3GPP TSG-T#6
Nice, FRANCE, 13-15 December 1999

TSGT#6(99)237

Agenda Item: 7.3

Source: T2

Title: 3G Change Requests

Document for: Approval

T2 Tdoc	Spec	CR	Ph	Subject	Cat	Version-Current	Version-New	Workitem
T2-99976	23.038	003	R99	Adaptations for UMTS	D	3.2.0	3.3.0	TEI
T2-991144	23.039	001	R99	Adaptations for UMTS	D	3.0.0	3.1.0	TEI
T2-991065	23.040	006	R99	Duplicate messages	C	3.2.0	3.3.0	TEI
T2-991069	23.040	007	R99	Adaptations for UMTS	D	3.2.0	3.3.0	TEI
T2-99982	23.040	008	R99	Concatenated Short Message	A	3.2.0	3.3.0	TEI
T2-991064	23.041	001	R99	Adaptation of the scope of TS 23.041 from “GSM only” to “GSM and UMTS”	D	3.0.0	3.1.0	CBS
T2-991062	23.041	002	R99	LCS Utilization of CBS	A	3.0.0	3.1.0	LCS
T2-99980	23.042	001	R99	Adaptations for UMTS	D	3.0.0	3.1.0	TEI
T2-991074	27.005	001	R99	Adaptations for UMTS	D	3.0.0	3.1.0	TEI
T2-991049	27.007	016	R99	Clarification to result codes for +CLIP +CCWA	F	3.2.0	3.3.0	TEI
T2-991050	27.007	017	R99	AT command for Frame Tunnelling Mode (FTM)	B	3.2.0	3.3.0	FTM
T2-991128	27.007	018	R99	New AT command for application protocols activation	B	3.2.0	3.3.0	TEI
T2-99954	27.007	019	R99	AT-commands for Enhanced QoS Support management.	B	3.2.0	3.3.0	Enhanced QoS Support in GPRS.
T2-99957	27.007	020	R99	Packet Domain ATD command syntax	C	3.2.0	3.3.0	GPRS
T2-99958	27.007	021	R99	Additional parameter for +CBST	B	3.2.0	3.3.0	TEI
T2-99960	27.007	022	R99	Add new AT command (+CDIP) to inform the called line identification	B	3.2.0	3.3.0	TEI

3GPP TSG-T2 #7 / ETSI SMG4
Ystad, SWEDEN, 22-26 November 1999

TSGT2#7(99)976

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.038	**CR**	**003**	Current Version:	3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-T#6	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source: T2 **Date:** 26/11/99

Subject: adaptations for UMTS

Work item: TEI

Category:				**Release:**		
	F	Correction			Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification	X		Release 99	X
					Release 00	

Reason for change: This specification has been transferred from SMG to 3GPP. Therefore, adaptations for UMTS are required.

Clauses affected: all

Other specs affected:			
	Other 3G core specifications		→ List of CRs:
	Other GSM core specifications		→ List of CRs:
	MS test specifications		→ List of CRs:
	BSS test specifications		→ List of CRs:
	O&M specifications		→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

1 Scope

This TS defines the alphabets, languages and message handling ~~language-specific~~ requirements for SMS,CBS and USSD~~GSM. These are specific codepoints required by the Short Message Service (SMS) specifications which in turn are used not only for SMS (GSM 03.40, 03.41) but also for Unstructured Data (GSM 02.90)~~ and may additionally be used for Man Machine Interface (MMI) (3G TS ~~GSM 02.30~~22.030 [2]).

The specification for the Data Circuit terminating Equipment/Data Terminal Equipment (DCE/DTE) interface (3G TS ~~GSM~~ ~~07.05~~27.005 [8]) will also use the codes specified herein for the transfer of SMS data to an external terminal.

2 Normative 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2] ~~GSM~~3G TS ~~02.30~~ 22.030: "~~Digital cellular telecommunication system (Phase 2+);~~ Man-Machine Interface (MMI) of the Mobile Station (MS)".

[3] ~~GSM~~3G TS ~~03.90~~23.090: "~~Digital cellular telecommunication system (Phase 2+);~~ Unstructured Supplementary Service Data (USSD) - Stage 2~~Unstructured supplementary services operation - Stage 2~~".

[4] ~~GSM~~3G TS ~~03.4~~23.040: "~~Digital cellular telecommunication system (Phase 2+);~~ Technical realization of the Short Message Service (SMS) ~~Point to Point (PP)~~".

[5] ~~GSM~~3G TS ~~03.4~~23.041: "~~Digital cellular telecommunication system (Phase 2+);~~ Technical realization of the Cell- Broadcast Service- (-CBS-).~~Short Message Service Cell Broadcast (SMSCB)~~".

[6] ~~GSM~~3G TS ~~04.11~~24.011: "~~Digital cellular telecommunication system (Phase 2+); Point-to-Point (PP)~~ Short Message Service (SMS) support on mobile radio interface".

[7] ~~GSM~~3G TS ~~04.12~~24.012: "~~Digital cellular telecommunication system (Phase 2+)~~; ~~Short Message Service Cell Broadcast (SMSCB)~~ Cell Broadcast Service- (-CBS-) support on the mobile radio interface".

[8] ~~GSM~~3G TS ~~07.05~~27.005: "~~Digital cellular telecommunication system (Phase 2+)~~; Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".

[10] ISO/IEC10646: "Universal Multiple-Octet Coded Character Set (UCS)"; UCS2, 16 bit coding.

[11] ~~GSM~~3G TS ~~04.90~~24.090: "~~Digital cellular telecommunication system (Phase 2+);~~ Unstructured Supplementary Service Data (USSD) - Stage 3~~Unstructured~~ S~~supplementary~~ S~~services operation - Stage 3~~".

[12] ISO 639 “Code for the representation of names of languages”

[13] ~~GSM~~3G TS ~~03.4~~23.042: "~~Digital cellular telecommunication system (Phase 2+);~~ Compression algorithm for text messaging services”.

~~[14] GSM 03.40: "Digital cellular telecommunication system (Phase 2+); Technical realization of the Short Message Service (SMS) Point to Point (PP)"~~.

[14] 3G TR 25.990: "Vocabulary"

[15] "Wireless Datagram Protocol Specification", Wireless Application Protocol Forum Ltd.

3 Abbreviations

Abbreviations used in this TS are listed in GSM TR 01.04~~.~~ [1] and 3G TR 25.990 [14].

4 SMS Data Coding Scheme

The TP-Data-Coding-Scheme field, defined in ~~GSM~~3G TS ~~03.4~~23.040 [4], indicates the data coding scheme of the TP-UD field, and may indicate a message class. Any reserved codings shall be assumed to be the GSM 7 bit default alphabet (the same as codepoint 00000000) by a receiving entity. The octet is used according to a coding group which is indicated in bits 7..4. The octet is then coded as follows:

Coding Group Bits 7..4	Use of bits 3..0
00xx	General Data Coding indication Bits 5..0 indicate the following~~-~~: Bit 5, if set to 0, indicates the text is uncompressed Bit 5, if set to 1, indicates the text is compressed using the ~~GSM standard~~ compression algorithm defined in ~~. (see GSM TS~~ 3G TS ~~03.4~~23.042 [13]~~)~~ Bit 4, if set to 0, indicates that bits 1 to 0 are reserved and have no message class meaning Bit 4, if set to 1, indicates that bits 1 to 0 have a message class meaning~~-~~: Bit 1 Bit 0 Message Class 0 0 Class 0 0 1 Class 1 –Default meaning: ME-specific. 1 0 Class 2 ~~SIM~~(U)SIM specific message 1 1 Class 3 Default meaning: TE specific (see ~~GSM TS~~ 3G TS ~~07.05~~27.005 [8]) Bits 3 and 2 indicate the alphabet being used, as follows : Bit 3 Bit2 Alphabet: 0 0 GSM 7 bit d~~D~~efault alphabet 0 1 8 bit data 1 0 UCS2 (16bit) [10] 1 1 Reserved NOTE: The special case of bits 7..0 being 0000 0000 indicates the GSM 7 bit d~~D~~efault a~~A~~lphabet ~~as in Phase 2~~with no message class
0100..1011	Reserved coding groups
1100	Message Waiting Indication Group: Discard Message Bits 3..0 are coded exactly the same as Group 1101, however with bits 7..4 set to 1100 the mobile may discard the contents of the message, and only present the indication to the user.

(continued)

Coding Group Bits 7..4	Use of bits 3..0
1101	Message Waiting Indication Group: Store Message This Group allows an indication to be provided to the user about the status of types of message waiting on systems connected to the GSM/~~-~~UMTS PLMN. The mobile may present this indication as an icon on the screen, or other MMI indication. The mobile may take note of the Origination Address for messages in this group and group 1100. For each indication supported, the mobile may provide storage for the Origination Address which is to control the mobile indicator. Text included in the user data is coded in the GSM 7 bit d~~D~~efault a~~A~~lphabet. Where a message is received with bits 7..4 set to 1101, the mobile shall store the text of the SMS message in addition to setting the indication. Bits 3 indicates Indication Sense: Bit 3 0 Set Indication Inactive 1 Set Indication Active Bit 2 is reserved, and set to 0 Bit 1 Bit 0 Indication Type: 0 0 Voicemail Message Waiting 0 1 Fax Message Waiting 1 0 Electronic Mail Message Waiting 1 1 Other Message Waiting* * Mobile manufacturers may implement the "Other Message Waiting" indication as an additional indication without specifying the meaning. The meaning of this indication is intended to be standardized in the future, so Operators should not make use of this indication until the standard for this indication is finalized.
1110	Message Waiting Indication Group: Store Message The coding of bits 3..0 and functionality of this feature are the same as for the Message Waiting Indication Group above, (bits 7..4 set to 1101) with the exception that the text included in the user data is coded in the uncompressed UCS2 alphabet.
1111	Data coding/message class Bit 3 is reserved, set to 0. Bit 2 Message coding: 0 GSM 7 bit ~~D~~default alphabet 1 8-bit data Bit 1 Bit 0 Message Class: 0 0 Class 0 0 1 Class 1 default meaning: ME-specific. 1 0 Class 2 ~~SIM~~(U)SIM-specific message. 1 1 Class 3 default meaning: TE specific (see ~~3G TS 27.005~~~~GSM TS~~3G TS ~~07.05~~27.005 [8])

GSM 7 bit ~~D~~default alphabet indicates that the TP-UD is coded from the GSM 7-bit default alphabet given in subclause 6.2.1. When this alphabet is used, the characters of the message are packed in octets as shown in subclause 6.1.2.1.1, and the message can consist of up to 160 characters. The GSM 7 bit default alphabet shall be supported by all MSs and SCs offering the service. If the GSM 7 bit default alphabet extension mechanism is used then the number of displayable characters will reduce by one for every instance where the GSM 7 bit default alphabet extension table is used. 8-bit data indicates that the TP-UD has user-defined coding, and the message can consist of up to 140 octets.

UCS2 alphabet indicates that the TP-UD has a UCS2 [10] coded message, and the message can consist of up to 140 octets, i.e. up to 70 UCS2 characters. The General notes specified in subclause 6.1.1 override any contrary specification in UCS2, so for example even in UCS2 a <CR> character will cause the MS to return to the beginning of the current line and overwrite any existing text with the characters which follow the <CR>.

When a message is compressed, the TP-UD consists of the GSM 7 bit default alphabet or UCS2 alphabet compressed message, and the compressed message itself can consist of up to 140 octets in total.

When a mobile terminated message is class 0 and the MS has the capability of displaying short messages, the MS shall display the message immediately and send an acknowledgement to the SC when the message has successfully reached the MS irrespective of whether there is memory available in the ~~SIM~~(U)SIM or ME. The message shall not be automatically stored in the ~~SIM~~(U)SIM or ME.

The ME may make provision through MMI for the user to selectively prevent the message from being displayed immediately.

If the ME is incapable of displaying short messages or if the immediate display of the message has been disabled through MMI then the ME shall treat the short message as though there was no message class, i.e. it will ignore bits 0 and 1 in the TP-DCS and normal rules for memory capacity exceeded shall apply.

When a mobile terminated message is Class 1, the MS shall send an acknowledgement to the SC when the message has successfully reached the MS and can be stored. The MS shall normally store the message in the ME by default, if that is possible, but otherwise the message may be stored elsewhere, e.g. in the ~~SIM~~(U)SIM. The user may be able to override the default meaning and select their own routing.

When a mobile terminated message is Class 2 (~~SIM~~(U)SIM-specific), an ~~phase 2 (or later)~~ MS shall ensure that the message has been transferred to the SMS data field in the ~~SIM~~(U)SIM before sending an acknowledgement to the SC. The MS shall return a "protocol error, unspecified" error message (see ~~GSM TS~~3G TS ~~0~~24.0011 [6]) if the short message cannot be stored in the ~~SIM~~(U)SIM and there is other short message storage available at the MS. If all the short message storage at the MS is already in use, the MS shall return "memory capacity exceeded". ~~$begin$(Secure SMS)$~~ This behaviour applies in all cases except for an ~~phase 2+~~ MS supporting ~~SIM~~(U)SIM Application Toolkit when the Protocol Identifier (TP-PID) of the mobile terminated message is set to "~~SIM~~(U)SIM Data download" (see ~~GSM~~3G TS ~~03.4~~23.040 ~~[14]~~[4])~~.end(Secure SMS)$.~~

When a mobile terminated message is Class 3, the MS shall send an acknowledgement to the SC when the message has successfully reached the MS and can be stored, irrespectively of whether the MS supports an SMS interface to a TE, and without waiting for the message to be transferred to the TE. Thus the acknowledgement to the SC of a TE-specific message does not imply that the message has reached the TE. Class 3 messages shall normally be transferred to the TE when the TE requests "TE-specific" messages (see ~~GSM TS~~3G TS ~~07.05~~27.005 [8]). The user may be able to override the default meaning and select their own routing.

The message class codes may also be used for mobile originated messages, to provide an indication to the destination SME of how the message was handled at the MS.

The MS will not interpret reserved or unsupported values but shall store them as received. The SC may reject messages with a Data Coding Scheme containing a reserved value or one which is not supported.

5 ~~Cell Broadcast~~ CBS Data Coding Scheme

The ~~Cell Broadcast~~CBS Data Coding Scheme indicates the intended handling of the message at the MS, the alphabet/coding, and the language (when applicable). Any reserved codings shall be assumed to be the GSM 7 bit default alphabet (the same as codepoint 00001111) by a receiving entity. The octet is used according to a coding group which is indicated in bits 7..4. The octet is then coded as follows:

Coding Group Bits 7..4	Use of bits 3..0
0000	Language using the GSM 7 bit default alphabet Bits 3..0 indicate the language: 0000 German 0001 English 0010 Italian 0011 French 0100 Spanish 0101 Dutch 0110 Swedish 0111 Danish 1000 Portuguese 1001 Finnish 1010 Norwegian 1011 Greek 1100 Turkish 1101 Hungarian 1110 -Polish 1111 Language unspecified
0001	0000 GSM 7 bit d~~D~~efault alphabet; message preceded by language indication. The first 3 characters of the message are a two-character representation of the language encoded according to ISO 639 [12], followed by a CR character. The CR character is then followed by 90 characters of text. ~~A Pre-Phase 2+ MS will overwrite the start of the message up to the CR and present only the text.~~ 0001 UCS2; message preceded by language indication The message starts with a two 7-bit default alphabet character representation of the language encoded according to ISO 639 [12]. This is padded to the octet boundary with two bits set to 0 and then followed by 40 characters of UCS2-encoded message. An MS not supporting UCS2 coding will present the two character language identifier followed by improperly interpreted user data. 0010..1111 Reserved ~~for European languages~~
0010..	0000 Czech 0001 Hebrew 0010 Arabic 0011 Russian.. 0100..1111 Reserved for other ~~L~~languages using the GSM 7 bit default alphabet, with unspecified handling at the MS
0011	0000..1111 Reserved for other ~~L~~languages using the GSM 7 bit default alphabet, with unspecified handling at the MS

(continued)

(concluded)

01xx	General Data Coding indication Bits 5..0 indicate the following: Bit 5, if set to 0, indicates the text is uncompressed Bit 5, if set to 1, indicates the text is compressed using the ~~GSM standard~~ compression~~ng~~ algorithm defined in ~~. (see GSM TS~~3G TS ~~03.4~~23.04~~2~~ 042 [13]~~)~~ Bit 4, if set to 0, indicates that bits 1 to 0 are reserved and have no message class meaning Bit 4, if set to 1, indicates that bits 1 to 0 have a message class meaning: Bit 1 Bit 0 Message Class: 0 0 Class 0 0 1 Class 1 Default meaning: ME-specific. 1 0 Class 2 ~~SIM~~(U)SIM specific message. 1 1 Class 3 Default meaning: TE-specific (see ~~GSM TS~~3G TS ~~07.05~~27.005 [8]) Bits 3 and 2 indicate the alphabet being used, as follows: Bit 3 Bit 2 Alphabet: 0 0 GSM 7 bit d~~D~~efault alphabet 0 1 8 bit data 1 0 USC2 (16 bit) [10] 1 1 Reserved
1000..1101	Reserved coding groups
1110	Defined by the WAP Forum [15]
1111	Data coding / message handling Bit 3 is reserved, set to 0. Bit 2 Message coding: 0 GSM 7 bit d~~D~~efault alphabet 1 8 bit data Bit 1 Bit 0 Message Class: 0 0 No message class. 0 1 Class 1 user defined. 1 0 Class 2 user defined. 1 1 Class 3 default meaning: TE specific (see ~~GSM TS~~3G TS3G TS ~~07.05~~27.005 [8])

These codings may also be used for USSD~~Unstructured SS Data~~ and MMI/display purposes.

See~~ GSM~~3G TS 24.090~~04.90~~ [11] for specific coding values applicable to USSD~~Unstructured SS Data~~ for MS originated USSD messages and MS terminated USSD messages. USSD messages using the default alphabet are coded with the GSM 7-bit default alphabet given in subclause 6.2.1. The message can then consist of up to 182 user characters.

Cell Broadcast messages using the default alphabet are coded with the GSM 7-bit default alphabet given in subclause 6.2.1. The message then consists of 93 user characters.

If the GSM 7 bit default alphabet extension mechanism is used then the number of displayable characters will reduce by one for every instance where the GSM 7 bit default alphabet extension table is usedCell Broadcast messages using 8-bit data have user-defined coding, and will be 82 octets in length.

UCS2 alphabet indicates that the message is coded in UCS2 [10]. The General notes specified in subclause 6.1.1 override any contrary specification in UCS2, so for example even in UCS2 a <CR> character will cause the MS to return to the beginning of the current line and overwrite any existing text with the characters which follow the <CR>. Messages encoded in UCS2 consist of 41 characters.

Class 1 and Class 2 messages may be routed by the ME to user-defined destinations, but the user may override any default meaning and select their own routing.

Class 3 messages will normally be selected for transfer to a TE, in cases where a ME supports an SMS/CBS interface to a TE, and the TE requests "TE-specific" cell broadcast messages (see~~ GSM~~3G TS~~S~~ ~~07.05~~27.005 [8]). The user may be able to override the default meaning and select their own routing.

6 Individual parameters

6.1 General principles

6.1.1 General notes

Except where otherwise indicated, the following shall apply to all alphabet tables:

1: The characters marked "1)" are not used but are displayed as a space.

2: The characters of this set, when displayed, should approximate to the appearance of the relevant characters specified in ISO 1073 and the relevant national standards.

3: Control characters:

Code Meaning

LF Line feed: Any characters following LF which are to be displayed shall be presented as the next line of the message, commencing with the first character position.

CR Carriage return: Any characters following CR which are to be displayed shall be presented as the current line of the message, commencing with the first character position.

SP Space character.

4: The display of characters within a message is achieved by taking each character in turn and placing it in the next available space from left to right and top to bottom.

6.1.2 Character packing

6.1.2.1 SMS ~~Point-to-Point~~ Packing

6.1.2.1.1 Packing of 7-bit characters

If a character number α is noted in the following way:

b7	b6	b5	b4	b3	b2	b1
αa	αb	αc	αd	αe	αf	αg

The packing of the 7-bits-characters in octets is done by completing the octets with zeros on the left.

For examples, packing: α

- one character in one octet:
  - bits number:

7	6	5	4	3	2	1	0
0	1a	1b	1c	1d	1e	1f	1g

- two characters in two octets:
  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
0	0	2a	2b	2c	2d	2e	2f

- three characters in three octets:

- bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
0	0	0	3a	3b	3c	3d	3e

- seven characters in seven octets:

  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
4e	4f	4g	3a	3b	3c	3d	3e
5d	5e	5f	5g	4a	4b	4c	4d
6c	6d	6e	6f	6g	5a	5b	5c
7b	7c	7d	7e	7f	7g	6a	6b
0	0	0	0	0	0	0	7a

- eight characters in seven octets:

  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
4e	4f	4g	3a	3b	3c	3d	3e
5d	5e	5f	5g	4a	4b	4c	4d
6c	6d	6e	6f	6g	5a	5b	5c
7b	7c	7d	7e	7f	7g	6a	6b
8a	8b	8c	8d	8e	8f	8g	7a

The bit number zero is always transmitted first.

Therefore, in 140 octets, it is possible to pack (140x8)/7=160 characters.

6.1.2.2 CBS ~~SMS Cell Broadcast~~ Packing

6.1.2.2.1 Packing of 7-bit characters

If a character number α is noted in the following way:

b7	b6	b5	b4	b3	b2	b1
αa	αb	αc	αd	αe	αf	αg

the packing of the 7-bits characters in octets is done as follows:

bit number

7 6 5 4 3 2 1 0

octet number

1	2g	1a	1b	1c	1d	1e	1f	1g
2	3f	3g	2a	2b	2c	2d	2e	2f
3	4e	4f	4g	3a	3b	3c	3d	3e
4	5d	5e	5f	5g	4a	4b	4c	4d
5	6c	6d	6e	6f	6g	5a	5b	5c
6	7b	7c	7d	7e	7f	7g	6a	6b
7	8a	8b	8c	8d	8e	8f	8g	7a
8	10g	9a	9b	9c	9d	9e	9f	9g
			.					
			.					
81	93d	93e	93f93g	92a	92b	92c	92d	
82	0 0	0 0	0	93a	93b	93c		

The bit number zero is always transmitted first.

Therefore, in 82 octets, it is possible to pack (82x8)/7 = 93.7, that is 93 characters. The 5 remaining bits are set to zero as stated above.

6.1.2.3 USSD packing

6.1.2.3.1 Packing of 7 bit characters

If a character number α is noted in the following way:

b7	b6	b5	b4	b3	b2	b1
αa	αb	αc	αd	αe	αf	αg

The packing of the 7-bit characters in octets is done by completing the octets with zeros on the left.

For example, packing: α

- one character in one octet:
  - bits number:

7	6	5	4	3	2	1	0
0	1a	1b	1c	1d	1e	1f	1g

- two characters in two octets:
  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
0	0	2a	2b	2c	2d	2e	2f

- three characters in three octets:
  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
0	0	0	3a	3b	3c	3d	3e

- six characters in six octets:
  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
4e	4f	4g	3a	3b	3c	3d	3e
5d	5e	5f	5g	4a	4b	4c	4d
6c	6d	6e	6f	6g	5a	5b	5c
0	0	0	0	0	0	6a	6b

- seven characters in seven octets:
  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
4e	4f	4g	3a	3b	3c	3d	3e
5d	5e	5f	5g	4a	4b	4c	4d
6c	6d	6e	6f	6g	5a	5b	5c
7b	7c	7d	7e	7f	7g	6a	6b
0	0	0	1	1	0	1	7a

The bit number zero is always transmitted first.

- eight characters in seven octets:
  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
4e	4f	4g	3a	3b	3c	3d	3e
5d	5e	5f	5g	4a	4b	4c	4d
6c	6d	6e	6f	6g	5a	5b	5c
7b	7c	7d	7e	7f	7g	6a	6b
8a	8b	8c	8d	8e	8f	8g	7a

- nine characters in eight octets:
  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
4e	4f	4g	3a	3b	3c	3d	3e
5d	5e	5f	5g	4a	4b	4c	4d
6c	6d	6e	6f	6g	5a	5b	5c
7b	7c	7d	7e	7f	7g	6a	6b
8a	8b	8c	8d	8e	8f	8g	7a
0	9a	9b	9c	9d	9e	9f	9g

- fifteen characters in fourteen octets:
  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
4e	4f	4g	3a	3b	3c	3d	3e
5d	5e	5f	5g	4a	4b	4c	4d
6c	6d	6e	6f	6g	5a	5b	5c
7b	7c	7d	7e	7f	7g	6a	6b
8a	8b	8c	8d	8e	8f	8g	7a
10g	9a	9b	9c	9d	9e	9f	9g
11f	11g	10a	10b	10c	10d	10e	10f
12e	12f	12g	11a	11b	11c	11d	11e
13d	13e	13f	13g	12a	12b	12c	12d
14c	14d	14e	14f	14g	13a	13b	13c
15b	15c	15d	15e	15f	15g	14a	14b
0	0	0	1	1	0	1	15a

- sixteen characters in fourteen octets:
  - bits number:

7	6	5	4	3	2	1	0
2g	1a	1b	1c	1d	1e	1f	1g
3f	3g	2a	2b	2c	2d	2e	2f
4e	4f	4g	3a	3b	3c	3d	3e
5d	5e	5f	5g	4a	4b	4c	4d
6c	6d	6e	6f	6g	5a	5b	5c
7b	7c	7d	7e	7f	7g	6a	6b
8a	8b	8c	8d	8e	8f	8g	7a
10g	9a	9b	9c	9d	9e	9f	9g
11f	11g	10a	10b	10c	10d	10e	10f
12e	12f	12g	11a	11b	11c	11d	11e
13d	13e	13f	13g	12a	12b	12c	12d
14c	14d	14e	14f	14g	13a	13b	13c
15b	15c	15d	15e	15f	15g	14a	14b
16a	16b	16c	16d	16e	16f	16g	15a

The bit number zero is always transmitted first.

Therefore, in 160 octets, is it possible to pack (160*8)/7 = 182.8, that is 182 characters. The remaining 6 bits are set to zero as stated above.

Packing of 7 bit characters in USSD strings is done in the same way as for SMS (subclause 7.1.2.1).The character stream is bit padded to octet boundary with binary zeroes as shown above.

If the total number of characters to be sent equals (8n-1) where n=1,2,3 etc. then there are 7 spare bits at the end of the message. To avoid the situation where the receiving entity confuses 7 binary zero pad bits as the @ character, the carriage return or <CR> character (defined in subclause 7.1.1) shall be used for padding in this situation, just as for Cell Broadcast.

If <CR> is intended to be the last character and the message (including the wanted <CR>) ends on an octet boundary, then another <CR> must be added together with a padding bit 0. The receiving entity will perform the carriage return function twice, but this will not result in misoperation as the definition of <CR> in subclause 7.1.1 is identical to the definition of <CR><CR>.

The receiving entity shall remove the final <CR> character where the message ends on an octet boundary with <CR> as the last character.

~~Under certain circumstances, a Pre Phase 2 + MS will perform the carriage return function after displaying the last USSD character received.~~

6.2 Alphabet tables

This section provides tables for all the alphabets to be supported by SMS, CBS and USSD. The GSM 7 bit default alphabet is mandatory. Additional alphabets are optional. Irrespective of support of an individual alphabet, a MS shall have the ability to store a short message coded in any alphabet on the ~~SIM~~(U)SIM.

6.2.1 GSM 7 bit Default Alphabet ~~Default alphabet~~

Bits per character: 7

~~SMS User Data Length meaning: Number of characters~~

CBS/USSD pad character: CR

Character table:

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0	@	Δ	SP	0	¡	P	¿	p
0	0	0	1	1	£	_	!	1	A	Q	a	q
0	0	1	0	2	$	Φ	"	2	B	R	b	r
0	0	1	1	3	¥	Γ	#	3	C	S	c	s
0	1	0	0	4	è	Λ	¤	4	D	T	d	t
0	1	0	1	5	é	Ω	%	5	E	U	e	u
0	1	1	0	6	ù	Π	&	6	F	V	f	v
0	1	1	1	7	ì	Ψ	'	7	G	W	g	w
1	0	0	0	8	ò	Σ	(	8	H	X	h	x
1	0	0	1	9	Ç	Θ	)	9	I	Y	i	y
1	0	1	0	10	LF	Ξ	*	:	J	Z	j	z
1	0	1	1	11	Ø	1)	+	;	K	Ä	k	ä
1	1	0	0	12	ø	Æ	,	<	L	Ö	l	ö
1	1	0	1	13	CR	æ	-	=	M	Ñ	m	ñ
1	1	1	0	14	Å	ß	.	>	N	Ü	n	ü
1	1	1	1	15	å	É	/	?	O	§	o	à

1) This code is an escape to an extension of the GSM 7 bit default alphabet table. A receiving entity which does not understand the meaning of this escape mechanism shall display it as a space character.

6.2.1.1 GSM 7 bit default alphabet extension table

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0					|			
0	0	0	1	1								
0	0	1	0	2								
0	0	1	1	3								
0	1	0	0	4		^						
0	1	0	1	5							2)	
0	1	1	0	6								
0	1	1	1	7								
1	0	0	0	8			{					
1	0	0	1	9			}					
1	0	1	0	10	3)							
1	0	1	1	11		1)						
1	1	0	0	12				[				
1	1	0	1	13				~				
1	1	1	0	14				]				
1	1	1	1	15			\					

In the event that an MS receives a code where a symbol is not represented in the above table then the MS shall display the character shown in the main GSM 7 bit default ~~7 bit~~ alphabet table in section 6.2.1

1) This code value is reserved for the extension to another extension table. On receipt of this code, a receiving entity shall display a space until another extension table is defined.

2) This code represents the EURO currency symbol. The code value is that used for the character ‘e’. Therefore a receiving entity which is incapable of displaying the EURO currency symbol will display the character ‘e’ instead.

3) This code is defined as a Page Break character and may be used for example in compressed CBS messages. Any mobile which does not understand the GSM 7 bit default alphabet table extension mechanism will treat this character as Line Feed

6.2.2 8 bit data

8 bit data is user defined

~~SMS User Data Length meaning: Number of octets~~

Padding: CR in the case of an 8 bit character set

Otherwise - user defined

Character table: User Specific

6.2.3 UCS2

Bits per character: 16

~~SMS User Data Length meaning: Number of octets~~

CBS/USSD pad character: CR

Character table: ISO/IEC10646 [10]

3GPP TSG-T2 #7 / ETSI SMG4
Ystad, SWEDEN, 22-26 November 1999

TSGT2#7(99)1144

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.039 CR 001 Current Version: 3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-T#6	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: T2 **Date:** 26/11/99

Subject: Adaptations for UMTS

Work item: TEI

Category:				**Release:**	
	F	Correction		Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature		Release 98	
with an X)	D	Editorial modification	X	Release 99	X
				Release 00	

Reason for change: This specification has been transferred from SMG to 3GPP. Therefore, adaptations for UMTS are required.

Clauses affected:

Other specs affected:			
	Other 3G core specifications		→ List of CRs:
	Other GSM core specifications		→ List of CRs:
	MS test specifications		→ List of CRs:
	BSS test specifications		→ List of CRs:
	O&M specifications		→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

3G TS 23.039 V3.0.0 (1999-07)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Terminals; Interface protocols for the connection of Short Message Service Centres (SMSCs) to Short Message Entities (SMEs) (3G TS 23.039 version 3.0.0)

Reference

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Contents

Foreword

This Technical Specification has been produced by the 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 this TS, 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;

3 Indicates TSG approved document under change control.

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 specification;

1 Scope

The present document describes a range of alternative interfaces which may be utilised by Short Message Service Centre (SMSC), and Short Message Entity (SME), developers for the connection of SMEs to SMSCs.

The purpose of the present document is to provide a single document within which the various proprietary SMSC to SME interface standards may be accommodated as optional implementations.

As stated in 3G TS 23.040~~GSM 03.40~~ [1], the functionality of the SMSC is outside of the scope of the 3GPP~~GSM~~ Technical Specifications. As a result, no standardised interfaces have been specified for the connection of SMEs to the SMSC. In the absence of a prevailing standard, SC (Service Centre), developers have devised their own protocols which have not necessarily been based on any existing standards and are therefore largely incompatible with one another. ~~It has been recognised by TC-SMG, that the development of a single European Telecommunication Standard (ETS) at this stage, would be of little value as these proprietary standards are now in extensive use in many networks.~~

This document by referring to the various de-facto protocols~~TC-SMG has concluded that the publication by ETSI of the various de facto protocols,~~ will limit the further proliferation of proprietary standards and will benefit new SC/SME developers who may then adopt one or more of the existing protocols outlined in the present document.

This document does not provide recommendations, as to the preferred protocol implementation as all are regarded as being of equal merit. SC/SME implementors should therefore adopt the protocol most suited to their particular implementation, application or market.

2 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] 3G TS 23.040 ~~GSM 03.40~~: ~~"Digital cellular telecommunications system (Phase 2+);~~ Technical realization of the Short Message Service (SMS) ~~Point-to-Point (PP)"~~.

~~[2] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".~~

~~[3] ETS 300 133-3: "Paging Systems (PS); European Radio Messaging System (ERMES) Part 3: Network aspects ".~~

~~[4] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".~~

~~[5] CCITT Recommendation X.208, Specification of Abstract Syntax Notation One (ASN.1). Blue book, Melbourne 1988.~~

~~[6] CCITT Recommendation X.209, Specification of Basic Encoding Rules (BER) for Abstract Syntax Notation One. Blue book, Melbourne 1988.~~

~~[7] CCITT Recommendation X.25 of 1984.~~

~~[8] SMS-C Technical Description. EN/LZT 123 718.~~

~~[9] SMPP Applications Guide: Version 2.0 Aldiscon Limited.~~

~~3 Abbreviations and definitions~~

~~3.1 Abbreviations~~

~~For the purposes of the the present document, the following abbreviations apply:~~

~~SC~~	~~Service Centre~~
~~SME~~	~~Short Message Entity~~
~~SMPP~~	~~Short Message Peer to Peer~~
~~SMSC~~	~~Short Message Service Centre~~

~~Abbreviations used in annex A~~

~~ACK~~	~~Acknowledgement~~
~~AIM~~	~~Application Interface Module~~
~~API~~	~~Application Programming Interface~~
~~CDR~~	~~Call Detail Record~~
~~ESME~~	~~External Short Message Entity. Refer to note[1]~~
~~MB~~	~~Message Bureau - This is typically an operator message bureau.~~
~~MSC~~	~~Mobile Switching Centre~~
~~MSISDN~~	~~Mobile Station ISDN Number, i.e. a telephone number~~
~~MS~~	~~Mobile Station~~
~~NAK~~	~~Negative Acknowledgement~~
~~SME~~	~~Short Message Entity~~
~~SMSC~~	~~Short Message Service Centre~~
~~SMPP~~	~~Short Message Peer to Peer~~
~~VC~~	~~Virtual Connection. Refer to note [1]~~
~~VMA~~	~~VoiceMail Alert or Message Waiting Indication (MWI)~~
~~VPS~~	~~Voice Processing System~~

~~Abbreviations used in annex B~~

~~CMG~~	~~Computer Management Group~~
~~EMI~~	~~External Machine Interface~~
~~ERMES~~	~~European Radio MEssaging System~~
~~ETS~~	~~European Technical Standard~~
~~FAX~~	~~Facsimile~~
~~GSM~~	~~Global System for Mobile communication~~
~~IVR~~	~~Interactive Voice Response~~
~~MSISDN~~	~~Mobile Station ISDN number~~
~~MS~~	~~Mobile Station~~
~~O&M~~	~~Operations and Maintenance~~
~~PC~~	~~Personal Computer~~
~~PLMN~~	~~Public Land Mobile Network~~
~~PSTN~~	~~Public Switched Telephone Network~~
~~SM~~	~~Short Message~~
~~SME~~	~~Short Message Entity~~
~~SMH~~	~~Short Message Handler~~
~~SMS~~	~~Short Message Service~~
~~SMSC~~	~~Short Message Service Centre~~
~~SMT~~	~~Short Message Terminal~~
~~UCP~~	~~Universal Computer Protocol~~
~~VMS~~	~~Voice Mail System~~

~~Additional abbreviations used within the present document may be found in GSM 01.04 [2].~~

~~3.2 Definitions~~

~~For the purposes of annex D of the present document the following definitions apply.~~

~~**High Availability SME:** An SME directly connected to the SMSC which is available most of the time - for example a voice mail system.~~

~~**Low Availability SME:** An SME which is only occasionally available - for example a MS.~~

~~**SMSC Reference number:** Reference number for an SM allocated by the SMSC. Not the same as an SME reference number.~~

~~**SME Reference number:** Reference number for an SM allocated by the SME. Not the same as an SMSC reference number.~~

~~For the purposes of annex A of this ETS the following definitions apply.~~

~~**External Short Message Entity:** This refers to such external sources and sinks of short messages as Voice Processing or Message Handling computers. It specifically excludes SMEs which are part of the interface to the PLMN.~~

~~**Virtual Connection:** This refers to a virtual circuit in the X.25 implementation.~~

3. SC to SME interface protocols ~~4 General~~

~~The individual specifications contained in the annexes to the present document outline the details of the various optional SC to SME interface standards. The present document does not provide recommendations, as to the preferred implementation as all are regarded as being of equal merit. SC/SME implementors should therefore adopt the protocol most suited to their particular implementation, application or market.~~

The proprietary SC to SME interface protocols specifications are listed ~~contained in the annexes are~~ as follows:

3.1~~Annex A:~~ **Short Message Peer to Peer (SMPP) Interface Specification (~~Aldiscon~~ Logica~~Information Systems~~)**

Specification available from :- www.smpp.org/docs

3.2~~Annex B:~~ **Short Message Service Centre external machine interface (Computer Management Group)**

Specification available from:- http//www.cmgtelecom.com

3.3~~Annex C:~~ **SMSC to SME Interface Specification (Nokia Cellular Systems)**

Specification available from:- No details available

3.4~~Annex D:~~ **SMSC Open Interface Specification (SEMA Group)**

Specification available from:- semagroup.com/m&t/telecoms.htm

3.5~~Annex E:~~ **SMSC Computer Access Service And Protocol Manual (Ericsson)**

Specification available from:- Ericsson Compitex AB, Telephone number +46 31 7099000

~~Control (through TC-SMG), over the contents of the annexes remains with owners of the proprietary standards.~~

NOTE: 3GPP~~ETSI~~ take no responsibility for the viability of any of the optional SC to SME interface protocols referred to ~~contained~~ in the annexes. Enquires relating to their technical content should be made directly to the editing authority for each specification.

~~Annex A:~~
~~Short Message Peer to Peer (SMPP) Interface Specification~~

~~A.1 Introduction~~

~~A.1.1 Purpose~~

~~This annex specifies a generalized interface between an SMSC and non-PLMN SMEs. Typically it specifies the interface used between the SMSC and Paging or VoiceMail systems. The command format defines a Short Message Peer to Peer Protocol (hereafter referred to as SMPP). This protocol may be implemented over a variety of underlying interfaces/communications protocols, namely X.25, or TCP/IP.~~

~~Using this interface, an external Short Message Entity such as a Paging or VoiceMail system may bind/ unbind to the SMSC, submit, cancel, replace and query short messages. The SMSC forwards responses and short messages (e.g delivery receipts, pager messages) to the external Short Message Entity.~~

~~A.1.2 Scope~~

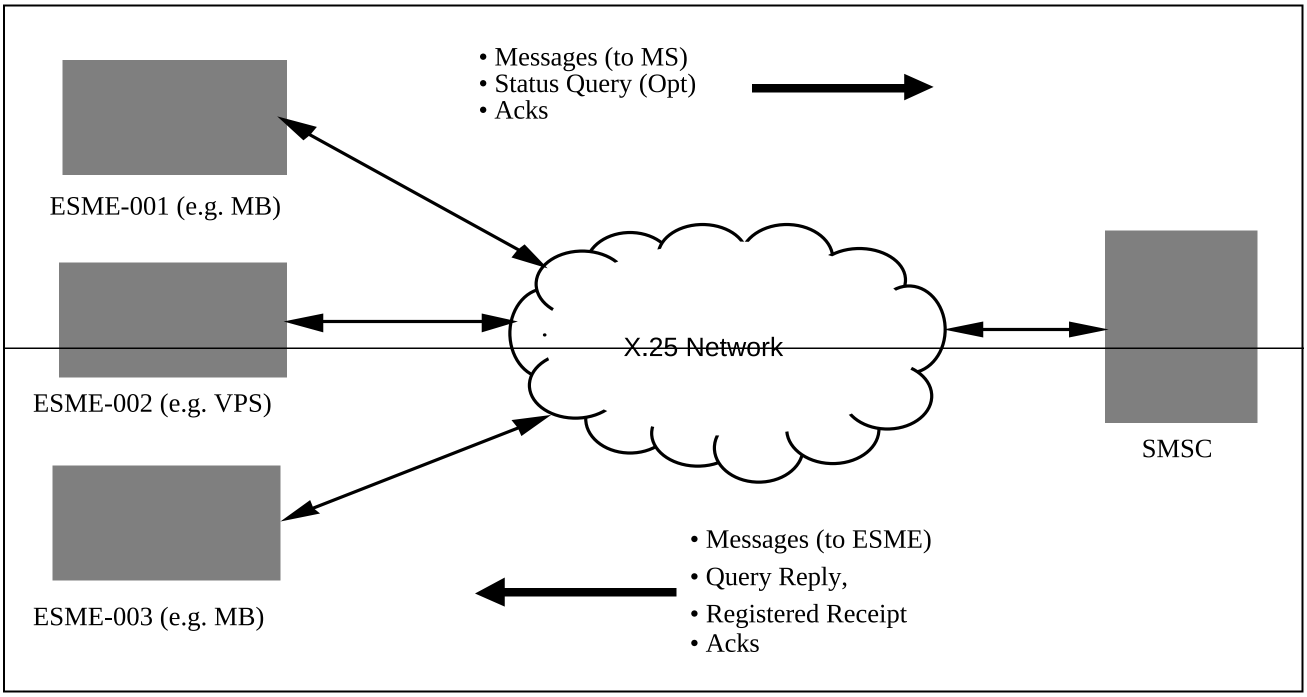
~~This annex is intended for designers and implementers of the interface between an SMSC and SMEs (Short Message Entities).~~

~~A.2 Functional overview~~

~~Interworking between the SMSC and ESMEs are categorised as:~~

- ~~(protocol) messages from ESMEs to the SMSC, and~~
- ~~(protocol) messages from SMSC to ESMEs.~~

~~Figure A.1 illustrates these categories which are detailed in the following clauses.~~



~~Figure A.1: SMSC & ESME Interworking using X.25~~

~~A.2.1 ESMEs to SMSC~~

~~Subscribers to a GSM Network may receive short messages from ESMEs. The means whereby these messages are originally generated within or are submitted to the ESME is beyond the scope of this annex, but the following are possible examples:~~

- ~~Calls directly dialled or diverted to a Message Bureau operator and forwarded to the SMSC.~~
- ~~Messages originated from terminals at a corporate customer's site.~~
- ~~Voice-Mail Alerts originating for a VPS indicating voice messages at a customer's mailbox.~~

~~Messages that are submitted to the SMSC by an ESME are immediately acknowledged. This acknowledgement informs the ESME that the message submitted is a valid message (i.e. fields are set to valid values).~~

~~In addition to "Message Submission", an ESME may "Query" the SMSC for the status of previously submitted messages, or cancel delivery of previously submitted messages using the Message ID returned by the SMSC when the particular message was originally submitted.~~

~~A.2.2 SMSC to ESME~~

~~The SMSC can deliver short messages to the ESME. A typical example would be the SMSC sending short messages to an MB for onward delivery as pager messages.~~

~~In addition the SMSC may use the "deliver short message" mechanism to generate a "Delivery Receipt". (See SMPP Applications guide [9] for details).~~

~~A.2.3 Backward compatibility~~

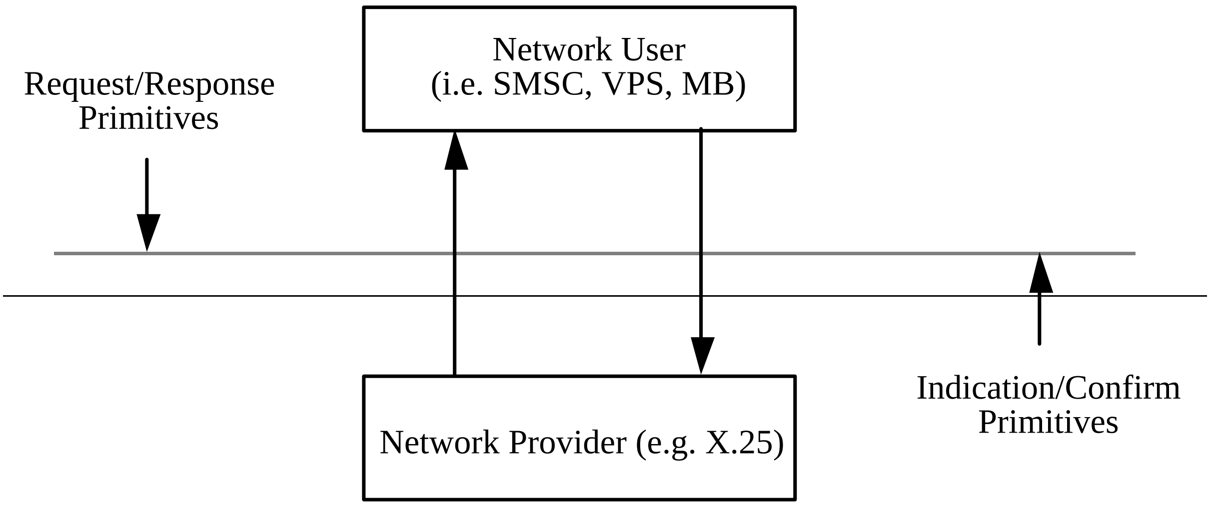
~~Where changes have occurred in the Interface Specification between versions, the "interface_version" provided in the "Bind" primitive is used to discriminate between version numbers for backward compatibility.~~

~~A.3 Interface Specification~~

~~The interface between the SMSC and ESME may be based on X.25, or TCP/IP. For details of a particular implementation refer to the SMPP Applications Guide [9].~~

~~The interface between the SMSC and the ESMEs regardless of the underlying network type will be a client -server model, in which, the SMSC has the server role and the ESME the client role. In the remainder of the present document, “client” is referred to the system that initiates a connection and “server” is referred to the system that services a connection.~~

~~NOTE: This annex specifies the interface at the network layer. However, this interface may be implemented over the transport layer. Figure A.2 provides a perspective on the scope of this annex:~~



~~Figure A.2: Model of SMSC-ESME Interface~~

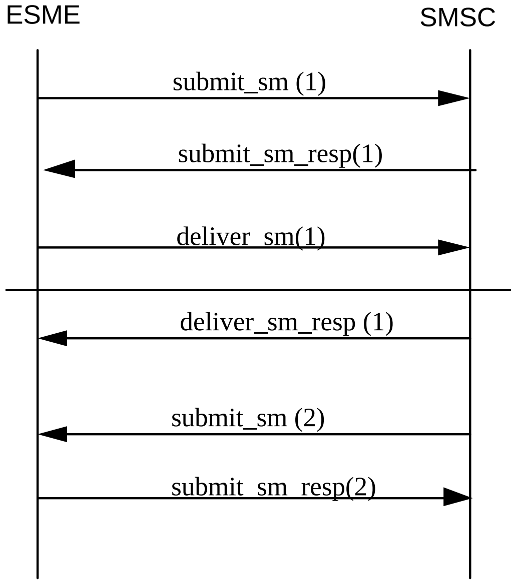
~~A.4 Protocol Messages~~

~~All messages sent, either ESME to SMSC, or SMSC to ESME, will generate an immediate response.~~

~~As previously mentioned, a message submitted from an ESME to SMSC can generate up to two responses. These are:~~

- ~~an application level “resp”, and~~
- ~~Where the message was submitted to the SMSC with the registered delivery flag set, a status report generated after the submitted short message reaches its final state.~~

~~Figure A.3 depicts a possible sequence of these messages (e.g for an X.25 or TCP/IP based implementation).~~



~~Figure A.3: Sample Message Sequence~~

~~For details of ESME/SMSC protocol message sequences refer to the SMPP Applications Guide [9].~~

~~A.5 Use of Primitives~~

~~This clause describes an overview of the mechanism for exchange of primitives between the ESME and SMSC. For details for a particular network implementation, such as X.25 or TCP/IP, see the SMPP Applications guide [9].~~

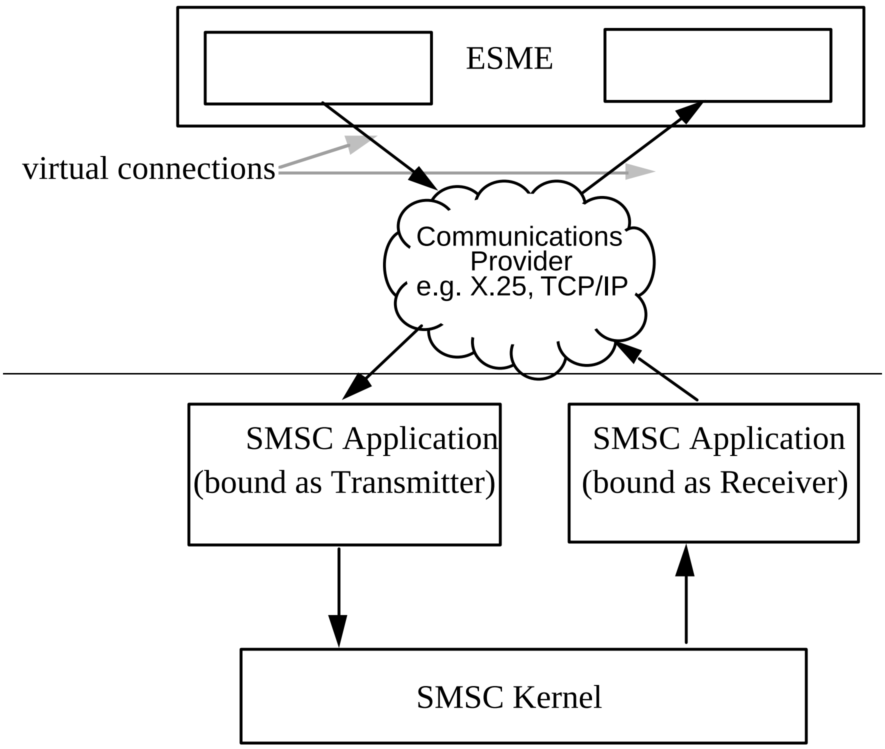
~~A.5.1 Initiation of Communication with SMSC~~

~~The ESME establishes communication with the SMSC, by an implementation specific mechanism (see SMPP Applications guide [9]).~~

~~Two ‘virtual connections’ are required. One will be used for messages originating in the ESME system, and the response messages for them. (e.g. submit_sm, query_sm, cancel_sm etc.), while the other will be used for messages originating in the SMSC and their responses (e.g. deliver_sm).~~

~~Once a ‘virtual connection’ has been established, each of the two processes on the ESME should send either a Bind-Transmitter request or a Bind-Receiver request. If a Bind Transmitter request is sent, the process on the SMSC that receives it will receive messages originating in the ESME system. If a Bind Receiver request is sent, the process on the SMSC that receives it will forward messages to the ESME. Responses will invariably be returned on the same ‘virtual connection’ as the corresponding request messages.~~

~~Figure A.4 illustrates this :~~



~~Figure A.4: ESME/SMSC Communication~~

~~A.5.2 Steady-State Communication with the SMSC~~

~~Once a connection has been established and an authenticated 'bind' request has been acknowledged, further requests/responses can be exchanged. A response will be issued for each request.~~

~~A.5.3 Terminating Communication with the SMSC~~

~~If, at any time, either the ESME or the SMSC needs to terminate communications with the other, it should issue an "unbind" request over the appropriate 'virtual connection'. This enables the receiving system to break communications in an orderly fashion. For both 'virtual connections', the unbind request should be acknowledged by the receiving system before the 'virtual connection' is closed.~~

~~A.5.4 Error Handling and Retransmission~~

~~On receipt of a message the receiving system will ensure that the message type is valid, and then check, where appropriate, the validity of the fields of the message body. If the message type or the values of the fields are incorrect an error code indicating this will be returned in the response message to the originator. A table of error and status codes can be found in Section A.7.1~~

~~Should an error be generated by the underlying communication network or the application being used on the host machine it is the responsibility of the sender of the message to retransmit to the destination. The originator should maintain a retry count and when this limit has been reached on a single message attempt the circuit should be closed. The ESME should attempt to re-connect. The re-connect method will be the same as the start-up protocol.~~

~~The Sequence number in the message header should be generated by the EM. This number should be incremented monotonically with each new transaction. This field will be preserved by the receiving system and returned in the acknowledgement message. This allows for transaction mapping and the detection of duplicate messages.~~

~~A.5.5 Protocol Message Types~~

~~The following message types are supported by the SMPP. The "command id" field of the protocol message. is set to specify the particular message.~~

~~The detailed formats of these messages are defined in Section A.6.~~

~~A.5.5.1 ESME to SMSC~~

~~The following messages are sent from the ESME to the SMSC~~

~~Table A.1: Message Types from ESME to SMSC.~~

~~Command ID~~	~~Description~~
~~bind_receiver~~	~~This command is issued by the ESME to inform the SMSC that this ESME wishes to act as a Server~~
~~bind_transmitter~~	~~This command is issued by the ESME to inform the SMSC that this ESME wishes to act as a Client~~
~~unbind~~	~~This command is issued by the ESME to Inform the SMSC that this ESME wishes to terminate its activities.~~
~~submit_sm~~	~~This command is issued by the ESME to submit a short message to the SMSC for transmission to a specified subscriber.~~
~~deliver_sm_resp~~	~~This command is issued by the ESME to acknowledge the receipt of a deliver_sm.~~
~~query_sm~~	~~This command is issued by the ESME to query the status of a previously submitted Short Message.~~
~~cancel_sm~~	~~This command is issued by the ESME to cancel one or more outstanding short messages for a subscriber. The command may specify a particular message or all messages for a particular source and destination.~~
~~replace_sm~~	~~This command is issued by the ESME to replace an outstanding short message for a subscriber.~~
~~enquire_link~~	~~Enquires whether the ESME-SMSC session is functioning, and thereby provides a link confidence-check.~~
~~generic_nak~~	~~Generic response to a command for which the message header is invalid.~~

~~A.5.5.2 SMSC to ESME~~

~~The following messages are sent from the SMSC to the ESME.~~

~~Table A.2: Message Types from SMSC to ESME~~

~~Command ID~~	~~Description~~
~~bind_transmitter_resp~~	~~Response to “bind_transmitter”.~~ ~~Messages submitted with this command id will contain a status indicating success or failure of the corresponding “bind_transmitter”.~~
~~bind_receiver_resp~~	~~Response to “bind_receiver”.~~ ~~Messages submitted with this command id will include a status indicating success or failure of the corresponding “bind_receiver”.~~
~~unbind_resp~~	~~Response to “unbind”.~~ ~~Messages submitted with this command id will include a status indicating success or failure of the corresponding “unbind”.~~
~~submit_sm_resp~~	~~Response indicating that a short message has been accepted successfully or not. Messages submitted with this command id will include the status indicating success or failure of the corresponding “submit_sm”.~~
~~deliver_sm~~	~~This command is issued by the SMSC to submit a short message to the ESME for delivery. It may also be used to return a delivery receipt for a message which had been submitted with the delivery receipt flag set.~~
~~query_sm_resp~~	~~Response to “query_sm”.~~ ~~Messages submitted with this command id will include the status indicating success or failure of the corresponding “query_sm” in addition to data relating to the queried message.~~
~~cancel_sm_resp~~	~~Response to “replace_sm”.~~ ~~Messages submitted with this command id will include the status indicating success or failure of the corresponding “replace_sm”.~~
~~replace_sm_resp~~	~~Response to “replace_sm”.~~ ~~Messages submitted with this command id will include the status indicating success or failure of the corresponding “replace_sm”.~~
~~enquire_link_resp~~	~~Response to “enquire_link”.~~ ~~Messages submitted with this command id will include the status indicating success or failure of the corresponding “enquire_link”.~~
~~generic_nak~~	~~Generic response to a command for which the message header is invalid.~~

~~A.6 Message Layouts~~

~~The general format of all protocol messages exchanged between the ESME and the SMSC will consist of a message header followed by a message body.~~

~~A.6.1 Definitions~~

~~In the following descriptions the following definitions will be used:~~

~~Integer:~~ ~~a signed value with the defined number of bytes~~

~~NOTE: The bytes will always be transmitted MSB first.~~

~~C-Octet String:~~ ~~a series of ASCII characters terminated with the NUL character.~~

~~C- Octet String (Decimal):~~ ~~a series of ASCII characters terminated with the NUL character.~~

~~NOTE: The octet string should represent a sequence of decimal digits~~

~~C-Octet String (Hex):~~ ~~a series of ASCII characters terminated with the NUL character.~~

~~NOTE: The octet string should represent a sequence of hexadecimal digits~~

~~Where reference is made below to NULL settings of Octet-String fields this implies that the field consists of a single NUL character, i.e. an Octet encoded with value zero.~~

~~Where reference is made to NULL settings of Integer fields this implies that the field is unused and can be set to 0.~~

~~A.6.2 Message Header Format~~

~~Table A.3: Message Header Format~~

~~Element~~	~~Size bytes~~	~~Type~~	~~Description~~
~~Command Length~~	~~4~~	~~Integer~~	~~This field defines the total length of the packet including the length field.~~
~~Command ID~~	~~4~~	~~Integer~~	~~The field indicates the type of request to be invoked by this protocol message, e.g. 'submit_sm', 'query_sm' etc..~~ ~~A request command identifier will be allocated to each request primitive. The following range is reserved for these purposes: 0h to FFh.~~ ~~A response command identifier will be allocated to each response primitive. The following range is reserved for these purposes: 080000000h to 08000000FF~~ ~~(In general a response command identifier will be identical to the corresponding request command identifier, but with bit 31 set.)~~ ~~For details of the actual IDs see clause A.7.2.~~
~~Command Status~~	~~4~~	~~Integer~~	~~This field will indicate the success or failure of a request. This field is only relevant in the response message, so in the request message it should contain NULL.~~ ~~A list of exception codes is given in clause A.7.1.~~
~~Sequence No.~~	~~4~~	~~Integer~~	~~A sequence number allowing requests and responses to be associated. Allocation of this reference number is the responsibility of the originator, who should ensure that the number is monotonically increasing for each submitted request. The associated response packet must preserve this field.~~ ~~The range is 01h to 07FFFFFFFh~~
~~Optional Message Body~~	~~var.~~	~~mixed~~	~~A list of parameters corresponding to the Command type. These fields are detailed in clause A.6.3~~

~~A.6.2.1 "Generic_Nak" Command~~

~~This is a generic response to a command for which the message header is invalid.~~

~~A.6.2.1.1 "Generic_Nak" Syntax~~

~~Apart from setting the header fields, no other parameters are required in the data body.~~

~~A.6.3 Message Body Formats~~

~~A.6.3.1 "BIND" Operation~~

~~There are two variations of the Bind Command namely "bind_transmitter" and "bind_receiver". The Command ID setting specifies whether the Bind is the "bind_transmitter" or "bind_receiver" primitive.~~

~~The purpose of the Bind operation is to register an instance of an ESME with the SMSC system, and inform the SMSC that the sending SME wishes to use this virtual circuit for commands initiated by the SMSC. To this end the Bind must provide key information within the "message" field of the protocol message.~~

- ~~The **password** must match the SMSC administration password for the instance of the ESME.~~
- ~~The **system_id** and **system_type** provide a unique identification of the interface.~~

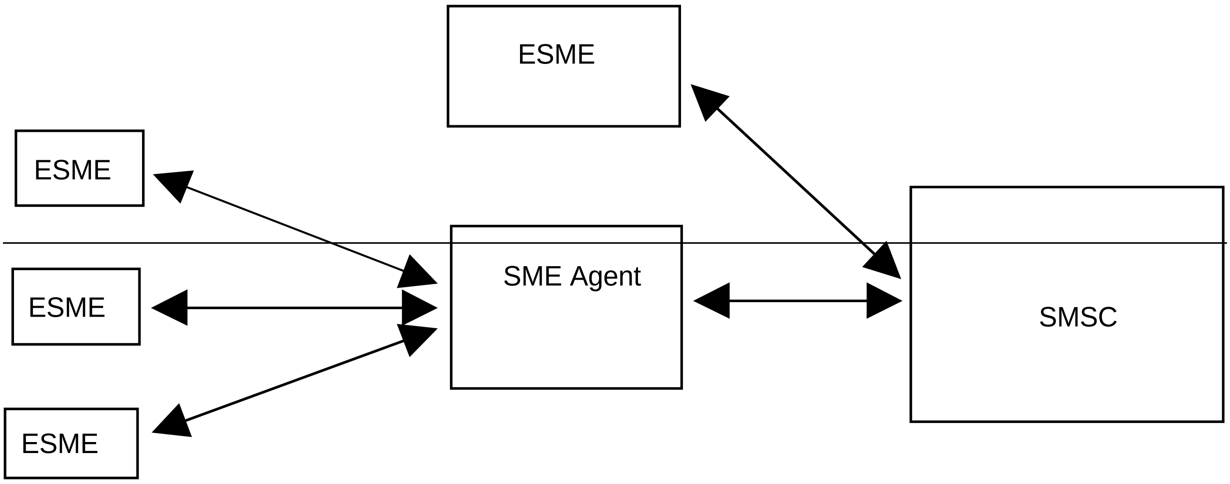
~~Associated with the interface is a unique default "callback address" which is configured via SMSC administration. The "callback address" is employed as the default source address, in cases where the actual ESME address is not supplied.~~

~~The interface may act as either an ESME in it's own right or as an agent for the transport of messages to or from other ESME's. (See figure 6-1).~~

~~In it's role as agent, the range of ESME addresses served by the interface is specified via a "regular expression" (See Note 2). This may be defined explicitly in the bind request or configured by SMSC administration.~~

~~NOTE 1: For the bind_transmitter the addr_ton, addr_npi and range of SME addresses (address_range) is not relevant and should be set to NULL.~~

~~NOTE 2: The "regular expression" in this context is a text pattern representing a range of addresses or a specific address. For further detail refer to the SMPP Application Guide[9].~~



~~**Figure A.5: ESME/SME address routing to/from SMSC**~~

~~A.6.3.1.1 "BIND_RECEIVER" Syntax~~

~~These parameters are included in the "message" field of the protocol message when the "command id" field is "bind_receiver".~~

~~Table A.4: Bind_Receiver Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~system_id~~	~~Var. Max 16~~	~~C-Octet String~~	~~Identifies the system requesting a bind to the SMSC. This variable length field may have leading spaces.~~
~~password~~	~~Var. Max 9~~	~~C-Octet String~~	~~The password is used for security purposes. This is a configurable attribute within the SMSC.~~
~~system_type~~	~~Var. Max 13~~	~~C-Octet String~~	~~Identifies the type of system requesting the bind. This may enable SMSC responses which are particular to a given type of ESME~~ ~~This variable length field may have leading spaces.~~
~~interface_version~~	~~1~~	~~Integer~~	~~Identifies the version number (major) of the interface to be implemented.~~
~~addr_ton~~	~~1~~	~~Integer~~	~~Type of Number for use in routing Delivery Receipts.~~ ~~(See GSM 03.40 [1] clause 9.1.2.5)~~ ~~Where not required this should be NULL.~~
~~addr_npi~~	~~1~~	~~Integer~~	~~Numbering Plan Identity for use in routing Delivery Receipts.~~ ~~(See GSM 03.40 [1] clause 9.1.2.5)~~ ~~Where not required this should be NULL.~~
~~address_range~~	~~Var. Max 41~~	~~C-Octet String~~	~~Address range for use in routing short messages and Delivery Receipts to an ESME.~~ ~~This variable length field may have leading spaces.~~ ~~Where not required this should be a single NULL byte.~~

~~A.6.3.1.2 "BIND_RECEIVER_RESP" Syntax~~

~~Apart from setting the header fields, the acknowledge message to a 'bind_receiver" requires only a single parameter.~~

~~Table A.5: Bind_Receiver_Resp Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~system_id~~	~~Var. Max 16~~	~~C-Octet String~~	~~Identifies the SMSC to the ESME requesting the bind.~~

~~A.6.3.1.3 "BIND_TRANSMITTER" Syntax~~

~~These parameters are included in the "message" field of the protocol message when the "command id" field is "bind_transmitter".~~

~~The Message layout is identical to the "bind_receiver" Message Layout except that the **addr_ton, addr_npi** and **the range of SME addresses**(address_range) are not relevant and should be set to NULL~~

~~A.6.3.1.4 "BIND_TRANSMITTER_RESP" Syntax~~

~~The Message layout is identical to the "bind_receiver_resp" Message Layout except that the "command id" field setting specifies "bind_transmitter_resp".~~

~~A.6.3.2 "UNBIND" Operation.~~

~~The purpose of the Unbind operation is to deregister an instance of an ESME from the SMSC system.~~

~~A.6.3.2.1 "UNBIND" Syntax~~

~~Apart from setting the header fields, no other parameters are required in the data body.~~

~~A.6.3.2.2 "UNBIND_RESP" Syntax~~

~~Apart from setting the header fields, no other parameters are required in the data body.~~

~~A.6.3.3 "SUBMIT_SM" Operation~~

~~This command is issued by the ESME to submit a short message to the SMSC for transmission to a specified subscriber.~~

~~When a real source address is provided in a registered submit_sm request, the source address can be used as the destination address for a delivery receipt. It can also be used in identifying the message source in a CDR. This source address must fall in the range of addresses associated with the bind command.~~

~~Where the originator of messages from the ESME is the ESME itself, or where the ESME does not have a real source address, the source address fields may be defaulted to NULL, and the source address will be taken from the SMSC administration "callback address" for the particular ESME instance.~~

~~The submit_sm operation can also be used to replace a short message which has previously been submitted. This is achieved by setting the replace_if_present_flag to 0x01 in the Interface. The first message found in the SMSC whose source and destination match those given in the submit_sm will have it's text replaced by the text in the short_message field of the submit_sm.~~

~~A.6.3.3.1 "SUBMIT_SM" Syntax~~

~~These parameters are included in the "message" field of the protocol message when the "command id" field is "submit_sm".~~

~~Table A.6: Submit_Sm Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~service_type~~	~~Var. Max 6~~	~~C-Octet String~~	~~Reserved for future use.~~ ~~This should be set to a single NULL byte.~~
~~source_addr_ton~~	~~1~~	~~Integer~~	~~Type of number for source.~~ ~~Where not required this should be NULL.~~ ~~(See GSM 03.40 [1] clause 9.1.2.5)~~
~~source_addr_npi~~	~~1~~	~~Integer~~	~~Numbering Plan Indicator for source~~ ~~Where not required this should be NULL.~~ ~~(See GSM 03.40 [1] clause 9.1.2.5)~~
~~source_addr~~	~~Var. Max 21~~	~~C-Octet String (Decimal)~~	~~Address of SME which originated this message.~~ ~~This is the source address of the short message submitted.~~ ~~This variable length field may have leading spaces~~ ~~Where not required this should be a single NULL byte~~
~~dest_addr_ton~~	~~1~~	~~Integer~~	~~Type of number for destination.~~ ~~Where not required this should be NULL~~ ~~(See GSM 03.40 [1] clause 9.1.2.5)~~
~~dest_addr_npi~~	~~1~~	~~Integer~~	~~for destination Where not required this should be NULL.~~ ~~(See GSM 03.40 [1] clause 9.1.2.5)~~

~~Table A.7: Submit_Sm Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~destination_addr~~	~~Var. Max 21~~	~~C-Octet String decimal~~	~~Destination address of this short message. For mobile terminated messages, this is the MSISDN address of the target subscriber.~~ ~~This variable length field may have leading spaces.~~ ~~Where not required this should be a single NULL byte.~~
~~esm_class~~	~~1~~	~~Integer~~	~~Indication of message type.~~ ~~For the submit_sm command this field is unused, and should be set to NULL.~~ ~~For the deliver_sm command however, this field may identify the message as a delivery receipt~~
~~protocol ID~~	~~1~~	~~Integer~~	~~GSM Protocol ID (See GSM 03.40 [1] clause 9.2.3.9)~~
~~priority_flag~~	~~1~~	~~Integer~~	~~Designates the message as priority. Setting priority on a message moves it to the top of the SMSC message queue for that subscriber.~~ ~~0 = non-priority (default)~~ ~~1 = priority~~ ~~>1=Reserved~~
~~schedule_delivery_time~~	~~17~~	~~C-Octet String~~	~~The absolute date and time at which delivery of this message must be attempted.~~ ~~The format is defined in clause A.7.5~~ ~~Where not required this should be a single NULL byte.~~
~~validity_period~~	~~17~~	~~C-Octet String~~	~~The expiration time of this message. This is specified as an absolute date and time of expiry.~~ ~~The format is defined in clause A.7.5~~ ~~Where not required this should be a single NULL byte.~~
~~registered_delivery_flag~~	~~1~~	~~Integer~~	~~Flag indicating if the message is a registered short message and thus if a Delivery Receipt is required upon the message attaining a final state.~~ ~~0=No receipt required (non-registered delivery).~~ ~~1=Receipt required (registered delivery)~~ ~~>1=Reserved~~
~~replace_if_present_flag~~	~~1~~	~~Integer~~	~~Flag indicating if submitted message should replace an existing message between the specified source and destination.~~ ~~0=Don't Replace (default)~~ ~~1=Replace~~ ~~>1=Reserved~~
~~data_coding~~	~~1~~	~~Integer~~	~~GSM Data-Coding-Scheme~~ ~~(See GSM 03.40 [1] clause 9.2.3.10)~~

~~Table A.8: Submit_Sm Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~sm_default_msg_id~~	~~1~~	~~Integer~~	~~Indicates the default short message to send, by providing an index into the table of Predefined Messages set up by the SMSC administrator.~~ ~~This should be set to NULL if a text message is being sent.~~ ~~Range is 0x01 to 0x64.~~ ~~(See SMPP Applications Guide [9] - Default Short Message).~~
~~sm_length~~	~~1~~	~~Integer~~	~~Length of the text of the message in bytes.~~
~~short_message~~	~~Var. Max 161~~	~~C-Octet String~~	~~Up to 160 bytes of data. This is the text that is transmitted to the mobile station.~~ ~~Note that only 'sm_length' bytes will be used.~~

~~A.6.3.3.2 SUBMIT_SM_RESP" Syntax~~

~~These parameters are included within the "message" field of the protocol message when the "message type" field is "submit_sm_resp".~~

~~Table A.9: Submit_Sm_Resp Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~Message_id~~	~~Var. Max 9~~	~~C-Octet String (Hex)~~	~~This field contains the message ID internal to the SMSC. It may be used at a later stage to query the status of a message, to replace a message, or match the original message to a corresponding delivery reeipt (deliver_sm) message.~~ ~~If absent this field must contain a single NULL byte.~~ ~~The SMSC will return a value for this field.~~

~~A.6.3.4 "DELIVER_SM" Operation~~

~~This is issued by the SMSC. Using this command, the SMSC may submit a short message to the ESME for delivery. It is also used to return a delivery receipt for a message which had been submitted with the delivery receipt flag set.~~

~~The values for destination address will depend on whether the ESME is the final destination of the short message, or merely routes the message to its final recipient (e.g. paging messages).~~

~~One should note that delivery receipts are returned to the originating SME using this command. In this instance of a deliver_sm command, the esm_class field will identify the message as a delivery receipt, and the required data relating to the original short message will be given in the message text field. (See SMPP Applications Guide [9] - Delivery Receipts).~~

~~A.6.3.4.1 "DELIVER_SM" Syntax~~

~~The parameters included within the "message" field of the protocol message when the "command id" field is "deliver_sm", are the same as for "submit_sm".~~

~~A.6.3.4.2 "DELIVER_SM_RESP" Syntax~~

~~The parameters included within the "message" field of the protocol message when the "command id" field is "**deliver_sm_resp**", are the same as for "**submit_sm_resp**".~~

~~A.6.3.5 "QUERY_SM" Operation~~

~~This Command is issued by the ESME to query the status of a previously submitted short message.~~

~~Where a message to be replaced was originally submitted with an individually identified SME source address, the originator address in the query_sm command must match. Where the original source address was defaulted to NULL, (i.e. the originator of messages from the ESME is the ESME itself, or the ESME does not have a real source address) then the originator address in the query_sm command should also be NULL, and the source address will be taken from the SMSC administration "callback address" for the particular ESME instance.~~

~~A.6.3.5.1 "QUERY_SM" Syntax~~

~~These parameters are included within the message" field of the protocol message when the message type is "query_sm".~~

~~Table A.10: Query_Sm Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~original_message_id~~	~~Var. Max 9~~	~~C-Octet String (Hex)~~	~~Message ID of the message whose state is to be queried.~~ ~~This must be the Message ID allocated to the original short message when submitted to the SMSC by the submit_sm command, and returned in the submit_sm_resp message by the SMSC.~~ ~~This variable length field may have leading spaces..~~
~~originating_ton~~	~~1~~	~~Integer~~	~~Type of Number of originator~~ ~~This is used for verification purposes, and must match that supplied in the corresponding 'submit_sm' request~~ ~~(See GSM 03.40 [1] clause 9.1.2.5)~~
~~originating_npi~~	~~1~~	~~Integer~~	~~Numbering Plan Identity of originator~~ ~~This is used for verification purposes, and must match that supplied in the corresponding 'submit_sm' request~~ ~~(See GSM 03.40 [1] clause 9.1.2.5)~~
~~originating_addr~~	~~Var. Max 21~~	~~C-Octet String (Decimal)~~	~~Address of originator~~ ~~This is used for verification purposes, and must match that supplied in the corresponding 'submit_sm' request~~

~~A.6.3.5.2 "QUERY_SM_RESP" Syntax~~

~~These parameters are included within the "message" field of the protocol message when the message type is "**query_sm_response**".~~

~~Table A.11: Query_Sm_Resp~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~original_message_id~~	~~Var. Max 9~~	~~C-Octet String (Hex)~~	~~Message ID of the message whose state is being queried.~~ ~~This must be the Message ID allocated to the original short message when submitted to the SMSC by the submit_sm command, and returned in the submit_sm_resp message by the SMSC.~~ ~~This variable length field may have leading spaces.~~
~~final_date~~	~~Var. Max 17~~	~~C-Octet String~~	~~Date and time when the submitted message reached the final state.~~ ~~For messages which have not yet reached a final state this field will contain a single NULL byte~~ ~~The date format is detailed in clause A.7.5.~~
~~message_status~~	~~1~~	~~Integer~~	~~Specifies the status of the SM.~~ ~~See clause A.7.4~~
~~GSM_code~~	~~1~~	~~Integer~~	~~Where appropriate this holds a GSM error code defining the reason for failure of message delivery.~~ ~~(See GSM 03.40 [1] clause 3.3)~~ ~~(Refer also to clause A.7.3)~~

~~A.6.3.6 "CANCEL_SM" Operation~~

~~This command is issued by the ESME to cancel one or more outstanding short messages. The command may specify a particular message, or all messages for a particular source and destination.~~

- ~~If the message ID is set to the ID of a previously submitted message, then provided the source and destination addresses supplied in the interface match, that message will be cancelled.~~

- ~~If the message ID is null all outstanding undelivered messages with the source and destination addresses given in the interface will be cancelled for the particular interface of the AIM. If the source address is set to NULL in the interface the source address will be taken from the SMSC administration "callback address" for the particular ESME instance.~~

- ~~A typical use of the command is to cancel outstanding undelivered VoiceMail Alert messages for a subscriber whose mailbox has just been directly accessed by the subscriber. The response (cancel_sm_resp) will indicate whether the message(s) had already been sent~~

~~A.6.3.6.1 "CANCEL_SM" Syntax~~

~~These parameters are included within the "message" field of the protocol message when the message type is "cancel_sm".~~

~~Table A.12: Cancel_Sm Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~service type~~	~~Var. Max 6~~	~~C-Octet String~~	~~Reserved for future use. This should be set to a single NULL byte.~~
~~original_message_id~~	~~Var. Max 9~~	~~C-Octet String (Hex)~~	~~Message ID of the message to be cancelled. This must be the Message ID allocated to the original short message when submitted to the SMSC by the submit_sm command, and returned in the submit_sm_resp message by the SMSC. This variable length field may have leading spaces.~~
~~source_addr_ton~~	~~1~~	~~Integer~~	~~Type of Number of originator. This is used for verification purposes, and must match that supplied in the corresponding '**submit_sm'** request. Where not required this should be NULL. (See GSM 03.40 [1] clause 9.1.2.5)~~
~~source_addr_npi~~	~~1~~	~~Integer~~	~~Numbering Plan Identity of originator. This is used for verification purposes, and must match that supplied in the corresponding 'submit_sm' request. Where not required this should be NULL. (See GSM 03.40 [1] clause 9.1.2.5)~~

~~Table A.13: Cancel_Sm Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~source_addr~~	~~Var. Max 21~~	~~C-Octet String (Decimal)~~	~~Source address of message(s) to be cancelled. This is used for verification purposes, and must match that supplied in the corresponding 'submit_sm' request This variable length field may have leading spaces.~~
~~dest_addr_ton~~	~~1~~	~~Integer~~	~~Type of number for destination. (See GSM 03.40 [1] clause 9.1.2.5)~~
~~dest_addr_npi~~	~~1~~	~~Integer~~	~~Numbering Plan Indicator for destination (See GSM 03.40 [1] clause 9.1.2.5)~~
~~destination_addr~~	~~Var. Max 21~~	~~C-Octet String (Decimal)~~	~~Destination address of message(s) to be cancelled. This is used for verification purposes, and must match that supplied in the corresponding 'submit_sm' request This variable length field may have leading spaces. Where not required this should be a single NULL byte.~~

~~A.6.3.6.2 "CANCEL_SM_RESP" Syntax~~

~~Apart from setting the header fields, no other parameters are required in the data body.~~

~~A.6.3.7 "REPLACE_SM" Operation~~

~~This command is issued by the ESME to replace an outstanding short message for a subscriber.~~

~~The message_id is set to the ID of a previously submitted message. Where a message to be replaced was originally submitted with an individually identified SME source address, the originator address in the replace_sm command must match. Where the original source address was defaulted to NULL, (i.e. the originator of messages from the ESME is the ESME itself, or the ESME does not have a real source address) then the originator address in the replace_sm command should also be NULL, and the source address will be taken from the SMSC administration "callback address" for the particular ESME instance.~~

~~A.6.3.7.1 "REPLACE_SM" Syntax~~

~~These parameters are included within the "message" field of the protocol message when the "command id" field is "replace_sm".~~

~~Table A.14: Replace_Sm Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~original_message_id~~	~~Var.~~ ~~Max 9~~	~~C-Octet String (Hex)~~	~~Message ID of the message to be replaced.~~ ~~This must be the Message ID allocated to the original short message when submitted to the SMSC by the submit_sm command, and returned in the submit_sm_resp message by the SMSC.~~ ~~This variable length field may have leading spaces~~
~~orig_addr_ton~~	~~1~~	~~Integer~~	~~Type of Number of originator.~~ ~~This is used for verification purposes, and must match that supplied in the corresponding 'submit_sm' request.~~ ~~Where not required this should be NULL~~
~~dest_addr_ton~~	~~1~~	~~Integer~~	~~Numbering Plan Identity of originator.~~ ~~This is used for verification purposes, and must match that supplied in the corresponding 'submit_sm' request~~ ~~Where not required this should be NULL~~
~~originating_addr~~	~~Var~~ ~~Max 21~~	~~ASCII~~	~~Originating address of the short message to be replaced. This is used for verification purposes, and must match that supplied in the corresponding 'submit_sm' request.~~ ~~This variable length field may have leading spaces.~~
~~schedule_delivery_time~~	~~17~~	~~C-Octet String~~	~~The absolute date and time at which delivery of this message must be attempted.~~ ~~Where not specified the original scheduled delivery time, if specified, will apply.~~ ~~The format is defined in clause A.7.5~~ ~~Where not required this should be a single NULL byte.~~

~~Table A.15: Replace_Sm Message Parameters~~

~~Field Name~~	~~Size (bytes)~~	~~Type~~	~~Description~~
~~validity_period~~	~~17~~	~~C-Octet String~~	~~The expiration time of this message. This is specified as an absolute date and time of expiry. Where not specified the original expiration time, if specified, will apply.~~ ~~The format is defined in clause A.7.5~~ ~~Where not required this should be a single NULL byte.~~
~~registered_delivery_flag~~	~~1~~	~~Integer~~	~~Flag indicating if the message is a registered short message and thus if a Delivery Receipt is required upon the message attaining a final state.~~ ~~(See SMPP Applications Guide [9] - Delivery Receipts)~~ ~~0=No receipt required (non-registered delivery).~~ ~~1=Receipt required (registered delivery)~~ ~~>1=Reserved~~
~~sm_default_msg_id~~	~~1~~	~~Integer~~	~~Indicates the default short message to send, by providing an index into the table of predefined messages set up by the SMSC administrator.~~ ~~This should be set to NULL if a text mesage is being sent.~~ ~~Range is 0x01 to 0x64~~ ~~(See SMPP Applications Guide [9] - Default Short Message).~~
~~sm_length~~	~~1~~	~~Integer~~	~~Length of the text of the message in bytes~~
~~short_message~~	~~Var. Max 161~~	~~C-Octet String~~	~~Up to 160 bytes of data. This is the text that is transmitted to the mobile station.~~ ~~This text, if specified will be used to replace the existing text for the originally submitted SM.~~ ~~(See SMPP Applications Guide [9] - Default Short Message).~~

~~A.6.3.7.2 "REPLACE_SM_RESP" Syntax~~

~~Apart from setting the header fields, no other parameters are required in the data body.~~

~~A.6.3.8 "ENQUIRE_LINK" Operation~~

~~This message is used to provide a confidence-check of the communication path between ESME and the SMSC. On receipt of this request the SMSC will simply respond with an enquire_link_resp, thus verifying that the application level connection between ESME and SMSC is functioning.~~

~~A.6.3.8.1 "ENQUIRE_LINK" Syntax~~

~~Apart from setting the header fields, no other parameters are required in the data body.~~

~~A.6.3.8.2 "ENQUIRE_LINK_RESP" Syntax~~

~~Apart from setting the header fields, no other parameters are required in the data body.~~

~~A.7 System Definitions~~

~~The following sections define the various system codes for Command-ID's and Error Codes.~~

~~NOTE: For ease of maintenance a 'C' include file is available which defines the actual values for these definitions.~~

~~A.7.1 Error Codes~~

~~The following are a list of error codes that can be returned in the status field of a message.~~

~~Table A.16: Error Codes~~

~~Error Code~~	~~Description~~
~~ESME_ROK~~	~~Ok - Message Acceptable~~
~~ESME_RINVMSGLEN~~	~~Invalid Message Length~~
~~ESME_RINVCMDLEN~~	~~Invalid Command Length~~
~~ESME_RINVCMDID~~	~~Invalid Command ID~~
~~ESME_RINVBNDSTS~~	~~Invalid bind status~~
~~ESME_RALYBND~~	~~Bind attempted when already bound~~
~~ESME_RINVPRTFLG~~	~~Invalid priority flag~~
~~ESME_RINVREGDLVFLG~~	~~Invalid registered-delivery flag~~
~~ESME_RSYSERR~~	~~SMSC system error~~
~~ESME_RINVPAR~~	~~Invalid parameter~~
~~ESME_RINVSRCADR~~	~~Invalid source address~~
~~ESME_RINVDSTADR~~	~~Invalid destination address~~
~~ESME_RINVMSGID~~	~~Invalid message-id~~
~~ESME_RINVPASWD~~	~~Invalid password~~
~~ESME_RINVPASWDLEN~~	~~Invalid password length~~
~~ESME_RINVSYSIDSRV~~	~~Invalid System-ID~~
~~ESME_RCNTCANMSG~~	~~Cannot cancel a message~~
~~ESME_RINVDATFMT~~	~~Invalid date format~~
~~ESME_RCNTREPMSG~~	~~Cannot replace a message~~
~~ESME_RMSGQFUL~~	~~Too many messages in queue, at present~~
~~ESME_RSERNOTSUP~~	~~Service not supported~~
~~ESME_RINVREPADDR~~	~~Address Mismatch in Replacement attempt~~
~~ESME_RUNKNOWNERR~~	~~Unknown Error~~

~~A.7.2 Command I.D. Values~~

~~The following is a list of the command ids and their associated values.~~

~~Table A.17: Command ID Values~~

~~Command ID Code~~	~~Command ID~~	~~Description~~
~~ESME_BNDRCV~~	~~bind_receiver~~	~~Bind to SMSC Kernel as a receiver~~
~~ESME_BNDRCV_RESP~~	~~bind_receiver_resp~~	~~Response to bind_receiver~~
~~ESME_BNDTRN~~	~~bind_transmitter~~	~~Bind to SMSC Kernel as transmitter~~
~~ESME_BNDTRN_RESP~~	~~bind_transmitrer_resp~~	~~Response to bind_transmitter~~
~~ESME_UBD~~	~~unbind~~	~~Unbind from SMSC Kernel~~
~~ESME_UBD_RESP~~	~~unbind_resp~~	~~Response to unbind~~
~~ESME_SUB_SM~~	~~submit_sm~~	~~Submit a short-message~~
~~ESME_SUB_SM_RESP~~	~~submit_sm_resp~~	~~Response to submit_sm~~
~~SMSC_DELIVER_SM~~	~~deliver_sm~~	~~Submit a short-message to ESME~~
~~SMSC_DELIVER_SM_RESP~~	~~deliver_sm_resp~~	~~Response to deliver_sm~~
~~ESME_QUERY_SM~~	~~query_sm~~	~~Query status of a short-message~~
~~ESME_QUERY_SM_RESP~~	~~query_sm_resp~~	~~Response to query_sm~~
~~ESME_CANCEL_SM~~	~~cancel_sm~~	~~Cancel a short message(s)~~
~~ESME_CANCEL_SM_RESP~~	~~cancel_sm_resp~~	~~Response to cancel_sm~~
~~ESME_REPLACE_SM~~	~~replace_sm~~	~~Replace a short message~~
~~ESME_REPLACE_SM_RESP~~	~~replace_sm_resp~~	~~Response to replace_sm~~
~~ESME_QRYLINK~~	~~enquire_link~~	~~Link confidence check~~
~~ESME_QRYLINK_RESP~~	~~enquire_link_resp~~	~~Response to enquire_link~~
~~ESME_NACK~~	~~nack~~	~~Negative Acknowledgement~~

~~A.7.3 GSM Error Codes~~

~~Where the message is submitted to the SMSC with the registered delivery flag set, a status report is generated after the submitted short message reaches it final state.The following is a list of the GSM error codes (See GSM 03.40 [1] clause 3.3) and their associated descriptions returned in the delivery receipt:~~

~~Table A.18: GSM Error Codes~~

~~Error Code~~	~~Description~~
~~ERROR_NONE~~	~~No error code given~~
~~P_UNKNOWN~~	~~unknown subscriber~~
~~P_PROVISION~~	~~Not Provisioned~~
~~T_BARRED~~	~~Call barred~~
~~T_SUPPORT~~	~~Facility not supported~~
~~T_ABSENT~~	~~Absent Subscriber~~
~~T_MSSUPPORT~~	~~SMS not supported by MS~~
~~T_MSERROR~~	~~Error in MS receiving message~~
~~P_ILLEGAL_SUB~~	~~Illegal Subscriber~~
~~P_ILLEGAL_EQUIP~~	~~Illegal Equipment~~
~~T_SYSTEM~~	~~System Failure~~
~~T_MEMCAP~~	~~Memory capacity exceeded~~

~~A.7.4 Message States~~

~~The following is a list of the states that a short message may achieve.~~

~~Table 19: Message States~~

~~Message State~~	~~Description~~
~~EN_ROUTE~~	~~Message is enroute~~
~~DELIVERED~~	~~Message in delivered state~~
~~EXPIRED~~	~~Messsage validity period has expired~~
~~DELETED~~	~~Message has been deleted~~
~~UNDELIVERABLE~~	~~Message is undeliverable~~
~~ACCEPTED~~	~~Message is in accepted state~~
~~INVALID~~	~~Message is in invalid state~~

~~A.7.5 Time Format~~

~~Time and Date fields are represented in a format similar to that specified in GSM 03.40 [1] clause 9.2.3.11. In this interface all time/date related fields will be in ASCII with the following format:~~
~~"YYMMDDhhmmsstnnp" where~~

~~'YY'~~	~~last two digits of the year (00-99)~~
~~'MM'~~	~~month (01-12)~~
~~'DD'~~	~~day (01-31)~~
~~'hh'~~	~~hour (00-23)~~
~~'mm'~~	~~minute (00-59)~~
~~'ss'~~	~~second (00-59)~~
~~'t'~~	~~tenths of second (0-9)~~
~~'nn'~~	~~Time difference in quarter hours between local time (as expressed in the first 13 bytes) and UTC (Universal Time Constant) time (00-48).~~
~~'p' - "+"~~	~~Local time is nn quarter hours advanced in relation to UTC time.~~
~~"-"~~	~~Local time is nn quarter hours retarded in relation to UTC time.~~

~~NOTE: Where responses are reported by the SMSC the local time of the SMSC will be given, and the format will be "YYMMDDhhmmss", with the same definitions as above.~~

~~Annex B:~~
~~Short Message Service Centre External Machine Interface~~

~~This annex describes the interface used between the SMSC System and other computer systems and applications. The interface is based on the ERMES UCP (Universal Computer Protocol) with some SMSC-specific extensions.~~

~~Throughout this annex the interface is called 'EMI': External Machine Interface.~~

~~Annex structure~~

~~This annex is structured as follows:~~

- ~~Clause B.1 contains the introduction to the EMI. It describes the position of the EMI between the SMSC components and the external machines.~~
- ~~Clause B.2 shows the structure of EMI messages and provides examples of valid exchanges of commands between the SMSC and the applications.~~
- ~~Clause B.3 defines the EMI operations, and describes briefly the actions that are expected from the SMSC and the Application upon reception of the commands (these are further detailed in the respective design documents).~~
- ~~Clause B.4 shows the syntax of EMI command messages.~~
- ~~Clause B.5 shows the syntax of the 50-series of EMI command messages.~~
- ~~Clause B.6 summarizes the error codes for the EMI operations.~~

~~B.1 Introduction~~

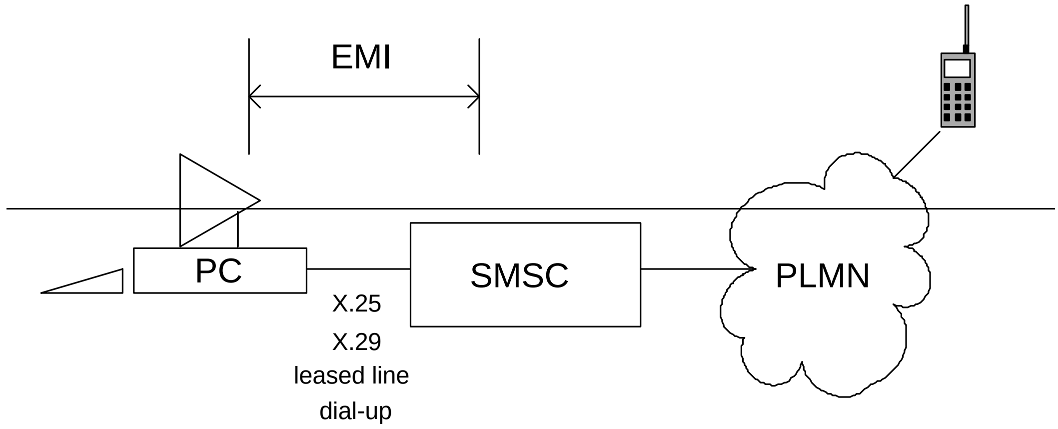
~~For submission and reception of Short Messages the Short Message Service Centre can interface with (among others):~~

- ~~GSM Mobile Telephones (PLMN),~~
- ~~Interactive Voice Response systems,~~
- ~~Voice Messaging systems,~~
- ~~a MENU application accessed from PC's through terminal emulation,~~
- ~~dedicated PC applications.~~

~~NOTE: Throughout this annex the External Machine will be referred to as 'SME' or 'PC'. For the latter, it can of course be any application system.~~

~~In order to allow any service provider to develop dedicated applications, an interface was developed to access SMSC functions. This manual describes that interface.~~

~~B.1.1 Position of interface~~



~~Figure B.1: EMI: External view~~

~~When viewed from the PC side, the EMI provides access to the SMSC functions:~~

- ~~Submission of Short Messages~~
- ~~Reception of Short Messages~~
- ~~Reception of Notifications~~

~~The SMSC can be viewed as a Black Box: Short Messages are directed to the GSM mobile telephone of the recipient. The SMSC and the PLMN only function as relay mechanisms for those Messages. The only visible action of the SMSC apart from this, is the provision of Notifications: upon request the SMSC will notify the originator of the SM regarding the status of the SM.~~

~~EMI can use the following lower level protocols as a carrier:~~

- ~~X.25~~
- ~~X.29~~
- ~~PSTNa (analog modem lines)~~
- ~~ISDN~~
- ~~tcp/ip~~
- ~~other on request~~

~~The set-up of the connection between the SMSC Platform and the PC depends on the carrier used. Once the connection is established, the EMI operations can be used.~~

~~B.1.2 Interface history~~

~~The SMSC External Machine Interface (EMI) is based on an extended subset of the UCP protocol defined for the ERMES paging system in ETS 300 133-3 [3]. When referring to 'UCP' in the context of the SMSC, almost always the EMI, the extended subset of the ERMES UCP, is meant.~~

In the SMSC the UCP protocol was chosen as the basis for the EMI because

1) the first operators that used the SMSC required to use the UCP protocol to interact with external machines.

2) it allows service providers to use a single mechanism to interface to both ERMES based paging systems and the SMSC.

3) no re-invention of 'yet another' protocol had to take place.

In order to provide access to the more extensive set of SMS commands, it was necessary to extend the UCP definition with some additional, SMSC specific commands, such as 'SMS message transfer operation' and 'SMT alert operation'

B.2 Structure of EMI Messages

In the ERMES/UCP-based EMI protocol, the message structure is as follows:

- stx <header> / <data> / <checksum> etx
  - stx = 02(hex)
  - etx = 03(hex)

NOTE that in the examples 'stx', 'etx' and '/' each represent only one character.

As separator between header and data, between data and checksum, as well as between parameters, a '/' (2F(hex)) is used.

In parameters that contain a list, the items are separated by a ',' (2C(hex)). Numeric characters (0..F) are encoded as in IA5. Alphanumeric characters are encoded as two numeric IA5 characters, the higher 3 bits (0..7) first, the lower 4 bits (0..F) thereafter.

The <**header**> consists of the following 4 mandatory fields:

Table B.1: <header> mandatory fields

Parameter	**Type**	**Description**
TRN	2 num. char.	Transaction reference number, right justified with leading zero
LEN	5 num. char.	Total number of IA5 characters contained between stx and etx, right justified with leading zeros.
O/R	Char 'O' or 'R'	'O' indicates operation, 'R' indicates result
OT	2 num. char.	Operation Type (see list in Clause B.3).

The <**data**> fields depend on the Operation Type. For each Operation Type they are listed in the next chapters.

The <**checksum**> is derived by the addition of all bytes of the header, data field separators and data fields (i.e. all characters after the stx-character, up to and including the last '/' before the checksum field). The 8 Least Significant Bits (LSB) of the result is then represented as two printable characters. The character containing 4 Most Significant Bits (MSB) (of those 8 LSB) shall be transmitted first. For example, if the checksum is 3A(hex) the representation shall be the characters '3' (33(hex)) and 'A' (41(hex)).

