ATIS-0700003

UTDOA LBIS INTERFACE: REMOTE PDE PROTOCOL (RPP) METHOD

TECHNICAL REPORT

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ATIS-0700003, *UTDOA Lbis Interface: Remote PDE Protocol (RPP) Method*

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ATIS-0700003

Technical Report on

UTDOA LBIS INTERFACE: REMOTE PDE PROTOCOL (RPP) METHOD

Secretariat

Alliance for Telecommunications Industry Solutions

Approved August, 2004

Abstract

UTDOA (Uplink Time Difference of Arrival) is one of the location technologies supported by 3GPP GSM standards. The Lbis interface and Remote PDE Protocol (RPP) enable upgrading earlier proprietary implementations of UTDOA to a 3GPP standards-based solution in a manner that minimizes impacts to the network infrastructure. This document is the second of a three-part set that together describe the Lbis interface in detail. This document is a Stage 3 description of Lbis RPP (Remote PDE Protocol) signaling between the SMLC (Serving Mobile Location Center) and the PDE (Positioning Determination Entity). The other two documents cover, separately, the functional architecture and the Stage 3 OAM protocol description.

FOREWORD

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The Wireless Technologies and Systems Committee (WTSC) – formerly T1P1 -- develops and recommends standards and technical reports related to wireless and/or mobile services and systems, including service descriptions and wireless technologies. WTSC develops and recommends positions on related subjects under consideration in other North American, regional and international standards bodies.

This document is entitled *UTDOA Lbis Interface: Remote PDE Protocol (RPP)*.

The method described in this report is intended for use in conjunction with standard 3GPP TS.22.071: *Location Services (LCS)-Stage 1*, 3GPP TS 23.271: *Technical Specification Group Services and System Aspects*; *Functional stage 2 description of LCS*, and 3GPP TS.48.071: *Serving Mobile Location Centre – Base Station System (SMLC-BSS) interface*.

Footnotes are not officially part of this technical report.

Future control of this document will reside with ATIS. This control of additions to the specification, such as protocol evolution, new applications, and operational requirements, will permit compatibility among U.S. networks. Such additions will be incorporated in an orderly manner with due consideration to the ITU-T layered model principles, conventions, and functional boundaries.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, WTSC Secretariat, 1200 G Street NW, Suite 500, Washington, DC 20005.

Committee WTSC chartered the UTDOA Ad Hoc Committee to provide technical assistance in reviewing this report.

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INTRODUCTION/EXECUTIVE SUMMARY

The Lbis interface and Remote PDE Protocol (RPP) have been developed as an addition to 3GPP specifications to enable upgrading earlier proprietary implementations of UTDOA to a 3GPP standards-based solution in a manner that minimizes impacts to the network infrastructure...

This document is a Stage 3 description of Lbis RPP (Remote PDE Protocol) signaling between the SMLC (serving mobile location center) and the PDE (Positioning Determination Entity). A Stage 2 description is contained in the companion ATIS-0700003 "GSM UTDOA Lbis Interface: Architecture and Functional Description" document published separately.

1 SCOPE, PURPOSE, AND APPLICATION

1.1 Scope

This document defines the protocol requirements for the Lbis interface that supports the UTDOA positioning method for emergency calls. Because the Lbis interface is primarily an extension of the Lb interface to a remote PDE, the relevant Lb interface is also reviewed in detail. The node procedure associated with the transmission and reception of UTDOA messages is also defined in this document. This document shall be used in conjunction with the UTDOA Architecture and Functional Description document.

1.2 Purpose

This document provides details of the Lbis interface and the RPP protocol sufficient to permit implementation of the protocol in a GSM system. The document is a Technical Report, and not a Technical Specification, because details of the PDE implementation are not typically addressed as part of the 3GPP specifications. Note that the information specific to the Lb interface is informative only, since the Lb interface parameters needed for UTDOA are now incorporated in 3GPP TS 48.071 v6.3.0.

1.3 Application

The application of this open interface is typically to North American GSM networks using UTDOA in support of E911 Phase 2 emergency services.

2 NORMATIVE REFERENCES

This technical report is not a standard, and contains no normative references of its own. All standards referred to in the report are subject to revision, and the parties to agreements based on this report are encouraged to investigate the possibility of applying the most recent edition of the standards and reports indicated below.

ATIS-0700002 August 2004, *UTDOA Lbis Interface: Architecture and Functional Description.*[1]

IETF RFC793, *Transmission Control Protocol.*[2]

3GPP TS 49.031v6.2.0 or latest: *Base Station System Application Part; LCS Extension (BSS-LE).* [1]

3GPP TS 48.071 v.6.4.0 or latest: *Serving Mobile Location Center - Base Station System (SMLC-BSS) interface; Layer 3 specification.* [1]

3GPP TS 43.059 v6.2.0 or latest: *Functional stage 2 description of Location Services (LCS in GERAN).* [1]

3GPP TS.22.071: *Location Services (LCS)-Stage 1.* [1]

3GPP TS.23.271: *Technical Specification Group Services and System Aspects; Functional stage 2 description of LCS.* [1]

3. Definitions

There are no new definitions being introduced as part of this report.

4. Abbreviations, Acronyms, and Symbols

This clause provides project-specific terms and acronyms used in this document.

Table 1: Abbreviations and Acronyms

3GPP	Third Generation Partnership Project
AMR	Adaptive Multi-Rate
BSC	Base Station Controller
BSSLAP	BSS LCS Assistance Protocol
BSSMAP-LE	BSS Management Application Part LCS Extension
CR	Change Request
IE	Information Element
IEI	Information Element Identifier
IP	Internet Protocol
Lb	Interface between SMLC and BSC
Lbis	Interface between SMLC and PDE
LCS	Location Services
MS	Mobile Station
PCF	Position Calculation Function (The set of software, data, and algorithms that calculate the MS location.)
PDE	Position Determination Entity (The set of nodes, application software, and links that support location data collection and the PCF.)

[1] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS), 1200 G Street N.W., Suite 500, Washington, DC 20005. < https://www.atis.org/docstore/default.aspx >

[2] This document is available from the Internet Engineering Task Force (IETF). < http://www.ietf.org >

QoS	Quality of Service
RP	Remote PDE -- the low level data connection (physical and link) between an SMLC and a controller in the PDE.
RPP	Remote PDE Protocol -- the high level data protocol (TCP/IP) between an SMLC and a controller in the PDE.
SCCP	Signaling Connection Control Part
SMLC	Serving Mobile Location Center
T	(IE format) Type
TCP	Transmission Control Protocol
TLV	(IE format) Type, Length, and Value
TS	Technical Specification
TV	(IE format) Type and Value
UTDOA	Uplink Time Difference Of Arrival
V	(IE format) Value only

5. NODE PROCEDURE

The general call flows, messages, and procedures for the BSC to support the UTDOA positioning procedure are described in ATIS-0700002.

Because of the introduction of the new Lbis interface, the requirements of that interface on the SMLC and the PDE are described in the following subsections.

