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Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Location Services (LCS);
Serving Mobile Location Centre -
Base Station System (SMLC-BSS) interface;
Layer 3
(3GPP TS 08.71 version 8.6.0 Release 1999)**

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Foreword

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The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document contains the coding of information necessary for support of location service operation on the SMLC-BSS interface layer 3.

Clause 2 gives the functional definitions and contents of messages for location service operations. Clause 3 gives the general format and coding for messages used for location service and the format and coding of information elements used for location service operations.

1.1 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 01.04: "Abbreviations and acronyms".

[2] 3GPP TS 03.71: "Location Services (LCS); (Functional description) - Stage 2".

[3] 3GPP TS 04.07: "Mobile radio interface signalling layer 3; General aspects".

[4] 3GPP TS 04.08: "Mobile radio interface layer 3 specification".

[5] 3GPP TS 05.08: "Radio subsystem link control".

[6] 3GPP TS 08.08: "Mobile-services Switching Centre - Base Station System (MSC-BSS) interface; Layer 3 specification".

[7] 3GPP TS 09.31: "Base Station System Application Part; LCS Extension (BSSAP-LE)".

1.2 Abbreviations

Abbreviations used in the present document are listed in 3GPP TS 01.04.

2 Messages functional definitions and contents

2.1 General

This subclause defines the structure of the messages of the SMLC-BSS layer 3 protocol defined in 3GPP TS 03.71.

Each definition includes:

a) a brief description of the message;

b) a table listing the information elements in the order of their appearance in the message.

   For each IE the table indicates:

   1) the name of the IE (which gives an idea of the semantics of the element), which is used in this and other specifications as a reference to the IE within the message;

   2) the name of the type of the IE (which indicates the coding of the value part of the IE), and a reference to a description of the value part of the IE;

   3) the presence requirement indication (M, C or O) for the IE, as defined in 3GPP TS 04.07;

   4) the format of the IE (T, V, TV, LV, TLV) as defined in 3GPP TS 04.07;

   5) the length of the IE (or permissible range of lengths), in octets, in the message. The value of the length gives the number of octets in the IE following the length and element identifier. Where the length is encoded using more than one octet, the high order bit is bit 8 of the first (lowest numbered octet) and the low order bit is bit 1 of the last (highest numbered octet).

c) subclauses specifying conditions for IEs with presence requirement C or O in the relevant message. Together with other conditions specified in 3GPP TS 03.71 this defines when the IE shall be included or not, what non-presence of such IEs means, and (for IEs with presence requirement C) the static conditions for presence and/or non-presence of the IEs (see 3GPP TS 03.71).

2.2 Messages

The following Location Services related messages are exchanged between the SMLC and the BSS, with the VMSC acting as a relay.

1. TA Request
2. TA Response
3. TOA Request
4. TOA Response
5. Reject
6. Reset
7. Abort
8. TA Layer3
9. MS Position Command
10. MS Position Response

On the A interface the messages are contained in the Location Information IE which is encapsulated in the BSSMAP-LE Connection Oriented Information message as specified in 3GPP TS 08.08. On the Ls interface the messages are contained in the Location Information IE which is encapsulated in the BSSMAP–LE Connection Oriented Information message as specified in 3GPP TS 09.31.

2.2.1 TA Request

The TA Request is a message from the SMLC to the BSS, requesting BSS to return the timing advance (or access delay) of the MS.

Table 2.1: TA Request message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1

2.2.2 TA Response

The TA Response is a message from the BSS to the SMLC. It is a response to TA Request message and contains the following information elements.

Table 2.2: TA Response message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1
Serving Cell Identity	Cell Identity IE 3.4	M	TV	3
Timing Advance	Timing Advance IE 3.2	M	TV	2
Measurement Report	Measurement Report IE 3.12	O	TLV	18
Enhanced Measurement Report	Enhanced Measurement Report IE 3.18	O	TLV	20
Measured Cell Identity List	Cell Identity List IE 3.17	O	TLV	6 to N

2.2.3 TOA Request

The TOA Request is a message from the SMLC to the BSS. It contains the following information elements.