B.2.1 Examples

Below you will find examples of the SMS message transfer operation and responses. The message sent is "hello":

stx01/00045/O/30/66677789///1//////68656C6C6F/CEetx

stx01/00041/R/30/A//66677789:180594141236/F3etx

stx01/00052/O/30/66677789///1/558/0138////68656C6C6F/3Aetx

stx01/00041/R/30/A//66677789:180594141430/EFetx

~~In the acknowledgement, the 'system message' parameter is used to indicate the recipient address and timestamp. Note that the 'Authentication Code' parameter is not used. The Notification requested in the first example will be sent to the originator of the short message, only as long as this session exists.~~

~~B.3 EMI COMMANDS~~

~~EMI commands can be initiated either from the PC, or from the SMSC. Each command will lead to an action on the other side. The other side will respond with a positive or negative acknowledgement. During the handling of commands, no other commands shall be sent; i.e. the SMSC does not support 'windowing'. Any command received in such time will be discarded.~~

~~B.3.1 Application initiated commands~~

~~The following PC initiated operations are available:~~

~~Table B.2: PC initiated operations~~

~~Command id~~	~~Command Name~~
~~01~~	~~Call input operation~~
~~02~~	~~Multiple address call input operation~~
~~03~~	~~Call input with supplementary services operation~~
~~30~~	~~SMS message transfer operation~~
~~31~~	~~SMT alert operation~~
~~32~~	~~(reserved)~~
~~33~~	~~(reserved)~~
~~40~~	~~(reserved)~~
~~41~~	~~(reserved)~~
~~5x~~	~~50-series, see Clause B.5~~

~~The definitions of operations '01', '02' and '03' are identical to the corresponding operations defined in GSM 03.40 [1].~~

~~The 'Call input operation' is the normal means of submitting a Short Message. The SMSC must, when it receives this command, send the message to the recipient address that is specified in the command.~~

~~The 'Multiple address call input operation' is used to address a number of recipients in one operation. The command contains a list of recipient addresses. The SMSC will send the same message to all addresses in this list.~~

~~The 'Call input with supplementary services operation' is used when a message is to be scheduled for deferred delivery.~~

~~The 'SMS message transfer operation' is used to submit a message when SMSC specific services are required, such as notification request, deferred delivery, or validity period.~~

~~The 'SMT alert operation' can be used by the application to alert the SMSC to send messages and notifications to the application. It can only be used when the application uses a connection that supports Calling Line Identification, such as X.25.~~

~~B.3.2 SMSC initiated commands~~

~~SMSC initiated operations (used to deliver Notifications or Mobile Originated Short Messages) are:~~

~~Table B.3: SMSC initiated operations~~

~~Command id~~	~~Command Name~~
~~01~~	~~Call input operation~~
~~34~~	~~(reserved)~~
~~36~~	~~(reserved)~~
~~38~~	~~(reserved)~~
~~42~~	~~(reserved)~~
~~43~~	~~(reserved)~~
~~5x~~	~~50-series, see Clause B.5~~

~~The SMSC uses the 'Call input operation' to transfer Notifications and Mobile Originated Short Messages to the PC (Short Message Terminal). The initiative to do so lies either with the SMSC (Notifications on messages submitted in the current session) or with the PC (the SMT has to issue an SMT alert command).~~

~~B.4 EMI Commands Syntax~~

~~This clause shows the syntax of the data fields of the EMI commands. For the syntax of the complete messages, please refer to Clause B.2, Structure of EMI messages. For each command also the format of the positive and negative responses is given, including the possible error codes. For convenience, all error codes are summarized in Clause B.6, Error Codes Overview. The order in which the commands are listed is:~~

1) ~~general commands, used for normal SM transfer.~~

2) ~~SMSC specific extensions, used to address SMS functions not foreseen in the UCP definition.~~

~~In the column marked 'Presence', 'M' indicates that the field is Mandatory, and 'O' indicates that it is Optional.~~

~~B.4.1 Address syntax~~

~~For all addresses used in the EMI-messages the following syntax rules are valid:~~

~~In the case the national prefix is used in the network the following syntax is seen as valid addresses:~~

~~<trunk-prefix><trunk-code><telephone-nr>~~

~~<int-prefix><country-code><trunk-code><telephone-nr>~~

~~<+><country-code><trunk-code><telephone-nr> (This format may only be used on Mobile Stations.)~~

~~In case the national prefix is not used in the network, the following syntax is seen as valid addresses (in these situations, a valid telephone number will be recognized by its length):~~

~~<int-prefix><country-code><telephone-nr>~~

~~<telephone-nr>~~

~~<+><country-code><telephone-nr> (This format may only be used on Mobile Stations.)~~

~~B.4.2 Call input operation - 01~~

~~This operation can be used by the PC to submit a message to the SMSC. This operation is also used by the SMSC to deliver Short Messages and Notifications to a PC user. The following list shows the parameters in the operation data field:~~

~~Table B.4: Parameters in the operation data field~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~AdC~~	~~String of num. char.~~	~~M~~	~~Address code recipient, maximum length is 16 digits.~~
~~OAdC~~	~~String of num. char.~~	~~O~~	~~Address code originator, maximum length is 16 digits.~~
~~AC~~	~~String of char.~~	~~O~~	~~Authentication code originator.~~
~~MT~~	~~1 numeric character~~	~~M~~	~~Message type. Associated parameters depend on the value of the message type.~~
~~MT=1:~~			~~Tone only: No additional parameters used.~~
~~MT=2:~~ ~~NMsg~~	~~String of char.~~	~~O~~	~~Numeric message.~~
~~MT=3:~~ ~~AMsg~~	~~String of char.~~	~~O~~	~~Alphanumeric message.~~
~~MT=4:~~ ~~NB~~	~~String of num. char.~~	~~M~~	~~No. of bits in Transparant Data (TD) message.~~
~~TMsg~~	~~String of char.~~	~~O~~	~~TD message encoded into IA5 characters.~~

- ~~The AC parameter is ignored if present.~~

~~B.4.2.1 Call input operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.5:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The SM parameter contains the following three fields:~~

~~Table B.6:~~

~~SM Parameter~~	~~Type~~	~~Description~~
~~AdC~~	~~String of num. char.~~	~~Address code recipient, maximum length is 16 digits.~~
~~SEP~~	~~char ':'~~	~~Separator~~
~~SCTS~~	~~String of 12 num char.~~	~~Service Centre time-stamp DDMMYYhhmmss~~

~~When the SMSC initiates this operation, the contents of the SM parameter will be discarded.~~

~~B.4.2.2 Call input operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.7:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 num. char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The following error codes can be returned in the operation negative result:~~

~~01 Checksum error~~

~~02 Syntax error~~

~~04 Operation not allowed (at this point in time)~~

~~05 Call barring active~~

~~06 AdC invalid~~

~~07 Authentication failure~~

~~08 Legitimisation code for all calls, failure~~

~~24 Message too long~~

~~26 Message type not valid for the pager type~~

~~B.4.3 Multiple address call input operation - 02~~

~~This message can be used by the PC to submit a message to the SMSC. With this operation a list of recipients of the message may be specified thus reducing the traffic between the SMSC and the PC. The following list shows the parameters in the operation data field:~~

~~Table B.8:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NPL~~	~~String of num. char.~~	~~M~~	~~Number of parameters in the following RAd:s list.~~
~~RAd:s~~	~~String of num. char.~~	~~M~~	~~List of parameters: Each parameter consists of AdC Address code recipient, maximum length is 16 digits with optional legitimisation code for all calls.~~
~~OAdC~~	~~String of num. char.~~	~~O~~	~~Address code originator, maximum length is 16 digits.~~
~~AC~~	~~String of char.~~	~~O~~	~~Authentication code originator.~~
~~MT~~	~~1 numeric char.~~	~~M~~	~~Message type. Associated parameters depend on the value of the message type.~~
~~MT=1:~~			~~Tone only: No additional parameters used.~~
~~MT=2:~~ ~~NMsg~~	 ~~String of char.~~	 ~~O~~	 ~~Numeric message.~~
~~MT=3:~~ ~~AMsg~~	 ~~String of char.~~	 ~~O~~	 ~~Alphanumeric message.~~
~~MT=4:~~ ~~NB~~ ~~TMsg~~	 ~~String of num. char.~~ ~~String of char.~~	 ~~M~~ ~~O~~	 ~~No. of bits in Transparan Data (TD) message.~~ ~~TD message encoded into IA5 characters.~~
~~MT=5:~~ ~~PNC~~ ~~LNo~~ ~~LST~~ ~~TNo~~	 ~~Char 'H' or char 'I'~~ ~~String of num. char.~~ ~~String of num. char.~~ ~~String of num. char.~~	 ~~O~~ ~~O~~ ~~O~~ ~~O~~	 ~~Definition of the PNC from which the standard text shall be chosen. Char 'H' represents PNC-H; char 'I' represents PNC-I.~~ ~~Standard text list number requested by the calling party.~~ ~~Legitimisation code for standard text.~~ ~~Standard text number requested by the calling party.~~

- ~~The NPL parameter must range from 1 to 20 thus limiting the length of the RAd:s list to 20. An IW also contains the DEST_MAX parameter. The NPL must also have a value less than or equal to this parameter.~~

- ~~The RAd:s is a list of NPL RAd fields. A RAd field contains an address and optionally a legitimisation code. If the legitimisation code is present it is separated from the address by a comma ",". If the legitimisation code is not present the comma may be omitted. If present the legitimisation code is discarded by the IW.~~

- ~~The AC parameter is ignored if present.~~

- ~~Currently the PC interworking needs to support MT=2 and MT=3. The parameters for MT=5 are essential if the Message Type (MT) defined is standard text.~~

~~B.4.3.1 Multiple address call input operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.9:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The SM field contains the following three fields:~~

~~Table B.10:~~

~~SM Parameter~~	~~Type~~	~~Description~~
~~AdC~~	~~String of num. char.~~	~~Address code recipient, maximum length is 16 digits.~~
~~SEP~~	~~char ':'~~	~~Separator~~
~~SCTS~~		~~String of 12 nem. char. Service Centre time-stamp DDMMYYhhmmss~~

~~Since the operation allows for a maximum of 20 addresses to be provided the positive result may also contain a maximum of 20 address:time-stamp combinations.~~

~~If some of the addresses are invalid, and some are valid, the invalid addresses can be recognized by the absence of the timestamp field. If all addresses are invalid, a negative result is returned.~~

~~B.4.3.2 Multiple address call input operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.11:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 numeric char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The following error codes can be returned in the operation negative result:~~

~~01 Checksum error~~

~~02 Syntax error~~

~~04 Operation not allowed (at this point in time)~~

~~05 Call barring active~~

~~06 AdC invalid~~

~~07 Authentication failure~~

~~08 Legitimisation code for all calls, failure~~

~~23 Message type not supported by system~~

~~24 Message too long~~

~~26 Message type not valid for the pager type~~

~~B.4.4 Call input with supplementary services operation - 03~~

~~This operation can be used by the PC to submit a Short message to the SMSC. The following list shows the parameters in the operation data field:~~

~~Table B.12:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~RAd~~	~~String of num. char.~~	~~M~~	~~AdC Address code recipient, maximum length is 16 digits, combined with optional legitimisation code for all calls.~~
~~OAdC~~	~~String of num. char.~~	~~O~~	~~Address code originator, maximum length is 16 digits.~~
~~AC~~	~~String of char.~~	~~O~~	~~Authentication code originator.~~
~~NPL~~	~~String of num. char.~~	~~M~~	~~Number of parameters in the following GA:s list.~~
~~GA:s~~	~~String of char.~~	~~O~~	~~List of additional GA:s requested by the calling party.~~
~~RP~~	~~Char '1'~~	~~O~~	~~Repetition requested.~~
~~PR~~	~~Char '1' or char '3'~~	~~O~~	~~Priority request 1 or 3.~~
~~LPR~~	~~String of num. char.~~	~~O~~	~~Legitimisation code for priority requested.~~
~~UR~~	~~Char '1'~~	~~O~~	~~Urgent message indicator request.~~
~~LUR~~	~~String of num. char.~~	~~O~~	~~Legitimisation code for urgent message.~~
~~RC~~	~~Char '1'~~	~~O~~	~~Reverse charging request.~~
~~LRC~~	~~String of num. char.~~	~~O~~	~~Legitimisation code for reverse charging~~
~~DD~~	~~Char '1'~~	~~O~~	~~Deferred delivery request.~~
~~DDT~~	~~10 num. char.~~	~~O~~	~~Deferred delivery time DDMMYYHHmm~~
~~MT~~	~~1 numeric char.~~	~~M~~	~~Message type. Associated parameters depend on the value of the message type.~~
~~MT=1:~~			~~Tone only: No additional parameters used.~~
~~MT=2:~~ ~~- NMsg~~	 ~~String of char.~~	 ~~O~~	 ~~Numeric message.~~
~~MT=3:~~ ~~- AMsg~~	 ~~String of char.~~	 ~~O~~	 ~~Alphanumeric message.~~
~~MT=4:~~ ~~- NB~~ ~~- TMsg~~	 ~~String of num. char.~~ ~~String of char.~~	 ~~M~~ ~~O~~	 ~~No. of bits in Transparant Data (TD) message.~~ ~~TD message encoded into IA5 characters.~~
~~MT=5:~~ ~~- PNC~~ ~~- LNo~~ ~~- LST~~ ~~- TNo~~	 ~~Char 'H' or 'I'~~ ~~String of num. char.~~ ~~String of num. char.~~ ~~String of num. char.~~	 ~~O~~ ~~O~~ ~~O~~ ~~O~~	 ~~Definition of the PNC from which the standard text shall be chosen. Char 'H' represents PNC-H; char 'I' represents PNC-I.~~ ~~Standard text list number requested by the calling party.~~ ~~Legitimisation code for standard text.~~ ~~Standard text number requested by the calling party.~~

- ~~The RAd field contains an address and optionally a legitimisation code. If the legitimisation code is present it is separated from the address by a comma ",". If the legitimisation code is not present the comma may be omitted. If present the legitimisation code is discarded by the IW.~~

- ~~The AC parameter is ignored if present.~~

- ~~The NPL must be equal to zero. If the NPL contains anything else than zero a negative response with "GA not valid" (09) must be sent to the message sender. Since NPL must be equal to zero the GA:s list must also be empty.~~

- ~~The RP parameter may not be set. If the RP parameter is set a negative response with "Repetition not allowed" (10) must be sent to the message sender.~~

- ~~The PR parameter may not be set. If the PR parameter is set a negative response with "Priority call not allowed" (12) must be sent to the message sender.~~

- ~~The LPR parameter may not be set. If the LPR parameter is set a negative response with "Priority call not allowed" (12) must be sent to the message sender.~~

- ~~The UR parameter may not be set. If the UR parameter is set a negative response with "Urgent message not allowed" (14) must be sent to the message sender.~~

- ~~The LUR parameter may not be set. If the LUR parameter is set a negative response with "Urgent message not allowed" (14) must be sent to the message sender.~~

- ~~The RC parameter may not be set. If the RC parameter is set a negative response with "Reverse charging not allowed" (16) must be sent to the message sender.~~

- ~~The LRC parameter may not be set. If the LRC parameter is set a negative response with "Reverse charging not allowed" (16) must be sent to the message sender.~~

- ~~The parameter NB is essential when MT=4.~~

- ~~The parameters for MT=5 are essential if the Message Type (MT) defined is standard text.~~

~~B.4.4.1 Call input with supplementary services operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.13:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The SM parameter contains the following three fields:~~

~~Table B.14:~~

~~SM Parameter~~	~~Type~~	~~Description~~
~~AdC~~	~~String of num. char.~~	~~Address code recipient, maximum length is 16 digits.~~
~~SEP~~	~~char ':'~~	~~Separator~~
~~SCTS~~	~~String of 12 num. char.~~	~~Service Centre time-stamp~~

~~B.4.4.2 Call input with supplementary services operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.15:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 numeric char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The following error codes can be returned in the operation negative result:~~

~~01 Checksum error~~

~~02 Syntax error~~

~~03 Operation not supported by system~~

~~04 Operation not allowed (at this point in time)~~

~~05 Call barring active~~

~~06 AdC invalid~~

~~07 Authentication failure~~

~~08 Legitimisation code for all calls, failure~~

~~10 Repetition not allowed~~

~~11 Legitimisation code for repetition, failure~~

~~12 Priority call not allowed~~

~~13 Legitimisation code for priority call, failure~~

~~14 Urgent message not allowed~~

~~15 Legitimisation code for urgent message, failure~~

~~16 Reverse charging not allowed~~

~~17 Legitimisation code for reverse charging, failure~~

~~18 Deferred delivery not allowed~~

~~21 Standard text not valid~~

~~23 Message type not supported by system~~

~~24 Message too long~~

~~26 Message type not valid for the pager type~~

~~B.4.5 SMS message transfer operation - 30~~

~~This operation can be used by the PC to submit a message to the SMSC. With this operation Short Message specific services can be requested. The following list shows the parameters in the operation data field:~~

~~Table B.16:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~AdC~~	~~String of num. char.~~	~~M~~	~~Address code recipient, maximum length is 16 digits.~~
~~OAdC~~	~~String of num. char.~~	~~O~~	~~Address code originator, maximum length is 16 digits.~~
~~AC~~	~~String of char.~~	~~O~~	~~Authentication code originator.~~
~~NRq~~	~~Char '1'~~	~~O~~	~~Notification requested.~~
~~NAd~~	~~String of num. char.~~	~~O~~	~~Notification address.~~
~~NPID~~	~~4 num. char.~~	~~O~~	~~Notification PID value:~~ ~~0100 Mobile Station~~ ~~0122 Fax Group 3~~ ~~0131 X.400~~ ~~0138 Menu~~ ~~0139 PC appl. over PSTNa~~ ~~0339 PC appl. over X.25~~
~~DD~~	~~Char '1'~~	~~O~~	~~Deferred delivery request.~~
~~DDT~~	~~10 num. char.~~	~~O~~	~~Deferred delivery time DDMMYYHHmm~~
~~VP~~	~~10 num. char.~~	~~O~~	~~Validity period DDMMYYHHmm.~~
~~AMsg~~	~~String of char.~~	~~O~~	~~Alphanumeric message, maximum length 160 characters.~~

~~B.4.5.1 SMS message transfer operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.17:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~MVP~~	~~10 num. char.~~	~~O~~	~~Modified validity period~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The SM parameter contains the following three fields:~~

~~Table B.18:~~

~~SM Parameter~~	~~Type~~	~~Description~~
~~AdC~~	~~String of num. char.~~	~~Address code recipient, maximum length is 16 digits.~~
~~SEP~~	~~char ':'~~	~~Separator~~
~~SCTS~~	~~String of 12 num. char.~~	~~Service Centre time-stamp DDMMHHhhmmss~~

~~B.4.5.2 SMS message transfer operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.19:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 numeric char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The following error codes can be returned in the operation negative result:~~

~~01 Checksum error~~

~~02 Syntax error~~

~~04 Operation not allowed (at this point in time)~~

~~05 Call barring active~~

~~06 AdC invalid~~

~~07 Authentication failure~~

~~08 Legitimisation code for all calls, failure~~

~~24 Message too long~~

~~26 Message type not valid for the pager type~~

~~B.4.6 SMT alert operation - 31~~

~~This operation can be used by a PC (SMT) to alert the SC. The following list shows the parameters in the operation data field:~~

~~Table B.20:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~AdC~~	~~String of num. char.~~	~~M~~	~~Address code for the SMT, maximum length is 16 digits.~~
~~PID~~	~~String of num. char.~~	~~M~~	~~PID value for the SMT.~~

~~B.4.6.1 SMT alert operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.21:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The positive SMT alert operation result text SM parameter must contain the number of messages waiting in the SC destined for the subscriber the alert was generated for. The number consists of four digits and contains leading zero's.~~

~~B.4.6.2 SMT alert operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.22:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 numeric char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The following error codes can be returned in the operation negative result:~~

~~01 Checksum error~~

~~02 Syntax error~~

~~04 Operation not allowed (at this point in time)~~

~~05 Call barring active~~

~~06 AdC invalid~~

~~07 Authentication failure~~

~~08 Legitimisation code for all calls, failure~~

~~24 Message too long~~

~~26 Message type not valid for the pager type~~

~~B.5 50-Series of EMI Messages~~

~~This clause introduces the newly defined 50-series of operations. The following defines these operations:~~

~~Table B.23:~~

~~EMI operation~~	~~Name~~	~~initiated by~~
~~51~~	~~Submit_short_message~~	~~External Machine~~
~~52~~	~~Deliver_short_message~~	~~SMSC~~
~~53~~	~~Deliver_notification~~	~~SMSC~~
~~55~~	~~Inquiry_message~~	~~External Machine~~
~~56~~	~~Delete_message~~	~~External Machine~~
~~57~~	~~Response_inquiry_message~~	~~SMSC~~
~~58~~	~~Response_delete_message~~	~~SMSC~~

~~These new messages have been introduced in order to provide more facilities to the SMSC users. If a user has used one of these new operations during a session, it is assumed that the other (output) operations are supported as well. Otherwise, the operations defined in the previous chapters will be used, on order to maintain compatibility with earlier implementations of EMI.~~

~~B.5.1 Abstract Data Types~~

~~For a higher maintainability a new generic Abstract Data Type (ADT) is introduced for all operations described in this chapter. This means that all 50-series of EMI strings, including responses, shall contain all fields listed, fields not appropriate shall be left empty.~~

~~The following is a description of this generic ADT (where 'Num string' indicates 'string of numeric char.'):~~

~~Table B.24:~~

~~Member~~	~~Length~~	~~Type~~	~~Meaning~~
~~AdC~~	~~20~~	~~Num string~~	~~Address code recipient for the SM~~
~~OAdC~~	~~20~~	~~Num string~~	~~Address code originator~~
~~AC~~	~~16~~	~~Num string~~	~~Authentication code originator~~
~~NRq~~	~~1~~	~~Num char.~~	~~Notification Request~~
~~NAdC~~	~~20~~	~~Num string~~	~~Notification Address~~
~~NT~~	~~1~~	~~Num char.~~	~~Notification Type:~~ ~~Buffered message notification (BN),~~ ~~Delivery Notification (DN),~~ ~~Non-delivery notification (ND),~~ ~~0 default value, 1 = BN, 2 = DN,~~ ~~3 = ND, 4 = BN+DN, 5 = BN+ND,~~ ~~6 = DN+ND, 7 = all.~~
~~NPID~~	~~4~~	~~4 num char.~~	~~Notification PID value~~ ~~0100 Mobile Station~~ ~~0122 Fax Group 3~~ ~~0131 X.400~~ ~~0138 Menu~~ ~~0139 PC appl. over PSTNa~~ ~~0339 PC appl. over X.25~~ ~~0539 PC appl. over TCP/IP~~
~~LRq~~	~~1~~	~~1 num char.~~	~~Last Resort Address request:~~ ~~0 = not used, 1 = LRAd used~~
~~LRAd~~	~~20~~	~~Num string~~	~~Last Resort Address~~
~~LPID~~	~~4~~	~~4 num char.~~	~~LRAD PID value~~ ~~0100 Mobile Station~~ ~~0122 Fax Group 3~~ ~~0131 X.400~~ ~~0138 Menu~~ ~~0139 PC appl. over PSTNa~~ ~~0339 PC appl. over X.25~~ ~~0539 PC appl. over TCP/IP~~
~~DD~~	~~1~~	~~1 num char.~~	~~Deferred Delivery requested~~
~~DDT~~	~~10~~	~~10 num char.~~	~~Deferred delivery time in DDMMYYHHmm~~
~~VP~~	~~10~~	~~10 num char.~~	~~Validity period in DDMMYYHHmm~~
~~RPID~~	~~4~~	~~Num string~~	~~Replace PID value (reserved for future use)~~
~~SCTS~~	~~12~~	~~Num string~~	~~Service Centre Time Stamp in DDMMYYHHmmss.~~ ~~For a Short Message this is the time stamp of the Short Message itself. For a Notification this is the time stamp of the corresponding Short Message.~~
~~Dst~~	~~1~~	~~1 num char.~~	~~Delivery status:~~ ~~0 = delivered~~ ~~1 = buffered (see Rsn)~~ ~~2 = not delivered (see Rsn)~~

~~(continued)~~

~~Table B.24 (concluded):~~

~~Member~~	~~Length~~	~~Type~~	~~Meaning~~
~~Rsn~~	~~3~~	~~3 num char.~~	~~Reason code, value '000'...'255'~~
~~DSCTS~~	~~12~~	~~Num string~~	~~Delivery time stamp in DDMMYYHHmmss. Indicates the actual time of delivery of the Short Message.~~
~~MT~~	~~1~~	~~1 num char.~~	~~Message Type. Associated parameters depend on the value of MT.~~
~~MT=2:~~ ~~NMsg~~	~~640~~	~~Char. string~~	~~Numeric message.~~
~~MT=3:~~ ~~AMsg~~	~~640~~	~~Char. string~~	~~Alphanumeric message.~~
~~MT=4:~~ ~~NB~~ ~~TMsg~~	~~4~~ ~~140~~	~~Num string~~ ~~Char. string~~	~~No. of bits in Transparant Data (TD) message.~~ ~~TD message encoded into IA5 characters.~~
~~MMS~~	~~1~~	~~1 num char.~~	~~More Messages to Send (to the same SME)~~
~~PR~~	~~1~~	~~1 char.~~	~~(reserved for Priority Requested)~~
~~DCs~~	~~2~~	~~2 hex char.~~	~~Data Coding scheme:~~ ~~0 = default alphabet~~ ~~1 = user defined data~~
~~MCLs~~	~~1~~	~~1 num char.~~	~~Message class:~~ ~~0 = message class 0~~ ~~1 = message class 1~~ ~~2 = message class 2~~ ~~3 = message class 3~~
~~RPI~~	~~1~~	~~Num string~~	~~(reserved for Reply Path)~~
~~CPg~~	~~1~~	~~Num string~~	~~(reserved for Code Page)~~
~~RPLy~~	~~1~~	~~1 num char.~~	~~(reserved for Reply type)~~
~~RES1~~	~~x~~	~~Num string~~	~~(reserved for future use)~~
~~RES2~~	~~x~~	~~Num string~~	~~(reserved for future use)~~
~~RES3~~	~~x~~	~~Num string~~	~~(reserved for future use)~~
~~RES4~~	~~x~~	~~Num string~~	~~(reserved for future use)~~
~~RES5~~	~~x~~	~~Num string~~	~~(reserved for future use)~~

~~x = not specified yet~~

~~A generic ADT for the EMI response is defined as follows:~~

- ~~For a positive response:~~

  ~~Member Type~~

  ~~AcK Positive acknowledgement~~

  ~~MVP Modified Validity Period~~

  ~~SM System Message~~

- ~~For a negative response:~~

  ~~Member Type~~

  ~~AcK Positive acknowledgement~~

  ~~MVP Modified Validity Period~~

  ~~SM System Message~~

~~B.5.2 Standard string~~

~~The advantage of using the generic ADT for all new EMI operations is, that one standard string can be used for all operations. The string is build complying to the [REF 1] specifications as follows:~~

~~stx <header> / <data> / <checksum> etx~~

- ~~stx = 02(hex)~~
- ~~etx = 03(hex)~~

~~The string header is build up in the same way as is done in UCP.~~

~~The data field shall always contain **ALL fields** listed in the 5x series generic ADT. These fields are separated by '/'. If a member of the ADT is not used in a specific message type, its place in the data string is empty, but the field separators will be present ('//').~~

~~For example the data block for INQM (OAdC and AdC fields only) will look like:~~

~~../55/O/012345/0324//////////......~~

~~This format provides a high degree of flexibility as well as upwards compatibility to future EMI specifications.~~

~~This does also apply for the responses. For example, the positive response message contains the MVP field. This field is only used for the SUBS message positive response; in all other cases this field is left empty.~~

~~In the columns marked 'Presence' of the sections to follow, 'M' indicates that the field is Mandatory, 'O' indicates that the parameter is Optional and '-' indicates that the parameter shall not be present.~~

~~B.5.3 Submit Short Message operation -51~~

~~This operation is used to submit a Short Message to the SMSC. The operation can be used for Short Messages with an alphanumeric or a binary message text field. In the latter case the MT parameter shall be set to '4'.~~

~~Table B.25:~~

~~Member~~	~~Presence~~	~~Meaning~~
~~AdC~~	~~M~~	~~Address code recipient for the SM~~
~~OAdC~~	~~M~~	~~Address code originator~~
~~AC~~	~~O~~	~~Authentication code originator~~
~~NRq~~	~~O~~	~~Notification Request~~
~~NAdC~~	~~O~~	~~Notification Address~~
~~NT~~	~~O~~	~~Notification Type~~
~~NPID~~	~~O~~	~~Notification PID value~~
~~LRq~~	~~O~~	~~Last Resort Address request~~
~~LRAd~~	~~O~~	~~Last Resort Address~~
~~LPID~~	~~O~~	~~LRAD PID value~~
~~DD~~	~~O~~	~~Deferred Delivery requested~~
~~DDT~~	~~O~~	~~Deferred delivery time in DDMMYYHHmm~~
~~VP~~	~~O~~	~~Validity period in DDMMYYHHmm~~
~~RPID~~	~~O~~	~~Replace PID value (reserved for future use)~~
~~SCTS~~	~~-~~	~~Service Centre Time Stamp in DDMMYYHHmmss.~~
~~Dst~~	~~-~~	~~Delivery status~~
~~Rsn~~	~~-~~	~~Reason code~~
~~DSCTS~~	~~-~~	~~Delivery time stamp in DDMMYYHHmmss.~~
~~MT~~	~~M~~	~~Message Type.~~
~~MT=2:~~ ~~- NMsg~~	 ~~O~~	 ~~Numeric message.~~
~~MT=3:~~ ~~- AMsg~~	 ~~O~~	 ~~Alphanumeric message.~~
~~MT=4:~~ ~~- NB~~ ~~- TMsg~~	 ~~M~~ ~~O~~	 ~~No. of bits in Transparant Data (TD) message.~~ ~~TD message encoded into IA5 characters.~~
~~MMS~~	~~-~~	~~More Messages to Send (to the same SME)~~
~~PR~~	~~-~~	~~(reserved for Priority Requested)~~
~~DCs~~	~~O~~	~~Data Coding scheme~~
~~MCLs~~	~~O~~	~~Message class. See GSM 03.38. Shall be supplied when MT=4, discarded otherwise.~~
~~RPI~~	~~-~~	~~(reserved for Reply Path)~~
~~CPg~~	~~-~~	~~(reserved for Code Page)~~
~~RPLy~~	~~-~~	~~(reserved for Reply type)~~

~~B.5.3.1 Submit Short Message operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.26:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~MVP~~	~~String of char~~	~~O~~	~~Modified validity period~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~The SM parameter contains the following three fields:~~

~~Table B.27:~~

~~SM Parameter~~	~~Type~~	~~Description~~
~~AdC~~	~~String of num. char.~~	~~Address code recipient, maximum length is 16 digits.~~
~~SEP~~	~~char ':'~~	~~Separator~~
~~SCTS~~	~~String of 12 num char~~	~~Service Centre time-stamp DDMMYYhhmmss.~~

~~B.5.3.2 Submit Short Message operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.28:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 num. char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.4 Delivery Short Message operation -52~~

~~This operation (DELS) is used to deliver a Short Message. The operation is initiated by the SMSC and answered by the SME.~~

~~Table B.29:~~

~~Member~~	~~Presence~~	~~Meaning~~
~~AdC~~	~~M~~	~~Address code recipient for the SM~~
~~OAdC~~	~~M~~	~~Address code originator~~
~~AC~~	~~-~~	~~Authentication code originator~~
~~NRq~~	~~-~~	~~Notification Request~~
~~NAdC~~	~~-~~	~~Notification Address~~
~~NT~~	~~-~~	~~Notification Type~~
~~NPID~~	~~-~~	~~Notification PID value~~
~~LRq~~	~~-~~	~~Last Resort Address request~~
~~LRAd~~	~~-~~	~~Last Resort Address~~
~~LPID~~	~~-~~	~~LRAD PID value~~
~~DD~~	~~-~~	~~Deferred Delivery requested~~
~~DDT~~	~~-~~	~~Deferred delivery time in DDMMYYHHmm~~
~~VP~~	~~O~~	~~Validity period in DDMMYYHHmm~~
~~RPID~~	~~-~~	~~Replace PID value (reserved for future use)~~
~~SCTS~~	~~M~~	~~Service Centre Time Stamp in DDMMYYHHmmss.~~
~~Dst~~	~~-~~	~~Delivery status~~
~~Rsn~~	~~-~~	~~Reason code~~
~~DSCTS~~	~~-~~	~~Delivery time stamp in DDMMYYHHmmss.~~
~~MT~~	~~M~~	~~Message Type.~~
~~MT=2:~~ ~~NMsg~~	~~O~~	~~Numeric message.~~
~~MT=3:~~ ~~AMsg~~	~~O~~	~~Alphanumeric message.~~
~~MT=4:~~ ~~NB~~ ~~TMsg~~	~~M~~ ~~O~~	~~No. of bits in Transparant Data (TD) message.~~ ~~TD message encoded into IA5 characters.~~
~~MMS~~	~~O~~	~~More Messages to Send (to the same SME)~~
~~PR~~	~~-~~	~~(reserved for Priority Requested)~~
~~DCs~~	~~O~~	~~Data Coding scheme~~
~~MCLs~~	~~O~~	~~Message class. See GSM 03.38. Shall be supplied when MT=4, discarded otherwise.~~
~~RPI~~	~~-~~	~~(reserved for Reply Path)~~
~~CPg~~	~~-~~	~~(reserved for Code Page)~~
~~RPLy~~	~~-~~	~~(reserved for Reply type)~~

~~B.5.4.1 Delivery Short Message operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.30:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~MVP~~	~~String of char~~	~~-~~	~~Modified validity period~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.4.2 Delivery Short Message operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.31:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 num. char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.5 Delivery notification operation -53~~

~~This operation (DELN) is used to indicate the (changed) status of a previously submitted Short Message to the SMSC. The operation is initiated by the SMSC.~~

~~Table B.32:~~

~~Member~~	~~Presence~~	~~Meaning~~
~~AdC~~	~~M~~	~~Address code recipient for the SM~~
~~OAdC~~	~~M~~	~~Address code originator~~
~~AC~~	~~-~~	~~Authentication code originator~~
~~NRq~~	~~-~~	~~Notification Request~~
~~NAdC~~	~~-~~	~~Notification Address~~
~~NT~~	~~-~~	~~Notification Type~~
~~NPID~~	~~-~~	~~Notification PID value~~
~~LRq~~	~~-~~	~~Last Resort Address request~~
~~LRAd~~	~~-~~	~~Last Resort Address~~
~~LPID~~	~~-~~	~~LRAD PID value~~
~~DD~~	~~-~~	~~Deferred Delivery requested~~
~~DDT~~	~~-~~	~~Deferred delivery time in DDMMYYHHmm~~
~~VP~~	~~-~~	~~Validity period in DDMMYYHHmm~~
~~RPID~~	~~-~~	~~Replace PID value (reserved for future use)~~
~~SCTS~~	~~M~~	~~Service Centre Time Stamp in DDMMYYHHmmss. This is the time stamp of the corresponding Short Message.~~
~~Dst~~	~~M~~	~~Delivery status~~
~~Rsn~~	~~M~~	~~Reason code~~
~~DSCTS~~	~~M~~	~~Delivery time stamp in DDMMYYHHmmss. Indicates the time of (non)delivery of the corresponding Short Message, or the time of creation of this notification.~~
~~MT~~	~~M~~	~~Message Type.~~
~~MT=2:~~ ~~-NMsg~~	~~-~~	~~Numeric message.~~
~~MT=3:~~ ~~-AMsg~~	~~O~~	~~Alphanumeric message.~~
~~MT=4:~~ ~~-NB~~ ~~-TMsg~~	~~-~~ ~~-~~	~~No. of bits in Transparant Data (TD) message.~~ ~~TD message encoded into IA5 characters.~~
~~MMS~~	~~O~~	~~More Messages to Send (to the same SME)~~
~~PR~~	~~-~~	~~(reserved for Priority Requested)~~
~~DCs~~	~~-~~	~~Data Coding scheme~~
~~MCLs~~	~~-~~	~~Message class. See GSM 03.38. Shall be supplied when MT=4, discarded otherwise.~~
~~RPI~~	~~-~~	~~(reserved for Reply Path)~~
~~CPg~~	~~-~~	~~(reserved for Code Page)~~
~~RPLy~~	~~-~~	~~(reserved for Reply type)~~

~~B.5.5.1 Delivery Notification operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.33:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~MVP~~	~~String of char~~	~~-~~	~~Modified validity period~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.5.2 Delivery Notification operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.34:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 num. char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.6 Inquiry message operation -55~~

~~This operation is initiated by the SME towards the SMSC to inquire about the status of a buffered message. As a result the SMSC can initiate a Response Inquiry message operation.~~

~~Table B.35:~~

~~Member~~	~~Presence~~	~~Meaning~~
~~AdC~~	~~M~~	~~Address code recipient for the SM~~
~~OAdC~~	~~M~~	~~Address code originator~~
~~AC~~	~~O~~	~~Authentication code originator~~
~~NRq~~	~~-~~	~~Notification Request~~
~~NAdC~~	~~-~~	~~Notification Address~~
~~NT~~	~~-~~	~~Notification Type~~
~~NPID~~	~~-~~	~~Notification PID value~~
~~LRq~~	~~-~~	~~Last Resort Address request~~
~~LRAd~~	~~-~~	~~Last Resort Address~~
~~LPID~~	~~-~~	~~LRAD PID value~~
~~DD~~	~~-~~	~~Deferred Delivery requested~~
~~DDT~~	~~-~~	~~Deferred delivery time in DDMMYYHHmm~~
~~VP~~	~~-~~	~~Validity period in DDMMYYHHmm~~
~~RPID~~	~~-~~	~~Replace PID value (reserved for future use)~~
~~SCTS~~	~~-~~	~~Service Centre Time Stamp in DDMMYYHHmmss.~~
~~Dst~~	~~-~~	~~Delivery status~~
~~Rsn~~	~~-~~	~~Reason code~~
~~DSCTS~~	~~-~~	~~Delivery time stamp in DDMMYYHHmmss.~~
~~MT~~	~~-~~	~~Message Type.~~
~~MT=2:~~ ~~-NMsg~~	 ~~-~~	 ~~Numeric message.~~
~~MT=3:~~ ~~-AMsg~~	 ~~-~~	 ~~Alphanumeric message.~~
~~MT=4:~~ ~~-NB~~ ~~-TMsg~~	 ~~-~~ ~~-~~	 ~~No. of bits in Transparant Data (TD) message.~~ ~~TD message encoded into IA5 characters.~~
~~MMS~~	~~-~~	~~More Messages to Send (to the same SME)~~
~~PR~~	~~-~~	~~(reserved for Priority Requested)~~
~~DCs~~	~~-~~	~~Data Coding scheme~~
~~MCLs~~	~~-~~	~~Message class. See GSM 03.38. Shall be supplied when MT=4, discarded otherwise.~~
~~RPI~~	~~-~~	~~(reserved for Reply Path)~~
~~CPg~~	~~-~~	~~(reserved for Code Page)~~
~~RPLy~~	~~-~~	~~(reserved for Reply type)~~

~~B.5.6.1 Inquiry message operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.36:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~MVP~~	~~String of char~~	~~-~~	~~Modified validity period~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.6.2 Inquiry message operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.37:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 num. char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.7 Delete message operation -56~~

~~This operation is initiated by the SME to delete one or more buffered Short Messages.~~

~~Table B.38:~~

Member	Presence	Meaning
AdC	M	Address code recipient for the SM
OAdC	M	Address code originator
AC	O	Authentication code originator
NRq	-	Notification Request
NAdC	-	Notification Address
NT	-	Notification Type
NPID	-	Notification PID value
LRq	-	Last Resort Address request
LRAd	-	Last Resort Address
LPID	-	LRAD PID value
DD	-	Deferred Delivery requested
DDT	-	Deferred delivery time in DDMMYYHHmm
VP	-	Validity period in DDMMYYHHmm
RPID	-	Replace PID value (reserved for future use)
SCTS	-	Service Centre Time Stamp in DDMMYYHHmmss.
Dst	-	Delivery status
Rsn	-	Reason code
DSCTS	-	Delivery time stamp in DDMMYYHHmmss.
MT	M	Message Type.
MT=2: NMsg	 -	 Numeric message.
MT=3: AMsg	 O	 Alphanumeric message. Contains the time stamps (format YYMMDDhhmmss) of the buffered Short Message(s), separated by spaces. Format: TIMESTAMP {TIMESTAMP}
MT=4: NB TMsg	 - -	 No. of bits in Transparant Data (TD) message. TD message encoded into IA5 characters.
MMS	O	More Messages to Send (to the same SME)
PR	-	(reserved for Priority Requested)
DCs	-	Data Coding scheme
MCLs	-	Message class. See GSM 03.38. Shall be supplied when MT=4, discarded otherwise.
RPI	-	(reserved for Reply Path)
CPg	-	(reserved for Code Page)
RPLy	-	(reserved for Reply type)

~~B.5.7.1 Delete message operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.39:~~

Parameter	Type	Presence	Description
ACK	Char "A"	M	Positive acknowledgement
MVP	String of char	-	Modified validity period
SM	String of char.	O	System message

~~B.5.7.2 Delete message operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.40:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 num. char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.8 Response Inquiry message operation -57~~

~~This operation is initiated by the SMSC in response to an Inquiry message operation. If necesary, the SMSC will start a dial-back session.~~

~~Table B.41:~~

~~Member~~	~~Presence~~	~~Meaning~~
~~AdC~~	~~M~~	~~Address code recipient for the SM~~
~~OAdC~~	~~-~~	~~Address code originator~~
~~AC~~	~~-~~	~~Authentication code originator~~
~~NRq~~	~~-~~	~~Notification Request~~
~~NAdC~~	~~-~~	~~Notification Address~~
~~NT~~	~~-~~	~~Notification Type~~
~~NPID~~	~~-~~	~~Notification PID value~~
~~LRq~~	~~-~~	~~Last Resort Address request~~
~~LRAd~~	~~-~~	~~Last Resort Address~~
~~LPID~~	~~-~~	~~LRAD PID value~~
~~DD~~	~~-~~	~~Deferred Delivery requested~~
~~DDT~~	~~-~~	~~Deferred delivery time in DDMMYYHHmm~~
~~VP~~	~~-~~	~~Validity period in DDMMYYHHmm~~
~~RPID~~	~~-~~	~~Replace PID value (reserved for future use)~~
~~SCTS~~	~~-~~	~~Service Centre Time Stamp in DDMMYYHHmmss.~~
~~Dst~~	~~-~~	~~Delivery status~~
~~Rsn~~	~~-~~	~~Reason code~~
~~DSCTS~~	~~-~~	~~Delivery time stamp in DDMMYYHHmmss.~~
~~MT~~	~~M~~	~~Message Type.~~
~~MT=2:~~ ~~NMsg~~	~~-~~	~~Numeric message.~~
~~MT=3:~~ ~~AMsg~~	~~O~~	~~Alphanumeric message. Contains the recipient address and the time stamps (format YYMMDDhhmmss) of the buffered Short Message(s), separated by spaces. Format: [TEXT1] <AdC> [TEXT2] {TIMESTAMP}~~
~~MT=4:~~ ~~NB~~ ~~TMsg~~	 ~~-~~ ~~-~~	 ~~No. of bits in Transparant Data (TD) message.~~ ~~TD message encoded into IA5 characters.~~
~~MMS~~	~~O~~	~~More Messages to Send (to the same SME)~~
~~PR~~	~~-~~	~~(reserved for Priority Requested)~~
~~DCs~~	~~-~~	~~Data Coding scheme~~
~~MCLs~~	~~-~~	~~Message class. See GSM 03.38. Shall be supplied when MT=4, discarded otherwise.~~
~~RPI~~	~~-~~	~~(reserved for Reply Path)~~
~~CPg~~	~~-~~	~~(reserved for Code Page)~~
~~RPLy~~	~~-~~	~~(reserved for Reply type)~~

~~B.5.8.1 Response inquiry message operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.42:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~MVP~~	~~String of char~~	~~-~~	~~Modified validity period~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.8.2 Response inquiry message operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.43:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 num. char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.9 Response delete message operation -58~~

~~This operation is initiated by the SMSC to indicate which Short Messages have been deleted succesfully.~~

~~Table B.44:~~

~~Member~~	~~Presence~~	~~Meaning~~
~~AdC~~	~~M~~	~~Address code recipient for the SM~~
~~OAdC~~	~~-~~	~~Address code originator~~
~~AC~~	~~-~~	~~Authentication code originator~~
~~NRq~~	~~-~~	~~Notification Request~~
~~NAdC~~	~~-~~	~~Notification Address~~
~~NT~~	~~-~~	~~Notification Type~~
~~NPID~~	~~-~~	~~Notification PID value~~
~~LRq~~	~~-~~	~~Last Resort Address request~~
~~LRAd~~	~~-~~	~~Last Resort Address~~
~~LPID~~	~~-~~	~~LRAD PID value~~
~~DD~~	~~-~~	~~Deferred Delivery requested~~
~~DDT~~	~~-~~	~~Deferred delivery time in DDMMYYHHmm~~
~~VP~~	~~-~~	~~Validity period in DDMMYYHHmm~~
~~RPID~~	~~-~~	~~Replace PID value (reserved for future use)~~
~~SCTS~~	~~-~~	~~Service Centre Time Stamp in DDMMYYHHmmss.~~
~~Dst~~	~~-~~	~~Delivery status~~
~~Rsn~~	~~-~~	~~Reason code~~
~~DSCTS~~	~~-~~	~~Delivery time stamp in DDMMYYHHmmss.~~
~~MT~~	~~M~~	~~Message Type.~~
~~MT=2:~~ ~~NMsg~~	 ~~-~~	 ~~Numeric message.~~
~~MT=3:~~ ~~AMsg~~	 ~~O~~	 ~~Alphanumeric message. Contains the recipient address and the time stamps (format YYMMDDhhmmss) of the deleted Short Message(s), separated by spaces. Format: [TEXT3] <AdC> [TEXT4] {TIMESTAMP} [TEXT5]~~
~~MT=4:~~ ~~NB~~ ~~TMsg~~	 ~~-~~ ~~-~~	 ~~No. of bits in Transparant Data (TD) message.~~ ~~TD message encoded into IA5 characters.~~
~~MMS~~	~~O~~	~~More Messages to Send (to the same SME)~~
~~PR~~	~~-~~	~~(reserved for Priority Requested)~~
~~DCs~~	~~-~~	~~Data Coding scheme~~
~~MCLs~~	~~-~~	~~Message class. See GSM 03.38. Shall be supplied when MT=4, discarded otherwise.~~
~~RPI~~	~~-~~	~~(reserved for Reply Path)~~
~~CPg~~	~~-~~	~~(reserved for Code Page)~~
~~RPLy~~	~~-~~	~~(reserved for Reply type)~~

~~B.5.9.1 Response delete message operation (positive result)~~

~~The following list shows the parameters in the positive result data field:~~

~~Table B.45:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~ACK~~	~~Char "A"~~	~~M~~	~~Positive acknowledgement~~
~~MVP~~	~~String of char~~	~~-~~	~~Modified validity period~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.5.9.2 Response delete message operation (negative result)~~

~~The following list shows the parameters in the negative result data field:~~

~~Table B.46:~~

~~Parameter~~	~~Type~~	~~Presence~~	~~Description~~
~~NACK~~	~~Char "N"~~	~~M~~	~~Negative acknowledgement~~
~~EC~~	~~2 num. char.~~	~~M~~	~~Error code~~
~~SM~~	~~String of char.~~	~~O~~	~~System message~~

~~B.6 Error codes overview~~

~~Error codes which can be returned in the operations negative result are listed in [1] paragraph 9.2.6. All operations defined in the ERMES recommendation which are not implemented~~

~~in the SMSC, EMI returns with error code 03 ("Operation not supported by system").~~

~~B.6.1 Error codes~~

~~Error Code Message~~

~~01 Checksum error~~

~~02 Syntax error~~

~~03 Operation not supported by system~~

~~04 Operation not allowed~~

~~05 Call barring active~~

~~06 AdC invalid~~

~~07 Authentication failure~~

~~08 Legitimisation code for all calls, failure~~

~~09 GA not valid~~

~~10 Repetition not allowed~~

~~11 Legitimisation code for repetition, failure~~

~~12 Priority call not allowed~~

~~13 Legitimisation code for priority call, failure~~

~~14 Urgent message not allowed~~

~~15 Legitimisation code for urgent message, failure~~

~~16 Reverse charging not allowed~~

~~17 Legitimisation code for rev. charging, failure~~

~~18 Deferred delivery not allowed~~

~~19 New AC not valid~~

~~20 New legitimisation code not valid~~

~~21 Standard text not valid~~

~~22 Time period not valid~~

~~23 Message type not supported by system~~

~~24 Message too long~~

~~25 Requested standard text not valid~~

~~26 Message type not valid for the pager type~~

~~27 Message not found in SMSC~~

~~30 Subscriber hang-up~~

~~31 Fax group not supported~~

~~32 Fax message type not supported~~

~~The following table summarizes some special occurrences of error codes:~~

~~Table B.47:~~

~~**Error Code**~~	~~**Meaning**~~
~~02~~	~~Error in the NPID parameter (SMS Message transfer) or in the PID parameter (SMT Alert).~~
~~04~~	~~Any internal error (e.g. no resources), often of temporary nature. If the RAd:s (number of addresses) parameter contained more addresses than the specified maximum, the System Message parameter will contain "too many addresses".~~
~~05~~	~~One of the addresses is on the blacklist.~~

~~Annex C:~~
~~SMSC to SME interface specification~~

~~C.1 Introduction~~

~~This clause introduces the Short Message Entity (SME) and the Short Message Service Centre (SMSC) architecturally, and explains how the interface between these two systems will be specified in the rest of this annex.~~

~~C.1.1 System architecture~~

~~A Short Message Entity (SME) is interconnected through a Short Message Entity Interface (SME-IF) with a Short Message Service Centre (SMSC). The main purpose of this interconnection is to send short messages from the SMEs to the Mobile Stations (MS) and from the MSs to the SMEs. Also other kind of information maybe conveyed over the interconnection, e.g. status reports and alerts from the GSM network to the SMEs. The system architecture discussed in this annex thus consists of the SME and the SMSC, and the purpose of this annex is to specify the SME-IF between the two.~~

~~C.1.2 What to communicate~~

~~The information communicated across the SME-IF is specified as SME operations sent as an entity from one system to the other. Typical operation is submitting a short message from the SME to the SMSC~~

~~The SME operations are specified in sections C.2 and C.3 of this annex.~~

~~Each SME operation carries a number of SME parameters with it, i.e. data items specifying the subscriber, some facts about the operation itself, etc.~~

~~The SME parameters are specified in clause C.4 of this annex.~~

~~C.1.3 How to communicate~~

~~Clauses C.2, C.3 and C.4 thus specify *what* is to be sent between the SME and the SMSC. The realization of that communication is the topic of section C.5.~~

~~Clause C.5 introduces the question of *how* to communicate between the SME and the SMSC, i.e. the coding of information related to operations and the SME link between the two systems, carrying the SME operations.~~

~~C.1.4 What to do with the information~~

~~The specifications in clauses C.2 through C.5 thus enable communication between the SME and the SMSC.~~

~~Clause C.6 introduces the service concept: assuming some SME operations (with the proper SME parameters) from the SME and the SMSC, what kind of short messages the subscriber is going to receive?~~

~~C.1.5 Interface profile~~

~~In this annex the operations and the parameters specified for each operation represent a maximum amount of information the SME or the SMSC may provide. It is very important to notice that in most cases it is not reasonable for the SME to send all the possible parameters, if the SMSC can provide that information or the information is static. Note also that in some cases the operator may want to restrict the use of some parameters. An example of this is the originating address, showing the sender of the short message. A value stored in the SMSC for each SME could be used instead of letting the SME set the address.~~

~~Because of what is said above it must be possible to state the information and the link between the two systems; such a statement is called the interface profile of the SME-IF.~~

~~Profiling example is given in clause C.6 for the service specified there.~~

~~C.2 Operations~~

~~C.2.1 Introduction~~

~~This clause defines the operations between the SME and the SMSC; please refer to subclause C.1.2 for an introduction to their role in this annex and the SME-SMSC architecture. Parameters related to each operation are specified in clause C.3.~~

~~The operations are divided to operations originated by the SME, operations originated by the SMSC and operations that can be originated by both the SME and the SMSC.~~

~~When defining the operations the different SMEs might use, two basic types of SMEs were considered:~~

- ~~querying SMEs;~~
- ~~listening SMEs.~~

~~Querying SMEs do not receive anything from the SMSC automatically, but they want to query if there is something to be retrieved. The SME is typically connected to the SMSC every now and then to submit a message and may at the same time also check if there is something to be received. An example of this kind of an SME is a PC-application with a modem connection to the SMSC.~~

~~Listening SME type is always ready to receive if the SMSC has something to send to it. This type of SMEs are usually always connected and perhaps the best example is a voice mail system sending notifications about new voice messages to the MSs.~~

~~The type of the SME must be specified before the SME may start to operate. The type is stored in the SMSC as well as some other information about the SME.~~

~~C.2.2 Operations from the SME to the SMSC~~

~~**operation**~~	~~**definition**~~
~~submit~~	~~This operation is used by the SME for sending short messages from to an MS.~~
~~cancel~~	~~This operation is used by the SME for cancelling short messages it has sent.~~
~~delivery request~~	~~This operation is used by the SME for retrieving mobile originated short messages.~~
~~status report request~~	~~This operation is used by the SME for requesting status reports of previously submitted short messages.~~
~~disable status report req.~~	~~This operation is used by the SME for disabling the status report request for a previously submitted short message.~~

~~enable status report req.~~	~~This operation is used by the SME for enabling the status report request for a previously submitted short message.~~
~~login~~	~~This operation is used by the session based SMEs (SME is connected until its operations are performed) before any other operations.~~
~~logout~~	~~This operations is used by the session based SMEs (SME is connected until its operations are performed) for indicate the end of the session.~~
~~change password~~	~~This operation is used by the SME for changing password used in login operation.~~
~~change profile parameter~~	~~This operation is used by the SME for changing values of those interface profile parameters that it is allowed to change.~~

~~C.2.3 Operations from the SMSC to the SME~~

~~**operation**~~	~~**definition**~~
~~delivery~~	~~This operation is used by the SMSC for delivering mobile originated short messages to the SME.~~
~~status report~~	~~This operation is used by the SMSC for sending a status reports describing the current status of a short message sent by the SME.~~
~~reachability notification~~	~~This operation is used by the SMSC for indicating to the SME that an MS to which the SME has tried to sent a short message is now reachable.~~
~~delivery data notification~~	~~This operation is used by the SMSC for indicating that there is new short message or a status report waiting for retrieval.~~

~~C.2.4 Common operations~~

~~**operation**~~	~~**definition**~~
~~alive~~	~~This operation may be used by both the SME and the SMSC for checking whether the link between the SME and the SMSC is still alive.~~
~~ack~~	~~This operation is used by both the SME and the SMSC for indicating back the positive result to the initiator of the operation.~~
~~nack~~	~~This operation is used by both the SME and the SMSC for indicating the negative result to the initiator of the operation.~~

~~C.3 Operation details~~

~~C.3.1 Submit~~

~~Submit in its simplest mode just passes the short message text to the SMSC which takes care of the delivery. There are, however, also some special features that may be requested with the submit operation like reachability notification, first delivery time, message to many recipients etc.~~

~~There are two ways for the SME to produce short messages:~~

- ~~The SME builds the message text and places it into the parameter **user data** in submit operation. The text is sent with other necessary parameters to the SMSC. The SMSC then sends the message as such to the MS.~~
- ~~The SME does not build the message text, but places a code indicating some predefined message in the SMSC into parameter **standard message identifier** in submit operation. The code is sent with other necessary parameters to the SMSC. The SMSC then sends the predefined message corresponding to the value of standard message identifier to the MS. Note that the predefined message may have places for parameter values coming from the SME. An example of this is given in clause C.6.1.~~

~~The submitted short message can be identified afterwards in two ways: by using time stamp generated by the SMSC (returned in acknowledgement) and the destination address or with short message identifier given by the SME in submit. Note that if the identifier is used, it is up to the SME to guarantee that the identifier is unique.~~

~~**Operation parameters:**~~

- ~~short message identifier~~
- ~~number of destinations~~
- ~~destination address type~~
- ~~destination address~~
- ~~originating address type~~
- ~~originating address~~
- ~~protocol identifier~~
- ~~data coding scheme~~
- ~~validity period relative (see note 1)~~
- ~~validity period absolute (see note 1)~~
- ~~first delivery time integer (see note 2)~~
- ~~first delivery time absolute (see note 2)~~
- ~~reply path~~
- ~~replace~~
- ~~user data length (see note 3)~~
- ~~user data (see note 3)~~
- ~~standard message identifier (see note 3)~~
- ~~language (see note 3)~~
- ~~status report request~~
- ~~reachability notification~~

~~- cancel enabled~~

~~NOTE 1: either relative or absolute validity period~~

~~NOTE 2: either integer or absolute first delivery time~~

~~NOTE 3: either user data or standard message identifier, user data length may be used together with user data and language together with standard message identifier~~

~~**Acknowledgement** contains additional parameter service centre time stamp.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~submit -->~~

~~<-- ack~~

~~........~~

~~<-- ack (see note)~~

~~NOTE: More than one ack in case more than one destination address was given~~

~~C.3.2 Cancel~~

~~NOTE: It is possible to cancel more than one message with one operation. If the short message is already sent to GSM network, it cannot be cancelled anymore.~~

~~Cancelling may be disabled in submit operation. Disabling is useful e.g. in cases where there are such messages to a certain MS that should not be cancelled, but the cancellation is done according to destination address.~~

~~**Operation parameters:**~~

~~- short message identifier~~

~~- service centre time stamp~~

~~- destination address type~~

~~- destination address~~

~~- originating address type~~

~~- originating address~~

~~- filter~~

~~**Acknowledgement** does not contain any additional parameters.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~cancel -->~~

~~<-- ack~~

~~.......~~

~~<-- status report (note)~~

~~NOTE: Status report(s) may follow in case status report was requested for the cancelled message(s) and SME is of type listening.~~

~~C.3.3 Delivery request~~

~~This operation is used by the querying SME to retrieve a mobile originated short message.~~

~~**Operation parameters:**~~

~~The operation does not require any parameters.~~

~~**Acknowledgement** contains parameter message count telling how many deliveries will follow.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~delivery request -->~~

~~<-- ack~~

~~<-- delivery (note)~~

~~ack -->~~

~~NOTE: Deliveries will follow in case there are messages to be retrieved. The SME controls the delivery sequence with a parameter get next in ack operation.~~

~~C.3.4 Status report request~~

~~This operation is used by the querying SME to request a status report of a previously submitted short messages.~~

~~NOTE: It is possible to request a status report to more than one message with one operation.~~

~~To be able to get status reports, the status report request must be set in submit operation.~~

~~**Operation parameters:**~~

- ~~short message identifier~~
- ~~service centre time stamp~~
- ~~destination address type~~
- ~~destination address~~
- ~~originating address type~~
- ~~originating address~~
- ~~filter~~

~~**Acknowledgement** contains parameter message count telling how many status reports will follow.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~status report request -->~~

~~<-- ack~~

~~<-- status report (note)~~

~~ack -->~~

~~NOTE: Status reports will follow in case there are status reports to be retrieved. The SME controls the status report sequence with a parameter get next in ack operation.~~

~~C.3.5 Disable status report request~~

~~This operation is used by the SME to disable the status report request for a previously submitted short message.~~

~~NOTE: It is possible to affect to more than one message with one operation.~~

~~**Operation parameters:**~~

- ~~short message identifier~~
- ~~service centre time stamp~~
- ~~destination address type~~
- ~~destination address~~
- ~~originating address type~~
- ~~originating address~~
- ~~filter~~

~~**Acknowledgement** does not contain any additional parameters.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~disable status report req -->~~

~~<-- ack~~

~~C.3.6 Enable status report request~~

~~This operation is used by the SME to enable the status report request for a previously submitted short message.~~

~~NOTE: It is possible to affect to more than one message with one operation.~~

~~**Operation parameters:**~~

- ~~short message identifier~~
- ~~service centre time stamp~~
- ~~destination address type~~
- ~~destination address~~
- ~~originating address type~~
- ~~originating address~~
- ~~filter~~

~~**Acknowledgement** does not contain any additional parameters.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~enable status report req -->~~

~~<-- ack~~

~~C.3.7 Login~~

~~If an SME is session based, i.e. SME is connected until its operations are performed, a login must be done first.~~

~~With the login, it is possible to define the version of interface software. The SMSC selects the interface profile to be used based on user identity given in the login operation.~~

~~NOTE: That the information given in login may also be included in operations like submit in case the SME just wants to perform one operation but does not want do anything else (no session needed).~~

~~**Operation parameters:**~~

- ~~user identity~~
- ~~password~~
- ~~interface version~~

~~**Acknowledgement** contains parameter message count telling the number of new message waiting for retrieval in case the SME is capable to receive mobile originated messages.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~login -->~~

~~<-- ack~~

~~C.3.8 Logout~~

~~If an SME is session based, i.e. it has done a login to perform some operations, it must do a logout when the session should be closed.~~

~~**Operation parameters:**~~

~~Logout operation does not need any parameters.~~

~~**Acknowledgement** does not contain any additional parameters.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~logout -->~~

~~<-- ack~~

~~C.3.9 Change password~~

~~This operation is used by the SME to change the password used in login operation.~~

~~**Operation parameters:**~~

- ~~user identity~~
- ~~old password~~
- ~~new password~~

~~**Acknowledgement** does not contain any additional parameters.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~change password -->~~

~~<-- ack~~

~~C.3.10 Change profile parameter~~

~~This operation is used by the SME to change those parameters of the interface profile that it is allowed to change, e.g. default validity period and interface version.~~

~~**Operation parameters:**~~

- ~~parameter identification~~
- ~~new parameter value~~

~~**Acknowledgement** does not contain any additional parameters.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~change profile parameter -->~~

~~<-- ack~~

~~C.3.11 Delivery~~

~~This operation is used by the SMSC deliver mobile originated short messages to the SME.~~

~~After a successful delivery the message will be removed from the SMSC.~~

~~**Operation parameters:**~~

- ~~service centre time stamp~~
- ~~destination address type~~
- ~~destination address~~
- ~~originating address type~~
- ~~originating address~~
- ~~protocol identifier~~
- ~~data coding scheme~~
- ~~reply path~~
- ~~user data length~~
- ~~user data~~

~~**Acknowledgement** may contain parameter get next in case the delivery was requested by the SME with delivery request operation.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~<-- delivery~~

~~ack -->~~

~~C.3.12 Status report~~

~~This operation is used by the SMSC for sending a status report describing current status of a previously submitted short message.~~

~~After a successful delivery the status report will be removed from the SMSC if it describes the final status of the message, i.e. no further delivery attempts will follow.~~

~~**Operation parameters:**~~

- ~~short message identifier~~
- ~~service centre time stamp~~
- ~~destination address type~~
- ~~destination address~~
- ~~originating address type~~
- ~~originating address~~
- ~~discharge time~~
- ~~status~~
- ~~delivery error code~~

~~**Acknowledgement** may contain parameter get next in case the delivery was requested by the SME with status report request operation.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~<-- status report~~

~~ack -->~~

~~C.3.13 Reachability notification~~

~~This operation is used by the SMSC to indicate to the SME that a specific MS is now reachable. The reachability notification may be sent because of an alert received from the GSM network or because of a temporary error other than absent subscriber to a delivery attempt. Reachability notification must be requested in a submit operation.~~

~~If the SME does not cancel the short message after receiving the reachability notification, the message will be delivered after a while.~~

~~**Operation parameters:**~~

- ~~short message identifier~~
- ~~service centre time stamp~~
- ~~destination address type~~
- ~~destination address~~
- ~~originating address type~~
- ~~originating address~~
- ~~reachability type~~

~~**Acknowledgement** does not contain any additional parameters.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~<-- reachability notification~~

~~ack -->~~

~~C.3.14 Delivery data indication~~

~~This operation is used by the SMSC to indicate that there is a new short message or a status report waiting for retrieval.~~

~~**Operation parameters:**~~

- ~~destination address type~~
- ~~destination address~~
- ~~originating address type~~
- ~~originating address~~
- ~~data type~~

~~**Acknowledgement** does not contain any additional parameters.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~<-- delivery data indication~~

~~ack -->~~

~~C.3.15 Alive~~

~~This operation can be used by both the SMSC and the SME to check whether the link between the SME and the SMSC is still alive. The recipient of the operation must send an acknowledgement back to the originator if the alive operation is received correctly.~~

~~**Operation parameters:**~~

~~Operation does not need any parameters.~~

~~**Acknowledgement** does not contain any additional parameters.~~

~~**Flow of operations:**~~

~~SME SMSC~~

~~<-- alive~~

~~ack -->~~

~~.......~~

~~alive -->~~

~~<-- ack~~

~~C.3.16 Ack~~

~~This operation is used by both the SMSC and the SME to send back the positive result of the operation to its originator.~~

~~**Operation parameters:**~~

- ~~initial operation sequence number~~
- ~~initial operation~~
- ~~(additional parameters)~~

~~Sequence number of the operation to which this is an acknowledgement is present only on binary coded SME link.~~

~~The additional parameters depend on the initial operation.~~

~~C.3.17 Nack~~

~~This operation is used by both the SMSC and the SME to send back the negative result of the operation to its originator.~~

~~**Operation parameters:**~~

- ~~initial operation sequence number~~
- ~~initial operation~~
- ~~error code~~
- ~~error text~~

~~Sequence number of the operation to which this is an acknowledgement is present only on binary coded SME link.~~

~~C.4 Interface parameters~~

~~This clause specifies the parameters that the operations communicated between the SME and the SMSC may carry; please refer to subclause C.1.2 for an introduction to their role in this annex and the SME-SMSC architecture.~~

~~C.4.1 Parameter types~~

~~Allowed types for the parameter values are:~~

~~**integer** single integer of one, two or four bytes.~~

~~**int. vector** vector of single integers.~~

~~**IA5** character vector (non-terminated string) of IA5 characters.~~

~~**BCD** vector of BCD digits and two additional characters '+' and '-', each being represented with 4 bits (0000 = '0', 0001 = '1', ... , 1001 = '9', 1010 = '+', 1011 = '-', 1100 - 1110 reserved, 1111 = last 4 bits of the vector, if they are not used), one byte of the vector may thus contain two digits or '+' or '-' characters.~~

~~**GSM7** character vector of GSM 03.38 characters (i.e. in the default 7-bit coded alphabet of the SMS), 7 bits per character, packed into octets according to GSM 03.38.~~

~~**GSM8** character vector of GSM 03.38 characters (i.e. in the default 7-bit coded alphabet of the SMS), *8 bits per character* with a zero bit as the most significant bit of each byte.~~

~~**8BIT** vector of 8 bit bytes which will be sent transparently through the SMSC.~~

~~Integer values are presented in two's complement notation, with the most significant byte in the former byte of parameter value.~~

~~BCD digits are presented so that in each byte, the **higher** order digit is coded in **lowest** order bits 3, 2, 1 and 0. If the number of BCD digits is odd, then bits 7, 6, 5 and 4 within the last byte should always be set to one.~~

~~Types GSM7 and 8BIT may be used only in cases where *the entire short message text is supplied as one parameter value.*~~

~~Type GSM8 may be used *only in character vectors to be copied into a short message without any other processing than conversion to type GSM7 by the services.*~~

~~C.4.2 Parameter definitions~~

~~Each parameter has a unique identifier. Identifier values from 0 to 80 are reserved for parameters defined in this annex. Values from 81 to 99 may be used for building short message texts. The use is agreed between the SME and the SMSC operator.~~

~~**Sequence Number**~~

~~Id: 1~~

~~Type: integer~~

~~Explanation: Sequence number of this operation, numbers incremented cyclically from 0 through 9999 (modulo 10000).~~

~~**Operation**~~

~~Id: 2~~

~~Type: integer~~

~~Explanation: Value as follows:~~
~~1 submit~~
~~2 cancel~~
~~3 delivery request~~
~~4 status report request~~
~~5 disable status report request~~
~~6 enable status report request~~
~~7 login~~
~~8 logout~~
~~9 change password~~
~~10 change profile parameter~~
~~11 delivery~~
~~12 status report~~
~~13 reachability notification~~
~~14 delivery data notification~~
~~15 alive~~
~~16 ack~~
~~17 nack~~

~~**Short Message Identifier**~~

~~Id: 3~~

~~Type: Integer~~

~~Explanation: Identifier given by the SME for the short message.~~

~~**Number Of Destinations**~~

~~Id: 4~~

~~Type: integer~~

~~Explanation: Number of destination addresses to follow. May be used for sending the same short message to many recipients. Maximum value is 20.~~

~~**Destination Address Type**~~

~~Id: 5~~

~~Type: integer~~

~~Explanation: As defined in GSM 03.40 [1]. (145 for an international address using ISDN/telephone numbering plan.)~~

~~**Usually not needed.**~~

~~**Destination Address**~~

~~Id: 6~~

~~Type: IA5/BCD~~

~~Explanation: destination address in GSM network, values in range '0'...'9' or '-' or '+'. '-' and '+' may be used in case there is no destination address type specified. '+' indicates destination address type 145. '-' is ignored.~~

~~**Originating Address Type**~~

~~Id: 7~~

~~Type: integer~~

~~Explanation: As defined in GSM 03.40 [1]. (145 for an international address using ISDN/telephone numbering plan.)~~

~~**Usually not needed.**~~

~~**Originating Address**~~

~~Id: 8~~

~~Type: IA5/BCD~~

~~Explanation: Originating address, values in range '0'...'9' or '-' or '+'. '-' and '+' may be used in case there is no originating address type specified. '+' indicates originating address type 145. '-' is ignored.~~

~~**Protocol Identifier**~~

~~Id: 9~~

~~Type: integer~~

~~Explanation: As defined in GSM 03.40 [1].~~

~~**Usually not needed.**~~

~~**Data Coding Scheme**~~

~~Id: 10~~

~~Type: integer~~

~~Explanation: As defined in GSM 03.38.~~

~~**Usually not needed.**~~

~~**Validity Period Relative**~~

~~Id: 11~~

~~Type: integer~~

~~Explanation: the length of the validity period of the short message counted from the time the message is received by the SMSC, integer representation as defined in GSM 03.40 [1]. If this parameter and validity period absolute are left out, SME specific default validity period is used.~~

~~**Validity Period Absolute**~~

~~Id: 12~~

~~Type: IA5/BCD~~

~~Explanation: The absolute time of the validity period termination of the short message, value consists of year, month, day, hour, minute, second and time zone as defined in GSM 03.40 [1]. If this parameter and validity period relative are left out, installation specific default validity period is used.~~

~~**First Delivery Time Integer**~~

~~Id: 13~~

~~Type: integer~~

~~Explanation: Time in seconds waited before the first delivery attempt of the short message will be made.~~

~~**Usually not needed.**~~

~~**First Delivery Time Absolute**~~

~~Id: 14~~

~~Type: IA5/BCD~~

~~Explanation: Time for the first delivery attempt of the short message. Absolute representation as defined in GSM 03.40 [1] for the absolute validity period.~~

~~**Usually not needed.**~~

~~**Reply Path**~~

~~Id: 15~~

~~Type: integer~~

~~Explanation: Value as follows:~~
~~0 no reply path provided~~
~~1 reply path provided~~

~~**Replace**~~

~~Id: 16~~

~~Type: integer~~

~~Explanation: If there is already a short message from the same originating address to the same destination address it may be replaced.~~

~~NOTE: The replace message type of protocol identifier parameter.~~

~~Value as follows:~~
~~0 don't replace~~
~~1 replace~~

~~**User Data Length**~~

~~Id: 17~~

~~Type: integer~~

~~Explanation: The length of the user data.~~

~~**Usually not needed.**~~

~~**User Data**~~

~~Id: 18~~

~~Type: IA5/GSM7/GSM8/8BIT~~

~~Explanation: The entire short message text which is sent as such to MS.~~

~~**Standard Message Identifier**~~

~~Id: 19~~

~~Type: integer~~

~~Explanation: An alternative to user data: a code identifying the short message text stored in the SMSC.~~

~~**Language**~~

~~Id: 20~~

~~Type: integer~~

~~Explanation: Identifies the language of a standard message that should be sent. Used together with standard message identifier.~~

~~**Status Report Request**~~

~~Id: 21~~

~~Type: integer~~

~~Explanation: Defines in what cases the status report should be returned. Bit map representation. If bit set to 1, a status report will be produced if such a situation occurs.~~

~~Meaning of bits in status report request:~~

~~0 temporary error~~
~~1 validity period expired~~
~~2 delivery failed~~
~~3 delivery successful~~
~~4 message cancelled~~
~~5 message deleted by the operator~~

~~Other bits are reserved for future use.~~

~~NOTE: The status report may be returned automatically or it may have to be requested by the SME with a status report request operation.~~

~~**Reachability Notification**~~

~~Id: 22~~

~~Type: integer~~

~~Explanation: Value as follows:~~
~~0 no reachability notification requested~~
~~1 reachability notification requested~~

~~NOTE: That the reachability notification may be requested only if the SME is of type listening.~~

~~**Cancel Enabled**~~

~~Id: 23~~

~~Type: integer~~

~~Explanation: Defines the possibility to cancel the message later.~~

~~Value as follows:~~
~~0 cancelling is disabled~~
~~1 cancelling is enabled~~

~~Service Centre Time Stamp~~

~~Id: 24~~

~~Type: IA5~~

~~Explanation: As defined in GSM 03.40 [1]~~

~~Filter~~

~~Id: 25~~

~~Type: integer~~

~~Explanation: Defines how the messages should be identified in operations cancel, status report request, enable status report request and disable status report request. Bit map representation. Note that all combinations are not reasonable.~~

~~Meaning of bits:~~
~~0 service centre time stamp~~
~~1 destination address~~
~~2 short message identifier~~
~~3 originating address~~
~~4 time before service centre time stamp~~
~~5 time after service centre time stamp~~

~~User Identity~~

~~Id: 26~~

~~Type: IA5~~

~~Explanation: Identity used in login. Max. 8 characters.~~

~~Password (Old/New)~~

~~Id: 27~~

~~Type: IA5~~

~~Explanation: Password used in login. Max. 8 characters.~~

~~Interface Version~~

~~Id: 28~~

~~Type: IA5~~

~~Explanation: Version of the interface software to be used.~~

~~Parameter Identifier~~

~~Id: 29~~

~~Type: integer~~

~~Explanation: Id number of parameter the default value of which should be changed.~~

~~New Parameter Value~~

~~Id: 30~~

~~Type: integer/IA5/BCD~~

~~Explanation: New default value for a parameter.~~

~~Explanation: As defined in GSM 03.40 [1].~~

~~**Status**~~

~~Id: 32~~

~~Type: integer~~

~~Explanation: Status of the short message:~~
~~Value as follows:~~
~~0 in process~~
~~1 validity period expired~~
~~2 delivery failed~~
~~3 delivery successful~~
~~4 message cancelled~~
~~5 message deleted by the operator~~

~~**Delivery Error Code**~~

~~Id: 33~~

~~Type: integer~~

~~Explanation: Value returned from the GSM network to a delivery attempt.~~

~~Value as follows:~~
~~0 no error code~~
~~1 unknown subscriber~~
~~11 no SMS teleservice~~
~~13 call barred~~
~~19 MS does not support SMS~~
~~20 error in MS~~
~~21 facility not supported~~
~~29 absent subscriber~~
~~36 system failure~~

~~**Reachability Notification Type**~~

~~Id: 34~~

~~Type: integer~~

~~Explanation: Value as follows:~~
~~0 reachability notification caused by a temporary error to delivery attempt~~
~~1 reachability notification caused by an alert from the network.~~

~~**Data Type**~~

~~Id: 35~~

~~Type: integer~~

~~Explanation: Type of data to be retrieved.~~

~~Value as follows:~~
~~0 short message to be retrieved~~
~~1 status report to be retrieved~~

~~**Initial Operation Sequence Number**~~

~~Id: 36~~

~~Type: integer~~

~~Explanation: Sequence number of the operation to which this an response, values from 0 to 9999.~~

~~Initial Operation~~

~~Id: 37~~

~~Type: integer~~

~~Explanation: Value of the operation to which this a response. Value as specified for operation.~~

~~Get Next~~

~~Id: 38~~

~~Type: integer~~

~~Explanation: Parameter used in acknowledgement operation to delivery and status report operations indicating whether the next short message or status report should delivered or not.~~

~~Value as follows:~~
~~0 don't deliver next message~~
~~1 deliver next message~~

~~Message Count~~

~~Id: 39~~

~~Type: integer~~

~~Explanation: Tells how many new mobile originated messages there are waiting for retrieval or how many status reports or deliveries will follow after status report or delivery request.~~

~~Error Code~~

~~Id: 40~~

~~Type: integer~~

~~Explanation: Error code of an operation.~~

~~Value as follows:~~
~~0 unspecified error~~
~~1 protocol error~~
~~2 operation not allowed~~
~~3 checksum error~~
~~4 no SMSC response~~
~~5 system error~~
~~6 unexpected operation~~
~~7 message error~~
~~8 login failure~~
~~9 invalid address~~
~~10 invalid parameter value~~
~~11 invalid character~~
~~12 message too long~~

~~Error Text~~

~~Id: 41~~

~~Type: IA5~~

~~Explanation: Text describing the error.~~

~~C.5 SME link~~

~~C.5.1 Introduction~~

~~As specified in previous clauses, operations are basically nothing but a sequence of parameters.~~

~~Each parameter may be characterized by the following attributes:~~

- ~~identifier~~
- ~~type~~
- ~~length of value~~
- ~~value.~~

~~The SME link specification problem thus becomes the following: how to communicate a sequence of parameters between the SME and the SMSC so that both ends would know what parameters are present, of what type they are, how long they are and what is the actual value.~~

~~In this clause two different SME links are specified:~~

- ~~binary coded SME link~~
- ~~text based SME link~~

~~C.5.2 Binary coded SME link~~

~~On binary coded SME link all four attributes of each parameter are always communicated over the SME link. This makes the link very flexible. There can be parameters to be included to the short message text and adding new parameters does not require synchronised updates to both to the SME and the SMSC. The link is also flexible in a sense that it is possible to start with a very basic service and then add the functionality later. The binary coded link is meant to be used with X.25 or TCP/IP connections. The binary coded SME link is mainly targeted to SMEs like voice mail systems and paging systems.~~

~~C.5.2.1 SME parameter format~~

~~Each (identifier, type, length, value) -quadruplet is coded according to figure C.1.~~

~~The identifier (id) field value for a parameter is taken from the parameter lists specified in clause C.3.2.~~

~~The type field values in binary coding and a guidance for counting the value of the corresponding length field are as follows (types specified in clause C.3.1):~~

~~**0000** reserved for the end mark (length must be = 0,)~~

~~**0001** single integer (length must be = 1, 2 or 4)~~

~~**0010** int. vector (length = 2 x number of integers)~~

~~**0011** IA5 (length = number of characters)~~

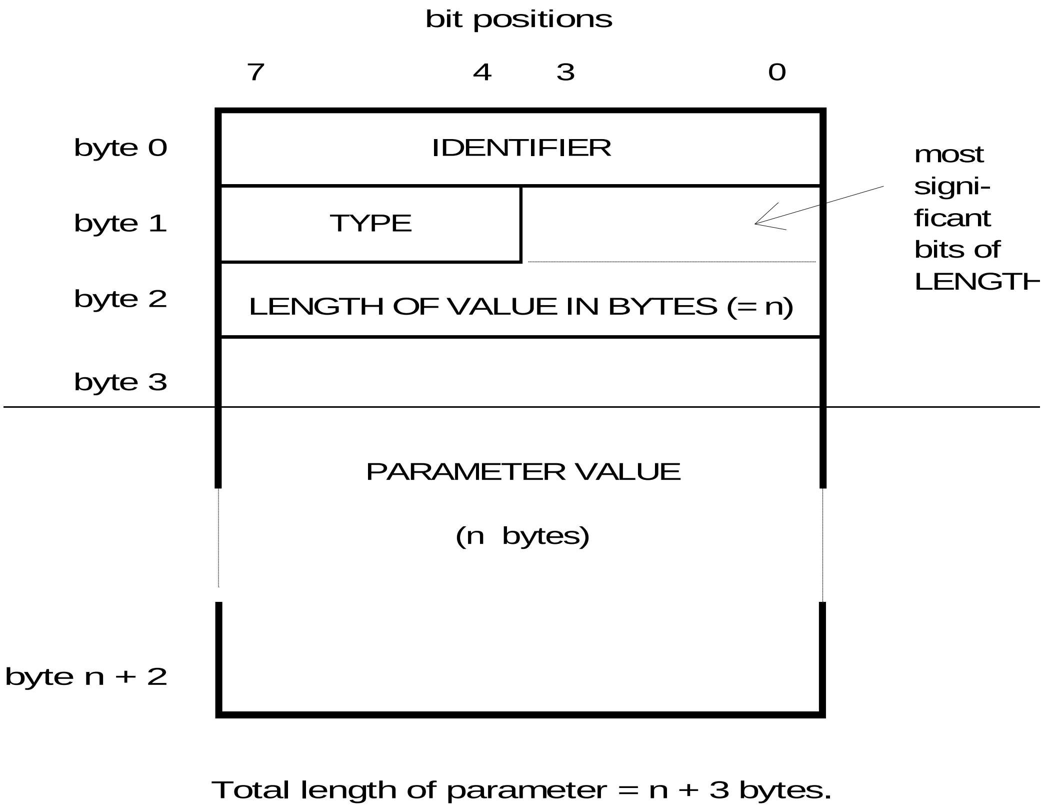
~~**0100** BCD (length = number of bytes)~~

~~**0101** GSM7 (length = number of packed bytes)~~

~~**0110** GSM8 (length = number of characters)~~

~~**0111** 8BIT (length = number of bytes)~~

~~**1000 through 1111** are reserved and *must not be produced* by SMEs.~~



~~**Figure C.1: Coding of a parameter on the binary coded SME link**~~

~~C.5.2.2 SME operation format~~

~~The format of operations on binary coded SME link is:~~

~~**HEADER DATA STOP**~~

~~The **HEADER** contains parameters sequence number and operation identifier. Both are represented with identifier, type, length and value just like any other parameter.~~

~~The **DATA** consists of parameters needed for the operation in question.~~

~~The **STOP** is three bytes of all zero bits, i.e. a parameter where identifier, type and length are all zeroes.~~

~~There is no separators between the parameters because the length of each parameter is known.~~

~~Since X.25 or TCP/IP is used, the error correction mechanisms provided by the network layer are considered adequate: no error checking is included.~~

~~C.5.3 Text based SME link~~

~~On text based SME link only the parameter values are communicated. This actually means that the number and order of parameters related to each operation must be fixed. Of course the profiling method enables that the parameters per operation can depend on user identification but the flexibility is not as good as on binary coded link. The clear advantage of text based SME link is that it meant for serial line connections, e.g. modems, X.25 PAD connections, that are easy to use and also the implementation is quite simple. The text based SME link is very well suitable e.g. for PC applications.~~

~~C.5.3.1 SME operation format~~

~~The format of operations on text based SME link is:~~

~~**START HEADER DATA CHECKSUM STOP**~~

~~The **START** is character "STX" (02h, i.e. 02 in hexadecimal).~~

~~The **HEADER** consists of an operation identifier, and is ended with a TAB (09h) as any other parameter.~~

~~The **DATA** consists of parameters needed for the operation in question. On a text based link only the value of the parameter is present, no type is defined. The parameter values are of type IA5; printing characters from 20h to 7Eh, CR (0Dh) and LF (0Ah). Also those parameters that are of type integer in the list specified in clause C.3.2. are represented as text. Parameters are ended with TAB characters.~~

~~The **CHECKSUM** is calculated as follows (programming language C):~~

~~while (b_ptr != b_ptr_max) {~~

~~sum += *b_ptr++;~~

~~sum &= 0x00FF;~~

~~}~~

~~All characters from very first start character to the last character before the CHECKSUM character are included into the sum.~~

~~The CHECKSUM is represented as two printable characters. The character containing the 4 most significant bits shall be transmitted first. For example, if the CHECKSUM is 3Ah the representation shall be the characters '3' (33h) and 'A' (41h).~~

~~The **STOP** is characters "ETX LF" (03h 0Ah).~~

~~General operation thus looks like this:~~

~~<STX>operation<TAB>parameter<TAB>[parameter<TAB>]checksum<ETX><LF>~~

~~C.5.3.2 Example session~~

~~Example session given here contains operations login, submit and logout. Note that in submit operation example only parameters destination address, validity period and user data are given by the SME.~~

~~SME <--> SMSC~~

~~Login -->~~

~~<STX>01<TAB>UserIdentity<TAB>Password<TAB>InterfaceVersion<TAB>Checksum<ETX><LF>~~

~~Ack <--~~

~~<STX>16<TAB>01<TAB>MessageCount<TAB>Checksum<ETX><LF>~~

~~Submit -->~~

~~<STX>03<TAB>DestinationAddress<TAB>ValidityPeriodRelative<TAB>UserData<TAB>Checksum<ETX><LF>~~

~~Ack <--~~

~~<STX>16<TAB>03<TAB>ServiceCentreTimeStamp<TAB>Checksum<ETX><LF>~~

~~Example of Nack <--~~

~~<STX>17<TAB>03<TAB>ErrorCode<TAB>ErrorText<TAB>Checksum<ETX><LF>~~

~~Logout -->~~

~~<STX>08<TAB>Checksum<ETX><LF>~~

~~Ack <--~~

~~<STX>16<TAB>08<TAB>Checksum<ETX><LF>~~

~~C.6 Waiting indication service~~

~~The specifications in the preceding clauses have outlined the SME-IF in terms of information and link. This clause provides *auxiliary information* by specifying a *sample* service as a "consumer" of information - thus making the preceding clauses more understandable.~~

~~This clause outlines one service called Waiting indication service.~~

~~The services will be specified in terms of~~

- ~~purpose of the service (from the subscribers' point of view)~~
- ~~interface profile for the service including~~
  - ~~minimum list of operations needed for the service,~~
  - ~~minimum list of parameters needed for the operations,~~
  - ~~SME link to be used.~~

~~C.6.1 Purpose of the service~~

~~The purpose of the Waiting indication service is to provide a short message to the voice mail subscriber whenever his/her voice mailbox becomes non-empty, i.e. the first voice message is placed there after emptying (being in connection with) the mailbox.~~

~~The service includes the cancellation of undelivered short message, if the subscriber empties the mailbox before the short message has been delivered to his/her MS.~~

~~The service also uses reachability notification so that the voice mail system may make a delivery call when it knows that the MS is reachable and that there are voice messages to be listened. If the delivery call fails the voice mail system may replace the short message stored in the SMSC with a new message telling the current status of the mailbox. If the delivery call is successful the short message will be cancelled.~~

~~The short message texts are produced in the SMSC according to information received from the voice mail system.~~

~~Two different standard messages are defined for this service. One for the initial short message and another for the update message.~~

~~The content of the first short message could the following, with places for parameter values indicated with ^ ^:~~

~~"*New* ^type^ *message from* ^caller^ *received*."~~

~~The actual short message, the content of which is shown above, would, for example, look like this:~~

~~"*New voice message from 112233 received*."~~

~~The content of the update short message could be following.~~

~~"*You have* ^totnew^ *new and* ^toturg^ *urgent messages in your mailbox*."~~

~~The actual short message in this case could look like this:~~

~~"*You have 4 new and 2 urgent messages in your mailbox."*~~

~~By defining more texts it is possible to extent the service to cover also standard message service offering possibility to send messages like "Call home", "Call secretary", etc.~~

~~C.6.2 Interface profile~~

~~C.6.2.1 Operations needed~~

~~Operations from the SME:~~

- ~~login~~
- ~~submit~~
- ~~cancel~~
- ~~logout~~

~~Operations from the SMSC:~~

- ~~reachability notification~~

~~Common operations:~~

- ~~ack~~
- ~~nack~~

~~C.6.2.2 Parameters needed~~

~~login:~~

- ~~user identity~~
- ~~password~~
- ~~interface version~~

~~submit:~~

- ~~destination address~~
- ~~originating address~~
- ~~validity period relative~~
- ~~replace~~
- ~~standard message identifier~~
- ~~language~~
- ~~reachability notification~~
- ~~cancel enabled~~
- ~~type (note)~~
- ~~totnew (note)~~
- ~~toturg (note)~~
- ~~caller (note)~~

~~NOTE: These parameters are additional parameters submit operation and they are used when building short message texts.~~

~~cancel:~~

- ~~destination address~~

~~logout:~~

- ~~(no parameters)~~

~~reachability notification:~~

- ~~destination address~~
- ~~reachability type~~

~~C.6.2.3 SME link~~

~~The SME link to be used would be a binary coded link over X.25 connection.~~

~~The SME is of type listening.~~

~~Annex D:~~
~~SMSC Open Interface Specification~~

~~D.1 Introduction~~

~~The objective of this annex is to provide a sufficiently detailed description of the protocol to be used for exchanging messages between an SMSC and an SME to allow a reader to implement that protocol.~~

~~D.1.1 Scope~~

~~The content of this annex is relevant to the implementers of any system which implements the functionality of an SME by communicating with an SMSC.~~

~~D.1.2 Annex Structure~~

~~Clause D. 2 provides an overview of the SMSC to SME message protocol.~~

~~Clause D.3 describes the procedures involved in the message protocol.~~

~~Clause D.4 gives details of the message formats.~~

~~D.2 Overview~~

~~This clause explains the purpose of the SMSC to SME protocol.~~

~~D.2.1 SMSC and SMEs~~

~~The exact functionality of SMEs, and the interfaces between SMEs and the SMSC, is specifically stated in GSM 03.40 [1] to be beyond the scope of the GSM recommendations. This annex describes a protocol which SMEs can use to communicate with an SMSC over any suitable transport service (such as that provided with X.25, DECnet or SS7).~~

~~The SMEs which communicate directly with the SMSC are assumed to be trusted systems. Control of access to usage of this protocol is outside the scope of this annex. Systems belonging to third parties should be connected via an SME which controls who may access the SMSC and what facilities are available to them.~~

~~D.2.2 Services Available~~

~~SMEs may invoke the following operations using the SMSC to SME protocol:~~

~~**Submit SM** Request to deliver an SM to an MS.~~

~~**Delete SM** Delete a previously submitted SM. This SM must have not yet been delivered.~~

~~**Replace SM** Replace a previous SM with a new SM to the same destination MSISDN. A new SMSC reference number is allocated to the replacement SM.~~

~~**Delete All SMs** Delete all undelivered SMs previously submitted by the SME to a destination MSISDN.~~

~~**Enquire SM** Obtain information on a previously submitted SM.~~

~~**Cancel SRR** Cancel all Status Report requests made on a previously submitted SM. The SM must have not yet been delivered.~~

~~**Alert SME Request** Request an 'Alert SME' message when the specified MSISDN becomes registered.~~

~~**Retrieve Request** Request transmission by the SMSC of any queued Incoming SM, Status Report or Alert SME messages, or request that none are transmitted.~~

~~**Get Version** Request the Open Interface version number supported by the SMSC.~~

~~SMEs may receive the following operations using the SMSC to SME protocol:~~

~~**Alert SME** An indication that an MSISDN has registered with the GSM network.~~

~~**Status Report** A report of the status of a previously submitted SM. This will indicate delivery or a reason for failure to deliver the SM.~~

~~**Incoming SM** An SM from an MSISDN has been sent destined for the SME.~~

~~D.2.3 General procedures in the SMSC to SME protocol~~

~~D.2.3.1 Summary~~

~~The SME invokes an operation of the SMSC by sending a request. On completion of the request by the SMSC, the SMSC sends a result to the SME reporting the completion status of the request.~~

~~The SME may receive a request from the SMSC if it has previously submitted a request asking for a Status Report, if it has requested an Alert SME or if it receives a mobile-originated SM. It sends a result to the SMSC for each request.~~

~~D.2.3.2 Procedures for Handling Operation Failure~~

~~D.2.3.3 SME Recovery Strategy~~

~~SME-invoked operations either complete with the SME receiving confirmation of the SMSC's attempt to perform them, or with no reply from the SMSC. If no reply is received from the SMSC this should be interpreted as a rejection of the message by the SMSC. The SME should implement a time-out on the result.~~

~~This annex imposes no defined recovery algorithm on the SME, it may repeat failed operations or abandon them.~~

~~Repetition of a failed invocation by the SME may lead to duplicated invocations. This is because the SMSC does not detect the SME's non-receipt of an SMSC response, so it behaves as though its responses were always received by the SME. The SMSC makes no provision for roll-back of any operation it has performed.~~

~~The effect of the SME duplicating an operation is as follows:~~

- ~~Re-submission of an SM to which the SME has given an SME reference number of the KEY type (see clause D.4.3.32 for a full explanation of SME reference number types). The re-submission of an already accepted SM will fail with an "already in store" error.~~

- ~~Re-submission of an SM to which the SME has not given an SME reference number of the KEY type (see clause D.4.3.32 for a full explanation of SME reference number types). The SM will be accepted again on the re-submission, which will result in it being delivered twice and, if a Status Report has been requested, in two Status Reports being returned to the SME.~~

- ~~Deletion of an already deleted SM. The second deletion will fail with a "no such SM" error.~~

~~D.2.3.3.1 SMSC Recovery Strategy~~

~~The SMSC ensures that the SME receives SMs, Status Report messages and Alert SME messages (collectively referred to as SMSC_Invoke messages in the following text). It follows a timed retry recovery strategy if it cannot send an SMSC_Invoke message to the SME or if the SME does not acknowledge an SMSC_Invoke message. The precise nature of this timed recovery strategy is outside the scope of this annex. If an SMSC_Invoke message waiting to be sent passes its expiry time before reaching the SME, the SMSC stops attempting to send it and discards it.~~

~~SMSC recovery only applies to SMSC-invoked operations. The SMSC does not retry its responses to SME-invoked operations but behaves as though the responses were always received by the SME.~~

~~The SMSC cannot distinguish between:~~

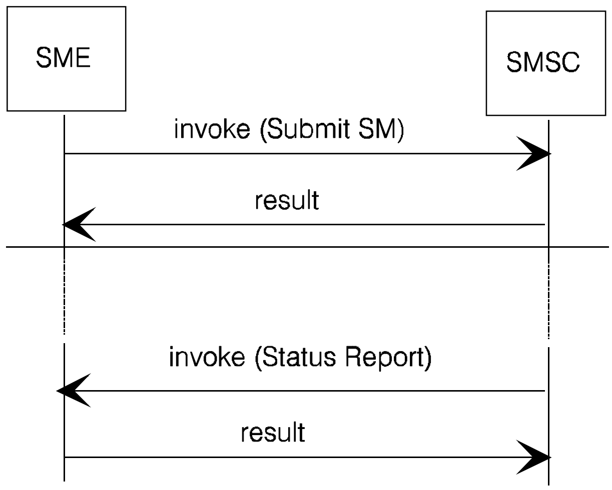
- ~~Failure to send an SMSC_Invoke message to the SME.~~
- ~~Successfully sending an SMSC_Invoke message but failing to receive the acknowledgement.~~

~~The SMSC makes a timed retry in both cases. Therefore the SME may receive a particular SMSC_Invoke message twice if an error has occurred.~~

~~D.3 SMSC Access Procedures~~

~~This clause defines the procedures for the exchange of information between the SME and the SMSC.~~

~~D.3.1 Procedure for Submission of an SM~~



~~Figure D.1: Submission of an SM~~

~~The procedure is shown in figure D.1. It is initiated by the SME to request the SMSC to deliver an SM to an MS. The procedure consists of the following actions:~~

- ~~An invoke is sent by the SME containing a submit SM operation.~~
- ~~A result is sent by the SMSC indicating that it has completed the submit SM operation and the SM has been secured in the SMSC database.~~
- ~~An invoke is sent by the SMSC passing a Status Report for the SM (if a Status Report has been requested).~~
- ~~A result is sent by the SME indicating that it has accepted the Status Report.~~

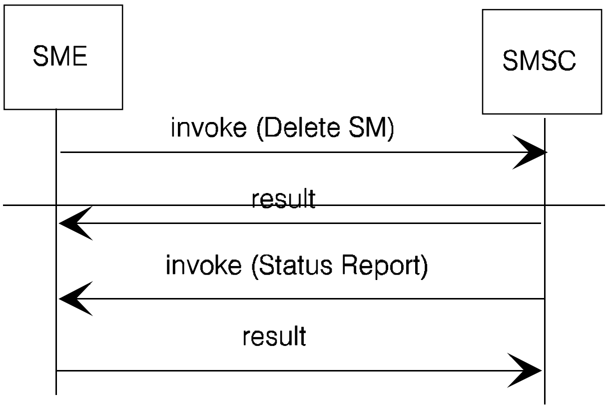
~~An SM submission may request a Status Report for a particular set of circumstances. After a delivery attempt is made, the SMSC checks whether one of the selected circumstances has occurred. If one has occurred, the SMSC sends a Status Report to the SME. The Status Report identifies the SM to which it relates and describes the status of that SM. It also carries the SME internal reference supplied by the SME when submitting the SM.~~

~~The SMSC does not monitor SM expiry dates in real-time so a Status Report informing the SME that an SM has expired will be sent some time after the actual expiry time. If an SME needs to know whether or not an SM has expired it should send an Enquire SM rather than rely on the receipt of a Status Report.~~

~~If a Status Report is not accepted by the SME, the SMSC timed retry algorithm is applied until the SMSC receives a Status Report acceptance or the Status Report expires.~~

~~It is possible, depending on the circumstances for which a Status Report is requested, that more than one Status Report will follow the SM submission request; e.g. if Status Reports are requested for "Unable to deliver SM - retrying delivery" a Status Report will be generated for each delivery attempt. However it is important to remember that the SMSC queues messages for a destination internally. When it tries to deliver to a destination it attempts to deliver the message at the head of the queue, if this delivery attempt results in "Unable to deliver SM - retrying delivery" a status report will be generated for this first message (if requested) and the delivery attempt ends. No attempt was made to deliver the other messages for this destination so no status reports will be generated for them.~~

~~D.3.2 Procedure for Deletion of an SM~~



~~Figure D.2: Deletion of an SM~~

~~The procedure is shown in figure D.2. It is initiated by the SME to request the SMSC to delete an SM previously submitted for delivery to an MS. The procedure consists of the following actions:~~

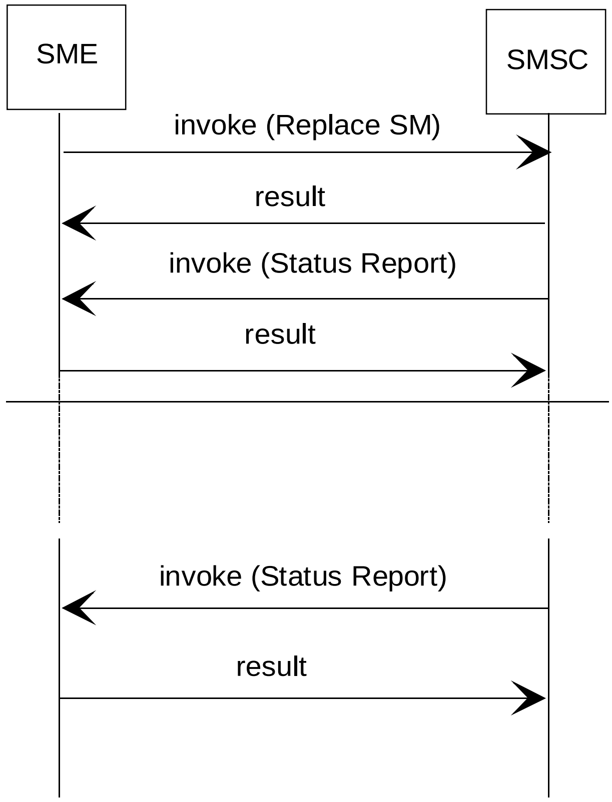
- ~~An invoke is sent by the SME containing a delete SM operation.~~
- ~~A result is sent by the SMSC indicating that it has completed the delete SM operation.~~
- ~~An invoke is sent by the SMSC passing a Status Report for the SM (if a Status Report was requested when the SM was submitted).~~
- ~~A result is sent by the SME indicating that it has accepted the Status Report.~~