5.1 SMLC/PDE Functionality with Lbis Interface Supports

In the definition of the SMLC under 3GPP TS 43.059 v6.2.0, the implicit architecture has the SMLC performing two different functions.

1. The SMLC supports RAN-oriented, LCS administrative functions (e.g. process and responds to position requests from the Core and Radio Access Networks through the Lb interface).
2. The SMLC supports PDE-oriented functions such as the PCF for certain positioning methods (e.g. returns the XY position – Lat/Long—for an MS using Cell ID+Timing Advance).

For some positioning technologies, such as UTDOA, the SMLC may not support the second function – the PCF. For such technologies it may be necessary to employ a technology-specific PDE controller. The Lbis interface supports this Remote PDE through an interface between the SMLC and the PDE controller. Specified here for the UTDOA positioning technology, this interface could be applied to other remote PDEs and to other positioning methods.

5.1.1 Physical Connection and Communication Protocol

In the link described here, the Lbis interface employs TCP/IP protocol RFC793. Ethernet (IEEE 802.3) connectivity may be used.

The Remote PDE Protocol (RPP) is defined as the communication protocol between the SMLC and the Remote PDE. RPP message content ciphering is not required. The connection between an SMLC and a

Remote PDE is called an RP link. It is assumed that RP links are supported on a dedicated, private IP network suitable for production telecommunications traffic. A typical implementation is shown in Table 2, below.

Table 2: Network Layers Supporting an RP Link

Layer	Supported by…
Application Layer	Remote PDE Protocol
Message Handler	Sockets API
Network and Transport Layers	TCP/IP
Interface Layers	IEEE 802.3 (Ethernet)

5.1.2 TCP Connection and Application Link Establishment on the Lbis

The TCP connection is initiated by the SMLC (client) to the PDE (UTDOA server). To start the TCP connection, the SMLC uses the PDE's IP address and a specific TCP port (default port is 9533, but it can be configured by the PDE to another port number).

The PDE shall have a list of the client's IP addresses that are authorized for connection. This will enable a refusal of a TCP connection request from an unknown source.

When a TCP session is established, an application level handshake is required to help authenticate the nodes and to ensure that both ends are communicating with the correct application. A successful handshake creates the RP link in which the UTDOA transaction on the Lbis Interface can be allowed (see Figure 1).

Each TCP session supports one RP link. An SMLC may establish multiple TCP sessions to create multiple RP links. Thus an SMLC may support multiple PDEs. Each RP link is created by successful application level handshaking.

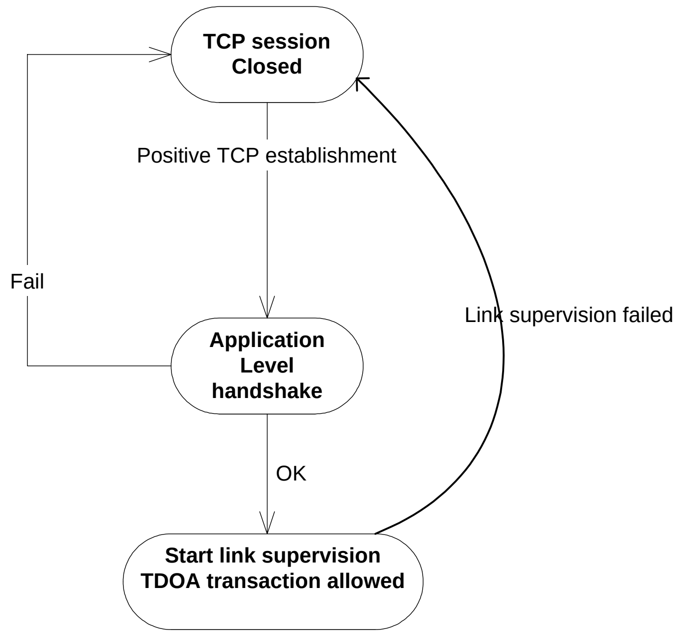

Figure 1: Lbis Application Link Setup State Diagram

5.1.3 Application Level Handshake

The SMLC is required to send an APPLICATION_CONTEXT message after the TCP session is established. This message contains the application ID and a version number. The responses to this message by the PDE are Allow, Not-Allow, or NotSupported (as shown in Figure 2). The response Allow is defined as a successful application-level handshake in which a UTDOA transaction can proceed. The responses Not-Allow and NotSupported indicate the handshake has failed. If the application-level handshake has failed, the SMLC will not resend the APPLICATION_CONTEXT message until a configurable timer (i.e., handshake reestablishment timer) expires. This timer has a default of 60 seconds. Other handling of failed handshaking by the SMLC is vendor-specific.

No specific action is required regarding PDE handling of a failed handshake. It is recommended, however, that the PDE implementation of the RPP also support a time-out period of at least 50 seconds to reduce the likelihood of a successful attack by a “spoofer” using an SMLC IP address. This lockout period would start if the SMLC fails to initiate the APPLICATION CONTEXT message within a short period of time after a TCP session is established.

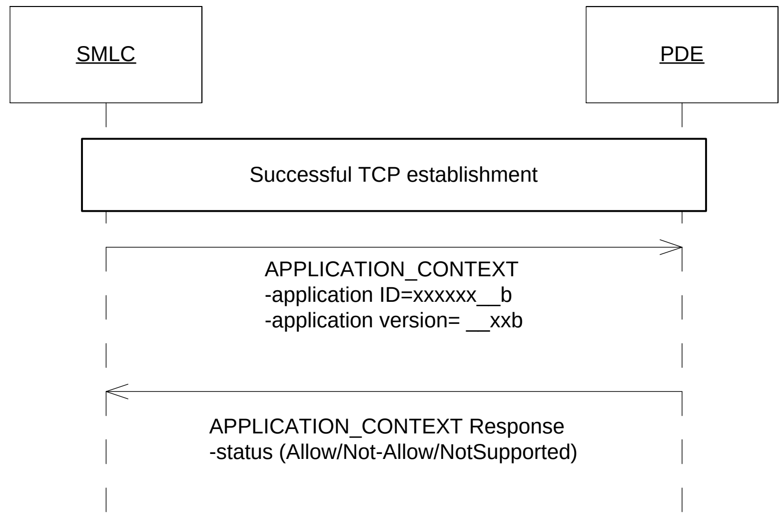

Figure 2: Application Level Message

5.1.4 RP Link Supervision Procedure

The RP link supervision procedure applies to each RP link established between an SMLC and a PDE.

5.1.4.1 SMLC Procedure

If an RP link on the SMLC has not received any application-level messages (i.e., a ping does not matter) from the PDE after a certain period of time, the SMLC will then send a CHECK ALIVE signal on that RP link to check the availability of the UTDOA application in the PDE (see Figure 3 and 4). This supervision timer (i.e., the SMLC-RP link check timer) shall be configurable with a maximum of at least 30 minutes.