Table 2.3: TOA Request message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1
Delta Timer	Delta Timer IE 3.13	M	TV	2
Handover Type	Handover Type IE 3.3	M	TV	2
Serving Cell Identity	Cell Identity IE 3.4	M	TV	3
Serving Starting Time	Starting Time IE 3.5	M	TV	3
Neighbor Cell Identity	Neighbor Cell Identity IE 3.6	O	TLV	4-n
Neighbor Starting Time	Neighbor Starting Time IE 3.7	O	TLV	4-n

2.2.4 TOA Response

The TOA Response is a message from the BSS to the SMLC. It is a response to the TOA Request message. It contains the following information elements.

Table 2.4: TOA Response message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1
Channel Description	Channel Description IE 3.8	M	TV	4
Frequency List	Frequency List IE 3.9	M	TLV	3-n
Handover Reference	Handover Reference IE 3.10	M	TV	2
Target Cell Identity	Cell Identity IE 3.4	M	TV	3
Serving Cell Identity	Cell Identity IE 3.4	M	TV	3
Timing Advance	Timing Advance IE 3.2	M	TV	2
MS Power	MS Power IE 3.11	M	TV	2
Measurement Report	Measurement Report IE 3.12	O	TLV	18

2.2.5 Reject

The Reject is a message from the BSS to the SMLC. It is a possible response to TOA Request, TA Request or MS Position Command and contains the following information elements.

Table 2.5: Reject message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1
Cause	Cause IE 3.14	M	TV	2

The following are the expected cause values for Reject message:

- congestion;
- channel Mode not supported;
- positioning procedure not supported;
- failure for other radio related events;
- incorrect serving cell identity.
- BSSAP-LE Segmentation error

2.2.6 Reset

The Reset is a message from the BSS to the SMLC. It is sent when the Response message contents for a positioning request are invalidated (e.g. due to handover) before the positioning procedure was completed. The message may also be sent instead of a Reject when a TOA Request cannot be performed due to an error in the serving cell identity.

Table 2.6: Reset message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1
Cell ID	Cell Identity IE 3.4	M	TV	3
Timing Advance	Timing Advance IE 3.2	M	TV	2
Channel description	Channel Description IE 3.8	M	TV	4
Cause	Cause IE 3.14	M	TV	2
Measurement Report	Measurement Report IE 3.12	O	TLV	18
Enhanced Measurement Report	Enhanced Measurement Report IE 3.18	O	TLV	20
Measured Cell Identity List	Cell Identity List IE 3.17	O	TLV	6 to N
LAC	Location Area Code IE 3.19	O	TV	3

The following are the expected cause values for Reset message:

- intra-BSS handover;
- failure for other radio related events;
- supervision Timer Expired;
- incorrect serving cell identity.

2.2.7 Abort

The Abort is a message either from the BSS to the SMLC or SMLC to the BSS. Upon receiving this signal, either SMLC or BSS shall abort ongoing positioning procedure.

Table 2.7: Abort message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1
Cause	Cause IE 3.14	M	TV	2

The following are the expected cause values for Abort message:

- failure for other radio related events;
- supervision Timer Expired;
- inter BSS handover;
- loss of signalling connection to MS.

2.2.8 TA Layer3

The TA Layer3 is an optional encapsulated message from the BSS to the SMLC that adds the following information in Complete layer 3 Information as described in 3GPP TS 08.08.

Table 2.8: TA Layer3 message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1
Timing Advance	Timing Advance IE 3.2	M	TV	2
Measurement Report	Measurement Report IE 3.12	O	TLV	18
Enhanced Measurement Report	Enhanced Measurement Report IE 3.18	O	TLV	20
Measured Cell Identity List	Cell Identity List IE 3.17	O	TLV	6 to N

2.2.9 MS Position Command

The BSSLAP MS Position Command is a message from the SMLC to BSS that contains the following information elements.