~~If a Status Report on "deletion by SME" was requested when the SM was originally submitted, the SMSC sends a Status Report to the SME. The procedure is the same as for SM submission.~~

~~Note that because the generation of status reports and their subsequent delivery is an entirely separate process from the return of the delete result it is possible (and quite likely) that the status report invoke will be sent by SMS2000 before the result of the delete SM operation is returned.~~

~~The SMSC will only delete the SM if the originating address of the SM to be deleted matches the originating address contained in the request. If there is no match the request will be rejected and a result returned indicating "SM not in SMSC database" (as there is no SM with the specified reference belonging to the requester).~~

~~D.3.3 Procedure for Replacement of an SM~~



~~Figure D.3: Replacement of an SM~~

~~The procedure is shown in figure D.3. It is initiated by the SME to request the SMSC to replace an SM previously submitted for delivery to an MS with another SM to the same MS. This procedure provides a shorthand way to combine the effects of the delete SM and submit SM procedures. The procedure consists of the following actions:~~

- ~~An invoke is sent by the SME containing a replace SM operation.~~
- ~~A result is sent by the SMSC indicating that it has completed the replace SM operation.~~
- ~~An invoke is sent by the SMSC passing a Status Report for the SM (if a Status Report was requested when the SM was submitted).~~
- ~~A result is sent by the SME indicating that it has accepted the Status Report.~~
- ~~An invoke is sent by the SMSC passing a Status Report for the SM (if a Status Report has been requested).~~
- ~~A result is sent by the SME indicating that it has accepted the Status Report.~~

~~Since this procedure combines the effects of the submit SM and delete SM procedures, two sets of Status Reports may be generated: for the deletion of the original SM and for the status of the replacement SM. It is possible, depending on the circumstances for which a Status Report is requested, that more than one Status Report will follow the submission of the SM replacement; e.g. if Status Reports are requested for "Unable to deliver SM - retrying delivery" a Status Report will be generated for each delivery attempt. The SMSC sends the Status Reports to the SME using the same procedure as for SM submission.~~

~~The SMSC carries out the deletion of the SM to be replaced and the submission of the replacement SM as two operations. It is therefore possible that the submission may succeed and the deletion fail (for example because the old SM has already been delivered).~~

~~Because status reports are routed and delivered by a separate mechanism to the replace result message it is not possible to predict with certainty what order they will occur in. It is quite likely that the status report generated on deletion of the original message will be sent to the SME by the SMSC before the replace result message is received. It is also possible (but less likely) that the status report generated as a result of attempting to deliver the new short message will be received before the replace result message is received. Finally it is possible (but very unlikely) that the status report generated by the first delivery attempt for the new message will be sent by the SMSC before the status report generated by deletion of the old message. So the following sequences are all possible (as are other variations) in addition to the one shown above :~~

~~Sequence 1~~

- ~~The SME sends a replace invoke;~~
- ~~The SMSC sends a status report invoke (for the delete);~~
- ~~The SME sends a result acknowledging the status report;~~
- ~~The SMSC sends a result acknowledging the replace request;~~
- ~~The SMSC sends a status report invoke (for the first delivery attempt of the new message);~~
- ~~The SME sends a result acknowledging the status report.~~

~~Sequence 2~~

- ~~The SME sends a replace invoke;~~
- ~~The SMSC sends a status report invoke (for the delete);~~
- ~~The SME sends a result acknowledging the status report;~~
- ~~The SMSC sends a status report invoke (for the first delivery attempt of the new message);~~
- ~~The SME sends a result acknowledging the status report.~~
- ~~The SMSC sends a result acknowledging the replace request;~~

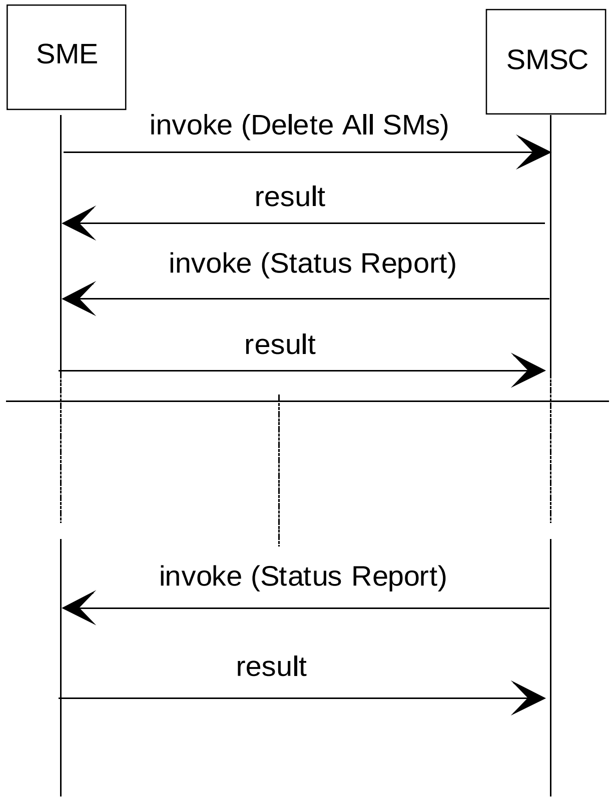
~~Sequence 3~~

- ~~The SME sends a replace invoke;~~
- ~~The SMSC sends a status report invoke (for another action totally unrelated to the replace. e.g. delivery of a previously submitted SM);~~
- ~~The SME sends a result acknowledging the status report;~~
- ~~The SMSC sends a status report invoke (for the first delivery attempt of the new message);~~
- ~~The SME sends a result acknowledging the status report.~~
- ~~The SMSC sends a result acknowledging the replace request;~~
- ~~The SMSC sends a status report invoke (for the delete);~~
- ~~The SME sends a result acknowledging the status report;~~

~~The SMSC carries out the deletion of the SM to be replaced and the submission of the replacement SM as two operations. It is therefore possible that the submission may succeed and the deletion fail (for example because the old SM has already been delivered).~~

~~The SMSC will only delete the SM if the originating address of the SM to be deleted matches the originating address contained in the request. If there is no match the delete request will be rejected and a result returned indicating "SM not in SMSC database" (as there is no SM with the specified reference belonging to the requester). The submission of the new SM will be carried out as usual.~~

~~D.3.4 Procedure for Deletion of All SMs~~



~~Figure D.4: Deletion of All SMs~~

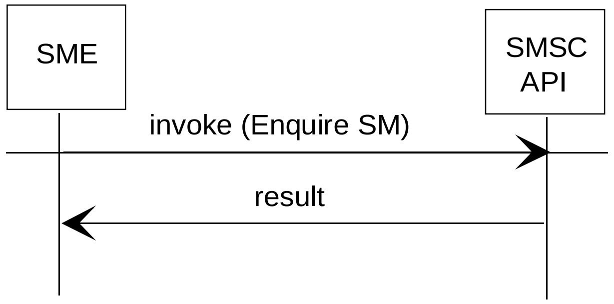
~~The procedure is shown in figure D.4. It is initiated by the SME to request the SMSC to delete all SMs remaining undelivered which were previously submitted for delivery to an MS by the SME. The procedure consists of the following actions:~~

- ~~An invoke is sent by the SME containing a delete all SMs operation.~~
- ~~A result is sent by the SMSC indicating that it has completed the delete all SMs operation.~~
- ~~A number of invokes may be sent by the SMSC each passing a Status Report for a deleted SM (if a Status Report was requested when the SM was submitted).~~
- ~~A result is sent by the SME in response to each Status Report indicating that the report has been accepted.~~

~~Since this procedure may delete many SMs, many Status Reports may be generated, one for each deleted SM. The SMSC sends the Status Reports to the SME using the same procedure as for SM submission.~~

~~The SMSC will only delete those SMs where the originating address of the SM to be deleted matches the originating address contained in the request.~~

~~D.3.5 Procedure for Enquiring on an SM~~



~~Figure D.5: Enquiry on an SM~~

~~The procedure is shown in figure D.5. It is initiated by the SME to request the SMSC to return information on an SM previously submitted for delivery to an MS. The procedure consists of the following actions:~~

- ~~An invoke is sent by the SME containing an enquire SM operation.~~
- ~~A result is sent by the SMSC, indicating that the SMSC has completed the enquire SM operation.~~

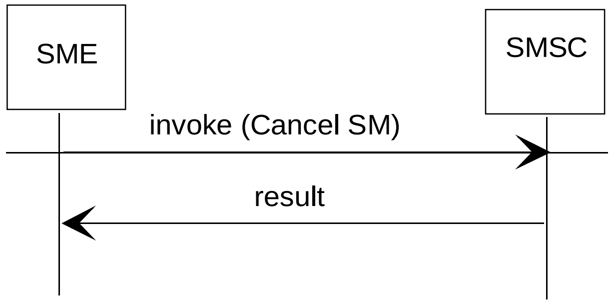
~~The result gives the delivery status of the SM.~~

~~An SM is only retained within the SMSC message store for a limited period after the SM has been delivered or delivery attempts have been abandoned, or after its validity period has expired. Once the SM has been archived from the SMSC message store any Enquire SM will get the result 'SM is not in SMSC database'. The SMSC retention period for SMs is outside the scope of this annex.~~

~~Because the SMSC stores all SM messages internally in GSM format, the returned message information will be encoded in GSM format, even if the message was originally submitted using IA5 encoding.~~

~~The SMSC will only return information about the SM if the originating address of the stored SM matches the originating address contained in the request. If there is no match the request will be rejected and a result returned indicating "SM not in SMSC database" (as there is no SM with the specified reference belonging to the requester).~~

~~D.3.6 Procedure for Cancelling Status Report Requests on an SM~~



~~Figure D.6: Cancel of SRR on an SM~~

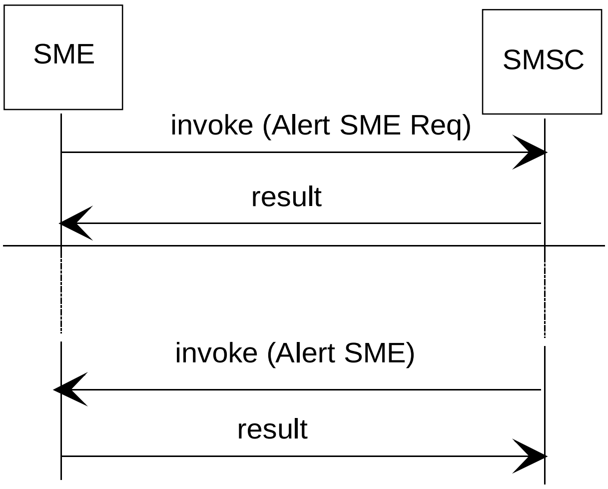
~~The procedure is shown in figure D.6. It is initiated by the SME to cancel any Status Report requests on an SM previously submitted for delivery to an MS. The procedure consists of the following actions:~~

- ~~An invoke is sent to the SMSC containing the Cancel SRR operation~~
- ~~A result is sent by the SMSC indicating that the SMSC has completed the cancel SRR operation.~~

~~The cancel will stop any Status Reports being generated after the cancel has been received. Any Status Reports that have already been generated will still be passed to the SME.~~

~~The SMSC will only cancel SR for the SM if the originating address of the stored SM matches the originating address contained in the request. If there is no match the request will be rejected and a result returned indicating "SM not in SMSC database" (as there is no SM with the specified reference belonging to the requester).~~

~~D.3.7 Procedure for Requesting an Alert SME~~



~~Figure D.7: Request an Alert SME~~

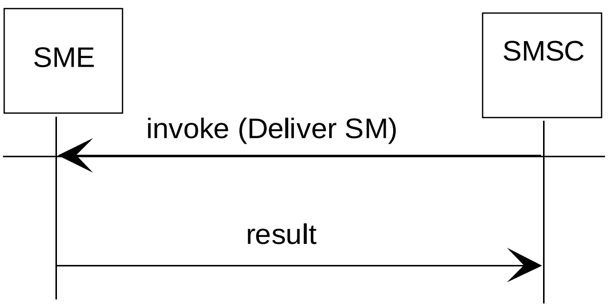
~~The procedure is shown in figure D.7. It is initiated by the SME to request the SMSC to notify the SME when an MSISDN is registered. The procedure consists of the following actions:~~

- ~~An invoke is sent to the SMSC containing an alert SME request operation.~~
- ~~A result is sent by the SMSC indicating that the SMSC has completed the alert SME request operation and the requirement to send an alert SME has been noted in the SMSC database.~~
- ~~An invoke is sent by the SMSC containing an Alert SME for the requested MSISDN.~~
- ~~A result is sent by the SME indicating that it has accepted the Alert SME.~~

~~The Alert SME Request will result in an Alert SME being generated when the requested MSISDN registers with the GSM network.~~

~~It does not matter how many times a single SME requests an Alert SME on a single destination - it will only be notified (by invoke Alert SME) once.~~

~~D.3.8 Procedure for Receiving an Incoming SM~~



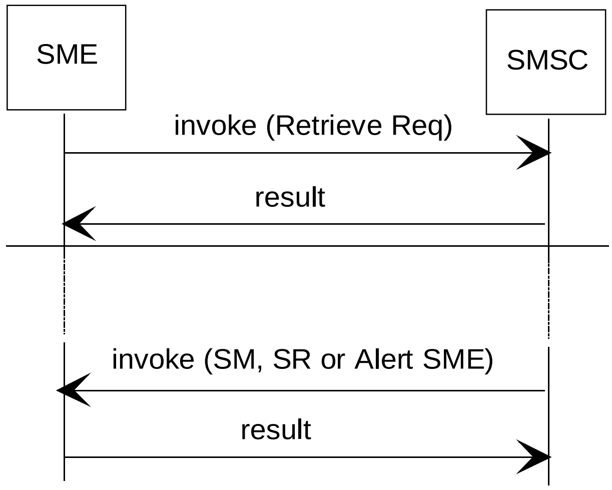
~~Figure D.8: Delivery of an SM~~

~~The procedure is shown in figure D.8. It is initiated by the SMSC to deliver an SM to the SME. The procedure consists of the following actions:~~

- ~~An invoke is sent by the SMSC containing an Incoming SM to the SME.~~
- ~~A result is sent by the SME, indicating that it has accepted the Incoming SM.~~

~~This procedure is only used for SME's that can receive SM's from MSISDNs.~~

~~D.3.9 Procedure for Retrieving Incoming SMs, SRs and Alert SMEs~~



~~Figure D.9: Retrieval Request~~

~~The procedure is shown in figure D.9. It is initiated by the SME to request the SMSC to switch on or off the sending of queued messages (Incoming SMs, Status Reports or Alert SMEs). The procedure consists of the following actions:~~

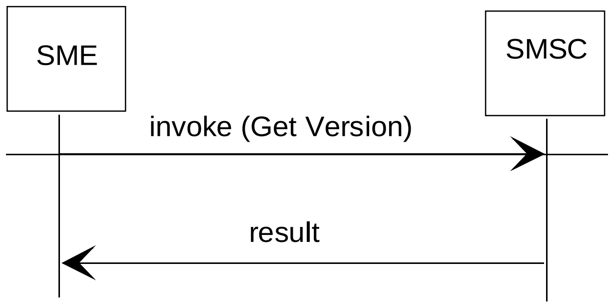
- ~~An invoke is sent by the SME containing a retrieval request to initiate or inactivate the message transmissions.~~
- ~~A result is sent by the SMSC indicating that the SMSC has noted the request.~~
- ~~If there are queued messages and retrieval has been initiated then a number of invokes are sent by the SMSC passing Incoming SM, Status Report or Alert SME.~~
- ~~For each invoke received by the SME a result is sent by the SME indicating that it has accepted a message.~~

~~This procedure has a number of uses. It gives SMEs control over when they receive messages. It enables SMEs whose communications link to the SMSC has been unavailable to request queued messages when it is ready for them. It gives the SME the ability to apply flow control with the SMSC by switching on and off the flow of messages to the SME.~~

~~The SME has two choices on the retrieve order of the messages. These are a) high priority SMs, then normal priority SMs and status reports interleaved, then alert SMEs, b) high priority SMs, then normal priority SMs, then status reports, then alert SMEs.~~

~~The SMSC will only retrieve messages (SMs, SRs, and alerts) which have the supplied originating address as their destination.~~

~~D.3.10 Procedure for Getting the Open Interface Version Number~~



~~Figure D.10: Get Version~~

~~The procedure is shown in figure D.10. It is initiated by the SME to request the version number of the Open Interface supported by the SMSC. The procedure consists of the following actions:~~

- ~~An invoke is sent by the SME containing a get version request~~
- ~~A result is sent by the SMSC indicating the version number.~~

~~D.4 Message Format~~

~~Messages are made up of a *header* and *data* part. Each invoke and result message is made up of a *header* and a *data* part in that order. The *header* part indicates the type of message and the *data* is the type-specific data. The *data* part must not exceed 215 bytes in length.~~

~~The encoding scheme and transmission mechanism used to transfer the messages defined by this protocol are outside the scope of this annex.~~

~~D.4.1 Header Details~~

~~D.4.1.1 Invoke Message Header~~

~~Table D.1: Header Part for Invoke~~

~~Opref (4 octets)~~
~~Message type (1 octet)~~
~~Operation (1 octet)~~
~~2 octets - unused~~
~~Data size (2 octets)~~

~~Opref provides a unique reference for an operation.~~

~~Message Type is 0, indicating invoke.~~

~~Operation identifies the type of operation and takes one of the following values:~~

~~0 = Submit SM~~

~~1 = Delete SM~~

~~2 = Replace SM~~

~~3 = Delete All SMs~~

~~4 = Status Report~~

~~5 = Enquire~~

~~6 = Cancel Status Report~~

~~7 = Alert Request~~

~~8 = Alert SME~~

~~9 = Deliver~~

~~Data size gives the length of the *data* part of the message in octets.~~

~~D.4.1.2 Result Message Header~~

~~Table D.2: Header Part for Result~~

~~Opref (4 octets)~~
~~Message type (1 octet)~~
~~Operation (1 octet)~~
~~2 octets - unused~~
~~Data size (2 octets)~~

~~Opref is the value from the corresponding invoke.~~

~~Message Type is 1, indicating result.~~

~~Operation is the value from the corresponding invoke.~~

~~Data size gives the length of the *data* part of the message in octets.~~

~~D.4.2 Operation Data~~

~~This subclause lists the contents of the *data* part of the message for each of the different types of operation. The invoke and the result of each operation each have an associated *data* parameter format.~~

~~For transmission purposes, the *data* parameter is defined to be a contiguous block of bytes. Each field within the block follows the previous without filler bytes, and the first field is defined to start in the least significant byte of the block (i.e. the first field occurs at the lowest address in memory). The transmission of the whole *data* parameter is performed to preserve this order, therefore for byte-oriented transmission mediums, the bytes are transmitted from low memory addresses first. Clause D.4.3 describes how data is stored within fields.~~

~~D.4.2.1 Submit SM Invoke~~

~~Table D.3: Data Part for Submit SM Invoke~~

~~MSISDN length~~
~~MSISDN~~
~~SME reference type~~
~~SME reference number~~
~~priority~~
~~originating address length~~
~~originating address~~
~~validity period type~~
~~[validity period (absolute)]~~
~~[validity period (relative)]~~
~~data coding scheme~~
~~status report request~~
~~protocol id~~
~~reply path~~
~~SM text size (characters)~~
~~SM text size (bytes)~~
~~SM text~~
~~[Sub-Logical SME number]~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"Validity period (relative)" is omitted unless "validity period type" is RELATIVE.~~
- ~~"Validity period (absolute)" is omitted unless "validity period type" is ABSOLUTE.~~
- ~~"Sub-Logical SME number" is omitted by SMEs using the general X.25 access method.~~

~~When submitting a SM which you may subsequently wish to enquire on, replace or delete (other than by use of 'delete all') you must either provide an SME Reference of type KEY or you must record the SMSC Reference returned in the Submit SM Result. Using the SMSC Reference is more efficient. SME references of type NOT KEY may not be used to access a SM in the SMSC.~~

~~D.4.2.2 Submit SM Result~~

~~Table D.4: Data Part for Submit SM Result~~

~~result~~
~~[SMSC reference number]~~
~~[accept time]~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"SMSC reference number" is omitted unless "result" indicates success.~~
- ~~"accept time" is omitted unless "result" indicates success.~~

~~If you need to access the SM to which this result applies on the SMSC you must either record the returned SMSC reference number, or have supplied a SME reference of type KEY in the Submit SM Invoke.~~

~~D.4.2.3 Delete SM Invoke~~

~~Table D.5: Data Part for Delete SM Invoke~~

~~SM reference type~~
~~[SME reference number]~~
~~[SMSC reference number]~~
~~MSISDN length~~
~~MSISDN~~
~~originating address length~~
~~originating address~~
~~[Sub-Logical SME number]~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"SME reference number" is omitted unless "SM reference type" is SME REFERENCE.~~
- ~~"SMSC reference number" is omitted unless "SM reference type" is SMSC REFERENCE.~~
- ~~"Sub-Logical SME number" is omitted by SMEs using the general X.25 access method.~~

~~To access an SM you must either supply a SMSC reference number or an SME Reference number. You may only use the SME reference number if when you submitted the SM you provided an SME reference number of type KEY. If you attempt to access a SM on a NOT KEY SME reference number the SMSC will fail to find the SM.~~

~~D.4.2.4 Delete SM Result~~

~~Table D.6: Data Part for Delete SM Result~~

~~result~~

~~D.4.2.5 Replace SM Invoke~~

~~Table D.7: Data Part for Replace SM Invoke~~

~~SM reference type~~	
~~[SME reference number]~~	~~Of the SM to be deleted~~
~~[SMSC reference number]~~	
~~MSISDN length~~	~~Of both the SM to be deleted~~
~~MSISDN~~	~~and the replacement SM~~
~~SME reference number type~~	
~~SME reference number~~	
~~priority~~	
~~originating address length~~	
~~originating address~~	
~~validity period type~~	
~~[validity period (absolute)]~~	
~~[validity period (relative)]~~	~~Of the replacement SM~~
~~data coding scheme~~	
~~status report request~~	
~~protocol id~~	
~~reply path~~	
~~SM text size (characters)~~	
~~SM text size (bytes)~~	
~~SM text~~	
~~[Sub-Logical SME number]~~	

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"SME reference number" for the SM to be replaced is omitted unless "SM reference type" is SME REFERENCE.~~

- ~~"SMSC reference number" for the SM to be replaced is omitted unless "SM reference type" is SMSC REFERENCE.~~
- ~~"Validity period (relative)" for the replacement SM is omitted unless "validity period type" is RELATIVE.~~
- ~~"Validity period (absolute)" for the replacement SM is omitted unless "validity period type" is ABSOLUTE.~~
- ~~"Sub-Logical SME number" is omitted by SMEs using the general X.25 access method.~~

~~D.4.2.6 Replace SM Result~~

~~Table D.8: Data Part for Replace SM Result~~

~~result~~	~~Applies to the deletion~~
~~result~~	~~Applies to the addition of the replacement SM~~
~~[SMSC reference number]~~	
~~[accept time]~~	

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"SMSC reference number" is omitted unless "result" of the submission indicates success.~~
- ~~"accept time" is omitted unless "result" of the submission indicates success.~~

~~The following matrix shows how the different combinations of the two result fields should be interpreted.~~

~~**Deletion** Result~~	~~**Addition** Result~~	~~**Meaning**~~
~~0~~	~~0~~	~~Replace successful~~
~~0~~	~~2~~	~~The delete succeeded, but it was not possible to insert the new message because the SMSC database is full.~~
~~0~~	~~3~~	~~The delete succeeded, but it was not possible to insert the new message because the SMSC database was busy.~~
~~0~~	~~5~~	~~The delete succeeded, but the new message has not been added to the SMSC database because a message with the specified key type SME reference number already exists for this destination.~~
~~1~~	~~1~~	~~Operation rejected because argument value(s) were missing or invalid~~
~~3~~	~~3~~	~~The entire replace failed because the SMSC database was busy.~~
~~4~~	~~0~~	~~The short message which was specified to be replaced did not exist (or has been delivered), the new message has been added to the SMSC database.~~
~~4~~	~~2~~	~~The short message which was specified to be replaced did not exist, the new message has not been added to the SMSC database because the database is full.~~
~~4~~	~~3~~	~~The short message which was specified to be replaced did not exist, the new message has not been added to the SMSC database because the database was busy.~~
~~4~~	~~5~~	~~The short message which was specified to be replaced did not exist, the new message has not been added to the SMSC database because a message with the specified key type SME reference number already exists for this destination.~~

~~Any other combination of result codes indicates a logic error in the SMSC.~~

~~D.4.2.7 Delete All SMs Invoke~~

~~Table D.9: Data Part for Delete All SMs Invoke~~

~~MSISDN length~~
~~MSISDN~~
~~originating address length~~
~~originating address~~
~~status report override~~
~~[Sub-Logical SME number]~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"Sub-Logical SME number" is omitted by SMEs using the general X.25 access method.~~

~~D.4.2.8 Delete All SMs Result~~

~~Table D.10: Data Part for Delete All SMs Result~~

~~result~~

~~D.4.2.9 Status Report Invoke~~

~~Table D.11: Data Parameter for Status Report Invoke~~

~~MSISDN length~~
~~MSISDN~~
~~SME reference number type~~
~~SME reference number~~
~~SMSC reference number~~
~~accept time~~
~~SM status~~
~~[completion time]~~
~~[intermediate time]~~
~~[delivery failure reason]~~
~~originating address length~~
~~originating address~~
~~Invoke time~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"Delivery failure reason" is omitted unless "SM status" is "Unable to deliver SM - delivery abandoned", or "Unable to deliver SM - retrying delivery"~~

- ~~"Completion time" is omitted when "SM status" is "Unable to deliver SM - retrying delivery"~~

- ~~"intermediate time" is omitted when "SM status" is not "Unable to deliver SM - retrying delivery"~~

~~Status Report Invoke supplies the SMSC reference number originally returned in the SM Submit Result, and the SME reference number sent in the original SM Submit Invoke. These numbers allow the SME to identify the SM to which the status report relates. In addition the SME reference number type is returned. If this field indicates the SME reference is of type KEY then this reference can be used to access the SM. If it indicates the SME reference is of type NOT KEY then attempts to locate the SM on this reference will fail.~~

~~D.4.2.10 Status Report Result~~

~~Table D.12: Data Part for Status Report Result~~

~~SME result~~

~~D.4.2.11 Enquire SM Invoke~~

~~Table D.13: Data Parameter for Enquire SM Invoke~~

~~SM reference type~~
~~[SME reference number]~~
~~[SMSC reference number]~~
~~MSISDN length~~
~~MSISDN~~
~~originating address length~~
~~originating address~~
~~enquiry type~~
~~[Sub-Logical SME number]~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"SME reference number" is omitted unless "SM reference type" is SME REFERENCE.~~
- ~~"SMSC reference number" is omitted unless "SM reference type" is SMSC REFERENCE.~~
- ~~"Sub-Logical SME number" is omitted by SMEs using the general X.25 access method.~~

~~To access a SM you must either supply a SMSC reference number or an SME Reference number. You may only use the SME reference number if when you submitted the SM you provided an SME reference number of type KEY. If you attempt to access a SM on a NOT KEY SME reference number the SMSC will fail to find the SM.~~

~~D.4.2.12 Enquire SM Result~~

~~Table D.14: Data Parameter for Enquire SM Result~~

~~result~~	
~~enquiry type~~	~~None of the fields after "result" are present unless "result" indicates success~~
~~SM status~~	
~~[completion time]~~	
~~[delivery failure reason]~~	
~~priority~~	~~Present only if "result" indicates success and Enquire SM Invoke requested SM attributes~~
~~originating address length~~	
~~originating address~~	
~~accept time~~	
~~expiry time~~	
~~data coding scheme~~	
~~status report request~~	
~~protocol id~~	
~~reply path~~	
~~SM text size (characters)~~	
~~SM text size (bytes)~~	
~~SM text~~	

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"Delivery failure reason" is omitted unless "SM status" is "Unable to deliver SM - delivery abandoned", or "Unable to deliver SM - retrying delivery"~~
- ~~"Completion time" is omitted when "SM status" is "Unable to deliver SM - retrying delivery"~~
- ~~When result indicates failure no other fields are returned.~~

~~D.4.2.13 Cancel Status Report Invoke~~

~~Table D.15: Data Parameter for Cancel Status Report Invoke~~

~~SM reference type~~
~~SME reference number~~
~~[SMSC reference number~~
~~MSISDN length~~
~~MSISDN~~
~~originating address length~~
~~originating address~~
~~[Sub-Logical SME number]~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"SME reference number" is omitted unless "SM reference type" is SME REFERENCE.~~
- ~~"SMSC reference number" is omitted unless "SM reference type" is SMSC REFERENCE.~~
- ~~"Sub-Logical SME number" is omitted by SMEs using the general X.25 access method.~~

~~To cancel status reports for a SM you must either supply a SMSC reference number or an SME Reference number. You may only use the SME reference number if when you submitted the SM you provided an SME reference number of type KEY. If you attempt to access a SM on a NOT KEY SME reference number the SMSC will fail to find the SM.~~

~~D.4.2.14 Cancel Status Report Result~~

~~Table D.16: Data Parameter for Cancel Status Report Result~~

~~result~~

~~D.4.2.15 Alert SME Request Invoke~~

~~Table D.17: Data Parameter for Alert SME Request Invoke~~

~~MSISDN length~~
~~MSISDN~~
~~ASR reference number~~
~~originating address length~~
~~originating address~~
~~[Sub-Logical SME number]~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"Sub-Logical SME number" is omitted by SMEs using the general X.25 access method.~~

~~It is not possible to delete, enquire on, or replace Alert requests. Therefore it is not necessary to distinguish between KEY and NOT KEY ASR reference numbers. All ASR reference numbers are of type NOT KEY.~~

~~D.4.2.16 Alert SME Request Result~~

~~Table D.18: Data Parameter for Alert SME Request Result~~

~~result~~
~~[SMSC reference number]~~
~~[accept time]~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"SMSC reference number" is omitted unless "result" indicates success.~~
- ~~"accept time" is omitted unless "result" indicates success.~~

~~It is not possible to delete, enquire on or replace Alert requests. The SMSC reference number returned is only supplied to provide a reference which may be compared with the one in the following Alert SME Invoke.~~

~~If an SME submits multiple Alert SME requests for the same destination (MSISDN) the reference returned for all such Alert SME requests will be the same. Also only a single Alert SME invoke will be sent to that SME when the destination becomes available.~~

~~D.4.2.17 Alert SME Invoke~~

~~Table D.19: Data Parameter for Alert SME Invoke~~

~~MSISDN length~~
~~MSISDN~~
~~ASR reference number~~
~~SMSC reference number~~
~~originating address length~~
~~originating address~~
~~available flag~~
~~[delivery failure reason]~~
~~invoke time~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"delivery failure reason" is omitted unless "available flag" indicates unavailable.~~

~~The SMSC reference number supplied will be the same as that received in the Alert SME Request Result which was sent when this alert was requested. The ASR reference number supplied will be the one which was contained in the Alert SME Request which requested this Alert.~~

~~Irrespective of how many Alert SME requests an SME makes relating to a single destination (providing it makes at least 1) that SME will only receive a single Alert SME invoke when the destination becomes available. All the request attempts will have returned the same SMSC reference number.~~

~~D.4.2.18 Alert SME Result~~

~~Table D.20: Data Parameter for Alert SME Result~~

~~SME result~~

~~D.4.2.19 Deliver SM Invoke~~

~~Table D.21: Data Parameter for Deliver SM Invoke~~

~~destination address length~~
~~destination address~~
~~SMSC reference number~~
~~originating address length~~
~~originating address~~
~~data coding scheme~~
~~protocol id~~
~~reply path~~
~~SM text size (characters)~~
~~SM text size (bytes)~~
~~SM text~~
~~accept time~~
~~invoke time~~

~~It is theoretically possible (but unlikely in practice) for the data for a deliver SM invoke request to exceed the maximum *data* part size of 215 bytes. In the unlikely event of this occurring the SMSC will truncate the SM text to reduce the *data* part to 215 bytes, and change the SM text size (characters) and SM text size (bytes) accordingly.~~

~~D.4.2.20 Deliver SM Result~~

~~Table D.22: Data Parameter for Deliver SM Result~~

~~SME result~~

~~D.4.2.21 Retrieve Request Invoke~~

~~Table D.23: Data Parameter for Retrieve Request Invoke~~

~~originating address length~~
~~originating address~~
~~receive ready flag~~
~~[retrieve order]~~

~~Arguments in square brackets are omitted under certain circumstances:~~

- ~~"retrieve order" is omitted unless "receive ready flag" is 1 (ON).~~

~~D.4.2.22 Retrieve Request Result~~

~~Table D.24: Data Parameter for Retrieve Request Result~~

~~result~~

~~D.4.2.23 Get Version Invoke~~

~~Table D.25: Data Parameter for Get Version Invoke~~

~~originating address length~~
~~originating address~~

~~D.4.2.24 Get Version Result~~

~~Table D.26: Data Parameter for Get Version Result~~

~~result~~
~~oi version number~~

~~D.4.3 Field Definitions~~

~~This subclause provides detailed descriptions of the fields that may appear in *header* and *data* parts. The fields are of two data types:~~

- ~~String. Array of char. The characters that may appear in the array depend on the field. Strings are not NULL terminated. Strings are in ASCII unless otherwise stated.~~

- ~~Integer. 1 byte, 2 byte or 4 byte. Integers larger than 1 byte are stored with the least significant byte first and the most significant byte last. Integers are not aligned on word or longword boundaries. All integers are unsigned.~~

~~D.4.3.1 Accept Time - 14 character string~~

~~Time that the SM was accepted into the SMSC message store. The format is YYMMDDHHMMSSZZ, with ZZ being the time zone, ((ZZ-48)/4) being the difference from GMT in hours. For example 92122113000048 represents 1 pm on December 21st 1992 GMT.~~

~~D.4.3.2 ASR Reference Number - 4 byte integer~~

~~Value of the SME's reference number for an Alert SME Request. This field is not used by the SMSC, it is stored, and returned in the Alert SME Invoke.~~

~~D.4.3.3 Available Flag - 1 byte integer~~

~~Boolean flag indicating if the MSISDN is available. 0 is false (ie. unavailable), and 1 is true (available).~~

~~D.4.3.4 Completion Time - 14 character string~~

~~The time that the SMSC completed delivery of an SM to a mobile or the time at which it abandoned its delivery attempts, which may be because of permanent delivery failure, message expiry or deletion. The format is as for Accept Time.~~

~~D.4.3.5 Data Coding Scheme - 1 byte integer~~

~~Specifies how the text of the SM is encoded. The full range of valid values of Data Coding Scheme is defined in GSM 03.38 version 4.0.0. The PLMN with which you are interworking may not support the full range of options defined in GSM 03.38. Please obtain a list of the values which you are permitted to use (and may expect to receive) from your network operator.~~

~~Your network operator will have configured the SMSC to recognise one value in the range 1 - 7 which is not already used by GSM 03.38. This value will have the following meaning - coding is IA5. The short message text is coded by the SME using the IA5 subset of ASCII characters. The text is automatically converted into GSM encoded format by the SMSC before the SM is delivered to the MSISDN. the SMSC will change the value of Data Coding Scheme supplied to 0 (default GSM alphabet) before delivering the message.~~

~~The SMSC does not perform any validation or manipulation of Data Coding Scheme other than that described above.~~

~~D.4.3.6 Delivery Failure Reason - 1 byte integer~~

~~Specifies the reason why the SMSC was unable to deliver an SM. The possible values are:~~

~~**Value**~~	~~**Reason**~~
~~3~~	~~Unknown Subscriber~~
~~4~~	~~Teleservice Not Provisioned~~
~~6~~	~~Call Barred~~
~~7~~	~~Facility Not Supported~~
~~8~~	~~Absent Subscriber~~
~~9~~	~~SMS Not Provisioned~~
~~10~~	~~Error in MS~~
~~11~~	~~System Failure~~
~~12~~	~~CUG Reject~~
~~13~~	~~Memory Capacity Exceeded~~
~~99~~	~~No Delivery attempt yet completed for this SM~~

~~Values 1, 2 and 5 are not currently used.~~

~~Refer to GSM 03.40 [1] for a full explanation of the above reasons.~~

~~The SMSC is usually configured to treat many of these reasons listed above as temporary. The failure of a delivery for a temporary reason will not cause the SMSC to abandon attempts to deliver an SM. How the SMSC is configured will determine which of these reasons it is possible to receive when a Status Report Invoke with an SM Status of "unable to deliver SM - retrying delivery" (i.e. a temporary error) is received, and which it is possible to receive when a Status Report Invoke with an SM Status of "Unable to deliver - delivery abandoned" (i.e. a permanent error) is received.~~

~~Note that when enquiring the delivery failure reasons for all undelivered messages for a single MSISDN will all be the same at any given point in time. This is because delivery failure reason is the reason why the last delivery attempt to that MSISDN failed. The SMSC queues messages for a destination and when it tries to deliver to a destination it starts at the head of the queue and keeps delivering until an attempt fails or all messages for the destination have been delivered. The SMSC does not generate delivery failure status reports for those messages it did not actually attempt to deliver. Therefore the presence of a delivery failure reason in an enquire result does NOT necessarily mean that an attempt has been made to deliver that particular message, merely that an attempt has been made to deliver a message to that destination and the attempt failed with the returned delivery failure reason. Message delivery attempts are made in the order in which the messages are secured by the SMSC (except for high priority messages for which an immediate delivery attempt is made). Messages which have been abandoned will have an individual delivery failure reason recorded against them.~~

~~D.4.3.7 Destination Address - variable length string - length held in "Destination Address Length"~~

~~Address where the SM is to be delivered. Formatted as in GSM 09.02 [4] - see clause D.4.3.16 for more details.~~

~~D.4.3.8 Destination Address Length - 1 byte integer~~

~~The number of digits in the following destination address. Will be in the range 3 to 20.~~

~~D.4.3.9 Enquiry Type - 1 byte integer~~

~~Flag used by SME to indicate whether or not SMSC should return SM attributes with the Enquire SM Result. A value of 0 indicates no attributes required; any other value will cause the SMSC to return the SM attributes.~~

~~D.4.3.10 Expiry Time - 14 character string~~

~~Time that the SM will expire. The format is as for Accept Time.~~

~~D.4.3.11 Intermediate Time~~

~~This field is only present in a Status Report Invoke. This field and Completion time are mutually exclusive, only one or the other will be present. If this field is present it indicates the time at which the delivery attempt to which the Status report relates was made.~~

~~D.4.3.12 Invoke Time - 14 character string~~

~~The time at which the invoke was sent by the SMSC to the SME. The format is as for Accept Time. When a Status report is successfully delivered at the first attempt Invoke time will correspond very closely with the time at which the event reported occurred. However if there is any delay in delivery there could be a significant difference between the time at which the event which gave rise to the Status Report occurred and the Invoke time returned in the Status report.~~

~~D.4.3.13 MSISDN - variable length string - length held in "MSISDN Length"~~

~~The ISDN number of the destination MS of the SM in ASCII, with the digits given in descending order of significance. The number must be an international number, and must be formatted using the E.164/E.163 numbering plan. The number does not include type of number or numbering plan fields - these are assumed.~~

~~D.4.3.14 MSISDN Length - 1 byte integer~~

~~The number of digits of the following MSISDN. Must be in the range 9 to 16.~~

~~D.4.3.15 OI Version Number - 1 byte integer~~

~~The version number of the Open Interface supported by this SMSC installation. The SME must be compatible with the specified Open Interface Version.~~

~~D.4.3.16 Originating Address - variable length string - length held in "Originating Address Length"~~

~~This field contains the address of the originator of the SM and is used by the SMSC to determine who owns a SM. The owner of a SM is deemed to be the device at the SMs originating address. The address supplied in this field is displayed on the receiving handset (in the SMS-DELIVER basic element TP-Originating-Address). Its format based on GSM 09.02 [4]:~~

~~**Character**~~	~~**Format**~~	~~**Meaning**~~
~~1~~	~~Hexadecimal~~	~~Extension indicator (top bit) and type of number (remaining 3 bits) - Bits 5 - 8 in GSM 09.02 [4]~~
~~2~~	~~Hexadecimal~~	~~Numbering plan - Bits 1 - 4 in GSM 09.02 [4]~~
~~3 and up~~	~~Decimal~~	~~The number~~

~~The hexadecimal fields contain ASCII characters in the ranges "0" to "9" and "A" to "F". The decimal fields contain ASCII characters in the range "0" to "9".~~

~~D.4.3.17 Originating Address Length - 1 byte integer~~

~~The number of digits in the following originating address. Must be in the range 3 to 20.~~

~~D.4.3.18 Priority - 1 byte integer~~

~~Priority of the SM. One of:~~

~~**Value**~~	~~**Description**~~
~~0~~	~~High priority.~~
~~1~~	~~Normal priority.~~

~~D.4.3.19 Protocol Id - 1 byte integer~~

~~The full list of possible values of Protocol Id is defined in GSM 03.40 [1]. Protocol Id is passed through the SMSC transparently. Not all PLMNs will support all of the facilities which can be selected by setting the Protocol Id field. The SMSC will be configured by the operator of the service centre to which you connect to reject all short messages requesting facilities which the PLMN does not support. Your service centre operator will be able to supply you with the list of Protocol Id values which you are allowed to specify in short messages which you submit. They will also be able to supply you with a list of the values of Protocol Id which you may receive in Deliver SM Invokes - this list may be different from the list of values you are allowed to submit.~~

~~D.4.3.20 Receive Ready Flag - 1 byte integer~~

~~Used by an SME on a retrieve request to indicate whether it is ready to receive messages (invokes) from the SMSC. The possible values are:~~

~~**Value**~~	~~**Description**~~
~~0~~	~~Off - Not ready to receive invokes from the SMSC - the SMSC is instructed not to send them.~~
~~1~~	~~On - Ready to receive invokes from the SMSC - the SMSC is instructed to send them~~

~~D.4.3.21 Reply Path - 1 byte integer~~

~~As defined in GSM 03.40 [1]. Must be either 0 (FALSE) or 1 (TRUE). Passed through the SMSC transparently.~~

~~D.4.3.22 Result - 1 byte integer~~

~~The result of the operation or part of the operation. The possible values are:~~

~~**Value**~~	~~**Description**~~
~~0~~	~~Success~~
~~1~~	~~Operation rejected because argument value(s) were missing or invalid~~
~~2~~	~~Failed because SMSC database is full~~
~~3~~	~~Failed because SMSC is busy~~
~~4~~	~~Failed because specified SM is not in the SMSC database (in the case of the Delete SM, Enquire SM and Replace SM operations) or because the SMSC database holds no SMs from the SME for the specified destination MSISDN (in the case of the Delete All SMs operation)~~
~~5~~	~~Failed because SM was already in the SMSC database~~

~~D.4.3.23 Retrieve Order - 1 byte integer~~

~~The order in which messages are to be received by the SME after issuing a retrieve request. The possible values are:~~

~~**Value**~~	~~**Order**~~
~~0~~	~~High Priority SMs first then, Normal Priority SMs and Status Reports interleaved, then Alert SMEs~~
~~1~~	~~High Priority SMs first, then Normal Priority SMs, then Status Reports, then Alert SMEs~~

~~D.4.3.24 Retrieval Type - 1 byte integer~~

~~Used by an SME to indicate what message types it is ready to receive from the SMSC. The possible values are:~~

~~**Value**~~	~~**Description**~~
~~0~~	~~No messages (request being used to check API version number)~~
~~1~~	~~All messages~~
~~2~~	~~SMs only~~

~~If a value of 2 is supplied all queued status reports and alert SME notifications for the retrieving destination will be discarded.~~

~~D.4.3.25 SM Reference Type - 1 byte integer~~

~~Method of specifying an SM to be deleted or replaced. The possible values are:~~

~~**Value**~~	~~**Description**~~
~~0~~	~~SME REFERENCE. The SME reference number of the SM is quoted. This method can only be used if the SME reference number type of the SM is KEY. See clause D.4.3.32 for more details of SME reference number types. In "Delete SM Invoke" and "Replace SM Invoke", if the SME reference type argument is SME REFERENCE then the following SME reference number argument is assumed by the SMSC to be of type KEY.~~
~~1~~	~~SMSC REFERENCE. The MSISDN and SMSC reference number of the SM is quoted. This method can be used for all SMs. Note: the SMSC reference for an SM is only unique when combined with its MSISDN.~~

~~D.4.3.26 SM Status - 1 byte integer~~

~~Status of an SM as reported in a Status Report or Enquire SM Result. The possible values are:~~

~~**Value**~~	~~**Status**~~
~~1~~	~~Unable to deliver SM - delivery abandoned~~
~~2~~	~~SM expired~~
~~3~~	~~SM delivered~~
~~4~~	~~SM deleted by SME~~
~~5~~	~~SM deleted by the SMSC operators~~
~~6~~	~~Unable to deliver SM - retrying delivery~~

~~D.4.3.27 SM Text - variable length string - length held in "SM Text Size (Bytes)"~~

~~Text of the SM. Least significant byte first. Format of the text depends on the data coding scheme.~~

~~D.4.3.28 SM Text Size (Bytes) - 1 byte integer~~

~~Size of the SM text in bytes. If the text is in the compressed GSM encoded format (see the data coding scheme argument) this will differ from the SM text size in characters, otherwise they will be the same. Must be in the range 1 - 160 if the text is in IA5 format, or 1 - 140 if the text is in the GSM format.~~

~~D.4.3.29 SM Text Size (Characters) - 1 byte integer~~

~~Size of the SM text in characters. Must be in the range 1 - 160.~~

~~D.4.3.30 SME Reference Number - 4 byte integer~~

~~Value of the SME's reference for an SM. See clause D.4.3.32 for more information on SME reference numbers.~~

~~D.4.3.31 SME Result - 1 byte integer~~

~~SME Result is used to covey the result of an SMSC originated invoke. SME Result is sent from the SME to the SMSC. In table D.27 'message' means short message, status report or alert SME notification.~~

~~**Value** is the integer value which the SME returns in the Result field of Status report result, Deliver SM result or Alert SME result.~~

~~**Description** is a short description of the meaning this value is intended to convey to the SMSC.~~

~~**Meaning** is a description of the circumstances in which it is intended that the *value* should be sent to the SMSC. **Meaning** also describes the way in which the SMSC will respond on receipt of this value.~~

~~Table D.27: SME Result~~

~~Value~~	~~Description~~	~~Meaning~~
~~0~~	~~Success~~	~~The SME has accepted the message. The SMSC may report the message as delivered, and mark it for deletion.~~
~~1~~	~~Invalid Data~~	~~The SME has rejected the message because the message does not contain the arguments expected, or the arguments received contain invalid or unexpected values. OR The SME returning this result has attempted to forward a message to a remote system, but the SM has been rejected and the remote system has indicated it cannot process the Invoke type sent to it. OR The SME returning this error is the final destination of the message and is not able to deal with the invoke type it has been sent. The SMSC will make timed retries to deliver this message.~~
~~2~~	~~Database Full~~	~~The SME (or ultimate destination) contains a message data store. The SME has rejected the message because this store is full. The SMSC will make timed retries to deliver this message.~~
~~3~~	~~SME Busy~~	~~The SME has rejected the message because it is too busy to process it at this time. The SMSC should make timed retries to deliver this message.~~
~~5~~	~~Duplicate SM~~	~~The SME has rejected the message because it believes it to be a duplicate of one it has already received. The SMSC may report the message as delivered, and mark it for deletion.~~
~~6~~	~~Destination Unavailable~~	~~The SME returning this result has attempted to deliver the SM to a remote system and has failed. The reason for this failure is that the remote system is not available. The SME or the final destination will issue a Retrieve SM Invoke for this destination when it becomes available. The SMSC is not required to perform timed retries . Note that when a destination is not available the choice between returning this value and Call barred should be made entirely on the basis of which behaviour is required from the SMSC.~~
~~20~~	~~Call Barred by User~~	~~Either the SME returning this result has attempted to deliver the SM to a remote system and has failed because the remote system is not available. OR The destination is not prepared to accept messages at this time. The SME returning this result has determined that the destination of the message to which this result applies has invoked a call barring function (implemented either in the SME or in the remote network). The SMSC is to continue attempting to deliver this message according to a timed retry schedule.~~
~~21~~	~~Transmission Error~~	~~Temporary transmission error. The SME returning this result has attempted to deliver the message to which this result applies to a remote destination. The remote destination has rejected the message indicating that there was a problem in reception, the message was unreadable, etc. AND there is some chance of the third party system being able to read the message if re-transmitted. OR the SME returning this error is the final destination of the SM, but has encountered a problem in interpreting the message which may be a result of garbled transmission. The SMSC is to continue attempting to deliver this message according to a timed retry schedule.~~
~~22~~	~~Facility not Supported~~	~~The SME has tried to use a network facility in delivering this message but has been refused use of the facility. The SMSC will continue attempting to deliver this message according to a timed retry schedule.~~
~~23~~	~~Error in SME~~	~~The SME returning this result has encountered an internal processing error dealing with this message. This error should be used as a catch all for any situation not explicitly covered where The SMSC is required to make timed retry attempts.~~
~~24~~	~~Unknown Subscriber~~	~~Destination not known to SME database/ Network. The SME returning this error has attempted to deliver this message to a remote destination and has determined that the destination does not exist, or is not a registered user of the service offered by the SME. The SMSC is to abandon all delivery attempts for the message to which this result relates and all others for the same destination.~~
~~25~~	~~Call Barred by Network Operator~~	~~The SME has determined that the network operator has barred access to the final destination of the message. The SMSC is to abandon all delivery attempts for the message to which this result relates and all other messages for the same destination.~~
~~120~~	~~Network Failure~~	~~The SME has detected failure of the communications network it is using. The SMSC will continue to make timed retries to deliver the message. The SMSC will raise an operational event to report receipt of this result code. This event may be configured to sound the contact closure alarm (if installed).~~

~~The values of SME result are partitioned as follows :~~

- ~~0 - 19. Errors relating to the SME application;~~
- ~~20 - 119. Errors relating to the communications protocol used either to communicate with the SME, or by the SME to communicate with the ultimate destination of the message.~~
- ~~120+. Errors relating to major communications failures which SMS2000 is required to report.~~

~~D.4.3.32 SME Reference Number Type - 1 byte integer~~

~~Type of the SME's reference number for an SM. The following are supported.~~

~~**Value**~~	~~**Description**~~
~~1~~	~~KEY~~
~~2~~	~~NOT KEY~~

~~The differences between the types are as follows:~~

a) ~~When deleting, replacing or enquiring on an SM with a SME reference number of the KEY type, the SME reference number can be used to identify the SM. If the SME reference number is of type 'NOT KEY' then the SMSC reference number must be used.~~

b) ~~The SMSC will not accept two SMs from a single originating address with the same SME reference number destined for the same destination if the SME reference of both messages is of type KEY. SME references should be unique for a given originating address. This can be useful in recovery situations where it is uncertain whether an SM has been accepted by the SMSC.~~

~~If SME reference numbers are not required by the SME, then type NOT KEY should be used. All SMs can then be given the same SME reference number.~~

~~D.4.3.33 SMSC Reference Number - 4 byte integer~~

~~The SMSC reference number for an SM. When combined with the MSISDN or the destination address (for an Incoming SM), this uniquely identifies the SM.~~

~~D.4.3.34 Status Report Override - 1 byte integer~~

~~This flag can be used to suppress the delivery of Status Reports generated as a consequence of a Delete All SMs Invoke. A value of 1 causes Status Report generation to be suppressed. The possible values are:~~

~~**Value**~~	~~**Description**~~
~~0~~	~~No override - status reports will be generated according to the current setting of the Status Report Request field for each short message deleted.~~
~~1~~	~~Override - No status reports will be generated as a result of the deletion of the short messages affected by this command.~~

~~D.4.3.35 Status Report Request - 1 byte integer~~

~~Set of circumstances for which the SME requests the SMSC to produce a Status Report. Each possible status of a SM corresponds to a bit in the status report request. If the bit is set then a Status Report will be generated if the SM takes the corresponding status.~~

~~**Bit**~~	~~**Status**~~
~~0~~	~~Unable to deliver SM - delivery abandoned~~
~~1~~	~~SM expired~~
~~2~~	~~SM delivered~~
~~3~~	~~SM deleted by SME~~
~~4~~	~~SM deleted by SMSC operators~~
~~5~~	~~Unable to deliver SM - retrying delivery~~
~~6-7~~	~~Not used~~

~~(bit 0 is the least significant bit, bit 7 the most significant)~~

~~Any number and combination of bits may be set to request Status Reports for a variety of status.~~

~~A status of "Unable to deliver SM - delivery abandoned" means that a SM delivery attempt has failed and no further delivery attempts will be made.~~

~~A Status Report indicating that an SM has expired will be generated some time after the SM expiry date, not necessarily at the exact expiry time.~~

~~A status of "Unable to deliver SM - retrying delivery" means that a SM delivery attempt has failed but a further delivery attempt will be made. Therefore, another Status Report may be generated. This may be on the next delivery attempt, or depending on which other status bits have been set, on one of the other circumstances arising. Once a Status Report indicating one of the other status has been received, no further delivery attempts will be made and no other Status Report will be generated.~~

~~D.4.3.36 Sub-Logical SME Number - 1 byte integer~~

~~This field is basically an account number. It is a value to be used in the least significant part of the logical SME identifier in call data (billing) records generated as a result of the SME request.~~

~~D.4.3.37 Validity Period (Absolute) - 14 character string~~

~~Validity period of the SM expressed as an absolute time (validity periods earlier than the current time cause the SMSC to expire an SM immediately without making any attempt to deliver it). It uses the same format as the SM status time argument.~~

~~The validity period cannot be more than 16 weeks later than the time of submission to the SMSC.~~

~~D.4.3.38 Validity Period (Relative) - 1 byte integer~~

~~Validity period of the SM expressed as a delta time relative to the time of the SM's acceptance by the SMSC. The following values are supported.~~

~~**Value (V)**~~	~~**Delta Time**~~	
~~0 to 143~~	~~(V + 1) * 5 mins~~	~~(5 mins to 720 mins, in 5 minute intervals)~~
~~144 to 167~~	~~((V - 143) * 0.5) + 12 hours~~	~~(12.5 hours to 24 hours, in 0.5 hour intervals)~~
~~168 to 196~~	~~(V - 166) days~~	~~(2 days to 30 days, in 1 day intervals)~~
~~197 to 208~~	~~(V - 192) weeks~~	~~(5 weeks to 16 weeks, in 1 week intervals)~~
~~209 to 255~~	~~Not used~~	

~~D.4.3.39 Validity Period Type - 1 byte integer~~

~~This type identifies the period for which the SMSC will retain an SM whilst attempting to deliver it. The following types of validity period are supported:~~

~~**Value**~~	~~**Description**~~
~~0~~	~~NONE. No validity period specified. A default SMSC value is used.~~
~~1~~	~~ABSOLUTE. The validity period is expressed as an absolute time.~~
~~2~~	~~RELATIVE. The validity period is expressed as a delta time relative to the time of the SM's acceptance by the SMSC.~~

~~Annex E:~~
~~SMSC Computer Access Service and Protocol Manual~~

~~E.1 Introduction~~

~~This annex describes the SMS-C Computer Access Protocol used between SMS-C and external computers.~~

~~This annex is intended for programmers responsible for the development of applications for communicating with SMS-C, using the SMS-C Computer Access Protocol.~~

~~Overview of contents~~

~~The clauses in this annex are organised as follows:~~

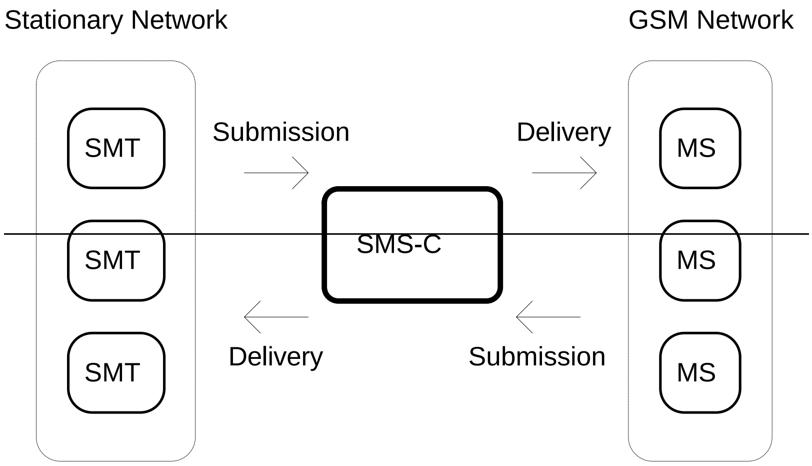
~~Overview:~~

- ~~gives an introduction to the Short Message Service and a description of the SMS-C software structure.~~
- ~~Computer Access Protocol~~
- ~~describes the protocol between the external computer and SMS-C.~~
- ~~Connect and Disconnect Procedures~~
- ~~describes the connect and disconnect procedures for the different types of lower protocol layers.~~
- ~~Scenarios illustrates the communication between an external computer and SMS-C.~~
- ~~Design Considerations~~
- ~~provides some useful hints for the application programmer.~~
- ~~Protocol Data Unit Definitions~~
- ~~defines the Computer Access Protocol Data Units using ASN.1 syntax.~~

~~E.2 Overview~~

~~E.2.1 The Short Message Service~~

~~The purpose of the Short Message Service is to provide the means for transferring of short messages, up to 160 characters, between Short Message Terminals (SMT) and GSM Mobile Stations (MS) via a Short Message Service Center (SMS-C). There are different types of SMT interfaces – one being the Computer Access Interface which provides services for external computers communicating with SMS-C through the Computer Access Protocol.~~



~~The Short Message Service provides the means for transferring of short messages between Short Message Terminals and Mobile Stations via a Short Message Service Center.~~

~~Figure E.1: The Short Message Service Center.~~

~~SMS-C is an interworking unit between stationary networks and the GSM Network. It acts as a store and forward center for short messages. Two different point-to-point services have been defined: Mobile Originated (MO) and Mobile Terminated (MT).~~

~~E.2.1.1 Submission and delivery~~

~~Short messages are submitted to SMS-C by Mobile Stations and Short Message Terminals. A short message always originates or terminates in the GSM network. This means that short messages can never be sent between two users both located in stationary networks.~~

~~Through notifications, the message originator may be informed about successful or unsuccessful delivery of the short message.~~

~~When submitting a message, the message originator must specify the:~~

- ~~message priority – non urgent, normal or urgent;~~
- ~~notification level, see subclause E.2.1.3 – Notifications;~~
- ~~destination address – the GSM telephone number of the Mobile Station.~~

~~Optional parameters which can be set by the message originator are:~~

- ~~validity time, which specifies the latest time at which the message delivery should be attempted. If not specified by the message originator, the default value specified through configuration parameters will be used;~~
- ~~deferred delivery time which specifies at what time the message should be delivered;~~
- ~~alternative notification address. This parameter can be used to change the address to where the notifications should be sent. The default value is the message originator's address.~~

~~E.2.1.2 Message buffering~~

~~All messages and notifications are safe stored in a database on an external media within SMS-C. Hence, the existence of the short message is guaranteed once it has been successfully submitted. This concept is called message buffering.~~

~~A short message is deleted when the delivery succeeds or when the validity time expires. During buffering SMS-C is responsible for the short message.~~

~~E.2.1.3 Notifications~~

~~A notification is a short message created by SMS-C containing information about the delivery of a short message. The following types of notifications exist:~~

- ~~Delivery notification, generated when a short message is successfully delivered.~~
- ~~Buffered message notification, generated when the first attempt to deliver a short message was unsuccessful, due to the recipient being temporarily inaccessible.~~
- ~~Non-delivery notification, generated due to a permanent failure or when the validity time of the short message expires.~~

~~The message originator can specify all notification types when submitting a short message. Any combination of the three notification types above is valid.~~

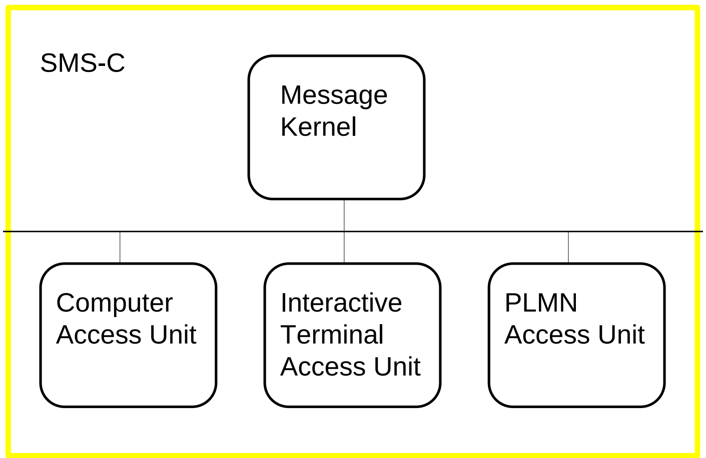
~~E.2.2 Software structure~~

~~The SMS-C software consists of a number of components, each responsible for a dedicated set of services. The Message Kernel is the central message store and forward component, responsible for safe storing of messages, routing and retry attempts.~~

~~The Message Kernel maintains a uniform interface to a set of Access Units (AU. There is one AU for each type of connection:~~

- ~~Computer AU for connections to external computers.~~
- ~~Interactive Terminal AU for connections to asynchronous terminals.~~
- ~~Public Land Mobile Network AU for connections to the GSM network.~~

~~The software structure overview is given in figure E.2.~~

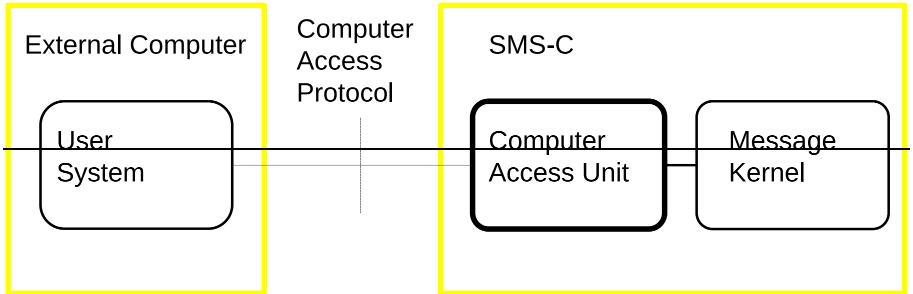


~~The Message Kernel maintains a uniform interface to the different types of Access Units.~~

~~Figure E.2: Software Structure Overview.~~

~~E.2.2.1 Computer Access Unit~~

~~The Computer Access Unit provides services for computers communicating with SMS-C using the Computer Access Protocol .~~



~~The Computer Access Unit provides services for the External Computer.~~

~~Figure E.3: Computer Access Unit.~~

~~The functions available to the external computer are:~~

- ~~submit short messages destined to mobile stations;~~
- ~~retrieve short messages originating from mobile stations;~~
- ~~retrieve notifications containing information about the delivery of short messages;~~
- ~~delete short messages that have been submitted but not yet delivered.~~

~~The external computer is identified to SMS-C by its network address.~~

~~The implementation is a Client/Server approach, where the user system in the external computer makes the decisions to submit, retrieve or delete messages and to disconnect. A connection can, however, be initiated from either side.~~

~~E.3 Computer Access Protocol~~

~~The interface towards the external computer is through the Computer Access Protocol. This protocol is placed on top of the network/transport layer, which is X.25 in the first release of the SMS-C software.~~

~~The Computer Access Protocol defines the following Protocol Data Units:~~

~~Table E.1: Protocol Data Units.~~

~~OpenReqPDU~~	~~Open request from SMS-C~~
~~OpenRspPDU~~	~~Open response from the user system~~
~~CloseReqPDU~~	~~Close request from the user system~~
~~SubmitReqPDU~~	~~Submit request from the user system~~
~~SubmitRspPDU~~	~~Submit response from SMS-C~~
~~RetrieveReqPDU~~	~~Retrieve request from the user system~~
~~RetrieveRspPDU~~	~~Retrieve response from SMS-C~~
~~DeleteReqPDU~~	~~Delete request from the user system~~
~~DeleteRspPDU~~	~~Delete response from SMS-C~~

~~The protocol data units are defined in clause E.7.~~

~~E.3.1 Connect and disconnect~~

~~The connect and disconnect procedures are different depending on the lower protocol layers used. See clause E.4 for further information.~~

~~The connect can be initiated from either side.~~

~~E.3.1.1 Connect Initiated from SMS-C~~

~~If a message or message notification is available for a user system that is not currently connected, SMS-C will establish a connection. SMS-C will only establish **one** connection, regardless of the number of messages to be transmitted to the same user address. Nothing is transmitted until the user system makes a retrieve request.~~

~~If the user system tries to establish a connection when one already exists, the attempt will be rejected by SMS-C.~~

~~E.3.1.2 Connect Initiated from the user system~~

~~The user system establishes a connection with SMS-C when it has a message to submit. Normally the user system sends its message/messages immediately after the connect.~~

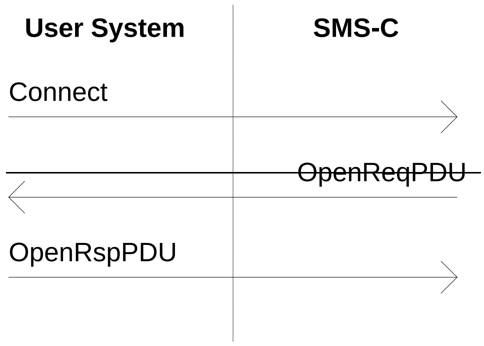
~~Before disconnecting, the user system should request messages from SMS-C. When the queue is empty the user system is expected to disconnect.~~

~~E.3.1.3 Disconnect~~

~~The user system is expected to initiate the disconnect by sending a close request. SMS-C will disconnect when this request is received.~~

~~SMS-C will also disconnect if the user system goes idle for more than a specified period of time.~~

~~E.3.2 Open procedure~~



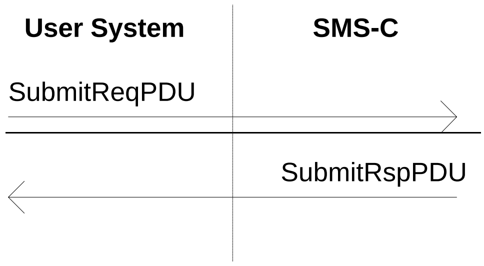
~~The OpenReqPDU specifies the supported release levels of the Computer Access Protocol. The OpenRspPDU specifies the release level to be used.~~

~~Figure E.4: Open Procedure.~~

~~After the connect, SMS-C transmits an OpenReqPDU specifying the supported release levels of the Computer Access Protocol.~~

~~The user system returns an OpenRspPDU that specifies the release level to be used.~~

~~E.3.3 Submit Short Message~~



~~To submit a message the user system transmits a SubmitReqPDU. SMS-C responds with a SubmitRspPDU containing a return code and a unique message identification.~~

~~Figure E.5: Submit Short Message.~~

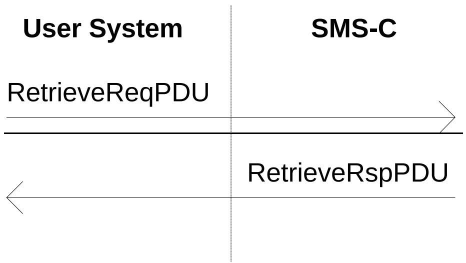
~~To submit a short message the user system transmits a SubmitReqPDU to SMS-C. The PDU contains the message priority, notification level, destination address and the short message text. Optional information is validity time, alternative notification address and deferred delivery time.~~

~~SMS-C responds with a SubmitRspPDU which contains a return code and a unique message identification. A positive return code indicates that the Message Kernel has taken over the responsibility of the message.~~

~~The actual delivery of the short message to the recipient is reported later by means of message notifications.~~

~~NOTE: The user system specifies, when submitting the short message, the type of notifications to be generated.~~

~~E.3.4 Retrieve Short Message or Message Notification~~



~~The user system transmits a RetrieveReqPDU to retrieve a message. SMS-C responds with a RetrieveRspPDU containing a short message, a message notification or a “no message” indicator.~~

~~Figure E.6: Retrieve Message.~~

~~To retrieve a short message or message notification the user system transmits a RetrieveReqPDU. SMS-C responds with a RetrieveRspPDU which contains either a short message, a message notification or a “no message” indicator.~~

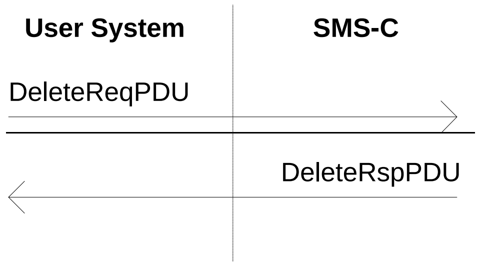
~~When the user system has retrieved one message it must send another RetrieveReqPDU to find out whether there are more messages waiting.~~

~~To make sure that all messages are retrieved, the user system must continue to transmit RetrieveReqPDU until a RetrieveRspPDU with a “no message” indicator is received.~~

~~When is the Message deleted from the database~~

~~A short message or message notification, retrieved by the user system, is deleted from the database in SMS-C when a subsequent RetrieveReqPDU, SubmitReqPDU, DeleteReqPDU or CloseReqPDU is received.~~

~~E.3.5 Delete Short Message~~



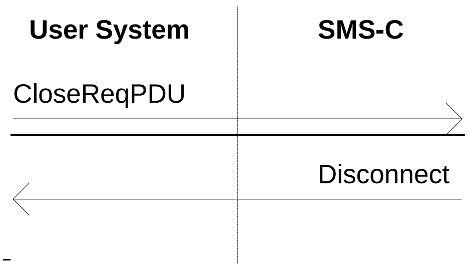
~~The user system transmits a DeleteReqPDU to request deletion of a short message. SMS-C responds with a DeleteRspPDU containing a return code.~~

~~Figure E.7: Delete Short Message.~~

~~A previously submitted short message that is not yet delivered can be deleted by the user system. Deletion of a short message can be done either by specifying the message identification or the recipient. In the latter case, all short messages from the user system to that recipient are deleted.~~

~~The user system transmits a DeleteReqPDU and SMS-C responds with a DeleteRspPDU which contains a return code. A positive return code indicates that the specified short message/messages have been deleted.~~

~~E.3.6 Close procedure~~



~~When finished, the user system sends a CloseReqPDU. SMS-C disconnects when this PDU is received.~~

~~Figure E.8: Close procedure.~~

~~When the user system is finished a CloseReqPDU should be sent. SMS-C disconnects when this PDU is received.~~

~~E.4 Connect and Disconnect Procedures~~

~~E.4.1 X.25~~

~~The Computer Access Interface handles multiple X.25 lines. Only SVCs, Switched Virtual Circuits are supported.~~

~~The D- and Q-bits are not used.~~

~~Reversed charging must be accepted by the user system if requested by SMS-C.~~

~~E.4.1.1 Multiport support~~

~~The user system is identified to SMS-C by its DTE address. To allow a user system to have more than one SVC connected in parallel, i.e. to be identified as several users, SMS-C can be configured to support the following features:~~

- ~~At connect from the user system, a specified number of digits can be given in the Call User Data field to form a subaddress. This subaddress is appended to the DTE address to form the originator address, by which the external computer is known to SMS-C.~~
- ~~When SMS-C connects to the user system, in order to deliver a short message or a message notification, the subaddress is removed from the originator address and inserted in the Call User Data field.~~

~~The number of digits used for the subaddress are specified through configuration parameters in SMS-C. If the user system does not provide any subaddress or if the number of digits are less than specified in the configuration, zeroes are appended. At connect from SMS-C, the appended zeroes are inserted in the Call User Data field.~~

~~NOTE: This feature is dependent on configuration parameters in SMS-C. Contact your SMS-C representative to discuss the issue.~~

~~E.4.1.2 Connect from the user system~~

~~When the user system connects to SMS-C, the following information must be present in the Call Request Packet:~~

~~Calling DTE address~~ ~~This address is used as the sender address when submitting messages, and as receiver address when receiving messages~~

~~Call user data~~ ~~Hex: 'C0434150xxxxxx' The first byte has the two leading bits set, indicating DTE-to-DTE use. Then follows "CAP". After "CAP", one or more subaddress digits might follow. "CAP" and the subaddress are coded in the IA5 character set.~~

~~E.4.1.3 Connect from SMS-C~~

~~When SMS-C connects to the user system the following information is present in the call request packet:~~

~~Call user data~~ ~~Hex: 'C0434150xxxxxx' The first byte has the two leading bits set, indicating DTE-to-DTE use. Then follows "CAP". After "CAP", one or more subaddress digits might follow. "CAP" and the subaddress are coded in the IA5 character set.~~

~~Calling DTE address~~ ~~The DTE address of SMS-C. This address is not provided by SMS-C. It will be present only if provided by the network.~~

~~Reversed charging might be requested.~~

~~E.4.1.4 Disconnect~~

~~The following diagnostic codes are given at disconnect:~~

~~0 Normal disconnect.~~

~~1 The SMS-C process has been forced to terminate.~~

~~2 Timeout towards the user system.~~

~~3 SMS-C is temporary blocked.~~

~~4 Not expected PDU is received.~~

~~5 Failure on lower levels.~~

~~6 Unexpected data is received.~~

~~7 Illegal release level is given in OpenRspPDU.~~

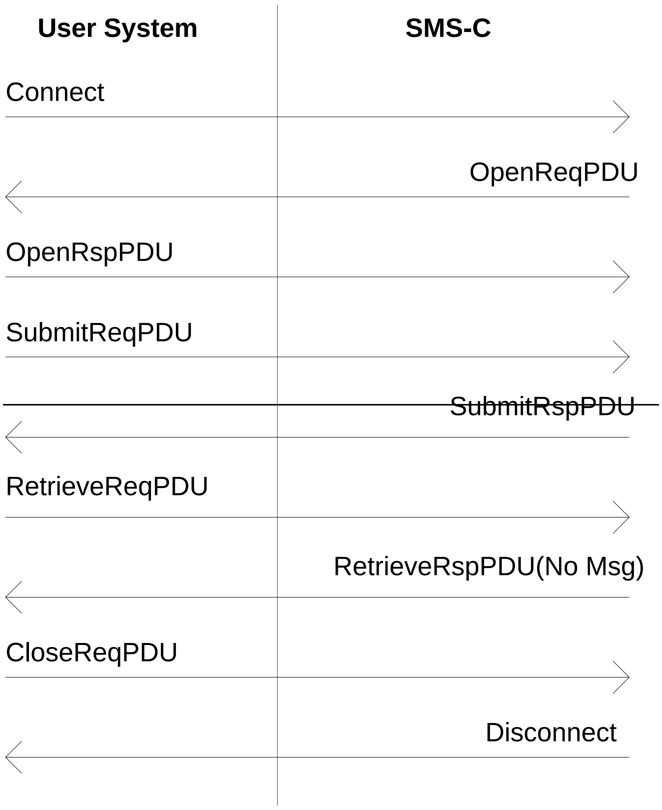
~~8 Invalid calling address~~

~~SMS-C will disconnect if an interrupt or reset is received.~~

~~E.5 Scenarios~~

~~E.5.1 Submit Short Message from the User System~~

~~The scenario below illustrates the case when the user system wants to submit a message to SMS-C. The user system establishes a connection and submits a message. Before terminating the session, the user system checks if SMS-C has something to deliver.~~



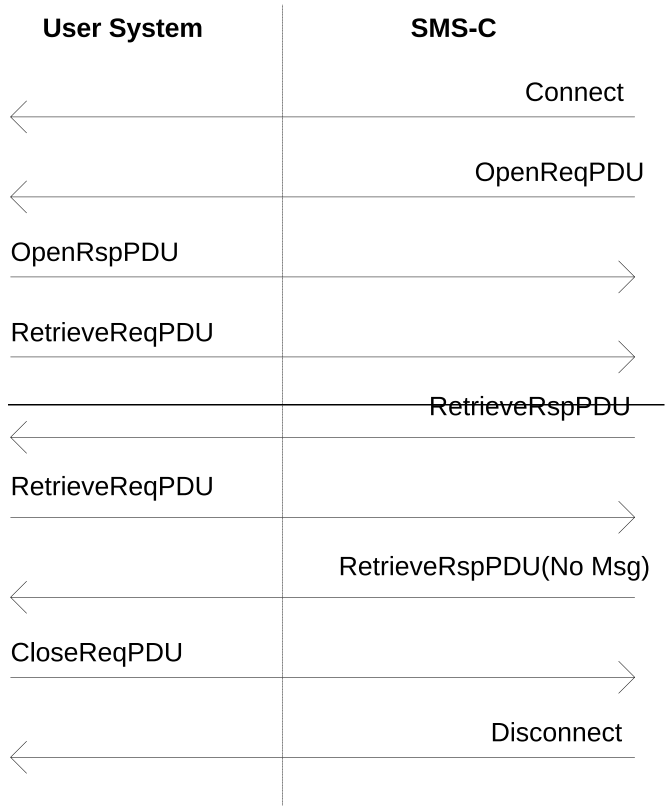
~~**Figure E.9: Submit Short Message from the User System.**~~

~~E.5.2 Delivery of Message from SMS-C~~

~~The scenario illustrates the case when SMS-C has a short message or message notification to deliver to the user system.~~

~~Since the user system is not currently connected, SMS-C connects. In order to retrieve any message or message notification the user system sends a RetrieveReqPDU. SMS-C responds with a RetrieveRspPDU which contains either a short message or message notification.~~

~~Before terminating the session, the user system checks if there are any more messages waiting by sending another RetrieveReqPDU.~~



~~Figure E.10: Delivery of Message from SMS-C.~~

~~E.6 Design considerations~~

~~E.6.1 SMS-C Configuration~~

~~In SMS-C there are a number of configuration parameters which determine the characteristics of the system. An application designer should consider the following parameters:~~

- ~~X.25 multiport support – determines whether SMS-C supports this feature or not.~~
- ~~user system idle time – if the user system is idle for more than this period of time, SMS-C will disconnect.~~
- ~~default validity time – if the user system does not specify a validity time, in the SubmitReqPDU, this value will be used.~~
- ~~maximum validity time – determines the maximum validity time the user system can specify in the SubmitReqPDU.~~
- ~~maximum deferred delivery time – determines the maximum deferred delivery time the user system can specify in the SubmitReqPDU.~~

~~E.6.2 Designing for High Throughput~~

~~When designing an application demanding high throughput consider the following:~~

~~E.6.2.1 Notifications~~

~~Use of notifications should be avoided. From SMS-C's point of view the handling of a notification is equal to a short message. This means that the capacity of SMS-C is decreased if notifications are used.~~

~~E.6.2.2 X.25 Multiport support~~

~~X.25 multiport support may be used to increase the message throughput:~~

- ~~Connect several SVCs in parallel and use them to submit and retrieve messages.~~
- ~~In a high volume environment, allocating one port to input only (for notifications) and several ports to output might increase the throughput. Use the alternative notification address option to specify the address of the input port.~~

~~E.7 Protocol Data Unit Definitions~~

~~This clause defines the Computer Access Protocol Data Units using Abstract Notation One (ASN.1), see CCITT Recommendation X.208 [5].~~

~~Each PDU is serialised using the Basic Encoding Rules (BER), see CCITT Recommendation X.209 [6].~~

```
CAP DEFINITIONS  ::= BEGIN
CAP-PDUs  ::=
    CHOICE
    {   [0]openReq                  -- Open request from SMS-C (server)
            OpenReqPDU,

        [1]openRsp                  -- Open response from User System (client)
            OpenRspPDU,

        [2]closeReq                 -- Close request from User System (client)
            CloseReqPDU,

        [3]submitReq                -- Submit request from User System (client)
            SubmitReqPDU,
        [4]submitRsp                -- Submit response from SMS-C (server)
            SubmitRspPDU,
        [5]retrieveReq              -- Retrieve request from User System (client)
            RetrieveReqPDU,

        [6]retrieveRsp              -- Retrieve response from SMS-C (server)
            RetrieveRspPDU,
        [7]deleteReq                -- Delete request from User System (client)
            DeleteReqPDU,
        [8]deleteRsp                -- Delete response from SMS-C (server)
            DeleteRspPDU
    }
```

```
--  OpenReqPDU.     Sent from SMS-C to the user system. Contains a list
--                  of supported release levels of the protocol.

OpenReqPDU  ::=
    SEQUENCE OF             -- List of supported release levels
        RelLevel            -- Each entry consists of at least 1 digit.


-   OpenRspPDU.     Sent from the user system to SMS-C in response
--                  to the OpenReqPDU. Contains the release level of the
--                  protocol to be used.

OpenRspPDU  ::= IMPLICIT RelLevel           -- Release level to be used.


-   CloseReqPDU.    Sent from the user system to SMS-C.
--                  Indicates that the user system finishes the session.

CloseReqPDU  ::=  IMPLICIT NULL             -- No parameters
-   SubmitReqPDU.   Sent from the user system to SMS-C.
--                  Contains short message.

SubmitReqPDU  ::= SEQUENCE {    priority                        -- Message priority Priority,
notificationLevel               -- Notification level NotificationLevel, destAddress
    -- Destination address Address, messageText                     -- Message text MessageText, [0]
validity  IMPLICIT          -- Optional validity time UTCTime  OPTIONAL, [1] alternNotAddress
    -- Optional alternative -- notification address Address OPTIONAL, [2] defDelivery  IMPLICIT  --
Optional deferred delivery time UTCTime OPTIONAL }


-   SubmitRspPDU.   Sent from SMS-C to the user system in response
--                  to a SubmitReqPDU. Contains return code and a
--                  unique message  identification.

SubmitRspPDU  ::= SEQUENCE {    returnCode ReturnCode, messageId MessageId }
```

```
--   RetrieveReqPDU. Sent from the user system to SMS-C.
--                   Indicates that the user system is ready to receive.

RetrieveReqPDU  ::=  IMPLICIT NULL                  -- No parameters


-    RetrieveRspPDU. Sent from SMS-C to the user system in response to
--                   a RetrieveReqPDU.
--                   Contains a short message, a notification or a
--                   "no message" indicator.

RetrieveRspPDU  ::= CHOICE {     [0] SEQUENCE {  messageText MessageText, origAddress             --
Address of originator Address }, [1] notification        -- Message notification Notification, NULL
                -- No more messages }


-    DeleteReqPDU .  Sent from the user system to SMS-C.
--                   Specifies the deletion of one or several messages.

DeleteReqPDU  ::= CHOICE {  messageId               -- Specific message MessageId, destAddress
    -- All messages to a specific destination Address }


-    DeleteRspPDU.   Sent from SMS-C to the user system in response to
--                   a DeleteReqPDU.
--                   Contains return code.

DeleteRspPDU  ::=  IMPLICIT returnCode ReturnCode
```

```
Priority  ::= ENUMERATED {  normal(0), nonUrgent(1),            -- Lowest priority urgent(2) }

NotificationLevel ::=
    BITSTRING                   -- True when bit is set
    {   DeliveredNotification(0),
        NonDeliveredNotification(1),
        BufferedNotification(2)
    }

MessageText  ::=
    SEQUENCE
    {   msgTxtCoding            -- Alphabet used
            MsgTxtCoding,
        text                    -- coded according to msgTxtCoding
            Text
    }

MsgTxtCoding  ::=
        ENUMERATED
        {   osi8859_1(0)        -- OSI 8859-1

        }

Text  ::=
        OCTET STRING (SIZE 1..160)

Address  ::=
    SEQUENCE
    {   Pid                     -- Type of address
            Pid,
        addr                    -- Address
            PackedBCDString
    }

Pid  ::=
    ENUMERATED
    {   gsm(0),                 -- GSM telephone number
        it(56),                 -- Interactive terminal PSTN number (hex 38)
        ca(57)                  -- Computer Access X.25 DTE number (hex 39)
    }
Notification  ::=
    SEQUENCE
    {   MessageId,
        ENUMERATED
        {   messageDelivered(0),
            messageBuffered(1),
            messageNotDelivered(2)
        },
        msgCreationTime
            UTCTime,
        destAddress
            Address,
        ReasonCode OPTIONAL     -- used with messageNotDelivered
    }

ReasonCode
    ENUMERATED
    {
        unknownRecipient(1),
        messageTimedOut(2),
        functionNotSupported(3),
        otherError(4)
    }

RelLevel  ::=                       -- Release Level
    PackedBCDString

MessageId  ::=
    OCTET STRING

PackedBCDString  ::=
    OCTET STRING                    -- The digits 0 through 9, two digits
                                    -- per octet.
                                    -- each digit encoded as 0000 to 1001.
                                    -- 1111 used for padding at the end, if
                                    -- needed.
                                    -- The leftmost digit is the most
                                    -- signigicant.

ReturnCode  ::=
    SEQUENCE
    {
        ENUMERATED
```

```
~~        {   ok (0),                         -- The request is forwarded into~~
~~                                            -- the kernel of SMS-C,~~
~~                                            --  and the kernel has taken over~~
~~                                            -- responsibility.~~
~~            notAvailable(1),                -- The kernel of SMS-C is not available~~
~~            protocolError(2)                -- Protocol error~~
~~            noMessageDeleted(3)             -- There is no message to delete;~~
~~                                            -- might be returned in DeleteRspPDU.~~
~~        }~~
~~         errorCode~~
~~            ErrorCode  OPTIONAL             -- If protocolError~~
~~    }~~

~~ErrorCode~~
~~    ENUMERATED~~
~~    {~~
~~        illegalPriority(2),                 -- Illegal priority~~
~~        illegalPid(3),                      -- Illegal recipient Pid~~
~~        illegalAddr(4),                     -- Illegal recipient address~~
~~        illegalTxtCoding(5),                -- Illegal message text coding~~
~~        illegalValTime(6),                  -- Illegal validity time~~
~~        illegalNotAddr(7),                  -- Illegal notification address~~
~~        illegalDelTime(8),                  -- Illegal deferred delivery time~~
~~        messageTooLong(9),                  -- Message size is too long~~
~~        unexpectedTag(11),                  -- Unexpected tag encountered~~
~~        expectedSequence(12),               -- "Sequence" tag was expected~~
~~        expectedInteger(13),                -- "Integer" tag was expected~~
~~        expectedBitstring(14),              -- "Bit string" tag was expected~~
~~        expectedOctstring(15),              -- "Octet string" tag was expected~~
~~        expectedEnumerated(16)              -- "Enumerated" tag was expected    }~~

~~END -- End of module describing the CAP protocol~~
```

Annex F (informative): Change Request History

Change history					
TSG-T No.	**TDoc. No.**	**CR. No.**	**Section affected**	**New version**	**Subject/Comments**
T#4		New		3.0.0	Creation of 3GPP 23.039 v3.0.0 out of GSM 03.39 v6.0.0

History

Document history		
V3.0.0	July 1999	

3GPP/SMG Meeting T2 #7 / ETSI SMG4
Ystad, Sweden, 22-26 11 1999

Document ***T2-991065***
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.040 **CR** **006** Current Version: 3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-T#6
list expected approval meeting # here
↑

for approval	X	strategic		(for SMG use only)
for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source: T2 **Date:** 17.11.1999

Subject: Duplicate messages

Work item: SMS ENHANCEMENTS AND IMPROVEMENTS

Category:
(only one category shall be marked with an X)

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: Although provision exists in 23.040 to avoid duplication of mobile originated SM's the description of how this can be achieved is unclear and requires clarification

Clauses affected: 9.2.3.6

Other specs affected:

Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

9.2.3.6 TP-Message-Reference (TP-MR)

The TP-Message-Reference field gives an integer representation of a reference number of the SMS-SUBMIT or SMS-COMMAND submitted to the SC by the MS. The MS increments TP-Message-Reference by 1 for each SMS-SUBMIT or SMS-COMMAND being submitted. The value to be used for each SMS-SUBMIT is obtained by reading the Last-Used-TP-MR value from the SMS Status data field in the SIM (see GSM 11.11) and incrementing this value by 1. After each SMS-SUBMIT has been submitted to the network, the Last-Used-TP-MR value in the SIM is updated with the TP-MR that was used in the SMS-SUBMIT operation. The reference number may possess values in the range 0 to 255. The value in the TP-MR assigned by the MS is the same value which is received at the SC.

In the case where no ~~acknowledgement~~response or an ~~appropriate~~ RP-Error is received in response to an SMS-SUBMIT or SMS-COMMAND, then the MS shall ~~may~~ automatically repeat the SMS-SUBMIT or SMS-COMMAND but must use the same TP-MR value and set the TP-RD bit to 1 (See 9.2.3.25). The number of times the MS ~~may~~ automatically repeats the SMS-SUBMIT or SMS-COMMAND shall be in the range 1 to 3 but the precise number is an implementation matter, The automatic repeat mechanism should be capable of being disabled through MMI~~.~~

If all automatic attempts fail (or in the case of no automatic attempts the first attempt fails) ~~(including the case where no automatic repeat is provided)~~, the user shall be informed. The failed message shall be stored in the mobile in such a way that the user can request a retransmission using the same TP-MR value, without the need ~~needing~~ to re-enter any information. Such storage need only be provided for a single failed message~~,~~i.e. the one most recently attempted.

The SC ~~may~~ should discard an SMS-SUBMIT or SMS-COMMAND which has the TP-RD bit set to a 1 and which has the same TP-MR value as the previous SMS-SUBMIT or SMS-COMMAND received from the same originating address. The SC shall send an RP-ACK in response to the discarded SMS-SUBMIT or SMS-COMMAND.

A Phase 2 or later ME using a Phase 1 SIM cannot read or update the TP-Message-Reference from/to the SIM, and so the ME shall always retain the Last-Used-TP-MR value in its own memory, to be used only in the case of a Phase 1 SIM.

The SMS-STATUS-REPORT also contains a TP-Message-Reference field. The value sent to the MS will be the same as the TP-Message-Reference value generated by the MS in the earlier SMS-SUBMIT or SMS-COMMAND to which the status report relates.

3GPP TSG-T2 #7 / ETSI SMG4
Ystad, SWEDEN, 22-26 November 1999

TSGT2#7(99)1069

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.040 CR 007 Current Version: 3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-T#6	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑	for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: T2 **Date:** 26/11/99

Subject: Adaptations for UMTS

Work item: TEI

Category:				**Release:**	
	F	Correction		Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature		Release 98	
with an X)	D	Editorial modification	X	Release 99	X
				Release 00	

Reason for change: This specification has been transferred from SMG to 3GPP. Therefore, adaptations for UMTS are required.

Clauses affected:

Other specs affected:			
	Other 3G core specifications		→ List of CRs:
	Other GSM core specifications		→ List of CRs:
	MS test specifications		→ List of CRs:
	BSS test specifications		→ List of CRs:
	O&M specifications		→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

3G TS 23.040 V3.~~2~~3.0 (1999-~~10~~12)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Terminals;
Technical realization of the Short Message Service (SMS);
~~Point-to-Point (PP)~~
(3G TS 23.040 version 3.~~2~~3.0)

Reference

DTS/TSGT-0223040U

Keywords

R99 Specification 3G

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Contents

Foreword

This Technical Specification has been produced by the 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 this TS, 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;

3 Indicates TSG approved document under change control.

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 specification;

Introduction

The ~~Point-to-Point~~ Short Message Service (SMS) provides a means of sending messages of limited size to and from ~~GSM~~GSM/UMTS mobiles. The provision of SMS makes use of a Service Centre, which acts as a store and forward centre for short messages. Thus a ~~GSM~~GSM/UMTS PLMN needs to support the transfer of short messages between Service Centres and mobiles.

~~Two different point-to-point services have been defined: mobile originated and mobile terminated.~~ Mobile originated messages ~~will~~shall be transported from an MS to a Service Centre. These may be destined for other mobile users, or for subscribers on a fixed network. Mobile terminated messages ~~will~~shall be transported from a Service Centre to an MS. These may be input to the Service Centre by other mobile users (via a mobile originated short message) or by a variety of other sources, e.g. speech, telex, or facsimile.

~~The present document includes references to features which were introduced into the GSM Technical specifications after Release 96 of GSM Phase 2+.~~

~~The following table lists all features that were introduced after Release 96 and have impacted this specification:~~

~~Feature~~	~~Designator~~
~~Optional SMSC Control Parameters - Selective Status Report~~	~~not used~~
~~Optional Source Indicator in the User Data Header~~	~~not used~~
~~Optional Status Report PDU Enhancement~~	~~not used~~
~~Optional UDH in all PDUs containing user data.~~	~~not used~~
~~Optional SMS Secured Messaging~~	~~not used~~
~~Optional Transmission of the SME Originating Address between the SMSC and the SMS-GMSC~~	~~not used~~
~~GPRS~~	~~not used~~
~~Mobile phone management~~	~~not used~~

1 Scope

This Technical Specification ~~(TS)~~ describes the ~~point-to-point~~ Short Message Service (SMS) for~~of the~~ GSM/UMTS networks.~~PLMN system.~~ It defines:

- the services and service elements;
- the network architecture;
- the Service Centre functionality;
- the MSC functionality (with regard to the SMS);
- the SGSN functionality (with regard to the SMS);
- the routing requirements;
- the protocols and protocol layering;

for the Teleservice~~s~~ Short Message Service ~~21 and 22~~, as specified in the GSM TS 02.03 [2] and 3G TS 22.105 [32]~~.~~

The use of radio resources for the transfer of short messages between the MS and the MSC or the SGSN is described in ~~GSM 04.11~~3G TS 24.011 [13] "~~Point-to-Point~~ Short Message Service Support on Mobile Radio Interface", and is dealt with in that specification.

The network aspects of Short Message Service provision are outside the scope of this specification (i.e. the provision of network connectivity between the PLMN subsystems). There is no technical restriction within this specification for the transfer of short messages between different PLMN's. Any such restriction is likely to be subject to commercial arrangements and PLMN operators must make their own provision for interworking or for preventing interworking with other PLMN's as they see fit.

The required and assumed network service offered to the higher layers is defined in this specification.

~~The Cell Broadcast Short Message Service (Teleservice 23) is a separate service, and is described in GSM 03.41~~3G TS 23.041 [10] ~~"Technical Realization of the Short Message Service - Cell Broadcast".~~

2 Normative 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.03: "Digital cellular telecommunication system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] ~~GSM~~ 3G TS 0~~2~~2.0~~0~~04: "~~Digital cellular telecommunication system (Phase 2+);~~ General on supplementary services".

[4] 3G TS ~~GSM~~ 2~~0~~2.041: "~~Digital cellular telecommunication system (Phase 2+);~~ Operator determined barring".

[5] GSM 03.02: "Digital cellular telecommunication system (Phase 2+); Network architecture".

[6] 3G TS~~GSM~~ ~~0~~23.~~0~~008: "~~Digital cellular telecommunication system (Phase 2+);~~ Organization of subscriber data".

[7] 3G TS~~GSM~~ 2~~0~~3.011: "~~Digital cellular telecommunication system (Phase 2+);~~ Technical realization of supplementary services - General Aspects".

[8] ~~GSM~~ 3G TS ~~0~~23.015: "~~Digital cellular telecommunication system (Phase 2+);~~ Technical realisation of Operator Determined Barring (ODB)~~Technical realization of operator determined barring~~".

[9] ~~GSM 03.38~~3G TS 23.038: "~~Digital cellular telecommunication system (Phase 2+);~~ Alphabets and language-specific information".

[10] ~~GSM 03.41~~3G TS 23.041: "~~Digital cellular telecommunication system (Phase 2+);~~ Technical realization of ~~Short Message Service~~ Cell Broadcast Service (~~SMS~~CBS)".

[11] GSM 03.47 (ETR 354): "Digital cellular telecommunication system; Example protocol stacks for interconnecting Service Centre(s) (SC) and Mobile-services Switching Centre(s) (MSC)".

[12] GSM 04.08: "Digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification".

[13] ~~GSM 04.11~~3G TS 24.011: "Digital cellular telecommunication system ~~(Phase 2+); Point-to-Point (PP)~~ Short Message Service (SMS) support on mobile radio interface".

[14] ~~GSM 07.05~~3G TS 27.005: "Digital cellular telecommunication system ~~(Phase 2+)~~; Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".

[15] ~~GSM 09.02~~3G TS 29.002: "Digital cellular telecommunication system ~~(Phase 2+)~~; Mobile Application Part (MAP) specification".

[16] GSM 11.11: "Digital cellular telecommunication system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM– ME) interface".

[17] CCITT Recommendation E.164 (Blue Book): "Numbering plan for the ISDN era".

[18] CCITT Recommendation E.163 (Blue Book): "Numbering plan for the international telephone service".

[19] CCITT Recommendation Q.771: "Specifications of Signalling System No.7; Functional description of transaction capabilities".

[20] CCITT Recommendation T.100 (Blue Book): "International information exchange for interactive videotex".

[21] CCITT Recommendation T.101 (Blue Book): "International interworking for videotex services".

[22] CCITT Recommendation X.121 (Blue Book): "International numbering plan for public data networks".

[23] CCITT Recommendation X.400 (Blue Book): "Message handling system and service overview".

[24] ISO/IEC10646, "Universal Multiple-Octet Coded Character Set (USC); UCS2, 16 bit coding".

[25] ~~GSM~~ 3G TS ~~0~~22.022: "~~Digital cellular telecommunication system (Phase 2+);~~ Personalisation of GSM ME Mobile functionality specification - Stage 1~~Personalization of GSM Mobile Equipment (ME); Mobile functionality specification~~".