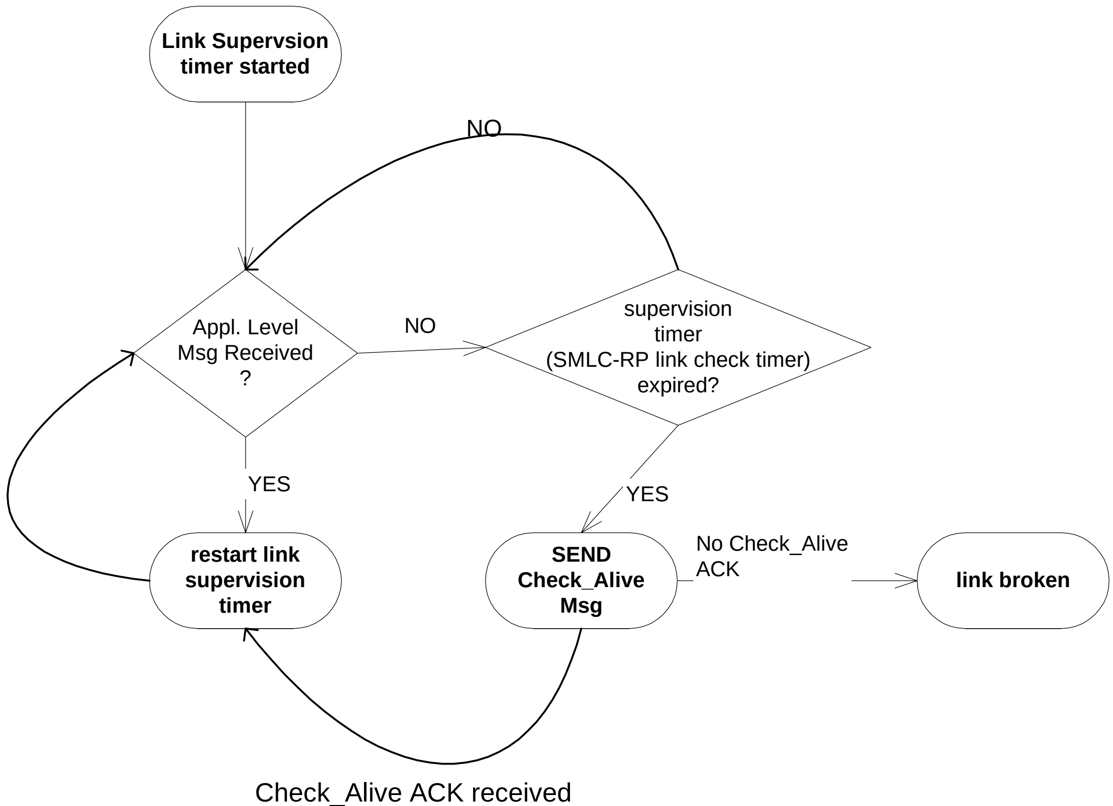

Figure 3: Heartbeat Checks State Diagram for the SMLC

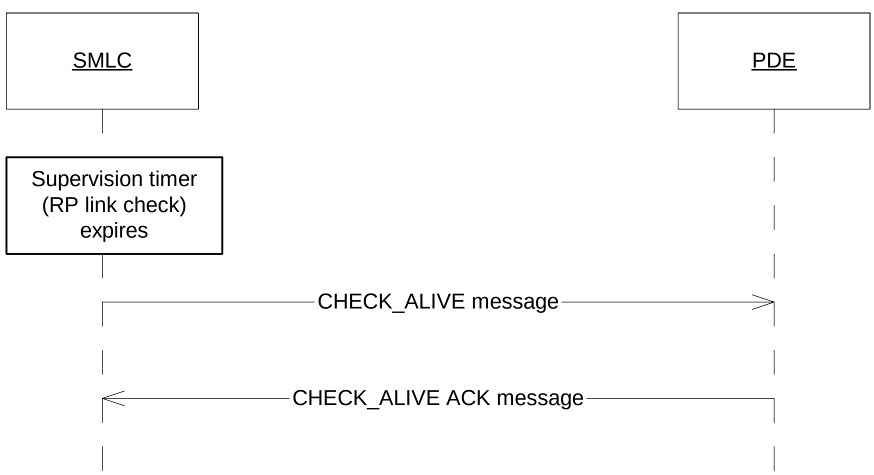

Figure 4: Heartbeat Message Between SMLC and PDE

If the CHECK_ALIVE ACK has not been received within 30 seconds, the SMLC will close the TCP session (i.e., RP link termination). Alarm generation and reestablishment of the RP link is vendor-specific.

5.1.4.2 PDE Procedure

If an RP link on the PDE has not received any application level messages (including CHECK_ALIVE) from the SMLC for a certain period of time, the PDE shall close that TCP session (i.e., RP link termination). This supervision timer (PDE-RP link check timer) shall be configurable to be greater than the SMLC supervision timer (i.e., the SMLC-RP link check timer).

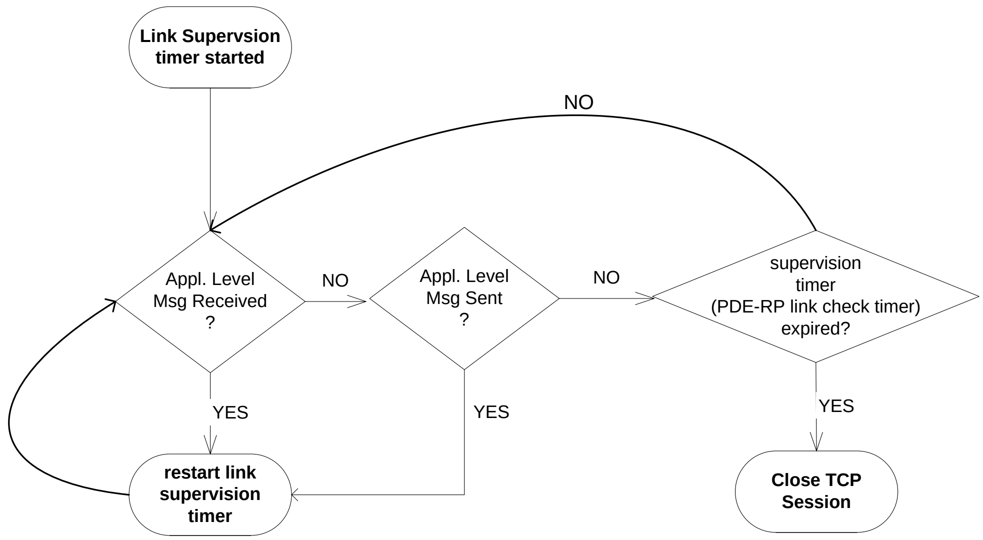

Figure 5: State Diagram for the PDE

5.1.5 Mapping of SMLCs to BSCs and PDEs.

This procedure applies when the SMLC is connected to multiple PDEs. The SMLC assigns a PDE for each BSC it is connected to. Therefore, any BSSMAP-LE Perform Location Request from a particular BSC is always routed to the same PDE. The protocol allows a BSC to obtain remote (non-SMLC) positioning support from only one PDE. This restriction implies that only one type of PDE (one additional positioning method) is available in the carrier's network—that all others would be internally supported on the SMLC node. This is a reasonable restriction given the current state of the art. However, additional remotely supported positioning methods with alternative BSC to PDE mapping could be supported in a future version of this specification.