Table 2.9: MS Position Command message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1
flag	RRLP flag IE 3.15	M	TV	2
RRLP Info	RRLP IE 3.16	M	TLV	3 to N

2.2.10 MS Position Response

The BSSLAP MS Position Response is a message from the BSS to the SMLC that contains the following information elements.

Table 2.10: MS Position Response message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE 3.1	M	V	1
flag	RRLP flag IE 3.15	M	TV	2
RRLP Info	RRLP IE 3.16	M	TLV	3 to N
Timing Advance	Timing Advance IE 3.2	O	TV	2
Measurement Report	Measurement Report IE 3.12	O	TLV	18
Enhanced Measurement Report	Enhanced Measurement Report IE 3.18	O	TLV	20
Measured Cell Identity List	Cell Identity List IE 3.17	O	TLV	6 to N

3 Information element encodings

This paragraph contains the coding of the signalling elements used.

The following conventions are assumed for the sequence of transmission of bits and bytes:

- each bit position is marked as 1 to 8. Bit 1 is the least significant bit and is transmitted first;
- in an element octets are identified by number, octet 1 is transmitted first, then octet 2 etc.

When a field extends over more than one octet, the order of bit values progressively decreases as the octet number increases. The least significant bit of the field is represented by the lowest numbered bit of the highest numbered octet of the field.

- For variable length elements a length indicator is included, this indicates the number of octets following in the element.
- All fields within Information Elements are mandatory unless otherwise specified. The Information Element Identifier shall always be included.

All spare bits are set to 0.

The elements used and their coding are:

Element Identifier Coding	Element name	Reference
0000 0001	Timing Advance	3.2
0000 1000	Handover Type	3.3
0000 1001	Cell Identity	3.4
0000 1010	Starting Time	3.5
0000 1011	Neighbor Cell Identity	3.6
0000 1100	Neighbor Starting Time	3.7
0001 0000	Channel Description	3.8
0001 0001	Frequency List	3.9
0001 0010	Handover Reference	3.10
0001 0011	MS Power	3.11
0001 0100	Measurement Report	3.12
0001 0101	Delta Timer	3.13
0001 1000	Cause	3.14
0001 1001	RRLP Flag	3.15
0001 1011	RRLP IE	3.16
0001 1100	Cell Identity List	3.17
0001 1101	Enhanced Measurement Report	3.18
0001 1110	Location Area Code	3.19

All unassigned codes are spare.

3.1 Message Type IE

Message Type uniquely identifies the message being sent. It is a single octet element, mandatory in all messages.

All unassigned codes are spare.

8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	Reserved.
0 0 0 0 0 0 0 1	TA REQUEST
0 0 0 0 0 0 1 0	TA RESPONSE
0 0 0 0 0 1 0 0	TOA REQUEST
0 0 0 0 0 1 0 1	TOA RESPONSE
0 0 0 0 1 0 1 0	REJECT
0 0 0 0 1 0 1 1	RESET
0 0 0 0 1 1 0 0	ABORT
0 0 0 0 1 1 0 1	TA LAYER3
0 0 0 0 1 1 1 1	MS Position Command
0 0 0 1 0 0 0 0	MS Position Response

3.2 Timing Advance IE

This element contains the Timing Advance measured by the BTS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Timing Advance								octet 2

The coding of the timing advance value field is the binary representation of the timing advance in bit periods; 1 bit period = 48/13 us, as described in 3GPP TS 04.08 with the difference that all 8 bits are significant (instead of the normal 6 bits), which is necessary in order to report TA from extended range cells. To be correct, values over 63 do not correspond to a TA used by the MS (maximum is 63). Instead values over 63 correspond to the access delay measured by the BTS.

3.3 Handover Type IE

This IE defines the preferred type of handover for positioning.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Handover Type								octet 2

The coding of the handover type field is as follows:

- 0000 0000 Intra-cell handover to same channel;
- 0000 0001 Intra-cell handover to new channel;
- 0000 0010 Inter-cell handover;
- 0000 0011 BSS selects handover type;
- all other values reserved.