[26] ~~GSM 03.42~~3G TS 23.042: "Digital cellular telecommunication system ~~(Phase 2+)~~; Compression Algorithm for Text Messaging Services"

[27] ~~GSM 03.60~~3G TS 23.060: "Digital cellular telecommunications system ~~(Phase 2+)~~; General Packet Radio Service (GPRS); Service description; Stage 2".

[28] GSM 03.48: "Digital cellular telecommunications system (Phase 2+); Security Mechanisms for the SIM application toolkit; Stage 2"

[29] 3G TR 25.990: "~~UMTS~~ Vocabulary".

[30] 3G TS 31.102: "Characteristics of the USIM application"

[31] 3G TS 31.101: "UICC – Terminal interface; Physical and logical characteristics"

[32] 3G TS 22.105: "Services and Service Capabilites"

2.1 Definitions and abbreviations

~~NOTE: Use of hyphens and full stops:~~

~~Care is needed when reading this specification as names containing words separated by hyphens have different meaning than when separated with full stops. E.g. TS-Status-Report-Request is a parameter within a TS-Submit primitive, whilst TS-Status-Report. Request is a primitive in its own right.~~

2.1.1 ~~2.1.1~~ Definitions

Note. The term 'mobile station' (MS) in this specification is synonymous with the term 'user equipment' (UE) in UMTS terminology as defined in 3G TR 25.990 [29]

active MS: A switched-on mobile station with a SIM / UICC see 3G TS 31.101 [31] module attached.

alert-SC: Service element provided by a ~~GSM~~GSM/UMTS PLMN to inform an SC which has previously initiated unsuccessful short message delivery attempt(s) to a specific MS, that the MS is now recognized by the PLMN to have recovered operation.

status report: SC informing the originating MS of the outcome of a short message submitted to an SME.

Gateway MSC For Short Message Service (SMS-GMSC): A function of an MSC capable of receiving a short message from an SC, interrogating an HLR for routing information and SMS info, and delivering the short message to the VMSC or the SGSN of the recipient MS.

Interworking MSC For Short Message Service (SMS-IWMSC): A function of an MSC capable of receiving a short message from within the PLMN and submitting it to the recipient SC.

Messages-Waiting (MW): Service element that makes a PLMN store information (Messages-Waiting-Indication), listing those SCs that have made unsuccessful short message delivery attempts to MSs in that PLMN.

Messages-Waiting-Indication (MWI): Data to be stored in the HLR and VLR with which an MS is associated, indicating that there is one or more messages waiting in a set of SCs to be delivered to the MS (due to unsuccessful delivery attempt(s)).

Messages-Waiting-Data (MWD): A part of the MWI to be stored in the HLR. MWD consists of an address list of the SCs which have messages waiting to be delivered to the MS.

Mobile-services Switching Centre (MSC): The Mobile-services Switching Centre is an exchange which performs switching functions for mobile stations located in a geographical area designated as the MSC area.

Mobile-Station-Memory-Capacity-Exceeded-Flag (MCEF): A part of the MWI to be stored in the HLR. MCEF is a Boolean parameter indicating if the address list of MWD contains one or more entries because an attempt to deliver a short message to an MS has failed with a cause of MS Memory Capacity Exceeded.

Mobile-Station-Not-Reachable-Flag (MNRF): The part of the MWI to be stored in the VLR and the HLR. MNRF is a Boolean parameter indicating if the address list of MWD contains one or more entries because an attempt to deliver a short message to an MS has failed with a cause of Absent Subscriber.

Mobile-station-Not-Reachable-for-GPRS (MNRG): The part of the MWI to be stored in the SGSN and the HLR. MNRG is a Boolean parameter indicating if the address list of MWD contains one or more entries because an attempt to deliver a short message to an MS has failed with a cause of Absent Subscriber.

Mobile-Station-Not-Reachable-Reason (MNRR): The part of the MWI in the HLR which stores the reason for an MS being absent when an attempt to deliver a short message to an MS fails at the MSC with a cause of Absent Subscriber.

More-Messages-To-Send (MMS): Information element offering an MS receiving a short message from an SC the information whether there are still more messages waiting to be sent from that SC to the MS. The TP-MMS element (conveyed in the Transfer layer) is copied into the RP-MMS element (conveyed in the Relay layer). It is possible with Phase 2 and later versions of MAP (~~GSM TS~~3G TS ~~09.02~~29.002 [15]) for the RP-MMS element to keep an SM transaction open between the GMSC and the MS in the case where there are more-messages-to-send. Earlier versions of MAP ~~will~~ support the transport of the TP-MMS element.

priority: Service element enabling the SC or SME to request a short message delivery attempt to an MS irrespective of whether or not the MS has been identified as temporarily absent.

protocol-identifier: Information element by which the originator of a short message (either an SC or an MS) may refer to a higher layer protocol.

reply path procedure: A mechanism which allows an SME to request that an SC should be permitted to handle a reply sent in response to a message previously sent from that SME to another SME. This may happen even though the SC may be unknown to the SME which received the initial message.

report: Response from either the network or the recipient upon a short message being sent from either an SC or an MS. A report may be a delivery report, which confirms the delivery of the short message to the recipient, or it may be a failure report, which informs the originator that the short message was never delivered and the reason why.

> When issued by the Service Centre, the delivery report confirms the reception of the Short Message by the SC, and not the delivery of the Short Message to the SME.
>
> When issued by the Mobile Station, the delivery report confirms the reception of the Short Message by the Mobile Station, and not the delivery of the Short Message to the user.

replace short message type: A range of values in the Protocol Identifier which allows an indication to be sent with a short message (MT or MO) that the short message is of a particular type allowing the receiving MS or the SC to replace an existing message of the same type held in the SC, the ME or on the SIM / UICC, provided it comes:

- in MT cases: from the same SC and originating address;
- in MO cases: from the same MS.

Service Centre (SC): Function responsible for the relaying and store-and-forwarding of a short message between an SME and an MS. The SC is not a part of the ~~GSM~~GSM/UMTS PLMN, however MSC and SC may be integrated.

Serving GPRS Support Node (SGSN): The Serving GPRS Support Node is an exchange which performs packet switching functions for mobile stations located in a geographical area designated as the SGSN area.

short message: Information that may be conveyed by means of the Short Message Service described in this specification.

Short Message Entity (SME): An entity which may send or receive Short Messages. The SME may be located in a fixed network, an MS, or an SC.

SMS-STATUS-REPORT: Short message transfer protocol data unit informing the receiving MS of the status of a mobile originated short message previously submitted by the MS, i.e. whether the SC was able to forward the message or not, or whether the message was stored in the SC for later delivery.

SMS-COMMAND: Short message transfer protocol data unit which enables an MS to invoke an operation at the SC. An MS may then, for example, delete a short message, cancel a TP-Status--Report--Request, enquire about the status of a short message or request another function to be performed by the SC.

The type of operation is indicated by the TP-Command-Type and the particular SM to operate on is indicated by the TP-Message-Number and the TP-Destination-Address. Receipt of an SMS-COMMAND is confirmed by an RP-ACK or RP-ERROR. In the case of certain SMS-COMMANDs, an SMS-STATUS-REPORT may be sent, where the outcome of the SMS-COMMAND is passed in its TP-Status field.

SMS-DELIVER: Short message transfer protocol data unit containing user data (the short message), being sent from an SC to an MS.

SMS-SUBMIT: Short message transfer protocol data unit containing user data (the short message), being sent from an MS to an SC.

Service-Centre-Time-Stamp (SCTS): Information element offering the recipient of a short message the information of when the message arrived at the SM-TL entity of the SC. The time of arrival comprises the year, month, day, hour, minute, second and time zone.

Validity-Period (VP): Information element enabling the originator MS to indicate the time period during which the originator considers the short message to be valid.

2.2.2 Abbreviations

For the purposes of this TS, the following abbreviations apply

ACSE	Association Control Service Element
E.163	CCITT Rec. E.163 (Blue Book)
E.164	CCITT Rec. E.164 (Blue Book)
SM MT	Short Message Mobile Terminated ~~Point-to-Point~~
SM MO	Short Message Mobile Originated ~~Point-to-Point~~
SM-AL	Short Message Application Layer
SM-TL	Short Message Transfer Layer
SM-RL	Short Message Relay Layer
SM-LL	Short Message Lower Layers
SM-TP	Short Message Transfer Layer Protocol
SM-RP	Short Message Relay Layer Protocol
SM-TS	Short Message Transfer Service
SM-RS	Short Message Relay Service
T.100	CCITT Rec. T.100 (Blue Book)
T.101	CCITT Rec. T.101 (Blue Book)
TPDU	Transfer protocol data unit
X.121	CCITT Rec. X.121 (Blue Book)
X.400	CCITT Rec. X.400 (Blue Book)

In addition to those above, definitions used in this TS are listed in GSM TR 01.04 [1]. / 3G TR 25.990 [29]

3 Services and service elements

The SMS provides a means to transfer short messages between a ~~GSM~~GSM/UMTS MS and an SME via an SC. The SC serves as an interworking and relaying function of the message transfer between the MS and the SME.

This specification describes only the short message ~~point-to-point~~ services between the MS and SC. It may, however, refer to possible higher layer applications.

3.1 Basic services

The S~~s~~hort M~~m~~essage ~~point-to-point~~ S~~s~~ervice~~s~~ comprise two basic services:

SM MT (Short Message Mobile Terminated ~~Point-to-Point~~);

SM MO (Short Message Mobile Originated ~~Point-to-Point~~).

SM MT denotes the capability of the ~~GSM~~GSM/UMTS system to transfer a short message submitted from the SC to one MS, and to provide information about the delivery of the short message either by a delivery report or a failure report with a specific mechanism for later delivery; see figure ~~03.40/~~1.

SM MO denotes the capability of the ~~GSM~~GSM/UMTS system to transfer a short message submitted by the MS to one SME via an SC, and to provide information about the delivery of the short message either by a delivery report or a failure report. The message must include the address of that SME to which the SC shall eventually attempt to relay the short message; see figure ~~03.40/~~2.

The text messages to be transferred by means of the SM MT or SM MO contain up to 140 octets.

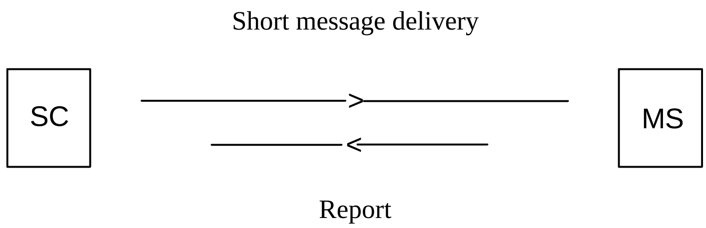


Figure ~~03.40/~~1: The Short Message Service mobile terminated.~~, point-to-point~~

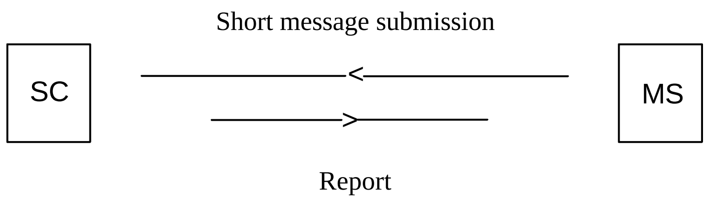


Figure ~~03.40/~~2: The Short Message Service mobile originated.~~, point-to-point~~

An active MS shall be able to receive a short message TPDU (SMS-DELIVER) at any time, independently of whether or not there is a speech or data call in progress. A report ~~will~~shall always be returned to the SC; either confirming that the MS has received the short message, or informing the SC that it was impossible to deliver the short message TPDU to the MS, including the reason why.

An active MS shall be able to submit a short message TPDU (SMS-SUBMIT) at any time, independently of whether or not there is a speech or data call in progress. A report ~~will~~shall always be returned to the MS; either confirming that the SC has received the short message TPDU, or informing the MS that it was impossible to deliver the short message TPDU to the SC, including the reason why.

NOTE: When the transmission or reception of a short message coincide with a change of state in the MS, i.e. from busy to idle or from idle to busy, or during a handover, the short message transfer might be aborted.
It is also possible for two short messages to be received in sequence having the same originating address and identification, i.e. message reference number (MO) or SC Timestamp (MT). Such a situation may be due to errors at the RP or CP layers (e.g. during inter MSC handover) where it may be a duplicated message or otherwise it may be a valid new message.
The receiving entity should therefore make provision to check other parameters contained in the short message to decide whether the second short message is to be discarded.

3.2 Short Message Service elements

The SMS comprises 7 elements particular to the submission and reception of messages:

Validity-Period;
Service-Centre-Time-Stamp;
Protocol-Identifier;
More-Messages-to-Send;
Priority;
Messages-Waiting;
Alert-SC.

3.2.1 Validity-Period

The Validity-Period is the information element which gives an MS submitting an SMS-SUBMIT to the SC the possibility to include a specific time period value in the short message (TP-Validity-Period field, see clause 9). The TP-Validity-Period parameter value indicates the time period for which the short message is valid, i.e. for how long the SC shall guarantee its existence in the SC memory before delivery to the recipient has been carried out.

3.2.2 Service-Centre-Time-Stamp

The Service-Centre-Time-Stamp is the information element by which the SC informs the recipient MS about the time of arrival of the short message at the SM-TL entity of the SC. The time value is included in every SMS-DELIVER (TP-Service-Centre-Time-Stamp field, see clause 9) being delivered to the MS.

3.2.3 Protocol-Identifier

The Protocol-Identifier is the information element by which the SM-TL either refers to the higher layer protocol being used, or indicates interworking with a certain type of telematic device.

The Protocol-Identifier information element makes use of a particular field in the message types SMS-SUBMIT, SMS-SUBMIT-REPORT for RP-ACK, SMS-DELIVER DELIVER, SMS-DELIVER-REPORT for RP-ACK, SMS_STATUS_REPORT and SMS-COMMAND TP-Protocol-Identifier (TP-PID).

3.2.4 More-Messages-to-Send

The More-Messages-to-Send is the information element by which the SC informs the MS that there is one or more messages waiting in that SC to be delivered to the MS. The More-Messages-to-Send information element makes use of a Boolean parameter in the message SMS-DELIVER, TP-More-Messages-to-Send (TP-MMS).

3.2.5 Delivery of Priority and non-Priority Messages

Priority is the information element provided by an SC or SME to indicate to the PLMN whether or not a message is a priority message.

Delivery of a non-priority message ~~will~~shall not be attempted if the MS has been identified as temporarily absent (see subclause 3.2.6).

Delivery of a non-priority message ~~will~~shall be attempted if the MS has not been identified as temporarily absent irrespective of whether the MS has been identified as having no free memory capacity (see subclause 3.2.6).

Delivery of a priority message ~~will~~shall be attempted irrespective of whether or not the MS has been identified as temporarily absent, or having no free memory capacity.

3.2.6 Messages-Waiting

The Messages-Waiting is the service element that enables the PLMN to provide the HLR, SGSN and VLR with which the recipient MS is associated with the information that there is a message in the originating SC waiting to be delivered to the MS. The service element is only used in case of previous unsuccessful delivery attempt(s) due to temporarily absent mobile or MS memory capacity exceeded. This information, denoted the Messages-Waiting-Indication (MWI), consists of Messages-Waiting-Data (MWD),), the Mobile-station-Not-Reachable-for-GPRS (MNRG), the Mobile-Station-Not-Reachable-Flag (MNRF), the Mobile-Not-Reachable-Reason (MNRR) and the Mobile-Station-Memory-Capacity-Exceeded-Flag (MCEF) located in the HLR; the Mobile-station-Not Reachable-for-GPRS (MNRG) located in the SGSN, and the Mobile-Station-Not-Reachable-Flag (MNRF) located in the VLR. figure ~~03.40/~~3 shows an example.

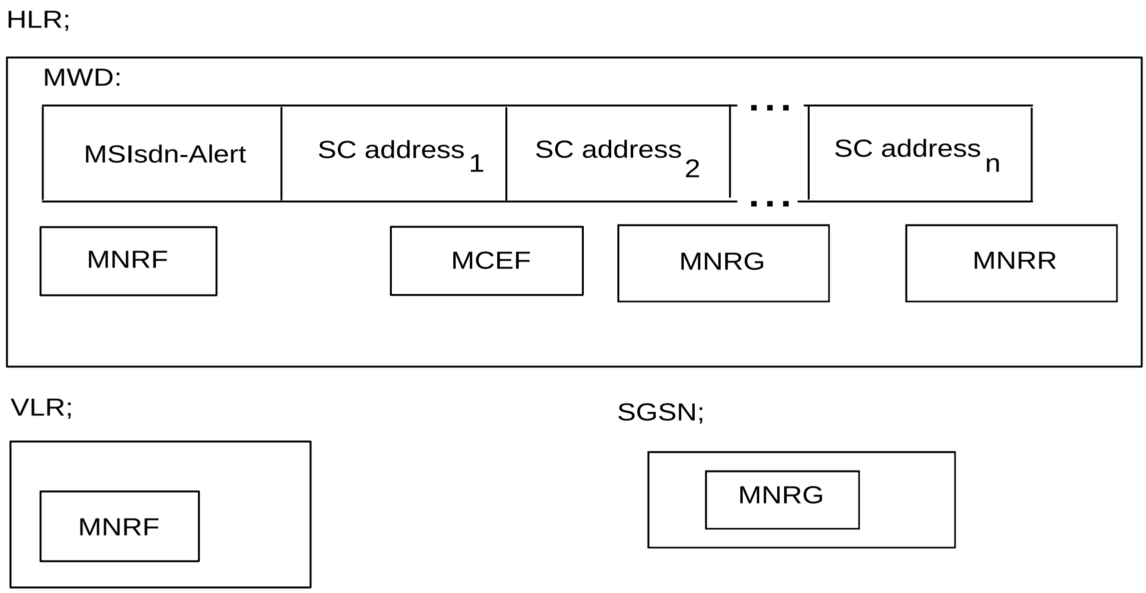


Figure ~~03.40/~~3: Example of how information on one MS can be put in relation to SC(s) in order to fulfil the requirement of Alert-SC mechanism

The MWD shall contain a list of addresses (SC-Addr) of SCs which have made previous unsuccessful delivery attempts of a message (see clause 5). In order to be able to send alert messages to every SC which has made unsuccessful delivery attempts to an MS, the HLR shall store the MSIsdn-Alert (see subclause 3.2.7) together with references to the SC addresses. The requirements placed upon the HLR are specified in GSM TS 03.08 [6]. The description of how the HLR is provided with SC and MS address information is given in ~~GSM 09.02~~3G TS 29.002 [15].

The Mobile-Station-Memory-Capacity-Exceeded-Flag (MCEF) within the HLR is a Boolean parameter with the value TRUE an attempt to deliver a short message to an MS has failed with a cause of MS Memory Capacity Exceeded, and with the value FALSE otherwise.

The Mobile-station-Not Reachable-for-GPRS (MNRG) within the HLR and the SGSN is a Boolean parameter with the value TRUE when an attempt to deliver a short message to an MS has failed with a cause of Absent Subscriber, and with the value FALSE otherwise (except as described in note 1 below).

The Mobile-Station-Not-Reachable-Flag (MNRF) within the HLR and the VLR is a Boolean parameter with the value TRUE when the list MWD contains one or more list elements because an attempt to deliver a short message to an MS has failed with a cause of Absent Subscriber, and with the value FALSE otherwise.

The Mobile-Station-Not-Reachable-Reason (MNRR) within the HLR stores the reason for the MS being absent when an attempt to deliver a short message to an MS fails at the MSC, SGSN or both with the cause Absent Subscriber. The HLR updates the MNRR with the reason for absence when an absent subscriber diagnostic information is received from the GMSC and the MNRF, MNRG or both are set. The HLR clears the MNRR when the MNRF and MNRG are cleared. If the MNRF is set due to a failure at the MSC with cause Absent Subscriber and information pertaining to the absence of the MS is not available from the GMSC, the MNRR ~~will~~shall remain in a cleared state. Also, if the MNRG is set due to a failure at the SGSN with cause Absent Subscriber and information pertaining to the absence of the MS is not available from the GMSC, the MNRR ~~will~~shall remain in a cleared state. The MNRR shall either be in a cleared state or contain one of the following reasons:

No Paging Response via the MSC;

No Paging Response via the SGSN;

IMSI Detached;

GPRS Detached.

NOTE 1: The MNRG can also be set in the HLR and in the SGSN after an unsuccessful attempt to invoke the network requested PDP-Context Activation procedure. In this case, no SC address is stored in MWD list (see ~~TS GSM 03.60~~3G TS 23.060 [27]).

NOTE 2: When a short message delivery attempt fails at the HLR due to Roaming being Restricted, the MS being deregistered in HLR or the MS being Purged the absent subscriber diagnostic reason is returned to the SC, however the reason is not stored in the MNRR.

The MWD, MCEF, MNRR, MNRG and MNRF are updated in the following way:

1a) When a mobile terminated short message delivery fails due to the MS being temporarily absent (i.e. either IMSI DETACH flag is set or there is no response from the MS to a paging request via the MSC), the SC address is inserted into the MWD list (if it is not already present), the MNRF is set (if it is not already set) and the MNRR via the MSC is updated (if the information is available), as described in clause 10.

1b) When a mobile terminated short message delivery fails due to the MS being temporarily absent (i.e. either GPRS DETACH flag is set or there is no response from the MS to a paging request via the SGSN), the SC address is inserted into the MWD list (if it is not already present), the MNRG is set (if it is not already set) and the MNRR via the SGSN is updated (if the information is available), as described in clause 10.

1c) When a mobile terminated short message delivery fails due to the MS memory capacity via the MSC being exceeded, the SC address is inserted into the MWD list (if it is not already present) ,the MCEF is set (if it is not already set), the MNRF is cleared and the MNRR via the MSC is updated as described in clause 10.

1d) When a mobile terminated short message delivery fails due to the MS memory capacity via the SGSN being exceeded, the SC address is inserted into the MWD list (if it is not already present), the MCEF is set (if it is not already set), the MNRG is cleared and the MNRR via the SGSN is updated as described in clause 10.

1e) If the MSIsdn used by the SC to address the recipient MS for alerting purposes is different from the MSIsdn-Alert of the MS (see subclause 3.2.7), the HLR returns the MSIsdn-Alert to the SC within the failure report, see "1c Failure report" in figures ~~03.40/~~15 and ~~/~~16.

2a) When either the HLR or VLR detects that the MS (with a non-empty MWD and the MCEF clear in the HLR and the MNRF set in the VLR) has recovered operation (e.g. has responded to a paging request over MSC), the HLR directly or on request of the VLR ~~will~~shall invoke operations to alert the SCs within the MWD (see subclause 3.2.7 and clause 10). Once the Alert SC operations have been invoked, the MNRF and MNRR via the MSC are cleared. After each SC is alerted by the HLR, the address for that SC is deleted from the MWD. If the MCEF is set in the HLR, the HLR clears the MNRF and MNRR via the MSC, but does not invoke operations to alert the SCs within the MWD and data are not cleared from the MWD.

2b) When either the HLR or SGSN detects that the MS (with a non-empty MWD and the MCEF clear in the HLR and the MNRG set in the SGSN) has recovered operation (e.g. has responded to a paging request via the SGSN), the HLR directly or on request of the SGSN ~~will~~shall invoke operations to alert the SCs within the MWD (see subclause 3.2.7 and clause 10). Once the Alert SC operations have been invoked, the MNRG and MNRR via the SGSN are cleared. After each SC is alerted by the HLR, the address for that SC is deleted from the MWD. If the MCEF is set in the HLR, the HLR clears the MNRG and MNRR via the SGSN, but does not invoke operations to alert the SCs within the MWD and data are not cleared from the MWD.

2c) When the HLR receives (via the MSC and the VLR) a notification that the MS (with a non-empty MWD and the MCEF set in the HLR) has memory capacity available to receive one or more short messages, the HLR ~~will~~shall invoke operations to alert the SCs within the MWD (see subclause 3.2.7 and clause 10). Once the Alert SC operations have been invoked, the MNRF is cleared in the VLR and the MCEF, MNRF and MNRR via the MSC are cleared in the HLR. After each SC is alerted by the HLR, the address for that SC is deleted from the MWD.

2d) When the HLR receives (via the SGSN) a notification that the MS (with a non-empty MWD and the MCEF set in the HLR) has memory capacity available to receive one or more short messages, the HLR ~~will~~shall invoke operations to alert the SCs within the MWD (see subclause 3.2.7 and clause 10). Once the Alert SC operations have been invoked, the MNRG is cleared in the SGSN and the MCEF, MNRG and MNRR via the SGSN are cleared in the HLR. After each SC is alerted by the HLR, the address for that SC is deleted from the MWD.

2e) When the HLR receives from the SMS-GMSC a notification that a short message has been successfully delivered from an SC to an MS via the MSC for which the MCEF is set and the MWD are not empty, the HLR ~~will~~shall invoke operations to alert other SCs within the MWD (see subclause 3.2.7 and clause 10). Once the Alert SC operations have been invoked, the MCEF, MNRF and MNRR via the MSC are cleared in the HLR. After each SC is alerted by the HLR, the address for that SC is deleted from the MWD. The SC which successfully delivered the message is also deleted from the MWD, if present.

2f) When the HLR receives from the SMS-GMSC a notification that a short message has been successfully delivered from an SC to an MS via the SGSN for which the MCEF is set and the MWD are not empty, the HLR ~~will~~shall invoke operations to alert other SCs within the MWD (see subclause 3.2.7 and clause 10). Once the Alert SC operations have been invoked, the MCEF, MNRG and MNRR via the SGSN are cleared in the HLR. After each SC is alerted by the HLR, the address for that SC is deleted from the MWD. The SC which successfully delivered the message is also deleted from the MWD, if present.

2g) When the HLR receives (via the MSC and the VLR, or the SGSN) a notification that the MS has memory capacity available to receive one or more short messages but the MCEF is not set and the MWD are empty, the HLR acknowledges the notification but does not alert any service centre.

NOTE 1: The HLR can be in a situation where the MWD list is empty but where either MNRF or MNRG (with the related MNRR) is still set. This enables the HLR to return the correct address (MSC or SGSN address) at the next Send Routing Information Request from the SMS-GMSC.

NOTE 2: If the SMS delivery failed on first attempt via the MSC or the SGSN (see cases 1a for IMSI Detach and 1b for GPRS Detach), and is successful on the second attempt (see cases 2e and 2f), the SC address shall not be inserted into the MWD list

3.2.7 Alert-SC

The Alert-SC is the service element, which may be provided by some ~~GSM~~GSM/UMTS PLMNs, to inform the SC that an MS

1) to which a delivery attempt has failed because the MS is not reachable or because the MS memory capacity was exceeded;

and

2) which is now recognized by the PLMN:

   a) to have resumed operation (e.g. to have responded to a paging request); or

   b) to have memory newly available (which implies that the mobile is reachable).

is again ready to receive one or more short messages. The SC may - on reception of an Alert-SC - initiate the delivery attempt procedure for the queued messages destined for this MS.

To each MS there may be allocated several MSIsdns. When the HLR is to alert an SC that an MS is again attainable it ~~will~~shall use a specific MSIsdn value for this purpose; in this specification called MSIsdn-Alert.

NOTE: Repeated delivery attempts from the SC may be of two types:

i) A repeated delivery attempt because the SC has been informed that the MS is active and available to receive short messages.

ii) An autonomous repeated delivery attempt by the SC.

The application of these two options is defined by the providers of the SC and the network.

3.2.8 Options concerning MNRG, MNRF, MNRR, MCEF and MWD

Setting the Mobile-Station-Not-Reachable-Flag (MNRF) in the VLR is mandatory. Setting the Mobile-station-Not-Reachable-for-GPRS (MNRG) in the SGSN is mandatory. It is mandatory for the VLR or the SGSN to send the "MS Reachable" message (see clause 10) to the HLR when the MS has been detected as becoming active and then to clear MNRF in the VLR or the MNRG in SGSN.

The Messages-Waiting-Data (MWD), the Mobile-Station-Not-Reachable-Flag (MNRF), the Mobile-station-Not-Reachable-for-GPRS (MNRG), the Mobile-Station-Not-Reachable-Reason (MNRR) and the Mobile-Station-Memory-Capacity-Exceeded-Flag (MCEF)) within the HLR are optional, but if one is implemented all must be implemented (except MNRG if the HLR does not support GPRS). This is linked to the transmission of the "Alert SC" message.

The following describes what happens when a delivery fails.

Case 1: MWD, MNRF, MNRG, MNRR and MCEF are implemented in the HLR

In the case of a delivery failure (to an MS) with cause Absent Subscriber, the SMS-GMSC requests the HLR to add, if needed, a new entry in the MWD with cause Absent Subscriber. This new entry contains the SC address. The HLR sets its copy of the MNRF, MNRG or both and updates the MNRR (if the information is available). The SC is notified of the failure, the reason for the MS being absent and also of the MWD setting in the HLR within the Report message (see clause 10).

In the case of a delivery failure (to an MS) with cause Mobile Station Memory Capacity Exceeded via the SGSN or the MSC, the SMS-GMSC requests the HLR to add, if needed, a new entry in the MWD with cause Mobile Station Memory Capacity Exceeded. This new entry contains the SC address. The HLR sets the MCEF and reset MNRF or MNRG. The SC is notified of the failure and also of the MWD setting in the HLR within the Report message (see clause 10).

If the HLR indicates that it is able to store the SC address, then the SC ~~will~~shall receive an Alert SC message when the MS becomes active.

If the HLR indicates that it is unable to store the SC address (e.g. because MWD is full), then the only way to ensure delivery is for the SC to try to retransmit the message periodically.

When the HLR receives the MS Reachable message, if the MCEF is clear it sends an Alert SC message to the concerned SC, updates MWD and clears MNRF (if the MS is reachable via the MSC) or MNRG (if the MS is reachable via the SGSN).

When the HLR receives the MS Memory Capacity Available message, it sends an Alert SC message to the concerned SC, updates MWD, clears the MCEF and clears MNRF (if the MS is reachable via the MSC) or MNRG (if the MS is reachable via the SGSN).

Case 2: MWD, MNRF, MNRG, MNRR and MCEF are not implemented in the HLR

In the case of a delivery failure, the SC is notified that the HLR is unable to store its address in the MWD. In case of a delivery failure (to a MS) with cause Absent Subscriber, the SC is notified of the reason for the MS being absent (if the information is available). The SC must retransmit the short message periodically in order to ensure delivery.

The HLR discards the MS Reachable message received from the VLR or SGSN without any failure or error report.

The HLR discards the MS Memory Capacity Available message received from the MS via the MSC and the VLR or SGSN without any failure or error report.

3.2.9 Status report capabilities

The SMS also offers to the SC the capabilities of informing the MS of the status of a previously sent mobile originated short message. The status of the message can be:

- Successfully delivered to the SME;
- The SC was not able to forward the message to the SME. The reason can be an error of permanent or temporary nature. Permanent errors can be e.g. validity period expired, invalid SME address. Errors of temporary nature can be e.g. SC-SME connection being down, SME temporarily unavailable.

This is achieved by the SC returning a status report TPDU (SMS-STATUS-REPORT) to the originating MS when the SC has concluded the status of the short message. The status report may be initiated by a status report request within the mobile originated short message. The status report TPDU is treated as an SMS-DELIVER TPDU by the SC when it comes to delivery procedures e.g. the alerting mechanism.

The SC may also return to a non-MS SME the status of a mobile terminated short message. This is however outside the scope of this specification.

The status report capabilities of the SMS are optional, i.e. the choice of whether to offer status report or not is left to the SC operator.

For reasons of resilience and/or load sharing architecture of SMSC's by network operators, the SMSC address (the RP-OA) used by the SMSC to send the Status Report to the MS cannot be guaranteed to be the same SMSC address (RP-DA) used by the MS to submit the SM to which the Status Report refers. Where an MS wishes to implement a check that these addresses correlate, a means of disabling the correlation check shall be provided at the MS through MMI.

3.2.10 Reply Path

Reply Path specified in this specification provides a way of both requesting and indicating a service centre's commitment to deliver a reply from the replying MS to the originating SME.

Annex D deals with MS procedures, which in general are outside the scope of ~~GSM~~GSM/UMTS specifications. However, for advanced use of the SMS, including both application level protocols and human responses, it is of vital importance to guarantee that a reply-supporting MS is able to reply on every SM, to every SME capable of receiving such reply short messages.

3.3 Unsuccessful short message TPDU transfer SC -> MS

Unsuccessful message transfer SC -> MS may be caused by a variety of different errors. The description of the occurrence of the different errors and how to handle and transfer the error indications is given in GSM 04.08 [12], ~~GSM 04.11~~3G TS 24.011 [13] and ~~GSM 09.02~~3G TS 29.002 [15].

The different error indications which the SMS-GMSC shall be capable of returning to the SC following an unsuccessful short message TPDU transfer SC -> MS, are given in table ~~03.40/~~1. In some cases, additional diagnostic information may be provided.

3.3.1 Errors occurring during transfer of TPDU to MS

These errors are generally due to barring or unsupported service in the PLMN or MS. An error indication is returned to the SC from the SMS-GMSC, but further diagnostic information from the MS ~~will~~shall not be available.

3.3.2 Errors occurring after TPDU arrives at MS

These errors may occur due to the MS not supporting optional short message service features, or in connection with a short message application. An error indication shall be returned to the SC from the SMS-GMSC. Additionally, a TPDU (SMS-DELIVER-REPORT) containing diagnostic information may be conveyed from the MS to the originating SC, transparently through the PLMN, by means defined in ~~GSM 04.11~~3G TS 24.011 [13] and ~~GSM 09.02~~3G TS 29.002 [15]. The sending of the diagnostic information is optional at the MS, but when it is sent, the PLMN shall convey the information to the SC, and the SC shall support reception of the information.

Table ~~03.40/~~1: Error indications related to mobile terminated short message transfer which may be transferred to the originating SC.

Error indication	S[1)]	Meaning
Unknown subscriber	P	The PLMN rejects the short message TPDU because there is not allocated an IMSI or a directory number for the mobile subscriber in the HLR (see ~~GSM 09.02~~3G TS 29.002 [15]).
Teleservice not provisioned	P	The PLMN rejects the short message TPDU because the recipient MS has no SMS subscription (see ~~GSM 09.02~~3G TS 29.002 [15]).
Call barred	T	The PLMN rejects the short message TPDU due to barring of the MS (see ~~GSM 09.02~~3G TS 29.002 [15], description of the Barring supplementary service, 3G~~GSM~~ TS 2~~0~~2.004 [3] and 3G~~GSM~~ TS 2~~0~~3.011[7]), description of Call barred due to Unauthorised Message Originator, ~~GSM 09.02~~3G TS 29.002 [15], and description of Operator Determined Barring, ~~GSM~~ 3G TS 2~~0~~2.041 [4] and ~~GSM~~3G TS ~~0~~23.015 [8]).
Facility not supported	T	The VPLMN rejects the short message TPDU due to no provision of the SMS in the VPLMN (see ~~GSM 09.02~~3G TS 29.002 [15]).
Absent subscriber	T	The PLMN rejects the short message TPDU because - there was no paging response via the SGSN, MSC or both~~,~~ (see GSM 04.08 [12] & ~~GMS~~3G TS ~~09.02~~29.002 [15]) - the IMSI GPRS or both records are marked detached (see ~~GSM 09.02~~3G TS 29.002 [15]), - the MS is subject to roaming restrictions (see "Roaming not allowed", ~~GSM 09.02~~3G TS 29.002 [15]). - deregistered in the HLR. The HLR does not have an MSC, SGSN or both numbers stored for the target MS, (see ~~GSM 09.02~~3G TS 29.002 [15]) - Unidentified subscriber (see ~~GSM 09.02~~3G TS 29.002 [15]) - MS purged, (see ~~GMS~~3G TS ~~09.02~~29.002 [15]) (The reasons for absence are assigned integer values in table ~~03.40/~~1a. The appropriate integer value is sent with the absent subscriber error indication as defined in ~~GSM 09.02~~3G TS 29.002 [15])
MS busy for MT SMS	T	The PLMN rejects the short message TPDU because of congestion encountered at the visited MSC or the SGSN. Possible reasons include any of the following events in progress: - short message delivery from another SC; - IMSI or GPRS detach - Location Update or Inter SGSN Routing Area Update; - paging; - emergency call; - call setup.
SMS lower layers capabilities not provisioned	T	The PLMN rejects the short message TPDU due to MS not being able to support the Short Message Service. The short message transfer attempt is rejected either due to information contained in the class-mark, or the MSC not being able to establish connection at SAPI = 3 (see GSM 04.08 [12] and ~~GSM 09.02~~3G TS 29.002 [15]).
Error in MS	T	The PLMN rejects the short message TPDU due to an error occurring within the MS at reception of a short message, e.g. lack of free memory capacity or protocol error.
Illegal Subscriber	P	The PLMN rejects the short message TPDU because the MS failed authentication
Illegal Equipment	P	The PLMN rejects the short message TPDU because the IMEI of the MS was black-listed in the EIR
System failure	T	The PLMN rejects the short message TPDU due to network or protocol failure others than those listed above (see ~~GSM 09.02~~3G TS 29.002 [15])
Memory Capacity Exceeded	T	The MS rejects the short message since it has no memory capacity available to store the message

1) : Status (Permanent or Temporary)

The relation between the two sets of error indications is given in the table ~~03.40/~~1. Each error is classified as either "Temporary" or "Permanent". This classification gives an indication of whether or not it is probable that the MS becomes attainable within a reasonable period, and so provides the recommended action to be taken by the SC, i.e. either to store the message for later transfer, or to discard it.

Table ~~03.40/~~1a: Assignment of values to reasons for absence (values must be in the range of 0 to 255, see ~~GSM 09.02~~3G TS 29.002 [15])

Values	Reason for absence
0	- no paging response via the MSC
1	- IMSI detached
2	- roaming restriction
3	- deregistered in the HLR for non GPRS
4	- MS purged for non GPRS
5	- no paging response via the SGSN
6	- GPRS detached
7	- deregistered in the HLR for GPRS
8	- MS purged for GPRS
9	- Unidentified subscriber via the MSC
10	- Unidentified subscriber via the SGSN
All ´non GPRS´ reasons (except for roaming restriction) can be combined with all ´GPRS´ reasons and vice-versa	
All other integer values are reserved.	

3.4 Unsuccessful short message TPDU transfer MS -> SC

The error indications related to mobile originated short message transfer which may be transferred to the originating MS are given in ~~GSM 04.11~~3G TS 24.011 [13]. In some cases, additional diagnostic information may be provided.

3.4.1 Errors occurring during transfer of TPDU to SC

These errors are generally due to barring or unsupported service in the PLMN. An error indication is returned to the MS from the MSC or the SGSN, but further diagnostic information from the SC ~~will~~shall not be available.

3.4.2 Errors occurring after TPDU arrives at SC

These errors may occur due to the SC not supporting optional short message service features, or in connection with a short message application. An error indication shall be returned to the MS from the MSC or from the SGSN. Additionally, a TPDU (SMS-SUBMIT-REPORT) containing diagnostic information may be conveyed from the SC to the originating MS, transparently through the PLMN, as defined in ~~GSM 09.02~~3G TS 29.002 [15] and ~~GSM 04.11~~3G TS 24.011 [13]. The sending of the diagnostic information is optional at the SC, but when it is sent, the PLMN shall convey the information to the MS, and the MS shall support reception of the information.

NOTE: The SMS-SUBMIT-REPORT is part of the negative acknowledgement to the mobile originated short message, and is not part of the status report capabilities described in subclause 3.2.9.

3.5 Use of Supplementary Services in combination with the Short Message Service

Only a sub-set of the Supplementary Services defined in ~~GSM~~ 3G TS ~~0~~22.004 [3]and ~~GSM~~3G TS 2~~0~~3.011[7] may be used in combination with the Short Message Service. This sub-set comprises the following Supplementary Services:

All the 5 Barring services

3.6 Applicability of Operator Determined Barring to the Short Message Service

The network feature Operator Determined Barring (see ~~GSM~~ 3G TS 2~~0~~2.041 [4]) applies to the Short Message Service.

If a short message fails due to operator determined barring then an appropriate error cause is returned to the originator.

3.7 Multiple short message transfer

To avoid the need for a mobile to be paged, authenticated etc. for each message waiting in the Service Centre, the SC may indicate to the SMS-GMSC that there are more messages to send. When this indication is given, MAP procedures are invoked such that this indication is passed to the VMSC, and the VMSC does not release the MS until all short messages waiting in the SC have been transferred.

3.8 SMS and Internet Electronic Mail interworking

The interworking between Internet electronic mail and SMS is offered in both directions which enables new and old mobiles to send/receive Internet electronic mails via SMS. The interworking is according to the following procedures:

- An SMS message which is required to interwork with Internet email may have its TP-PID value set for Internet electronic mail;
- Either single or concatenated SMS can be used to transport the email;
- Concatenation may be achieved by the TPUDH mechanism or text-based means described below;
- Email cc fields are not supported;
- Where multiple fields are present, additional spaces may be inserted by the sender to improve presentation of the message. Spaces may not be inserted into the actual email address (e.g. user@domain1.domain2).

3.8.1 Basic Format

The basic format for transferring email in either direction consists of the following:

MT SMS:

[<from-address><space>]<message>

MO SMS:

[<to-address><space>]<message>

where [] denote optional fields and <> delimit fields.

The to-address or from address may take the form

user@domain1.domain2

or

User Name <user@domain1.domain2>

In the latter case the angle brackets <> are part of the address and are actually transmitted.

Depending on the nature of the gateway, the destination/origination address is either derived from the content of the SMS TP-OA or TP-DA field, or the TP-OA/TP-DA field contains a generic gateway address and the to/from address is added at the beginning as shown above.

Multiple addresses may be identified in MO messages by separating each address by a comma like this:

address1,address2,address3<space><message>

It is optional for the receiving gateway to support this. If the receiving gateway does not support multiple messages then it shall reject the original message by returning an appropriate error in a text message.

3.8.2 Optional Fields

The following further optional fields are supported. An email <-> SMS gateway may insert additional spaces in the MT message for presentation to the user, and must accept additional spaces in the MO message from the user.

3.8.2.1 Subject

The subject is placed between the address and the message, delimited by round brackets () or preceded by ##, for example:

[<to-address>](<subject>)<message>

or

[<to-address>]##<subject>#<message>

An MO message may contain either format. An MT message may contain either format. Developers must ensure that both forms are supported for full compatibility.

3.8.2.2 Real Name

The Real Name field contains the real name of the sender and is used only in MO messages. The SC or email gateway ~~will~~shall generate an email message according to standard email procedures containing Real Name <user@domain1.domain2> (the angle brackets being part of the address and hence transmitted). If a subject is to be included with the Real Name then only the ## prefix is used.

The syntax is:

[<to-address>]#<real-name>[##<subject>]#<message>

3.8.2.3 Optional Control Flag

An optional control flag may be added to the start of the message in MO messages only. This consists of a single character <CF> following a # symbol as follows:

[#<CF>#][<to-address>]<space><message>

This may also be used in combination with the above fields. It is intended for use where a particular SC or email gateway specific function is required to be invoked. For example, the control flag #A# might add a particular (pre-stored) signature to the end of the message or #R# might change the from-address to a pre-stored value or #5# might add the text "Please phone me at the office". All of these functions are open for definition by Service Centre or email gateway operators.

3.8.3 Text concatenation

If the ~~GSM binary~~ concatenation ~~protocol~~ mechanism described in 9.2.3.24.1 is not supported by the transmitting or receiving entity, the following textual concatenation mechanism may be used. The first message is ended with a + sign, and each subsequent message start and end with + signs until the final message which starts with a + sign but does not end with a + sign.

<message1>+

+<message2>+

+<message3>

Any header fields placed on the front of an MO or MT message are not added to the second and subsequent messages.

This provides a simple mechanism which is completely backward compatible. There is no indication of the number of messages and should a message be lost by the system or arrive out of sequence then the original message cannot be reconstructed. Therefore, wherever possible the ~~GSM binary~~ concatenation mechanism specified in ~~subclause~~ 9.2.3.24.1 should be used instead.

3.8.4 Alternative characters for Internet email addresses in MO SMS.

It is difficult or impossible to generate some characters on a mobile phone and so the following alternatives may be used:

@ may be replaced by *

_ (underscore) may be replaced by $

3.9 SMS COMPRESSION

Short Messages may be compressed in accordance with the compression algorithm described in ~~GSM 03.42~~3G TS 23.042 [26].

Compression and Decompression may take place between SME's or between an SME and the SC.

The compression only applies to the TP-User-Data part of the TPDU and excludes any TP-User-Data-Header which may be present. The Compression Header (see ~~GSM 03.42~~3G TS 23.042 [26]) must commence at the first octet of the TP-User-Data field immediately following any TP-User-Data-Header field which may be present.

The TP-UDL value must be set in accordance with that value defined for the compressed TP-User-Data case in subclause 9.2.3.16.

The TP-DCS parameter indicates whether or not a short message is compressed. If the TP-DCS parameter indicates that the short message is compressed then the alphabet encoding values (bits 2 and 3 in ~~GSM 03.38~~3G TS 23.038 [9]) must be ignored by the receiving entity.

In the case where a short message after compression is greater than 140 octets (including the Compression Header and Footer (see ~~GSM 03.42~~3G TS 23.042 [26]) and any TP-User-Data-Header which may be present) then the sending entity must concatenate the short message in the normal way as described in subclause 9.2.3.24.1 if it wishes to continue to send the short message. Only the first segment of the concatenated short message must contain the Compression Header defined in ~~GSM TS~~3G TS ~~03.42~~23.042 [26]. All segments other than the final segment must be 140 octets in length. Only the final segment contains the Compression Footer (see ~~GSM 03.42~~3G TS 23.042 [26]).

For mobile terminated compressed messages, where the MMI or the Message Class indicated in the TP-DCS requires the message to be stored in the MS then the MS shall store the compressed message as received. In the case where the MS is capable of decompression then the MS may display the decompressed message. Such an MS may optionally store the message in decompressed form subject to the MS being configured to do this via MMI. However, prior to storing the message in decompressed form, the MS may have to create a concatenated SM and carry out component modification on the TP-UDL and TP-DCS values to indicate the correct length values and that the message is no longer compressed. Transfer of messages direct from the radio interface or those stored in the MS to a TE is according to the procedure defined in ~~GSM 07.05~~3G TS 27.005 [14] and is independent of whether the message is compressed or uncompressed.

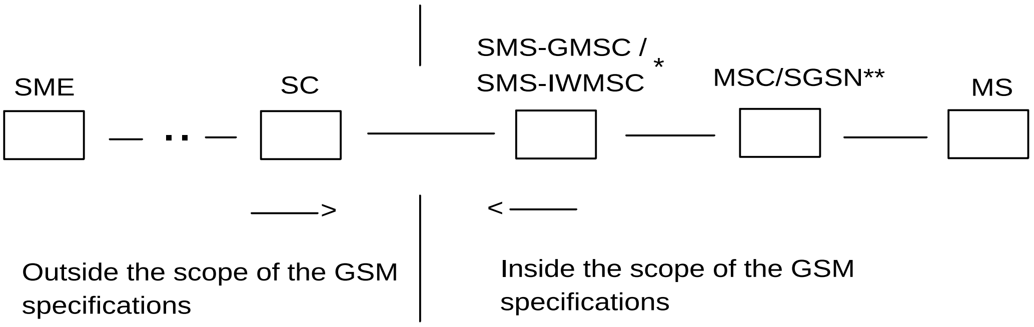
For mobile originated compressed messages, an MS capable of compression may compress a short message generated within the MS itself prior to sending it to the radio interface. An MS capable of compression may optionally compress an uncompressed message received from a TE subject to the MS being configured to do this via MMI. In such a case the MS would have to carry out component modification on the TP-UDL and TP-DCS values to indicate the correct length values and that the message is compressed. A TE may send a message (compressed or uncompressed) to the MS using the procedures defined in ~~GSM 07.05~~3G TS 27.005 [14]. The MS ~~will~~shall store the compressed message as received and/or transfer it directly to the radio interface.

4 Network architecture

4.1 Basic network structure

The exchange of messages between an MS and an SME involves the entities shown in figure ~~03.40/~~4.

The basic network structure of the SMS is depicted in figure ~~03.40/~~5.



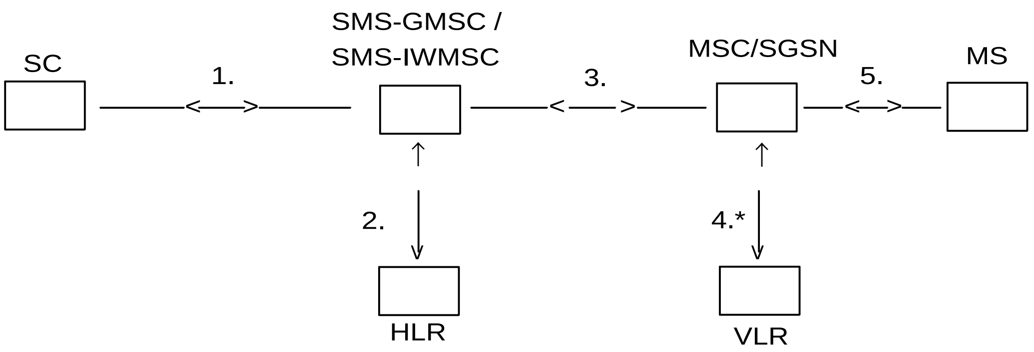
*) : SMS-GMSC when the short message is transferred from the SC to the MS, SMS-IWMSC when the short message is transferred from the MS to the SC. The SC may be integrated with the SMS-GMSC/SMS-IWMSC.

**): SGSN is used in place of the MSC in case of SMS transfer over GPRS

Figure ~~03.40/~~4: Entities involved in the provision of SM MT and SM MO: SC, SMS-GMSC/SMS-IWMSC, SGSN, MSC and MS

The links of figure ~~03.40/~~5 support the short message transfer in the following way:

- message transfer on link 1 is described in clause 5;
- the operations performed on links 2 and 4 is described in ~~GSM 09.02~~3G TS 29.002 [15];
- message transfer on link 3 is described in subclause 4.2;
- message transfer on link 5 is supported by protocol described in ~~GSM 04.11~~3G TS 24.011 [13].



*): This interface is not used in case of SMS transfer via the SGSN

Figure ~~03.40/~~5: The main network structure serving as a basis for the short message transfer

4.2 Transfer on link 3

The link 3 is used to support communications between MSC, SMS-GMSC and SMS-IWMSC, or between SGSN, SMS-GMSC and SMS-IWMSC. Two cases can be distinguished according to whether or not the MSC, SMS-GMSC, SMS-IWMSC and SGSN are located in the same PLMN.

In the first case, the link definition is left to the operators. For example, this link may use:

- PSPDN or
- CCITT SS no 7 (according to ~~GSM 09.02~~3G TS 29.002 [15]).

In the second case, CCITT SS no 7 shall be used over link 3 according to ~~GSM 09.02~~3G TS 29.002 [15], unless otherwise bilaterally agreed.

5 Service Centre and PLMN interconnection

This specification deals with the SC only with regard to the interchange of messages between SC and MS. Only the requirements put upon the SC by the SMS functionality are specified in this specification.

5.1 Service centre connection

One SC may be connected to several PLMNs, and may be connected to several MSCs (SMS-GMSCs or SMS-IWMSCs) within one and the same PLMN.

The SC is addressed from the mobile by an E.164 [17] number in the numbering plan of the PLMN to which the SC is connected. This E.164 [17] number shall uniquely identify the SC to that PLMN.

There may be an intermediate network between the PLMN and the SC; in this case the PLMN must autonomously make a connection to the SC using the SC address in this intermediate network.

No mandatory protocol between the SC and the MSC below the transfer layer is specified by ~~GSM~~GSM/UMTS; this is a matter for agreement between SC and PLMN operators. However, annex A provides an example protocol stack which could be used.

5.2 Routing requirements

5.2.1 Mobile terminated short message

The SC sends the short message to the SMS-GMSC. The SMS-GMSC interrogates the HLR to retrieve routing information necessary to forward the short message, and then sends the message to the relevant MSC or SGSN, transiting other networks if necessary. The MSC or SGSN then sends the short message to the MS.

5.2.2 Mobile originated short message

The MS sends the short message to the MSC or the SGSN. The MS ~~will~~shall always address the required SC by an E.164 [17] address. The visited PLMN ~~will~~shall route the message to the appropriate SMS-IWMSC in the SC's PLMN, transiting other networks if necessary.

6 Service Centre functionality

In this specification, only the SC functionality related to the short message ~~point-to-point~~ service between the SC and the MS is specified.

6.1 Service Centre capabilities

The SC should be capable of

- submitting a short message to an MS, retaining the responsibility of the message until

  1) the report has been received; or

  2) the Validity-Period expires.

- receiving a report from the PLMN;

- receiving a short message from an MS;

- returning a report to the PLMN for a previously received short message.

6.2 SC functional requirements

The detailed functionality of the SC is outside the scope of this specification, and is for the SC operator to define. However, the following functional requirements are mandatory for all SCs in order to support the SM-TP (see clause 9) towards the PLMN:

1) To identify each SMS-DELIVER sent to an MS in a unique way, a time stamp value is included in the field TP-Service-Centre-Time-Stamp, TP-SCTS, of the SMS-DELIVER. The time stamp gives the time when the message arrived at the SC with the accuracy of a second. If two or more messages to the same MS arrive at the SC within one second, the SC shall modify the time stamp of those messages in such a way that

   a) all messages to the MS contain different time stamps;

   b) the modification of the time stamps is kept to a minimum.

2) The SC is only allowed to have one outstanding SMS-DELIVER (i.e. a message for which a report has not been received) to a specific MS at a given time.

3) The SC shall be able to initiate overwriting of short messages previously received by the SC if requested by the same originating address (MS or any other source) by use of the same message type.

7 MS functionality

In this specification, only the MS functionality related to the short message ~~point-to-point~~ service between the SC and the MS is specified.

7.1 MS capabilities

The MS, when equipped for SMS, should be capable of

- submitting a short message TPDU to an SC, retaining the responsibility of the message until:

  1) the report arrives from the network; or

  2) a timer expires.

- receiving a short message TPDU from an SC;

- returning a delivery report to the network for a previously received short message;

- receiving a report from the network;

- notifying the network when it has memory capacity available to receive one or more short messages when it has previously rejected a short message because its memory capacity was exceeded;

- notifying the SC when a short message is intended to replace a short message the MS has previously submitted to the same destination address.

It is recommended that an MS supporting both replying and automatic SC selection (as specified in clause D.2 of annex D) follows procedures specified in annex D when replying to MT short messages with MO short messages.

It is recommended that an MS supporting a capability for requesting a reply path follows procedures specified in annex D.

7.2 MS configuration

The reference configuration is assumed as in figure ~~03.40/~~6, i.e. only the case where the terminal is integrated in the MS is considered.

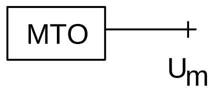


Figure ~~03.40/~~6: Reference configuration of the MS which apply to the SMS

NOTE: It is foreseen that a terminal interface may be offered, e.g. for higher layer protocols, memory capacity reasons or to be able to type in mobile originated messages. This terminal interface is regarded as an implementation option, although, where offered, it must be based upon an R- or S-reference point. ~~GSM 07.05~~3G TS 27.005 [14] provides an example based on the R reference point.

8 Node functionality

The overall requirements to the MSC, SMS-GMSC, SMS-IWMSC and SGSN with respect to handling of the Short Message Service ~~point-to-point~~ is to cater for the routing and necessary intermediate buffering of the short messages.

8.1 Node functionality related to SM MT

8.1.1 Functionality of the SMS-GMSC

When receiving a short message TPDU from the SC, the SMS-GMSC is responsible for the following operations:

- reception of the short message TPDU;
- inspection of the parameters.

NOTE: The SMS-GMSC may be identical to the MSC.

if parameters are incorrect:

- returning the appropriate error information to the SC in a failure report (see clauses 9 and 10);

if errors are not found within parameters:

- interrogating the HLR ("sendRoutingInfoForShortMsg", see clause 10); retrieving routing information or possible error information;

if HLR is returning error information:

- returning the appropriate error information to the SC in a failure report (see clauses 9 and 10);

if no errors are indicated by the HLR:

- transferring the short message TPDU to the MSC or SGSN using the routing information obtained from the HLR ("forwardShortMessage", see clause 10).

NOTE: In case where two addresses (SGSN and MSC) are received from HLR, the SMS-GMSC may choose (operator dependant) via which nodes (SGSN or MSC) the SMS is first to be sent. The SMS delivery via the SGSN is normally more radio resource efficient than the SMS delivery via the MSC.

if one address (SGSN or MSC) is received from HLR:

- When receiving the report associated with the short message from the MSC or SGSN (positive or negative outcome of "forwardShortMessage", see clause 10), the SMS-GMSC is responsible for the following operations:

  if the report indicates successful delivery:

  - notifying the HLR of the successful delivery via the MSC or the SGSN, which ~~will~~shall cause the HLR to alert any service centres whose addresses are stored in the MWD for the MS;

  - creating and sending the successful report to the SC;

  if the report is a failure report indicating "absent subscriber" via the MSC or the SGSN (see subclause 3.3):

  - requesting the HLR to insert the address of the originating SC into the MWD (if implemented) with cause Absent Subscriber ("SM_DeliveryReportStatus", see clauses 9 and 10);

  - informing the HLR of the reason for the MS being absent via the MSC or the SGSN (if this information is available);

  - establishing, where necessary, a link with the addressed SC (see clause 5);

  - creating and sending the negative report to the SC which should include the reason for the MS being absent (if this information is available) so that the SC may adjust any retry algorithm appropriately (see clauses 9 and 10);

  if the report is a failure report indicating "MS memory capacity exceeded" via the MSC or the SGSN (see subclause 3.3):

  - requesting the HLR to insert the address of the originating SC into the MWD (if implemented) with cause MS Memory Capacity Exceeded via the MSC or the SGSN ("SM_DeliveryReportStatus" , see clauses 9 and 10);

  - establishing, where necessary, a link with the addressed SC (see clause 5);

  - creating and sending the report to the SC (see clauses 9 and 10).

if two addresses (SGSN and MSC) are received from HLR:

- When receiving the first report associated with the short message from the MSC or SGSN (positive or negative outcome of "forwardShortMessage", see clause 10), the SMS-GMSC is responsible for the following operations:

  if the first report indicates successful delivery:

  - notifying the HLR of the successful delivery via the MSC or the SGSN, which ~~will~~shall cause the HLR to alert any service centres whose addresses are stored in the MWD for the MS;

  - creating and sending the successful report to the SC;

  if the first report is a failure report indicating

  - Unidentified subscriber

  - Facility not supported

  - Absent subscriber with indication: GPRS or IMSI Detach

  - System failure

  - Unexpected data value

  - Data missing

  - GPRS connection suspended (see TS ~~GSM 09.02~~3G TS 29.002 [15]) :

- transferring the short message TPDU to the second path using the routing information obtained from HLR.

  if the second report indicates successful delivery:

  - notifying the HLR of the successful delivery of the second transfer via the MSC or SGSN, which ~~will~~shall cause the HLR to alert any service centres whose addresses are stored in the MWD for the MS;
  - notifying the HLR of the unsuccessful delivery at first transfer only with cause “absent subscriber”;
  - notifying the HLR of the reason for the MS being absent via the MSC or the SGSN (if this information is available);
  - establishing, when necessary, a link with the addressed SC (see clause 5);
  - creating and sending the successful report to the SC;

  if the second report is a failure report:

  - requesting the HLR to insert the address of the originating SC into the MWD (if implemented) only if at least one of the first or second report failed due to “MS Memory Capacity Exceeded” or “Absent Subscriber” (“SM_DeliveryReportStatus”, see clauses 9 and 10);
  - notifying the HLR only with the causes “Absent Subscriber”, “Memory Capacity Exceeded” via the MSC or the SGSN, or both;
  - notifying the HLR of the reason for the MS being absent via the MSC, SGSN or both (if this information is available);
  - establishing, where necessary, a link with the addressed SC (see clause 5);
  - creating and sending the negative report to the SC with errors from first and second path (see clauses 9 and 10);

8.1.2 Functionality of the MSC

When receiving a short message TPDU from the SMS-GMSC ("forwardShortMessage", see clause 10), the MSC is responsible for the following operations:

- reception of the short message TPDU;
- retrieving information from the VLR ("sendInfoFor-MT-SMS", see clause 10); location area address and, when appropriate, error information;

if errors are indicated by the VLR:

- returning the appropriate error information to the SMS-GMSC in a failure report (negative outcome of "forwardShortMessage" see clauses 10 and 11);

if no errors are indicated by the VLR:

- transferring the short message to the MS (see ~~GSM 04.11~~3G TS 24.011 [13]).

When receiving a confirmation that the message is received by the MS (see ~~GSM 04.11~~3G TS 24.011 [13]):

- relaying the delivery confirmation to the SMS-GMSC in a delivery report (positive outcome of "forwardShortMessage", see clauses 10 and 11).

When receiving a failure report of the short message transfer to the MS (see ~~GSM 04.11~~3G TS 24.011 [13]):

- returning the appropriate error information to the SMS-GMSC in a failure report (negative outcome of "forwardShortMessage", see clause 10).

When receiving a notification from the MS that it has memory available to receive one or more short messages (see ~~GSM 04.11~~3G TS 24.011 [13]):

- relaying the notification to the VLR ("mSMemoryCapacityAvailable", see clause 10);

if errors are indicated by the VLR:

- returning the appropriate error information to the MS in a failure report (negative outcome of "ReadyForSM", see clauses 10 and 11).

When there is an ongoing MT-SMS transfer to the MS (see ~~GSM 04.11~~3G TS 24.011 [13]), or other busy condition for MT-SMS, the MSC has the option to store the TPDU in a queue for a short time (which must be shorter than the supervision timer defined in ~~GSM 09.02~~3G TS 29.002 [15]). The maximum time that a message may be queued is related to the permitted delay for the MSC to respond to the SMS-GMSC. When the MS becomes available for MT-SMS transfer, the stored TPDUs are delivered to the MS on a first-in first-out basis. If a message is not successfully transferred to the MS within the permitted time, the MSC returns an appropriate error to the SMS-GMSC.

8.1.3 Functionality of the SGSN

When receiving a short message TPDU from the SMS-GMSC ("forwardShortMessage", see clause 10), the SGSN is responsible for the following operations:

- reception of the short message TPDU;

if errors are detected by the SGSN:

- returning the appropriate error information to the SMS-GMSC in a failure report (negative outcome of "forwardShortMessage" see clauses 10 and 11);

if no errors are detected by the SGSN:

- transferring the short message to the MS (see ~~GSM 04.11~~3G TS 24.011 [13]).

When receiving a confirmation that the message is received by the MS (see ~~GSM 04.11~~3G TS 24.011 [13]):

- relaying the delivery confirmation to the SMS-GMSC in a delivery report (positive outcome of "forwardShortMessage", see clauses 10 and 11).

When receiving a failure report of the short message transfer to the MS (see ~~GSM 04.11~~3G TS 24.011 [13]):

- returning the appropriate error information to the SMS-GMSC in a failure report (negative outcome of "forwardShortMessage", see clause 10).

When receiving a notification from the MS that it has memory available to receive one or more short messages (see ~~GSM 04.11~~3G TS 24.011 [13]):

if errors are detected by the SGSN:

- returning the appropriate error information to the MS in a failure report (negative outcome of "ReadyForSM", see clauses 10 and 11).

if no errors are detected by the SGSN:

- notifying the HLR of memory available in the MS via the SGSN with "ReadyForSM" (see clauses 10 and 11).

When the MS is becoming reachable again (see GSM 04.08 [12]):

- notifying the HLR of MS being reachable via the SGSN (and via the MSC if any) with "ReadyForSM" (see clauses 10).

When there is an ongoing MT-SMS transfer to the MS (see ~~GSM 04.11~~3G TS 24.011 [13]), or other busy condition for MT-SMS, the SGSN has the option to store the TPDU in a queue for a short time (which must be shorter than the supervision timer defined in ~~GSM 09.02~~3G TS 29.002 [15]). The maximum time that a message may be queued is related to the permitted delay for the SGSN to respond to the SMS-GMSC. When the MS becomes available for MT-SMS transfer, the stored TPDUs are delivered to the MS on a first-in first-out basis. If a message is not successfully transferred to the MS within the permitted time, the SGSN returns an appropriate error to the SMS-GMSC.

8.2 Node functionality related to SM MO

8.2.1 Functionality of the MSC

When receiving a short message TPDU from the MS, the MSC is responsible for the following operations:

- reception of the short message TPDU (see ~~GSM 04.11~~3G TS 24.011 [13]);
- retrieving information from the VLR ("sendInfoForMO-SMS", see clause 10); the MSISDN of the MS and, when appropriate, error information. The retrieval of information from the VLR is followed by the VLR investigating the MNRF (to be used in the alerting procedure, see clause 10)

if errors are indicated by the VLR:

- returning the appropriate error information to the MS in a failure report (negative outcome of "sendInfoForMO-SMS" see clauses 10 and 11);

if no errors are indicated by the VLR:

- inspection of the RP-DA parameter;

if parameters are incorrect:

- returning the appropriate error information to the MS in a failure report (see ~~GSM 04.11~~3G TS 24.011 [13]);

if no parameter errors are found:

NOTE: The SMS-IWMSC may be identical to the MSC.

- transferring the short message TPDU to the SMS-IWMSC ("forwardShortMessage", see clause 10).

When receiving the report of the short message from the SMS-IWMSC (positive or negative outcome of the "forwardShortMessage", see clause 10), the MSC is responsible for the following operations:

- relaying the report to the MS (see ~~GSM 04.11~~3G TS 24.011 [13]).

8.2.2 Functionality of the SMS-IWMSC

When receiving a short message TPDU from the MSC or SGSN ("forwardShortMessage", see clause 10), the SMS-IWMSC is responsible for the following operations:

- reception of the short message TPDU;
- establishing, where necessary, a link with the addressed SC (see clause 5);
- transferring the short message TPDU to the SC (if the address is valid).

If a report associated with the short message is received from the SC, the SMS-IWMSC is responsible for the following operations:

- relaying of the report to the MSC or SGSN (positive or negative outcome of "forwardShortMessage", see clause 10).

If a report associated with the short message is not received from the SC before a timer expires or if the SC address is invalid, the SMS-IWMSC is responsible for the following operations:

- returning the appropriate error information to the MSC or SGSN in a failure report (negative outcome of "forwardShortMessage", see clause 10).

The value of the timer is dependent on the protocol between the SC and the SMS-IWMSC.

8.2.3 Functionality of the SGSN

When receiving a short message TPDU from the MS, the SGSN is responsible for the following operations:

- reception of the short message TPDU (see ~~GSM 04.11~~3G TS 24.011 [13]);
- inspection of the RP-DA parameter;

if parameters are incorrect:

- returning the appropriate error information to the MS in a failure report (see ~~GSM 04.11~~3G TS 24.011 [13]);

if no parameter errors are found:

- transferring the short message TPDU to the SMS-IWMSC ("forwardShortMessage", see clause 10).

When receiving the report of the short message from the SMS-IWMSC (positive or negative outcome of the "forwardShortMessage", see clause 10), the SGSN is responsible for the following operations:

- relaying the report to the MS (see ~~GSM 04.11~~3G TS 24.011 [13]).

8.3 SMS-IWMSC functionality related to alerting

When receiving an alert from the HLR ("alertServiceCentre", see clause 10), the SMS-IWMSC is responsible for the following operations:

- inspect the SC address;
- generate an RP-Alert-SC (see clause 9);
- transferring the RP-Alert-SC to the SC.

NOTE: If the SC address is not valid, then no further action ~~will~~shall be taken.

9 Protocols and protocol architecture

The protocol layers of the SMS are structured as shown in figure ~~03.40/~~7.

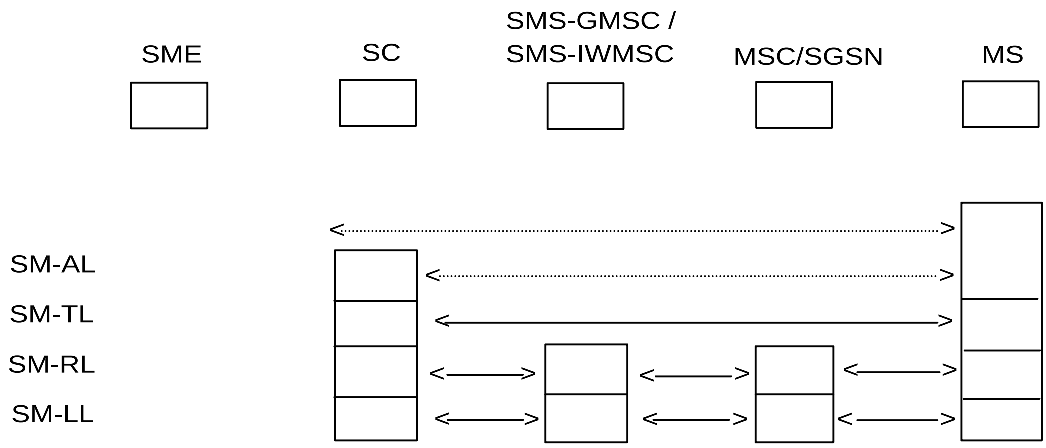


Figure ~~03.40/~~7: Protocol layer overview for the Short Message Service~~, point-to-point~~

This specification specifies the protocol at the SM-TL, the service offered by the SM-TL at the MS and the SC, and the service offered by the SM-RL at the SC.

9.1 Protocol element features

9.1.1 Octet and Bit transmission order

The octets are transmitted according to their individual numbering; the octet with the lowest number being transmitted first. The bits within each octet are transmitted according to their individual numbering also; the bits with the lowest internal number being transmitted first.

9.1.2 Numeric and alphanumeric representation

For parameters within the TPDUs, there are four ways of numeric representation: Integer representation, octet, semi-octet and alphanumeric representation.

9.1.2.1 Integer representation

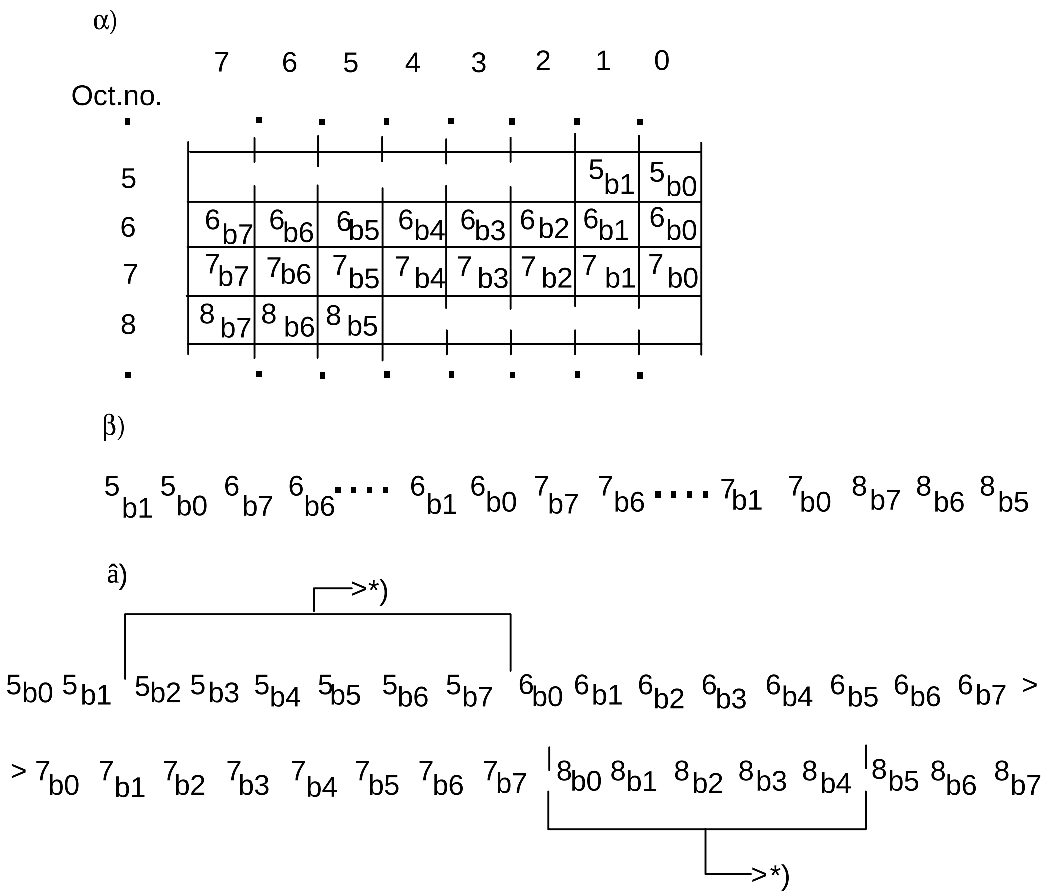
Wherever the bits from a number of octets, complete or in fractions, are to represent an integer, the interpretation ~~will~~shall be according to the following:

1) Between octets: The octets with the lowest octet numbers ~~will~~shall contain the most significant bits.

2) Within an octet: The bits with the highest bit numbers ~~will~~shall be the most significant.

Below is given an example of octet and bit representation and transmission order of an integer represented field.

Let the 2 rightmost bits of octet no 5, the complete octet no 6 and 7, and the 3 leftmost bits of octet no 8 represent an integer, as shown in figure ~~03.40/~~8.



*) : Bits not representing the integer.

Figure ~~03.40/~~8: 21 bits from the octets 5, 6, 7, and 8 in a short message α) ~~will~~shall represent an integer as shown in β), and ~~will~~shall be transmitted in an order as shown in Γ)

9.1.2.2 Octet representation

A field which is octet represented, ~~will~~shall always consist of a number of complete octets. Each octet within the field represents one decimal digit. The octets with the lowest octet numbers ~~will~~shall contain the most significant decimal digits.

9.1.2.3 Semi-octet representation

A field which is semi-octet represented, ~~will~~shall consist of a number of complete octets and - possibly - one half octet. Each half octet within the field represents one decimal digit. The octets with the lowest octet numbers ~~will~~shall contain the most significant decimal digits. Within one octet, the half octet containing the bits with bit numbers 0 to 3, ~~will~~shall represent the most significant digit.

In the case where a semi-octet represented field comprises an odd number of digits, the bits with bit numbers 4 to 7 within the last octet are fill bits and shall always be set to "1111".

If a mobile receives an address field containing non-integer information in the semi-octets other than "1111" (e.g. 1110) it shall display the semi-octet as the representation given in GSM 04.08 [12] under "called BCD number", viz 1010="*", 1011="#", 1100="a", 1101="b", 1110="c". In the event of a discrepancy between the values quoted here and the values specified in GSM 04.08[12] then GSM 04.08 [12] shall take precedence. If a mobile receives "1111" in a position prior to the last semi-octet then processing shall commence with the next semi-octet and the intervening semi-octet ~~will~~shall be ignored.

Within each semi octet, the bits with the highest bit numbers ~~will~~shall be the most significant.

Below is given an example:

Octet no:

n+1	Digit 2	Digit 1
n+2	Digit 4	Digit 3
n+3	1 1 1 1	Digit 5

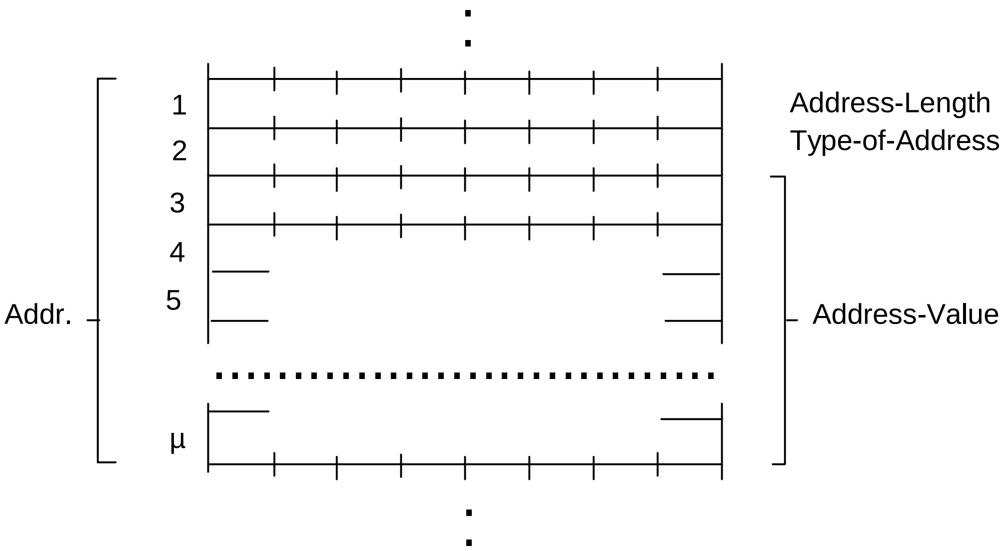
9.1.2.4 Alphanumeric representation

A field which uses alphanumeric representation ~~will~~shall consist of a number of 7-bit characters represented as the default alphabet defined in ~~GSM 03.38~~3G TS 23.038 [9].

9.1.2.5 Address fields

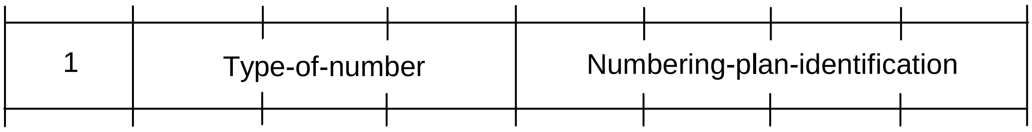
Address fields used by SM-RL are specified in ~~GSM 04.11~~3G TS 24.011 [13] and 3G TS ~~09.02~~29.002 [15].

Each address field of the SM-TL consists of the following sub-fields: An Address-Length field of one octet, a Type-of-Address field of one octet, and one Address-Value field of variable length; as shown below:



The Address-Length field is an integer representation of the number of useful semi-octets within the Address-Value field, i.e. excludes any semi octet containing only fill bits.

The Type-of-Address field format is as follows:



Type-of-number:

Bits 6 5 4

0 0 0 Unknown 1)
0 0 1 International number 2)
0 1 0 National number 3)
0 1 1 Network specific number 4)
1 0 0 Subscriber number 5)
1 0 1 Alphanumeric, (coded according to ~~GSM TS~~3G TS ~~03.38~~23.038 [9] GSM 7-bit default alphabet)
1 1 0 Abbreviated number
1 1 1 Reserved for extension

The MS ~~will~~shall interpret reserved values as "Unknown" but ~~will~~shall store them exactly as received.

The SC may reject messages with a type of number containing a reserved value or one which is not supported.

1) "Unknown" is used when the user or network has no a priori information about the numbering plan. In this case, the Address-Value field is organized according to the network dialling plan, e.g. prefix or escape digits might be present.

2) The international format shall be accepted also when the message is destined to a recipient in the same country as the MSC or as the SGSN.

3) Prefix or escape digits shall not be included.

4) "Network specific number" is used to indicate administration/service number specific to the serving network, e.g. used to access an operator.

5) "Subscriber number" is used when a specific short number representation is stored in one or more SCs as part of a higher layer application. (Note that "Subscriber number" shall only be used in connection with the proper PID referring to this application).

Numbering-plan-identification (applies for Type-of-number = 000,001,010)

Bits 3 2 1 0

0 0 0 0	Unknown
0 0 0 1	ISDN/telephone numbering plan (E.164 [17]/E.163[18])
0 0 1 1	Data numbering plan (X.121)
0 1 0 0	Telex numbering plan
1 0 0 0	National numbering plan
1 0 0 1	Private numbering plan
1 0 1 0	ERMES numbering plan (ETSI DE/PS 3 01-3)
1 1 1 1	Reserved for extension

All other values are reserved.

For Type-of-number = 101 bits 3,2,1,0 are reserved and shall be transmitted as 0000. Note that for addressing any of the entities SC, MSC, SGSN or MS, Numbering-plan-identification = 0001 ~~will~~shall always be used. However, for addressing the SME, any specified Numbering-plan-identification value may be used.

The MS ~~will~~shall interpret reserved values as "Unknown" but ~~will~~shall store them exactly as received.

The SC may reject messages with a type of number containing a reserved value or one which is not supported.

Within the Address-Value field, either a semi-octet or an alphanumeric[1)] representation applies.

The maximum length of the full address field (Address-Length, Type-of-Address and Address-Value) is 12 octets.

1) Applies only to addressing at the SM-TL.

9.2 Service provided by the SM-TL

9.2.1 General

The Short Message Transfer Layer (SM-TL) provides a service to the Short Message Application Layer (SM-AL). This service enables the SM-AL to transfer short messages to its peer entity, receive short messages from its peer entity and receive reports about earlier requests for short messages to be transferred.

In order to keep track of messages and reports about those messages, primitives between the SM-AL and SM-TL contain a Short Message Identifier (SMI), which is a reference number for the message associated with the primitive. This Short Message Identifier is mapped to and from the Short Message Identifier used between the SM-TL and the Short Message Relay Layer (SM-RL). The Short Message Identifier is not carried between entities and therefore a given message may have different SMIs at the MS and SC sides (see subclause 9.3.1 below).

The SM-TL communicates with its peer entity by the protocol described in the following subclauses.

9.2.2 PDU Type repertoire at SM-TL

The SM-TL comprises the following six PDUs:

SMS-DELIVER, conveying a short message from the SC to the MS;

SMS-DELIVER-REPORT, conveying

a) a failure cause (if necessary);

b) information as part of a positive or negative acknowledgement to an SMS-DELIVER or SMS-STATUS-REPORT

SMS-SUBMIT, conveying a short message from the MS to the SC;

SMS-SUBMIT-REPORT, conveying

a) a failure cause (if necessary);

b) information as part of a positive or negative acknowledgement to an SMS-SUBMIT or SMS-COMMAND

SMS-STATUS-REPORT, conveying a status report from the SC to the MS;

SMS-COMMAND, conveying a command from the MS to the SC.

9.2.2.1 SMS-DELIVER type

Basic elements of the SMS-DELIVER type:

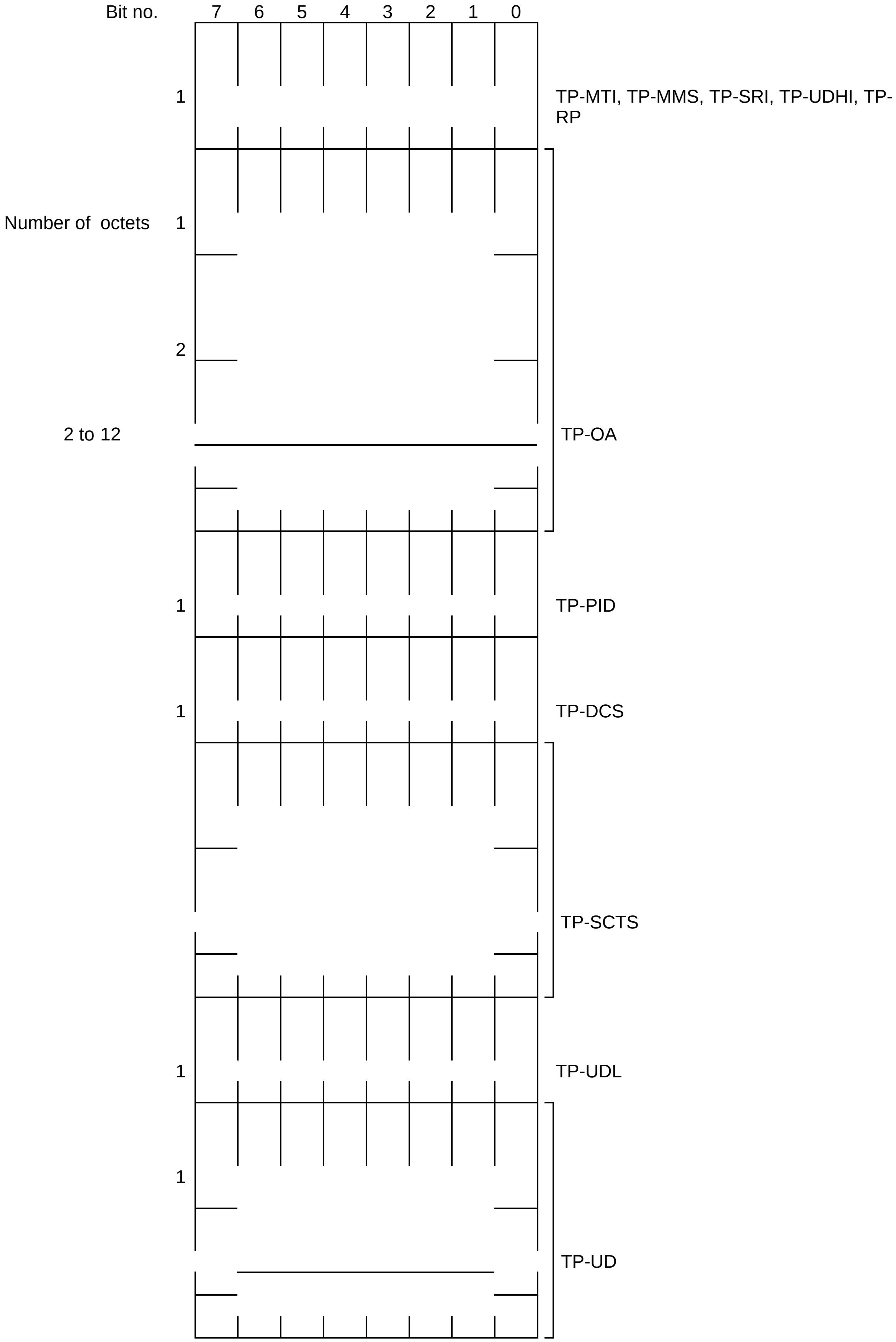
Abbr.	Reference	P[1)]	R[2)]	Description
TP-MTI	TP-Message-Type-Indicator	M	2b	Parameter describing the message type.
TP-MMS	TP-More-Messages-to-Send	M	b	Parameter indicating whether or not there are more messages to send
TP-RP	TP-Reply-Path	M	b	Parameter indicating that Reply Path exists.
TP-UDHI	TP-User-Data-Header-Indicator	O	b	Parameter indicating that the TP-UD field contains a Header
TP-SRI	TP-Status-Report-Indication	O	b	Parameter indicating if the SME has requested a status report.
TP-OA	TP-Originating-Address	M	2-12o	Address of the originating SME.
TP-PID	TP-Protocol-Identifier	M	o	Parameter identifying the above layer protocol, if any.
TP-DCS	TP-Data-Coding-Scheme	M	o	Parameter identifying the coding scheme within the TP-User-Data.
TP-SCTS	TP-Service-Centre-Time-Stamp	M	7o	Parameter identifying time when the SC received the message.
TP-UDL	TP-User-Data-Length	M	I	Parameter indicating the length of the TP-User-Data field to follow.
TP-UD	TP-User-Data	O	3)	

1) Provision; Mandatory (M) or Optional (O).

2) Representation; Integer (I), bit (b), 2 bits (2b), Octet (o), 7 octets (7o), 2-12 octets (2-12o)

3) Dependent on the TP-DCS

Layout of SMS-DELIVER:



NOTE: Any unused bits ~~will~~shall be set to zero by the sending entity and ~~will~~shall be ignored by the receiving entity.

9.2.2.1a SMS-DELIVER-REPORT type

An SMS-DELIVER-REPORT TPDU is carried as a RP-User-Data element within an RP-ERROR PDU and is part of the negative acknowledgement to an SMS-DELIVER or SMS-STATUS-REPORT.

An SMS-DELIVER-REPORT TPDU is also carried as a RP-User-Data element within an RP-ACK PDU and is part of a positive acknowledgement to a SMS-DELIVER or SMS-STATUS REPORT

(i) SMS-DELIVER-REPORT for RP-ERROR

Basic elements of the SMS-DELIVER-REPORT type:

Abbr.	Reference	P1)	P2)	Description
TP-MTI	TP-Message-Type-Indicator	M	2b	Parameter describing the message type
TP-UDHI	TP-User-Data-Header-Indication	O	b	Parameter indicating that the TP-UD field contains a Header
TP-FCS	TP-Failure-Cause	M	I	Parameter indicating the reason for SMS-DELIVER failure
TP-PI	TP-Parameter-Indicator	M	o	Parameter indicating the presence of any of the optional parameters which follow
TP-PID	TP-Protocol-Identifier	O	o	see subclause 9.2.3.9
TP-DCS	TP-Data-Coding-Scheme	O	o	see subclause 9.2.3.10
TP-UDL	TP-User-Data-Length	O	o	see subclause 9.2.3.16
TP-UD	TP-User-Data	O	3) 4)	see subclause 9.2.3.24

1) Provision: Mandatory (M) or Optional (O)

2) Representation: Integer (I), bit (b), 2bits (2b), octet (o)

3) Dependent upon the TP-DCS

4) The TP-User-Data field in the SMS-DELIVER-REPORT is only available for use by the MT.

Layout of SMS-DELIVER-REPORT:

Bit Number

Number of Octets	7	6	5	4	3	2	1	0	
1									TP-MTI, TP-UDHI
1									TP-FCS
1									TP-PI
0,1									TP-PID
0,1									TP-DCS
0,1									TP-UDL
0 to 158									TP-UD

Bits 7 and 5 - 2 in octet 1 are presently unused and the sender shall set them to zero. If any of these bits is non-zero, the receiver shall not examine the other field and shall treat the TP-Failure-Cause as "Unspecified error cause".

(ii) SMS-DELIVER-REPORT for RP-ACK

Basic elements of the SMS-DELIVER-REPORT type:

Abbr	Reference	P1)	P2)	Description
TP-MTI	TP-Message Type Indicator	M	2b	Parameter describing the message type
TP-UDHI	TP-User-Data-Header-Indication	O	b	Parameter indicating that the TP-UD field contains a Header
TP-PI	TP-Parameter-Indicator	M	o	Parameter indicating the presence of any of the optional parameters which follow
TP-PID	TP-Protocol-Identifier	O	o	see subclause 9.2.3.9
TP-DCS	TP-Data-Coding-Scheme	O	o	see subclause 9.2.3.10
TP-UDL	TP-User-Data-Length	O	o	see subclause 9.2.3.16
TP-UD	TP-User-Data	O	3) 4)	see subclause 9.2.3.24

1) Provision: Mandatory (M) or Optional (O)

2) Representation: Integer (I), Bit (b), 2 bits (2b), octet (o)

3) Dependent upon the TP-DCS

4) The TP-User-Data field in the SMS-DELIVER-REPORT is only available for use by the MT.

Layout of SMS-DELIVER-REPORT:

Bit Number

Number of Octets	7	6	5	4	3	2	1	0	
1									TP-MTI, TP-UDHI
1									TP-PI
0,1									TP-PID
0,1									TP-DCS
0,1									TP-UDL
0 to 159									TP-UD

Bits 7 and 5 - 2 in octet 1 ~~the TP-MTI~~ are presently unused in the SMS-DELIVER-REPORT and the sender shall set them to zero,~~.~~ If any of these bits is non-zero, the receiver shall ignore them.

9.2.2.2 SMS-SUBMIT type

Basic elements of the SMS-SUBMIT type:

Abbr.	Reference	P1)	P2)	Description
TP-MTI	TP-Message-Type-Indicator	M	2b	Parameter describing the message type.
TP-RD	TP-Reject-Duplicates	M	b	Parameter indicating whether or not the SC shall accept an SMS-SUBMIT for an SM still

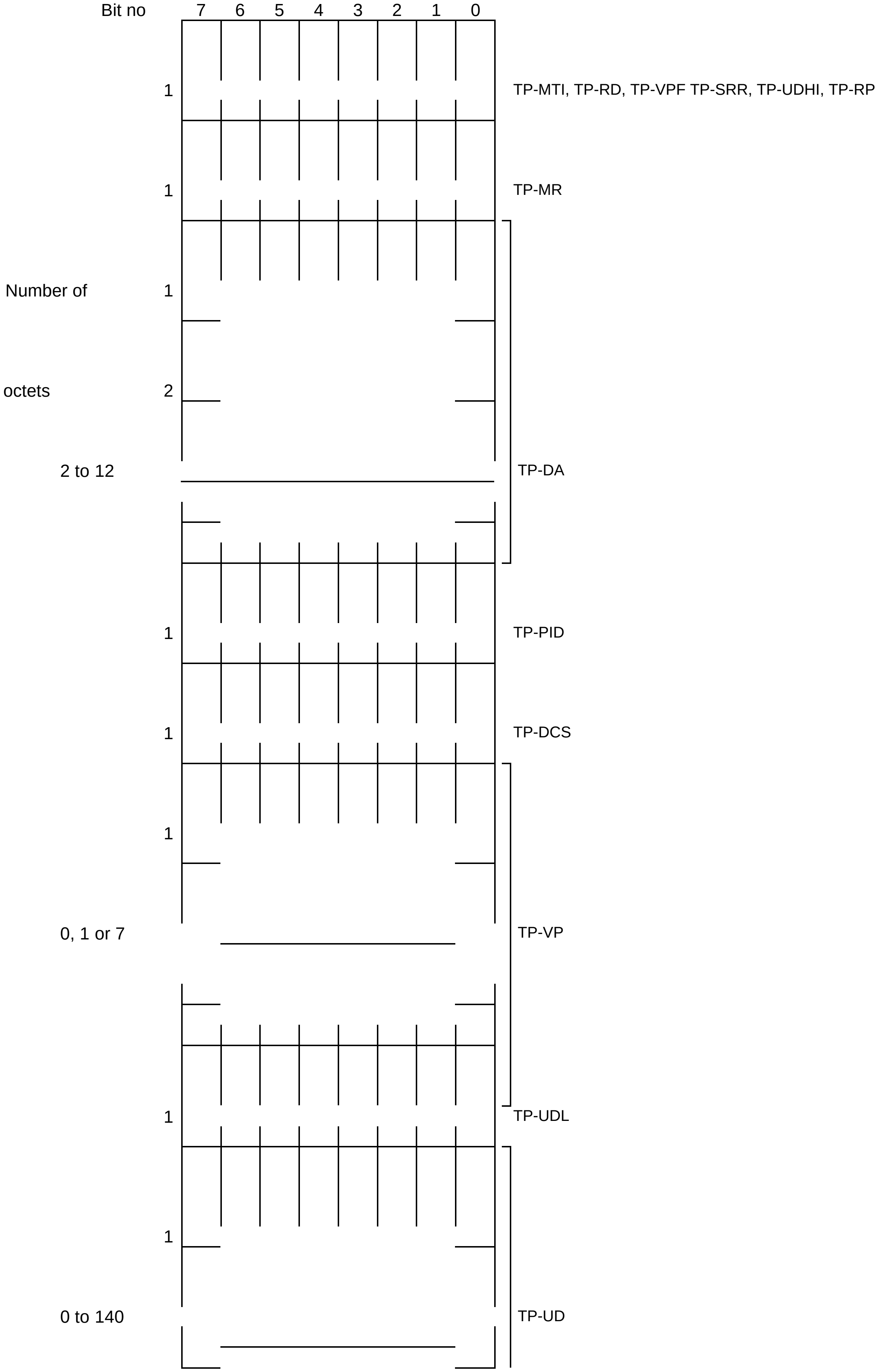
				held in the SC which has the same TP-MR and the same TP-DA as a previously submitted SM from the same OA
TP-VPF	TP-Validity-Period-Format	M	2b	Parameter indicating whether or not the TP-VP field is present.
TP-RP	TP-Reply-Path	M	b	Parameter indicating the request for Reply Path.
TP-UDHI	TP-User-Data-Header-Indicator	O	b	Parameter indicating that the TP-UD field contains a Header.
TP-SRR	TP-Status-Report-Request	O	b	Parameter indicating if the MS is requesting a status report.
TP-MR	TP-Message-Reference	M	I	Parameter identifying the SMS-SUBMIT.
TP-DA	TP-Destination-Address	M	2-12o	Address of the destination SME.
TP-PID	TP-Protocol-Identifier	M	o	Parameter identifying the above layer protocol, if any.
TP-DCS	TP-Data-Coding-Scheme	M	o	Parameter identifying the coding scheme within the TP-User-Data.
TP-VP	TP-Validity-Period	O	o/7o	Parameter identifying the time from where the message is no longer valid.
TP-UDL	TP-User-Data-Length	M	I	Parameter indicating the length of the TP-User-Data field to follow.
TP-UD	TP-User-Data	O	3)	

1) Provision; Mandatory (M) or Optional (O).

2) Representation; Integer (I), bit (b), 2 bits (2b), Octet (o), 7 octets (7o), 2-12 octets (2-12o).

3) Dependent on the TP-DCS

Layout of SMS-SUBMIT:


Bit no
7 6 5 4 3 2 1 0
1
TP-MTI, TP-RD, TP-VPF TP-SRR, TP-UDHI, TP-RP
1
TP-MR
Number of
1
octets
2
2 to 12
TP-DA
1
TP-PID
1
TP-DCS
1
0, 1 or 7
TP-VP
1
TP-UDL
1
0 to 140
TP-UD

NOTE: Any unused bits ~~will~~shall be set to zero by the sending entity and ~~will~~shall be ignored by the receiving entity.

9.2.2.2a SMS-SUBMIT-REPORT type

An SMS-SUBMIT-REPORT TPDU is carried as a RP-User-Data element within an RP-ERROR PDU and is part of the negative acknowledgement to an SMS-SUBMIT or SMS-COMMAND.

An SMS-SUBMIT-REPORT TPDU is also carried as a RP-User-Data element with an RP-ACK PDU and is part of a positive acknowledgement to a SMS-SUBMIT or SMS-COMMAND.