5.1.6 Transaction Coordination Function for Lbis and Lb

The SCCP connection-oriented protocol is used on the Lb interface. This allows all messages belonging to a specific LOCATION REQUEST transaction to be known at both end points.

Transactions on the Lbis Interface are tracked at the application level with a Transaction_ID. The SMLC needs to maintain the transaction correlation between the Lb and Lbis Interfaces. The underlying reason the Transaction ID needs to be maintained is that it forms the only association in the Lbis interface between the LCS request and the position information returned from the Remote PDE.

An SMLC originates the Transaction ID during an initial Location Message. The PDE only accepts the new transaction from this message. A new transaction ID sent from the SMLC with any other message is not recognized (see clause 5.1.10 "Transaction Error" below).

Figure 6 shows an example of the correlation function in the SMLC. The exact Transaction_ID generation method is vendor-specific.

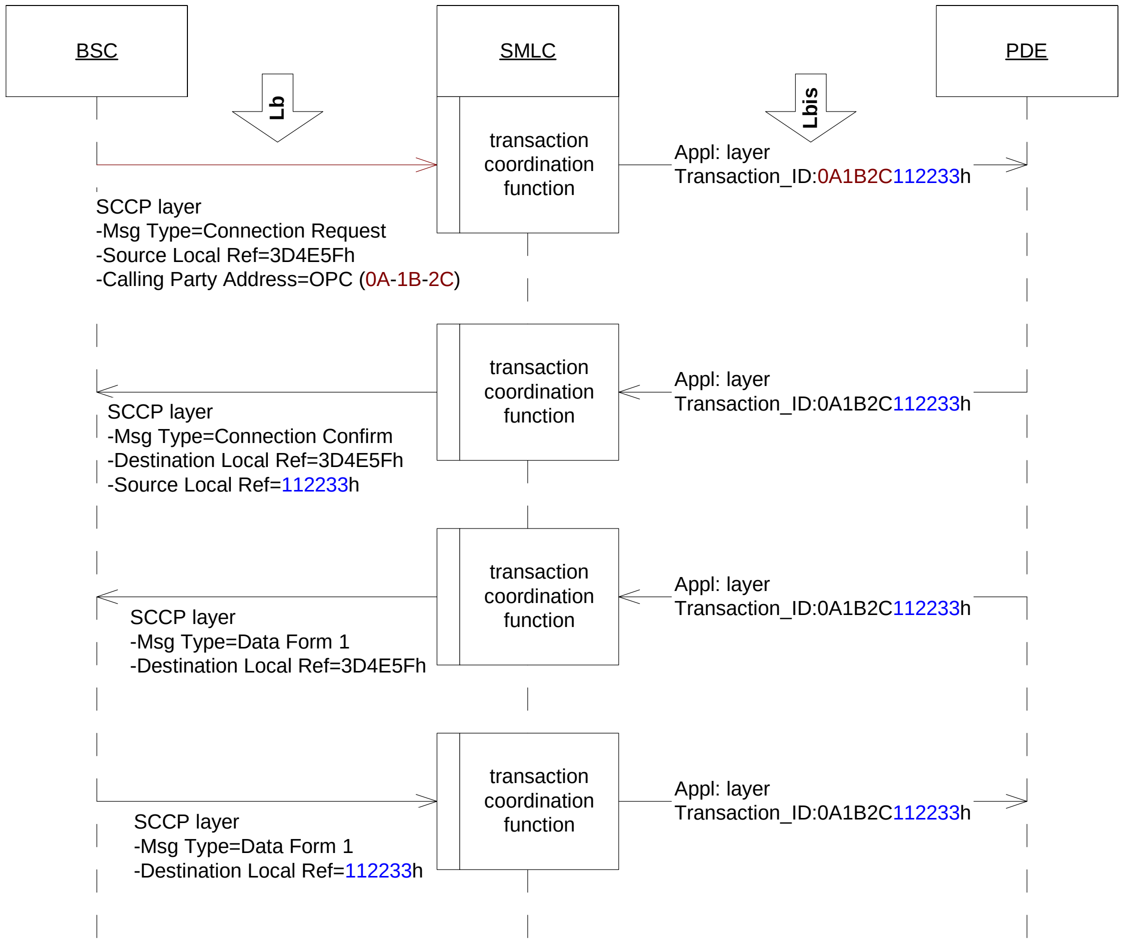

Figure 6: Example of a Transaction Coordination Function in SMLC

5.1.7 RPP Message Sending Rules

TCP/IP is a byte streaming protocol. When sending RPP messages using TCP/IP, the following rules are defined:

- RPP messages related to the same positioning transaction are sent/received on the same RP link. This only applies if there is more than one RP link established between a PDE and an SMLC. If multiple threads are sending RPP messages to the same RP link, it is important that the bytes from these messages are not intermixed in the TCP byte stream.
- Partial or incomplete messages are not permitted. The TCP Push Flag (IETF RFC793, *Transmission Control Protocol, section 2.8)* should be used to ensure the entire RPP message is sent to the receiving end.

5.1.8 Loss of RP Link Procedure

When the PDE determines an RP link is lost, it shall terminate all ongoing location transactions associated with that link and shall flush all cached information for location requests in progress that are associated with the failed link. This rule reduces the possibility that old position data could be used erroneously, and adds some protection against IP network attacks.

When the SMLC determines an RP link is lost, it shall invoke the appropriate vendor-specific procedure to handle any incomplete BSSLAP procedure and BSSMAP-LE procedure on all the transaction(s) associated with the disconnected RP link. The SMLC procedures will assume that the PDE has also detected an RP link failure and has flushed all pending location requests and data associated with that link.

5.1.9 Exceptional Procedure on Lbis Transaction

The RPP PROTOCOL ERROR message is sent from the PDE to the SMLC only. The SMLC does not send RPP PROTOCOL ERROR message to the PDE.

5.1.10 Transaction Error on the Lbis

If a Transaction_ID is unknown to the local system, the PDE sends an RPP PROTOCOL ERROR message with status "unknown Transaction ID" (see Figure 7). When the SMLC detects a protocol error or receives the RPP PROTOCOL ERROR MESSAGE, it may either:

- Terminate specific ongoing location positioning transactions on the Lb interface with the "LCS cause = 0 0 0 0 0 1 0 1 - Position method failure"
- Invoke another native positioning method

Alarm generation and other error handling procedures are vendor-specific.

