message structure (Continued)

Attribute	Presence	Type	Description
Protocol Data	M	Variable	This attribute contains the original SS7 MTP3 message, including the Service Information Octet and Routing Label. OPC is from the routing label of the original SS7 message.
DPC	M	Variable	DPC is OPC from the routing label of the original SS7 message.
Service Indicator	M	Variable	Service Indicator contains the SI field from the original SS7 message justified to the least significant bit. Unused bits are coded as `0'. 3, which indicates SCCP.
Network Indicator	M	Variable	Network Indicator contains the NI field from the original SS7 message justified to the least significant bit. Unused bits are coded `0.
Message Priority	M	0	Message Priority contains the MP bits (if any) from the original SS7 message.
Signaling Link Selection	M	Variable	Signaling Link Selection contains the SLS bits from the routing label of the original SS7 message.
User Protocol Data	M	Variable	User Protocol Data contains an octet string of MTP-User information from the original SS7 message.
Correlation ID	O	Variable	

M3UA Heartbeat Message

The BEAT message is optionally used to ensure that the M3UA peers are still available to each other. The BEAT Ack message is sent in response to a received BEAT message. It includes all the parameters of the received BEAT message, without any change. Table 30 lists the BEAT attributes.

Table 30.   M3UA Heartbeat Message structure

Attribute	Presence	Type	Description
Version	M	Variable	This attribute contains the version of the M3UA adaptation layer.
Reserved	M	0	This attribute should be set to '0's and ignored by the receiver.
Message Class	M	Variable	Defines the message type class. 1 indicates transfer message.
Message Length	M	Variable	This attribute defines the length of the message in octets, including the common header. The message length must include parameter padding octets, if any.
Tag	M	Variable	This attribute is for BEAT message.
Heartbeat Data	M	Variable	This attribute contents are defined by the sending node.

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