(i~~I~~) SMS-SUBMIT-REPORT for RP-ERROR

Basic elements of the SMS-SUBMIT-REPORT type:

Abbr.	Reference	P1)	P2)	Description
TP-MTI	TP-Message-Type-Indicator	M	2b	Parameter describing the message type
TP-UDHI	TP-User-Data-Header-Indication	O	b	Parameter indicating that the TP-UD field contains a Header
TP-FCS	TP-Failure-Cause	M	I	Parameter indicating the reason for SMS-SUBMIT failure
TP-PI	TP-Parameter-Indicator	M	o	Parameter indicating the presence of any of the optional parameters which follow
TP-SCTS	TP-Service-Centre-Time-Stamp	M	7o 5)	Parameter identifying the time when the SC received the SMS-SU~~I~~BMIT See subclause 9.2.3.11
TP-PID	TP-Protocol-Identifier	O	o	See subclause 9.2.3.9
TP-DCS	TP-Data-Coding-Scheme	O	o	see subclause 9.2.3.10
TP-UDL	TP-User-Data-Length	O	o	see subclause 9.2.3.16
TP-UD	TP-User-Data	O	3) 4)	see subclause 9.2.3.24

1) Provision: Mandatory (M) or Optional (O)

2) Representation: Integer (I), bit (b), 2bits (2b), octet (o)

3) Dependent upon the TP-DCS;

4) The TP-User-Data field in the SMS-SUBMIT-REPORT is only available for use by the SC.;

5) This same time value ~~will~~shall also be carried in the SMS-STATUS-REPORT relating to a particular SM. See subclause 9.2.2.3. This ~~will~~shall allow the submitting SME to associate a particular SMS-SUBMIT with a subsequent SMS-STATUS-REPORT by correlating the TP-SCTS values.

Layout of SMS-SUBMIT-REPORT:

Bit Number

Number of Octets	7	6	5	4	3	2	1	0	
1									TP-MTI, TP-UDHI
1									TP-FCS

1									TP-PI
7									TP-SCTS
0,1									TP-PID
0,1									TP-DCS
0,1									TP-UDL
0 to 151									TP-UD

Bits 7 and 5 - 2 in octet 1 are presently unused and the sender shall set them to zero. If any of these bits is non-zero, the receiver shall not examine the other field and shall treat the TP-Failure-Cause as "Unspecified error cause".

(ii) SMS-SUBMIT-REPORT for RP-ACK

Basic elements of the SMS-SUBMIT_REPORT type:

Abbr	**Reference**	**P1)**	**P2)**	**Description**
TP-MTI	TP-Message Type-Indicator	M	2b	Parameter describing the message type
TP-UDHI	TP-User-Data-Header-Indication	O	b	Parameter indicating that the TP-UD field contains a Header
TP-PI	TP-Parameter-Indicator	M	o	Parameter indicating the presence of any of the optional parameters which follow
TP-SCTS	TP-Service-Centre-Time-Stamp	M	7o 5)	Parameter identifying the time when the SC received the SMS-SU~~I~~BMIT See subclause 9.2.3.11
TP-PID	TP-Protocol-Identifier	O	o	See subclause 9.2.3.9
TP-DCS	TP-Data-Coding-Scheme	O	o	see subclause 9.2.3.10
TP-UDL	TP-User-Data-Length	O	o	see subclause 9.2.3.16
TP-UD	TP-User-Data	O	3) 4)	see subclause 9.2.3.24

1) Provision: Mandatory (M) or Optional (O);

2) Representation: Integer (I), Bit (B), 2bits (2b), octet (o);

3) Dependent upon the TP-DCS;

4) The TP-User-Data field in the SMS-SUBMIT-REPORT is only available for use by the SC.;

5) This same time value ~~will~~shall also be carried in the SMS-STATUS-REPORT relating to a particular SM. See subclause 9.2.2.3. This ~~will~~shall allow the submitting SME to associate a particular SMS-SUBMIT with a subsequent SMS-STATUS-REPORT by correlating the TP-SCTS values.

Layout of SMS-SUBMIT REPORT

Bit Number

Number of Octets	7	6	5	4	3	2	1	0	
1									TP-MTI, TP-UDHI
1									TP-PI

7									TP-SCTS
0,1									TP-PID
0,1									TP-DCS
0,1									TP-UDL
0 to 152									TP-UD

Bits 7 and 5 - 2 in ~~the TP-MTI~~octet 1 are presently unused in the SMS-SUBMIT-REPORT and the sender shall set them to zero. If any of these bits is non-zero, the receiver shall ignore them.

9.2.2.3 SMS-STATUS-REPORT type

Basic elements of the SMS-STATUS-REPORT type:

Abbr.	Reference	P 1)	R 2)	Description
TP-MTI	TP-Message-Type-Indicator	M	2b	Parameter describing the message type
TP-UDHI	TP-User-Data-Header-Indication	O	b	Parameter indicating that the TP-UD field contains a Header
TP-MMS	TP-More-Messages-to-Send	M	b	Parameter indicating whether or not there are more messages to send
TP-SRQ	TP-Status-Report-Qualifier	M	b	Parameter indicating whether the previously submitted TPDU was an SMS~~-~~–SUBMIT or an SMS-COMMAND
TP-MR	TP-Message-Reference 3)	M	I	Parameter identifying the previously submitted SMS-SUBMIT or SMS-COMMAND
TP-RA	TP-Recipient-Address	M	2-12o	Address of the recipient of the previously submitted mobile originated short message
TP-SCTS	TP-Service-Centre-Time-Stamp	M	7o	Parameter identifying time when the SC received the previously sent SMS-SUBMIT
TP-DT	TP-Discharge-Time	M	7o	Parameter identifying the time associated with a particular TP-ST outcome
TP-ST	TP-Status	M	o	Parameter identifying the status of the previously sent mobile originated short message
TP-PI	TP-Parameter-Indicator	O 4)	o	Parameter indicating the presence of any of the optional parameters which follow
TP-PID	TP-Protocol-Identifier	O	o	see subclause 9.2.3.9. TP-PID of original SMS-SUBMIT
TP-DCS	TP-Data-Coding-Scheme	O	o	see subclause 9.2.3.10
TP-UDL	TP-User-Data-Length	O	o	see subclause 9.2.3.16
TP-UD	TP-User-Data	O	5)	see subclause 9.2.3.24

1) Provision: Mandatory (M) or Optional (O).

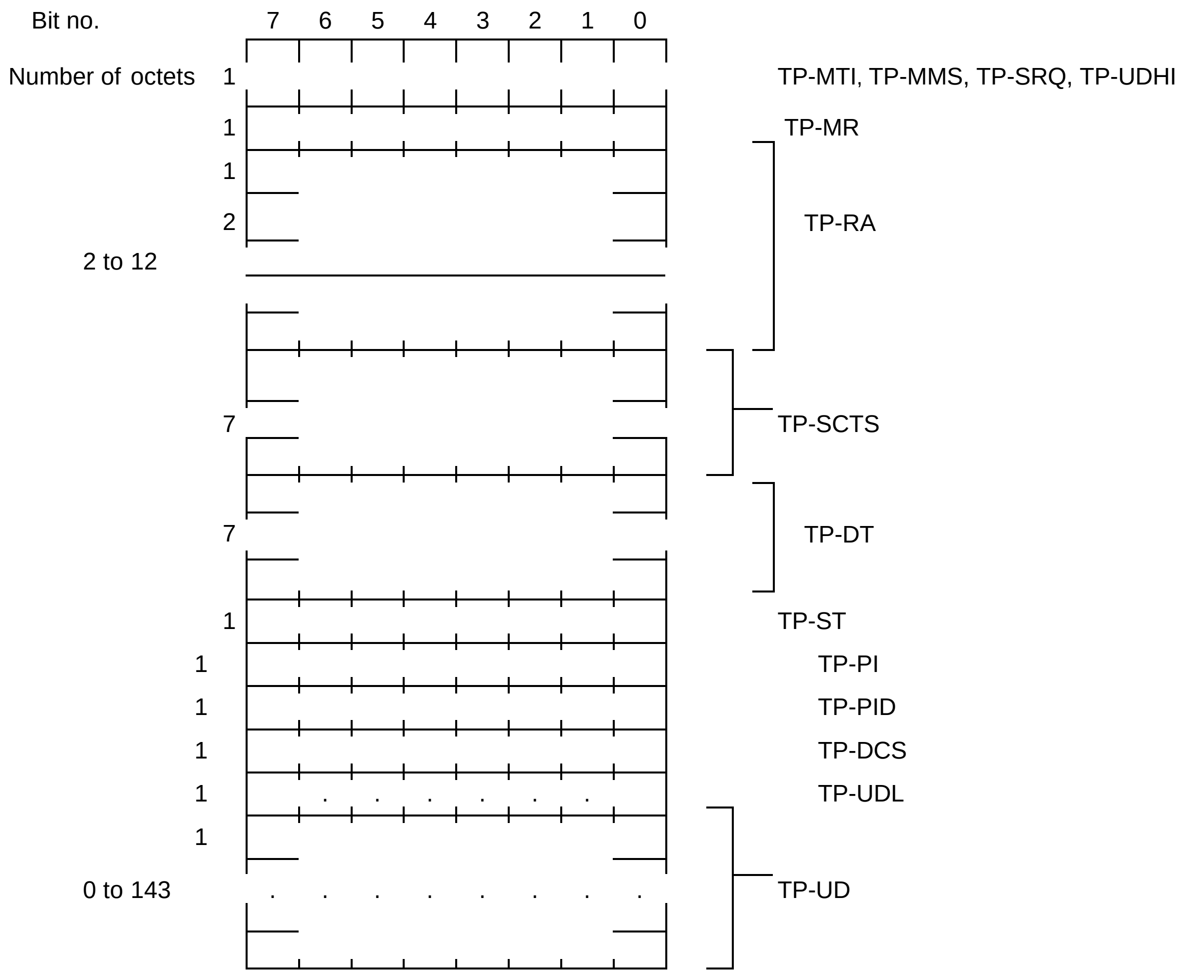
2) Representation: Integer (I), bit (b), 2 bits (2b), Octet (o), 7 octets (7o), 2-12 octets (2-12o)

3) Where the SMS-STATUS-REPORT is the result of an SMS-COMMAND and the TP-Command-Type was an Enquiry, the TP-MR returned in the SMS-STATUS-REPORT shall be the TP-MN which was sent in the SMS-COMMAND (i.e. the TP-MR of the previously submitted SM to which the Enquiry refers).

4) Mandatory if any of the optional parameters following TP-PI is present, otherwise optional.

5) TP-UD contains information related to a SMS-DELIVER; can contain information transported in the TP-UD of SMS-DELIVER-REPORT, and information inserted by the SMSC. The length of the TP-UD field is limited and might not be long enough to fit information both from the original receiving terminal (as included into the SMS-DELIVER-REPORT) and information added by the SMSC. In these cases the former information has higher priority, and the latter ~~will~~shall be truncated.

Layout of SMS-STATUS-REPORT:



NOTE: Any unused bits ~~will~~shall be set to zero by the sending entity and ~~will~~shall be ignored by the receiving entity.

The maximum guaranteed length of TP-UD is 131 octets. In order to achieve the maximum stated above (143 octets), the TP-RA field must have a length of 2 octets and TP-PID and TP-DCS must not be present.

9.2.2.4 SMS-COMMAND type

Basic elements of the SMS-COMMAND type:

Abbr.	Reference	P[1)]	R[2)]	Description
TP-MTI	TP-Message-Type-Indicator	M	2b	Parameter describing the type
TP-UDHI	TP-User-Data-Header-Indication	O	b	Parameter indicating that the TP-CD field contains a Header
TP-SRR	TP-Status-Report- Request	O	b	Parameter indicating if the SMS Command is requesting a status report.
TP-MR	TP-Message Reference	M	I	Parameter identifying the SMS-COMMAND
TP-PID	TP-Protocol- Identifier	M	o	Parameter identifying the above layer protocol, if any
TP-CT	TP-Command-Type	M	o	Parameter specifying which operation is to be performed on a SM
TP-MN	TP-Message-Number	M[3)]	o	Parameter indicating which SM in the SC to operate on
TP-DA	TP-Destination-Address	M[4)]	2-12o	Parameter indicating the Destination Address to which the TP-Command refers
TP-CDL	TP-Command-Data-Length	M	o	Parameter indicating the length of the TP-CD field in octets
TP-CD	TP-Command-Data	O	o	Parameter containing user data

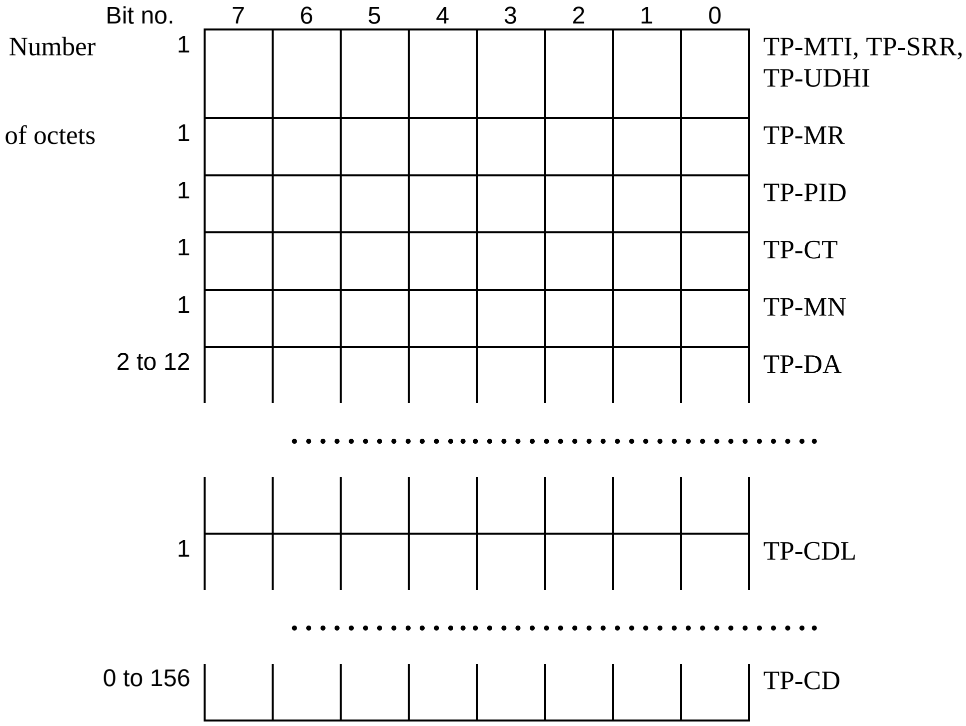
1) Provision: Mandatory (M) or Optional (O).

2) Representation: Integer (I), bit (b), 2bits (2b), octet (o)

3) For TP-Command-Types which are not for a specific SM this field shall be ignored when received. Its value is of no concern but the field must be present to maintain the structure.

4) For certain TP-Command-Types which operate on a specific SM (e.g. Enquire, Delete etc.) the full TP-DA must be specified. For TP-Command-Types which do not operate on a specific SM, the address length must be set to zero indicating that the Address-Value fields are not present. The Type-of-Address field must be present (see 9.1.2.5) and shall be set to zero and ignored.

Layout of SMS-COMMAND:



NOTE: The maximum guaranteed length of TP-CD is 146 octets. In order to achieve the maximum stated above (156 octets), the TP-DA field must have a length of 2 octets.

9.2.3 Definition of the TPDU parameters

9.2.3.1 TP-Message-Type-Indicator (TP-MTI)

The TP-Message-Type-Indicator is a 2-bit field, located within bits no 0 and 1 of the first octet of all PDUs which can be given the following values:

bit1	bit0	Message type
0	0	SMS-DELIVER (in the direction SC to MS)
0	0	SMS-DELIVER REPORT (in the direction MS to SC)
1	0	SMS-STATUS-REPORT (in the direction SC to MS)
1	0	SMS-COMMAND (in the direction MS to SC)
0	1	SMS-SUBMIT (in the direction MS to SC)
0	1	SMS-SUBMIT-REPORT (in the direction SC to MS)
1	1	Reserved

If an MS receives a TPDU with a "Reserved" value in the TP-MTI it shall process the message as if it were an "SMS-DELIVER" but store the message exactly as received.

9.2.3.2 TP-More-Messages-to-Send (TP-MMS)

The TP-More-Messages-to-Send is a 1-bit field, located within bit no 2 of the first octet of SMS-DELIVER and SMS-STATUS-REPORT, and to be given the following values:

Bit no 2: 0 More messages are waiting for the MS in this SC

1 No more messages are waiting for the MS in this SC

NOTE: In the case of SMS-STATUS-REPORT this parameter refers to messages waiting for the mobile to which the status report is sent. The term message in this context refers to SMS-messages or status reports.

9.2.3.3 TP-Validity-Period-Format (TP-VPF)

The TP-Validity-Period-Format is a 2-bit field, located within bit no 3 and 4 of the first octet of SMS-SUBMIT, and to be given the following values:

bit4	bit3	
0	0	TP-VP field not present
1	0	TP-VP field present - relative format
0	1	TP-VP field present - enhanced format
1	1	TP-VP field present - absolute format

Any unsupported value may be rejected by the SC by returning the 'TP-VPF not supported' TP-FCS value in the SMS Submit Report for RP-Error.

9.2.3.4 TP-Status-Report-Indication (TP-SRI)

The TP-Status-Report-Indication is a 1-bit field, located within bit no. 5 of the first octet of SMS-DELIVER, and to be given the following values:

Bit no. 5: 0 A status report ~~will~~shall not be returned to the SME
1 A status report ~~will~~shall be returned to the SME

9.2.3.5 TP-Status-Report-Request (TP-SRR)

The TP-Status-Report-Request is a 1-bit field, located within bit no. 5 of the first octet of SMS-SUBMIT and SMS-COMMAND, and to be given the following values:

Bit no. 5: 0 A status report is not requested
1 A status report is requested

9.2.3.6 TP-Message-Reference (TP-MR)

The TP-Message-Reference field gives an integer representation of a reference number of the SMS-SUBMIT or SMS-COMMAND submitted to the SC by the MS. The MS increments TP-Message-Reference by 1 for each SMS-SUBMIT or SMS-COMMAND being submitted. The value to be used for each SMS-SUBMIT is obtained by reading the Last-Used-TP-MR value from the SMS Status data field in the ~~SIM~~(U)SIM (see GSM TS 11.11 [16] and 3G TS 31.102 [30]) and incrementing this value by 1. After each SMS-SUBMIT has been submitted to the network, the Last-Used-TP-MR value in the ~~SIM~~(U)SIM is updated with the TP-MR that was used in the SMS-SUBMIT operation. The reference number may possess values in the range 0 to 255. The value in the TP-MR assigned by the MS is the same value which is received at the SC.

In the case where no acknowledgement or an appropriate RP-Error is received in response to an SMS-SUBMIT or SMS-COMMAND, then the MS may automatically repeat the SMS-SUBMIT or SMS-COMMAND but must use the same TP-MR value. The number of times the MS may repeat the SMS-SUBMIT or SMS-COMMAND is an implementation matter.

If all automatic attempts fail (including the case where no automatic repeat is provided), the user shall be informed. The failed message shall be stored in the mobile in such a way that the user can request a retransmission using the same TP-MR value, without needing to re-enter any information. Such storage need only be provided for a single failed message, the one most recently attempted.

The SC may discard an SMS-SUBMIT or SMS-COMMAND which has the same TP-MR value as the previous SMS-SUBMIT or SMS-COMMAND received from the same originating address.

~~A Phase 2 or later ME using a Phase 1 SIM cannot read or update the TP-Message-Reference from/to the SIM, and so the ME shall always retain the Last-Used-TP-MR value in its own memory, to be used only in the case of a Phase 1 SIM.~~

The SMS-STATUS-REPORT also contains a TP-Message-Reference field. The value sent to the MS ~~will~~shall be the same as the TP-Message-Reference value generated by the MS in the earlier SMS-SUBMIT or SMS-COMMAND to which the status report relates.

9.2.3.7 TP-Originating-Address (TP-OA)

The TP-Originating-Address field is formatted according to the formatting rules of address fields.

9.2.3.8 TP-Destination-Address (TP-DA)

The TP-Destination-Address field is formatted according to the formatting rules of address fields.

9.2.3.9 TP-Protocol-Identifier (TP-PID)

The TP-Protocol-Identifier parameter serves the purposes indicated in subclause 3.2.3. It consists of one octet, and the bits in the octet are used as follows:

The MS ~~will~~shall interpret reserved or unsupported values as the value 00000000 but shall store them exactly as received.

The SC may reject messages with a TP-Protocol-Identifier containing a reserved value or one which is not supported.

bits	usage
7 6	
0 0	Assigns bits 0..5 as defined below
0 1	Assigns bits 0..5 as defined below
1 0	reserved
1 1	Assigns bits 0-5 for SC specific use

In the case where bit 7 = 0 and bit 6 = 0,

bit 5 indicates telematic interworking:
value = 0 : no interworking, but SME-to-SME protocol
value = 1 : telematic interworking

In the case of telematic interworking, the following five bit patterns in bits 4..0 are used to indicate different types of telematic devices:

4.. .0	
00000	implicit - device type is specific to this SC, or can be concluded on the basis of the address
00001	telex (or teletex reduced to telex format)
00010	group 3 telefax
00011	group 4 telefax
00100	voice telephone (i.e. conversion to speech)
00101	ERMES (European Radio Messaging System)
00110	National Paging system (known to the SC)
00111	Videotex (T.100 [20] /T.101 [21])
01000	teletex, carrier unspecified
01001	teletex, in PSPDN
01010	teletex, in CSPDN
01011	teletex, in analog PSTN
01100	teletex, in digital ISDN
01101	UCI (Universal Computer Interface, ETSI DE/PS 3 01-3)
01110..01111	(reserved, 2 combinations)
10000	a message handling facility (known to the SC)
10001	any public X.400-based message handling system
10010	Internet Electronic Mail
10011..10111	(reserved, 5 combinations)
11000..11110	values specific to each SC, usage based on mutual agreement between the SME and the SC (7 combinations available for each SC)
11111	A ~~GSM~~GSM/UMTS mobile station. The SC converts the SM from the received TP-Data-Coding-Scheme to any data coding scheme supported by that MS (e.g. the default).

If bit 5 has value 1 in an SMS-SUBMIT PDU, it indicates that the SME is a telematic device of a type which is indicated in bits 4..0, and requests the SC to convert the SM into a form suited for that device type. If the destination network is ISDN, the SC must also select the proper service indicators for connecting to a device of that type.

If bit 5 has value 1 in an SMS-DELIVER PDU, it indicates that the SME is a telematic device of a type which is indicated in bits 4..0.

If bit 5 has value 0 in an SMS-DELIVER PDU, the value in bits 4..0 identifies the SM-AL protocol being used between the SME and the MS.

Note that for the straightforward case of simple MS-to-SC short message transfer the Protocol Identifier is set to the value 0.

In the case where bit 7 = 0, bit 6 = 1, bits 5..0 are used as defined below

5 0	
000000	Short Message Type 0
000001	Replace Short Message Type 1
000010	Replace Short Message Type 2
000011	Replace Short Message Type 3
000100	Replace Short Message Type 4
000101	Replace Short Message Type 5
000110	Replace Short Message Type 6
000111	Replace Short Message Type 7
001000..011110	Reserved
011111	Return Call Message
100000..111011	Reserved
111100	ANSI-136 R-DATA
111101	ME Data download
111110	ME De-personalization Short Message
111111	~~SIM~~(U)SIM Data download

A short message type 0 indicates that the ME must acknowledge receipt of the short message but may discard its contents.

The Replace Short Message feature is optional for the ME and the ~~SIM~~(U)SIM but if implemented it shall be performed as described here.

For MT short messages, on receipt of a short message from the SC, the MS shall check to see if the associated Protocol Identifier contains a Replace Short Message Type code.

If such a code is present, then the MS ~~will~~shall check the originating address and replace any existing stored message having the same Protocol Identifier code and originating address with the new short message and other parameter values. If there is no message to be replaced, the MS shall store the message in the normal way. The MS may also check the SC address as well as the Originating Address. However, in a network which has multiple SCs, it is possible for a Replace Message type for a SM to be sent via different SCs and so it is recommended that the SC address should not be checked by the MS unless the application specifically requires such a check.

If a Replace Short Message Type code is not present then the MS ~~will~~shall store the message in the normal way.

In MO short messages the SC reacts similarly but only the address of the originating MS or any other source is checked.

A Return Call Message indicates to the MS to inform the user that a call (e.g. a telephone call) can be established to the address specified within the TP-OA. The RP-OA contains the address of the SC as usual. The message content (if present) gives displayable information (e.g. the number of waiting voice messages). The message is handled in the same way as all other messages of the Replace Short Message Types.

The ME De-personalization Short Message is a ME-specific message which instructs the ME to de-personalities the ME (see ~~GSM~~ 3G TS 2~~0~~2.022 [25]). The TP-DCS shall be set to Uncompressed, Default Alphabet, and Message Class 1 (ME-specific), which corresponds to a bit coding of 00010001. The TP-UD field contains de-personalization information coded according to ~~GSM~~ 3G TS 2~~0~~2.022 [25]. This information shall not be displayed by an ME which supports the scheme. The acknowledgement to this message is a SMS-DELIVER-REPORT for RP-ACK in which the TP-User-Data shall be coded according to ~~GSM~~ 3G TS ~~0~~22.022 [25].

~~SIM~~(U)SIM Data download is a facility whereby the ME must pass the short message in its entirety including all SMS elements contained in the SMS deliver to the ~~SIM~~(U)SIM using the mechanism described in GSM TS 11.11 [16] and 3G TS 31.102 [30]. The DCS shall be set to 8 bit message class 2 (either bit coding 1111 0110 or 00010110). The entire user data field is available for ~~SIM~~(U)SIM Data download. If the DCS is not set to 8-bit message class 2 then the message shall be handled in the normal way by the ME.

ME Data download is a facility whereby the ME shall process the short message in its entirety including all SMS elements contained in the SMS deliver to the ME. The DCS shall be set to message class 1. The entire user data field is available for ME data download.

ANSI-136 R-DATA is a facility whereby the ME must pass the short message in its entirety, including all elements contained in the SMS DELIVER, to the ~~SIM~~(U)SIM using the mechanism described in GSM TS 11.14 [16] and 3G TS 31.102 [30]. The DCS shall be set to 8-bit message class 2 (either bit coding 11110110 or 00010110). If the DCS is not set to 8-bit message class 2 then the message shall be handled in the normal way by the ME.

9.2.3.10 TP-Data-Coding-Scheme (TP-DCS)

The TP-Data-Coding-Scheme is defined in ~~GSM 03.38~~3G TS 23.038 [9].

9.2.3.11 TP-Service-Centre-Time-Stamp (TP-SCTS)

The TP-Service-Centre-Time-Stamp field is given in semi-octet representation, and represents the local time in the following way:

	Year:	**Month:**	**Day:**	**Hour:**	**Minute:**	**Second:**	**Time Zone**
Digits: (Semi-octets)	2	2	2	2	2	2	2

The Time Zone indicates the difference, expressed in quarters of an hour, between the local time and GMT. In the first of the two semi-octets, the first bit (bit 3 of the seventh octet of the TP-Service-Centre-Time-Stamp field) represents the algebraic sign of this difference (0 : positive, 1 : negative).

The Service-Centre-Time-Stamp, and any other times coded in this format that are defined in this specification, represent the time local to the sending entity.

If the MS has knowledge of the local time zone, then any time received (e.g. Service-Centre-Time-Stamp) at the MS may be displayed in the local time rather than the time local to the sending entity. Messages shall be stored as received without change to any time contained therein.

The Time Zone code enables the receiver to calculate the equivalent time in GMT from the other semi-octets in the Service-Centre-Time-Stamp, or indicate the time zone (GMT, GMT+1H etc.), or perform other similar calculations as required by the implementation.

If the MS receives a non-integer value in the SCTS, it shall assume that the digit is set to 0 but shall store the entire field exactly as received.

9.2.3.12 TP-Validity-Period (TP-VP)

9.2.3.12.1 TP-VP (Relative format)

The TP-Validity-Period comprises 1 octet in integer representation, giving the length of the validity period, counted from when the SMS-SUBMIT is received by the SC.

The representation of time is as follows:

TP-VP value	Validity period value
0 to 143	(TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours)
144 to 167	12 hours + ((TP-VP -143) x 30 minutes)
168 to 196	(TP-VP - 166) x 1 day
197 to 255	(TP-VP - 192) x 1 week

9.2.3.12.2 TP-VP (Absolute format)

The TP-Validity Period comprises 7 octets in semi octet representation giving the absolute time of the validity period termination

The representation of time is identical to the representation of the TP-Service-Centre-Time-Stamp.

9.2.3.12.3 TP-VP (Enhanced format)

The TP-Validity Period comprises 7 octets. The presence of all octets is mandatory although they may not all be used. The first octet indicates the way in which the following 6 octets are used. Any reserved/unused bits or octets must be set to zero.

Octet 1 TP-VP functionality indicator

bit 7 Extension bit
Set to 1 if the TP-VP functionality indicator is to be extended to another octet. A setting of 0 indicates that there are no more TP-VP functionality indicator extension octets to follow.
Any such extension octet ~~will~~shall immediately follow the previous TP-VP functionality indicator.

bit 6 Single shot SM.
Set to 1 if the SC is required to make up to one delivery attempt. The TP-Validity Period, where present, ~~will~~shall be applicable to the Single shot SM.

bits 5, 4, 3 Reserved

bits 2, 1, 0 Validity Period Format.

Value bits	**2 1 0**	
	0 0 0	No Validity Period specified
	0 0 1	Validity Period is as specified for the relative case. The following octet contains the TP-VP value as described in 9.2.3.12.1
	0 1 0	Validity period is relative in integer representation and the following octet contains the TP-VP value in the range 0 to 255 representing 0 to 255 seconds. A TP-VP value of zero is undefined and reserved for future use.
	0 1 1	Validity period is relative in semi-octet representation. The following 3 octets contain the relative time in Hours, Minutes and Seconds giving the length of the validity period counted from when the SMS-~~-~~SUBMIT is received by the SC. The representation of time uses the same representation as the Hours, Minutes and Seconds in the TP-Service-Centre-Time-Stamp.
	1 0 0	Reserved
	1 0 1	Reserved
	1 1 0	Reserved
	1 1 1	Reserved

The SC ~~will~~shall reject any Unsupported/ Reserved values received by returning the 'TP-VP not supported' TP-FCS value in the Submit SM Report for RP-Error

9.2.3.13 TP-Discharge-Time (TP-DT)

The TP-Discharge-Time field indicates the time at which a previously submitted SMS-SUBMIT was successfully delivered to or attempted to deliver to the recipient SME or disposed of by the SC.

In the case of "transaction completed" the time shall be the time of the completion of the transaction. In the case of "SC still trying to transfer SM" the time shall be the time of the last transfer attempt. In the case of "permanent or temporary error - SC not making any more transfer attempts" the time shall be the time of either the last transfer attempt or the time at which the SC disposed of the SM according to the Status outcome in TP-ST.

The TP-Discharge-Time is given in semi-octet representation in a format identical to the TP-SCTS.

9.2.3.14 TP-Recipient-Address (TP-RA)

The TP-Recipient-Address field indicates the address of the SME that was the destination of the previously submitted mobile originated short message being subject to the status report. The field is formatted according to the formatting rules of address fields.

9.2.3.15 TP-Status (TP-ST)

The TP-Status field indicates the status of a previously submitted SMS-SUBMIT and certain SMS COMMANDS for which a Status -Report has been requested. It consists of one octet and the bits in the octet are used as follows:

The MS ~~will~~shall interpret any reserved values as "Service Rejected" (01100011) but shall store them exactly as received.

bits value/usage

7 0 Bits 0..6 as defined below:

6....0 Indicate whether the previously submitted short message was successfully forwarded to the SME, or whether an error condition has been encountered, as follows:

Short message transaction completed

0000000	Short message received by the SME
0000001	Short message forwarded by the SC to the SME but the SC is unable to confirm delivery
0000010	Short message replaced by the SC

Reserved values

0000011..0001111	Reserved
0010000..0011111	Values specific to each SC

Temporary error, SC still trying to transfer SM

0100000	Congestion
0100001	SME busy
0100010	No response from SME
0100011	Service rejected
0100100	Quality of service not available
0100101	Error in SME
0100110..0101111	Reserved
0110000..0111111	Values specific to each SC

Permanent error, SC is not making any more transfer attempts

1000000	Remote procedure error
1000001	Incompatible destination
1000010	Connection rejected by SME
1000011	Not obtainable
1000100	Quality of service not available

1000101	No interworking available
1000110	SM Validity Period Expired
1000111	SM Deleted by originating SME
1001000	SM Deleted by SC Administration
1001001	SM does not exist (The SM may have previously existed in the SC but the SC no longer has knowledge of it or the SM may never have previously existed in the SC)
1001010..1001111	Reserved
1010000..1011111	Values specific to each SC

Temporary error, SC is not making any more transfer attempts

1100000	Congestion
1100001	SME busy
1100010	No response from SME
1100011	Service rejected
1100100	Quality of service not available
1100101	Error in SME
1100110..1101001	Reserved
1101010..1101111	Reserved
1110000..1111111	Values specific to each SC

bits	value/usage		
7	1	Bits 0..6	reserved

9.2.3.16 TP-User-Data-Length (TP-UDL)

If the TP-User-Data is coded using the GSM 7 bit default alphabet, the TP-User-Data-Length field gives an integer representation of the number of septets within the TP-User-Data field to follow. If the 7bit default-alphabet extension mechanism is used within the TP-User-Data (see ~~GSM 03.38~~3G TS 23.038 [9]), the actual number of characters in the message ~~will~~shall be less than the number of septets. If a TP-User-Data-Header field is present, then the TP-User-Data-Length value is the sum of the number of septets in the TP-User-Data-Header field (including any padding) and the number of septets in the TP-User-Data field which follows. See figure 9.2.3.24.(a).If the TP-User-Data is coded using 8-bit data, the TP-User-Data-Length field gives an integer representation of the number of octets within the TP-User-Data field to follow. If a TP-User-Data-Header field is present, then the TP-User-Data-Length value is the sum of the number of octets in the TP-User-Data-Header field and the number of octets in the TP-User-Data field which follows. See figure 9.2.3.24.(b).

If the TP-User-Data is coded using UCS2 [24] data, the TP-User-Data-Length field gives an integer representation of the number of octets within the TP-User-Data field to follow. If a TP-User-Data-Header field is present, then the TP-User-Data-Length value is the sum of the number of octets in the TP-User-Data-Header field and the number of octets in the TP-User-Data field which follows. See figure 9.2.3.24.(b).

If the TP-User-Data is coded using compressed GSM 7 bit default alphabet or compressed 8 bit data or compressed UCS2 [24] data, the TP-User-Data-Length field gives an integer representation of the number of octets after compression within the TP-User-Data field to follow. If a TP-User-Data-Header field is present, then the TP-User-Data-Length value is the sum of the number of uncompressed octets in the TP-User-Data-Header field and the number of octets in the compressed TP-User-Data field which follows. See figure 9.2.3.24.(c)

For other Data Coding Schemes, see ~~GSM 03.38~~3G TS 23.038 [9].If this field is zero, the TP-User-Data field ~~will~~shall not be present.

9.2.3.17 TP-Reply-Path (TP-RP)

The TP-Reply-Path is a 1-bit field, located within bit no 7 of the first octet of both SMS-DELIVER and SMS-SUBMIT, and to be given the following values:

Bit no 7:	0	TP-Reply-Path parameter is not set in this SMS-SUBMIT/DELIVER
	1	TP-Reply-Path parameter is set in this SMS-SUBMIT/DELIVER

Please refer to annex D for details about the Reply procedures.

9.2.3.18 TP-Message-Number (TP-MN)

The TP-Message-Number is an 8-bit field allowing an MS to refer uniquely to an SM in the SC which that MS has previously submitted. The TP-MN value is the TP-MR value of a previously submitted SM.

9.2.3.19 TP-Command-Type (TP-CT)

The TP-Command-Type is an 8-bit field specifying the type of operation that the SC is to perform. It has the following values:

Value (bit 7 .. 0)	Command Description	Status Report Request Value
00000000	Enquiry relating to previously submitted short message	1
00000001	Cancel Status Report Request relating to previously submitted short message	0
00000010	Delete previously submitted Short Message	0
00000011	Enable Status Report Request relating to previously submitted short message	0
00000100..00011111	Reserved	unspecified
11100000..11111111	Values specific for each SC	1 or 0

The SC ~~will~~shall return an RP-Error with an appropriate TP-Failure-Cause for any TP-Command value which is reserved, unsupported or invalid or the actioning of the command has failed.

The SC ~~will~~shall return an RP-ACK if the actioning of the Command has succeeded.

A successful Enquiry ~~will~~shall result in the SC sending a SMS-STATUS-REPORT for the SM to which the Enquiry refers. In the case where the SC has a number of SMs which have the same TP-MR, the same TP-DA and have come from the same originating address the SC ~~will~~shall send a SMS-STATUS-REPORT for each SM.

In the case where a TP-Command is to Delete a previously submitted short message, the SC ~~will~~shall send a Status Report indicating that the SM has been deleted if the original Submit SM request requested a status Report.

9.2.3.20 TP-Command-Data-Length (TP-CDL)

The TP-Command-Data-Length field is used to indicate the number of octets contained within the TP-Command-Data-field. If this field is set to zero, the TP-Command-Data field ~~will~~shall not be present.

9.2.3.21 TP-Command-Data (TP-CD)

The TP-Command-Data field contains data relating to the operation requested by the MS which is to be performed at the SC. The maximum length of this field is 157 octets. The usage and provision of the optional TP-Command-Data field ~~will~~shall be determined by the function selected by the TP-Command-Type field.

9.2.3.22 TP-Failure-Cause (TP-FCS)

The TP-Failure-Cause field is used to report the reason for failure to transfer or process a short message. It consists of a single octet used as follows:

TP-FCS Value (Hex)	Meaning	When used	
		MO	MT
00 - 7F	Reserved		
80 - 8F	TP-PID errors		
80	Telematic interworking not supported	x	
81	Short message Type 0 not supported	x	x
82	Cannot replace short message	x	x
83 - 8E	Reserved		
8F	Unspecified TP-PID error	x	x
90 - 9F	TP-DCS errors		
90	Data coding scheme (alphabet) not supported	x	
91	Message class not supported		x
92 - 9E	Reserved		
9F	Unspecified TP-DCS error	x	x
A0 - AF	TP-Command Errors		
A0	Command cannot be actioned	x	
A1	Command unsupported	x	
A2 - AE	Reserved		
AF	Unspecified TP-Command error	x	
B0	TPDU not supported	x	x
B1 - BF	Reserved		
C0	SC busy	x	
C1	No SC subscription	x	
C2	SC system failure	x	
C3	Invalid SME address	x	
C4	Destination SME barred	x	
C5	SM Rejected-Duplicate SM	x	
C6	TP-VPF not supported	X	
C7	TP-VP not supported	X	
C8 - CF	Reserved		
D0	~~SIM~~(U)SIM SMS storage full		x
D1	No SMS storage capability in ~~SIM~~(U)SIM		x
D2	Error in MS		x
D3	Memory Capacity Exceeded		X
D4	~~SIM~~(U)SIM Application Toolkit Busy		x
D5	~~SIM~~(U)SIM data download error		x
D6 - DF	Reserved		
E0 - FE	Values specific to an application	x	x
FF	Unspecified error cause	x	x

NOTE: Any reserved codes which are received should be treated as an unspecified error cause.
MT and MO refer to the overall mobile terminated and mobile originated services; not the direction of transmission of TP-FCS.

9.2.3.23 TP-User-Data-Header-Indicator (TP-UDHI)

The TP-User-Data-Header-Indicator is a 1 bit field within bit 6 of the first octet of the following six PDUs:

- SMS-SUBMIT,
- SMS-SUBMIT-REPORT
- SMS-DELIVER,
- SMS-DELIVER-REPORT
- SMS-STATUS-REPORT
- SMS-COMMAND.

TP-UDHI has the following values.

Bit no. 6	0	The TP-UD field contains only the short message
	1	The beginning of the TP-UD field contains a Header in addition to the short message

9.2.3.24 TP-User Data (TP-UD)

The length of the TP-User-Data field is defined in the PDU’s of the SM-TL (see subclause 9.2.2).

The TP-User-Data field may comprise just the short message itself or a Header in addition to the short message depending upon the setting of TP-UDHI.

Where the TP-UDHI value is set to 0 the TP-User-Data field comprises the short message only, where the user data can be 7 bit (default alphabet) data, 8 bit data, or 16 bit (UCS2 [24]) data.

Where the TP-UDHI value is set to 1 the first octets of the TP-User-Data field contains a Header in the following order starting at the first octet of the TP-User-Data field.

Irrespective of whether any part of the User Data Header is ignored or discarded, the MS shall always store the entire TPDU exactly as received.

FIELD	LENGTH
Length of User Data Header	1 octet
Information-Element-Identifier "A"	1 octet
Length of Information-Element "A"	1 octet
Information-Element "A" Data	1 to "n" octets
Information-Element-Identifier "B"	1 octet
Length of Information-Element "B"	1 octet
Information-Element "B" Data	1 to "n" octets
Information-Element-Identifier "n"	1 octet
Length of Information-Element "n"	1 octet
Information-Element "n" Data	1 to "n" octets

The diagram below shows the layout of the TP-User-Data-Length and the TP-User-Data for uncompressed GSM 7 bit default alphabet data. The UDHL field is the first octet of the TP-User-Data content of the Short Message.

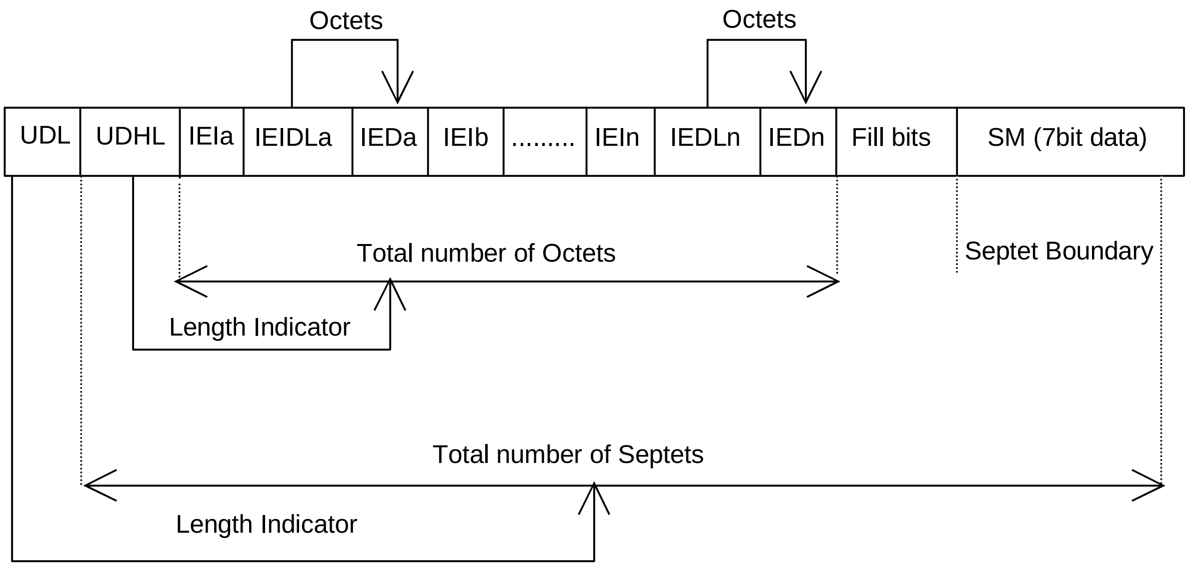


Figure 9.2.3.24 (a)

The diagram below shows the layout of the TP-User-Data-Length and the TP-User-Data for uncompressed 8 bit data or uncompressed UCS2 data. The UDHL field is the first octet of the TP-User-Data content of the Short Message.

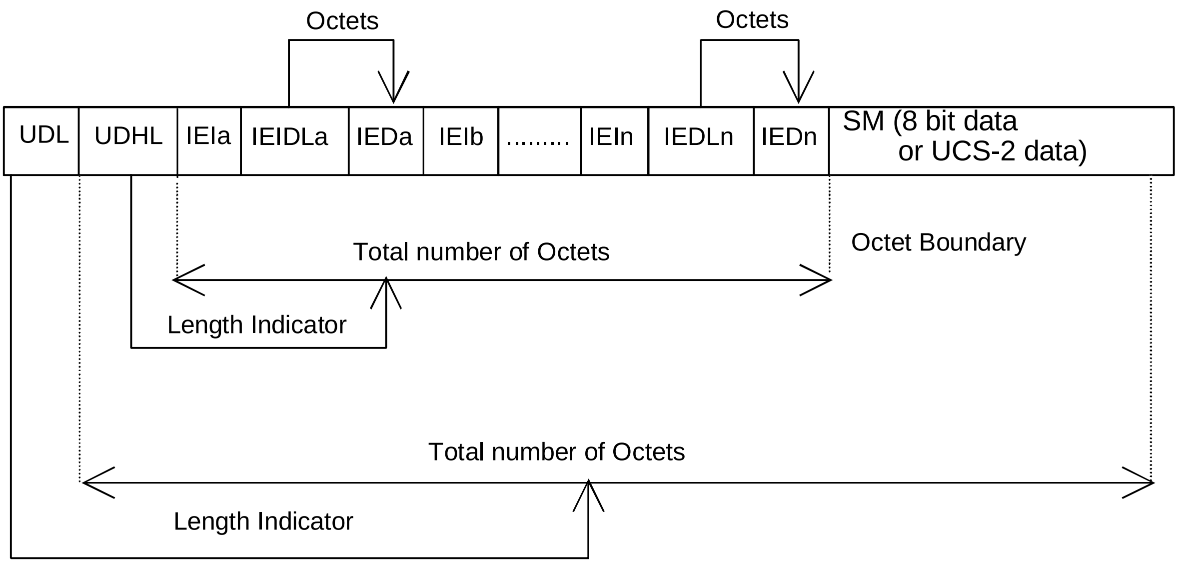


Figure 9.2.3.24 (b)

The diagram below shows the layout of the TP-User-Data-Length and the TP-User-Data for compressed GSM 7 bit default alphabet data, compressed 8 bit data or compressed UCS2 data. The UDHL field is the first octet of the TP-User-Data content of the Short Message.

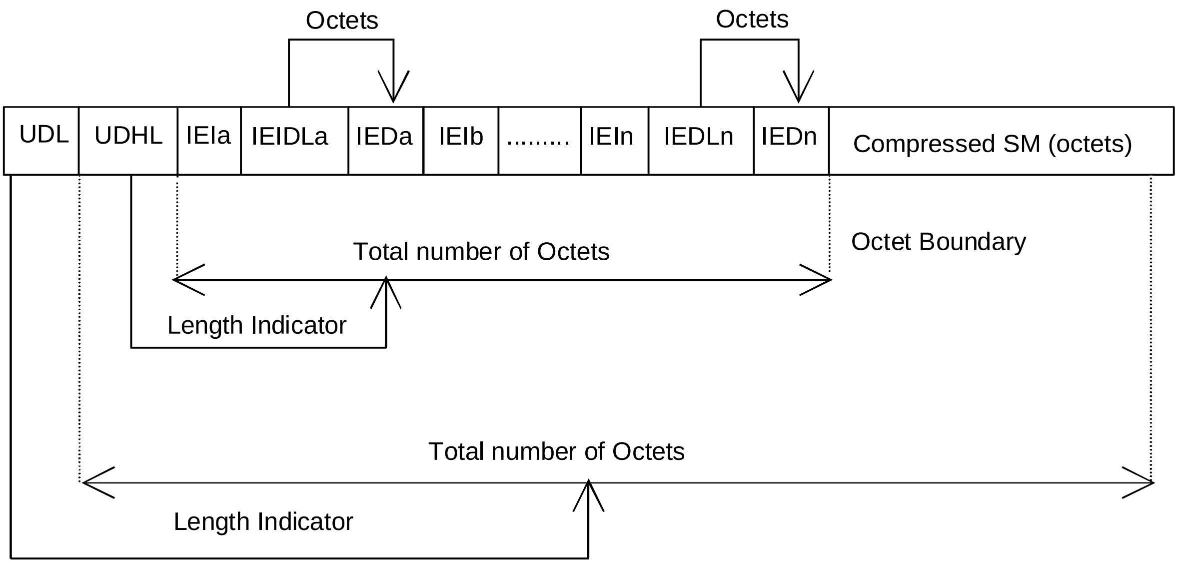


Figure 9.2.3.24 (c)

The definition of the TP-User-Data-Length field which immediately precedes the "Length of User Data Header" is unchanged and ~~will~~shall therefore be the total length of the TP-User-Data field including the Header, if present. (see 9.2.3.16)

The "Length-of-Information-Element" fields shall be the integer representation of the number of octets within its associated "Information-Element-Data" field which follows and shall not include itself in its count value.

The "Length-of-User-Data-Header" field shall be the integer representation of the number of octets within the "User-Data-Header" information fields which follow and shall not include itself in its count or any fill bits which may be present (see text below).

Information Elements may appear in any order and need not necessarily follow the order used in this specification. If Information Elements are duplicated (either with the same or different content) then the contents of the last occurrence of the Information Element shall be used. If the length of the User Data Header overall is such that there appear to be too few or too many octets in the final Information Element then the whole User Data Header shall be ignored.

If any reserved values are received within the content of any Information Element then that part of the Information Element shall be ignored.

The Information Element Identifier octet shall be coded as follows:

VALUE (hex)	MEANING
00	Concatenated short messages, 8-bit reference number
01	Special SMS Message Indication
02	Reserved
03	Value not used to avoid misinterpretation as <LF> character
04	Application port addressing scheme, 8 bit address
05	Application port addressing scheme, 16 bit address
06	SMSC Control Parameters
07	UDH Source Indicator
08	Concatenated short message, 16-bit reference number
09	Wireless Control Message Protocol
0A-6F	Reserved for future use
70-7F	~~SIM~~(U)SIM Toolkit Security Headers
80 - 9F	SME to SME specific use
A0 - BF	Reserved for future use
C0 - DF	SC specific use
E0 - FF	Reserved for future use

A receiving entity shall ignore (i.e. skip over and commence processing at the next information element) any information element where the IEI is Reserved or not supported. The receiving entity calculates the start of the next information element by looking at the length of the current information element and skipping that number of octets.

The SM itself may be coded as 7, 8 or 16 bit data.

If 7 bit data is used and the TP-UD-Header does not finish on a septet boundary then fill bits are inserted after the last Information Element Data octet up to the next septet boundary so that there is an integral number of septets for the entire TP-UD header. This is to ensure that the SM itself starts on an septet boundary so that an earlier Phase mobile ~~will~~shall be capable of displaying the SM itself although the TP-UD Header in the TP-UD field may not be understood.

It is optional to make the first character of the SM itself a Carriage Return character encoded according to the default 7 bit alphabet so that earlier Phase mobiles, which do not understand the TP-UD-Header, ~~will~~shall over-write the displayed TP-UD-Header with the SM itself.

If 16 bit (USC2) data is used then padding octets are not necessary. The SM itself ~~will~~shall start on an octet boundary.

If 8 bit data is used then padding is not necessary. An earlier Phase mobile ~~will~~shall be able to display the SM itself although the TP-UD header may not be understood.

It is also possible for mobiles not wishing to support the TP-UD header to check the value of the TP-UDHI bit in the SMS-Deliver PDU and the first octet of the TP-UD field and skip to the start of the SM and ignore the TP-UD header.

9.2.3.24.1 Concatenated Short Messages

This facility allows short messages to be concatenated to form a longer message.

In the case of uncompressed 8-bit data, the maximum length of the short message within the TP-UD field is 134 (140-6) octets.

In the case of uncompressed GSM 7 bit ~~D~~default alphabet~~7 bit~~ data, the maximum length of the short message within the TP-UD field is 153 (160-7) characters.

In the case of 16 bit uncompressed USC2 data, the maximum length of the short message within the TP-UD field is 67 ((140-6)/2) characters. A UCS2 character must not be split in the middle; if the length of the User Data Header is odd, the maximum length of the whole TP-UD field is 139 octets.

In the case of compressed GSM 7 bit ~~D~~default alphabet ~~7 bit~~ data, 8 bit data or UCS2 the maximum length of the compressed short message within the TP-UD field is 134 (140-6) octets including the Compression Header and Compression Footer, both or either of which may be present (See subclause 3.9).

The maximum length of an uncompressed concatenated short message is 39015 (255*153) default alphabet characters, 34170 (255*134) octets or 17085 (255*67) UCS2 characters.

The maximum length of a compressed concatenated message is 34170 (255*134) octets including the Compression Header and Compression Footer (see subclause 3.9 and Fig 9.2.3.24.1(a) below).

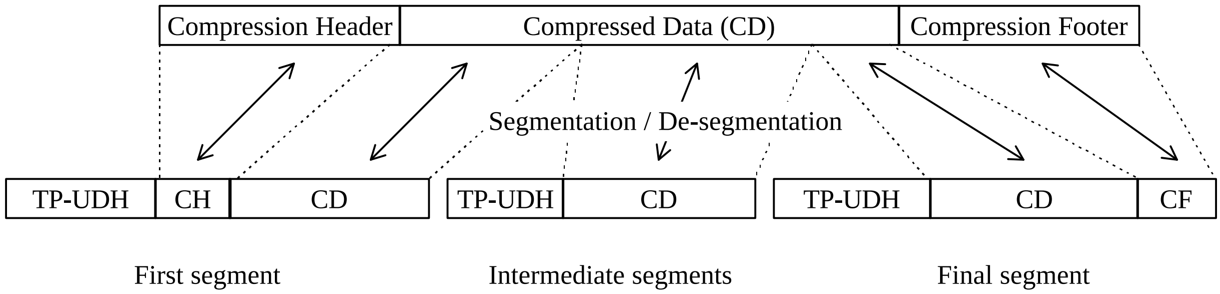


Figure 9.2.3.24.1.(a) Concatenation of a Compressed short message

The Information-Element-Data field contains information set by the application in the SMS-SUBMIT so that the receiving entity is able to re-assemble the short messages in the correct order. Each concatenated short message contains a reference number which together with the originating address and Service Centre address allows the receiving entity to discriminate between concatenated short messages sent from different originating SMEs and/or SCs. In a network which has multiple SCs, it is possible for different segments of a concatenated SM to be sent via different SCs and so it is recommended that the SC address should not be checked by the MS unless the application specifically requires such a check.

The TP elements in the SMS-SUBMIT PDU, apart from TP-MR, TP-SRR, TP-UDL and TP-UD, should remain unchanged for each SM which forms part of a concatenated SM, otherwise this may lead to irrational behaviour. TP-MR must be incremented for every segment of a concatenated message as defined in subclause 9.2.3.6. A SC shall~~willl~~ handle segments of a concatenated message like any other short message. The relation between segments of a concatenated message is made only at the originator, where the message is segmented, and at the recipient, where the message is reassembled. SMS-COMMANDs identify messages by TP-MR and therefore apply to only one segment of a concatenated message. It is up to the originating SME to issue SMS-COMMANDs for all the required segments of a concatenated message.

The Information-Element-Data octets shall be coded as follows.

Octet 1 Concatenated short message reference number

This octet shall contain a modulo 256 counter indicating the reference number for a particular concatenated short message. This reference number shall remain constant for every short message which makes up a particular concatenated short message.

Octet 2 Maximum number of short messages in the concatenated short message.

This octet shall contain a value in the range 0 to 255 indicating the total number of short messages within the concatenated short message. The value shall start at 1 and remain constant for every short message which makes up the concatenated short message. If the value is zero then the receiving entity shall ignore the whole Information Element.

Octet 3 Sequence number of the current short message.

This octet shall contain a value in the range 0 to 255 indicating the sequence number of a particular short message within the concatenated short message. The value shall start at 1 and increment by one for every short message sent within the concatenated short message. If the value is zero or the value is greater than the value in octet 2 then the receiving entity shall ignore the whole Information Element.

The IEI and associated IEI length and IEI data shall be present in every segment of the concatenated SM.

9.2.3.24.2 Special SMS Message Indication

There are three levels of "Message Waiting" indication provided within this specification. The first level is to set the Protocol Identifier to "Return Call message", which indicates that a message is waiting and relies on the text of the message to supply the detail. The second level uses the Data Coding Scheme with or without Return Call Message (see ~~GSM 03.38~~3G TS 23.038 [9]) to indicate the type of message waiting and whether there are some messages or no messages. The third level is described here, and provides the maximum detail level for analysis by the mobile, i.e. an indication of the number and type of messages waiting in systems connected to the PLMN. This third level is provided for future flexibility, as it cannot immediately be used without compatibility problems with the earliest Phase mobiles. It is envisaged that this scheme can start to be used once mobiles supporting TP-UDH become widely available.

This information may be stored by the MS in a form other than an SMS message, for example an indicator may be shown if the number of messages is non-zero or removed if the number of messages is zero. The MS may also store actual number of messages waiting and provide some other MMI to access this information. Text may be included by the SMS Service Centre for backward compatibility with the earliest Phase mobiles and the Data Coding Scheme may also be used to convey this information in parallel for backward compatibility with "middle" Phase mobiles (which support the use of Data Coding Scheme for Message Waiting Indication but not the use of TP-UDH for Message Waiting Indication).

The information-Element octets shall be coded as follows:

Octet 1 Message Indication type and Storage

Bit 7 Indicates whether or not the message shall be stored.

Bit 7

0 Discard message after updating indication

1 Store message

In the event of a conflict between this setting and the setting of the Data Coding Scheme (see ~~GSM 03.38~~3G TS 23.038 [9]) then the message shall be stored if either the DCS indicates this, or Octet 1 above indicates this.

Bits 6..0 show the message indication type

000 0000 Voice Message Waiting
000 0001 Fax Message Waiting
000 0010 Electronic Mail Message Waiting
000 0011 Other Message Waiting (see ~~GSM 03.38~~3G TS 23.038 [9] for definition of "other")

Other values are reserved for future use

Octet 2 Message Count

This octet shall contain a value in the range 0 to 255 indicating the number of messages of the type specified in Octet 1 waiting. The value 255 shall be taken to mean 255 or greater. In the event of a conflict between this setting and the setting of the Data Coding Scheme (see ~~GSM 03.38~~3G TS 23.038 [9]) then the Message Count in the TP-UDH shall override the indication in the TP-DCS.

If more than one type of message is required to be indicated within one SMS message, then further octets must be used, as in the following example:

[00] TP-UDL [1E] (30 decimal septets)

[01] Length of TP-UDH [08]

[02] IEI = Special SMS Message Indication [01]

[03] Length = 02

[04] Octet 1 = Voice Mail, do not store [00]

[05] Octet 2 = 04 Messages

[06] IEI = Special SMS Message Indication [01]

[07] Length = 02

[08] Octet 1 = Fax Mail, Store [81]

[09] Octet 2 = 02 Messages

+ 5 Fill bits

+ 19 seven-bit character message text

The Total number of bits is 210.

In the case where this IEI is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data should also be contained in every subsequent segment of the concatenated SM although this is not mandatory. However, in the case where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded.

9.2.3.24.3 Application Port Addressing 8 bit address

This facility allows short messages to be routed to one of multiple applications in the TE (terminal equipment), using a method similar to TCP/UDP ports in a TCP/IP network. An application entity is uniquely identified by the pair of TP-DA/TP-OA and the port address. The port addressing is transparent to the transport, and also useful in Status Reports.

The total length of the IE is 2 octets

octet 1 Destination port

This octet contains a number indicating the receiving port, i.e. application, in the receiving device.

octet 2 Originator port

This octet contains a number indicating the sending port, i.e. application, in the sending device.

The port range is up to 255 using 8 bit addressing space. The Integer value of the port number is presented as in ~~GSM 03.40~~3G TS 23.040 subclause 9.1.2.1.

VALUE (port number)	MEANING
0 - 239	Reserved
240 - 255	Available for allocation by applications

A receiving entity shall ignore (i.e. skip over and commence processing at the next information element) any information element where the value of the Information-Element-Data is Reserved or not supported.

In the case where this IEI is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data should also be contained in every subsequent segment of the concatenated SM although this is not mandatory. However, in the case where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded.

9.2.3.24.4 Application Port Addressing 16 bit address

This facility allows short messages to be routed to one of multiple applications in the TE (terminal equipment), using a method similar to TCP/UDP ports in a TCP/IP network. An application entity is uniquely identified by the pair of TP-DA/TP-OA and the port address. The port addressing is transparent to the transport, and also useful in Status Reports.

The total length of the IE is 4 octets

octet 1,2 Destination port

These octets contain a number indicating the receiving port, i.e. application, in the receiving device.

octet 3,4 Originator port

These octets contain a number indicating the sending port, i.e. application, in the sending device.

The port range is up to 65535 using 16 bit addressing space. The Integer value of the port number is presented as in ~~GSM 03.40~~3G TS 23.040 subclause 9.1.2.1.

VALUE (port number)	MEANING
0 - 15999	As allocated by IANA (http://www.IANA.com/)
16000 - 16999	Available for allocation by applications
17000 - 65535	Reserved

A receiving entity shall ignore (i.e. skip over and commence processing at the next information element) any information element where the value of the Information-Element-Data is Reserved or not supported.

In the case where this IEI is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data should also be contained in every subsequent segment of the concatenated SM although this is not mandatory. However, in the case where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded.

9.2.3.24.5 SMSC Control Parameters

The facility enables the SMS protocol headers to be expanded using a flexible method. It may be used to control the SMSC, but is also passed transparently to the receiving mobile. The Information Element must be present in every short message affected by it, i.e. in every short message in a concatenated message.

The Information Element data octets shall be coded as follows:

octet 1 Selective Status Report

This facility is used to control the creation of Status Reports, depending on the error code of the particular message. It is also used by the sending entity to request inclusion of the original UDH into the Status Report. In this case the original UDH must be separated from the rest of the UDH using the Source Indicator. The TP-SRR must be set in order for the Selective Status Report to be enabled. The bits are defined as follows

bit 0

0 No Status Report for short message transaction completed

1 Status Report for short message transaction completed

bit 1

0 No Status Report for permanent error when SC is not making any more transfer attempts

1 Status Report for permanent error when SC is not making any more transfer attempts

bit 2

0 No Status Report for temporary error when SC is not making any more transfer attempts

1 Status Report for temporary error when SC is not making any more transfer attempts

bit 3

0 No Status Report for temporary error when SC is still trying to transfer SM

1 Status Report for temporary error when SC is still trying to transfer SM

bits 4 and 5

reserved for future use.

bit 6

0 No activation

1 A Status Report generated by this Short Message, due to a permanent error or last temporary error, cancels the SRR of the rest of the Short Messages in a concatenated message. This feature can only be used where a SC is aware of the segmentation of a concatenated SM and is therefore an implementation matter.

bit 7

0 Do not include original UDH into the Status Report

1 Include original UDH into the Status Report

9.2.3.24.6 UDH Source Indicator

The facility is used to separate the UDH of the original message, a UDH created by the SMSC, and a UDH provided by the original receiving entity. The Source Indicator is placed in front of the content inserted by the source. The indicated content (one or more Information-Elements) ends at the next UDH-Source-Indicator, or at the end of the UDH. The Separator is intended to be used especially in Status Reports, but can also be used by the SMSC to add information into Short Message (for example Message waiting). The default content for a UDH in a SMS-DELIVERY is the headers inserted by the sending device, and the default content for a UDH in a SMS-STATUS-REPORT is the headers copied from the SMS-DELIVERY-REPORT.

Values of octet:

01 The following part of the UDH is created by the original sender (valid in case of Status Report)

02 The following part of the UDH is created by the original receiver (valid in case of Status Report)

03 The following part of the UDH is created by the SMSC (can occur in any message or report)

In the case where this IEI is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data should also be contained in every subsequent segment of the concatenated SM although this is not mandatory. However, in the case where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded.

9.2.3.24.7 ~~SIM~~(U)SIM Toolkit Security Headers

There are no IEI data values associated with these IEI values and so the associated Length of Information element field is present but set to zero.

These IEI values implicitly define that a Security Header is always present at the start of the TP-User-Data field which immediately follows the TP-User-Data-Header. Details of the Security Header will be found in GSM TS 03.48 [28].

In the case where a concatenated message contains a Security Header then the Security Header will only be present in the first segment of a concatenated message.

In the case where SMS compression is applied to a TP-User-Data field which contains a Security Header then the SMS compression header (~~GSM 03.42~~3G TS 23.042 [26]) ~~will~~shall immediately precede the Security Header.

9.2.3.24.8 Concatenated short messages, 16-bit reference number

This facility is an enhanced variant of the Concatenated Short Message facility (see subclause 9.2.3.24.1). The enhancement is a 16-bit reference number, instead of the short 8-bit reference number. The larger reference number reduces the probability that two different concatenated messages are mistakenly sent with identical reference numbers to a receiver. Except for the size of the reference number this facility is identical to the Concatenated Short Message facility (see subclause 9.2.3.24.1).

In the case of uncompressed 8-bit data, the maximum length of the short message within the TP-UD field is 133 (140-7) octets.

In the case of uncompressed GSM 7 bit ~~D~~default alphabet ~~7 bit~~ data, the maximum length of the short message within the TP-UD field is 151 (160-9) characters.

In the case of 16 bit uncompressed USC2 data, the maximum length of the short message within the TP-UD field is 66 ((140-7)/2) characters. A UCS2 character must not be split in the middle; if the length of the User Data Header is odd, the maximum length of the whole TP-UD field is 139 octets.

In the case of compressed GSM 7 bit ~~D~~default alphabet ~~7 bit~~ data, 8 bit data or UCS2 the maximum length of the compressed short message within the TP-UD field is 133 (140-7) octets including the Compression Header and Compression Footer, both or either of which may be present (see subclause 3.9).

The relation between compression and concatenation is the same as for Concatenated Short Messages (see subclause 9.2.3.24.1).

The Information-Element-Data field contains information set by the application in the SMS-SUBMIT so that the receiving entity is able to re-assemble the short messages in the correct order. Each concatenated short message contains a reference number which together with the originating address and Service Centre address allows the receiving entity to discriminate between concatenated short messages sent from different originating SMEs and/or SCs. In a network which has multiple SCs, it is possible for different segments of a concatenated SM to be sent via different SCs and so it is recommended that the SC address should not be checked by the MS unless the application specifically requires such a check.

The TP elements in the SMS-SUBMIT PDU, apart from TP-MR, TP-UDL and TP-UD, should remain unchanged for each SM which forms part of a concatenated SM, otherwise this may lead to irrational behaviour. TP-MR must be incremented for every segment of a concatenated message as defined in subclause 9.2.3.6. A SC shall~~will~~ handle segments of concatenated message like any other short message. The relation between segments of a concatenated message is made at the originator, where the message is segmented, and at the receipient, where the message is reassembled. SMS-COMMANDs identify messages by TP-MR and therefore apply to only one segment of a concatenated message. It is up to the originating SME to issue SMS-COMMANDs for all the required segments of a concatenated message.

The Information-Element-Data octets shall be coded as follows.

Octet 1-2 Concatenated short messages, 16-bit reference number

This octet shall contain a modulo 65536 counter indicating the reference number for a particular enhanced concatenated short message. This reference number shall remain constant for every short message which makes up a particular enhanced concatenated short message.

Octet 3 Maximum number of short messages in the enhanced concatenated short message.

This octet shall contain a value in the range 0 to 255 indicating the total number of short messages within the concatenated short message. The value shall start at 1 and remain constant for every short message which makes up the enhanced concatenated short message. If the value is zero then the receiving entity shall ignore the whole Information Element.

Octet 4 Sequence number of the current short message.

This octet shall contain a value in the range 0 to 255 indicating the sequence number of a particular short message within the concatenated short message. The value shall start at 1 and increment by one for every short message sent within the concatenated short message. If the value is zero or the value is greater than the value in octet 3 then the receiving entity shall ignore the whole Information Element.

The IEI and associated IEI length and IEI data shall be present in every segment of the concatenated SM.

9.2.3.24.9 Wireless Control Message Protocol

The Wireless Control Message Protocol (WCMP) is part of the WAP suite of protocols; an open standard specified by the WAP Forum Ltd.

The protocol specifies a set of messages that can be used by the receiver to notify the sender if an error occurs. This can be due to routing problems, no application listening at the destination port number, or due to insufficient buffer capacity. The error messages can be used by the sender to avoid retransmitting packets, that can not be properly handled at the receiver. WCMP can also be used for diagnostics and informational purposes. WCMP messages are usually generated by a datagram transport layer or a management entity.

The Information-Element-Data octet(s) shall be coded as follows.

Octet 1-n Protocol Data Unit of WCMP

This octet(s) shall contain a WCMP protocol data unit.

In the case where this IEI is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data should also be contained in every subsequent segment of the concatenated SM although this is not mandatory. However, in the case where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded.

9.2.3.25 TP-Reject-Duplicates (TP-RD)

The TP-Reject-Duplicates is a 1 bit field located within bit 2 of the first octet of SMS-SUBMIT and has the following values.

Bit no. 2: 0 Instruct the SC to accept an SMS-SUBMIT for an SM still held in the SC which has the same TP-MR and the same TP-DA as a previously submitted SM from the same OA.

1 Instruct the SC to reject an SMS-SUBMIT for an SM still held in the SC which has the same TP-MR and the same TP-DA as the previously submitted SM from the same OA. In this case an appropriate TP-FCS value shall~~will~~ be returned in the SMS-SUBMIT-REPORT.

9.2.3.26 TP-Status-Report-Qualifier (TP-SRQ)

The TP-Status-Report-Qualifier is a 1 bit field located within bit 5 of the first octet of SMS-STATUS-REPORT and has the following values

Bit no. 5: 0 The SMS-STATUS-REPORT is the result of a SMS-SUBMIT.
1 The SMS-STATUS-REPORT is the result of an SMS-COMMAND e.g. an Enquiry.

9.2.3.27 TP-Parameter-Indicator (TP-PI)

The TP-Parameter-Indicator comprises a number of octets between 1 and n where each bit when set to a 1 indicates that a particular optional parameter is present in the fields which follow. The TP-PI is present as part of the RP-User-Data in the RP-ACK for both the SMS-DELIVER TPDU and the SMS-SUBMIT TPDU.

The structure of the TP-PI is as follows:

Octet 1

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Extension bit	Reserved	Reserved	Reserved	Reserved	TP-UDL	TP-DCS	TP-PID

The most significant bit in octet 1 and any other TP-PI octets which may be added later is reserved as an extension bit which when set to a 1 shall~~will~~ indicate that another TP-PI octet follows immediately afterwards.

If the TP-UDL bit is set to zero then by definition then neither the TP-UDL field or the TP-UD field can be present.

If a Reserved bit is set to "1" then the receiving entity shall ignore the setting. The setting of this bit shall~~will~~ mean that additional information will follow the TP-User-Data, so a receiving entity shall discard any octets following the TP-User-Data.

9.3 Service provided by the SM-RL

9.3.1 General

The Short Message Relay Layer (SM-RL) provides a service to the Short Message Transfer Layer (SM-TL). This service enables the SM-TL to send Transfer Protocol Data Units (TPDUs) to its peer entity, receive TPDUs from its peer entity and receive reports about earlier requests for TPDUs to be transferred.

In order to keep track of TPDUs and reports about those TPDUs, primitives between the SM-TL and SM-RL contain a Short Message Identifier (SMI), which is a reference number for the TPDU associated with the primitive. This Short Message Identifier is not carried via the SM-RL protocol of subclause 9.3.2. It is carried via the relay layer service between the SC and GMSC. It is also carried by SM-RL of ~~GSM 04.11~~3G TS 24.011 [13], between the visited MSC and MS. The parameter is not carried by MAP but is mapped to and from the TCAP dialogue Identifier (see CCITT recommendation Q.771, "Blue Book" [19]) at the GMSC and the visited MSC (therefore the Message Identifier at the SC/GMSC interface is not the same as at the visited MSC/MS interface).

The SM-RL communicates with its peer entity by the protocol described in the following subclauses.

9.3.2 Protocol element repertoire at SM-RL

Different protocols are required between different pairs of SM-RL entities. Those are described in other ~~GSM~~GSM/UMTS specifications. This subclause gives a survey of the different information elements which have to be conveyed between those entities. (Note that the notation of the protocol and information elements may vary between different ~~GSM~~GSM/UMTS specifications).

The SM-RL comprises the following 6 protocol elements:

RP-MO-DATA	for transferring a TPDU from MS to SC
RP-MT-DATA	for transferring a TPDU from SC to MS
RP-ACK	for acknowledging an RP-MO-DATA, an RP-MT-DATA or an RP-SM-MEMORY-AVAILABLE
RP-ERROR	for informing of an unsuccessful RP-MO-DATA or an RP-MT-DATA transfer attempt
RP-ALERT-SC	for alerting the SC that the MS has recovered operation (information sent from the HLR to the SC)
RP-SM-MEMORY-AVAILABLE	for notifying the network that the MS has memory available to accept one or more short messages (information sent from the MS to the HLR)

9.3.2.1 RP-MO-DATA

Basic elements of the RP-MO-DATA type.

Abbr.	Reference	P[1)]	Description
RP-OA	RP-Originating-Address	++-	Address of the originating MS.
RP-DA	RP-Destination-Address	-++	Address of the destination SC.
RP-UD	RP-User-Data	+++	Parameter containing the TPDU

1) Provision on the links SC<->MSC, MSC<->MSC or MSC<->SGSN, and MSC<->MS or SGSN<->MS indicated by "xxx", where x may be either "+" or "-", dependent on whether the parameter is mandatory or not on the respective link.

9.3.2.2 RP-MT-DATA

Basic elements of the RP-MT-DATA type.

Abbr.	Reference	P[1)]	Description
RP-PRI	RP-Priority-Request	+--	Parameter indicating whether or not the short message transfer should be stopped if the originator SC address is already contained in the MWD.
RP-MMS	RP-More-Messages-To-Send	OO-	Parameter indicating that there are more messages waiting in the SC
RP-OA	RP-Originating-Address	+++	Address of the originating SC.
RP-DA	RP-Destination-Address	++-	Address of the destination MS.
RP-UD	RP-User-Data	+++	Parameter containing the TPDU
RP-MTI	RP-Message Type Indicator	O--	Parameter indicating if the TPDU is a SMS Deliver or a SMS Status Report [2)]
RP-SMEA	RP-originating SME-Address	O--	Address of the originating SME [2)]

1) Provision on the links SC<->MSC, MSC<->MSC or MSC<->SGSN, and MSC<->MS or SGSN<->MS indicated by "xxx", where x may be "+", "-" or "O", dependent on whether the parameter is mandatory, not present or optional on the respective link.

2) These information elements may be included in the "Send Routing Information for SM" sent by the SMS-GMSC to the HLR.

When transmitted, the RP-SMEA shall take the TP-OA value.

When transmitted, the RP-MTI shall be given the following values:

0 SMS Deliver

1 SMS Status Report.

This may be used by the HLR to distinguish the two cases in order not to apply any filtering mechanism based on the RP-SMEA value in case of a SMS-Status Report transmission.

9.3.2.3 RP-ACK

The RP-ACK contains the RP-User-Data which is a parameter containing the TPDU (see 9.2.2.1a and 9.2.2.2a).

9.3.2.4 RP-ERROR

Basic elements of the RP-ERROR type.

Abbr.	Reference	P1)	Description
RP-MSI	RP-MW-Set-Indication	+--	Parameter indicating whether or not the MWI has been up-dated. 2)
RP-CS	RP-Cause	+++	Parameter identifying the error type. The RP-Cause parameter gives the reason why a short message transfer attempt fails. In practice three relay layer protocols are used - SC to GMSC/IWMSC (see GSM TS 03.47 [11]), MAP (see ~~GSM 09.02~~3G TS 29.002 [15]) and via the radio interface (see ~~GSM 04.11~~3G TS 24.011 [13])
RP-MSIsdn	RP-international--MS-ISDN-number	+--	MSIsdn-Alert of the MS, see subclause 3.2.7 3)
RP-UD	RP-User-Data	OO O	Parameter containing a TPDU

1) Provision on the links SC<->MSC, MSC<->MSC or MSC<->SGSN, and MSC<->MS or SGSN<->MS indicated by "xxx", where x may be "+", "-" or "O" dependent on whether the parameter is mandatory, not present or optional on the respective link.

2) Only present when the RP-ERROR is transferred from the SMS-GMSC to the SC.

3) Only present when the RP-MT-DATA transfer attempt failed because the MS is not reachable or because the MS memory capacity was exceeded and the MSIsdn-Alert is different from the MSIsdn used by the SC to address the recipient MS

9.3.2.5 RP-ALERT-SC

Basic elements of the RP-ALERT-SC type:

Abbr.	Reference	P1)	Description
RP-MSIsdn	RP-International-MS-ISDN-Number	M	MSIsdn of the MS.

1) Provision; Mandatory (M).

9.3.2.6 RP-SM-MEMORY-AVAILABLE

Basic elements of the RP-SM-MEMORY-AVAILABLE type:

Abbr.	Reference	P1)	Description
RP-IMSI	RP-International-Mobile-Subscriber-Identity	++-	IMSI of the MS.

1) Provision on the links HLR<->VLR or HLR<->SGSN, VLR<->MSC and MSC<->MS or SGSN<->MS indicated by "xxx", where x may be either "+" or "-", dependent on whether the parameter is mandatory or not present on the respective link.

10 Fundamental procedures within ~~the point-to-point~~ SMS

The ~~point-to-point~~ SMS comprises 3 fundamental procedures:

1) Short message mobile terminated. This procedure consists of all necessary operations to:

   a) transfer a short message or status report from the SC to the MS;

b) return a report to the SC, containing the result of the message transfer attempt.

2) Short message mobile originated. This procedure consists of all necessary operations to:

a) transfer a short message from the MS to the SC;

b) return a report to the MS, containing the result of the message transfer attempt.

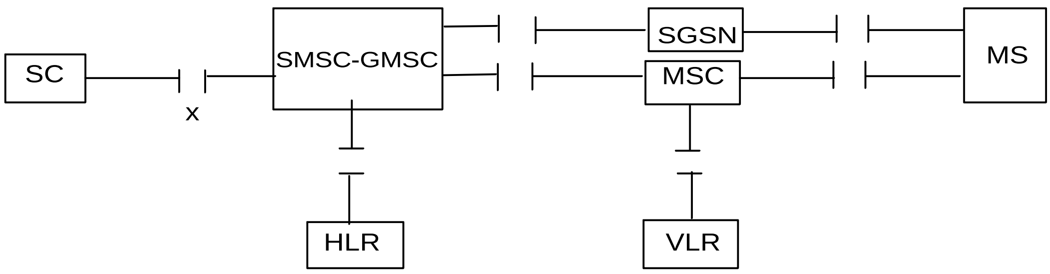
3) Transfer of an Alert. This procedure consists of all necessary operations for an HLR or a VLR to initiate a transfer of an Alert to a specific SC, informing the SC that the MS has recovered operation.

~~GSM 09.02~~3G TS 29.002 [15] defines operations necessary for the provision of the Short Message Service ~~point-to-point~~. The operations defined in clause 10 describe the requirement that the Short Message Service puts upon the network functionality. If discrepancies exist in nomenclature, it is the ~~GSM 09.02~~3G TS 29.002 [15] that shall~~will~~ be the reference.

Annex C indicates the flow of primitives and parameters during the short message transfer between the SC and the MS. Both the Mobile terminated and the Mobile originated cases are covered.

10.1 Short message mobile terminated

The entities involved in this procedure are depicted in figure ~~03.40/~~14.



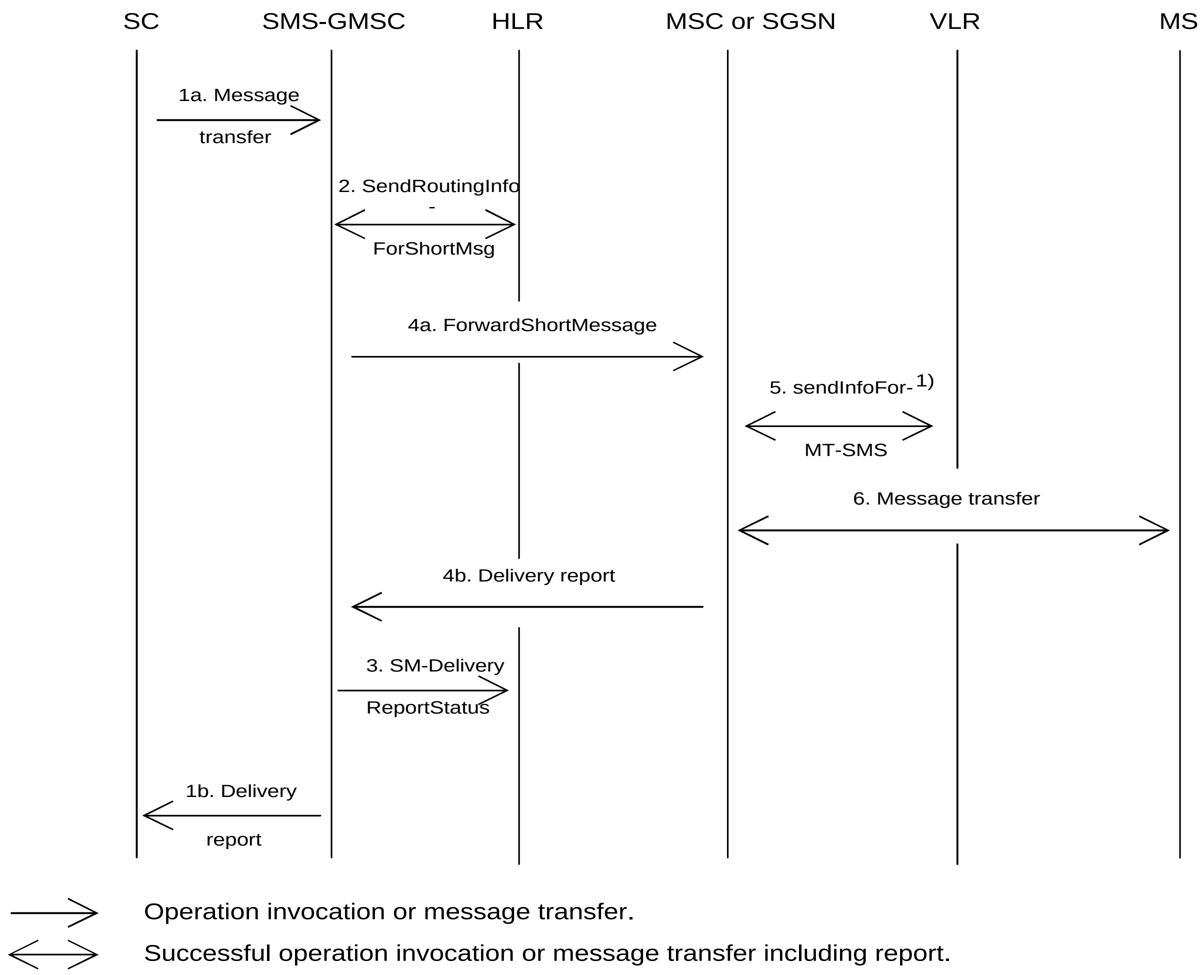
NOTE: Since the short message mobile terminated procedure covers the functionality required at SM-RL for transferring TPDUs from SC to MS, the procedure described covers both short message (SMS-DELIVER) and status report (SMS-STATUS-REPORT) transfer. The term "short message transfer" therefore, in this clause, covers both cases.

Figure ~~03.40/~~14: Interfaces involved in the Short message mobile terminated procedure. GSM TS 03.02 [5]. X is the interface between an MSC and an SC as defined in clause 5.

In figure ~~03.40/~~15, sequence diagrams are shown for the following basic situations of short message mobile terminated transfer attempt:

- Successful short message transfer via the MSC or the SGSN;
- Short message transfer attempt failing due to error at the SMS-GMSC;
- Short message transfer attempt failing due to negative outcome of HLR information retrieval;
- Short message transfer attempt failing due to error at the MSC or SGSN;
- Short message transfer attempt failing due to negative outcome of VLR information retrieval;
- Short message transfer attempt failing due to erroneous message transfer on the radio path.
- Short message transfer attempt failing over the first path (e.g. SGSN) and succeeding over the second path (e.g. MSC)
- Short message transfer attempt failing over the first path (e.g. SGSN) and over the second path (e.g. MSC)

References to the relevant specifications of the different operations are given in clause 4.



NOTE:

1): This operation is not used by the SGSN

Figure ~~03.40/~~15a): Successful short message transfer attempt via the MSC or the SGSN

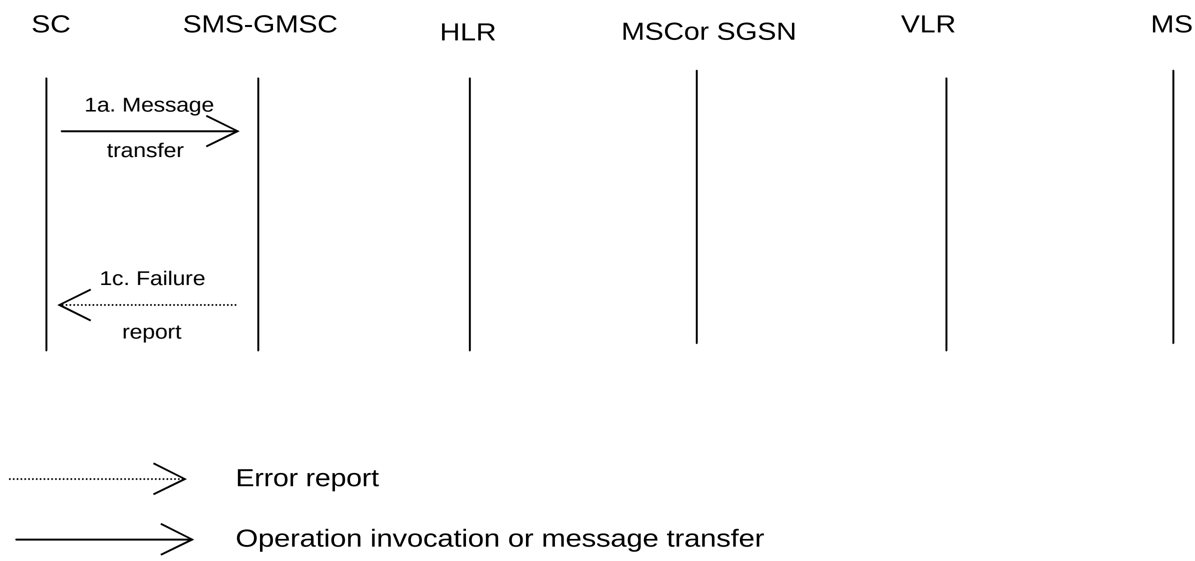


Figure ~~03.40/~~15b): Short message transfer attempt failing due to error at the SMS-GMSC

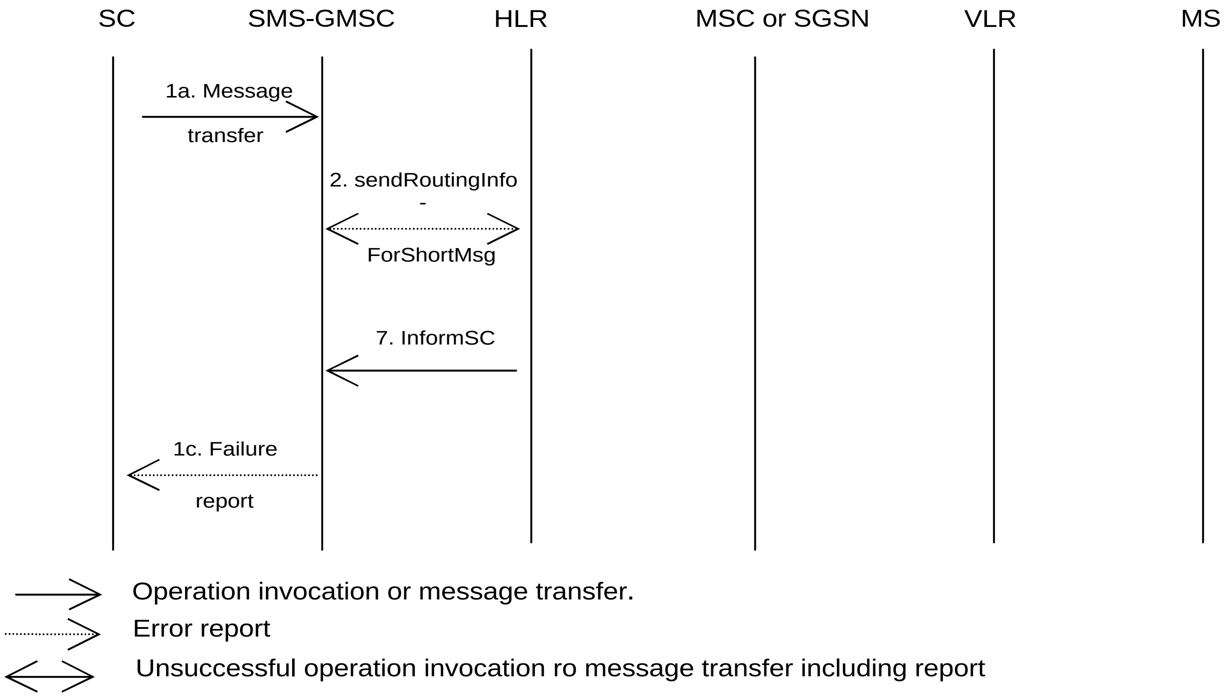


Figure ~~03.40/~~15c): Short message transfer attempt failing due to negative outcome of HLR information retrieval

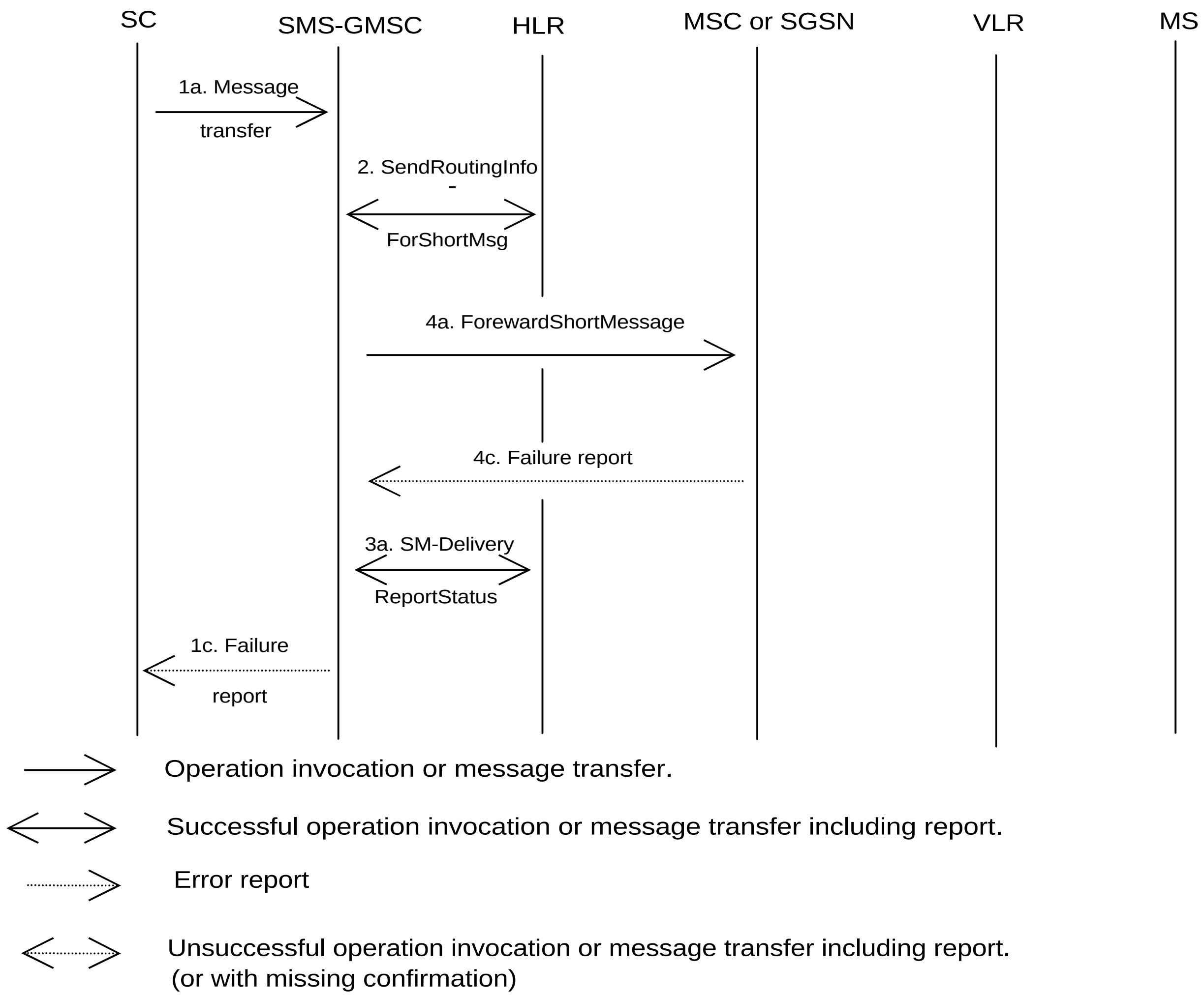


Figure ~~03.40/~~15d): Short message transfer attempt failing due to error at the MSC or SGSN

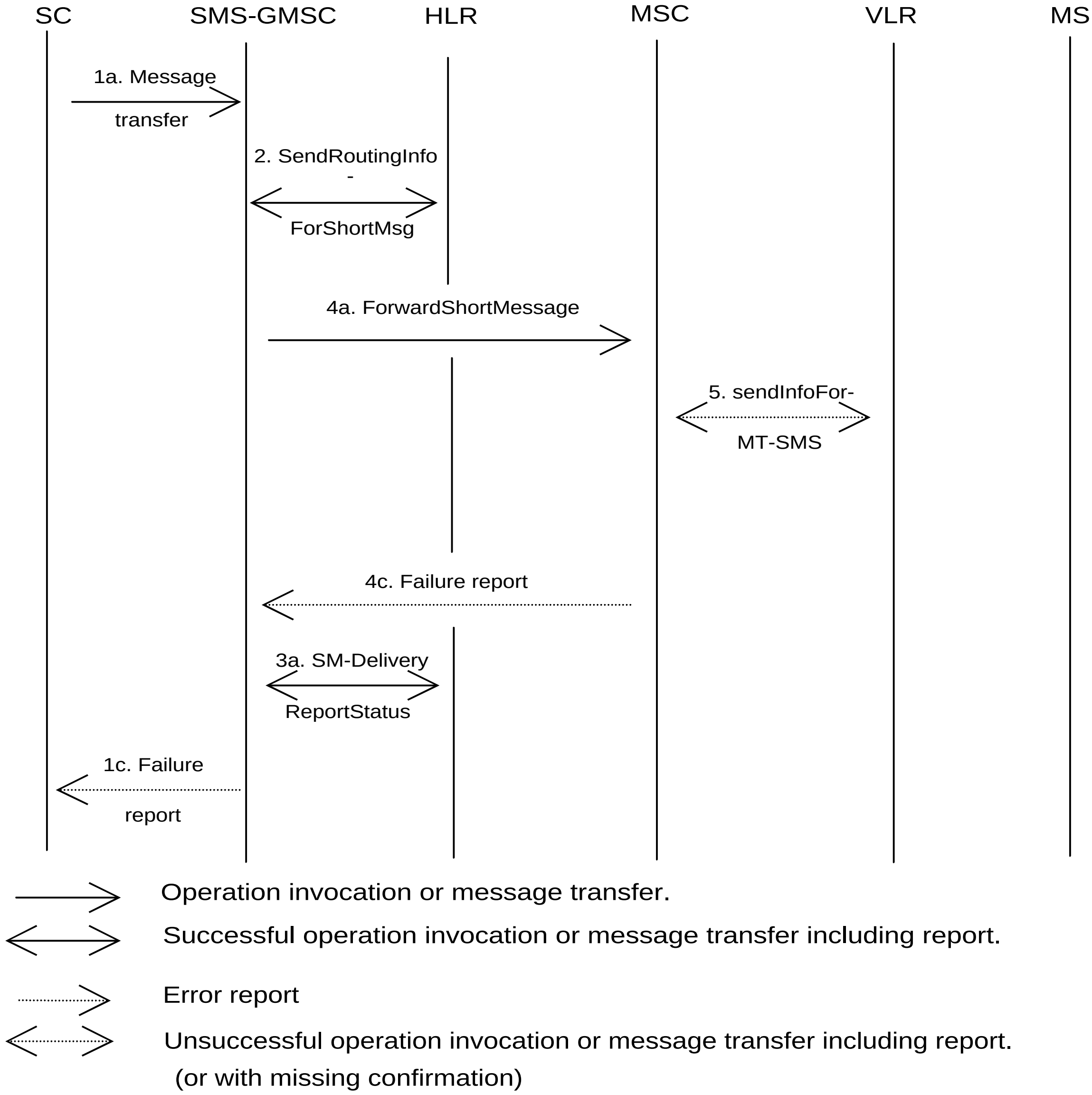
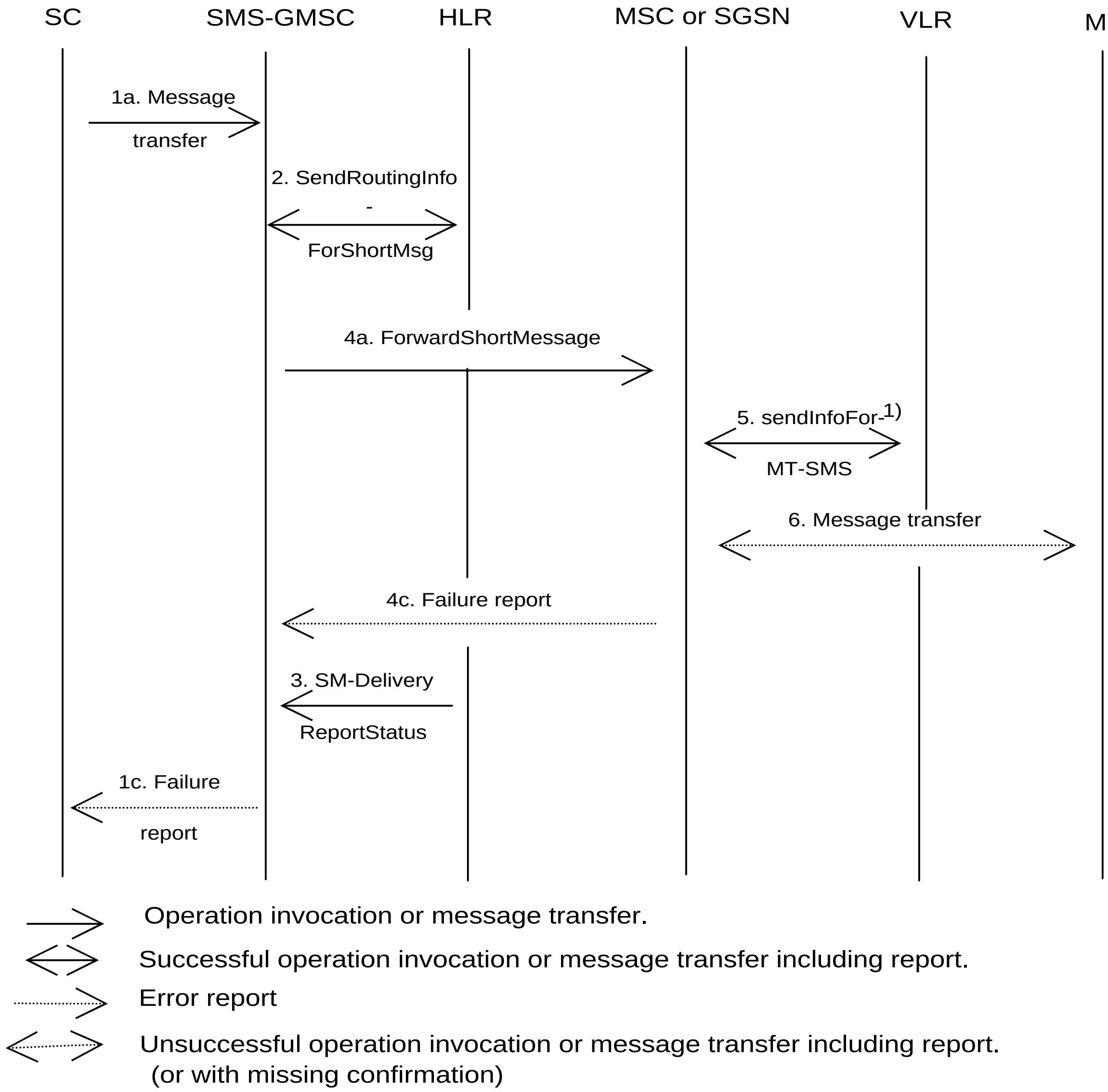


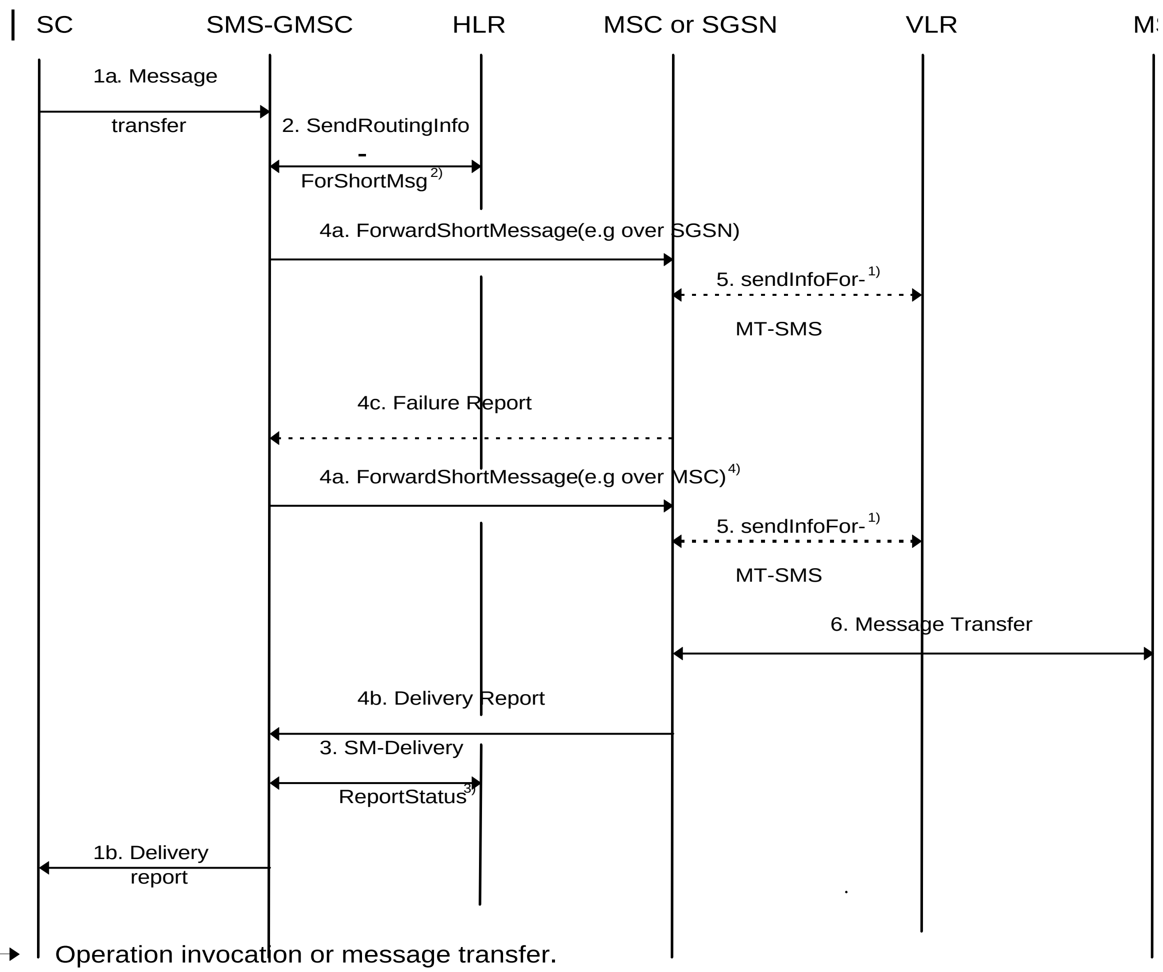
Figure ~~03.40/~~15e): Short message transfer attempt failing due to negative outcome of VLR information retrieval



NOTE:

1): This operation is not used by the SGSN

Figure ~~03.40/~~15f): Short message transfer attempt failing due to erroneous message transfer on the radio path



Operation invocation or message transfer.
Successful operation invocation or message transfer including report.
Error report
Unsuccessful operation invocation or message transfer including report.
(or with missing confirmation)

NOTES:

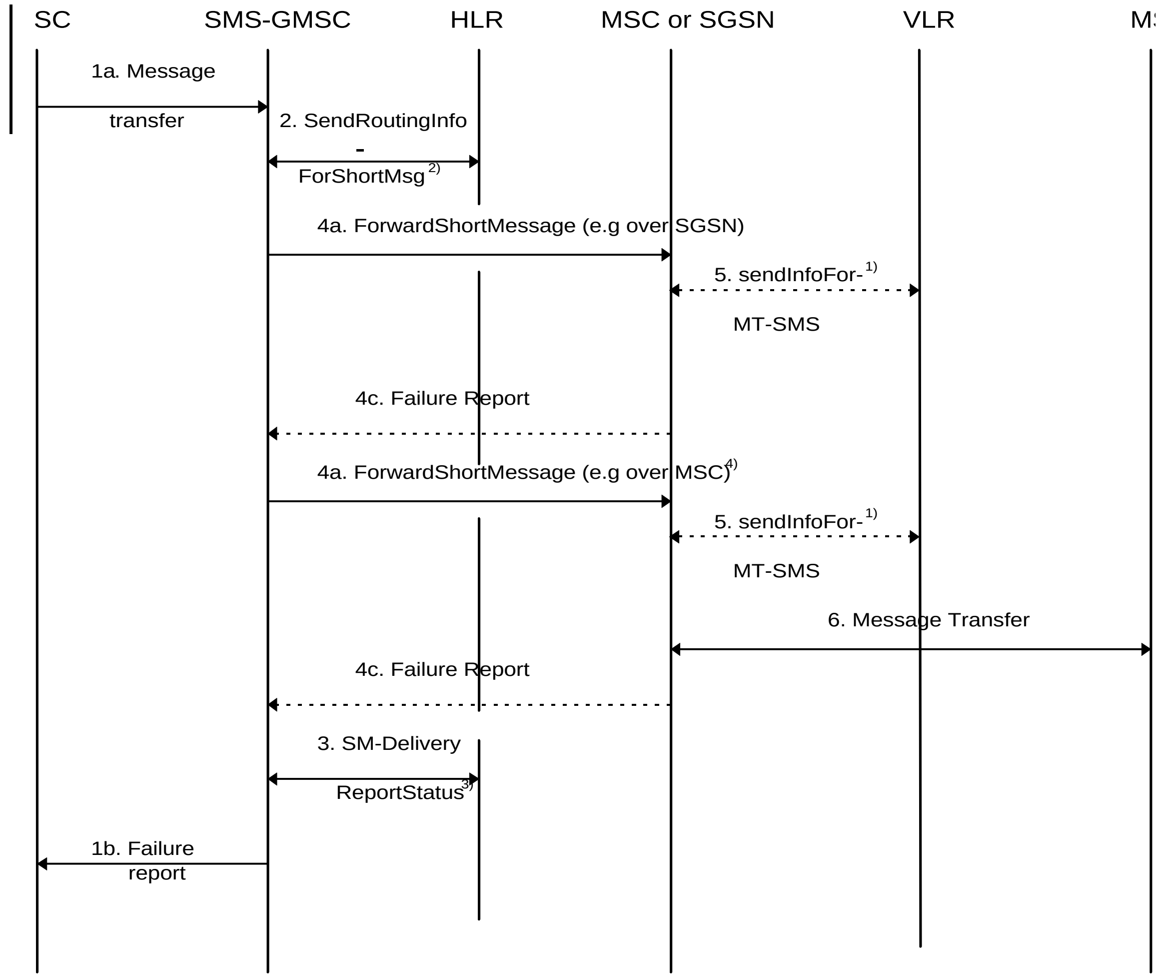
1): This operation is not used by the SGSN

2): Two addresses (SGSN and MSC) are received from HLR

3): Successful transfer over second path and unsuccessful transfer over first path (e.g. Absent subscriber) are sent to HLR

4): The SMS transfer towards the second path is only triggered by the reception of some MAP errors on the first path as described in chapter 8.1.1.