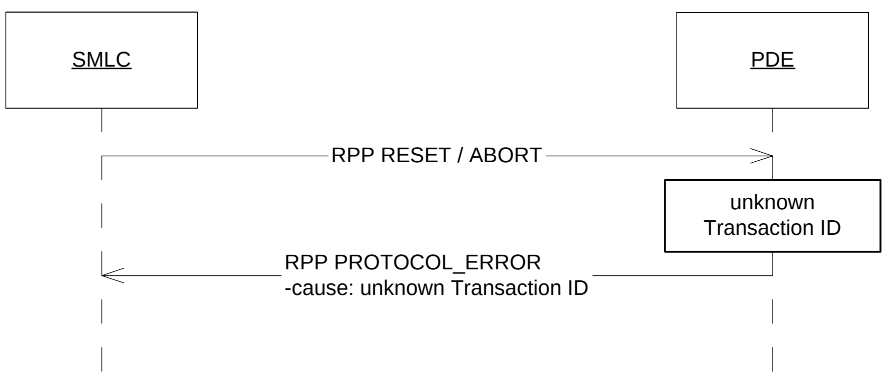

Figure 7: Transaction Error with Unknown Transaction ID

If the PDE receives an RPP Perform Location Request message with the Transaction ID already in use by another ongoing location process, the PDE shall terminate that ongoing location process and return a single RPP PROTOCOL ERROR message to the SMLC with the cause set to "duplicated transaction ID". (See Figure 8).

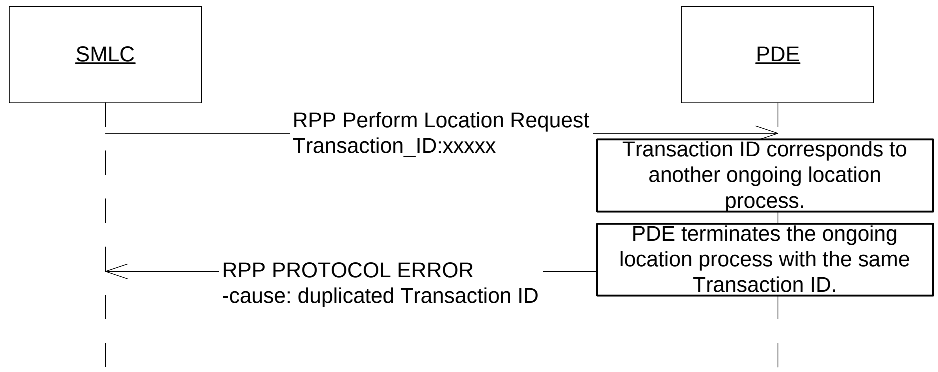

Figure 8: Lbis Transaction Confusion

The SMLC may terminate a specific ongoing location positioning transaction on the Lb interface with the "LCS cause = 0 0 0 0 0 1 0 1 - Position method failure" or the SMLC may invoke another native positioning method. Alarm generation and other error handling procedures are vendor-specific.

5.1.11 Badly Formed Message

If the PDE or SMLC receives an RPP message that cannot be decoded, it will discard the message. Alarm generation is vendor-specific. The reception of a badly formed message shall not reset the RP link check timer. Because of a lack of a valid response from the PDE, a timeout on the UTDOA transaction will occur (see Figure 9). The SMLC may terminate a specific ongoing Location Positioning Transaction on the Lb interface with the "LCS cause = 0 0 0 0 0 1 0 1 - Position method failure" or the SMLC may invoke another native positioning method.

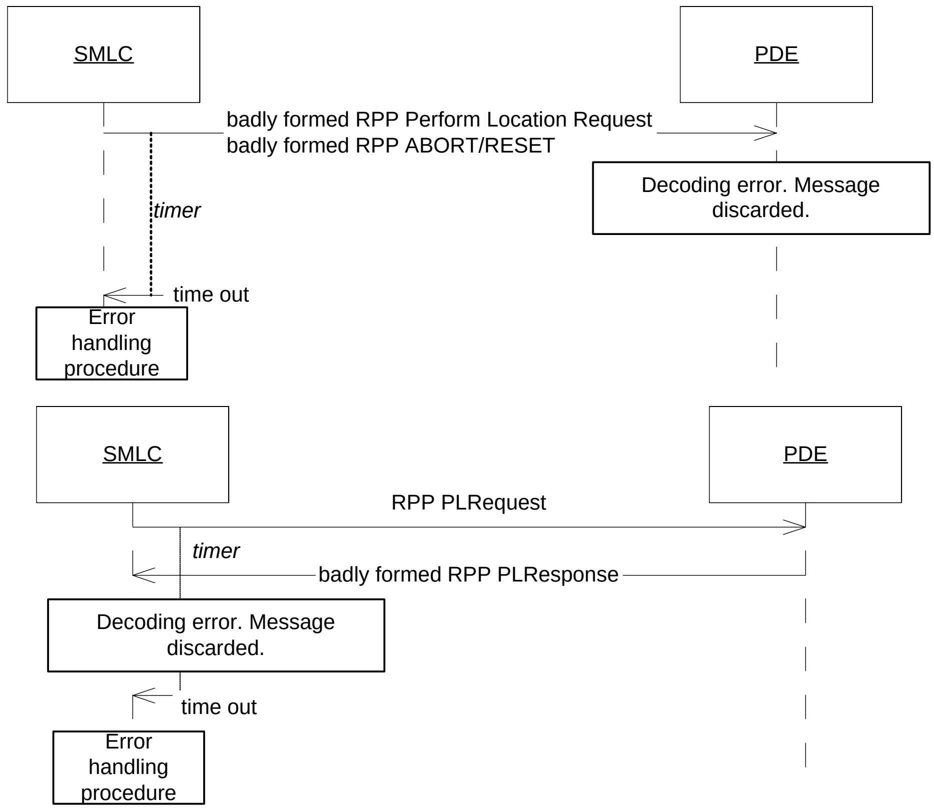

Figure 9: Lbis Transaction Timeout Due to Badly Formed Message

If the PDE is able to decode the Transaction ID from the badly formed message, it shall return an RPP PROTOCOL ERROR message with the cause set to "Badly coded Message". Optionally, the PDE can include additional information in the "User Info" field to assist in identifying the error (e.g., copy of the RPP message that has the decoding error—see Figure 10). The SMLC may terminate a specific ongoing Location Positioning Transaction on the Lb interface with the "LCS cause = 0 0 0 0 0 1 0 1 - Position method failure" or the SMLC may invoke another native positioning method.

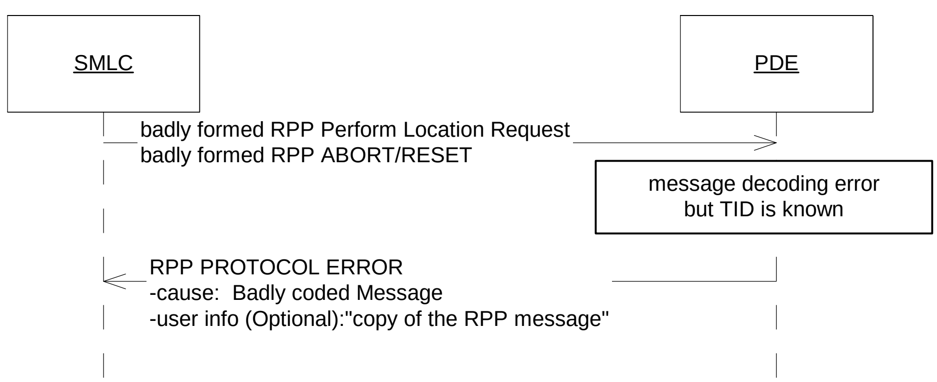

Figure 10: Message Rejected by PDE with RPP PROTOCOL ERROR Message

5.1.12 Messages Collision Scenarios

The SMLC implementation is responsible for addressing and resolving or reporting message collisions or ambiguities between the Lb and Lbis interfaces. There is a possibility that the BSC has sent the BSSLAP RESET or ABORT message, while the PERFORM LOCATION RESPONSE message is already being sent from the PDE. Two cases are defined for this scenario (see Figure 11).