3.4 Cell Identity IE

This element defines the cell identity of the MS serving cell.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Cell Identity								octet 2-3

The coding of the Cell Identity field is as defined in 3GPP TS 24.008 clause 10.5.1.1 Cell Identity (excluding IEI).

3.5 Starting Time IE

This element defines the starting frame number for handover.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Starting Time								octet 2-3

The coding of the Starting Time field is as defined in 3GPP TS 04.08 clause 10.5.2.38 Starting Time (excluding IEI).

3.6 Neighbor Cell Identity IE

This element defines the cell identity of the candidate neighbor cells for positioning handover.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Cell Identity (1)								octets 3-4
:								
Cell Identity (n)								octets 2n+1 - 2n+2

The coding of the Cell Identity field is as defined in in 3GPP TS 04.08 subclause 10.5.1.1 Cell Identity (excluding IEI"s).

3.7 Neighbor Starting Time IE

This element defines the starting frame number for handover to neighboring cells.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Starting Time (1)								octets 3-4
:								
Starting Time (n)								octets 2n+1 - 2n+2

The coding of the Starting Time field is as defined in 3GPP TS 04.08 subclause 10.5.2.38 Starting Time (excluding IEI).

3.8 Channel Decription IE

This element defines the physical channel allocation of the MS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Channel Description								octets 2-4

The coding of Channel Description field is as defined in 3GPP TS 04.08 subclause 10.5.2.5a Channel Description (excluding IEI).

3.9 Frequency List IE

The Frequency List IE contains a list of frequencies used by the MS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Frequency List								octets 3-n

The coding of Frequency List field is as defined in 3GPP TS 04.08 subclause 10.5.2.13 Frequency List (excluding IEI and length field).

3.10 Handover Reference IE

This element defines the handover reference number used by the MS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Handover Reference								octet 2

The coding of Handover Reference field is as defined in 3GPP TS 04.08 subclause 10.5.2.15 Handover Reference (excluding IEI).

3.11 MS Power IE

This element contains the MS power.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
MS Power								octet 2

The MS Power field is encoded as in 3GPP TS 04.08 subclause 10.5.2.28 Power Command (excluding IEI) and 3GPP TS 05.08.

3.12 Measurement Report IE

This element contains the measurement report from the BSS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Measurement Results								octet 3-18

The Measurement Results field is encoded as in 3GPP TS 04.08 subclause 10.5.2.20 Measurement Result (excluding IEI).

3.13 Delta Timer

This element contains the value of the delta timer. The coding is as follows.

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

The Timer Value field is expressed in units of 0,05s.

3.14 Cause IE

This element contains the cause value.

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

The cause field is coded as follows:

0000 0000	Congestion
0000 0001	Channel Mode not supported
0000 0010	Positioning procedure not supported
0000 0011	Failure for other radio related events
0000 0100	Intra-BSS handover
0000 0101	Supervision Timer Expired
0000 0110	Inter-BSS handover
0000 0111	Loss of signalling connection to MS
0000 1000	Incorrect serving cell identity
0000 1001	BSSAP-LE Segmentation error
All unassigned codes are spare.	

3.15 RRLP Flag IE

This element is coded as:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
SPARE							Flag1	octet 2

The fields are coded as follows:

Flag 1 (Octet 2, bit 1)

0 – Position Command (SMLC to BSC) or final response (BSC to SMLC)

1 – Not a Positioning Command or final response

3.16 RRLP IE

RRLP IE is coded as:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2-3
RRLP APDU (3GPP TS 04.31)								octet 4-N

3.17 Cell Identity List IE

This element defines the list of cell identities of neighbour cells, for which measurements are reported. The Cell Identities are listed in the same order than the corresponding measurements in the (Enhanced) Measurement Report IE.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Spare				Cell identification Discriminator 1				octet 3
Cell Identification 1								Octet 4-4+p
…								
Spare				Cell identification Discriminator N				octet n-1
Cell Identification N								Octet n-n+q

The coding of octet 2 is a binary number indicating the Length of the remaining element. The Length depends on the Cell identification discriminator i as well as the number of cells to be identified.