Figure ~~03.40/~~15g): Short message transfer attempt failing over the first path (e.g. SGSN) and succeeding over the second path (e.g. MSC)



Operation invocation or message transfer.
Successful operation invocation or message transfer including report.
Error report
Unsuccessful operation invocation or message transfer including report.
(or with missing confirmation)

NOTES:

1): This operation is not used by the SGSN

2): Two addresses (SGSN and MSC) are received from HLR

3): Unsuccessful transfer over the second path (e.g. MemoryCapacityExceeded) and over the first path (e.g. Absent subscriber) are sent to HLR

4): The SMS transfer towards the second path is only triggered by the reception of some MAP errors on the first path as described in chapter 8.1.1.

Figure ~~03.40/~~15h): Short message transfer attempt failing over the first path (e.g. SGSN) and over the second path (e.g. MSC)

Operation 1: Message transfer SC -> SMS-GMSC

This operation is used to transfer a short message from an SC to an SMS-GMSC.

The operation consists of:

- the transfer of a message containing the TPDU from the SC to the SMS-GMSC (see "1a. Message transfer" in figure ~~03.40/~~15); and
- the return of either a "Failure report" (see 1c. in figure ~~03.40/~~15) or a "Delivery report" (see 1b. in figure ~~03.40/~~15).

"Failure report" is returned to the SC when the SMS-GMSC has received indication from another entity (MSC, SGSN or HLR) the procedure was unsuccessful. The error indications which the SMS-GMSC may receive from the MSC, SGSN, HLR, VLR or MS enable the SMS-GMSC to return one of the error indications given in subclause 3.3 back to the SC.

Operation 2: sendRoutingInfoForShortMsg

The operation is an interrogation of the HLR by the SMS-GMSC to retrieve information necessary to forward the short message.

The result may contain the MSC, SGSN or both addresses, and shall also indicates which address belongs the MSC and the SGSN.

Operation 3: SM-DeliveryReportStatus

The operation provides a means for the SMS-GMSC to request the HLR to add an SC address to the MWD, and is activated when the SMS-GMSC receives an absent subscriber indication from the MSC, SGSN or both, and/or when the SMS-GMSC receives a failure report for a short message transfer with cause MS Memory Capacity Exceeded via the MSC or SGSN. The Return Result optionally contains the MSIsdn-Alert.

This operation is also activated at successful delivery short message when the MNRF, MNRG or both are set in HLR.

The operation consists of:

- the transfer of a message, containing the MSISDN of the MS to which the short message was addressed, the SC-address, the successful outcome and/or the causes (Absent Subscriber, MS memory capacity exceeded or both) for updating the MWD, from the SMS-GMSC to the HLR (see 3. in figure ~~03.40/~~15).

Operation 4: forwardShortMessage

The operation provides a means for the SMS-GMSC to transfer a short message to the MSC or to the SGSN at which the MS is currently located.

The operation works in tandem with the forwarding of the short message from the MSC or from the SGSN to the MS. Thus, the outcome of the operation comprises either success, i.e. that the message has been delivered to the MS; or a failure that may be caused by several reasons, e.g. failure in the transfer SMS-GMSC -> MSC or SMS-GMSC -> SGSN, MS being detached, or no paging response.

It should be noted that the MNRG setting is implicitly carried out in SGSN when the message transfer is denied due to GPRS DETACH

Operation 5: sendInfoForMT-SMS

The operation provides a means for the MSC to retrieve subscriber information from VLR for mobile terminated short message transfer. The operation may be associated with an authentication procedure, as shown in figure ~~03.40/~~16. Unsuccessful retrieval (e.g. absent subscriber) is indicated by a cause indication to the SMS-GMSC.

An overall depiction of how operation 5 interacts with signalling on the radio path is given in figure ~~03.40/~~16.

It should be noted that the MNRF setting is implicitly carried out when the message transfer is denied due to IMSI DETACH.

NOTE: This operation is not used by the SGSN.

Operation 6: Message transfer MSC -> MS

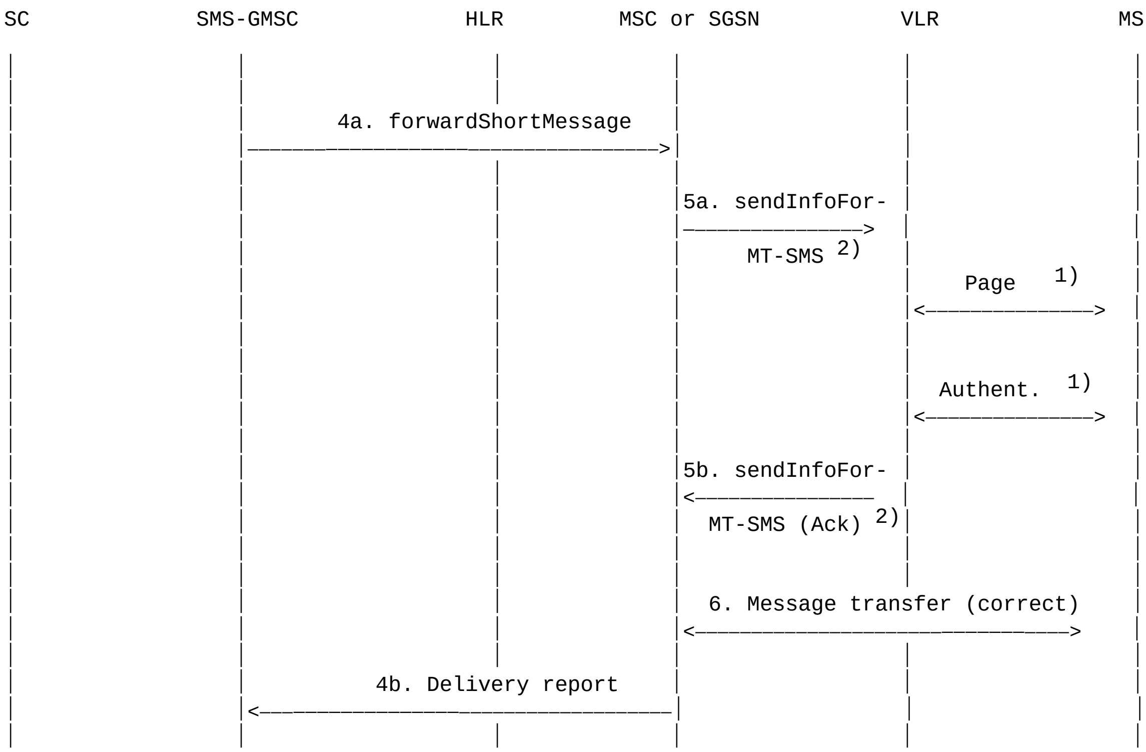
The operation is used to transfer a short message from the MSC to the MS.

If the transfer is not successful, e.g. due to the MS losing radio coverage after having successfully authenticated, a failure report (RP-ERROR) is returned to the SMS-GMSC. In this case, MWD and MCEF in the HLR ~~will~~shall be updated only for the case where the transfer fails with cause MS Memory Capacity Exceeded.

If the MS notifies the network that the MS has been unable to accept a short message because its memory capacity has been exceeded, then the ME ~~will~~shall set the memory capacity Exceeded Notification flag if present.

Operation 7: InformSC

The operation is used to transfer the MSIsdn-Alert from the HLR to the SMS-GMSC in case of the error Absent Subscriber or positive result given as an answer to the operation SendRoutingInfoForSM.




```
-------->:   Operation invocation or message transfer
<------->:   Successful operation invocation or message transfer incl. report
```

NOTES:

1): Described in GSM 04.08 [12] and ~~GSM 09.02~~3G TS 29.002 [15]

If the SGSN is used, Paging and Authentication are performed from SGSN

2): This operation is not used by the SGSN

Figure ~~03.40/~~16a): "Send information for MT SMS" procedure; error free case

```
SC             SMS-GMSC            HLR          MSC or SGSN        VLR              MS

|                 |                  |                  |                 |                 |
|                 |                  |                  |                 |                 |
|                 |     4a. forwardShortMessage         |                 |                 |
|                 |---------------------------------->  |                 |                 |
|                 |                  |                  |                 |                 |
|                 |                  |                  |5a. sendInfoFor- |                 |
|                 |                  |                  |---------------> |                 |
|                 |                  |                  |     MT-SMS  1)  |                 |
|                 |                  |                  |                 |                 |
|                 |                  |                  |                 |                 |
|                 |                  |                  | 5c. Failure     |                 |
|                 |                  |                  |<- - - - - - - - |                 |
|                 |                  |                  |     report  1)  |                 |
|                 |                  |                  |                 |                 |
|                 |        4c. Failure report           |                 |                 |
|                 |<- - - - - - - - - - - - - - - - - - |                 |                 |
|                 |                  |                  |                 |                 |
|                 | 3a. SMDelivery   |                  |                 |                 |
|                 |---------------->  |                  |                 |                 |
|                 |   ReportStatus   |                  |                 |                 |

-------->:   Operation invocation or message transfer
 - - - ->        :   Error report
```

NOTE:

1): The GPRS DETACH information is in the SGSN

This operation is not used by the SGSN

Figure ~~03.40/~~16b): "Send information for MT SMS" procedure; erroneous case: absent subscriber (e.g. IMSI DETACH or GPRS DETACH)

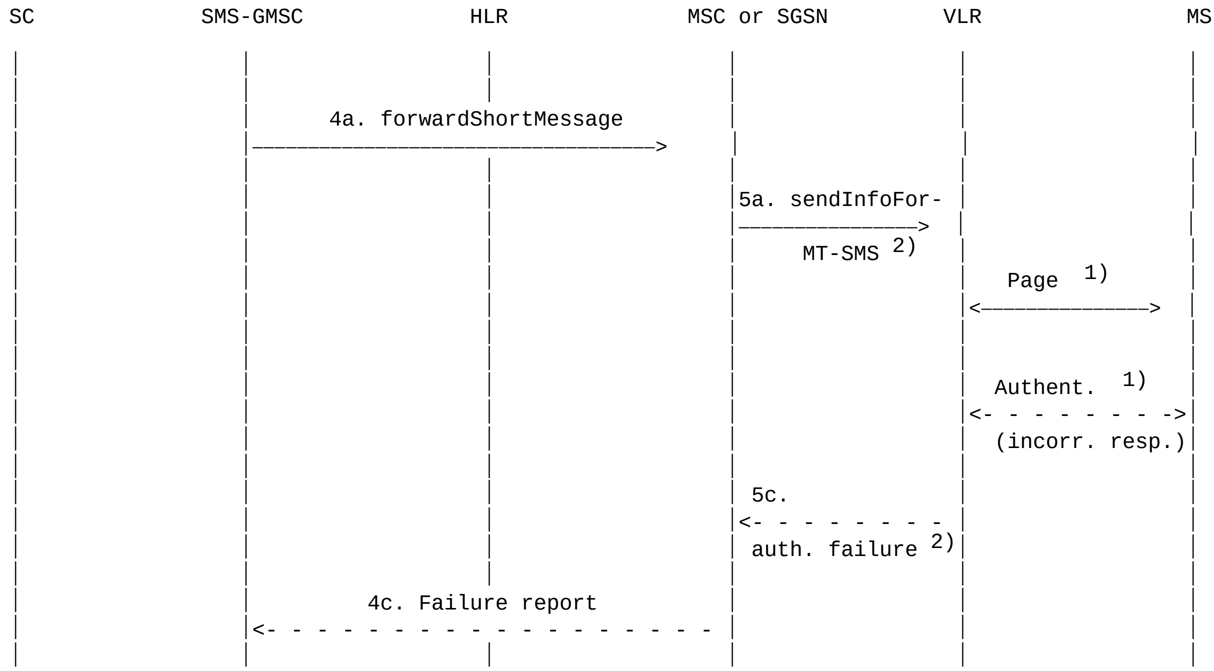
```
SC             SMS-GMSC            HLR            MSC or SGSN        VLR              MS

|                 |                  |                  |                 |                 |
|                 |                  |                  |                 |                 |
|                 |     4a. forwardShortMessage         |                 |                 |
|                 |---------------------------------->  |                 |                 |
|                 |                  |                  |                 |                 |
|                 |                  |                  |5a. sendInfoFor- |                 |
|                 |                  |                  |---------------> |                 |
|                 |                  |                  |   MT-SMS 2)     |                 |
|                 |                  |                  |                 |   Page  1)      |
|                 |                  |                  |                 |---------------->|
|                 |                  |                  |                 |                 |
|                 |                  |                  | 5c. Paging      |                 |
|                 |                  |                  |<- - - - - - - - |                 |
|                 |                  |                  |   failure2)     |                 |
|                 |                  |                  |                 |                 |
|                 |        4c. Failure report           |                 |                 |
|                 |<- - - - - - - - - - - - - - - - - - |                 |                 |
|                 |                  |                  |                 |                 |
|                 | 3a. SM-Delivery                     |                 |                 |
|                 |---------------->  |                  |                 |                 |
|                 |   ReportStatus                      |                 |                 |

-------->:   Operation invocation or message transfer
 - - - ->        :   Error report
```

NOTES:

1): Described in GSM 04.08 [12] and ~~GSM 09.02~~3G TS 29.002 [15]
If the SGSN is used, Paging is performed from SGSN

2): This operation is not used by the SGSN

Figure ~~03.40/~~16c): "Send information for MT SMS" procedure; erroneous case: Absent subscriber (e.g. no paging response)



——————>: Operation invocation or message transfer
- - - -> : Error report
<- - - -> : Unsuccessful operation invocation or message transfer including error report (or with missing confirmation)

NOTES:

1): Described in GSM 04.08 [12] and ~~GSM 09.02~~3G TS 29.002 [15]

If the SGSN is used, Paging and Authentication are performed from SGSN

2): This operation is not used by the SGSN

Figure ~~03.40/~~16d): "Send information for MT SMS" procedure; incorrect authentication

10.2 Short message mobile originated

The entities involved in this procedure is depicted in figure ~~03.40/~~17.

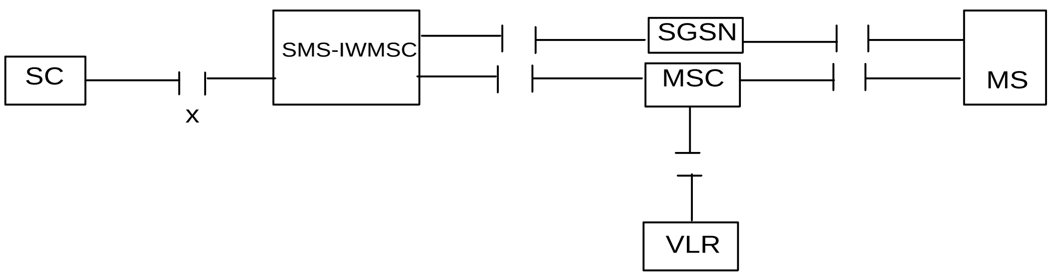


Figure ~~03.40/~~17: Interfaces involved in the Short message mobile originated procedure.

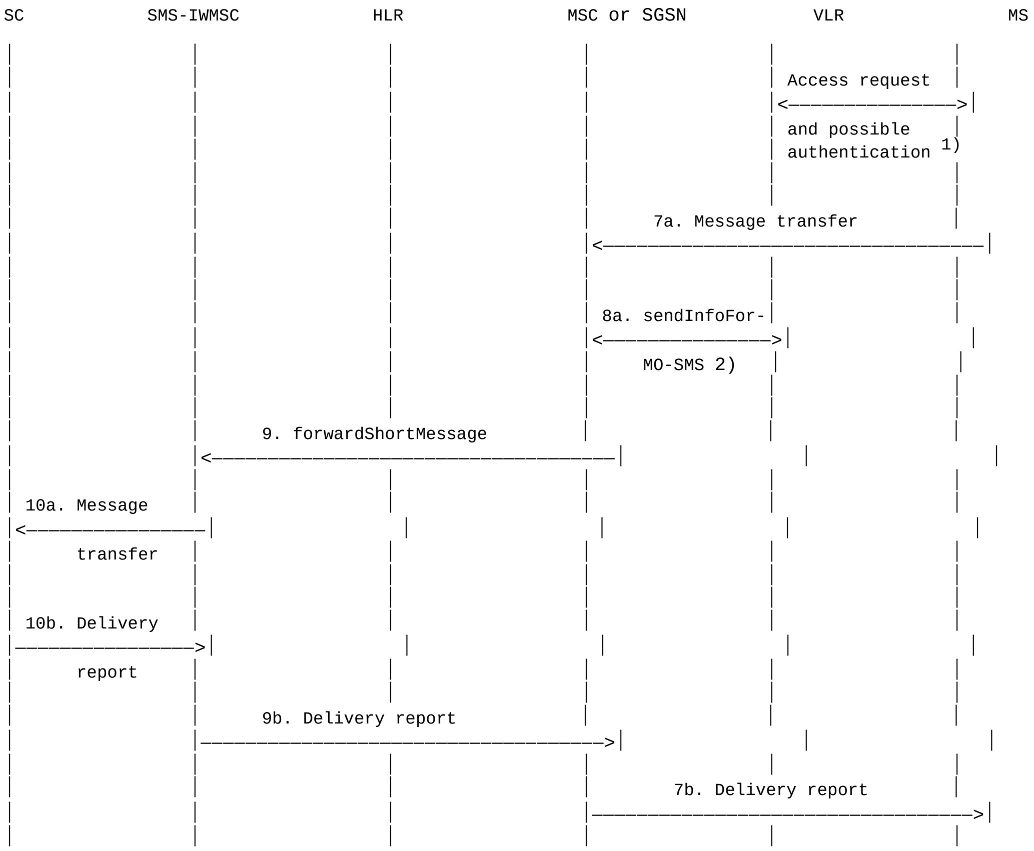
GSM TS 03.02 [5]. X is the interface between an MSC or an SGSN and an SC as defined in chapter 5

Note that since the short message mobile originated procedure covers the functionality required at SM-RL for transferring TPDUs from SC to MS, the procedure described covers both short message (SMS-SUBMIT) and command (SMS-COMMAND) transfer. The term "short message transfer" therefore in this subclause, covers both cases.

In figure ~~03.40/~~18, sequence diagrams for the following basic situations of short message mobile terminated transfer attempt:

- Successful short message transfer;
- Short message transfer attempt failing due to error at the MSC or SGSN;
- Short message transfer attempt failing due to negative outcome of VLR information retrieval;
- Short message transfer attempt failing due to error at the SMS-IWMSC;
- Short message transfer attempt failing due to error at the SC.

References to the relevant specifications of the different operations are given in clause 4.



————> : Operation invocation or message transfer
<————> : Successful operation invocation or message transfer including report

NOTES:

1): Described in ~~GSM 04.08~~ [12] and ~~GSM 09.02~~3G TS 29.002 [15].

2): This operation is not used by the SGSN

Figure ~~03.40/~~18a): Successful short message transfer attempt

```
  SC          SMS-IWMSC         HLR            MSC or SGSN       VLR              MS

   |              |              |                  |              |               |
   |              |              |                  |              |               |
   |              |              |                  |              | Access request|
   |              |              |                  |              |<------------->|
   |              |              |                  |              | and possible  |
   |              |              |                  |              | authentication 1)
   |              |              |                  |              |               |
   |              |              |                  |              |               |
   |              |              |                  |      7a. Message transfer    |
   |              |              |                  |<-----------------------------|
   |              |              |                  |              |               |
   |              |              |                  |              |               |
   |              |              |                  |        7c. Failure report    |
   |              |              |                  | - - - - - - - - - - - - - - >|
   |              |              |                  |              |               |
```

—————> : Operation invocation or message transfer
<—————> : Successful operation invocation or message transfer including report
- - - -> : Error report

NOTE:

1) : Described in GSM 04.08 [12] and ~~GSM 09.02~~3G TS 29.002 [15]

Figure ~~03.40/~~18b): Short message transfer attempt failing due to error at the MSC or SGSN

```
  SC          SMS-IWMSC         HLR          MSC or SGSN         VLR             MS

   |              |              |                  |              |               |
   |              |              |                  |              |               |
   |              |              |                  |              | Access request|
   |              |              |                  |              |<------------->|
   |              |              |                  |              | and possible  |
   |              |              |                  |              | authentication 1)
   |              |              |                  |              |               |
   |              |              |                  |              |               |
   |              |              |                  |      7a. Message transfer    |
   |              |              |                  |<-----------------------------|
   |              |              |                  |              |               |
   |              |              |                  |              |               |
   |              |              |                  | 8. sendInfoFor-              |
   |              |              |                  |<- - - - - - >|               |
   |              |              |                  |   MO-SMS 2)  |               |
   |              |              |                  |              |               |
   |              |              |                  |              |               |
   |              |              |                  |        7c. Failure report    |
   |              |              |                  | - - - - - - - - - - - - - - >|
   |              |              |                  |              |               |
```

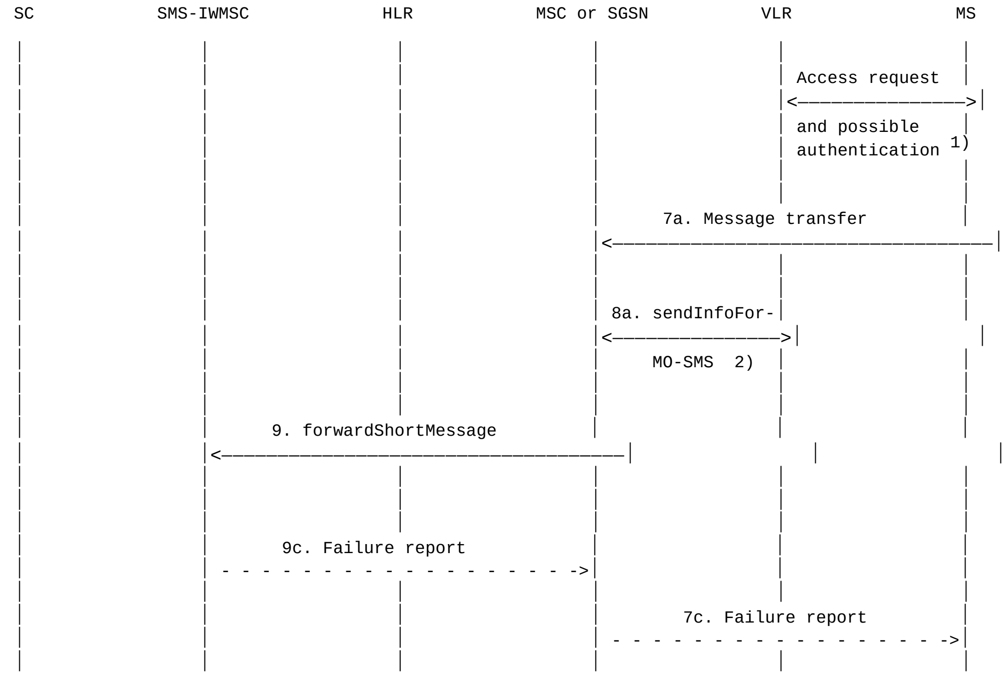
—————> : Operation invocation or message transfer
<—————> : Successful operation invocation or message transfer including report
- - - -> : Error report
<- - - -> : Unsuccessful operation invocation or message transfer incl. error report (or with missing confirmation)

NOTES:

1): Described in GSM 04.08 [12] and ~~GSM 09.02~~3G TS 29.002 [15]

2): This operation is not used by the SGSN

Figure ~~03.40/~~18c): Short message transfer attempt failing due to negative outcome of VLR information retrieval



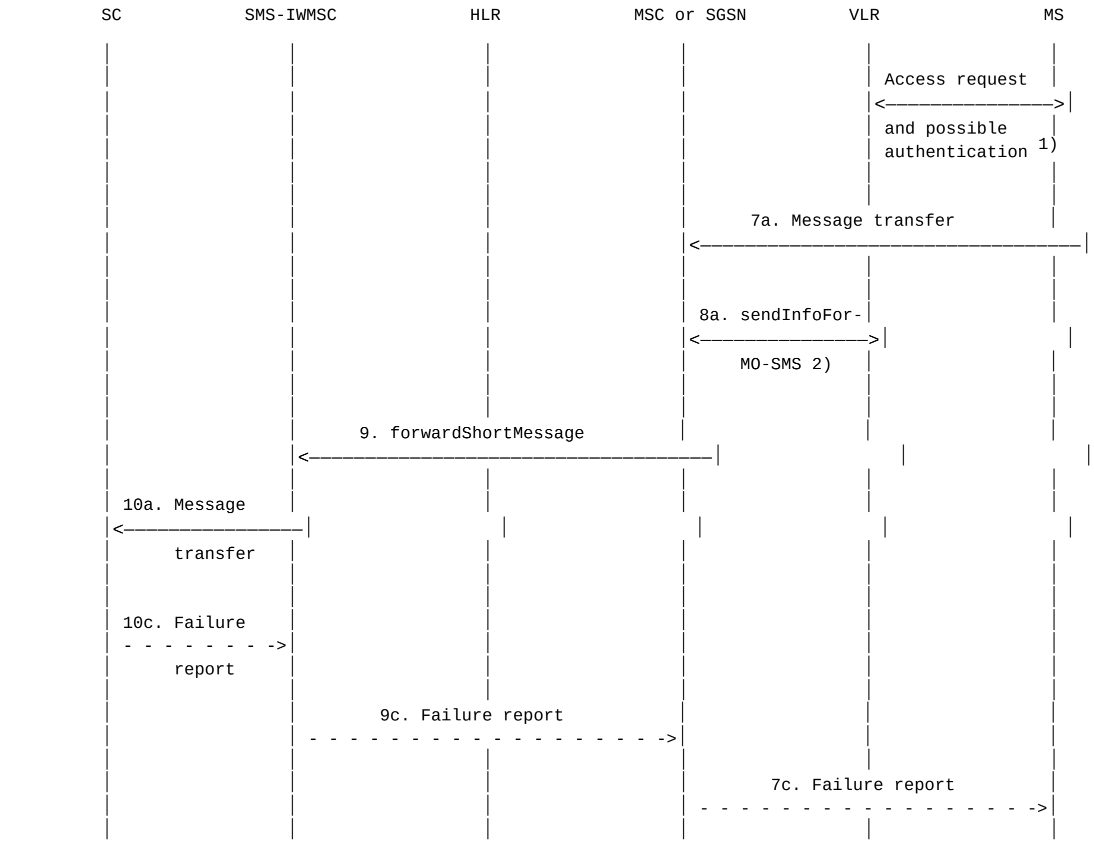
——————> : Operation invocation or message transfer
<——————> : Successful operation invocation or message transfer including report
- - - -> : Error report

NOTES:

1): Described in GSM 04.08 [12] and ~~GSM 09.02~~3G TS 29.002 [15]

2): This operation is not used by the SGSN

Figure ~~03.40/~~18d): Short message transfer attempt failing due to error at the SMS-IWMSC



———————> : Operation invocation or message transfer
<———————> : Successful operation invocation or message transfer including report
- - - -> : Error report

NOTES:

1): Described in ~~GSM 04.08~~GSM 04.08 [12] and ~~GSM 09.02~~3G TS 29.002 [15].

2): This operation is not used by the SGSN

Figure ~~03.40/~~18e): Short message transfer attempt failing due to error at the SC

Operation 7: Message transfer MS -> MSC or MS -> SGSN

The operation is used to transfer a short message from the MS to the MSC or to the SGSN.

Operation 8: sendInfoForMO-SMS

The operation provides a means for the MSC to verify from the VLR that the mobile originated short message transfer does not violate supplementary services invoked or restrictions imposed using the network feature Operator Determined Barring.

A successful VLR response carries the MSIsdn of the originating MS being transferred to the SC at SM-RL.

NOTE: This operation is not used by SGSN.

Operation 9: forwardShortMessage

The operation provides a means for the MSC or for the SGSN to transfer a short message to the SMS-IWMSC.

The procedure is required if the serving MSC or SGSN cannot access the SC directly, e.g. because it has no connection to SC (see clause 5).

The procedure works in tandem with the forwarding of the short message from the SMS-IWMSC to the SC. Thus, the outcome of the operation comprises either success, i.e. that the message has been delivered to the SC; or a failure that may be caused by several reasons, e.g. failure in the transfer MSC --> SMS-IWMSC or SGSN --> SMS-IWMSC, SC does not comply.

Operation 10: Message transfer SMS-IWMSC -> SC

The operation is used to transfer a short message from an SMS-IWMSC to an SC, and consists of:

- the transfer of a message containing the TPDU from the SMS-IWMSC to the SC (see "10a. Message transfer" in figure ~~03.40/~~18); and
- the return of either a "Failure report" (see 10c. in figure ~~03.40/~~18) or a "Delivery report" (see 10b. in figure ~~03.40/~~18).

"Failure report" is returned to the MS when the SMS-IWMSC has received indication from the network or the SC that the procedure was unsuccessful.

10.3 Alert transfer

The entities involved in this procedure are depicted in figure ~~03.40/~~19.

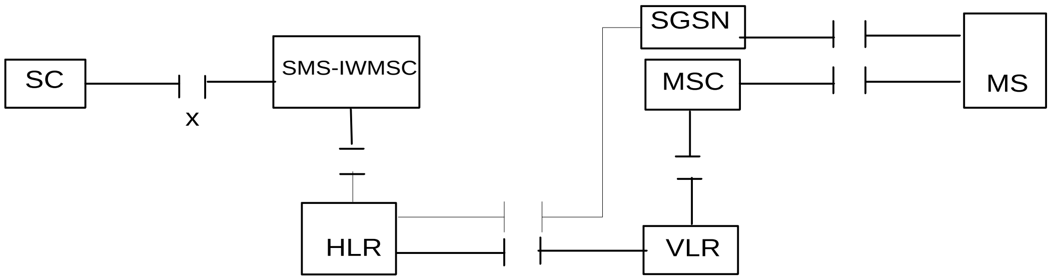


Figure ~~03.40/~~19: Interfaces involved in the Alert procedure. X is the interface between an SC and an MSC as defined in clause 5

This procedure consists of the operations shown in figure ~~03.40/~~20.

Three cases are distinguished:

- the MS becomes reachable when the MNRF, MNRG or both are set but the MCEF is not set (figure ~~03.40/~~20a);
- the MS becomes reachable when the MNRF, MNRG or both, and the MCEF are set (figure ~~03.40/~~20b);
- the MS notifies the network that it has memory available to receive one or more short messages when the MCEF is set (figure ~~03.40/~~20c).

The operations between MSC and VLR, between HLR and VLR or SGSN and between HLR and SMS-IWMSC are specified in ~~GSM 09.02~~3G TS 29.002 [15]. The operation between MS and MSC or SGSN is specified in ~~GSM 04.11~~3G TS 24.011 [13]. References to specifications of other operations are given in clause 4.

```
SC              SMS-IWMSC          HLR               MSC             VLR or SGSN        MS

 |                  |                  |                  |                  |                  |
 |                  |                  |                  |                  |                  |
 |                  |                  |       11. ReadyForSM                |                  |
 |                  |                  |<--------------------------------    |                  |
 |                  |                  |                  | (MS reachable) 1)                   |
 |                  |                  |                  |                  |                  |
 |                  |12. alertService- |                  |                  |                  |
 |                  |<---------------  |                  |                  |                  |
 |                  |      Centre      |                  |                  |                  |
 |                  |                  |                  |                  |                  |
 |                  |                  |                  |                  |                  |
 |13. Service-      |                  |                  |                  |                  |
 |<---------------  |                  |                  |                  |                  |
 |    CentreAlert   |                  |                  |                  |                  |
 |                  |                  |                  |                  |                  |

-------->:    Operation invocation or message transfer
```

NOTE:1): In case ReadyForSM is sent by the SGSN, the reason may be MS reachable via the SGSN, or MS reachable via the SGSN and the MSC (see ~~GSM 03.60~~3G TS 23.060 [27]).

Figure ~~03.40/~~20a: The alert procedure when the MS becomes reachable, MNRF, MNRG or both are set and MCEF is not set

```
SC              SMS-IWMSC          HLR               MSC         VLR or SGSN          MS

 |                  |                  |                  |                  |                  |
 |                  |                  |                  |                  |                  |
 |                  |                  |       11. ReadyForSM                                   |
 |                  |                  |<--------------------------------    |                  |
 |                  |                  |                  |  (MS reachable) 1)                  |

-------->:    Operation invocation or message transfer
```

NOTE:1): In case ReadyForSM is sent by the SGSN, the reason may be MS reachable via the SGSN, or MS reachable via the SGSN and the MSC (see ~~GSM 03.60~~3G TS 23.060 [27]).

Figure ~~03.40/~~20b: The alert procedure when the MS becomes reachable, MNRF, MNRG or both are set and MCEF is set

```
SC              SMS-IWMSC          HLR          MSC or SGSN          VLR                MS

 |                  |                  |                  |                  |                  |
 |                  |                  |                  | ReadyForSM       |                  |
 |                  |                  |    14. (smMemoryCapacityAvailable) 1)                  |
 |                  |                  |<---------------------------------------------------->|
 |                  |                  |                  |                  |                  |
 |                  |                  |                  |                  |                  |
 |                  |12. alertService- |                  |                  |                  |
 |                  |<---------------  |                  |                  |                  |
 |                  |      Centre      |                  |                  |                  |
 |                  |                  |                  |                  |                  |
 |13. Service-      |                  |                  |                  |                  |
 |<---------------  |                  |                  |                  |                  |
 |    Centrealert   |                  |                  |                  |                  |
 |                  |                  |                  |                  |                  |
 |                  |                  |                  |                  |                  |

--------> :   Operation invocation or message transfer
<-------->    :   Successful operation invocation or message transfer including report
```

NOTE:1): Described in ~~GSM 04.11~~3G TS 24.011 [13] and ~~GSM 09.02~~3G TS 29.002 [15].

Figure ~~03.40/~~20c; The alert procedure when the MS notifies the network that it has memory available to receive one or more short messages and MCEF is set

Operation 11: ReadyForSM (MS reachable)

The operation provides a means to transfer alert information from VLR or SGSN to HLR.

The procedure is activated when the VLR or the SGSN detects that the MS is active, i.e. when the MS responds to a paging request.

Operation 12: alertServiceCentre

The operation provides a means to transfer alert information from HLR to MSC.

Operation 13: ServiceCentrealert

The operation provides a means to transfer alert information from an SMS-IWMSC to an SC.

The operation consists of transfer of a message ("RP-ALERT-SC") from the SMS-IWMSC to the SC.

Operation 14: ReadyForSM (smMemoryCapacityAvailable)

The operation provides a means for the MS to notify the network that it has memory available to receive one or more short messages.

The following applies if the memory capacity available notification flag is implemented in the ~~SIM~~(U)SIM.

The operation consists of transfer of a message ("RP-SM-MEMORY-AVAILABLE") from the MS to the HLR, and the return of an acknowledgement to the MS. When the MS rejects a short message due to lack of available memory capacity the need to transfer notification shall be stored in the ~~SIM~~(U)SIM. After a attempt to transfer the RP-SM-Memory-Available message the following applies:

If the MS receives a positive acknowledgement it ~~will~~shall unset the memory capacity exceeded notification flag in the ~~SIM~~(U)SIM and exit this procedure.

If the MS receives a negative acknowledgement indicating a permanent failure condition (as specified in ~~GSM 04.11~~3G TS 24.011 [13]) it ~~will~~shall unset the memory capacity exceeded notification flag in the ~~SIM~~(U)SIM and exit the procedure.

If the MS receives a negative acknowledgement indicating a temporary failure condition (as specified in ~~GSM 04.11~~3G TS 24.011 [13]) or receives no acknowledgement or an indication of failure by lower layers, it ~~will~~shall repeat the attempt to transfer the message in accordance with procedures defined in ~~GSM 04.11~~3G TS 24.011 [13]. If these repeat procedures fail, the mobile ~~will~~shall unset the memory capacity exceeded notification flag in the ~~SIM~~(U)SIM and exit this procedure.

If memory capacity has become available because memory is cleared, the value of the memory capacity exceeded notification flag is read. If the flag is set, the MS notifies the network that memory capacity is now available as described above.

When the mobile is powered up or the SIM / UICC is inserted, the mobile shall check the memory capacity exceeded notification flag in the ~~SIM~~(U)SIM; if the flag is set and the ~~SIM~~(U)SIM has memory available to receive a short message the mobile shall attempt to notify the network that it has memory available, as described above.

11 Mapping of error causes between RP layers

This clause describes the interworking between the relay layers on the radio interface (i.e. between the servicing MSC/SGSN and the mobile station), and within the network (i.e. between servicing MSC/SGSN, VLR, HLR, or GMSC).

11.1 Mobile Terminated short message transfer

If errors are indicated by the VLR after invocation of the "sendInfoFor-MT-SMS" operation, the appropriate error information is returned to the SMS-GMSC in a failure report as specified in ~~GSM 09.02~~3G TS 29.002 [15] (negative outcome of "forwardShortMessage" see clause 10), If errors are detected by the MSC or by the SGSN during the transfer on the radio interface, the error cause returned in the return error of the MAP procedure ForwardShortMessage shall be set as follows:

Failure at the MSC or SGSN	**Return error to be included in the MAP-proc**
RP-ERROR message with error cause: 22 Memory capacity exceeded Other error causes	 SM_DeliveryFailure with cause "MemoryCapacityExceeded"1) SM_DeliveryFailure with cause "equipmentProtocolError"1)
CP or lower layer error (e.g. RR, layer 2 failure)2) Mobile has no SM capability	SM_DeliveryFailure with cause "equipmentProtocolError"1) SM_DeliveryFailure with cause "equipmentNotSM-Equiped"1)0
TR1N timeout 2) MNSMS-error-ind (No SAPI 3)	SM_DeliveryFailure with cause "equipmentProtocolError"1)

1) For definition of MAP error SM_DeliveryFailure and its parameter "cause" see ~~GSM 09.02~~3G TS 29.002 [15].

2) The error causes of the RP-ERROR message, the CP layer and timer TR1N are defined in ~~GSM 04.11~~3G TS 24.011 [13].

11.2 Memory available notification

If errors are indicated by the HLR (via the VLR or the SGSN) after invocation of the "ReadyForSM" operation, the MSC or the SGSN shall return the appropriate error information to the MS in a failure report (i.e. a RP-ERROR message) containing the following error cause:

Return error from ReadyForSM (Alert Reason is "memory available")	**Cause value in the RP-ERROR message**
DataMissing UnexpectedDataValue UnknownSubscriber FacilityNotSupported System Failure	38 Network out of order 38 Network out of order 30 Unknown Subscriber 69 Requested facility not implemented 38 Network out of order
Local or lower layer failure (e.g. reject condition, timer expired or transaction abort)	38 Network out of order

NOTE: The coding and the use of the RP-ERROR message is specified in ~~GSM 04.11~~3G TS 24.011 [13].

11.3 Mobile Originated short message transfer

If errors are indicated by the VLR after invocation of the "sendInfoForMO-SMS" operation.(see clause 10), the MSC shall return the appropriate error information to the MS in a failure report (i.e. a RP-ERROR message) containing the following error cause:

Return error from SendInfoForMO-SMS	Cause value in the RP-ERROR message
DataMissing UnexpectedDataValue TeleserviceNotProvisioned CallBarred - barringServiceActive - operatorBarring	38 Network out of order 38 Network out of order 50 Requested facility not subscribed 10 Call barred 8 Operator determined barring

NOTE: The coding and the use of the RP-ERROR message is specified in ~~GSM 04.11~~3G TS 24.011 [13].The operation SendInfoForMO-SMS is not used by the SGSN.

If errors are indicated by the SMS-IWMSC (negative outcome of the "forwardShortMessage),) the MSC or the SGSN shall send a failure report (i.e. a RP-ERROR message) to the MS, with the error cause coded as follows:

Return error from ForwardShortMessage	Cause value in the RP-ERROR message
DataMissing FacilityNotSupported UnexpectedDataValue SM-DeliveryFailure cause: unknownSC SM-DeliveryFailure cause: SC-Congestion SM-DeliveryFailure cause: invalidSME-Addr SM-DeliveryFailure cause: subscriberNotSC-Subscriber	38 Network out of order 69 Requested facility not implemented 38 Network out of order 1 Unassigned number 42 Congestion 21 Short message transfer rejected 28 Unidentified subscriber
Local or lower layer failure (e.g. reject condition, timer expired or transaction abort)	38 Network out of order

NOTE: The coding and the use of the RP-ERROR message is specified in ~~GSM 04.11~~3G TS 24.011 [13].

Annex A (informative): Protocol stacks for interconnecting SCs and MSCs

No mandatory protocol between the Service Centre (SC) and the Mobile Switching Centre (MSC) below the transfer layer is specified by ~~GSM~~GSM/UMTS specifications; this is a matter of agreement between SC and PLMN operators.

Some example protocols are provided in GSM TS 03.47 [11] to assist SC and PLMN operators. These are based on the following principles, which SC and PLMN operators are recommended to follow even if they choose not to use one of the examples given in GSM TS 03.47 [11]:

The protocol(s) between SC and MSC below transfer layer should:

a) provide the service defined for SM-RL (see Section 9.3);

b) be based on widely accepted telecommunications protocols in the public domain;

c) permit open interconnection.

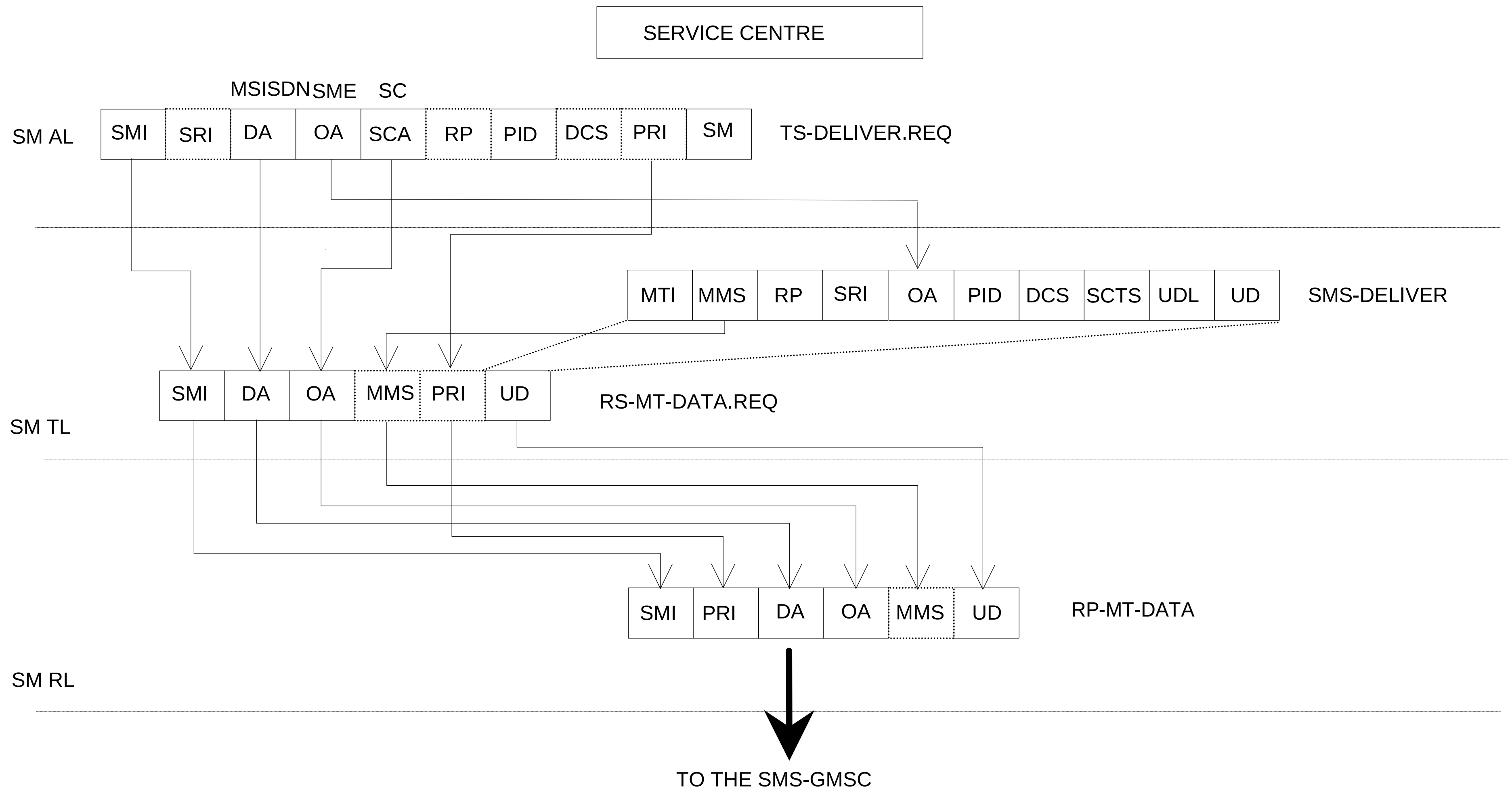
Annex B (informative):
Information now contained in ~~GSM 03.38~~3G TS 23.038 [9]

Annex B held information that is now contained in ~~GSM 03.38~~3G TS 23.038 [9].

Annex C (informative): Short message information flow

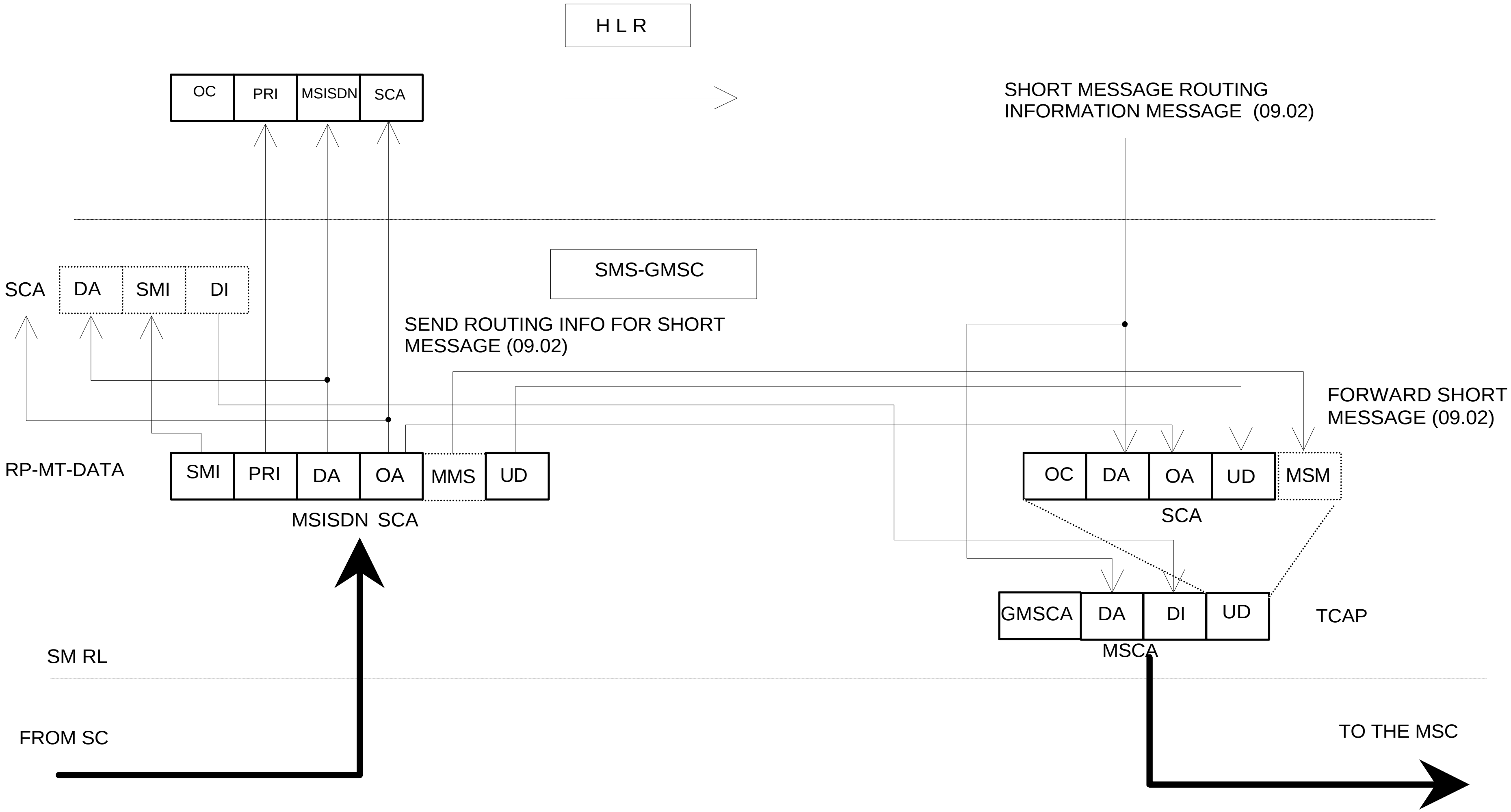
The diagrams in this annex describe the flow of primitives and parameters during the short message transfer. These diagrams refer to specifications ~~GSM 03.40~~3G TS 23.040, 3G TS ~~04.11~~24.011[13] and 3G TS ~~09.02~~29.002 [15]. The parameters in dotted lines are optional. The abbreviations used in diagrams are listed below. The relevant specifications are given in parentheses. (*) stands for a common ~~GSM~~GSM/UMTS abbreviations and (-) for a general abbreviation.

CM	Call Management (*)
CS	CauSe (-)
DA	Destination Address (-)
DCS	Data Coding Scheme (3G TS 23.040~~03.40~~)
DI	Dialogue Identifier TCAP
GMSCA	Gateway MSC Address
GPRS	General Packet Radio Services 3G TS 23.060~~(03.60~~ [27])
HLR	Home Location Register (*)
IMSI	International Mobile Subscriber Identity (*)
MAL	MSIsdn-Alert (~~03.40~~3G TS 23.040)
MMS	More Messages to Send (~~03.40~~3G TS 23.040)
MR	Message Reference (~~03.40~~3G TS 23.040)
MS	Mobile Station (*)
MSC	Mobile services Switching Centre (*)
MSCA	MSC Address
MSI	Mobile waiting Set Indication (~~03.40~~3G TS 23.040)
MSIsdn	Mobile Station ISDN number (*)
MSM	More Short Messages (~~09.02~~3G TS 29.002 [15])
MSRN	Mobile Station Roaming Number (*)
MT	Message Type (~~04.11~~3G TS 24.011[13])
MTI	Message Type Indicator (~~04.11~~3G TS 24.011[13])
MWS	Message Waiting Set (~~03.40~~3G TS 23.040)
OA	Originating Address (-)
OC	Operation Code (~~09.02~~3G TS 29.002 [15])
PCI	Protocol Control Information (-)
PDI	Protocol DIscriminator (*)
PRI	PRIority (~~03.40~~3G TS 23.040)
RCT	ReCeption Time (~~03.40~~3G TS 23.040)
REA	REcipient Address (~~03.40~~3G TS 23.040)
RL	ReLay function (~~04.11~~3G TS 24.011[13])
RP	Reply Path (~~03.40~~3G TS 23.040)
SC	Service Centre (~~03.40~~3G TS 23.040)
SCA	Service Centre Address (~~03.40~~3G TS 23.040)
SCTS	Service Centre Time Stamp (~~03.40~~3G TS 23.040)
SGSN	Serving GPRS Support Node (3G TS 23.060~~03.0)~~ [27]
SM	Short Message (~~03.40~~3G TS 23.040)
SM-AL	Short Message Application Layer (~~03.40~~3G TS 23.040)
SME	Short Message Entity (~~03.40~~3G TS 23.040)
SMI	Short Message Identifier (~~03.40~~3G TS 23.040)
SM-RL	Short Message Relay Layer (~~03.40~~3G TS 23.040, ~~04.11~~24.011[13])
SMS-GMSC	Short Message Service Gateway MSC (~~03.40~~3G TS 23.040)
SMS-IWMSC	Short Message Service Interworking MSC (~~03.40~~3G TS 23.040)
SoR	Status of Report (~~03.40~~3G TS 23.040)
SM-TL	Short Message Transfer Layer (~~03.40~~3G TS 23.040)
SRI	Status Report Indication (~~03.40~~3G TS 23.040)
SRR	Status Report Request (~~03.40~~3G TS 23.040)
~~ST~~	~~STatus (03.40)~~
TCAP	Transaction Capabilities Application Part (-)
TID	Transaction Identifier (*)
UD	User Data (-)
UDL	User Data Length (~~03.40~~3G TS 23.040)
VLR	Visitor Location Register (*)
VP	Validity Period (~~03.40~~3G TS 23.040)
VPF	Validity Period Format (~~03.40~~3G TS 23.040)



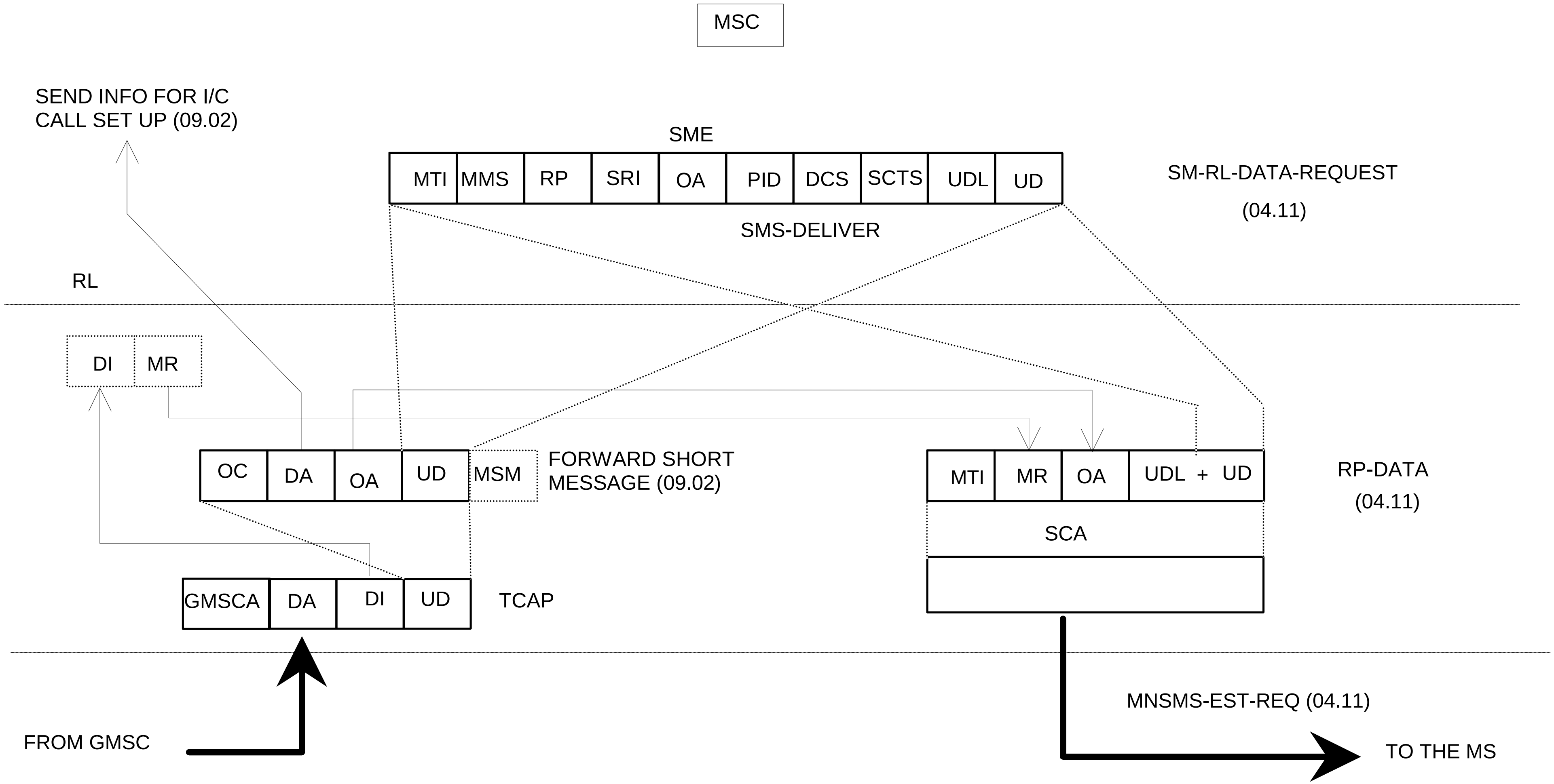
NOTE: SMI is not carried via SM-RL of subclause 9.3.5 but is carried via the relay service between the SC and GMSC (see subclause 9.3.4.1).

Figure 1.1: Mobile terminated short message



NOTE: A sequence of short messages ~~will~~shall have MMS set to 1 in each RP-MT-DATA except the last (last ~~will~~shall have MMS set to 0). Each RP-MT-DATA ~~will~~shall be carried via FORWARD SHORT MESSAGE via TCAP and ~~will~~shall be assigned the same Dialogue Identifier as previous RP-MT-DATAS in the sequence.

Figure 1.2: Mobile terminated short message



NOTE: MR is of local significance to the MSC/MS interface and is not the value supplied to the MSC

Figure 1.3: Mobile terminated short message

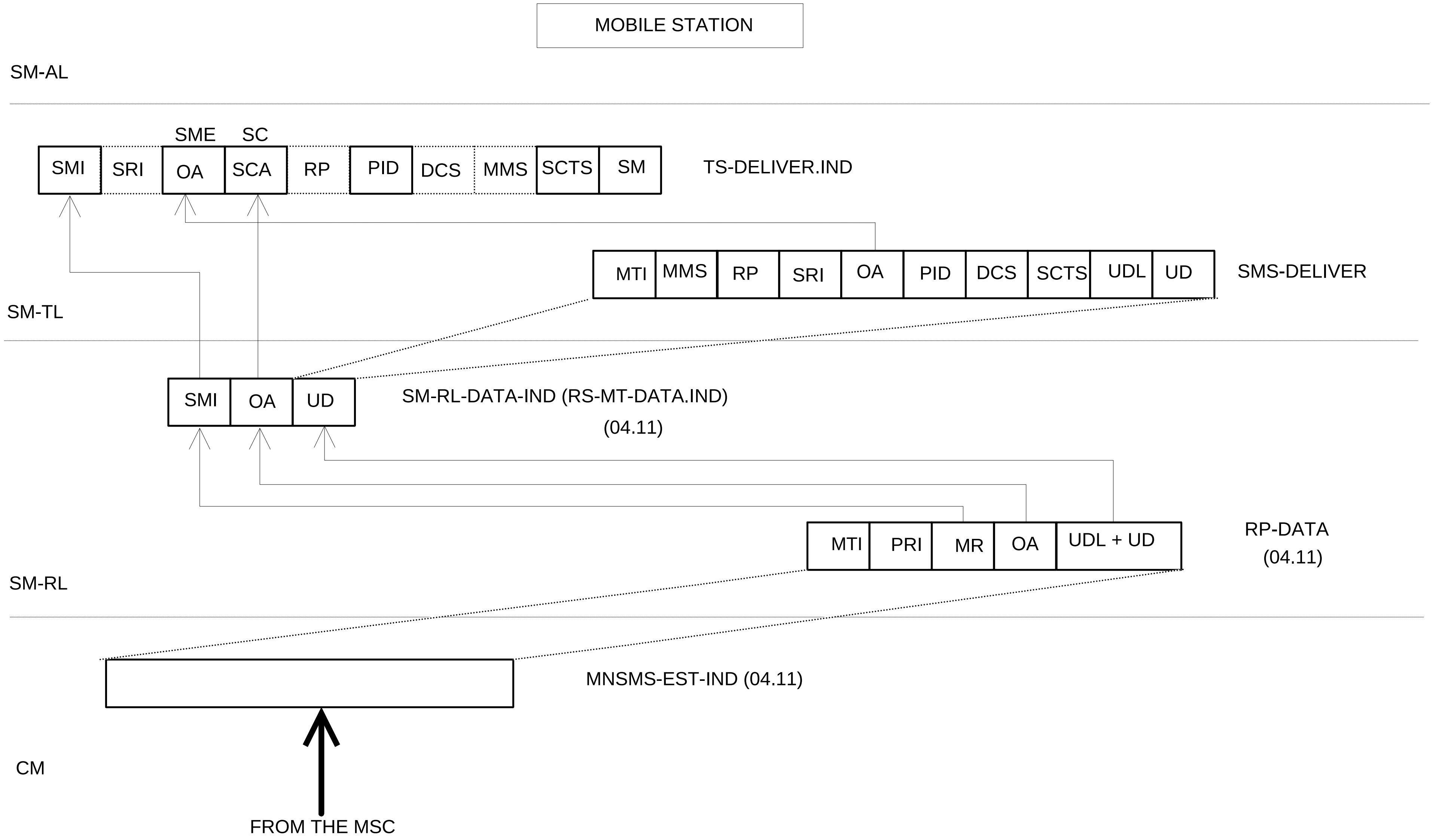


Figure 1.4: Mobile terminated short message

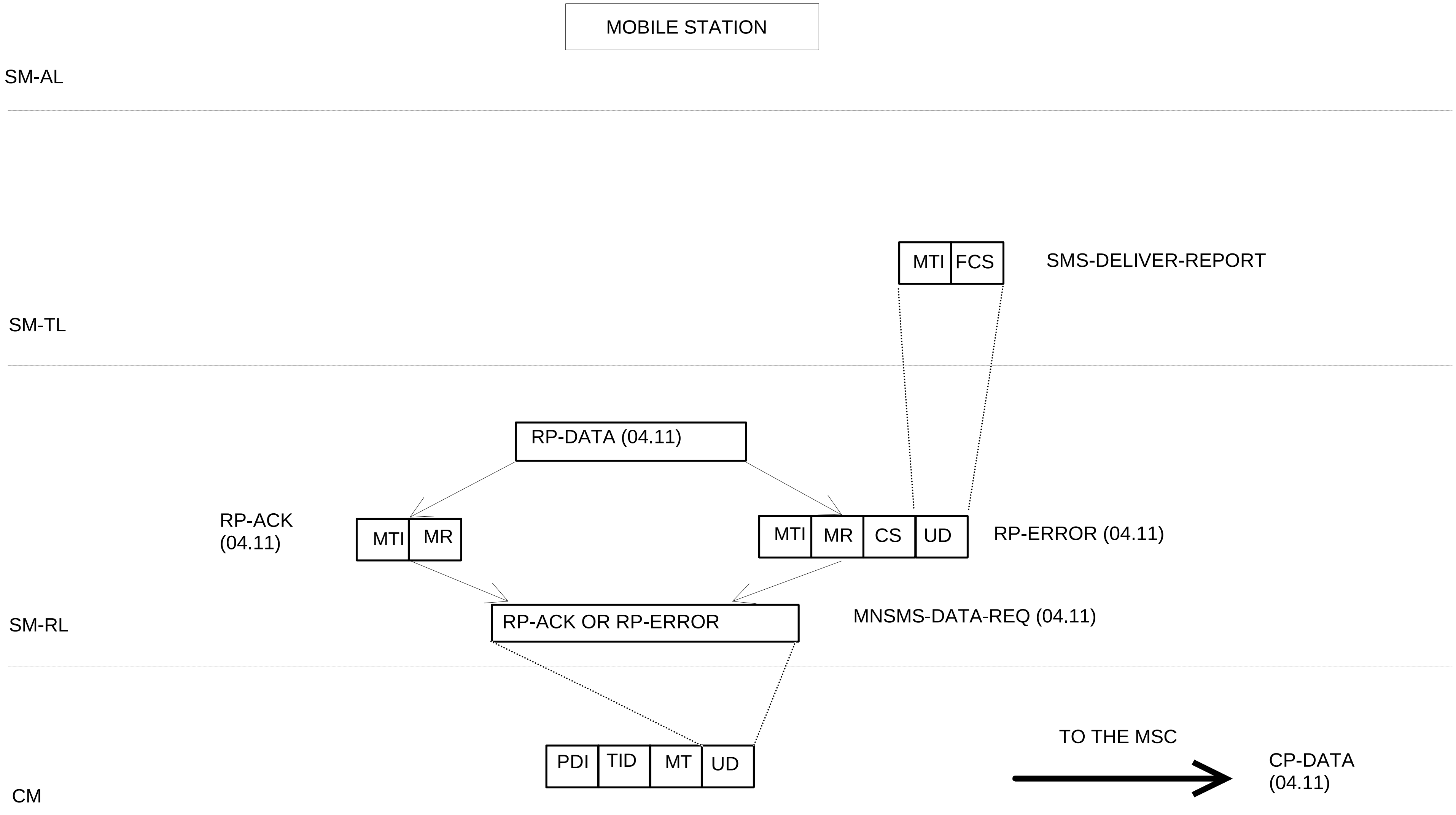
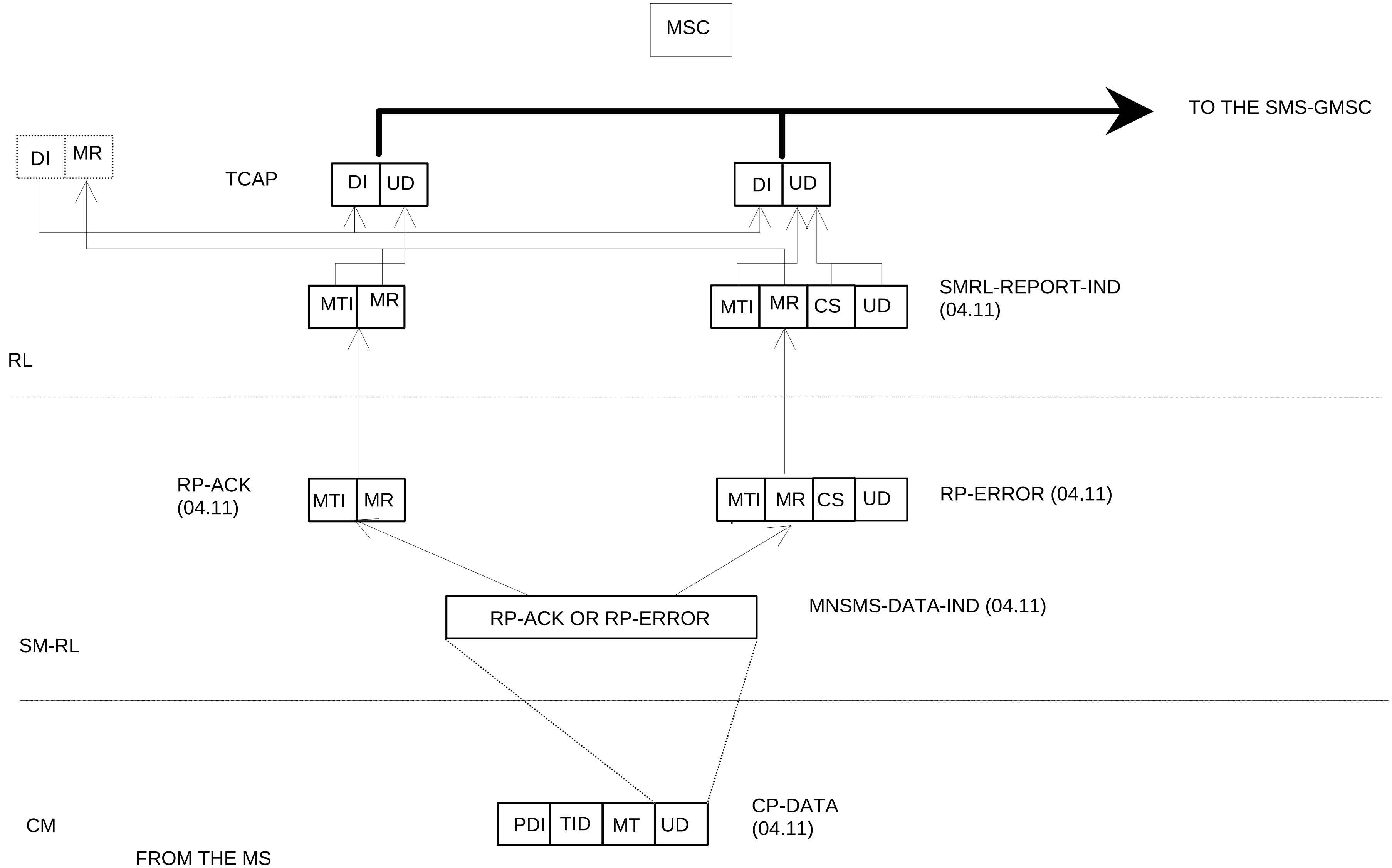
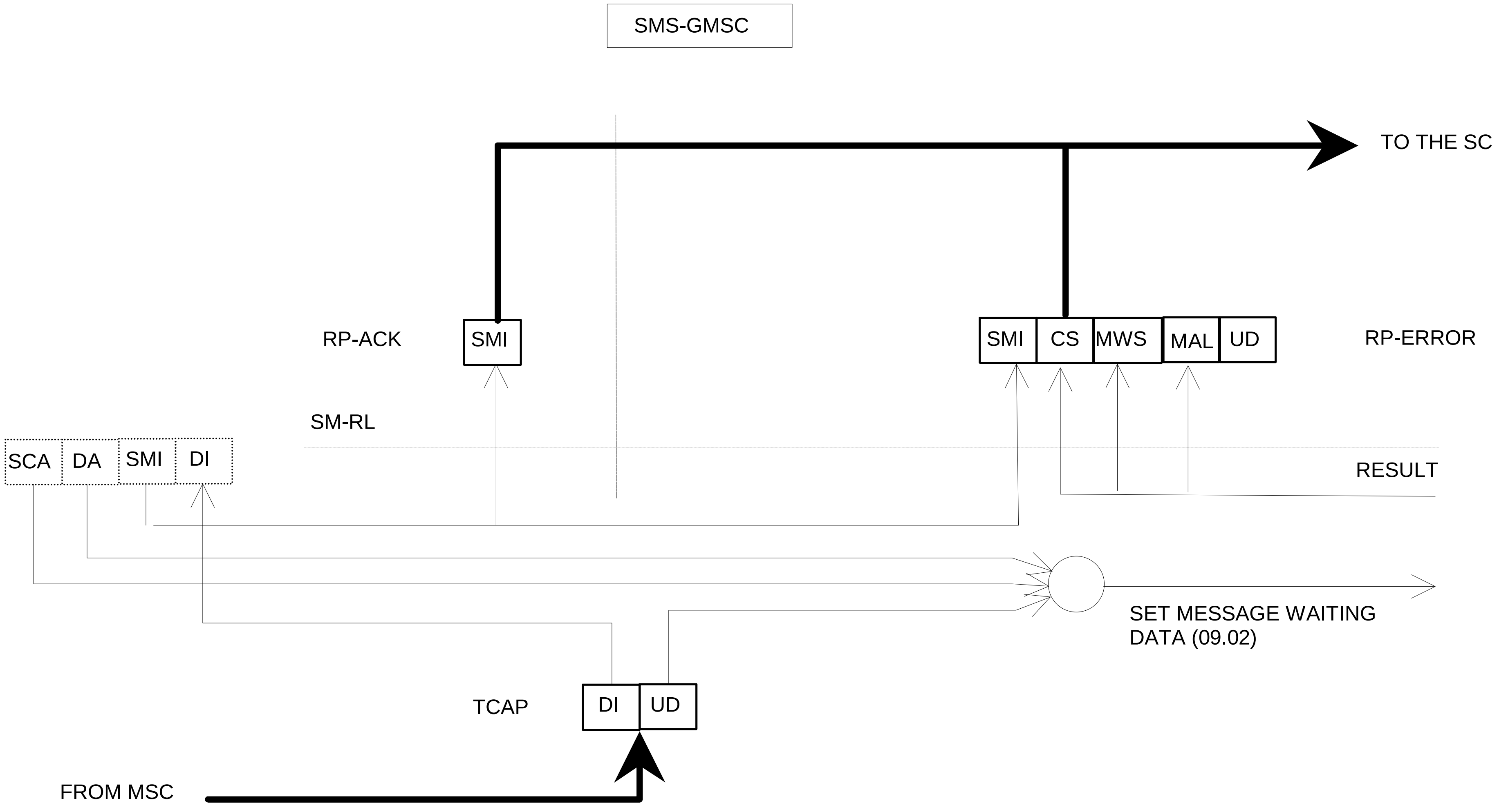


Figure 2.1: Acknowledgement in the MT case



NOTE: The cause carried via UD of TCAP is not the cause supplied via RP-ERROR but is the cause resulting from application of the mapping specified by table 8.5 of ~~04.11~~24.011[13].

Figure 2.2: Acknowledgement in the MT case



NOTE 1: The MAP operation "SetMessageWaitingData" is invoked only if a cause "Absent Subscriber" is carried in TCAP UD.
NOTE 2: The cause delivered to the SC is not necessarily the cause carried via TCAP but is one of the set specified by table 03.40/1.

Figure 2.3a: Acknowledgement in the MT case

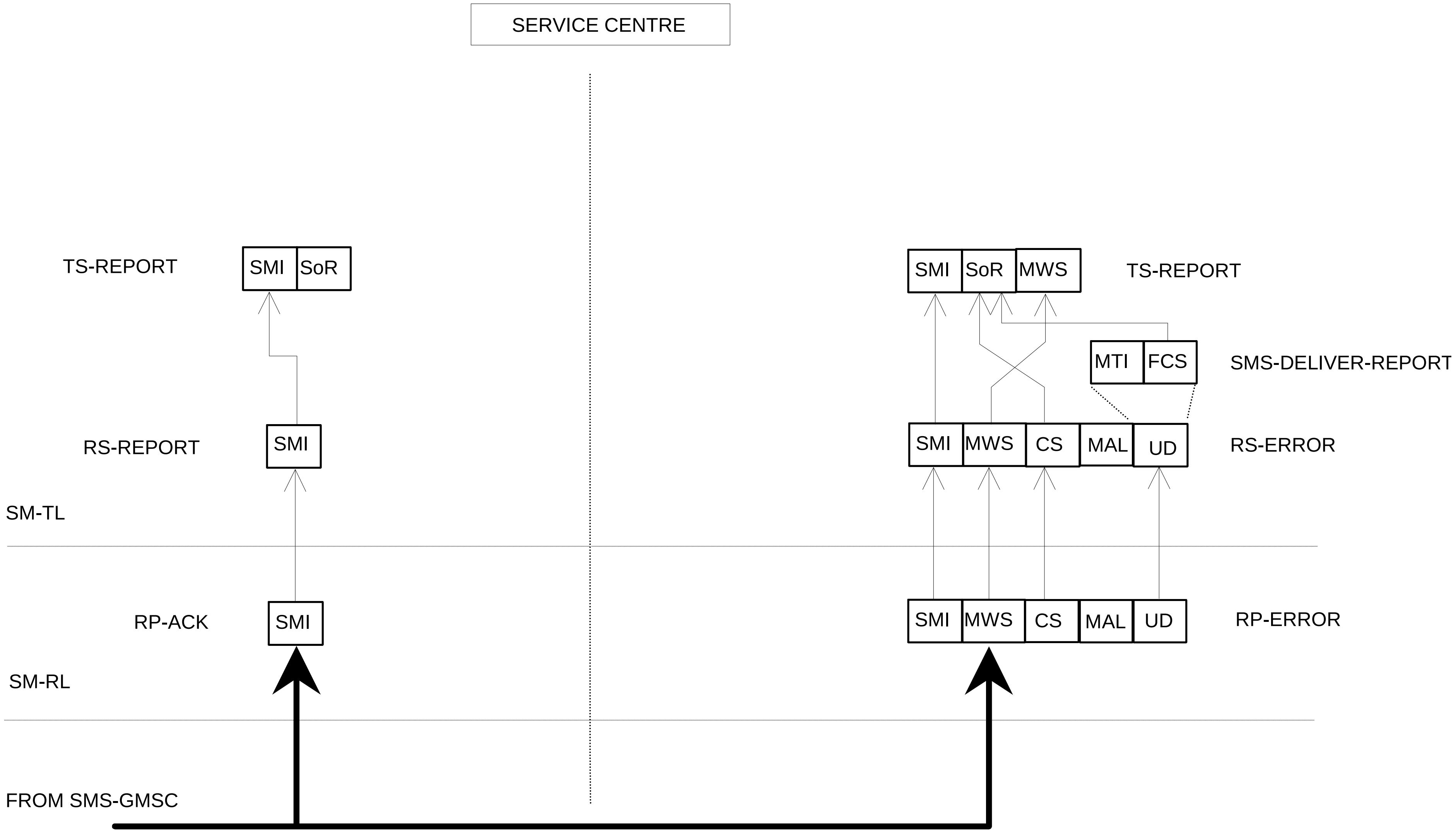
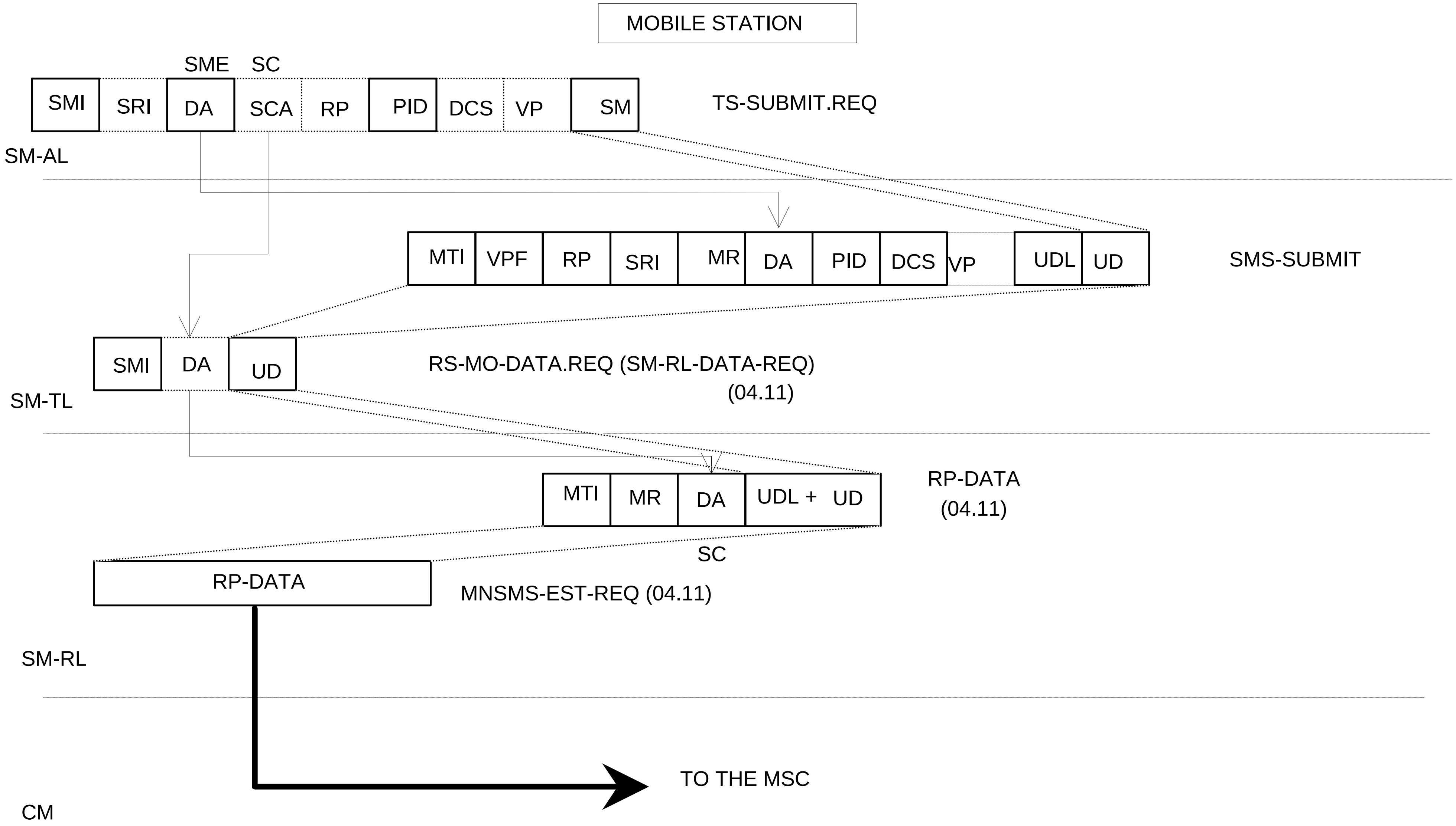


Figure 2.3b: Acknowledgement in the MT case



NOTE: The mapping of SMI to MR by the MS is a local matter.