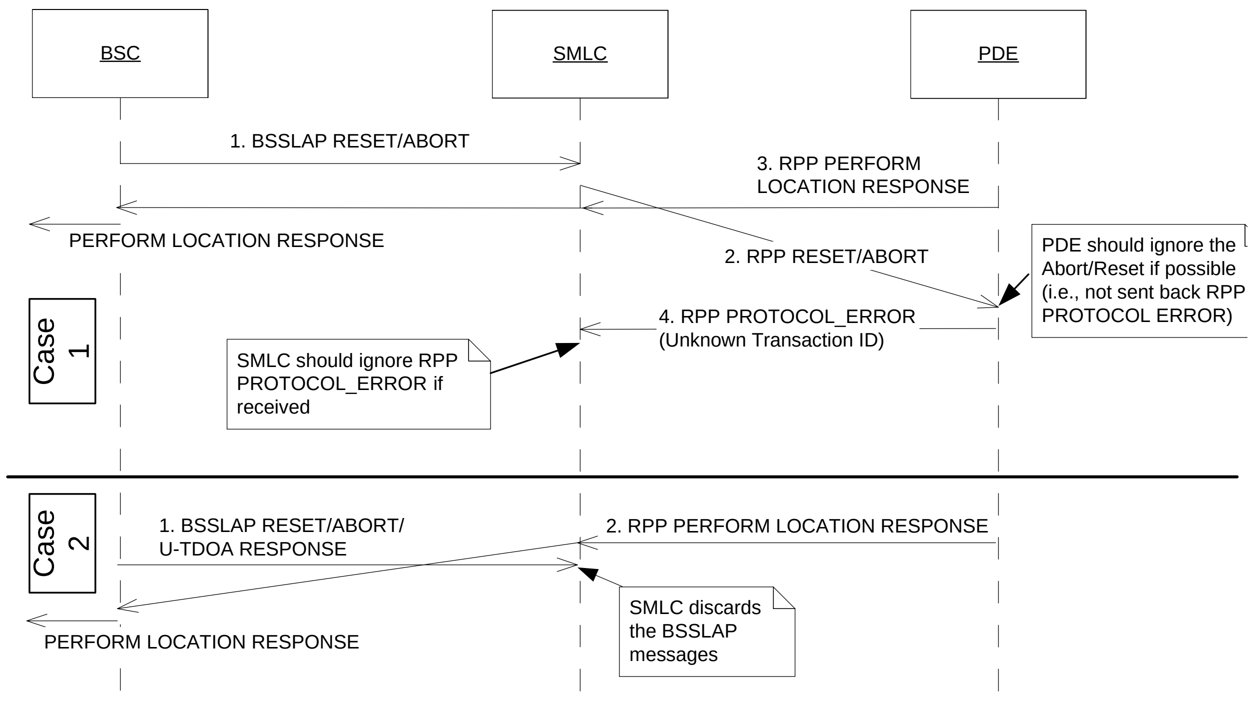

Figure 11: Messages Collision Scenarios Between Lb and Lbis

CASE 1: The PDE shall discard the RPP RESET or ABORT message if it is received after the RPP PERFORM LOCATION RESPONSE message has been sent. If received, the SMLC shall discard the RPP PROTOCOL_ERROR message (with unknown Transaction ID) from the PDE.

CASE 2: The SMLC shall discard the BSSLAP RESET/ABORT/UTDOA RESPONSE message if it is received after the PERFORM LOCATION RESPONSE message has been sent.

5.1.13 RPP Message Synchronization Lost

When the PDE application detects that it can no longer decide the starting byte of the incoming message, then it should send a Protocol Error message with cause “Message Synchronization lost” to any ongoing transaction (s) on that RP link. After sending this message, it shall tear down the RP link.

- If the application cannot decode the RPP message after more than five consecutive attempts, it shall be treated as synchronization lost.

  Note: The number of attempts to decode the RPP message shall be configured in the SMLC and the PDE.

- If the PDE loses message synchronization, it shall terminate that RP link by closing the TCP session to the SMLC. As a result, the SMLC shall reestablish the RP link by opening a new TCP session and initiating the application level handshake procedure with the PDE to resume UTDOA service.

- If the SMLC loses message synchronization, it shall terminate that RP link by closing the TCP session to the PDE. As a result, the PDE will also close the TCP session. The SMLC shall reestablish the RP link by opening a new TCP session and initiating the application level handshake procedure with the PDE to resume UTDOA service.

Alarm generation and other error handling procedures are vendor-specific.

5.1.14 Ending of RPP Transaction

In some cases (e.g., reception of BSSMAP-LE RESET, SCCP connection lost, etc.), the SMLC may decide to terminate the RPP transaction without receiving any response from the PDE. This is accomplished by sending an RPP TERMINATION message (see Figure 12).

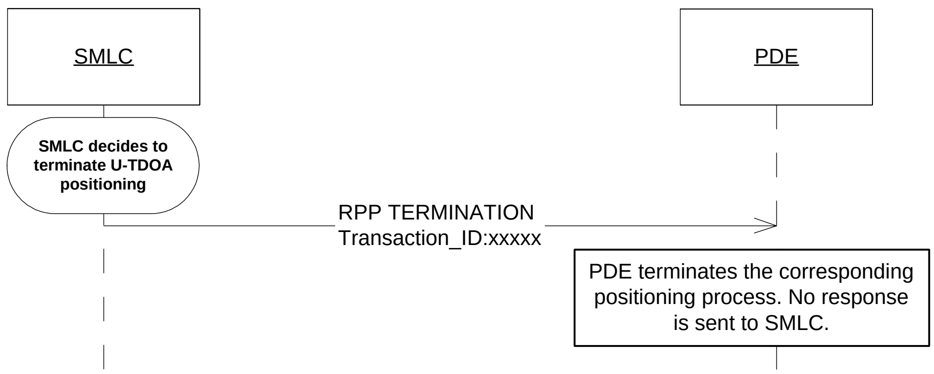

Figure 12: Ending RPP Transaction Without PDE Returning a Response

Following receipt of this TERMINATION message, the PDE should halt the processes associated with the Transaction ID, and flush caches or registers used in the PCF for that transaction.

6. INTERFACE DESCRIPTION

6.1 Lb Interface

The Lb interface used to support Remote PDEs, such as UTDOA, is specified in the following documents: 3GPP TS 43.059 v,6,3,0 , 3GPP TS 48.071 v.6.4.0, and 3GPP TS 49.031 v6.2.0.