The Cell identification discriminator i is coded as follows:

0000	The whole Cell Global Identification, CGI, is used to identify the 2G cells.
0001	Location Area Code, LAC, and Cell Identify, CI, are used to identify the 2G cells.
0010	3G Cell identification container 1
0011	3G Cell identification container 2

All other values are reserved.

The coding of the Cell Identification i depends on the Cell identification discriminator i. Below the coding of the i-th Cell Identification is shown for each Cell identification discriminator (with "i" in the range 1 to n):

Coding of the i-th Cell Identification for Cell identification discriminator = 0000

8	7	6	5	4	3	2	1	
MCC dig 2				MCC dig 1				octet x+1
MNC dig 3				MCC dig 3				octet x+2
MNC dig 2				MNC dig 1				octet x+3
LAC								octet x+4
LAC cont.								octet x+5
CI value								octet x+6
CI value cont								octet x+7

The octet (x+2) bits 5-8 are filled by '1111' if 2 digit MNC is used.

The octets (x+1)-(x+5) are coded as the value part shown in 3GPP TS 24.008, Table 'Location Area Identification information element'.

The octets (x+6)-(x+7) are coded as the value part shown in 3GPP TS 24.008, Table 'Cell Identity information element'.

Coding of i-th Cell Identification for Cell identification discriminator = 0001

8	7	6	5	4	3	2	1	
LAC								octet x+1
LAC cont.								octet x+2
CI value								octet x+3
CI value cont								octet x+4

The octets (x+1)-(x+2) are coded as the value part shown in 3GPP TS 24.008, Table 'Location Area Identification information element'.

The octets (x+3)-(x+4) are coded as the value part shown in 3GPP TS 24.008, Table 'Cell Identity information element'.

Coding of the Target ID for Cell identification discriminator = 0010

Octets (x+1) to (x+9) shall be ignored by the receiver.

NOTE: in the 3G Cell identification container 1, the transmitter may send PLMN-ID, LAC, RNC-ID and C-ID to identify a 3G cell.

Coding of the Target ID for Cell identification discriminator = 0011

Octets (x+1) to (x+6) shall be ignored by the receiver.

NOTE: in the 3G Cell identification container 2, the transmitter may send LAC, RNC-ID and C-ID to identify a 3G cell.

3.18 Enhanced Measurement Report IE

This element contains the measurement report from the BSS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Enhanced Measurement Results								octet 3-18

The Enhanced Measurement Results field is encoded as the contents of the ENHANCED MEASUREMENT REPORT message in 3GPP TS 04.18 (excluding the fields: "RR short PD", "Message type" and "Short layer 2 header").

3.19 Location Area Code IE

This element defines the cell identity of the MS serving cell.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Location Area Code								octet 2-3

The coding of the Location Area Code field is as defined in 3GPP TS 24.008 clause 10.5.1.3 Location Area Identification (excluding IEI, MCC, and MNC).

Annex A (informative): Change History

Meeting	CR	Rev	Subject/Comment	New version
SMG#31			Version for Release 99 based upon version 7.2.0.	8.0.0
SMG#31bis	A004		Addition of new error cause and other minor corrections	8.1.0
GP-02	A006		Corrections to LCS BSSLAP Protocol	8.2.0
-	-	-	Update to 3GPP format and template. Minor formatting corrections.	8.2.0
GP-06	A012		Addition of a missing cause value in BSSLAP for segmentation errors (R99)	8.3.0
GP-07	A015		Correction of faulty reference	8.4.0
GP-07	A017		Correction of Cause IE reference	8.4.0
GP-07	A014	1	Addition of Cell Identifier List related to Measurement report information	8.4.0
GP-08	A018	1	Addition of LAC optional to BSSLAP Reset	8.5.0
GP-35	A019		Correction to Enhanced Measurement Report IE definition	8.6.0

History

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V8.1.0	May 2000	Publication
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V8.5.0	March 2002	Publication
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