Figure 3.1: Mobile originated short message

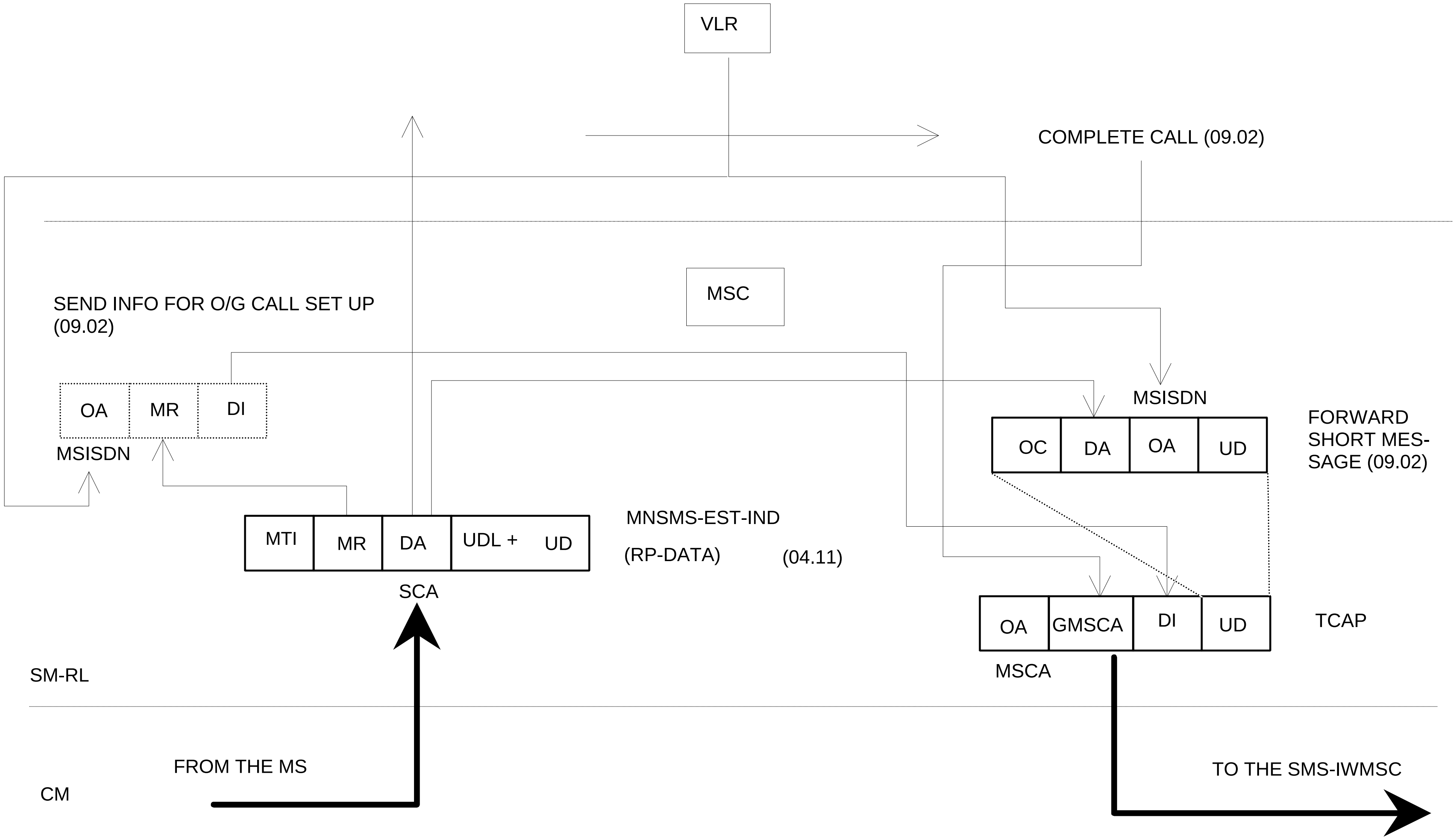
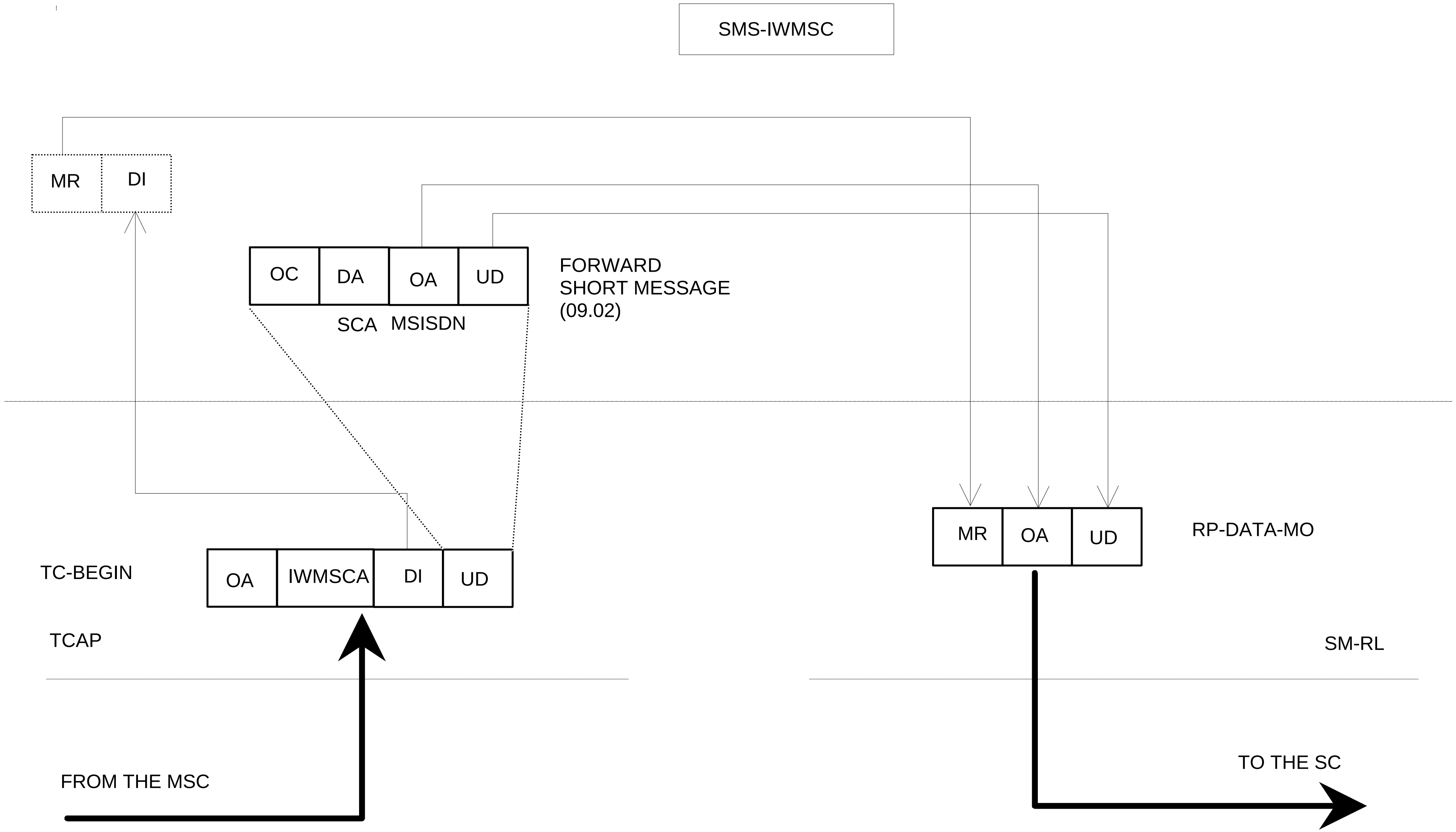


Figure 3.2: Mobile originated short message



NOTE: MR is of local significance to the IWMSC/SC interface and is not the value supplied by the MS via the MS/MSC interface

Figure 3.3: Mobile originated short message

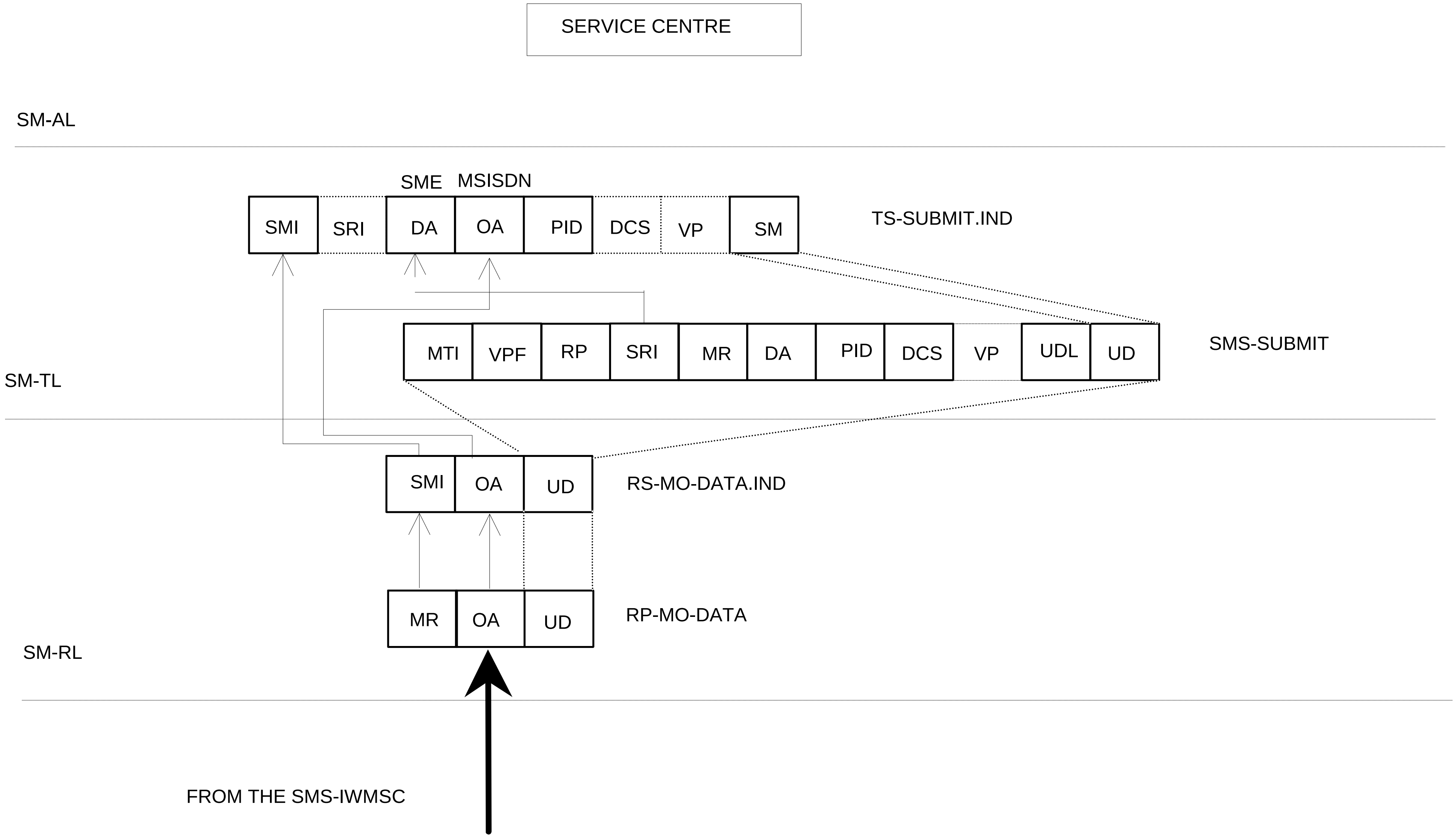


Figure 3.4: Mobile originated short message

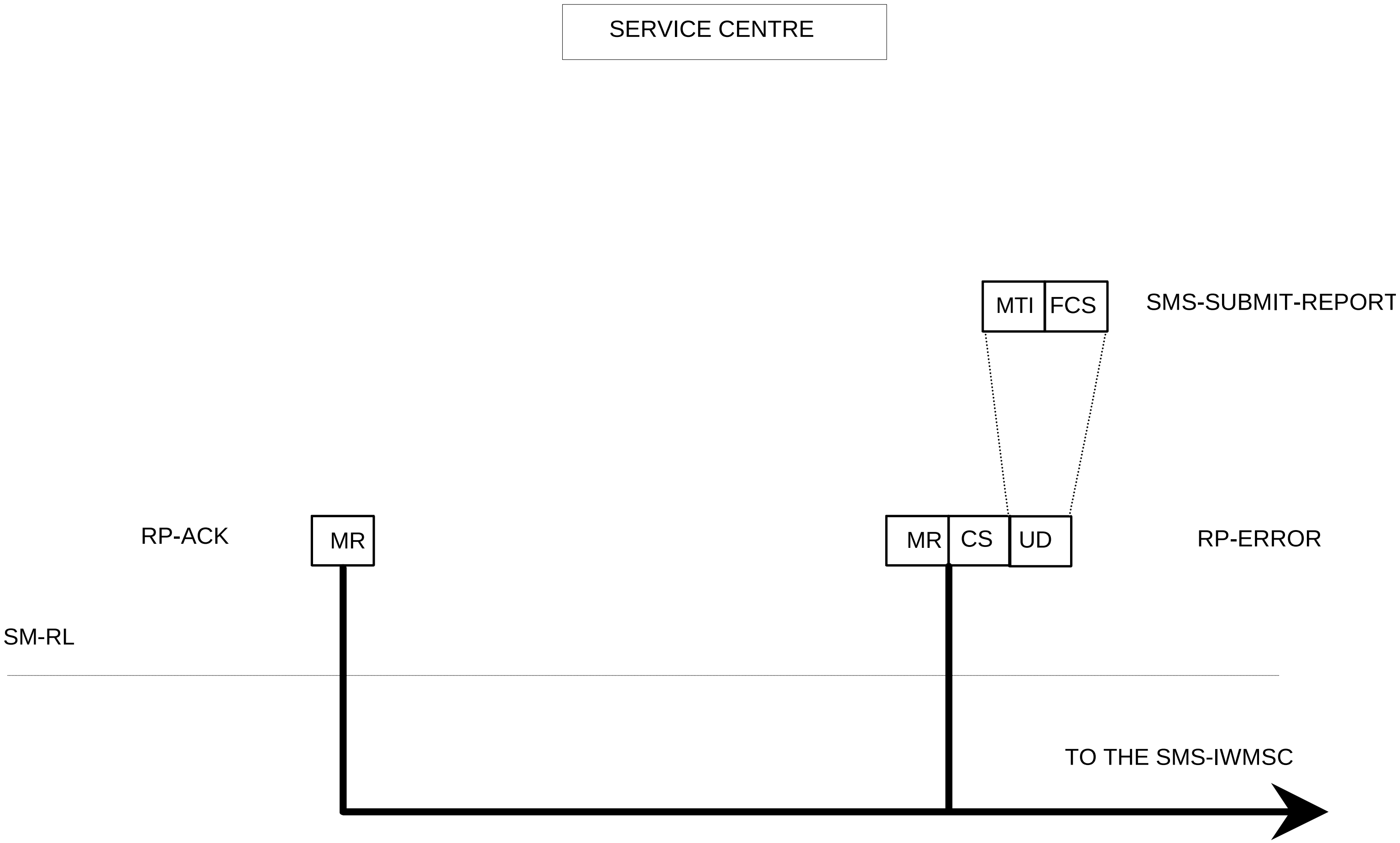


Figure 4.1a: Acknowledgement in the MO case

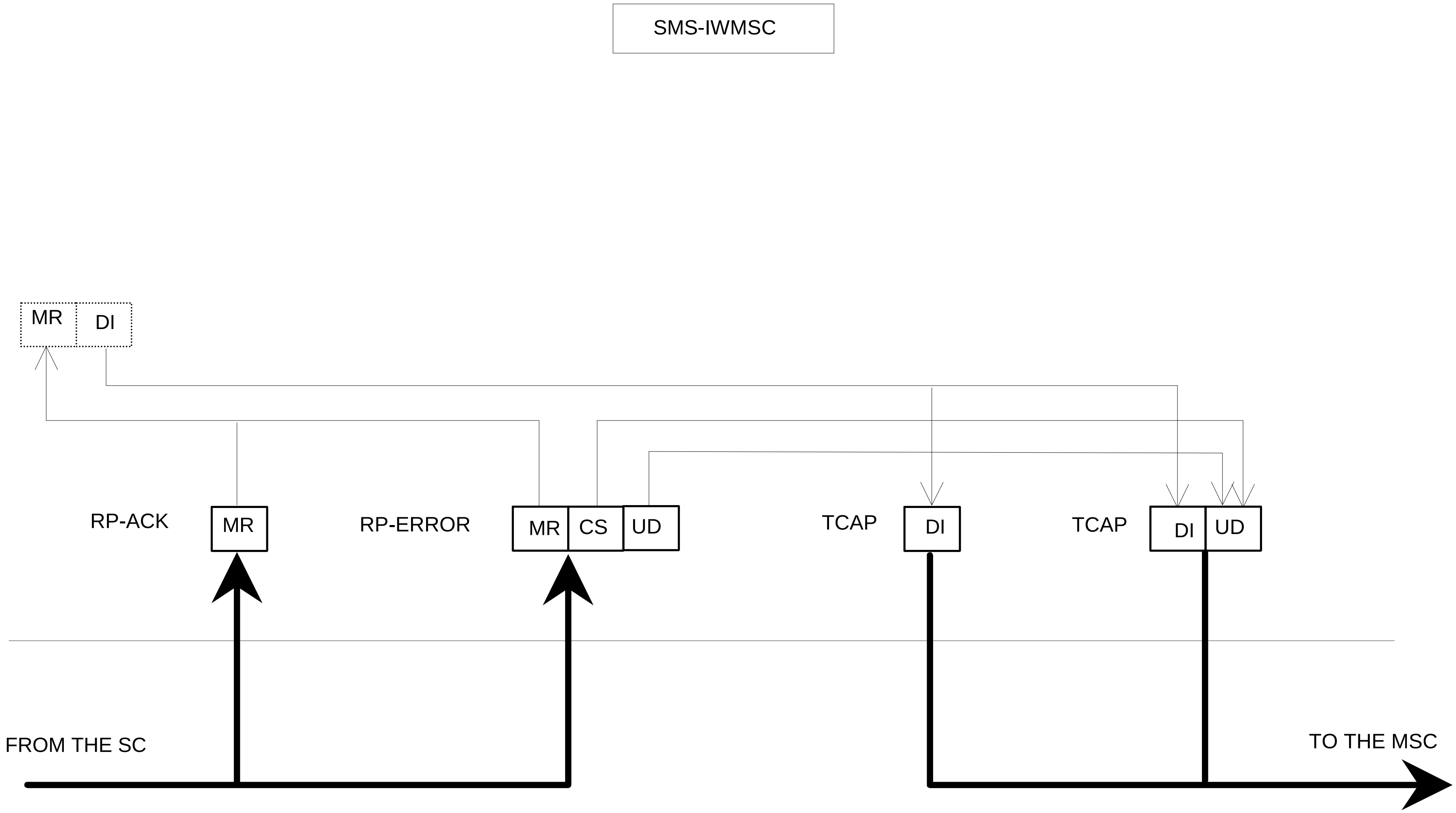


Figure 4.1b: Acknowledgement in the MO case

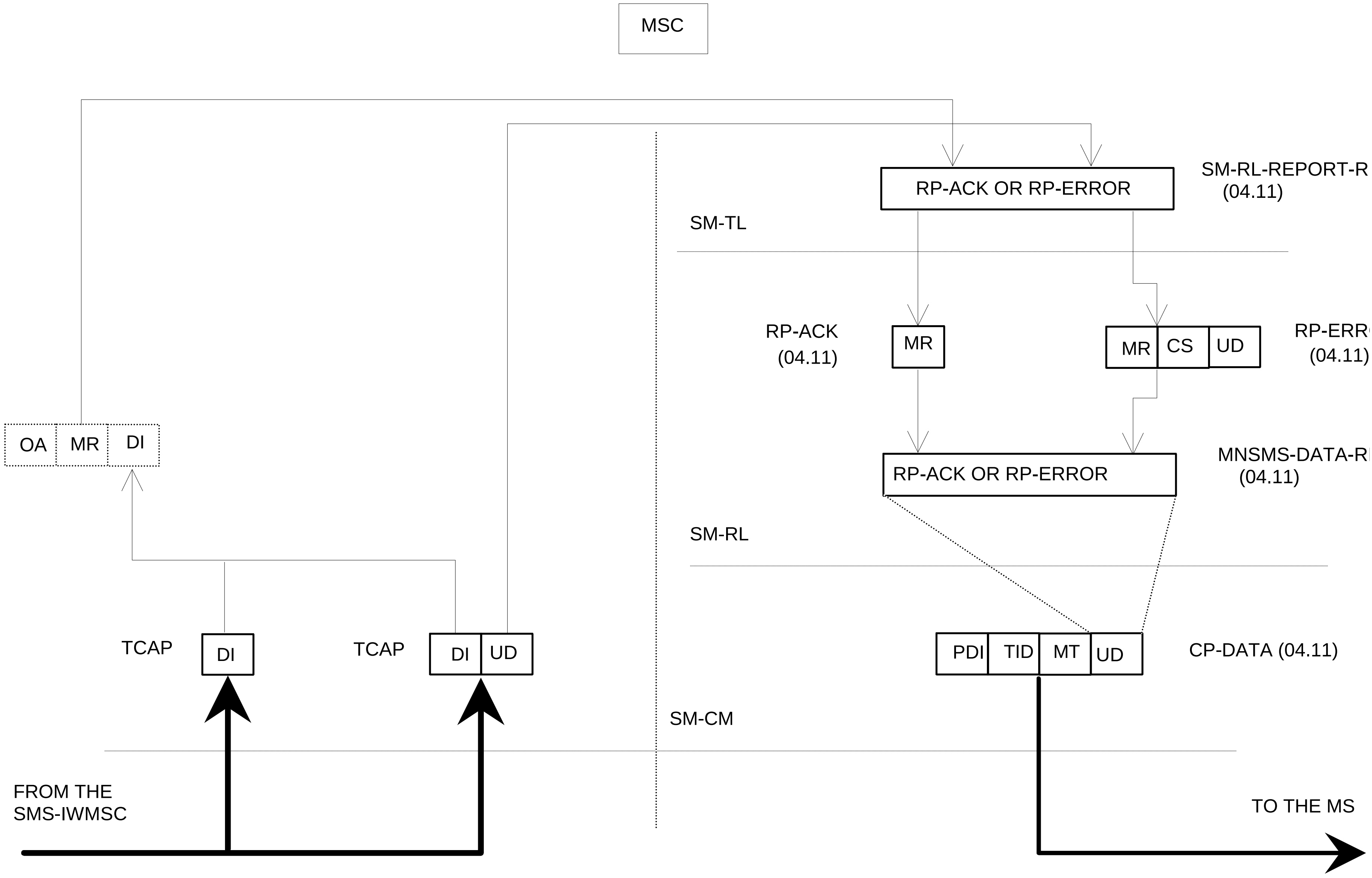


Figure 4.2: Acknowledgement in the MO case

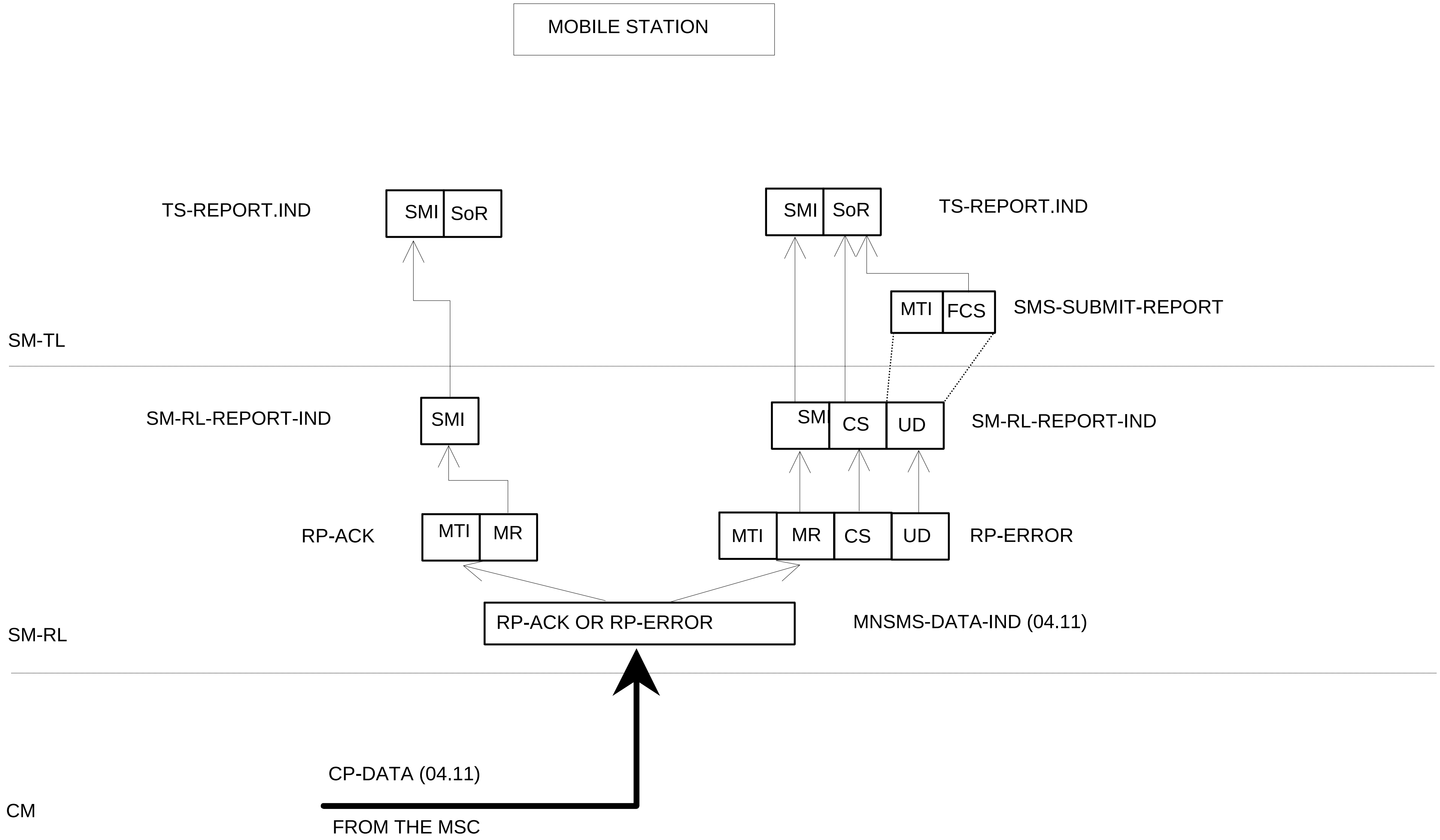


Figure 4.3: Acknowledgement in the MO case

Annex D (informative): Mobile Station reply procedures

D.1 Introduction

The reply procedures specified in this annex should be followed by a mobile station when replying to a short message, i.e. when generating a MO SM in response to a received MT SM, addressed to the originator of that MT SM. The main purpose of this annex is to specify how the MS selects the service centre for delivering that MO SM: an arbitrary SME may only be reached by submitting the reply SM to a specific SC, known to be able of delivering to that SME.

D.2 The scope of applicability

The reply procedures in clauses 5 and 6 of this annex should be followed by every MS which fulfils the following criteria:

1) The MS automatically selects the value for the RP-Destination-Address parameter in RP-MO-DATA, or the MS has the SC address within the SM-RL entity. (That is to say: the human user is not obliged to manually key in the SC address for every MO short message).

2) The MS or an application within it supports some form of replying to a MT SM with a MO SM. (That is to say: in the process of generating the reply MO SM, any reference whatsoever, implicit or explicit, is made to the original MT SM.).

3) The replying support of (2) is to be equally available towards every SME.

When an SME submits an SM to an SC for delivery, it may request that the SC sets the TP-Reply-Path parameter in the SM to be delivered. If the submitting SME is an MS, the reply path requesting procedure; in clause 4 of this annex may be applied. However, an SC may support the reply procedures without supporting the reply path requesting procedure; in that case, the SC sets the TP-Reply-Path parameter on another basis, which must be the case if the SM originates from an SME which is not an MS.

D.3 Terminology

An originating SME submits an original SM to an original SC, which delivers the original MT SM to a replying MS. The replying MS sends back a reply MO SM, a MO SM which is generated (automatically or by human operations) in response to the original MT SM, and which is addressed to the originating SME.

If the originating SME is an MS, the original MT SM is submitted within an SMS-SUBMIT PDU; we say that reply path is requested if the TP-Reply-Path parameter is set in the SMS-SUBMIT PDU of the original MT SM.

We say that reply path exists if the TP-Reply-Path parameter was set in the SMS-DELIVER PDU of the original MT SM; we say that reply path does not exist otherwise.

The replying MS may have a default SC which is normally used for delivering all the MO short messages originated from the replying MS. Alternatively, a human user or automatic application may specify a selected SC for delivering a particular SM (thus the term selected SC refers to an SC address selected for one short message only).

D.4 The reply path requesting procedure

The discussion in this clause applies to cases when the originating SME is a mobile station only. The reply procedures discussed in the clauses to follow this one are independent of the type of the originating SME.

The reply path is requested by the originating SME (an MS) by setting the TP-Reply-Path parameter in the SMS SUBMIT PDU of the original SM. If the original SC supports reply path requesting for the originating SME (an MS), it ~~will~~shall take notice of the TP-Reply-Path parameter in the SMS-SUBMIT PDU and set the TP-Reply-Path parameter in the SMS-DELIVER PDU of the original MT SM towards the replying MS. Hence, reply path exists for the replying MS towards the originating SME (an MS).

D.5 The reception of an original MT SM

When a replying MS receives an original MT SM, it then has

1) originating SME = TP-Originating-Address in the SMS-DELIVER PDU,

2) original SC = RP-Originating-Address in RPS-MT-DATA, and

3) reply path exists / reply path does not exist = TP-Reply-Path in SMS-DELIVER PDU (set / not set).

D.6 The submission of the reply MO SM

According to clause 5, the replying MS knows if

a) reply path exists or

b) reply path does not exist.

We then specify that when submitting the reply MO SM, the replying MS should use parameters as follows:

1) TP-Destination-Address in SMS-SUBMIT PDU = originating SME,

2a) If reply path exists:

RP-Destination-Address in RP-MO-DATA = original SC,

2b) If reply path does not exist:

RP-Destination-Address in RS-MO-DATA = selected SC or default SC or original SC,

3a) If reply path exists:

after submitting one reply MO SM, the reply path does not exist any more.

In case (2b), it is allowed to use the original SC or the default SC, but then there is no guarantee that the original/default SC ~~will~~shall deliver the reply MO SM. (The original SC may refuse to deliver, if the replying MS is not its subscriber; the default SC may be unable to deliver, if it has no access path to the originating SME.)

Requirement (3a) states that the case (a), reply path exists, holds for one reply MO SM only (per original MT SM).

D.7 Usage of SCs for replying

The specification in this annex supports the following way of replying.

The original MT SM and the reply MO SM are delivered by the same SC, the original SC. This principle maximizes the probability that the SC can e.g. route the reply MO SM to the proper data network for reaching the originating SME; this principle is a must, if the originating SME is integrated within the original SC.

If the original SC by any means whatsoever knows that it is both willing and able to deliver one (potential) reply MO SM, it may indicate this fact by setting the TP-Reply-Path parameter in the original MT SM. The original SC thus commits itself to delivering one reply MO SM; let us call this reply delivery commitment.

One reason for the SC to make the reply delivery commitment may be the reply path requesting procedure specified in clause 4 on this annex.

The reply path commitment is not valid forever, but the original SC pay have e.g. a time limit for maintaining this commitment.

D.8 Replying possibilities for Phase 1 mobile stations

The Phase 2 mobile stations should support the procedures in this annex (if they fulfil the criteria in clause 2 of it). Yet, Phase 1 mobile stations, too, may apply steps (1) and (2a) in clause 6 of this annex, i.e. reply via the original SC, automatically or manually (by choosing selected SC = original SC), despite the fact that the TP-Reply-Path parameter ~~will~~shall be ignored by them. The delivery of the reply MO SM cannot be guarantied in this case, yet the possibility of delivery may be improved (especially if the originating SME is not an MS.)

D.9 The resulting service for originating SMEs

As the consequence of the replying procedures specified in this annex, all SMEs and applications within them may assume that replying from all mobile stations is always possible, provided that the mobile stations do support the proper replying mechanism itself (human response in context with the original MT SM, automatic replying by an application, application level protocols, etc.).

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Ystad, Sweden, 22-26 11 1999

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Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: T2 **Date:** 17.11.1999

Subject: Concatenated Short Message

Work item: TEI

Category:
(only one category shall be marked with an X)

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release	X		Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: In order to ensure a correct processing at the receiving SME certain IE's shall be contained in every segment of a concatenated SM.

Clauses affected: 9.2.3.24.3, 9.2.3.24.4 and 9.2.3.24.9

Other specs affected:

Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

9.2.3.24.3 Application Port Addressing 8 bit address

This facility allows short messages to be routed to one of multiple applications in the TE (terminal equipment), using a method similar to TCP/UDP ports in a TCP/IP network. An application entity is uniquely identified by the pair of TP-DA/TP-OA and the port address. The port addressing is transparent to the transport, and also useful in Status Reports.

The total length of the IE is 2 octets

octet 1 Destination port

This octet contains a number indicating the receiving port, i.e. application, in the receiving device.

octet 2 Originator port

This octet contains a number indicating the sending port, i.e. application, in the sending device.

The port range is up to 255 using 8 bit addressing space. The Integer value of the port number is presented as in GSM 03.40 subclause 9.1.2.1.

VALUE (port number)	MEANING
0 - 239	Reserved
240 - 255	Available for allocation by applications

A receiving entity shall ignore (i.e. skip over and commence processing at the next information element) any information element where the value of the Information-Element-Data is Reserved or not supported.

In the case where this IE~~I~~ is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data ~~should~~ shall also be contained in every subsequent segment of the concatenated SM ~~although this is not mandatory~~. ~~However, in the case where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded~~.

9.2.3.24.4 Application Port Addressing 16 bit address

This facility allows short messages to be routed to one of multiple applications in the TE (terminal equipment), using a method similar to TCP/UDP ports in a TCP/IP network. An application entity is uniquely identified by the pair of TP-DA/TP-OA and the port address. The port addressing is transparent to the transport, and also useful in Status Reports.

The total length of the IE is 4 octets

octet 1,2 Destination port

These octets contain a number indicating the receiving port, i.e. application, in the receiving device.

octet 3,4 Originator port

These octets contain a number indicating the sending port, i.e. application, in the sending device.

The port range is up to 65535 using 16 bit addressing space. The Integer value of the port number is presented as in GSM 03.40 subclause 9.1.2.1.

VALUE (port number)	MEANING
0 - 15999	As allocated by IANA (http://www.IANA.com/)
16000 - 16999	Available for allocation by applications
17000 - 65535	Reserved

A receiving entity shall ignore (i.e. skip over and commence processing at the next information element) any information element where the value of the Information-Element-Data is Reserved or not supported.

In the case where this IE~~I~~ is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data ~~should~~ shall also be contained in every subsequent segment of the concatenated SM ~~although this is not mandatory~~. ~~However, in the case~~

~~where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded~~.

9.2.3.24.9 Wireless Control Message Protocol

The Wireless Control Message Protocol (WCMP) is part of the WAP suite of protocols; an open standard specified by the WAP Forum Ltd.
The protocol specifies a set of messages that can be used by the receiver to notify the sender if an error occurs. This can be due to routing problems, no application listening at the destination port number, or due to insufficient buffer capacity. The error messages can be used by the sender to avoid retransmitting packets, that can not be properly handled at the receiver. WCMP can also be used for diagnostics and informational purposes. WCMP messages are usually generated by a datagram transport layer or a management entity.

The Information-Element-Data octet(s) shall be coded as follows.

Octet 1-n Protocol Data Unit of WCMP

This octet(s) shall contain a WCMP protocol data unit.

In the case where this IE~~I~~ is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data ~~should~~ shall also be contained in every subsequent segment of the concatenated SM ~~although this is not mandatory. However, in the case where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded.~~

3GPP TSG-T2 #7
Ystad, Sweden, 22 – 26 November 1999

TSGT2#7(99)1064

Agenda Item: **Cell Broadcast Service**

Source: **Mannesmann Mobilfunk / CMG**

Title: **Change Request to 3G TS 23.041**

Document for: **Approval**

The attached CR intends to enlarge the scope of the document 3G TS 23.041 from 'GSM only' to 'GSM and UMTS'.

Some abbreviations and definitions were purely valid in the GSM domain and the corresponding abbreviations in UMTS have been added to the text.

Parts in the existing document which were only applicable for GSM have been clearly identified.

Furthermore changes to the structure and content of the document to identify the new or changed behaviour and requirements in UMTS have been incorporated in the Change Request.

Since the work done in TSG-T2 SWG3 for CBS is also influenced by outstanding work in other 3G TSG's some items in this CR are for further study. Nevertheless these items are important to identify the difference in behaviour between GSM and UMTS and cannot be left out. It is expected to solve the open issues until March 2000.

The following list reflects the open issues:

- In Chapter **2 General Description** the meaning of ‚Idle State' in UMTS will be further elaborated.
- In Chapter **6 BSC/RNC Functionality** it is described how the BSC reacts on CBCH load indication messages. The corresponding behaviour of the RNC has to be described.
- In Chapter **8 MS/UE Functionality** it has to be clarified how to deal with remaining blocks of a CBS message not containing cell broadcast information (see GSM 04.12).
- Chapter **9.1.2 UMTS Radio Access Network**: A figure for the message flow will be added.
- In Chapter **9.3 Parameters** the parameters of the primitives are described. Wherever a cell is addressed with LAC + CI in GSM the corresponding mechanism in UMTS will be added.
- In Chapter **9.4.2 UMTS** the Message Format on the Radio Network – MS/UE Interface is described. The information elements Serial Number, Message Identifier and Data Coding Scheme are identical with those described for GSM in section 9.4.1 with respect to their structure and possible values. Any other differences to GSM, e.g. concerning the storage of the parameters on the USIM are for further study.

3GPP/SMG Meeting T2#7
Ystad, Sweden, 22-26 Nov 1999

Document T2-991064
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.041	**CR**	**001**	Current Version:	V 3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	T#6	for approval	X	Strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		Non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio		Core Network	X

Source: TSG T2 **Date:** 23.11.1999

Subject: Adaptation of the scope of TS 23.041 from “GSM only” to “GSM and UMTS”

Work item: Cell Broadcast Service CBS

Category:				**Release:**		
	F	Correction			Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification	X		Release 99	X
					Release 00	

Reason for change:
Cell Broadcast Service CBS is part of UMTS Release 99. The 3G TS 23.041 so far contains only specifications and requirements for CBS in GSM. This change request proposes the necessary editorial changes to enlarge the scope of the document. It identifies parts in the TS which are only applicable for GSM, only applicable for UMTS or applicable for both.
The structure of the document has been adapted to incorporate new requirements by the UTRAN.
Furthermore it indicates a mandatory protocol between the Cell Broadcast Center CBC and the Radio Network Controler RNC implied by the integration of the CBC into the Core Network.

Clauses affected:

Other specs affected:			
Other 3G core specifications		→ List of CRs:	23.121, 25.301, 25.401
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

1 Scope

This Technical Specification describes the Cell Broadcast short message service (CBS) for GSM and UMTS. For GSM ~~I~~it defines the primitives over the Cell Broadcast Centre - Base Station System (CBC-BSS) interface and the message formats over the Base Station System - Mobile Station (BSS-MS) interface for Teleservice 23 as specified in ~~GSM~~3GPP ~~0~~22.003 [2].
For UMTS it defines the interface requirements for the Cell Broadcast Center – UMTS Radio Network System (RNS) interface and the radio interface requirements for UMTS Radio Acces Networks to support CBS as specified in 3GPP 22.003 [2].

1.1 Normative 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2] ~~GSM~~3GPP ~~0~~22.003: "Digital cellular telecommunication system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] ~~GSM~~3GPP ~~0~~23.038: "Digital cellular telecommunication system (Phase 2+);"Alphabets and language-specific information".

[4] ~~GSM~~3GPP~~ 0~~23.040: "Digital cellular telecommunication system (Phase 2+); Technical realization of the Short Message Service (SMS) Point to Point (PP)".

[5] GSM 03.47: "Digital cellular telecommunication system (Phase 2+); Example protocol stacks for interconnecting Service Centre(s) (SC) and Mobile-services Switching Centre(s) (MSC)".

[6] GSM 03.49: "Digital cellular telecommunication system (Phase 2+); Example protocol stacks for interconnecting Cell Broadcast Centre (CBC) and Mobile-services Switching Centre (MSC)".

[7] GSM 04.12: "Digital cellular telecommunication system (Phase 2+); Short Message Service Cell Broadcast (SMSCB) support on the mobile radio interface".

[8] GSM 05.02: "Digital cellular telecommunication system (Phase 2+); Multiplexing and multiple access on the radio path".

[9] ~~GSM~~3GPP ~~0~~27.005: "Digital cellular telecommunication system (Phase 2+); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".

[10] GSM 08.52: "Digital cellular telecommunication system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Interface principles".

[11] GSM 08.58: "Digital cellular telecommunication system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Layer 3 specification".

[12] CCITT Recommendation X.210: "Open systems interconnection layer service definition conventions".

[13] GSM 08.08 MSC-BSS Interface Layer 3 specification

[14] ~~GSM~~3GPP ~~0~~23.~~0~~42: “ Compression algorithm for text messaging services”.

[15] GSM 03.48: "Digital cellular telecommunications system (Phase 2+); Security Mechanisms for the SIM application toolkit; Stage 2"

1.2 Abbreviations

Abbreviations used in this TS are listed in GSM 01.04 [1].

2 General description

The CBS service is analogous to the Teletex service offered on television, in that like Teletex, it permits a number of unacknowledged general ~~message~~CBS messages to be broadcast to all receivers within a particular region. CBS messages are broadcast to defined geographical areas known as cell broadcast areas. These areas may comprise of one or more cells, or may comprise the entire PLMN. Individual CBS messages will be assigned their own geographical coverage areas by mutual agreement between the information provider and the PLMN operator. CBS messages may originate from a number of Cell Broadcast Entities (CBEs), which are connected to the Cell Broadcast Centre. CBS messages are then sent from the CBC to the ~~BTSs~~cells, in accordance with the CBS's coverage requirements.
~~The~~A CBS ~~message~~page comprises of 82 octets, which, using the default character set, equates to 93 characters. Other Data Coding Schemes may also be used, as described in 3G TS 23.038 [3]. Up to 15 of these ~~messages~~ ~~(~~pages~~)~~ may be concatenated to form a CBS message~~macromessag~~e. Each page of such CBS message~~macromessages~~ will have the same message identifier (indicating the source of the message), and the same serial number. Using this information, the MS/UE is able to identify and ignore re-broadcasts of already received messages.
CBS messages are broadcast cyclically by the ~~BTS~~ cell at a frequency and for a duration agreed with the information provider. The frequency at which CBS messages are repeatedly transmitted will be dependent on the information that they contain; for example, it is likely that dynamic information such as road traffic information, will require more frequent transmission than weather information. The repetition period will also be affected by the desire for CBS messages to be received by high speed mobiles which rapidly traverse cells. All suitably equipped mobiles within the catchment area of the transmitting ~~BTS~~cell will be able to receive the ~~broadcast~~CBS messages, provided that they are switched on and in the idle state.

The meaning of ‘Idle State’ differs in GSM and UMTS. The concrete mapping between the meaning of ‘Idle State’ from a users perspective and the meaning in radio resource management and mobility management in UMTS is for further study.

GSM only [CBS messages may be broadcast on two different cell broadcast channels, which are characterized by different QoS. A MS is always able to read the basic channel (see [8]). The reading of the extended channel may collide with other tasks of the MS. Therefore the probability of receiving a CBS message on the extended channel is smaller than on the basic channel. The reading of the extended channel for MSs is optional. The scheduling on the channels will be done independently.]
To permit mobiles to selectively display only those CBS messages required by the MS/UE user, CBS messages are assigned a message class which categorises the type of information that they contain and the language (Data Coding Scheme) in which the CBS message has been compiled. Through the use of appropriate MMI, the user is then able to ignore message types that he does not wish to receive, e.g. advertising information or messages in an unfamiliar language.

3 Network Architecture

The chosen network architectures differs for GSM and UMTS. In chapter 3.1 the GSM network architecture is descripted, in chapter 3.2 the UMTS network architecture.

3.1 GSM Network Architecture

The basic network structure of CBS is depicted by figure 1.

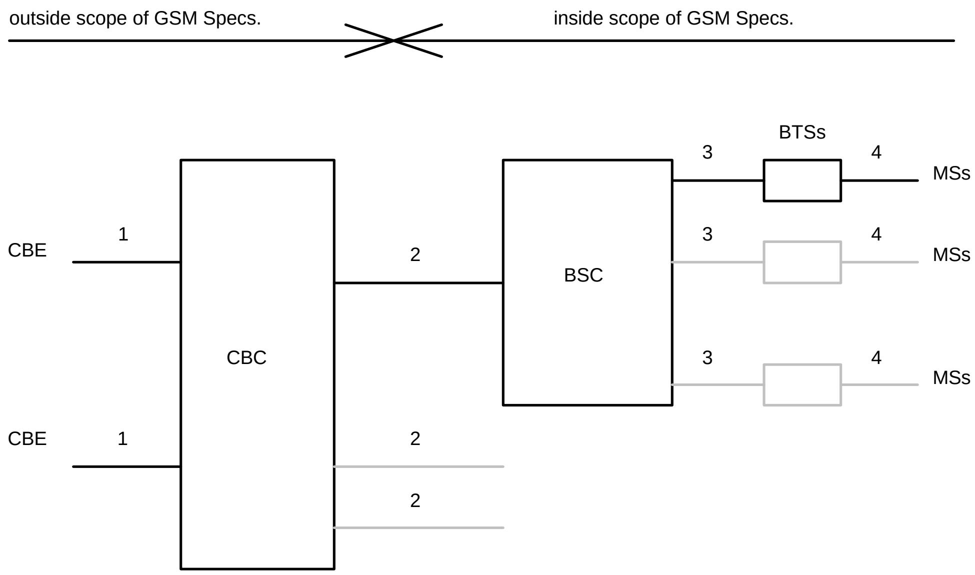


Figure 1

- message transfer on link 1 is outside the scope of GSM Specifications;
- message transfer on link 2 is described in subclause 9.1;
- message transfer on link 3 is described in GSM 08.58;
- message transfer on link 4 is described in GSM 04.12 and the timing of messages transferred on link 4 is described in GSM 05.02.

3.2 UMTS Network Architecture

The basic network structure of CBS is depicted by figure 2

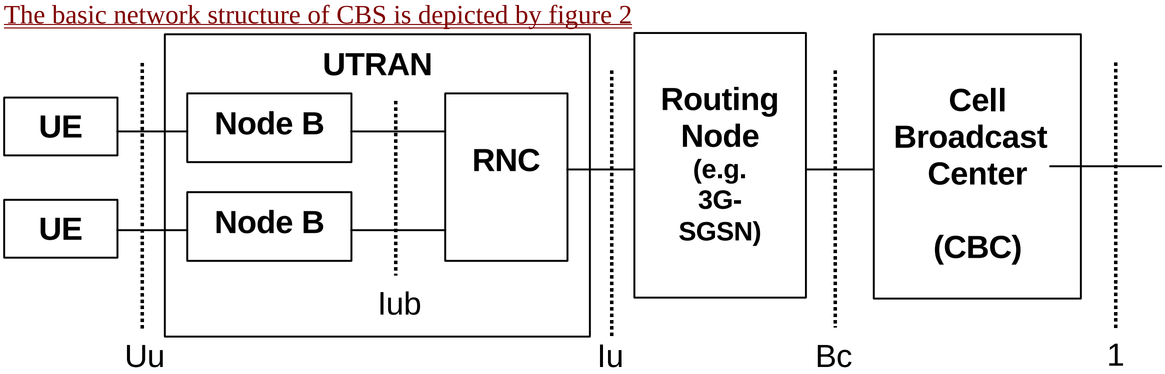


Figure 2

The basic network structure replaces the GSM BSS with the UTRAN containing the RNC and the Node B. The cell broadcast center (CBC) is part of the core network and connected to a routing node e.g. a 3G SGSN via the Bc reference point. Thus the CBC can reach every RNC via the user plane of the Iu interface. On the logical interface between the CBC and the RNC a mandatory protocol shall be defined. The other UTRAN related interfaces are described in the according UTRAN specifications based on the RAN 2 TR 25.925. Based on this architecture and the current requirements for cell broadcast the core network elements like MSC, VLR, HLR etc are not involved for the service delivery.

4 CBE Functionality

The functionality of the CBE is outside of the scope of GSM and UMTS Specifications; however it is assumed that the CBE is responsible for all aspects of formatting CBS, including the splitting of a CBS message into a number of pages.

5 CBC Functionality

GSM only [As in GSM the CBC (and any originating point for ~~cell broadcast short~~ CBS messages) is regarded as a node outside the PLMN, only the requirements placed upon the CBC by CBS functionality are specified by this specification.]
In UMTS the CBC is regarded to be integrated as a node into the core network.
The CBC may be connected to several BSCs/RNCs. The CBC may be connected to several CBEs. The CBC shall be responsible for the management of cell ~~broadcast short~~CBS messages including:

- allocation of serial numbers;
- modifying or deleting CBS messages held by the BSC/RNC;
- initiating broadcast by sending fixed length ~~cell broadcast short~~ CBS messages to a BSC/RNC for each language provided by the cell, and where necessary padding the ~~message~~ pages to a length of 82 octets [see GSM 03.38];
- determining the set of cells~~/BTSs~~ to which a CBS message should be broadcast, and indicating within the Serial Number the geographical scope of each CBS message;
- determining the time at which a ~~message~~CBS message should commence being broadcast;
- determining the time at which a ~~message~~CBS message should cease being broadcast and subsequently instructing each BSC/RNC to cease broadcast of the ~~message~~CBS message;
- determining the period at which broadcast of the ~~message~~CBS message should be repeated;
- determining the cell broadcast channel, on which the ~~message~~CBS message should be broadcast.

To work efficiently on the interfaces, the BSC/RNC - which is normally controlling more than one cell of a broadcast area - should be used as a concentrator as far as CBS message handling is concerned. Hence, the CBC should work on lists of cells when issuing CB related requests towards the BSC/RNC.

6 BSC/RNC Functionality

The BSC/RNC shall interface to only one CBC. A BSC may interface to several BTSs as indicated by GSM 08.52. A RNC may interface to several Node Bs.
The BSC/RNC shall be responsible for:

<table>
<tr><th>BSC</th><th>RNC</th></tr>
<tr><td colspan="2">interpretation of commands from the CBC;</td></tr>
<tr><td colspan="2">storage of ~~cell broadcast~~ CBS messages;</td></tr>
<tr><td>scheduling of ~~cell broadcast~~ CBS messages on the CBCH;</td><td>Scheduling of CBS messages on the CBS related radio resources</td></tr>
<tr><td colspan="2">providing an indication to the CBC when the desired repetition period cannot be achieved;</td></tr>
<tr><td colspan="2">Providing to the CBC acknowledgement of successful execution of commands received from the CBC;</td></tr>
<tr><td colspan="2">reporting to the CBC failure when a command received from the CBC is not understood or cannot be executed;</td></tr>
</table>

routing ~~cell broadcast~~ CBS messages to the appropriate BTSs;	Routing CBS messages
transferring CBS information to each appropriate BTS via a sequence of 4 SMS BROADCAST REQUEST messages or 1 SMS BROADCAST COMMAND message (see GSM 08.58), indicating the channel which shall be used.	The Node B has no functionality regarding CBS. This implies that CBS messages do not have to be transmitted explicitely to the Node Bs for further processing.
optionally generating Schedule Messages, indicating the intended schedule of transmissions (see GSM 04.12);	Generating Schedule Messages, indicating the intended schedule of transmissions (see 3GPP TS 25.324)
optionally receiving CBCH Load Indication messages and reacting by broadcasting a burst of scheduled CBS messages or by suspending the broadcast for a period indicated by BTS (see GSM 08.58);	ffs

To work efficiently on the interfaces, the BSC/RNC should forward CB related messages to the CBC using cell lists as far as applicable.

7 BTS Functionality

Only GSM [The BTS is responsible for conveying CBS information received via SMS BROADCAST REQUEST or SMS BROADCAST COMMAND messages over the radio path to the MS.

- optionally generating CBCH Load Indication messages, indicating an underflow or overflow situation on the CBCH (see GSM 08.58).]

8 MS/UE Functionality

Only GSM [The MS is responsible for recombination of the blocks received via the radio path to reconstitute the ~~cell broadcast short~~CBS message.]
The precise method of display of ~~cell broadcast short~~CBS messages is outside the scope of GSM Specifications, however it is assumed that an MS/UE will:

MS	UE
discard sequences transferred via the radio path (see GSM 04.12) which do not consist of consecutive blocks;	Discard corrupt CBS messages received on the radio interface
have the ability to discard CBS information which is not in a suitable data coding scheme;	
have the ability to discard a CBS message which has a message identifier indicating that it is of subject matter which is not of interest to the MS;	
have the ability to ignore repeat broadcasts of CBS messages already received (message has not changed since it was last broadcast i.e. sequence number has not changed within the message's indicated geographical area);	
have the ability to transfer a CBS message to an external device, when supported ;	
optionally enter CBS DRX mode based upon received Schedule Messages (see GSM 04.12);	Enter CBS DRX mode based upon received Schedule Messages (see 3GPP TS 25.324)

optionally skip reception of the remaining block(s) of a ~~cell broadcast~~CBS message which do(es) not contain cell broadcast information (see GSM 04.12);	ffs.
optionally read the extended channel	Not applicable for UMTS.
enable the user to activate/deactivate CBS through MMI	
enable the user to maintain a "search list" and receive CBS messages with a Message Identifier in the list while discarding CBS messages with a Message Identifier not in the list	
allow the user to enter the Message Identifier via MMI only for the 1000 lowest codes	
be capable of receiving CBS messages consisting of up to 15 pages	

9 Protocols and Protocol Architecture

9.1 Requirements on the Radio Access Network

9.1.1 GSM Radio Access Network

Commands interpreted by the BSC will result in a sequence of 4 SMS BROADCAST REQUEST messages or 1 SMS BROADCAST COMMAND message being sent to a BTS, which in turn result in a sequence of 4 ~~messages~~blocks each 22 octets long being transferred via the BTS-MS interface (see GSM 04.12).
With the SMS BROADCAST REQUEST mode of operation, the 88 octet fixed length CBS page which is specified in Section 9.3 is split into four 22 octet blocks which are carried in SMS BROADCAST REQUEST messages as follows:

octets 1-22 are transferred in the 1st SMS BROADCAST REQUEST
with a sequence number (see GSM 04.12) indicating first block

octets 23-44 are transferred in the 2nd SMS BROADCAST REQUEST
with a sequence number (see GSM 04.12) indicating second block

octets 45-66 are transferred in the 3rd SMS BROADCAST REQUEST
with a sequence number (see GSM 04.12) indicating third block

octets 67-88 are transferred in the 4th SMS BROADCAST REQUEST
with a sequence number (see GSM 04.12) indicating fourth block.

Figure ~~2~~3 illustrates the protocol architecture and the scope of the various GSM Specifications for the SMS BROADCAST REQUEST mode of operation.

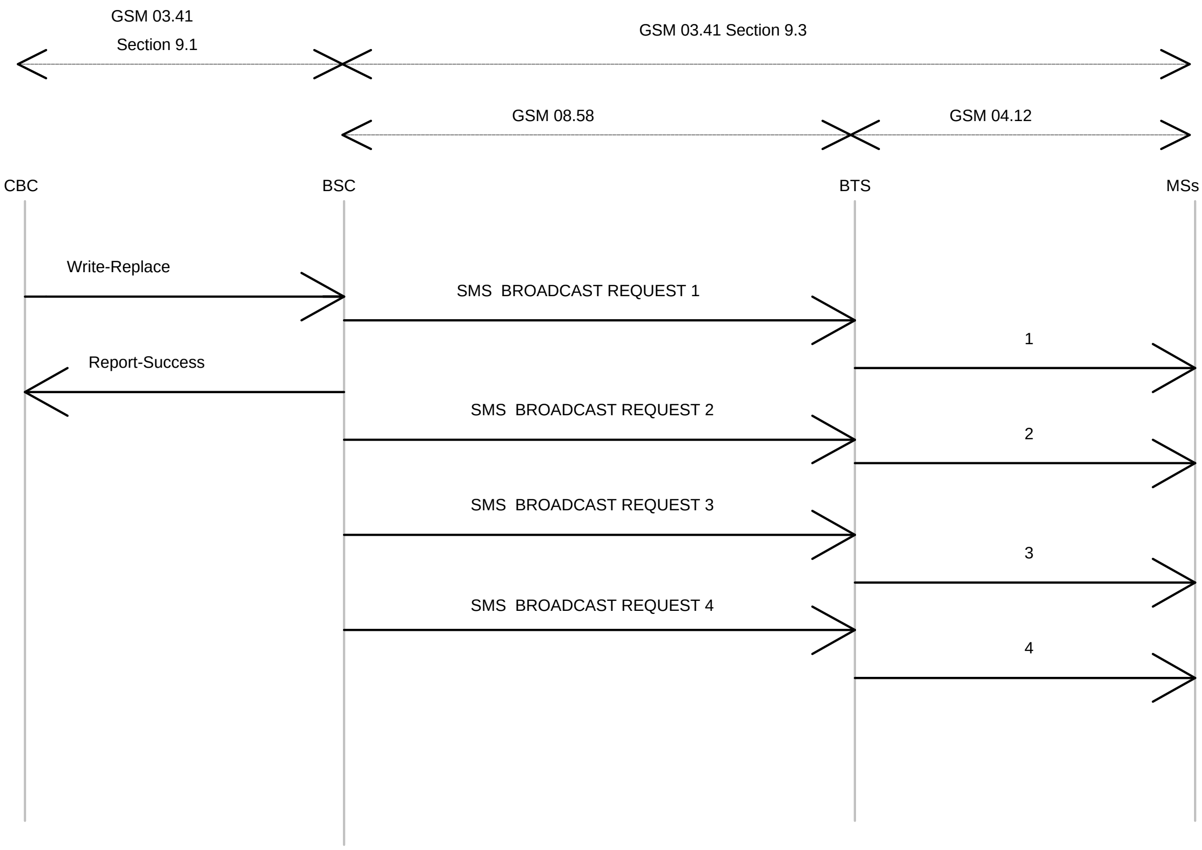


Figure ~~2~~3

With the SMS BROADCAST COMMAND mode of operation, the BSC sends to the BTS in one single message the 88 octet fixed length CBS page. The BTS then splits the page into four 22 octet blocks, adds the sequence number (see GSM 04.12) and transmits the four resulting blocks on the air.

Figure ~~3~~4 illustrates the protocol architecture and the scope of the various GSM Specifications for the SMS BROADCAST COMMAND mode of operation.

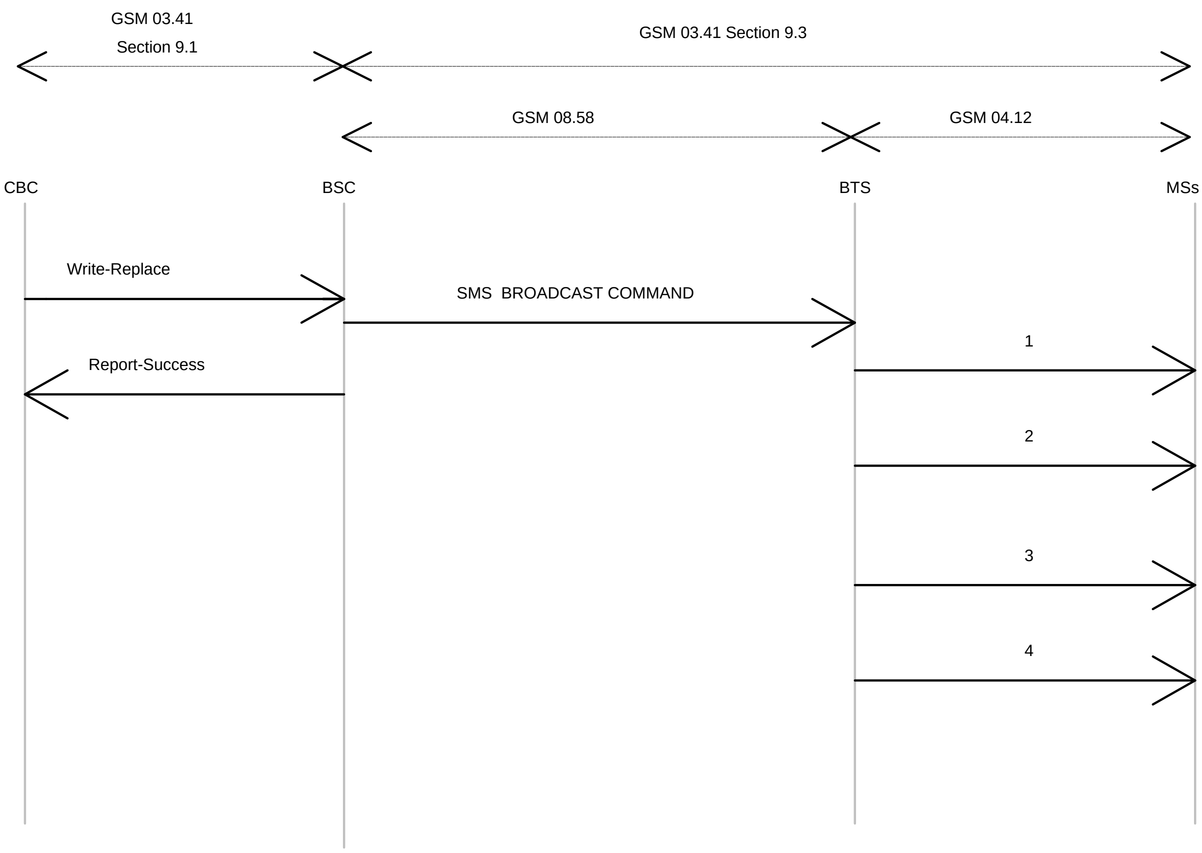


Figure 4~~3~~

9.1.2 UMTS Radio Access Network

ffs.

9.1.3 UMTS Protocol Overview

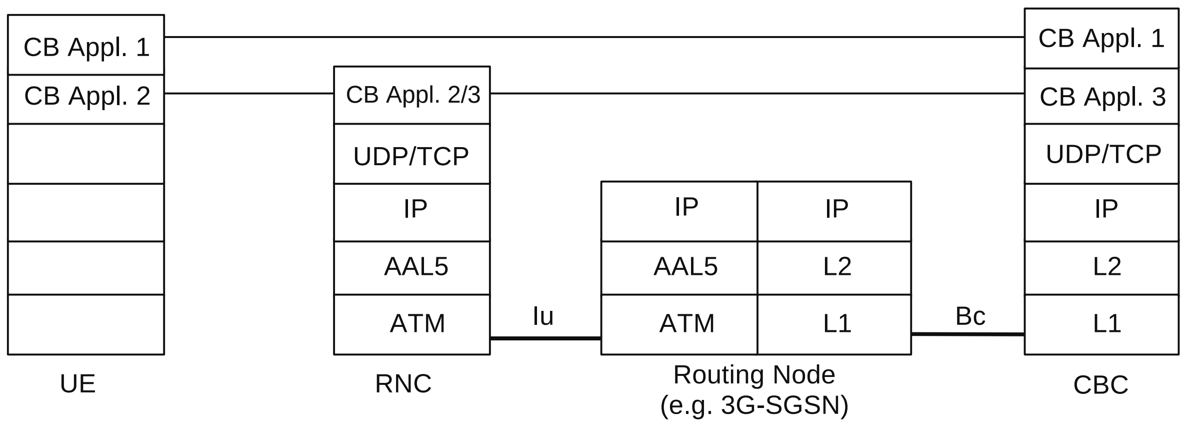


Figure 5

~~9.1 CBC-BSC Primitives~~

9.2 Requirements on the CBC-interfaces CBC-BSC and CBC-RNC

The requirements are described by primitives. The term primitive is used to indicate "an abstract, implementation independent interaction between a service user and a service provider" (see CCITT X.210). For the CBC-BSC interface, the service provider would be the protocol interconnecting CBC and BSC. A Primitive may therefore be viewed as an abstract, implementation independent request/indication or response/confirm interaction between the service user (CBC or BSC) and the service provider (protocol). A set of primitives for use between the CBC and BSC is specified appropriate to the functionality assigned to the CBC and BSC in Sections 5 and 6. In order to allow future extensions to the primitives, where possible a primitive shall not be rejected because a parameter is not recognised; the recipient shall ignore the parameter in question and process the remainder of the primitive's parameters as usual.
GSM only [No mandatory protocol between the CBC and the BSC is specified by GSM, this is a matter of agreement between CBC and PLMN operators. GSM 03.49 (see also annex A of this TS) provides example protocol stacks using the primitives defined as follows.]
In UMTS the CBC is integrated into the Core Network.This implies a mandatory protocol between CBC and RNC.

NOTE: In the following definitions, M indicates "mandatory parameter" and O indicates "optional parameter".

9.~~1~~2.1 Identification of a CBS message

In GSM ~~W~~within a CBC-BSC interface, a CBS message is uniquely identified by the quartet (Message Identifier, Serial Number, Cell Identifier, Channel Indicator).
In UMTS within the CBC-RNC interface, a CBS message is uniquely identified by the triplet (Message Identifier, Serial Number, Cell Identifier)
This means that even when two CBS messages have the same semantic containts (for example the same weather forecast) but in different languages or coding schemes, they are considered as different and must therefore be identified by a different quartet.
The Serial Number (Old-Serial-Number or New-Serial-Number) is managed cyclically and therefore this does not prevent the re-use of the same quartet for a different CBS message when the serial number have been incremented a sufficient number of times. How to manage the ambiguity is described subsequently.
This unique identification of a CBS message across the CBC-BSC interface is used in all the primitives defined hereafter. This means that the quartet/triplet will be implicitly or explicitly present in every interface primitive which applies to a given CBS message.
This unique quartet/triplet will be referred in the rest of the document as the « message reference ».

9.~~1~~2.2 WRITE-REPLACE Request/Indication

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.2.1	M
Old-Serial-Number	9.2.2	O
New-Serial-Number	9.2.3	M
Cell-List	9.2.5.1	M
GSM only [Channel Indicator	9.2.6	O]
Category	9.2.7	O
Repetition-Period	9.2.8	M
No-of-Broadcasts-Requested	9.2.9	M
Number-of-Pages	9.2.4	M
Data Coding Scheme	9.2.18	M
CBS-Message-Information-Page 1	9.2.19	M
CBS-Message-Information-Length 1	9.2.20	M
CBS-Message-Information-Page 2	9.2.19	O
CBS-Message-Information-Length 2	9.2.20	O
:		:
CBS-Message-Information-Page n	9.2.19	O
CBS-Message-Information-Length n	9.2.20	O

This primitive is sent by the CBC to the BSC/RNC. As this primitive can be used either to broadcast a new CBS message or replace a CBS message already broadcast, the CBC will use the presence and content of the Old-Serial-Number and New-Serial-Number fields in this primitive to instruct the BSC/RNC as follows:-

- Old-Serial-Number not present/New-Serial-Number present

  This is a write request which will be interpreted by the BSC/RNC as an instruction to broadcast a new CBS message in all the cells of the Cell list.

  GSM only [~~ and~~The CBS message will be broadcasted on the channel derived by the Channel Indicator (see the section on parameters that describes the implicit value of the Channel Indicator when not present in the CBS message).]

  The following table identifies the BSC/RNC's behaviour:

Success/Failure of write request	BSC/RNC behaviour
Success	The BSC/RNC completes the following parameters to be returned in the Report PDU: • a '0' value is entered in the number of broadcasts completed list for the cell • no entry is made in the failure list for the cell
Failure	The BSC/RNC completes the following parameters to be returned in the Report PDU: • no entry is made in the number of broadcasts completed list for the cell • an entry is made in the failure list for the new CBS message identifying the failure cause for the cell

  The BSC/RNC will build as many message references as the number of cells in the list. These message references will be used in particular in the subsequent primitives.

  When a message reference is already known by the BSC/RNC for certain cells in the list (even if the Update field of the Serial-Number is different), the primitive will be rejected for those cells with the cause « message reference already used ». The list of cells where the message reference is not valid will be provided in the failure list of the REPORT ~~message~~primative. For these cells ~~N~~no entry will be made in the number of broadcasts completed parameter.

- Old-Serial-Number present/New-Serial-Number present

  This is a replace request which will be interpreted by the BSC/RNC as a kill request for the CBS message with the old serial number, followed by a write request for the CBS message with the new serial number.

The handling of the new serial number in the write part of this request, is as described above in the write request where no Old-Serial-Number is supplied. These two kill and write requests are executed sequentially. If the kill request is unsuccessful, the BSC/RNC does not proceed to execute the write request. The kill request will stop broadcast of, and cause all information currently associated with the combination of message identifier, old serial number, GSM only [Channel Indicator] and the list of cells in the Cell list to be deleted from the cells in the BSC/RNC (i.e. for all cells provided in the Cell-List parameter). If the kill request is successful, the subsequent write request information conveyed in the primitive replaces the killed CBS message. The following table identifies the BSC/RNC's behaviour:

Success/Failure of kill request	BSC/RNC behaviour
Success	The BSC/RNC proceeds to execute the write request: • Write successful: the BSC/RNC completes the following parameters to be returned in the Report PDU: • an entry is made in the number of broadcasts completed list for the cell • no entry is made in the failure list for the cell • Write unsuccessful: the BSC/RNC completes the following parameters to be returned in the Report PDU: • an entry is made in the number of broadcasts completed list for the cell • an entry is made in the failure list for the new CBS message identifying the failure cause for the cell
Failure	The BSC/RNC does not proceed to execute the write request, and completes the following parameters to be returned in the Report PDU: • no entry is made in the number of completed broadcasts list • an entry is made for the old CBS message in the failure list identifying the failure cause for the cell

All cells which should perform the broadcasting are mentioned in the Cell-List parameter.
The broadcast of the referenced CBS message in the cells which are not mentioned in the Cell-List remains unaffected.
If no category is present, the default category is interpreted by the BSC/RNC, see the parameter section.
This primitive is responded by a REPORT or REJECT primitive.

NOTE: GSM only [~~i~~In the case of multipage CBS messages, the individual pages are considered as independent by the BSC scheduling algorithm.]

9.~~1~~2.3 KILL Request/Indication

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.2.1	M
Old-Serial-Number	9.2.2	M
Cell-List	9.2.5.1	M
GSM only [Channel Indicator	9.2.6	O]

This primitive is sent by the CBC to the BSC/RNC. The CBC will use this primitive to kill the message indicated by the combination of message identifier, serial number, GSM only [Channel Indicator] and the cells indicated in the Cell-List of this KILL request, i.e. the primitive will halt broadcast of the message in the indicated cells and remove any knowledge of the message from the BSC/RNC for these cells. The broadcast of the referenced message in the cells which are not mentioned in the Cell-List remains unaffected. This primitive is responded with a REPORT or REJECT primitive.

9.~~1~~2.4 REPORT Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.2.1	M
Serial-Number	9.2.2/9.2.3	M
GSM only [Channel Indicator	9.2.6	O]
No-of-Broadcasts-Completed-List	9.2.10	O
Failure-List	9.2.14	O

This primitive will be sent by the BSC/RNC to the CBC in response to WRITE-REPLACE and KILL primitives. The Serial-Number field will contain the old serial number if this primitive is sent in response to a KILL primitive, and the new serial number if the primitive is sent in response to a WRITE-REPLACE primitive.

The No-of-Broadcasts-Completed-List if present, may contain for each cell the number of broadcasts of the (replaced or killed) CB message with the old message reference sent to this particular cell for broadcast. The serial number information element in the case of a WRITE-REPLACE does not refer to the message for which the number of broadcasts completed information is supplied. The Failure-List if present, may contain those cells which were present in the related WRITE-REPLACE or KILL primitive and failed the requested operation.

9.~~1~~2.5 STATUS-~~CBCH~~LOAD-QUERY Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.2.5.1	M
GSM only [Channel Indicator	9.2.6	O]

This primitive is sent by the CBC to the BSC/RNC in order to obtain the current loading of the CBCH/UTRAN Radio Resource of particular cells referenced in the Cell-List parameter. This primitive is responded by a STATUS-~~CBCH~~LOAD-QUERY Response/Confirm or a REJECT primitive.

9.~~1~~2.6 STATUS-~~CBCH~~LOAD-QUERY Response/Confirm

PARAMETER	REFERENCE	PRESENCE
~~CBCH~~Radio-Resource-Loading-List	9.2.15	O
Failure-List	9.2.14	O
GSM only [Channel Indicator	9.2.6	O]

This primitive will be sent by the BSC/RNC in response to the STATUS-~~CBCH~~LOAD-QUERY Request/Indication primitive.
The ~~CBCH~~Radio-Resource-Loading-List, if present, may contain each cell which successfully performed the requested operation and for each of these cells the CBCH loading/ UTRAN Radio Resource loading of this particular cell. (Note that for cells with DRX the load caused by the schedule messages will be included in the ~~CBCH~~ load calculation). The ~~CBCH~~Radio-Resource-Loading-List will not be present if all cells indicated in the related STATUS-~~CBCH~~LOAD-QUERY Request/Indication failed the requested operation.
The Failure-List, if present, may contain all cells for which the requested operation failed (e.g. because the cells CBCH is not available in a BTS). The STATUS-~~CBCH~~LOAD-QUERY Response/Confirm will not contain the Failure-List parameter if none of the cells in the Cell-List of the related STATUS-~~CBCH~~LOAD-QUERY Request failed the requested operation.

9.~~1~~2.7 STATUS-MESSAGE-QUERY Request/Indication

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.2.1	M
Old-Serial-Number	9.2.2	M
Cell-List	9.2.5.1	M
GSM only [Channel Indicator	9.2.6	O]

This primitive is sent by the CBC to the BSC/RNC in order to obtain the current status of a CB-message for the cells referenced in the Cell-List parameter. This primitive is responded by the STATUS-MESSAGE-QUERY Response/Confirm or by a REJECT Response/Confirm.

9.~~1~~2.8 STATUS-MESSAGE-QUERY Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.2.1	M
Old-Serial-Number	9.2.2	M
No-of-Broadcasts-Completed-List	9.2.10	O
Failure-List	9.2.14	O
GSM only [Channel Indicator	9.2.6	O]

This primitive will be sent by the BSC/RNC to the CBC in response to a STATUS-MESSAGE-QUERY Request/Indication primitive.

The No-of-Broadcasts-Completed-List, if present, may contain each cell which successfully performed the requested operation and for each of these cells the number of times this CB message has been sent to this particular cell for broadcast (parameter Number-of-Broadcasts-Completed; this parameter is not included for the cell if the old message reference is not known to the BSC/RNC, and an entry is made in the failure list). The No-of-Broadcasts-Completed-List will not be present if all cells indicated in the related STATUS-MESSAGE-QUERY Request failed the requested operation.
The Failure-List may contain all cells for which the requested operation failed (e.g. because the broadcast of the requested message was never requested before or because the cells CBCH is not available). The STATUS-MESSAGE-QUERY Response/Confirm will not contain the Failure-List parameter if none of the cells in the Cell-List of the related STATUS-MESSAGE-QUERY Request failed the requested operation.

9.~~1~~2.9 REJECT Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Cause	9.2.16	M
Diagnostic	9.2.17	O
Message-Identifier	9.2.1	O
Serial Number	9.2.2	O

This primitive is sent by the BSC/RNC to the CBC in response to any primitive which is not understood (e.g. invalid parameter or parameter value).

9.~~1~~2.10 RESTART-INDICATION Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.2.5.2	M
Recovery Indication	9.2.20	O

The RESTART-INDICATION Request is used by the BSC/RNC to indicate to the CBC a CB related restart situation in one or more of its cells (e.g. when an existing or a new cell becomes operational during normal BSC/RNC operation or when the BSC/RNC initialises).
Any referenced cell are again in CB-operational state (have resumed CB operation). The parameter Recovery Indication, if present, indicates whether CB related data are lost for the cells referenced in the Cell-List and have to be re-loaded. If the Recovery Indication parameter is absent, the CBC shall interpret it as the Recovery Indication with the value data lost.
The CBC upon receiving a RESTART INDICATION indication, marks the cell as operational again. It will usually generate WRITE-REPLACE requests for this cell, according to the actual CB message loading at the moment of the restart.
Note that a RESTART INDICATION indication may be triggered from the CBC by a RESET Request. This allows to recover from situations, where a PDU occasionally may be lost.

9.~~1~~2.11 RESET Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.2.5.1	M

The RESET Request is used by the CBC to force one or more cells ~~(BTSs)~~ of one BSC/RNC into CB-idle state. The RESET Request may also be used by the CBC to ask for the CB operational state of cells earlier indicated to have failed (polling CB operational state).
If a ~~base station controller (BSC)~~BSC/RNC receives a RESET Indication, the indicated cells enter idle state (same state as after "power on"). All CB related information concerning earlier CB messages in a referenced cell is lost.
The BSC/RNC acknowledges the RESET Indication for each cell by an RESTART- or, if not adequate, by a FAILURE-INDICATION request.
Of course, several responses may be combined using a cell list in the RESTART or FAILURE INDICATION.

9.~~1~~2.12 FAILURE-INDICATION Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.2.5.2	M

The FAILURE-INDICATION Request is used by the BSC/RNC to indicate to the CBC a CB related problem situation in one or more of its cells.
Any referenced cell enters CB-not-operational state. The status of the CBS messages is undefined until the Restart-Indication is sent. It remains in not-operational state until a RESTART-INDICATION request (see 9.1.10) indicates normal CB operation (again).
The CBC upon receiving a FAILURE indication, marks this cell as failed. It will generally not generate further WRITE-REPLACE requests for this cell, up to the point, when the CBC is informed by a RESTART indication, that the cell has resumed CB operation.
The BSC/RNC refuses further WRITE-REPLACE requests from the CBC with the cause "cell-broadcast-not-operational" when any referenced cell is in the CB-not-operational state.
Note, that a Failure-Indication may be triggered by a RESET Request. This allows to recover from situations, where a PDU occasionally may be lost.

9.~~1~~2.13 SET-DRX Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.2.5.1	M
Schedule-Period	9.2.12	O
Reserved-Slots	9.2.13	O
GSM only [Channel Indicator	9.2.6	O]

The SET-DRX Request is used by the CBC to set DRX specific parameters i.e. the schedule period and the number of slots reserved for high priority CBS messages, see GSM 04.12. At least one of the Schedule-Period or Reserved-Slots parameters must be present in the primitive. If this primitive is not supported, the BSC/RNC may use default values.
If a ~~base station controller (BSC)~~ BSC/RNC receives a SET-DRX Indication, the new DRX parameters will be taken into account starting from the next schedule period in each cell, see GSM 04.12.
If a BSC/RNC receives a SET-DRX Indication, the new DRX parameters will be applied for all cells that do not handle any broadcast message (null loading).

9.~~1~~2.14 SET-DRX- REPORT Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.2.5.2	O
Failure-List	9.2.14	O
GSM only [Channel Indicator	9.2.6	O]

This primitive will be sent by the BSC/RNC to the CBC in response to a SET-DRX Request/Indication primitive.
The Failure-List will contain those cells which were present in the Request message and which failed the requested operation.
If the new schedule period parameters are not acceptable on a cell due to the load of the cell, the cause "bss-capacity-exceeded" is used in the Failure-list.

9.~~2~~3 Parameters

9.~~2~~3.1 Message-Identifier

This parameter identifies source/type of a CBS message and is passed transparently from the CBC to the MS/UE. Its format is defined in 9.~~3~~4.2.2.

9.~~2~~3.2 Old-Serial-Number

This parameter equates to the parameter - Serial Number sent between the BSC/RNC and the MS/UE. Its format is defined in 9.~~3~~4.2.1.
This parameter enables a particular existing CBS message, from the source/type indicated by the message identifier, to be identified.

9.~~2~~3.3 New-Serial-Number

This parameter equates to the parameter - Serial Number sent between the BSC/RNC and the MS/UE. Its format is defined in 9.~~3~~4.2.1.
This parameter enables CBS message change to be indicated since it is altered every time the CBS message is changed. The serial number identifies a particular CBS message, which may be several pages in length, from the source indicated by the message identifier.

9.~~2~~3.4 Number-of-Pages

This parameter enables the number of pages in the CBS message to be indicated.

9.~~2~~3.5 Cell-List

The cell-list identifies a sequence of one or more cells to which the primitives apply.
The following applies for GSM only:
The cells in the list are described in GSM 08.08 and can be identified by the CBC or BSC in LAC and CI format or CI format only.
In addition (see GSM 08.08) it is possible for the CBC to refer to all cells in a LAC or in a complete BSC. If supplied, the Cell-List parameter must refer to at least one cell.
Given the above differences between cell identification in the two directions, a cell list sent from the CBC to the BSC has a different structure compared to a cell list sent from the BSC to the CBC. The different cell lists are described in sections 9.2.5.1 and 9.2.5.2.
The following applies for UMTS only:
ffs.

9.~~2~~3.5.1 Cell-List sent from CBC to BSC/RNC

The CBC to BSC/RNC Cell-List contains a length parameter identifying the number of cell-identifications present in the list, a Cell-Id-Discriminator, which is common for all cell-identifications in the list, and a sequence of cell-identifications.
Description of list elements:

PARAMETER	PRESENCE
Length	M
Cell-Id-Discriminator	M
Cell-Identification	M

The following applies for GSM only:
The Cell-Id-Discriminator is described in GSM 08.08 and has one of the following formats:

- LAC and CI;
- CI only;
- all cells in the BSC belonging to a certain Location Area;
- all cells in the BSC.

The Cell-identification is repeated for each cell included in the list. The Cell-List must refer to at least one cell.
The following applies for UMTS only:
ffs.

9.~~2~~3.5.2 Cell-List sent from BSC/RNC to CBC

The BSC/RNC to CBC Cell-List contains a sequence of cell-identifiers as defined in 9.~~2~~3.11. The Cell-List must contain at least one cell-identifier as defined in 9.~~2~~3.11.

9.~~2~~3.6 Channel Indicator

The following applies for GSM only:
This parameter indicates the CB channel, which shall be used for broadcasting the data.

basic channel;

extended channel (supporting such a channel by the network or MSs is optional);

If no channel indicator is present, it shall be interpreted as an indication to the basic channel.

9.~~2~~3.7 Category

The following applies for GSM only:
This indicates the category of the CBS message:

High Priority: to be broadcast at the earliest opportunity in the reserved slots of the current schedule period (i.e. until the emission of the next schedule message), then according to the associated repetition period in the next schedule periods, in non reserved slots.

Background: to be broadcast in the slots left free by CBS messages of category "High Priority" and "Normal", possibly shared with unscheduled schedule messages, see GSM 04.12. The repetition period defines the minimum broadcast requirement.

Normal: to be broadcast according to the associated repetition period.

If the category is omitted, the default category implied is "Normal" message.
The following applies for UMTS only:
ffs.

9.~~2~~3.8 Repetition-Period

The following applies for GSM only:
This indicates the period of time after which broadcast of the CBS message should be repeated. The minimum period with which a CBS message may be broadcast over the air interface is one 8 x 51 multiframe sequence which corresponds to a period of approximately 1.883 seconds.
The value of "Repetition-Period" shall be in the range 1 to 1024 where each unit will represent one 8 x 51 multiframe sequence.
In the event of a conflict where the BSS has more than one CBS message to send at the same time, the BSC shall decide the order of such CBS messages as an implementation matter.
The following applies for UMTS only:
ffs.

9.~~2~~3.9 No-of-Broadcasts-Requested

This specifies the number of times the CBS message is to be broadcast.
The following applies for GSM only:
The parameter may take any value up to 65535 (this maximum allows the CBS message to be broadcast approximately every 1.883 seconds for more than 24 hours). If the parameter is set to 0 then the CBS message will be broadcast indefinitely (i.e. until the BSC receives an appropriate Kill-Message Request/Indication primitive).
The following applies for UMTS only:
ffs.

9.~~2~~3.10 No-of-Broadcasts-Completed-List

This parameter is a list indicating the number of times that the CBS message (i.e. all pages of the CBS message) has been sent to each ~~C~~cell in the Cell-List for broadcast over the air interface.
The following applies for GSM only:
The cells in the list are described as per section 3.2.2.17 of GSM 08.08 and can be identified by LAC and CI or CI only.
The following applies for UMTS only:
ffs.
Description of list elements:

PARAMETER	PRESENCE
Cell Identifier	M
No-of-Broadcasts-completed	M
No-of-Broadcasts-Compl-Info	O

The information above is repeated for the number of cells in the list.
To each cell in the list the information element No-of-Broadcasts-completed is associated. This information element is related to the particular referenced cell in the list and contains the number of times a CBS message (i.e. all pages of a CBS message) has been sent to this cell for broadcast. The No-of-Broadcasts-completed information element represents the number of full broadcasts made of a CBS message, and that the CBS message is being (or had been) broadcast.

The optional No-of-Broadcasts-Compl-Info information element may be supplied to indicate to the CBC one of the following cases:

- overflow

  the count of the number of full broadcasts made of a CBS message has overflowed, and that the CBS message is being (or had been) broadcast. The actual number of broadcasts completed is greater than the value indicated in the No-of-Broadcasts-completed information element.

- unknown

  indicates that there is no information regarding the number of broadcasts completed in the BSC/RNC for the CBS message with the old serial number. The value indicated in the No-of-Broadcasts-completed information element is undefined in this case.

The No-of-Broadcasts-Completed-List must contain at least one cell.

9.~~2~~3.11 Cell-Identifier

The following applies for GSM only:
The cell-identifier consists of a cell-id-discriminator and cell-identification pair.
Description of list elements:

PARAMETER	PRESENCE
Cell-Id-Discriminator	M
Cell-Identification	M

The Cell-Id-Discriminator is described inGSM 08.08 and has one of the following formats:

- LAC and CI,
- CI only.

The BSC can use the 'LAC and CI' format for a cell identifier in any response to the CBC. The BSC may also use the 'CI only' format for a cell identifier when responding to a CBC primitive that had contained a cell with 'CI only' format for a cell identifier.
The following applies for UMTS only:
ffs.

9.~~2~~3.12 Schedule-Period

The following applies for GSM only:
Indicates the DRX schedule period length, see GSM 04.12.
The following values should be coded:

- no DRX;
- length of the schedule period.

If a schedule period length greater than 40 is used, the schedule message cannot be built entirely if more than 40 CBS messages have to be described in the period. Therefore, schedule period length shall be reduced to 40.

The following applies for UMTS only:

ffs.

9.~~2~~3.13 Reserved-Slots

The following applies for GSM only:
Indicates the number of slots marked as "free slots reading advised" in the schedule message and considered as reserved in a DRX schedule period for incoming high priority CBS messages, not scheduled in the current schedule period, see GSM 04.12.
The spacing of the reserved slots is implementation dependent.
Reserved slots shall receive a 40 value at maximum, taking into account the constraint for schedule period length.
The following applies for UMTS only:
ffs.

9.~~2~~3.14 Failure-List

This identifies the list of cells for which the BSC/RNC could not complete the request. The failure cause for each cell is indicated.
The following applies for GSM only:
The cells in the list are described as per section 3.2.2.17 of GSM 08.08 and can be identified by LAC and CI or CI only.
Description of list elements:

PARAMETER	PRESENCE
Cell Identifier	M
Cause	M
Diagnostic	O

The information above is repeated for the number of cells that failed.
To each cell in the list the information elements Cause and, as an implementation option, Diagnostic are associated. These are related to the particular referenced cell in the list.
The Failure-List must contain at least one cell.
The following applies for UMTS only:
ffs.

9.~~2~~3.15 ~~CBCH~~Radio-Resource-Loading-List

The following applies for GSM only:
A list of the predicted short term load of each cell in the list expressed as a percentage. The calculation of this percentage is an implementation matter. The load should reflect the number of used slots, and schedule messages and reserved slots must be taken into account. The cells in the list are described inGSM 08.08 and can be identified by LAC and CI or CI only.
Description of list elements:

PARAMETER	PRESENCE
Cell Identifier	M
CBCH-Loading	M

The information above is repeated for the number of cells in the list.
To each cell in the list the information element CBCH-Loading is associated. This information element is related to the particular referenced cell in the list and contains the cells load.
Note that for cells with DRX the load caused by the schedule messages will be included in the CBCH load.
The CBCH-Loading-List must contain at least one cell.
The following applies for UMTS only:
ffs.

9.~~2~~3.16 Cause

Indicates reason why the BSC/RNC was not able to interpret or execute the received primitive. The causes are given in table 1.

Table 1

Cause	Reason
Parameter-not-recognized	Sent when the recipient (CBC or BSC/RNC) was unable to act upon the primitive received due to an unrecognized parameter. A primitive should not be rejected only because a parameter is not recognized as this would prevent extensions to the service
parameter-value-invalid	Sent when a failure occurred due to the value of a parameter being invalid, e.g. out of range, or in Write-Replace, the parameter "no of pages" does not equal the number of pages received
valid-CBS-message-not- identified	Sent when the BSC/RNC does not recognize the CBS message reference
cell-identity-not-valid	Sent when the BSC/RNC does not recognize a cell Identity
unrecognized-primitive	Sent when the BSC/RNC did not recognize the primitive at all
missing-mandatory-element	Sent when a mandatory element is missing from the primitive
bss-capacity-exceeded	Sent when a write-replace fails because the BSC/RNC cannot meet the requested repetition period or when the set-drx parameters cannot be applied because of the cell loading
GSM only [cell-memory-exceeded	Sent when the local cell memory has been exceeded]
bss-memory-exceeded	Sent when the BSS/RNS is unable to store a CBS message as the BSS/RNS memory has been exceeded
cell-broadcast-not-supported	Sent when the CBCH/CBS related Radio Resource is not configured for a cell
cell-broadcast-not-operational	Sent when the CBCH/CBS related radio resource is not available because of error conditions or due to maintenance activities
incompatible-DRX-parameter	Sent when the DRX parameter(s) cannot be applied.
GSM only [Extended-channel-not-supported	Sent when a write-replace fails because the extended channel is not configured for a cell]
message-reference already-used	Sent when the recipient (BSC/RNC) was unable to act upon the write_replace received due to a previous write_replace received with the same message_reference.
unspecified-error	Sent when none of the above cause values apply

9.~~2~~3.17 Diagnostic

Provides additional information associated with Cause parameter and may contain parameter which could not be interpreted/executed.

9.~~2~~3.18 Data Coding Scheme

This parameter identifies the alphabet or coding employed for the message characters and message handling at the MS/UE and is passed transparently from the CBC to the MS/UE. This parameter is defined in ~~GSM~~3GPP ~~0~~23.~~0~~38 [3].

9.~~2~~3.19 CBS-Message-Information-Page n

This parameter is of a fixed length of 82 octets and carries up to and including 82 octets of user information. Where the user information is less than 82 octets, the remaining octets must be filled with padding (see ~~GSM~~3GPP ~~0~~23.~~0~~38 [3]).
The content of a CBS-Message-Information-Page is passed transparently from the CBC to the MS/UE. ~~and~~In GSM the CBS-Message-Information-Page n becomes the 'Content of Message' parameter at the MS.
In UMTS the CBS-Message-Information-Pages together with the associated CBS-Message-Information-Length parameter is broadcasted as a single unit over the radio inteface.
In the case where the user information is GSM 7 bit default alphabet encoded, the appropriate padding characters and bit-fill are added to the end of the user information to complete the CBC-Message-Information-Page (see ~~GSM~~3GPP ~~0~~23.~~0~~38).

In the case where the user information is 8 bit encoded, the appropriate padding octets are added to the end of the user information to complete the CBC-Message-Information-Page (see ~~GSM~~3GPP ~~0~~23.038).

9.~~2~~3.20 CBS-Message-Information-Length n

This parameter gives the number of octets of the CBS-Message-Information-Page n containing user information. The remaining octets of the CBS-Message-Information-Page n contain only padding information and are not included in this parameter.
In the case where the user information is encoded using the GSM 7 bit default alphabet and the last character terminates at an octet boundary, this parameter indicates the number of octets of user information. In the case where the last character does not terminate at an octet boundary, this parameter indicates the number of octets up to the octet boundary immediately following the last GSM 7 bit default alphabet character of user information.
In UMTS the CBS-Message-Information-Pages together with the associated CBS-Message-Information-Length parameter is broadcasted as a single unit over the radio inteface.

9.~~2~~3.21 Recovery-Indication

Indicates whether the CBS related data was lost or is still available.
The following values should be coded:

- Data-available;
- Data-lost.

9.~~3~~4 Message Format on ~~BTS-Ms~~the Radio Network – MS/UE Interface

9.4.1 GSM

The CBS messages which are transmitted by the BTS for the MS include the CBS Message (information for the user) and Schedule Message (schedule of CBS messages).
The use and the formatting of the CBS messages, which contain information for the MS user, is described in this section.
The Schedule Message is broadcast to support CBS DRX mode for Mobile Stations. The Schedule Message is helpful in minimizing battery usage for Cell Broadcast in the Mobile Station, because it allows the MS to ignore transmissions of CBS messages the customer is not interested in. The use and formatting of the Schedule Message is described in GSM 04.12.

9.~~3~~4.1.1 General Description

Each page of a CBS Message sent to the MS by the BTS is a fixed block of 88 octets as coded in GSM 04.12. This is sent on the channel allocated as CBCH by GSM 05.02. The 88 octets of the CBS Message are formatted as described in 9.3.2.

9.~~3~~4.~~2~~1.2 Message Parameter

Octet Number(s)	**Field**
1-2	Serial Number
3-4	Message Identifier
5	Data Coding Scheme
6	Page Parameter
7-88	Content of Message

The octets in the above table are transmitted in order, starting with octet 1. The bits within these octets are numbered 0 to 7; bit 0 is the low order bit and is transmitted first.

9.~~3~~4.~~2~~1.~~1~~2.1 Serial Number

This parameter is a 16-bit integer which identifies a particular CBS message (which may be one to fifteen pages in length) from the source and type indicated by the Message Identifier and is altered every time the CBS message with a given Message Identifier is changed.

The two octets of the Serial Number field are divided into a 2-bit Geographical Scope (GS) indicator, a 10-bit Message Code and a 4-bit Update Number as shown below:

<table>
<tr><td colspan="8">Octet 1</td><td colspan="8">Octet 2</td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="2">GS</td><td colspan="10">Message Code</td><td colspan="4">Update Number</td></tr>
</table>

The most significant bit of the update number is octet 2 bit 3. The most significant bit of the Message Code is octet 1 bit 5 and the least significant bit of the Message Code is octet 2 bit 4. The most significant bit of the Geographical Scope is octet 1 bit 7.

- Message Code

The Message Code differentiates between CBS messages from the same source and type (i.e. with the same Message Identifier). Message Codes are for allocation by PLMN operators.

The Message Code identifies different message themes. For example, let the value for the Message Identifier be "Automotive Association" (= source), "Traffic Reports" (= type). Then "Crash on A1 J5" could be one value for the message code, "Cow on A32 J4" could be another, and "Slow vehicle on M3 J3" yet another.

- Geographical Scope

The Geographical Scope (GS) indicates the geographical area over which the Message Code is unique, and the display mode. The CBS message is not necessarily broadcast by all cells within the geographical area. When two CBS messages are received with identical Serial Numbers/Message Identifiers in two different cells, the Geographical Scope may be used to determine if the CBS messages are indeed identical.

In particular, the Geographical Scope tells the mobile if the CBS message is only cell wide (which means that any CBS message if received in the next cell is regarded as "new"), or PLMN wide (which means that the Message Code and/or Update Number must change in the next cell for the CBS message to be "new"), or Location Area wide (which means that a CBS message with the same Message Code and Update Number may or may not be "new" in the next cell according to whether the next cell is in the same Location Area as the current cell).

The display mode indicates whether the CBS message is supposed to be on the display all the time ("immediate") or only when the user wants to see it ("normal"). In either case, the CBS message will be displayed only if its Message Identifier is contained within the "search list" of the mobile (see 9.3.2). These display modes are indicative of intended use, without indicating a mandatory requirement or constraining the detailed implementation by mobile manufacturers. The user may be able to select activation of these different modes.

The coding of the Geographical Scope field is shown below:

GS Code	**Display Mode**	**Geographical Scope**
00	Immediate	Cell wide
01	Normal	PLMN wide

10	Normal	Location Area wide
11	Normal	Cell wide

Immediate = default direct display

Normal = default display under user interaction

NOTE: Code 00 is intended for use by the network operators for base station IDs.

- Update Number

The Update Number indicates a change of the message content of the same CBS message, i.e. the CBS message with the same Message Identifier, Geographical Scope, and Message Code.

In other words, the Update Number will differentiate between older and newer versions of the same CBS message, within the indicated geographical area. A new CBS message may have Update Number 0000; however this number will increment by 1 for each update. Any Update Number eight or less higher (modulo 16) than the last received Update Number will be considered more recent, and shall be treated as a new CBS message, provided the mobile has not been switched off.

9.~~3~~4.~~2~~1.~~2~~2.2 Message Identifier

This parameter identifies the source and type of the CBS message. For example, "Automotive Association" (= source), " Traffic Reports" (= type) could correspond to one value. A number of CBS messages may originate from the same source and/or be of the same type. These will be distinguished by the Serial Number. The Message Identifier is coded in binary.

The ME shall attempt to receive the CBS messages whose Message Identifiers are in the "search list". This "search list" shall contain the Message Identifiers stored in the EF_{CBMI}, EF_{CBMID} and EF_{CBMIR} files on the SIM (see GSM 11.11) and any Message Identifiers stored in the ME in a "list of CBS messages to be received". If the ME has restricted capabilities with respect to the number of Message Identifiers it can search for, the Message Identifiers stored in the SIM shall take priority over any stored in the ME.

The use/application of the Message Identifier is shown in the following list, with octet 3 of the Message Identifier shown first, followed by octet 4. Thus "1234" (hex) represents octet 3 = 0001 0010 and octet 4 = 0011 0100.

0000 - 03E7 (hex): To be allocated by PLMN operator associations. If a Message Identifier from this range is in the "search list", the ME shall attempt to receive such CBS message.

This version of GSM 03.41 does not prohibit networks from using Message Identifiers in the range 0000 - 03E7 (hex) for Cell Broadcast Data Download to the SIM.

03E8 - 0FFF (hex): Intended for standardization in future versions of GSM 03.41. These values shall not be transmitted by networks that are compliant to this version of GSM 03.41. If a Message Identifier from this range is in the "search list", the ME shall attempt to receive this CBS message.

1000 - 107F (hex): Networks shall only use Message Identifiers from this range for Cell Broadcast Data Download in "clear" (i.e. unsecured) to the SIM (see GSM 11.14). If a message Identifier from this range is in the "search list", the ME shall attempt to receive this CBS message.

1080 – 10FF (hex): Networks shall only use Message Identifiers from this range for Cell Broadcast Data Download secured according to GSM 03.48 [15] to the SIM (see GSM 11.14). If a message Identifier from this range is in the "search list", the ME shall attempt to receive this CBS message.

1100 - 9FFF (hex): intended for standardization in future versions of GSM 03.41. These values shall not be transmitted by networks that are compliant to this version of GSM 03.41. If a Message Identifier from this range is in the "search list", the ME shall attempt to receive this CBS message.

A000 - AFFF (hex): PLMN operator specific range. The type of information provided by PLMN operators using these Message Identifiers is not guaranteed to be the same across different PLMNs. If a Message Identifier from this range is in the "search list", the ME shall attempt to receive this CBS message.

B000 - FFFE (hex): intended as PLMN operator specific range in future versions of GSM 03.41. These values shall not be transmitted by networks that are compliant to this version of GSM 03.41. If a Message Identifier from this range is in the "search list", then the ME shall attempt to receive this CBS message.

FFFF (hex): Reserved, and should not be used for new services, as this value is used on the SIM to indicate that no Message Identifier is stored in those two octets of the SIM. If this Message Identifier is in the "search list", the ME shall attempt to receive this CBS message.

Generally, the MMI for entering these codes in the ME is left to the manufacturers' discretion. However, the 1000 lowest codes shall be capable of being specified via their decimal representation i.e.:

	Octet 3	Octet 4	
	0000 0000	0000 0000	(decimal '000')
	0000 0000	0000 0001	(decimal '001')
	0000 0000	0000 0010	(decimal '002')
	0000 0000	0000 0011	(decimal '003')
		:	:
:			
		:	:
:			
	0000 0011	1110 0111	(decimal '999')

9.~~3~~4.~~2~~1.~~3~~2.3 Data Coding Scheme

This parameter indicates the intended handling of the CBS message at the MS, the alphabet/coding, and the language (when applicable). This is defined in ~~GSM~~ 3GPP ~~0~~23.038 [3].

When the SIM indicates one or more language preferences, the ME shall, by default, use the language(s) stored in the SIM (in the EF_{LP} file) to set any language filter mechanisms provided by the ME.

Optionally, the user can select the language(s) required by using an MMI, to determine whether a particular CBS message should be read and displayed.

9.~~3~~4.~~2~~1.~~4~~2.4 Page Parameter

This parameter is coded as two 4-bit fields. The first field (bits 0-3) indicates the binary value of the total number of pages in the CBS message and the second field (bits 4-7) indicates binary the page number within that sequence. The coding starts at 0001, with 0000 reserved. If a mobile receives the code 0000 in either the first field or the second field then it shall treat the CBS message exactly the same as a CBS message with page parameter 0001 0001 (i.e. a single page message).

9.~~3~~4.~~2~~1.~~5~~2.5 Content of Message

This parameter is a copy of the 'CBS-Message-Information-Page' as sent from the CBC to the BSC.

9.4.2 UMTS

The CBS message format is described in 3G TS 25.324. The information elements Serial Number, Message Identifier and Data Coding Scheme are identical with those described for GSM in section 9.4.1 with respect to their structure and possible values. Any other differences to GSM, e.g. concerning the storage of the parameters on the USIM are for further study.

9.~~4~~5 CBS Compression

Cell Broadcast messages may be compressed in accordance with the compression algorithm described in ~~GSM~~3GPP ~~0~~23.042 [14].
The Data Coding Scheme parameter (see 9.~~3~~4.~~2~~1.~~3~~2.3) indicates whether or not a CBS Message is compressed.
Compression and decompression may take place between a CBE and an MS or between a CBC and an MS.
The compression applies only to user information sent between the CBC and the MS i.e. excludes any padding octets.
Padding in the case of CBS compression is defined as an integral number of octets where each padding octet has a value FF hexadecimal. The insertion of padding for different scenarios is described in the paragraphs below.
The compression footer (see ~~GSM~~3GPP ~~0~~23.042) delimits the compressed user information bit stream at an octet boundary. The remainder of the 'CBS-Message-Information-Page' sent between the CBC and the BSC contains padding octets. The parameter 'CBS-Message-Information-Length' identifies the sum of the compressed octets, the compression header, and the compression footer (see ~~GSM~~3GPP ~~0~~23.042), but not any padding.
Compression may apply to a single 'CBS-Message-Information-Page' or across multiple 'CBS-Message-Information-Page's.
In the case where Compression applies only to a single 'CBS-Message-Information-Page', the compression header shall be the first octet in that 'CBS-Message-Information-Page' and the compression footer shall immediately follow the compressed data stream. Any remaining octets after the compression footer shall contain padding up to and including the 82nd octet position. However, if the 82nd octet position contains the compression footer then there is no padding.
In the case where compression applies across multiple 'CBS-Message-Information-Page's, the compression header shall be present only in the first octet position of the first 'CBS-Message-Information-Page'. The compression footer shall immediately follow the compressed data stream which will terminate within the last ‘CBS-Message-Infirmation-Page’. Any remaining octets after the compression footer in the last 'CBS-Message-Information-Page' shall contain padding up to and including the 82nd octet position in the last ‘CBS-Message-Information-Page’. However, if the 82nd octet position of the last 'CBS-Message-Information-Page' contains the compression footer then there is no padding.
If it is required to convey different blocks of information which are to be treated by the MS as though they were physically independent pages rather than concatenated information then page break characters (see ~~GSM~~3GPP ~~0~~23.038) may be inserted in the character stream prior to compression. The boundaries created by the page breaks will not normally align with the boundaries set by the page number parameters and so the page number parameters cannot be used to identify physically separate blocks of meaningful information.
The decoding at the MS may be achieved by first locating the compression footer octet by working back from the 82nd octet in the last 'CBS-Message-Information-Page'. If padding is present, the MS must skip backwards over the padding until a non padding octet is found. By definition this octet must be the compression footer. The compression footer has a pre-defined bit combination which can never replicate a padding octet. If padding is not present in the 82nd octet position of the last 'CBS-Message-Information-Page', by definition the 82nd octet must be the compression footer.
The compression footer defined in ~~GSM~~3GPP ~~0~~23.042 indicates whether there are any compressed data bits contained within the compression footer octet and, if not, how many compressed data bits are contained within the octet immediately preceding the compression footer. In order to prevent possible replication of the padding octet value in the compression footer octet value, the compression mechanism must ensure that when bits 0,1,2 in the compression footer are all ones all other bits in the compression footer octet are set to 0~~.~~

10 CBS Index

An index structure is defined in this section. Index can be used by the operator to inform the end user about the type of CBS services available. Index has the structure of a tree. It can thus have sub parts which are called subindexes. A subindex can be embedded in the same index message as its parent ("embedded subindex") or it can physically be in a separate index message ("child subindex"). Every index message has a unique message identifier. They are always of the same type. Message Code 1010101010b shall be used to indicate this type. The root of the index structure shall be the index message with message identifier 0. Other index messages are linked to the root index with links. Definition of their message identifiers is left to the operator.
A format ("enhanced format") for the index messages is described in this section. If this enhanced format is used in the index message the ms can present the index messages in its preferred format.
Available CBS services are introduced in the index. This means that their message identifier and name are stated.
Enhanced format includes a mechanism for separating a normal service introduction from embedded subindex

introduction and child subindex introduction. The introduction of an embedded subindex specifies the "subindex-id" used for identifying services that belong to this subindex. Embedded subindexes can have subindexes embedded in them etc. If these "second level embedded subindexes" are introduced their subindex-id shall begin with the subindex-id of their parent. Same principle applies for subindexes in third, fourth etc. level. An example of an index structure is given in figure 46.