6.2 Lbis Interface

Two types of RPP messages are defined: Positioning message and Control message. Their message structures are shown in Figures 13 and 14 respectively.

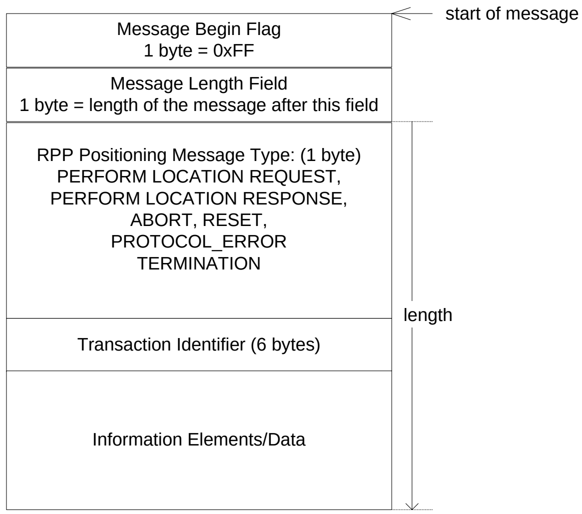

Figure 13: RPP Positioning Message

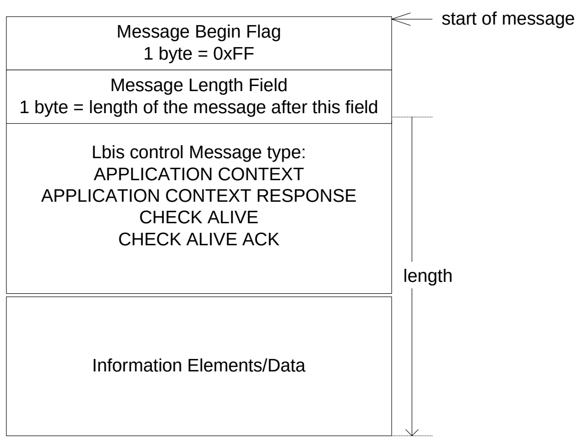

Figure 14: RPP Control Message

The ordering of the parameters sequence for the RPP message shall adhere to the order specified herein. Network byte ordering is used for sending data (i.e., the data must be sent in high-to-low order).

6.2.1 RPP Positioning Message

When the information element is referenced to 3GPP TS 49.031 v6.2.0 or 3GPP TS 48.071 v.6.4.0, the coding of the information element identifier is replaced with the information element identifier defined in clause 6.2.4. The rest of the octet coding is unchanged from 3GPP TS 49.031 v6.2.0 and 3GPP TS 48.071 v. 6.4.0.

6.2.1.1 RPP Perform Location Request Message (from SMLC to PDE)

Table 3: RPP Perform Location Request Message

Information Element	Type / Reference	Presence	Format	Length in octets
Message type	See 6.2.3	M	V	1
Transaction_ID	See 6.2.4.2	M	V	6
Channel Description	See 3GPP TS 4 8.071 IE 5.8	M	TV	4
Serving Cell Identifier	See 3GPP TS 48.071 IE 5.23	M	TLV	4-n
LCS Client Type	See 3GPP TS 49.031 IE 10.14	C	TLV	3
LCS QoS	See 3GPP TS 49.031 IE 10.16	C	TLV	6
Frequency List	See 3GPP TS 48.071 IE 5.20	C	TLV	3-n
Encryption Key (Kc) (See Note B below)	See 3GPP TS 48.071 IE 5.24	C	TV	9
Cipher Mode Setting (See Note B below)	See 3GPP TS 48.071 IE 5.25	C	TV	2
MS Power (See Note A below)	See 3GPP TS 48.071 IE 5.21	C	TV	2
Timing Advance (See Note A below)	See 3GPP TS 48.071 IE 5.2	C	TV	2
Measurement Report (See Note A below)	See 3GPP TS 48.071 IE 5.12	C	TLV	18
Geographic Location (See Note A below)	See 3GPP TS 49.031IE 10.9	C	TLV	2-22
LCS Priority	See 3GPP TS 49.031 IE 10.15	O	TLV	3
Response Time	See 6.2.4.3	O	TV	2
Generic Information	See 6.2.4.10	O	TLV	3-n
Channel Mode	See 3GPP TS 48.071 IE 5.26	C	TV	2
MultiRate Configuration	See 3GPP TS 48.071 IE 5.27	C	TLV	4-n

Note A: MS Power, Timing Advance, and Measurement Report IEs are not sent if the Geographic Location IE is sent and vice versa

Note B: Refer to 3GPP TS 43.059 for a discussion of rules for inclusion of Encryption Key and Cipher Mode Setting in the handling of ES calls.

6.2.1.2 RPP Perform Location Response Message (From PDE to SMLC)

Table 4: RPP Perform Location Response Message (From PDE to SMLC)

Information Element	Type / Reference	Presence	Format	Length in octets
Message type	See 6.2.3	M	V	1
Transaction_ID	See 6.2.4.2	M	V	6
Location Estimate	See 3GPP TS 49.031 IE 10.9	C	TLV	2-22
Positioning Data (See Note below)	See Geographic Location 3GPP TS 49.031 IE 10.20	O	TLV	2-n
LCS Cause (See Note below)	See 3GPP TS 49.031 10.13	C	TLV	3-4

Note: The LCS cause IE is included if and only if a Location Estimate IE is not included

6.2.1.3 RPP Abort Message (from SMLC to PDE)

Table 5: RPP Abort Message

Information element	Type / Reference	Presence	Format	Length in octets
Message type	See 6.2.3	M	V	1
Transaction_ID	See 6.2.4.2	M	V	6
Cause	See 6.2.4.8	M	TV	2

6.2.1.4 RPP RESET message (from SMLC to PDE)

Table 6: RPP RESET Message

Information Element	Type/Reference	Presence	Format	Length
Message Type	See 6.2.3	M	V	1
Transaction_ID	See 6.2.4.2	M	V	6
Cause	See 6.2.4.8	M	TV	2
Channel Description	See 3GPP TS 48.071 IE 5.8	M	TV	4
Serving Cell Identifier	See 3GPP TS 48.071 IE 5.23	M	TLV	4-n
Frequency List	See 3GPP TS 48.071 IE 5.20	C	TLV	3-n
MS Power	See 3GPP TS 48.071 IE 5.21	C	TV	2
Timing Advance	See 3GPP TS 48.071 IE 5.2	C	TV	2
Measurement Report	See 3GPP TS 48.071 IE 5.12	C	TLV	18
Geographic Location	See 3GPP TS 49.031 IE 10.9	C	TLV	2-22
Channel Mode	See 3GPP TS 48.071 IE 5.26	C	TV	2
MultiRate Configuration	See 3GPP TS 48.071 IE 5.27	C	TLV	4-n

Note: MS Power, Timing Advance, and Measurement Report IEs are not sent if the Geographic Location IE is sent and vice versa

6.2.1.5 RPP PROTOCOL ERROR Message (from PDE to SMLC)

Table 7: RPP PROTOCOL ERROR Message

Information Element	Type/Reference	Presence	Format	Length
Message Type	See 6.2.3	M	V	1
Transaction_ID	See 6.2.4.2	M	V	6
Transaction Error Cause	See 6.2.4.6	M	TV	2
User information	See 6.2.4.7	O	TLV	3-n

6.2.1.6 RPP TERMINATION Message (from SMLC to PDE)

Table 8: RPP TERMINATION Message

Information Element	Type/Reference	Presence	Format	Length
Message Type	See 6.2.3	M	V	1
Transaction_ID	See 6.2.4.2	M	V	6
Termination Cause	See 6.2.4.9	M	TV	2

6.2.2 RPP Control Message

6.2.2.1 RPP APPLICATION CONTEXT Message

Table 9: RPP APPLICATION CONTEXT Messages

Information element	Type/Reference	Presence	Format	Length
Message Type	See 6.2.3	M	V	1
Application ID	See 6.2.4.4	M	TV	2

6.2.2.2 RPP APPLICATION CONTEXT RESPONSE Message

Table 10: RPP APPLICATION CONTEXT RESPONSE Messages

Information element	Type/Reference	Presence	Format	Length
Message Type	See 6.2.3	M	V	1
Context Status	See 6.2.4.5	M	TV	2

6.2.2.3 RPP CHECK ALIVE Message

Table 11: RPP CHECK ALIVE Message

Information element	Type/Reference	Presence	Format	Length
Message Type	See 6.2.3	M	V	1

6.2.2.4 RPP CHECK ALIVE ACK Message

Table 12: RPP CHECK ALIVE ACK Message

Information element	Type/Reference	Presence	Format	Length
Message Type	See 6.2.3	M	V	1

6.2.3 Coding of Messages on RPP

Table 13: Coding of Messages on RPP

8 7 6 5 4 3 2 1	Message Type
0 0 0 0 0 0 0 0	Reserved
0 0 0 0 0 0 0 1	RPP Perform Location Request message
0 0 0 0 0 0 1 0	RPP Perform Location Response
0 0 0 0 0 0 1 1	RPP Abort
0 0 0 0 0 1 0 0	RPP RESET
0 0 0 0 0 1 0 1	RPP PROTOCOL ERROR
0 0 0 0 0 1 1 0	RPP TERMINATION
0 0 0 0 0 1 1 1 to 1 0 0 0 0 0 0 0	Reserved
1 0 0 0 0 0 0 1	RPP APPICATION CONTEXT
z	RPP APPICATION CONTEXT RESPONSE
1 0 0 0 0 0 1 1	RPP CHECK ALIVE
1 0 0 0 0 1 0 0	RPP CHECK ALIVE ACK
1 0 0 0 0 1 0 1 to 1 1 1 1 1 1 1 1	Reserved

6.2.4 Coding of Information Element on RPP

6.2.4.1 Element Identifier

Table 14: Coding of Information Element on RPP

Element Identifier Coding	Element name
0000 0000	Reserved
0000 0001	Channel Description
0000 0010	Serving Cell Identifier
0000 0011	LCS Client Type
0000 0100	LCS QoS
0000 0101	Frequency List
0000 0110	Encryption Key (Kc)
0000 0111	Cipher Mode Setting
0000 1000	MS Power
0000 1001	Timing Advance
0000 1010	Measurement Report
0000 1011	Geographic Location
0000 1100	LCS Priority
0000 1101	Response Time
0000 1110	Location Estimate
0000 1111	LCS Cause
0001 0000	Cause
0001 0001	Application ID
0001 0010	Context Status
0001 0011	Transaction Error Cause
0001 0100	User Info
0001 0101	Termination Cause
0001 0110	Generic Information
0001 0111	Positioning Data
0001 1000	Channel Mode
0001 1001	MultiRate Configuration
0001 1010 to 1111 1111	Reserved

6.2.4.2 Transaction_ID

Table 15: Transaction ID

8	7	6	5	4	3	2	1	
Transaction ID value								octet 1
continue								octet 2
continue								octet 3
continue								octet 4
continue								octet 5
continue								octet 6

Possible range of Transaction ID value: 00 00 00 00 00 00 to FF FF FF FF FF FF.

6.2.4.3 Response Time

Table 16: Response Time

8	7	6	5	4	3	2	1	
Element identifier, see 6.2.4								octet 1
Timer Value								octet 2

Note**:** The Timer Value field is expressed in units of 500 ms. TimerValue = 0 is invalid.

6.2.4.4 Application ID

Table 17: Application ID

8	7	6	5	4	3	2	1	
Element identifier, See 6.2.4								octet 1
Application ID						Version		octet 2

Coding of Application ID (bits 8-3): 000001 UTDOA Application

Note: The Version field (bits 2-1) shall be coded as follows: The current version described in this document is coded “0 0”

6.2.4.5 Context Status

Table 18: Context Status

8	7	6	5	4	3	2	1	
Element identifier, See 6.2.4								octet 1
Status								octet 2

Coding of Status (bits 8-1):

00000000 Reserved
00000001 Allow
00000010 Not Allow
00000011 Not Supported
00000100 to 11111111 Reserved

6.2.4.6 Transaction Error Cause

Table 19: Transaction Error Cause

8	7	6	5	4	3	2	1	
Element identifier, See 6.2.4								octet 1
Cause								octet 2

Coding of Cause (bits 8-1):

00000000 Reserved
00000001 Unknown Transaction
00000010 Duplicated Transaction ID
00000011 Message Synchronization Lost
00000100 Message Rejected
00000101 Invalid Message
00000110 Badly coded Message
00000111 to 11111111 Reserved

6.2.4.7 User Information IE

Table 20: User Information IE

8	7	6	5	4	3	2	1	
Element identifier, See 6.2.4								octet 1
Length								octet 2
The rest of the octet contains User Information data								octets 3-n

6.2.4.8 Cause IE

Table 21: Cause IE

8	7	6	5	4	3	2	1	
Element identifier, See 6.2.4								octet 1
Cause value								octet 2

The cause field is coded as follows:

0000 0000 Reserved
0000 0001 Congestion
0000 0010 Channel Mode not supported
0000 0011 Failure for other radio related events
0000 0100 Intra-BSS handover
0000 0101 Inter-BSS handover
0000 0110 Loss of signaling connection to MS
0000 0111 BSSMAP-LE Perform Location Abort from BSC
0000 1000 Failure or Error in SMLC
All unassigned codes are spare.

6.2.4.9 Termination Cause IE

Table 22: Termination Cause IE

8	7	6	5	4	3	2	1	
Element identifier, See 6.2.4								octet 1
Cause value								octet 2

The cause field is coded as follows:

0000 0000 Reserved
0000 0001 Normal - unspecified
0000 0010 System Reset
All unassigned codes are spare.

6.2.4.10 Generic Information IE

Table 23: Generic Information IE

8	7	6	5	4	3	2	1	
Element identifier, See 6.2.4								octet 1
Length								octet 2
The rest of the octet contains generic information data								octets 3-n

The generic information is used for communication of messages, data, and parameters that are outside the scope of the RPP specification.