Enhanced format includes a mechanism which allows the terminals to identify that the format of the index message is enhanced. The index-id -field and the above mentioned Message Code (1010101010b) constitute this mechanism:

message-format = index-id index-element-intro+

index-id = "EI" version crlf

version = number+

number = "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9" | "0"

index-element-intro = subindex-intro | service-intro

subindex-intro = subindex-id " " subindex-name crlf

subindex-id = subindex-character+

subindex-character = "a" | "b" | … | "z" | "A" | "B" | … | "Z"

subindex-name = name-character+

name-character = <gsm03.38character excluding <CR> and <LF> >

crlf = <CR> <LF>

service-intro = subindex-id message-id delimiter service-name crlf.

message-id = number+

delimiter = "." | " "

service-name = name-character+

Current version used is 1.

The use of "." as delimiter means that this service is a child subindex of the index structure.

Delimiter " " is used in all other cases.

Subindex-id shall not be used if the service introduced is in the first level of the index. Subindex-id:s are used in alphabetical order within an index message. They can be re-used in a child subindex.

0 Index:
(MsgId=0, Message Code = 1010101010b)

EI1
20 Hospitals
34 Taxis
a News
a201 Int News
a202 Nat News
a203 Local News
b Sports
b301 Football News
b302 Hockey Results
b303 Basketball
c Finance
c401 Finance News
ca Quotes NYSE
ca412 NYSE industrial
ca413 NYSE electronics
ca414 NYSE blue
c420.Quotes Tokyo
d Weather
d501 Local Weather
d502 National Weather
d503 Weather in Europe
d504 Weather in the World
900.Buy and Sell

420 Quotes Tokyo:
(MsgId = 420, Message Code = 1010101010b)

EI1
421 Tokyo Industrial
422 Tokyo Finance
423 Tokyo Blue

900 Buy and Sell:
(MsgId = 900, Message Code = 1010101010b)

EI1
901 Cars
902 Bikes
903 Boats
a Home Electronics
a911 Computers
a912 Televisions
a913 Radios
920 Baby Clothes
930 Magazines
940 Books

Figure 46

Annex A (informative): Protocols for interconnecting CBC and BSC

The following is applicable for GSM only:

No mandatory protocol between the Cell Broadcast Centre (CBC) and the Base Station Controller (BSC) is specified by GSM; this is a matter of agreement between CBC and PLMN operators.

Some example protocols are provided in GSM 03.49 to assist CBC and PLMN operators. These are based on the following principles, which CBC and PLMN operators are recommended to follow even if they choose not to use one of the examples given in GSM 03.49.

The protocol(s) between CBC and BSC should:

a) provide the service defined for the CBC-BSC interface (see section 9);

b) be based on protocols normally used for communication between switching and/or computer equipment;

c) permit open interconnection - preferably using the OSI stack or equivalent (e.g. CCITT Number 7 Stack).

3GPP TSG-T2 #7 / ETSI SMG4
Ystad, SWEDEN, 22-26 November 1999

TSGT2#7(99)1062

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.041 CR 002 Current Version: 3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-T#6
list expected approval meeting # here ↑

for approval	X	strategic		*(for SMG use only)*
for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: T2 **Date:** 26 Nov 1999

Subject: LCS Utilization of CBS

Work item: Location Services (LCS)

Category: *(only one category shall be marked with an X)*

Correction		Phase 2	
Corresponds to a correction in an earlier release	X	Release 96	
Addition of feature		Release 97	
Functional modification of feature		Release 98	
Editorial modification		Release 99	X
		Release 00	

Reason for change: LCS Message Identifiers to support E-OTD and GPS broadcast messaging

Clauses affected: 9.3.2.2

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

9.3.2.2 Message Identifier

This parameter identifies the source and type of the message. For example, "Automotive Association" (= source), " Traffic Reports" (= type) could correspond to one value. A number of messages may originate from the same source and/or be of the same type. These will be distinguished by the Serial Number. The Message Identifier is coded in binary.

The ME shall attempt to receive the CBS messages whose Message Identifiers are in the "search list". This "search list" shall contain the Message Identifiers stored in the EF_{CBMI}, EF_{CBMID} and EF_{CBMIR} files on the SIM (see GSM 11.11) and any Message Identifiers stored in the ME in a "list of CBS messages to be received". If the ME has restricted capabilities with respect to the number of Message Identifiers it can search for, the Message Identifiers stored in the SIM shall take priority over any stored in the ME.

The use/application of the Message Identifier is shown in the following list, with octet 3 of the Message Identifier shown first, followed by octet 4. Thus "1234" (hex) represents octet 3 = 0001 0010 and octet 4 = 0011 0100.

0000 - 03E7 (hex): To be allocated by PLMN operator associations. If a Message Identifier from this range is in the "search list", the ME shall attempt to receive such message.

This version of GSM 03.41 does not prohibit networks from using Message Identifiers in the range 0000 - 03E7 (hex) for Cell Broadcast Data Download to the SIM.

03E8 (hex) LCS SMSCB Message Identifier for E-OTD Assistance Data message

03E9 (hex) LCS SMSCB Message Identifier for GPS Assistance Data message

03EA~~8~~ - 0FFF (hex): Intended for standardization in future versions of GSM 03.41. These values shall not be transmitted by networks that are compliant to this version of GSM 03.41. If a Message Identifier from this range is in the "search list", the ME shall attempt to receive this message.

1000 - 107F (hex): Networks shall only use Message Identifiers from this range for Cell Broadcast Data Download in "clear" (i.e. unsecured) to the SIM (see GSM 11.14). If a message Identifier from this range is in the "search list", the ME shall attempt to receive this message.

1080 – 10FF (hex): Networks shall only use Message Identifiers from this range for Cell Broadcast Data Download secured according to GSM 03.48 [15] to the SIM (see GSM 11.14). If a message Identifier from this range is in the "search list", the ME shall attempt to receive this message.

1100 - 9FFF (hex): intended for standardization in future versions of GSM 03.41. These values shall not be transmitted by networks that are compliant to this version of GSM 03.41. If a Message Identifier from this range is in the "search list", the ME shall attempt to receive this message.

A000 - AFFF (hex): PLMN operator specific range. The type of information provided by PLMN operators using these Message Identifiers is not guaranteed to be the same across different PLMNs. If a Message Identifier from this range is in the "search list", the ME shall attempt to receive this message.

B000 - FFFE (hex): intended as PLMN operator specific range in future versions of GSM 03.41. These values shall not be transmitted by networks that are compliant to this version of GSM 03.41. If a Message Identifier from this range is in the "search list", then the ME shall attempt to receive this message.

FFFF (hex): Reserved, and should not be used for new services, as this value is used on the SIM to indicate that no Message Identifier is stored in those two octets of the SIM. If this Message Identifier is in the "search list", the ME shall attempt to receive this message.

3GPP TSG-T2 #7 / ETSI SMG4
Ystad, SWEDEN, 22-26 November 1999

TSGT2#7(99)980

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.042 CR 001 Current Version: 3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-T#6	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑	for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio		Core Network	

Source:	T2
Date:	26/11/99
Subject:	Adaptations for UMTS
Work item:	TEI

Category:	F	Correction		**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification	X		Release 99	X
					Release 00	

Reason for change:	This specification has been transferred from SMG to 3GPP. Therefore, adaptations for UMTS are required.
Clauses affected:	

Other specs affected:	Other 3G core specifications		→ List of CRs:	
	Other GSM core specifications		→ List of CRs:	
	MS test specifications		→ List of CRs:	
	BSS test specifications		→ List of CRs:	
	O&M specifications		→ List of CRs:	

Other comments:	

help.doc

<--------- double-click here for help and instructions on how to create a CR.

Introduction

This clause introduces the concepts and mechanisms involved in the compression and decompression of a stream of data.

Overview

Central to the compression of a stream of data and the subsequent recovery of the original data is the that both sender and receiver have information that not only describes the content of the data stream, but how the stream is encoded.

For example, a simple rule such as "it's 8 bit data" is enough to transport any character value in the range 0 to 255 with 8 bits being required for each and every character. In contrast if both sender and receive know that some characters are more frequent than others, then the more frequent might be encoded in fewer bits while the less frequent in more - resulting in a net reduction of the total number of bits used to express the data stream.

This knowledge of the nature of the data stream can be established in two ways. Either both sender and receiver can agree some key aspects of the data stream *prior* to it being processed or key aspects of the data can be garnered *dynamically* during its processing.

The disadvantage of an approach based on "prior information" is that it must be known. It can either be carried as a header to the data stream, in which case it adds to the net size of the compressed stream. Or it can be fixed and known to the (de)compression algorithm itself in which case compression performance degrades as a given stream diverges in nature from these fixed and known states. In contrast, the disadvantage of "dynamic information" is that it must be discovered; typically this means a greater processing requirement for the (de)compressor. It also implies that compression performance is initially poor as the algorithm has to "learn" about the data stream before it can apply this knowledge. It will also require greater working memory to store its knowledge about the data stream.

The choice of compression algorithms is always a balancing of compression rate (in terms of fewer output bits), working memory requirements of the (de)compressor and CPU bandwidth. For the compression of SMS messages, there is the additional requirement that it should work well (in terms of compression rate) even on short data streams.

Compression / Decompression is an optional feature but when implemented, the only mandatory requirement is ‘Raw Untrained Dynamic Huffman’ . The default initialisation for the Huffman Encoder / Decoder operating in the Raw Untrained Dynamic Huffman mode are defined in annex R. (See also subclause 4.1.)

i.e. There is no need for any pre-defined attributes such as language dependency to be included. This is of particular significance for entities such as an MS which may have memory storage constraints.

1 Scope

The present document introduces the concepts and mechanisms involved in the compression and decompression of a stream of data.

2 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

2.1 Normative references

[1] 3G TS 23.038: "Alphabets and language-specific information".

2.2 Informative references

[2] "The Data Compression Handbook 2nd Edition" by Mark Nelson and Jean-Loup Gailly, published by M&T Books, ISBN 1-22851-434-1.

3 Abbreviations

For the purposes of the present document, the following abbreviations apply.

CD	Compressed Data
CDS	Compressed Data Stream
CDSL	Compressed Data Stream Length
CF	Compression Footer
CG-ID	Character Group ID
CH	Compression Header
CLC	Compression Language Context
HI-ID	Huffman initialization ID
KD-ID	Keyword Dictionary ID
PU-ID	PUnctuator ID

4 Algorithms

The compression algorithm comprises a number of components that may be combined in a variety of configurations. The discrete algorithms are discussed in the following subclauses.

4.1 Huffman Coding

The base compression algorithm is a Huffman coder, whereby characters in the input stream are represented in the output stream by bit sequences of variable length. This length is inversely proportional to the frequency with which the character occurs in the input stream.

This is the only component of the whole compression algorithm that can be expected to be included in any implementation, all other components are optional.

There are two possible approaches here:

a) the (de)coder can be "pre-loaded" with a character frequency distribution, thus improving compression rate for streams that approximate to this distribution; or

b) the (de)coder can adapt the frequency distribution it uses to (de)code characters based on the incidence of previous characters within the input stream.

In both cases, the character frequency distribution is represented in a "tree" structure, an example of which is shown in figure 1.

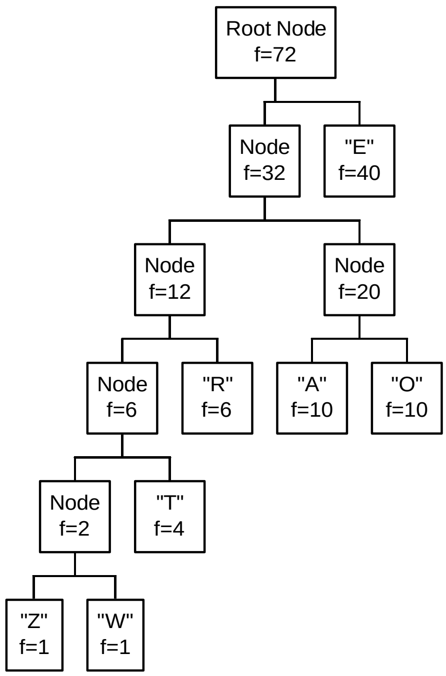


Figure 1: Character frequency distribution

The tree represents the characters Z, W, T, R, A, O and E which have frequencies of 1, 1, 4, 6, 10, 10 and 40 respectively. The characters may be coded as variable length bit streams by starting at the "character node" and ascending to the "root node". At each stage, if a left hand path is traversed, a 0 bit is emitted and if a right hand path is traversed a 1 bit is emitted. Thus the infrequent Z and W would require 5 bits, whereas the most frequent character E requires just 1 bit. The resulting bit stream is decoded by starting at the "root node" and descending the tree, to the left or right depending on the value of the current bit, until a "character node" is reached.

It is a requirement that at any time the trees expressing the character frequencies shall be identical for both coder and decoder. This can be achieved in a number of ways.

Firstly, both coder and decoder could use a fixed and pre-agreed frequency distribution that includes all possible characters but as noted above, this use of "prior information" suffers when a given input stream has a significantly different character frequency distribution.

Secondly, the coder may calculate the character frequency distribution for the entire input stream and prepend this information to the encoded bit stream. The decoder would then generate the appropriate tree prior to processing the bitstream. This approach offers good compression, especially if the character frequency information may itself be compressed in some manner. Approaches of this type are common but the cost of the prepended information for a potentially small data stream makes it less attractive.

Thirdly, extend the algorithm such that although both coder and decoder start with known frequency distributions, and subsequently adapt these distributions to reflect the addition of each character in the input stream. One possibility is to have initial distributions that encompass all possible characters so that all that is required, as each input character is processed, is to increment the appropriate frequency and update the tree. However, the inclusion of all *possible* characters in the initial distribution means that the tree is relatively slow to adapt, making this approach less appropriate for short messages. An alternative is to have an initial distribution that does not include all possible characters and to add new characters to the distribution if, and when, they occur in the input stream.

To achieve the latter approach, the concept of a "special" character is required. A "special" character is one whose value is outside the range of the character set being used (e.g. 256 if the character set has a range 0 to 255). These characters therefore do not form part of the input stream being conveyed, but their existence in the compressed stream signals the need for the decoder to adjust its behaviour. Here a "special" character is used to signal that the following n bits (where n is a fixed value) represent a new character that needs to be added to the frequency distribution. In the example above this would be done by replacing the "character" node containing the character Z with a new node that had as its children the "character" nodes for Z and for the new character.

This is the approach taken here. It provides considerable flexibility, effectively enabling all of the foregoing approaches. The specific approach to be used for a given message is signalled in the header.

The algorithm uses an additional optimization in that 2 special characters are defined, one meaning that a 7-bit literal follows and the other for 8-bit characters. So for example:

- The initial tree can contain just the "new character follows" special character(s). In this case, the input stream "AAA" would result in:
  [1 bit = new character(7bit) special][7 bits = "A"][2 bits = "A"][1 bit = "A"]
- As can be seen from the above there is quite a high cost in adding a new character (the "special" plus literal). So if the initial tree contains a small subset of the generally most frequently used characters, the cost of character addition can be avoided for these characters.
- Given that we can signal in the header a specific initial frequency distribution, there is no reason why this distribution cannot contain all possible characters and frequency adaptation enabled or disabled as appropriate.

A detailed description of Huffman coding can be found in Chapter 4 of "The Data Compression Handbook 2nd Edition" by Mark Nelson and Jean-Loup Gailly, published by M&T Books, ISBN 1-22851-434-1.

4.2 Character Groups

Character grouping is an optional component that can effect an increase in compression performance of the Huffman coder. This technique groups characters that may be expected to occur together within the input stream and signals transitions between the groups rather than each individual character.

The algorithm derives benefit by;

a) reducing the need to add new characters to the frequency distribution; and

b) using a smaller overall tree. For example, assume that there is no pre-loaded distribution and a stream comprised the characters "abcdefABCDEF".

The capital letters can be encoded more efficiently by signalling the transition to "upper case" and then coding the extant lower case characters rather than introducing 6 new characters. "Special" characters are used to signal transitions between groups of characters.

4.3 UCS2

Input streams comprising 16bit UCS2 information are handled in a manner similar to Character groups. Both coder and decoder maintain knowledge of "the current" Basic Multilingual Plane row for characters in the input stream and the row octet itself is then omitted from the output stream for sequences of characters within that row. Transitions between rows are signalled in the output stream by a "special" character.

Support for UCS2 is optional.

4.4 Keywords

The algorithm optionally supports the concept of dictionaries - essentially a list of key words or phrases of up to 255 characters in length. Dictionaries need to be known to both the coder and the decoder. The input stream is matched against entries in the dictionary and matching characters in the stream are replaced with a reference to the dictionary entry.

Again "special" characters are used to signal that the following sequence of bits describe a reference to a dictionary entry. So for example, if a dictionary contains the phrases "Please" and "meeting", an input stream "Please cancel the monthly meeting" would be rendered as:

[keyword special][10 bits = "Please"][.......][keyword special][10 bits = "meeting"]

Dictionary matches for long strings can result in very high compression rates.

4.5 Punctuation

The punctuation processor is distinct from the other algorithms in that it is non-symmetric so the decompressed stream may not be identical to the original. Its use is therefore mainly applicable to input streams comprising human readable sentences where it is sufficient to preserve the meaning of the content, but not the exact format. It is also applicable when the input stream is a "standard sentence" that is known to produce a symmetric result. The punctuation processor is applied before (on coding) and after (on decoding) any of the other algorithms. Its functions are:

- to remove leading and trailing spaces from the input stream;
- to replace repeated spaces within the stream with a single space;
- to remove (on coding) and insert (on decoding) spaces following certain punctuation characters;
- to decapitalize (on coding) and capitalize (on decoding) the first character of the stream, the first character following an appropriate punctuation character or a paragraph symbol and capitalized single character words such as "I";
- to remove (on coding) and insert (on decoding) a full stop if it is the last character of the stream.

The use of the punctuation processor is optional.

4.6 Character Sets

The use of pre-loaded frequencies, key word dictionaries and the punctuation processor all require that a consistent character set is used by both coder and decoder. As there can be no assumption that the same character will be have the same value (or even be available) on the devices used to send and receive a compressed message, the algorithms are specified to operate on a known character set *to* which (prior to coding) and *from* which (post decoding) a device needs to convert an input stream to render it in the native character set of the device.

The handling of character sets is mandatory for all implementations.

5 Compressed Data Streams

This clause provides:

- A detailed specification of the algorithms and data structures that implement compression and decompression mechanisms.

5.1 Structure

A Compressed Data Stream (CDS) comprises three key components:

- a Compression Header (CH) containing a variable number of octets, the content of which defines the nature of the compressed data;
- the Compressed Data (CD) which is a bit stream of variable length;
- a Compression Footer (CF) which is used to signal the number of bits in the last octet of the CDS that form part of the compressed data.

5.2 Compression Header

The Compression Header (CH) comprises a variable number of octets that define the nature of the compressed data.

The compression header allows for a wide range of compression alternatives, however of these alternatives only one is defined as the basic mandatory form of compression that shall be supported by all implementations. This is the use of the basic Huffman algorithm initialized with no prior knowledge of character distribution. This case can be signalled directly by setting a single octet(octet 1) for the compression header with the value of 120 (decimal).

5.2.1 Compression Header - Octet 1

The first CH octet is mandatory and is defined as follows:

Table 1: CH octet

7	6	5	4	3	2	1	0	Description
0								There is no subsequent CH octet
1								A further CH octet follows
	n	n	n	n				The "Compression Language Context" this is described below
					0			Punctuation processing disabled
					1			Punctuation processing enabled
						0		Keyword processing disabled
						1		Keyword processing enabled
							0	Character group processing disabled
							1	Character group processing enabled

As noted in clause 4, the compression algorithms can be configured to operate in a variety of ways and may rely on end-to-end knowledge of "prior" information such as which key word dictionary is to be used.

A requirement that all configuration information be explicitly stated in the CH is less efficient (in terms of compression ratio) than if a default configuration is known and only variations from this need be signalled. However, a major determinant of configuration is the language in which the original message to be compressed is composed. For example, different keyword dictionaries would be required for French and opposed to German and character frequency distributions for English texts may vary greatly from those for Swedish texts. From this it can be seen that a universal "default" configuration would be of little value.

To address this, the Compression Language Context (CLC) allows a default configuration to be specified for each of the languages defined in ~~GSM 03.38~~3G TS 23.038 [1] in relation to the Cell Broadcast Data Coding Scheme as follows:

- The CLC in bits 6 to 3 of the CH specify the language as per ~~GSM 03.38~~3G TS 23.038 [1] in the case where bits 7 to 4 of the Cell Broadcast Data Coding Scheme octet are set to 0000.
- If and when required, higher order bits of the CLC can be signalled by a subsequent CH octet as described below.
- The CLC value 1111 (language unspecified) will indicate a "default" configuration that is language independent. This is specified in annex R and involves the basic Huffman (de-)coding with no initial character frequency distribution, see example below.

Table 2: Huffman (de-)coding with no initial character frequency distribution

7	6	5	4	3	2	1	0	Description
0	1	1	1	1	0	0	0	Basic Huffman (de-)coding only.

5.2.2 Compression Header - Octets 2 to n

Any second and subsequent CH octets are used to vary the configuration defaults established by the CLC. These octets all comprise a continuation bit followed by a Type, Value structure as follows:

Table 3: Value structure

7	6	5	4	3	2	1	0	Description
0								There is no subsequent CH octet
1								A further CH octet follows
	n	n	n					CH Extension Type
				n	n	n	n	CH Extension Value

The bits of the semi-octet CH Extension value are interpreted left to right, MSB to LSB. If the CH contains more than one octet of the same CH Extension type, the CH Extension value of a subsequent CH octet, is interpreted as being next most significant semi-octet of the composite value being signalled.

For example if the CLC in CH octet 1 indicates that the default Huffman Initialization ID is 1 (decimal) and the required HI-ID is 37 (decimal), then the following octets (in the range 2 to n) would also be required in the CH.

Table 4: CH extension octets (Example)

7	6	5	4	3	2	1	0	Description
1	0	1	1	0	1	0	1	The default HI-ID is replaced with the value 0101
0	0	1	1	0	0	1	0	The current HI-ID value (0101) is extended to 0010 0101

The following values are defined for the CH Extension Type:

000 Extend CLC. The CH Extension Value contains higher order bits that are to be pre-pended to the current CLC value.

NOTE: for 1st occurrence of the Extend CLC CH Extension Type in the CH, the value for the CLC specified in CH octet 1 is *not* replaced but rather the process of "extension" begins directly. Thus is the CLC to be used is 18, octets 1 and 2 of the CH would contain:

Table 5: CLC extension (Example)

7	6	5	4	3	2	1	0	Description
1	**0**	**0**	**1**	**0**				The least significant semi-octet of the CLC is 0010
0	**0**	**0**	**0**	**0**	**0**	**0**	**1**	The CLC value (0010) is extended to 0001 0010

001 Change Character Set. The CLC defines a default character set (UCS2 or otherwise) within which compression will operate. The Change Character Set CH Extension Type indicates that this should be overridden by the character set specified by the CH Extension Value. If a CH contains more than one Change Character Set CH Extension Type octet, the CH Extension Value contained in subsequent CH octets of this type contains higher order bits and are to be pre-pended to the value of the new character set.

The following Character Sets are defined:

0000 No character set defined. To be used where original message content is binary data and compression is solely via Huffman coding with no initial frequency training and thus there is no requirement to ensure consistent use of character set by coder and decoder.

0001 GSM 7 bit default alphabet (3G TS 23.038~~GSM TS 03.38~~ [1])

0010 Codepage 437

0011 Codepage 850

All other values are reserved - see section 5.2.2.1

A Change Character Set to UCS2 codepoint is not defined here. Where the CLC indicates a character set other than UCS2 and there is a need to change to UCS2 then this is achieved using the Change UCS2 row parameter described below.

010 Change UCS2 Row. The CLC defines a default character set (UCS2 or otherwise) within which compression will operate. The Change UCS2 Row CH Extension Type indicates that this should be overridden by the use of UCS2 *and* the UCS2 row value for the first character in the input stream is that specified by the CH Extension Value. If a CH contains more than one Change UCS2 Row CH Extension Type octet, the CH Extension Value contained in subsequent CH octets of this type contains higher order bits for the initial UCS2 Row value and are to be pre-pended to the current value.

NOTE: Change UCS2 Row CH Extension Type octet effectively overrides any prior Change Character Set CH Extension Type octet and vice versa so these types are logically mutually exclusive within a given CH.

011 Change Huffman Initialization. The CLC defines a default set of parameters for the initialization of the Huffman (de)coder. The Change Huffman Initialization CH Extension Type indicates that this should be overridden by the set of initialization parameters identified by the Huffman Initialization ID contained in the CH Extension Value. If a CH contains more than one Change Huffman Initialization CH Extension Type octet, the CH Extension Value contained in subsequent CH octets of this type contains higher order bits for the initial Huffman Initialization ID value and are to be pre-pended to the current value.

100 Change Keyword Dictionary. The CLC defines a default set of parameters for the initialization of the Keyword (de)coder. The Change Keyword Dictionary CH Extension Type indicates that this should be overridden by the set of initialization parameters identified by the Keyword Dictionary ID contained in the CH Extension Value. If a CH contains more than one Change Keyword Dictionary CH Extension Type octet, the CH Extension Value contained in subsequent CH octets of this type contains higher order bits for the initial Keyword Dictionary ID value and are to be pre-pended to the current value.

101 Change Punctuator. The CLC defines a default set of parameters for the initialization of the punctuation (de)coder. The Change Punctuator CH Extension Type indicates that this should be overridden by the set of initialization parameters identified by the Punctuator ID contained in the CH Extension Value. If a CH contains more than one Punctuator CH Extension Type octet, the CH Extension Value contained in subsequent CH octets of this type contains higher order bits for the initial Punctuator ID value and are to be pre-pended to the current value.

110 Change Character Group. The CLC defines a default set of parameters for the initialization of the Character Group (de)coder. The Change Character Group CH Extension Type indicates that this should be overridden by the set of initialization parameters identified by the Character Group ID contained in the CH Extension Value. If a CH contains more than one Change Character Group CH Extension Type octet, the CH Extension Value contained in subsequent CH octets of this type contains higher order bits for the initial Character Group ID value and are to be pre-pended to the current value.

111 Reserved, see section 5.2.2.1

5.2.2.1 Compression Header reserved extension types and values

Any currently undefined values in the range 0 to 255 decimal are reserved.

Values above 255 are available for user to user requirements.

5.2.3 Identifying unique parameter sets

The four component compression algorithms (Huffman, Keywords, Character Groups and Punctuation) may all have a variety of initialization options. For each algorithm, a given set of initialization options needs to be identified for the processing of a given input stream.

Initialization and operation of the algorithms depends not only on the language in which the original source text is composed but also the character set (UCS2 or otherwise) that is to be used during processing. Thus the Huffman Initialization ID (HI-ID), Keyword Dictionary ID (KD-ID), Punctuator ID (PU-ID) and Character Group ID (CG-ID) only define unique values within the context of a given character set (the default established by the CLC or subsequently amended via Change Character Set or Change UCS2 Row CH Extension types) and within the context of the language indicated by the CLC.

5.3 Compressed Data

The Compressed Data (CD) is a stream bits of variable length that represent either an encoding of the content original input stream or control information indication that the operation of some algorithm should vary in some manner.

Control information is signalled within the CD by Huffman encoded symbols (characters) whose value is greater than 255 decimal. Huffman encoded symbols in the range 0 to 255 are of course characters from the original input stream.

The following control symbols are defined:

Table 6: Compressed Data: control symbols

Decimal value	Significance
256	New 7 bit character. On encoding, if a character (octet) from the input stream in the range 0 to 127 does not exist in the Huffman tree, then the New 7 bit character symbol is Huffman encoded to the CD and bits 6 to 0 of the original octet are copied unchanged to the CD. The Huffman tree would then be updated to include the new character as described in the sections below. On decoding the New 7 bit character symbol, the symbol itself is discarded and the next 7 bits of the CD are copied unchanged to bits 6-0 of the octet to be output, bit 7 of which is zero. The Huffman tree would then be updated to include the new character.
257	New 8 bit character. The operation of this is identical to that of the New 7 bit character except that on encoding, the input character is in the range 128-255 and on decoding, bit 7 of the output character is set to 1.
258	Keyword. This symbol (Huffman encoded) prefixes a sequence of bits of variable length in the CD that define a representation of characters in the uncompressed stream by an entry in a keyword dictionary. On encoding, if a sequence of characters in the input stream can be represented by an entry in a keyword dictionary, the Keyword symbol is Huffman encoded to the CD followed by the bit sequence describing the keyword entry (this is described below). On decoding the Keyword symbol, the symbol itself is discarded and the bit sequence describing the keyword entry is passed to the Keyword processor to recovery the original character sequence to be placed in the output stream.
259 to 265	Character Group Transitions. These symbols signal transitions between groups of characters defined within the Character Group processor. For example, if 2 groups are defined to be the lower case and upper case characters then the input stream: "abcdefABCDEF" would become "abcdef<Change Group>abcdef" On encoding, Character Group Transition symbols are generated by the Character Group processor and simply passed to the Huffman processor for encoding. On decoding a Character Group Transition symbol, it is simply passed from the Huffman processor to the Character Group processor which takes the appropriate action based its current state and the group transition indicated.
266	New UCS2 Row. On encoding, if the next UCS2 character in the input stream has a "row octet" of a different value to that of the previous character in the input stream, the New UCS2 Row symbol is Huffman encoded to the CD and the 8 bit of the new row octet are copied unchanged to the CD. The new row octet is stored by the UCS2 processor as the "current row octet" and subsequent input characters within the current row are Huffman encoded as the 8 bit value of the character *within* the "current row". On decoding the New UCS2 Row symbol, the symbol is discarded and the next 8 bits are read from the CD and stored by the UCS2 processor as the "current row octet". Subsequent UCS2 characters are decoded by treating the 8 bit character values decoded by the Huffman processor as characters *within* the "current row".

5.4 Compression Footer

Although Compressed Data Stream Length (CDSL) - the total number of octets that contain the CDS - is known, the CD element of the CDS is a bit stream and therefore may not end on an octet boundary. The Compression Footer (CF) is used to indicate the end of the CD as follows:

- Calculate the number of meaningful bits in the last octet of the CD (i.e. total CD bits modulo 8).
- If the number of meaningful bits is >0 and <6 store the number of meaningful bits in bits 2 to 0 of the last octet. Otherwise extend the CD by adding 1 octet and store the number of meaningful bits in bits 2 to 0 of this new octet. In the case where the number of meaningful bits is 8 then bits 2 to 0 of the new octet are set to zero.

For example if there are 4 meaningful bits in the last CD octet, the CF will be constructed to occupy the shaded area in table 7.

Table 7: CF with >0 and <6 meaningful bits in last octet (Example)

0	7	6	5	4	3	2	1	0
X	X	X	X	X		1	0	0

Alternatively if there are 6 meaningful bits in the last CD octet, a new octet needs to be added. The CF will be constructed to occupy the shaded area in table 8.

Table 8: CF with >5 meaningful bits in last octet (Example)

0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
X	X	X	X	X	X	X								1	1	0

If there are 8 meaningful bits in the last CD octet, a new octet needs to be added. The CF will be constructed to occupy the shaded area in table 8a.

Table 8a: CF with 8 meaningful bits in last octet (Example)

0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
X	X	X	X	X	X	X	X	X						0	0	0

In all the tables above, the bits in the shaded area which have no bit value defined are set according to the particular bearer being used to transport compressed data. e.g. CBS. Where no particular reference is made regarding the value of those bits they may be set to any value.

6 Compression processes

This clause defines the detailed operation of the various compression algorithms.

6.1 Overview

This subclause describes how the various compression algorithms are combined.

6.1.1 Compression

Table 9: Compression

Input	1) The nature of the compression to be performed. 2) The input stream of characters to be compressed.
Step 1	Construct the Compression Header so as to fully describe the nature of the compression to be performed as requested by higher software layers. Note that it is the responsibility of higher software layers that use the compression algorithms to ensure that only those aspects of the compression algorithms that are supported by a particular implementation are requested.
Step 2	Initialize as defined by the CH the following components: 1) Character Set Converter 2) Punctuation Processor 3) Keyword Processor 4) UCS2 Processor 5) Character Group Processor 6) Huffman Processor
Step 3	If the Character set in which input stream is composed is different from that specified in the CH, convert the input stream so that it is rendered in the Character set (UCS2 or otherwise) specified in the CH. Note that if characters in the input stream cannot be rendered in the character set specified in the CH, it is the responsibility of higher software layers that use the compression algorithms to detect this situation and take appropriate action.
Step 4	If the Punctuation Processor is enabled, use it to encode the character set converted input stream produced by Step 3 above.
Step 5	Set the current character position to the start of the character stream produced as the output of Step 4 above.
Step 6	If the Keyword processor is *not* enabled goto Step 7. Examine the sequence of characters starting at the current character position in the input stream and determine if they can be represented by an entry in the keyword dictionary. If an appropriate keyword is *not* found goto Step 7. If the Character Group processor is enabled, pass it the Keyword symbol and Huffman encode to the CD the sequence of symbols output by it. Huffman encode the Keyword symbol to the CD and then copy the bit sequence describing the keyword entry to the CD. Goto Step 10.
Step 7	If the input stream is *not* UCS2 goto Step 8. If the character at the current character position in the input stream has a different UCS2 row octet from the previous character Huffman encode the New UCS2 Row symbol to the CD and then copy the new row octet to the CD. Remove the row octet from the character at the current character position in the input stream which will subsequently treated as an 8 bit value.
Step 8	If the Character Group processor is *not* enabled goto Step 9. Pass the character at the current character position in the input stream to the Character Group processor and Huffman encode to the CD the sequence of symbols output by it. Goto Step 10.
Step 9	Huffman encode the character at the current character position in the input stream.
Step 10	Increment the current character position by the number if input characters processed in steps 6 to 9 above. If the entire input stream has *not* been processed goto Step 6 above.
Step 11	Construct the Compression Footer.
Output	The completed Compressed Data Stream. Note that the possibility exists that the CDS may be larger than the original input stream. In this case it is the responsibility of higher software layers that use the compression algorithms to detect this situation and take appropriate action.

6.1.2 Decompression

Table 10: Decompression

Input	The Compressed Data Stream
Step 1	Interpret the Compression Header to determine the nature of the decompression to be performed. Note that it is the responsibility of higher software layers that use the decompression algorithms to handle appropriately the case where the nature of the decompression to be performed is not supported by a particular implementation.
Step 2	Initialize as defined by the CH the following components: 1) Character Set Converter 2) Punctuation Processor 3) Keyword Processor 4) UCS2 Processor 5) Character Group Processor 6) Huffman Processor
Step 3	Interpret the Compression Footer to determine the total number of significant bits in the Compressed Data (CD). Set the total number of bits processed to zero.
Step 4	Read bits from the CD passing them to the Huffman decoder to generate the "current symbol". The bits should be read in the order bit 7 to bit 0 within each CD octet. CD octets are processed in the order 1 to n.
Step 5	If the Keyword processor is *not* enabled, goto Step 6. If the "current symbol" is the Keyword symbol, read the bit sequence describing the keyword entry from the CD. Pass the keyword entry description to the Keyword processor for decoding and add the resulting sequence of characters representing the keyword to the output stream. Goto Step 9.
Step 6	If the Character Group processor is *not* enabled goto Step 7. If the "current symbol" is a Character Group Transition symbol, pass it to the Character Group processor so that the current group can be updated and goto Step 9. If the value of the "current symbol" is in the range 0 to 255 (i.e. not a control symbol), pass the "current symbol" to the Character Group processor and set the new value of the "current symbol" to that returned by the Character Group processor.
Step 7	If the output stream is *not* UCS2 goto Step 8. If the "current symbol" is the New USC2 Row symbol, read the new "current UCS2 row octet" from the CD and goto Step 9. Pre-pend the "current UCS2 row octet" to the 8 bit value of the "current symbol" to produce a 16 bit UCS2 character.
Step 8	Add the "current symbol" to the output stream.
Step 9	Increment the total number of bits processed by the number of bits read from the CD in steps 4 to 8 above. If the total number of bits processed is less than the total number of significant bits in the CD goto Step 4.
Step 10	If the Punctuation Processor is enabled, use it to decode output stream produced by steps 3 to 9 above.
Step 11	If the Character set (UCS2 or otherwise) specified in the CH, is different from that required by higher level software layers, convert the output stream produced by step 10 above so that it is rendered in the Character set (UCS2 or otherwise) required by higher level software layers. Note that if characters in the stream cannot be converted, it is the responsibility of higher software layers that use the compression algorithms to detect this situation and take appropriate action.
Output	The decompressed original input stream.

6.2 Character sets

The need for character set conversion arises in that a number of the compression algorithms operate on the basis of "prior information" about the nature of human readable texts. For example Huffman frequency initializations may specify the an initial relative frequency for the letter "e" as opposed to the letter "x". Similarly, a keyword dictionary may contain the word "meeting".

Consider the case where a keyword dictionary contains the entry "£10,000" composed using the Code Page 850 character set. If an input stream containing the string "£10,000" also composed in Code Page 850 is processed, the string will be replace in the CD by a reference to the keyword entry. In contrast if the input string is composed using the GSM 7 bit default alphabet (3G TS 23.038~~GSM 03.38~~ [1]) than a match between the input string and the keyword entry will not be found as the value of the "£" symbol in Code Page 850 is 156 decimal whereas in the GSM 7 bit default alphabet it is 2 decimal.

There can be no assumption that higher level software layers responsible for composing the original input stream to be compressed and displaying the resulting decompressed output stream use the same character set.

Thus:

- The character set used to compose initialization parameter sets and used for the compression of a given input stream shall be the same for both compression and decompression.
- Where an input stream is composed using a character set that is different from that used for compression it shall be converted prior to compression.
- Where an output stream is required in a character set that is different from that used for compression it shall be converted after decompression.

There is an additional requirement in that a number of the compression algorithms perform upper / lower case conversions upon the characters within the character set used for compression. The mapping between "lower" and "upper" case characters needs to therefore be known.

6.2.1 Initialization

Initialization of character set conversion processing will typically involve identifying and loading the appropriate tables to a) convert between character sets and b) convert between upper and lower case characters.

As the character set(s) in which uncompressed data is required to be rendered is largely an implementation specific matter, so is the precise specification of the tables to convert these to/from the character set specified for compression. However, they need to be sufficient to support the following functions:

6.2.2 Character set conversion

Table 11: Character set conversion

Input	1) The value of the source character. 2) The character set in which the source character is rendered. 3) The character set in which the source character is to be rendered.
Output	1) The value of the converted character. 2) A Boolean value indicating whether a successful conversion has been performed.
Process	If the source character can be rendered in the target character set, its value in the target characterset is returned and a successful conversion is indicated. Otherwise, the value of the source character is returned unchanged, a conversion failure is indicated and higher software layers need to take appropriate action. For example: - The character "A", 65 decimal in Code Page 850 is rendered in the GSM 7 bit default alphabet also as 65 decimal so this value is returned and a successful conversion is indicated. - The character "£", 156 decimal in Code Page 850 is rendered in the GSM 7 bit default alphabet as 1 decimal so the value 1 is returned and a successful conversion is indicated. - The character "Û" 234 decimal in Code Page 850 cannot be rendered in the GSM 7 bit default alphabet so the value 234 is returned unchanged and a conversion failure is indicated.

6.2.3 Character case conversion

Conversion between upper and lower case for characters within the character set used for compression will also typically be supported by conversion tables that indicate for each character in the character set, the value of any lower case or upper case equivalent character such that the following function can be supported.

Table 12: Character case conversion

Input	1) The value of the source character. 2) The case (lower or upper) in which the source character is to be rendered.
Output	1) The value of the case converted character.
Process	If the character can be rendered in the case requested and the value of this case converted character is different from that of the source character, the value of the case converted character is returned. Otherwise (i.e. the source character is already in the requested case or the character does not have upper and lower case equivalents), the value of the source character is returned unchanged.

6.3 Punctuation processing

The punctuation processor achieves compression by using the "prior information" that the uncompressed stream is human readable and is constructed of sentences that conform to a known set of punctuation rules. Essentially this means that certain characters within the input stream, of themselves imply information about subsequent characters and this may therefore be omitted from the compressed stream. In this way the algorithm achieves some significant compression in a very simple manner.

However, because the algorithm operates on information about sentence structure rather than the exact sequence of characters used to render this, it is non-symmetric. In other words, although the overall meaning of the human readable input stream is preserved between compression and decompression, the exact sequence of characters is not. Higher level software layers or even user inspection may therefore be required to determine if the use of this processor is appropriate for a given input stream.

In addition to the ability to handle the conversion of characters between upper and lower case (as described in the previous subclause), the processor requires that certain characters (expressed in the character set to be used for compression) are assigned special attributes. These are:

Table 13: special attributes

Attribute	Description
PU-IWS	Inter-word separator. A character with this attribute is that typically used to separate words within the input stream. Only one character in the character set may have this attribute. This attribute is typically set for the "space" character (32 decimal).
PU-LST	Last Sentence Terminator. A character with this attribute is that typically used to terminate the last sentence in the input stream. Only one character in the character set may have this attribute. This attribute is typically set for the "." full stop character (46 decimal).
PU-WSF	Word Separator Follows. A character with this attribute is expected to be followed by one or more characters which have the PU-IWS attribute set. Any number of characters within the character set may have this attribute. Examples of characters that would normally have this attribute set are the exclamation mark (!), comma (,), full stop (.), colon (:), semi-colon (;) and question mark (?).
PU-UCF	Upper Case Follows. A character with this attribute is expected to be followed by an upper case character such as occurs at the start of a sentence or paragraph. Any number of characters within the character set may have this attribute. Typically, characters with this attribute set will also have the PU-WSF attribute set. Examples are the exclamation mark (!), full stop (.), and question mark (?). Other examples associated with new paragraphs might include the carriage return (13 decimal) and line feed (10 decimal) symbols.
PU-UCW	Upper Case Word. A character with this attribute set is expected to be upper case if it is a word i.e. if it is both preceded and succeeded by character with the PU-IWS attribute set. Any number of characters within the character set may have this attribute. An example in the English language is the letter "I".
PU-NSI	No Separator Insertion. A character with this attribute set is does not have the PU-IWS attribute set but is none the less expected to be preceded by a character for which the PU-WSF attribute is set. Any number of characters within the character set may have this attribute. Typically, characters with this attribute set will be numeric digits so that the case can be resolved where characters which have the PU-WSF attribute set such as comma (,) and full stop (.) can be used in number formatting as in the case of the string "£10,000.25".

6.3.1 Initialization

Initialization of the punctuation processor will typically involve loading a table containing the combination of attributes defined for each character in the character set to be used for compression for the language defined by the CLC.

6.3.2 Compression

For compression, the punctuation processor operates as follows:

Table 14: compression punctuation processor

Input	The input stream of characters to be compressed, rendered in the appropriate character set.
Step 1	Set the current character position to the start of the input stream.
Step 2	Determine the attributes of the current character. If some previous character in the input stream has not had the PU-IWS attribute set goto Step 3. If the current character has the PU-IWS attribute set goto Step 8. Convert the current character to lower case and store the returned value as that of the "previous character". Store the attributes of the current character as those of the "previous character" after clearing any PU-UCW attribute. Goto Step 8.
Step 3	If the previous character has the PU-WSF attribute and the current character has the PU-IWS attribute goto Step 8. Otherwise clear the PU-WSF attribute for the "previous character".
Step 4	If the previous character has the PU-UCF attribute, convert the current character to lower case and clear the PU-UCF attribute for the "previous character".
Step 5	If the previous character has the PU-UCW attribute and the current character has the PU-IWS attribute, convert the previous character to lower case.
Step 6	If the previous character has the PU-IWS attribute and the current character has the PU-IWS attribute, goto Step 8. Otherwise add the previous character to the output stream and set the value of the previous character to that of the current character.
Step 7	If the current character has the PU-UCW attribute and the previous character attributes do not contain the PU-IWS attribute, clear the PU-UCW attribute for the current character. Set the attributes for the "previous character" to those of the current character.
Step 8	If the current character is the last character in the input stream *and* if some previous character in the input stream has not had the PU-IWS attribute set *and* if the previous character attributes contain neither the PU-IWS not the PU-LST attribute, add the previous character to the output stream.
Step 9	If the current character is *not* the last character in the input stream, read the next character from the input stream, set the current character to this value and goto Step 2.
Output	The de-punctuated data stream.

6.3.3 Decompression

For decompression, the punctuation processor operates as follows:

Table 15: decompression punctuation processor

Input	The de-punctuated stream of characters to be punctuated, rendered in the character set used for compression.
Step 1	Set the current character position to the start of the de-punctuated stream.
Step 2	Determine the attributes of the current character. If the current character is the first character in the stream, convert it to upper case and goto Step 8.
Step 3	If the current character has the PU-IWS attribute and the "previous character" attributes has the PU-UCW attribute, convert the stored value of the "previous character" to upper case.
Step 4	If the "previous character" attributes contain the PU-UCF attribute, and the current character was not generated by Step 10 below, convert the current character to upper case and clear the PU-UCF attribute for the "previous character" attributes.
Step 5	If the "previous character" was generated as a result of Step 10 and the current character contains the PU-NSI attribute goto Step 7.
Step 6	Add the "previous character" value to the output stream.
Step 7	If "previous character" attributes contain the PU-IWS attribute and the current character has the PU-UCW attribute, add the PU-UCW attribute to those of the "previous character". Otherwise clear any PU-UCW attribute stored for the "previous character".
Step 8	Set the value of the "previous character" to be that of the current character.
Step 9	If the attributes of the current character contain the PU-UCF attribute set this attribute for the "previous character".
Step 10	If the attributes of the current character contain the PU-WSF attribute and the current character is not the last character in the de-punctuated stream, insert the character containing the PU-IWS attribute at the position following the current character in the de-punctuated stream.
Step 11	If the current character is *not* the last character in the de-punctuated stream, read the next character from the stream, set the current character to this value and goto Step 2.
Step 12	Add the previous character to the output stream. If the current character attributes do not contain the PU-UCF attribute or the previous character value equals that of the character which has the PU-LST attribute set, add the character which has the PU-LST attribute set to the output stream.
Output	The punctuated data stream.

6.4 Keywords

The operation of the Keyword processor is controlled by the set of parameters defined by a Keyword Dictionary that is uniquely defined (within a CLC) by the value of the Keyword Dictionary ID (KD-ID) specified in the CH.

6.4.1 Dictionaries

A Keyword Dictionary specifies the following items:

1) Character Set ID

   This is the character set in which the dictionary is composed and shall therefore be equal to the character set to be used for compression as specified in the CH.

2) Match Options

   This is a collection of bit flags that control how text in the input stream is to be matched against key word dictionary entries. These are described in the table below in which Bit 0 is considered to be the lease significant bit of the Match Options value.

Table 16: Match options

Bit	Description
0	If set, input stream text shall exactly match the dictionary entry.
1	If set, input stream text may match the lower case conversion of a dictionary entry.
2	If set, input stream text may match the upper case conversion of a dictionary entry.
3	If set, input stream text may match the upper case conversion of the 1st character of a dictionary entry followed by the lower case conversion of the remaining characters of the dictionary entry.
4	If set, input stream text may match a dictionary entry prefixed by the keyword prefix characters (if any) described below.
5	If set, input stream text may match a dictionary entry suffixed by the keyword suffix characters (if any) described below.
6	If set, input stream text may match a part of a dictionary entry. A partial match occurs when, a dictionary entry contains n characters and a match is found with the first m characters where m is less than n.
7-	All other bits are reserved.

3) Keyword Prefix

   The 1st octet is the Keyword Prefix Length which specifies the number of characters that form the prefix string. The length octet is followed by the actual characters of the prefix string.

4) Keyword Suffix

   The 1st octet is the Keyword Suffix Length which specifies the number of characters that form the suffix string. The length octet is followed by the actual characters of the suffix string.

5) Keyword Threshold

   This value determines the minimum number of characters in the input stream that needs to be replaced by a full match with a keyword entry. For a partial match the value of the threshold needs to be incremented by 2.

   If a match occurs involving fewer characters than that specified by the threshold, keyword substitution does not take place.

6) Maximum Partial Match Length

   This value determines the maximum number of characters in the input stream that needs to be replaced by a partial match with a keyword entry.

   If a partial match occurs involving fewer characters than that specified by this value, keyword substitution does not take place.

7) Key Word Group List

   The actual key word dictionary entries are not directly specified within the Keyword Dictionary. Instead, a set of key word dictionary entries is explicitly identified by a Key Word Group ID - an octet value that is unique within the language specified by the CLC. This approach allows the same set of keyword dictionary entries to be used in conjunction with different values for the parameters specified within the Keyword Dictionary and for Keyword Dictionaries to be defined that combine multiple Key Word Groups.

   The 1st octet of the Key Word Group List specifies the number of Key Word Group IDs that follow, each of the following octets specifies a Key Word Group ID.

6.4.2 Groups

A Keyword Group specifies the following items:

1) Character Set ID

   This is the character set in which the keyword dictionary entries are composed and shall therefore be equal to the character set to be used for compression as specified in the CH.

2) Number of Entries

   The value specifies the number of keyword dictionary entries contained in the Keyword Group.

3) Keyword Entry

   The 1st octet is the Keyword Entry Length which specifies the number of characters that form the keyword entry string. The length octet is followed by the actual characters of the entry string.

The sequence of entries within a dictionary needs to be known by both coder and decoder. Thus keyword entries in a Keyword Group needs to be sorted in ascending sequence of the actual characters of the entry string. Furthermore if a dictionary defines multiple Keyword Groups, the combined set of entries needs to be resorted as part of initialization of the Keyword processor so that the ascending alphanumeric sequence of entries is achieved for all entries in the combined set.

A further requirement is that all entries in the combined set shall be unique.

6.4.3 Matches

A Keyword Match specifies how a sequence of characters in the input stream is represented by a keyword dictionary entry. A Keyword Match is a bit stream that is interpreted left to right as described on the table below wherein Bit 0 refers to the most significant, left most bit.

Table 17:

Bits	Description
0 to N_1	Case conversion. If bit 0 of the Dictionary Match Options is set (i.e. Exact matching is enabled), the Case conversion bits are omitted and the Keyword Match starts with the Keyword Entry ID described below. Otherwise, if the match involves a lower case conversion, a single Case conversion bit with value 0 is used. Otherwise, 2 case conversion bits are used with the following value: 10 Upper Case. 11 1st character Upper case, remainder Lower case.
N_1+1 to N_2	Keyword Entry ID. This value represents the position in the list of keyword dictionary entries of the entry with which a match has been found. A value of 0 indicates the first entry. The number of bits used to express the Keyword Entry ID is minimum number of bits required to represent the total number of keyword dictionary entries defined for the Keyword Dictionary minus 1.
N_2+1 to N_3	Prefix Match. If bit 4 of the Dictionary Match Options is set (i.e. Prefix matching is enabled), a single bit is used to indicate whether a prefix match applies (1) or not (0). If prefix matching is not enabled, this bit is omitted from the Keyword Match.
N_3+1 to N_4	Partial Match. If bit 6 of the Dictionary Match Options is set (i.e. Partial matching is enabled), a single bit is used to indicate whether a partial match has occurred (1) or not (0). If partial matching is not enabled, this bit is omitted from the Keyword Match. If partial matching is enabled and a full match has occurred, no further bits are required to describe the match. If partial matching is enabled and a partial match has occurred, it is necessary to encode the length of the partial match as follows: The partial match length equals the total number of characters in the input stream represented by the Keyword Match (excluding any characters represented by any prefix and suffix matches) less the value of the partial match threshold (i.e. Keyword Threshold +2). If the partial match length is less than 8 a single bit (0) is added to the bit stream to indicate this fact followed by 3 bits containing the partial match length. Otherwise a single bit (1) is added to the bit stream to indicate that more than 3 bits follow containing the partial match length. In this case the number of bits used to represent the partial match length is the minimum number of bits required to represent the value (Maximum Partial Match Length - (Keyword Threshold +2))
N_4+1 to N_5	Suffix Match. If bit 5 of the Dictionary Match Options is set (i.e. Suffix matching is enabled), a single bit is used to indicate whether a suffix match applies (1) or not (0). If suffix matching is not enabled, this bit is omitted from the Keyword Match.

6.4.4 Initialization

Initialization of the Keyword processor involves loading the various parameters specified by the KD-ID contained in the CH.

As noted above, if the dictionary is composed on more than 1 Keyword Group, the combined set of keyword entries needs to be resorted so that the full set conforms to an ascending alphanumeric sequence.

Clearly,as it is the total combined and sorted set of keyword entries that is required, implementors may choose to construct this from the component keyword groups at run time or to produce such a combination and use it directly as indicated by the constituent keyword group ID's.

6.4.5 Compression

For compression, the Keyword processor operates as follows:

Table 18: compression Keyword processor

Input	A offset into the input stream of characters from which a matching keyword is to be found.
Step 1	Set the current character position to the input offset.
Step 2	If Prefix matching is not enabled goto Step 3. If the string starting at the current character position exactly matches Keyword Prefix, record this fact and increment the current character position by the length of the prefix string.
Step 3	Identify the Keyword Entry ID and if enabled Case Conversion and Partial Match details for the longest match (i.e. that what whereby the greatest number of characters in the input stream are represented) between a dictionary entry and the string starting at the current character position subject to the following rules: 1) An exact match shall be greater than or equal to the Keyword Threshold to be considered. 2) A partial match shall be greater than or equal to the Keyword Threshold +2 to be considered. 3) If more than 1 partial match of equal length is found, the one with the greater Keyword Entry ID is used. 4) If an exact match and a partial match are found, the length of the partial match shall be at least 2 greater than that of the exact match for it to be used. 5) Although the case of more than 1 exact match of equal length being found is not possible as entries are unique, should such a case arise, the one with the greater Keyword Entry ID is used. If the longest match is a partial match with length greater than the Maximum Partial Match Length, the match length is limited to the Maximum Partial Match Length. If no match has been found goto Step 5.
Step 4	If Suffix matching is not enabled goto Step 5. If the string starting at the current character position exactly matches Keyword Prefix, record this fact and increment the current character position by the length of the prefix string.
Step 5	If a matching keyword has been found, construct the Keyword Match bitstream.
Output	A Keyword Match bitstream or an indication that no suitable match is available.

6.4.6 Decompression

For decompression, the Keyword processor operates as follows:

Table 19: decompression Keyword processor

Input	A Keyword Match bitstream.
Step 1	Interpret the Keyword Match bitstream to determine if there is a Prefix match. If so add the Keyword Prefix string to the string to be output.
Step 2	Interpret the Keyword Match bitstream to identify the dictionary entry or part thereof as indicated by any Partial Match details. Perform any case conversion (indicated by the Keyword Match bitstream) on the dictionary entry string and add the resulting string to the string to be output.
Step 3	Interpret the Keyword Match bitstream to determine if there is a Suffix match. If so add the Keyword Suffix string to the string to be output.
Output	The character string represented by the input Keyword Match bitstream.

6.5 UCS2

6.5.1 Initialization

Initialization of the USC2 processor involves storing the default UCS2 row as specified by the CH.

6.5.2 Compression

For compression, the UCS2 processor operates as follows:

Table 20:

Input	A 16 bit UCS2 character value.
Step 1	If the row octet of the input character is different from the "current UCS2 row" store the row octet of the input character as the new "current UCS2 row".
Output	A Boolean value indicating whether the current UCS2 row has been changed.

6.5.3 Decompression

For decompression, the USC2 processor needs to set and sense the "current UCS2 row" as required by the higher level software described in subclause 6.1.2 above.

6.6 Character group processing

The operation of the Character Group processor is controlled by the set of parameters defined by a Character Group that is uniquely defined (within a CLC) by the value of the Character Group ID (CG-ID) specified in the CH.

Character grouping operates by defining 2 or more subsets (groups) of characters within the character set used for compression with the following properties:

- Each sub set contains the same number of characters.
- One subset (referred to as Group 0 or the "base group" contains the characters expected to have higher frequencies in a input stream than those of the characters in other subsets.
- Input stream are expected to contain contiguous sequences of characters belonging to a single group.

Compression is achieved by assigning a 1:1 mapping between the characters in the base group and those in the other groups and when appropriate signalling a transition between groups and then continuing to encode base group characters. This has the effect of improving the performance of the Huffman encoder by reducing the need to add new characters to the tree and by maintaining a smaller overall tree with a more distinct frequency distribution.

For example, assume that we have a character set that comprises just the numeric digits 0 to 9 and the letters A to B and 3 groups containing the digits 1 to 3, 4 to 6 and 0 and 7 to 9. The digits 1 to 3 are considered to be the most frequent and are therefore the base group. The digit 0 is defined to exist in all the groups and the letters A and B do not occur in any group.

Encoding and decoding of characters is achieved using the various items in table 21.

Table 21: Encoding and decoding of characters

Item	Element												Comment
Value	0	1	2	3	4	5	6	7	8	9	10	11	Decimal character value
Character	0	1	2	3	4	5	6	7	8	9	A	B	Character symbol
Group 0	1	1	1	1	0	0	0	0	0	0	0	0	Bit flags for Group 0
Group 1	1	0	0	0	1	1	1	0	0	0	0	0	Bit flags for Group 1
Group 2	1	0	0	0	0	0	0	1	1	1	0	0	Bit flags for Group 2
Fold 0	0	1	2	3	1	2	3	1	2	3	A	B	Group 0 Conversions
Fold 1	0	4	5	6	4	5	6	7	8	9	A	B	Group 1 Conversions
Fold 2	0	7	8	9	4	5	6	7	8	9	A	B	Group 2 Conversions

The items Group 0, Group 1 and Group 2 simply enable the determination of whether a given character is a member of the given group by checking the value of the Group x element associated with the value of the character.

The elements of the Fold 0 item associated with the members of a given group represent the characters within Group 0 to which the characters of the given group are mapped. For example character 4 in Group 1 is mapped to character 1 in Group 0.

The elements of the Fold 1 and Fold 2 items provide the reverse mapping in that the elements associated with membership of Group 0 represent the characters in Groups 1 or 2 that are associated with the Group 0 characters.

Thus if the "current group" is Group x, a character with value c can be encoded as follows:

- If c is a member of Group x or not a member of any group, element c of Fold 0 is output.
- If c is not a member of Group x it can be output as a "literal" which is element c of Fold y where Group y has c as a member alternatively a change of group can be signalled.

Similarly, if the "current group" is Group x, a character with value c can be decoded as follows:

- If c is a member of Group x or x is not 0 then, element c of Fold x is output.
- Otherwise the value c is output unchanged.

The detailed operation of the Character Group processor (described below) primarily extends these simple rules to optimize the case where a choice between a "literal" or a group change arises.

6.6.1 Character Groups

A Character Group specifies the following items:

1) Character Set ID

   This is the character set in which the character group is composed and shall therefore be equal to the character set to be used for compression as specified in the CH.

2) Number of Groups

   This value specifies the number of groups to be defined. The maximum value is 8.

3) Group Transition Controls

Group transitions are signalled through the use of the Character Group Transition symbols in the decimal range 259 to 265.

If the Number of Groups is N, (N-1) Character Group Transition symbols shall be specified such that if the "current group" is x one Character Group Transition symbol is allocated to signify a transition to each of the other (N-1) groups.

4) Fold Tables

These are the inter-group character conversion tables described above. One is required for each group defined.

5) Group Membership

This is an array of octets, one for each character in the character set. The 1st octet in the array contains bit flags indicating the group membership of the character value 0 and so on.

Within each octet, bit 0 (least significant) indicates membership of Group 0, bit 1 that of Group 1 and so on.

6.6.2 Initialization

Initialization of the Character Group processor involves loading the various parameters specified by the CG-ID contained in the CH.

Additionally on initialization, the "current group" is assumed to be Group 0.

6.6.3 Compression

For compression, the Character Group processor operates as follows:

Table 22: compression Character Group processor

Input	1) A single symbol to be encoded. 2) An indication that this is the last symbol to be encoded.
Step 1	Set the number of output symbols to zero.
Step 2	If the input symbol is not the Keyword symbol, goto Step 3. If a previous input symbol is being held, add this as a "literal" to the output sequence by calculating the value of the element indicated by the value of the previous symbol in the fold table associated with the group of the previous symbol and increment the number of output symbols and clear the previous symbol. Goto Step 9.
Step 3	If the input symbol is a member of no group or a member of the current group, set the group for the input symbol to be the current group. Otherwise, if a previous input symbol is being held and the input symbol is a member of the group of the previous symbol, set the group for the input symbol to be that of the previous symbol. Otherwise, test the input symbol for membership of each group in ascending order of groups starting with group 0 and set the group for the input symbol to be that for which membership is first detected.
Step 4	If a previous input symbol is not being held goto Step 5. If the input symbol group equals the previous symbol group: - Add the Character Group Transition symbol that indicates a transition from the current group to the previous symbol group to the output sequence and increment the number of output symbols. - Set the current group to the previous symbol group. - Encode the previous symbol by calculating the value of the element indicated by the value of the previous symbol in the fold table associated with the base group and add this value to the output sequence and increment the number of output symbols. - Encode the input symbol by calculating the value of the element indicated by the value of the input symbol in the fold table associated with the base group and add this value to the output sequence and increment the number of output symbols. - Clear the previous symbol. - Goto Step 9. Otherwise, encode the previous symbol as a "literal" by calculating the value of the element indicated by the value of the previous symbol in the fold table associated with the group of the previous symbol group and add this value to the output sequence and increment the number of output symbols and clear the previous symbol.
Step 5	If the input symbol group is the base group and the current group is not the base group, add the Character Group Transition symbol that indicates a transition from the current group to the base group to the output sequence and increment the number of output symbols. Set the current group to be the base group.
Step 6	If the input symbol group is the base group or the current group: - Encode the input symbol by calculating the value of the element indicated by the value of the input symbol in the fold table associated with the base group and add this value to the output sequence and increment the number of output symbols. - Goto Step 9.
Step 7	If the input symbol is the last symbol to be encoded: - Encode the input symbol as a "literal" by calculating the value of the element indicated by the value of the input symbol in the fold table associated with the group of the input symbol and add this value to the output sequence and increment the number of output symbols. - Goto Step 9.
Step 8	Set the previous symbol to be the value of the input symbol and set the group for the previous symbol to be that of the input symbol.
Step 9	Output the number of output symbols and the associated symbols.
Output	A count of the number of encoded symbols output and a sequence of encoded symbols.

6.6.4 Decompression

For decompression, the Character Group processor operates as follows:

Table 23: Decompression Character Group processor

Input	A single symbol to be decoded.
Step 1	If the symbol is a Character Group Transition symbol, update the "current group" to be that indicated by the Character Group Transition. Goto Step 3.
Step 2	If the input symbol is a member of the "current group" or the "current group" is not the base group, calculate the value of the decoded symbol as that given by the element indicated by the value of the input symbol in the fold table associated with the "current group". Otherwise set the value of the decoded symbol to that of the input symbol.
Step 3	If a decoded symbol has been generated indicate this fact.
Output	The decoded symbol or an indication that no symbol has been generated.

6.7 Huffman coding

As described in subclause 4.2, Huffman encoding requires the set of characters that may be encoded to be represented within a binary tree structure. The tree is constructed of "nodes" which have the following properties:

- A Parent node. A node that has no parent is the "root" node.
- Up to 2 Child nodes. A node that has no children is a "leaf" node.
- Character value. If the node is a leaf node it represents a character represented within the tree.
- Weight. If the node is a leaf node, the weight is the frequency with which the associated character has occurred in the input stream. Otherwise the weight is simply the sum of the weights of the nodes children.

Typically, a tree will be implemented as an array of node structures and parent / child details for a given node will be represented by the index of the appropriate node within the array.

Every node in the tree (except the root node or in the case where the tree contains just a single leaf node) has a "sibling" - the other node that shares the same parent node.

For the binary tree to be a Huffman tree its construction needs to display a further property. This is that the nodes can be listed in ascending order of weight and in so doing every node is adjacent to its sibling in the list. This property needs to be preserved at all times - when the tree is initially created, when a new leaf node is added to the tree to represent a new character and when the frequency of a leaf node is incremented as a new instance of that character is processed.

The ordering of nodes is also significant in that it will determine which of the siblings is the "left-hand" as opposed to "right-hand" of the sibling pair. Encoding a symbol involves navigating the tree from leaf to root and emitting a bit to the encoded stream the value of which depends on whether the current node is the left or right hand sibling. If the node is a left hand node, the bit value is 0 and if it is a right hand node, the bit value is 1. Assuming that the 1st element of the array of nodes has an index value of 0, this means that left hand nodes will have even numbered indices and right hand nodes will have odd numbered indices.

Node weights are assumed to be 16 bit unsigned values and this means that the potential exists for these values to overflow. To handle this case, the algorithm defines a maximum weight value for the root node. If this is to be exceeded, the weights of all leaf nodes are divided by 2 and the tree is rebuilt. The maximum value for the root weight is defined to be 8000 (hex).

Although the bit sequence representing the encoded symbol is discovered in the order of traversing the tree from leaf to root, for decoding the bit sequence needs to be processed in the order that describes the navigation of the tree from root to leaf. Thus the entire encoding bit sequence needs to be collected in some temporary variable and emitted to the output stream in reverse order. For example if the passage from leaf to root is described by the sequence 010011, the bits added to the output stream would be 110010. The need to collect the bits in a temporary variable also introduces the potential for this value to overflow. Given the maximum value for the root node weight described above, a 32bit variable is suitable of containing all possible bit sequences.

If a symbol that does not already exist in the tree is to be encoded, either the "New 7bit Character" or the "New 8bit Character" is encoded, the lower 7 bits of the new character value are then added literally to the out put stream and the new character needs to be added to the tree. This is done by splitting the "lightest" node (the first node in the list ordered by ascending weight) such that it becomes a parent node whose right hand child is the leaf node that was originally represented by the node being split and the left hand child is a new leaf node representing the new character. The new leaf is initially created with a weight of 0 but this is immediately updated as described below.

If a new symbol has been added to the tree or a new instance of an existing symbol processed, the weight for the associated leaf node needs to be incremented and the tree updated to preserve the "sibling" property.

The tree is updated in the following manner. If the node a position x in the ascending weight ordered list has had its weight incremented by 1, the list needs to be scanned from position x in ascending weight order to identify the node at position y such that the node at position (y+1) is the first node encountered that has a weight greater than or equal to the new weight of the node at position x. The nodes at x and y are then "swapped" in terms of their position in the list and their parents while maintaining all other attributes. This process of weight increment and swapping is then repeated for the parent of the node at position y until the root node is reached.

The operation of the Huffman processor is controlled by the set of parameters defined by a Huffman Initialization that is uniquely defined (within a CLC) by the value of the Huffman Initialization ID (HI-ID) specified in the CH.

6.7.1 Initialization Overview

A Huffman Initialization specifies the following items:

1) Character Set ID

   This is the character set in which the Huffman Initialization is composed and shall therefore be equal to the character set to be used for compression as specified in the CH.

2) Options

   This is a collection of bit flags that control how the processor is to operate. These are described in table 24 in which Bit 0 is considered to be the lease significant bit of the Match Options value.

Table 24: collection of bit flags

Bit	Description
0	If set, weights for leaf nodes representing control symbols (other than New 7 bit character and New 8 bit character symbols) are to be updated.
1	If set, weights for leaf nodes representing control symbols are to be updated.
2	All other bits are reserved.

3) The Character Group ID with which these initializations may operate.

4) Number of initial symbol frequencies

   2 values representing the cases where the Character Group processor is enabled or disabled.

   These are counts of the number of characters or control symbols for which there are following initial frequencies defined.

   As this initializations will vary significantly depending on whether the Character Group processor is enabled 2 sets of initializations are provided to cover both cases.

5) Initial frequencies

Two sets of initialization values are supplied as described above.

Any control symbol that may occur when processing an input stream needs to be represented within the tree, prior to the first character of the input stream being processed. These symbols shall therefore be handled by the initialization process. This is achieved by :

- The frequency initialization *data* will always include all control symbols that *might* occur for any stream. Thus the New 7bit character, New 8bit character, New UCS2 Row and Keyword symbols will always be included and if the initialization set is that for the case where the specified Character Group ID is enabled, the associated Character Group Transition symbols will also be included.

- For a given input stream, the frequency initialization *process* (described in subclause 6.7.2 below) will determine whether a control symbol contained in the frequency initialization *data* can occur in the input stream based on the information contained in the CH. If it is determined that a control symbol contained in the frequency initialization *data* can NOT occur in the input stream, this symbol will not be added to the Huffman tree.

Frequency initialization data comprises the value of the character or symbol and the initial frequency for that symbol.

- The order in which character or symbol values and their associated initial frequencies are stated is significant and this order must be preserved when these items are loaded as part of the Huffman Initialisation process. Frequency Initialisation data must be stated in ascending order of character or symbol initial frequency.

6.7.2 Initialization

Initialization of the Huffman processor involves loading the various parameters specified by the HI-ID contained in the CH.

The appropriate set of frequency initialization data is selected depending on whether the Character Group processor is enabled.

Leaf nodes are created for each symbol for which a frequency initialization is specified, subject to the following rules:

- Leaf nodes must be created within the array of Huffman tree nodes in exactly the same ascending order in which they are stated in the Huffman Initialisation data.

- If the character set specified for compression is the GSM 7 bit default alphabet, leaf nodes are not created for the New 8bit Character and the New UCS2 Row symbols.

- If the character set specified for compression is not UCS2 a leaf node is not created for the New UCS2 Row symbol.

- If the Keyword processor is disabled, no leaf node is created for the Keyword symbol.

The initial tree is then built as described below - rescaling is not indicated.

6.7.3 Build Tree

To build the tree, the Huffman processor operates as follows:

Table 25: Build Tree, Huffman processor operation

Input	1) The array of Huffman tree nodes. 2) A Boolean value indicating whether frequencies need to be rescaled as a result of the root node weight becoming the maximum value.
Step 1	Assemble all leaf nodes, preserving their ascending weight order at the start of the node array. This is achieved by setting the “current node” and “assembled leaf” node position to the base of the array. If the current node is a leaf node, set the symbol and frequency associated with assembled leaf node to those of the current node and increment the assembled leaf node position. Increment the current node position and repeat this process until the current node becomes the root node. If rescaling is requested recalculate each leaf node weight as (current weight+1)/2. Set the current node to the start of the array.
Step 2	Create a parent node for the current node and the next node and insert it into the array at position x where the node at position (x+1) is the first node with a weight greater than that of the newly created node. If the newly created node is not the root node, increment the current node by 2 and goto Step 2.
Output	A completed Huffman tree.

6.7.4 Update Tree

To update the tree, the Huffman processor operates as follows:

Table 26: Update Tree, Huffman processor operation

Input	The symbol whose frequency is to be incremented by 1.
Step 1	If the weight of the root node +1 is greater than 0 x 8000 build the tree indicating that resealing is required.
Step 2	Increment the weight of the leaf node associated with the input symbol by 1 and "swap" it with the node at position y such that the node at position (y+1) is the first node encountered in the order list that has a weight greater than or equal to the new weight of the incremented leaf node. Repeat this process of weight increment and "swap" for the parent of the node at position y until the node at position y becomes the root node.
Output	An updated Huffman tree.

6.7.5 Add New Node

To add a new node, the Huffman processor operates as follows:

Table 27: Add New Node, Huffman processor operation

Input	The symbol to be added to the tree.
Step 1	Splitting the "lightest" node (the first node in the list ordered by ascending weight) such that it becomes a parent node whose right hand child is the leaf node that was originally represented by the node being split and the left hand child is a new leaf node representing the new input symbol. The new leaf node is initially created with a weight of 0.
Step 2	Update the tree (as above) passing the new symbol as the input parameter.
Output	An updated Huffman tree.

6.7.6 Compression

For compression, the Huffman processor operates as follows:

Table 28: Compression, Huffman processor operation

Input	A character from the input stream or control symbol.
Step 1	If there is no existing leaf node for the input symbol set the "source" symbol to be either the New 7bit or New 8bit symbol depending on the value of the input symbol. Otherwise set the source symbol to be the input symbol.
Step 2	Traverse the tree from the leaf node associated with the source symbol to the root node while generating the Huffman bit sequence.
Step 3	Reverse the generated Huffman bit sequence and add it to the output bitstream.
Step 4	If the source symbol equals the input symbol goto Step 5. Add the lower 7 bits of the input symbol to the output bitstream. Add a new node for the input symbol. Update the tree for the input symbol. Goto Output.
Step 5	If the input symbol value is less than 256 and bit 0 of the Huffman Initialization Options value is set, update the tree for the input symbol and goto Output.
Step 6	If the input symbol value is greater than or equal 256 and bit 1 of the Huffman Initialization Options value is set, update the tree for the input symbol.
Output	A Huffman bitstream.

6.7.7 Decompression

For decompression, the Huffman processor operates as follows:

Table 29: Decompression, Huffman processor operation

Input	A bit stream.
Step 1	Traverse the tree from the root node to a leaf node as indicated by the value of the bits read from the front of the input bitstream.
Step 2	If the symbol associated with the leaf node identified in step 1 is neither the New 7bit nor New 8bit symbol, goto Step 3. Set the lower 7 bits of the output symbol to be next 7 bits read from the input bitstream and set bit 7 as indicated. Add a new node for the output symbol. Update the tree for the output symbol. Goto Output.
Step 3	Set the output symbol to the symbol associated with the leaf node from Step 1.
Step 4	If the output symbol value is less than 256 and bit 0 of the Huffman Initialization Options value is set, update the tree for the output symbol and goto Output.
Step 5	If the input symbol value is greater than or equal 256 and bit 1 of the Huffman Initialization Options value is set update the tree for the output symbol.
Output	A decoded symbol.

7 Test Vectors

In order to assist implementors of the compression algorithm described in this specification, a suite of test vectors and ‘help’ information are available in electronic format. The test vectors are supplied on a single diskette attached to this specification.

These test vectors provide checks for most of the commonly expected parameter value variants in this specification and may be updated as the need arises.

Annex A (normative): German Language parameters

A.1 Compression Language Context

CLC Value: 0 (decimal)

This specifies the following items as defaults:

1) Language German
2) Character set Character Set ID 3 (decimal) = Code Page 850
3) Punctuator ID 0 (decimal)
4) Keyword Dictionary ID 0 (decimal)
5) Character Group ID 1 (decimal)
6) Huffman Initialization ID 1 (decimal)

A.2 Punctuators

Punctuator ID 0 (decimal)

This punctuator ID has the special meaning that no punctuator is defined (or therefore enabled) and the value of bit 2 of octet 1 of the CH is always to be interpreted as zero.

Punctuator ID 1 (decimal)

The punctuator is rendered in Character Set ID 3 (decimal) = Code Page 850.

The following characters have punctuator attributes set:

Table A.1: punctuator attributes set:

Char	Value	PU-IWS	PU-LST	PU-WSF	PU-UCF	PU-UCW	PU-NSI
<LF>	010	0	0	0	1	0	0
<CR>	013	0	0	0	1	0	0
<SP>	032	1	0	0	0	0	0
!	033	0	0	1	1	0	0
,	044	0	0	1	0	0	0
.	046	0	1	1	1	0	0
0	048	0	0	0	0	0	1
1	049	0	0	0	0	0	1
2	050	0	0	0	0	0	1
3	051	0	0	0	0	0	1
4	052	0	0	0	0	0	1

(continued)

Table A.1 (concluded): punctuator attributes set:

Char	Value	PU-IWS	PU-LST	PU-WSF	PU-UCF	PU-UCW	PU-NSI
5	053	0	0	0	0	0	1
6	054	0	0	0	0	0	1
7	055	0	0	0	0	0	1
8	056	0	0	0	0	0	1
9	057	0	0	0	0	0	1
:	058	0	0	1	0	0	0
;	059	0	0	1	0	0	0
?	063	0	0	1	1	0	0

NOTE: The characters "<SP>" are used to represent the "space" character, the characters "<LF>" the "line feed" character and "<CR>" the "carriage return" character.

Punctuator ID >1 (decimal)

No other punctuators are defined and all other values are reserved.

A.3 Keyword Dictionaries

Keyword Dictionary ID 0 (decimal)

This Keyword Dictionary ID has the special meaning that no Keyword Dictionary is defined (or therefore enabled) and the value of bit 1 of octet 1 of the CH is always to be interpreted as zero.

Keyword Dictionary ID 1 (decimal)

The Keyword Dictionary is rendered in Character Set ID 3 (decimal) = Code Page 850.

The Match Options value is 94 (decimal) indicating the following:

- Partial matching is enabled.
- Suffix matching is not enabled.
- Prefix matching is enabled.
- 1st char upper case, remainder lower case matching is enabled.
- Upper case matching is enabled.
- Lower case matching is enabled.
- Exact matching is not enabled.

The Keyword Prefix Length is 1 and the prefix string contains a single character with value 32 decimal (a space).

The Keyword Suffix Length is 0.

The Keyword Threshold value is 4.

The Maximum Partial Match Length value is 20 (decimal).

The Key Word Group List contains only 1 Key Word Group ID. The value of this Key Word Group ID is 0.

Keyword Dictionary ID >1 (decimal)

No other Keyword Dictionaries are defined and all other values are reserved.

Key Word Group ID 0 (decimal)

The entries within this Key Word Group are rendered in Character Set ID 3 (decimal) = Code Page 850.

The Number of Entries value is 128 (decimal).

The entries are defined in table A.2 wherein the characters "<SP>" are used to represent the "space" character of decimal value 32.

Table A.2: Key Word Group ID 0 (decimal)

Entry ID	Entry Length	Entry String
1	5	Abend
2	7	Abholen
3	6	Alles<SP>
4	10	Angekommen
5	9	Angerufen
6	7	Anrufen
7	7	Antwort
8	6	Anzahl
9	6	Arbeit
10	5	Auch<SP>
11	8	Bekommen
12	8	Bescheid
13	6	Besser
14	5	Bitte
15	7	Brauche
16	5	Dabei
17	6	Damit<SP>
18	5	Danke
19	5	Dann<SP>
20	8	Dienstag
21	5	Doch<SP>
22	10	Donnerstag
23	8	Dringend
24	10	Eigentlich
25	7	Einfach
26	6	Einmal
27	7	Empfang
28	7	Endlich
29	11	Erfolgreich
30	9	Eröffnung
31	8	Erhalten
32	10	Erreichbar
33	5	Essen
34	6	Etwas<SP>
35	6	Fahren
36	10	Feierabend
37	6	Fertig
38	7	Freitag
39	6	Freund
40	5	Gegen
41	5	Gehen
42	5	Geht_
43	6	Gerade
44	8	Gespräch
45	7	Gestern
46	6	Glaube
47	6	Gleich
48	6	Grüsse
49	5	Guten
50	5	Haben
51	6	Hallo<SP>
52	6	Heute<SP>
53	12	Hoffentlich<SP>
54	6	Immer<SP>
55	6	Jetzt<SP>
56	6	Kaufen
57	6	Können
58	5	Komme
59	6	Konnte

(continued)

Table A.2 (continued): Key Word Group ID 0 (decimal)

Entry ID	Entry Length	Entry String
60	5	Konto
61	5	Lange
62	7	Langsam
63	6	Lassen
64	6	Laufen
65	7	Leider<SP>
66	6	Letzte
67	5	Liebe
68	6	Machen
69	5	Macht
70	6	Melden
71	6	Mittag
72	8	Mittwoch
73	6	Montag
74	6	Morgen
75	7	Nachher
76	10	Nachmittag
77	9	Nachricht
78	5	Nacht
79	9	Natürlich
80	5	Nicht
81	6	Nummer
82	7	Nutzung
83	5	Pause
84	7	Problem
85	7	Rückruf
86	8	Rechnung
87	5	Reden
88	7	Richtig
89	5	Sagen
90	7	Samstag
91	8	Schlafen
92	8	Schlecht
93	7	Schnell
94	6	Schon<SP>
95	5	Schön
96	7	Schreib
97	6	Schule
98	5	Sehen
99	6	Sicher
100	6	Sofort
101	7	Sonntag
102	5	Sonst
103	6	Später
104	6	Stunde
105	7	Telefon
106	6	Termin
107	5	Total
108	7	Treffen
109	7	Trinken
110	10	Unterwegs<SP>
111	6	urlaub
112	9	Vergessen
113	7	Versuch
114	11	Vielleicht<SP>
115	14	Wahrscheinlich
116	5	Wann<SP>
117	6	Warum<SP>

(continued)

Table A.2 (concluded): Key Word Group ID 0 (decimal)

Entry ID	Entry Length	Entry String
118	6	`Wegen<SP>`
119	5	`Wenn<SP>`
120	6	`Werden`
121	7	`Wichtig`
122	6	`Wieder`
123	8	`Wirklich`
124	6	`Wissen`
125	5	`Woche`
126	10	`Wochenende`
127	6	`Zurück`
128	8	`Zusammen`

Key Word Group ID >0 (decimal)

No other Key Word Groups are defined and all other values are reserved.

A.4 Character Groups

Character Group ID 0 (decimal)

This Character Group ID has the special meaning that no Character Group is defined (or therefore enabled) and the value of bit 0 of octet 1 of the CH is always to be interpreted as zero.

Character Group ID 1 (decimal)

The Character Group is rendered in Character Set ID 3 (decimal) = Code Page 850.

The Number of Groups value is 3.

There are 2 Group Transition symbols used these have the decimal values 259 and 260. Their use in signalling transitions between the 3 groups are shown in the table A.3.

Table A.3: Character Group ID 1 (decimal)

	New Group		
Current Group	0	1	2
0		260	259
1	260		259
2	260	259	

The fold tables and Group Membership bit flags are set out in the following table A.4.

Table A.4: fold tables and Group Membership bit flags

Char	Value	Group 0 Fold Table	Group 1 Fold Table	Group 2 Fold Table	Group 2 Member	Group 1 Member	Group 0 Member
<SP>	032	032	032	032	1	1	1
!	033	033	033	033	1	1	1
"	034	034	034	012	1	1	1
#	035	107	035	035	1	0	0
$	036	113	035	035	1	0	0
%	037	118	037	037	1	0	0
&	038	112	038	038	1	0	0
'	039	111	039	039	1	0	0
(	040	119	040	040	1	0	0
)	041	098	041	041	1	0	0
*	042	109	042	042	1	0	0
+	043	103	043	043	1	0	0
,	044	044	044	044	1	1	1
-	045	097	045	045	1	0	0
.	046	046	046	046	1	1	1
/	047	102	047	047	1	0	0
0	048	110	048	048	1	0	0
1	049	101	049	049	1	0	0
2	050	105	050	050	1	0	0
3	051	104	051	051	1	0	0
4	052	114	052	052	1	0	0
5	053	100	053	053	1	0	0
6	054	108	054	054	1	0	0
7	055	115	055	055	1	0	0
8	056	117	056	056	1	0	0
9	057	099	057	057	1	0	0
:	058	116	058	058	1	0	0
;	059	121	059	059	1	0	0
<	060	106	060	060	1	0	0
=	061	120	061	061	1	0	0
>	062	122	062	062	1	0	0
?	063	063	063	063	1	1	1
A	065	097	065	065	0	1	0
B	066	098	066	066	0	1	0
C	067	099	067	067	0	1	0
D	068	100	068	068	0	1	0
E	069	101	069	069	0	1	0
F	070	102	070	070	0	1	0
G	071	103	071	071	0	1	0
H	072	104	072	072	0	1	0
I	073	105	073	073	0	1	0
J	074	106	074	074	0	1	0
K	075	107	075	075	0	1	0
L	076	108	076	076	0	1	0
M	077	109	077	077	0	1	0
N	078	110	078	078	0	1	0
O	079	111	079	079	0	1	0
P	080	112	080	080	0	1	0
Q	081	113	081	081	0	1	0
R	082	114	082	082	0	1	0
S	083	115	083	083	0	1	0
T	084	116	084	084	0	1	0
U	085	117	085	085	0	1	0
V	086	118	086	086	0	1	0
W	087	119	087	087	0	1	0
X	088	120	088	088	0	1	0

(continued)

Table A.4 (concluded): fold tables and Group Membership bit flags

Char	Value	Group 0 Fold Table	Group 1 Fold Table	Group 2 Fold Table	Group 2 Member	Group 1 Member	Group 0 Member
Y	089	121	089	089	0	1	0
Z	090	122	090	090	0	1	0
a	097	097	065	045	0	0	1
b	098	098	066	041	0	0	1
c	099	099	067	057	0	0	1
d	100	100	068	053	0	0	1
e	101	101	069	049	0	0	1
f	102	102	070	047	0	0	1
g	103	103	071	043	0	0	1
h	104	104	072	051	0	0	1
i	105	105	073	050	0	0	1
j	106	106	074	060	0	0	1
k	107	107	075	035	0	0	1
l	108	108	076	054	0	0	1
m	109	109	077	042	0	0	1
n	110	110	078	048	0	0	1
o	111	111	079	039	0	0	1
p	112	112	080	038	0	0	1
q	113	113	081	036	0	0	1
r	114	114	082	052	0	0	1
s	115	115	083	055	0	0	1
t	116	116	084	058	0	0	1
u	117	117	085	056	0	0	1
v	118	118	086	037	0	0	1
w	119	119	087	040	0	0	1
x	120	120	088	061	0	0	1
y	121	121	089	059	0	0	1
z	122	122	090	062	0	0	1

NOTE: The characters "<SP>" are used to represent the "space" character.

Characters with any other value in the range 0 to 255 are not a member of any group and therefore the fold table values will be equal to the character value in all cases.

Character Group ID >1 (decimal)

No other Character Groups are defined and all other values are reserved.

A.5 Huffman Initializations

Huffman Initialization ID 0 (decimal)

The Huffman Initialization is rendered in Character Set ID 3(decimal) = Code Page 850.

The Options value indicates that both character and control symbol updating are enabled.

As described is subclause 6.7.1, the tables below include initialization values for *all* control symbols that *might* occur in conjunction with the use of this Huffman Initialization. However, initialization values for control symbols that *cannot* occur for a *particular* use of this Huffman Initialization are identified as part of the Huffman initialization process and are *not* added to the Huffman tree as described in subclause 6.7.2.

The Character Group ID value is 1.

Character Group Processing is disabled:

The number of frequency initializations is 4.

The initial frequencies are:

Table A.5: Character Group Processing is disabled: initial frequencies

Symbol	Value	Frequency
New UCS2 Row	266	1
Keyword	258	1
New 8bit	257	1
New 7bit	256	1

Character Group Processing is enabled:

The number of frequency initializations is 6.

The initial frequencies are:

Table A.6: Character Group Processing is enabled: initial frequencies

Symbol	Value	Frequency
New UCS2 Row	266	1
Change CG1	260	1
Change CG0	259	1
Keyword	258	1
New 8bit	257	1
New 7bit	256	1

Huffman Initialization ID 1 (decimal)

The Huffman Initialization is rendered in Character Set ID 3 (decimal) = Code Page 850.

The Options value indicates that both character and control symbol updating are enabled.

As described is subclause 6.7.1, the tables below include initialization values for *all* control symbols that *might* occur in conjunction with the use of this Huffman Initialization. However, initialization values for control symbols that *cannot* occur for a *particular* use of this Huffman Initialization are identified as part of the Huffman initialization process and are *not* added to the Huffman tree as described in subclause 6.7.2.

The Character Group ID value is 1.

Character Group Processing is disabled:

The number of frequency initializations is 32.

The initial frequencies are:

Table A.7: Character Group Processing is disabled: initial frequencies

Symbol	Value	Frequency
New UCS2 Row	266	00001
q	113	00001
x	120	00001
y	121	00001
j	106	00001
v	118	00001
p	112	00001
New 8bit	257	00002
z	122	00002
.	46	00003
k	107	00003
f	102	00003
w	119	00003
Keyword	258	00004
b	98	00004
g	103	00004
o	111	00005
m	109	00006
l	108	00006
u	117	00007
c	99	00007
d	100	00007
New 7bit	256	00009
r	114	00009
t	116	00009
s	115	00010
h	104	00010
a	97	00012
i	105	00013
n	110	00014
e	101	00021
<SP>	32	00032

NOTE: In the above table, the characters "<SP>" are used to represent the "space" character.

Character Group Processing is enabled:

The number of frequency initializations is 34.

The initial frequencies are:

Table A.8: Character Group Processing is enabled: initial frequencies

Symbol	Value	Frequency
New UCS2 Row	266	00001
q	113	00001
x	120	00001
y	121	00001
j	106	00001
v	118	00001
p	112	00001
New 8bit	257	00002
z	122	00002
Change CG0	259	00002
.	46	00003
k	107	00003
f	102	00003
w	119	00003
Keyword	258	00004
Change CG1	260	00004
b	98	00004
g	103	00004
o	111	00005
m	109	00006
l	108	00006
u	117	00007
c	99	00007
d	100	00007
New 7bit	256	00009
r	114	00009
t	116	00009
s	115	00010
h	104	00010
a	97	00012
i	105	00013
n	110	00014
e	101	00021
<SP>	32	00032

Note in the above table, the characters "<SP>" are used to represent the "space" character.

Huffman Initialization ID >1 (decimal)

No other Huffman Initializations are defined and all other values are reserved.

Annex B (normative): English language parameters

B.1 Compression Language Context

CLC Value: 1 (decimal)

This specifies the following items as defaults:

1) Language English
2) Character set Character Set ID 2 (decimal) = Code page 437
3) Punctuator ID 1 (decimal)
4) Keyword Dictionary ID 0 (decimal)
5) Character Group ID 1 (decimal)
6) Huffman Initialization ID 1 (decimal)

B.2 Punctuators

Punctuator ID 0 (decimal)

This punctuator ID has the special meaning that no punctuator is defined (or therefore enabled) and the value of bit 2 of octet 1 of the CH is always to be interpreted as zero.

Punctuator ID 1 (decimal)

The punctuator is rendered in Character Set ID 2 (decimal) = Code Page 437.

The following characters have punctuator attributes set:

Table B.1: punctuator attributes set:

Char	Value	PU-IWS	PU-LST	PU-WSF	PU-UCF	PU-UCW	PU-NSI
<LF>	010	0	0	0	1	0	0
<CR>	013	0	0	0	1	0	0
<SP>	032	1	0	0	0	0	0
!	033	0	0	1	1	0	0
,	044	0	0	1	0	0	0
.	046	0	1	1	1	0	0
0	048	0	0	0	0	0	1
1	049	0	0	0	0	0	1
2	050	0	0	0	0	0	1
3	051	0	0	0	0	0	1
4	052	0	0	0	0	0	1

(continued)

Table B.1 (concluded): punctuator attributes set:

Char	Value	PU-IWS	PU-LST	PU-WSF	PU-UCF	PU-UCW	PU-NSI
5	053	0	0	0	0	0	1
6	054	0	0	0	0	0	1
7	055	0	0	0	0	0	1
8	056	0	0	0	0	0	1
9	057	0	0	0	0	0	1
:	058	0	0	1	0	0	0
;	059	0	0	1	0	0	0
?	063	0	0	1	1	0	0
I	073	0	0	0	0	1	0
NOTE: The characters "<SP>" are used to represent the "space" character, the characters "<LF>" the "line feed" character and "<CR>" the "carriage return" character.							

Punctuator ID >1 (decimal)

No other punctuators are defined and all other values are reserved.

B.3 Keyword Dictionaries

Keyword Dictionary ID 0 (decimal)

This Keyword Dictionary ID has the special meaning that no Keyword Dictionary is defined (or therefore enabled) and the value of bit 1 of octet 1 of the CH is always to be interpreted as zero.

Keyword Dictionary ID 1 (decimal)

The Keyword Dictionary is rendered in Character Set ID 2 (decimal) = Code Page 437.

The Match Options value is 94 (decimal) indicating the following:

- Partial matching is enabled.
- Suffix matching is not enabled.
- Prefix matching is enabled.
- 1st char upper case, remainder lower case matching is enabled.
- Upper case matching is enabled.
- Lower case matching is enabled.
- Exact matching is not enabled.

The Keyword Prefix Length is 1 and the prefix string contains a single character with value 32 decimal (a space).

The Keyword Suffix Length is 0.

The Keyword Threshold value is 4.

The Maximum Partial Match Length value is 46 (decimal).

The Key Word Group List contains only 1 Key Word Group ID. The value of this Key Word Group ID is 0.

Keyword Dictionary ID >1 (decimal)

No other Keyword Dictionaries are defined and all other values are reserved.

Key Word Group ID 0 (decimal)

The entries within this Key Word Group are rendered in Character Set ID 2 (decimal) = Code Page 437.

The Number of Entries value is 128 (decimal).

The entries are defined in table B.2wherein the characters "<SP>" are used to represent the "space" character of decimal value 32.

Table B.2: Key Word Group ID 0 (decimal)

Entry ID	Entry Length	Entry String
1	5	About
2	9	Afternoon
3	5	Again
4	6	Agenda
5	6	Agreed
6	4	And<SP>
7	11	Appointment
8	4	Are<SP>
9	7	Arrange
10	6	Arrive
11	6	Attend
12	9	Available
13	4	Away
14	7	Because
15	6	Before
16	7	Benefit
17	8	Business
18	4	But<SP>
19	4	Call
20	6	Can't<SP>
21	6	Cancel
22	6	Commit
23	7	Company
24	8	Complete
25	7	Confirm
26	7	Contact
27	10	Convenient
28	5	Could
29	7	Deliver
30	6	Demand
31	10	Department
32	6	Dinner
33	7	Discuss
34	6	Don't<SP>
35	5	Exist
36	6	Flight
37	4	For<SP>
38	7	Forward
39	6	Friday
40	5	From<SP>
41	5	Going
42	7	Goodbye
43	8	Hardware
44	5	Have<SP>
45	4	Hear
46	5	Hello
47	4	Help
48	4	Home
49	5	Hotel
50	4	How<SP>
51	9	Immediate
52	9	Important
53	11	Information
54	4	Its<SP>
55	5	Later
56	6	Letter
57	7	Machine
58	5	Make<SP>
59	6	Manage

(continued)

Table B.2 (continued): Key Word Group ID 0 (decimal)

Entry ID	Entry Length	Entry String
60	7	Meeting
61	7	Message
62	6	Mobile
63	6	Monday
64	7	Morning
65	5	Need<SP>
66	6	Office
67	5	Other
68	6	Passed
69	8	Personal
70	5	Phone
71	6	Please
72	8	Possible
73	4	Post
74	8	Postpone
75	5	Price
76	8	Priority
77	7	Product
78	7	Project
79	5	Quick
80	7	Receive
81	9	Reference
82	7	Regards
83	8	Remember
84	6	Return
85	4	Ring
86	8	Saturday
87	4	Send
88	7	Service
89	6	Should
90	5	Since
91	8	Software
92	4	Soon
93	5	Speak
94	5	Still
95	7	Subject
96	7	Success
97	6	Sunday
98	4	Talk
99	9	Telephone
100	5	Thank
101	4	That
102	4	The<SP>
103	5	Them<SP>
104	5	There
105	5	They<SP>
106	5	Think
107	4	This
108	8	Thursday
109	5	Today
110	8	Tomorrow
111	7	Tonight
112	5	Total
113	6	Travel
114	7	Tuesday
115	6	Until<SP>
116	6	Update
117	6	Urgent

(continued)

Table B.2 (concluded): Key Word Group ID 0 (decimal)

Entry ID	Entry Length	Entry String
118	5	`Using`
119	4	`Want`
120	9	`Wednesday`
121	7	`Weekend`
122	7	`Welcome`
123	5	`When<SP>`
124	6	`Where<SP>`
125	4	`Will`
126	5	`Would`
127	9	`Yesterday`
128	4	`You<SP>`

Key Word Group ID >0 (decimal)

No other Key Word Groups are defined and all other values are reserved.

B.4 Character Groups

Character Group ID 0 (decimal)

This Character Group ID has the special meaning that no Character Group is defined (or therefore enabled) and the value of bit 0 of octet 1 of the CH is always to be interpreted as zero.

Character Group ID 1 (decimal)

The Character Group is rendered in Character Set ID 2 (decimal) = Code Page 437.

The Number of Groups value is 3.

There are 2 Group Transition symbols used these have the decimal values 259 and 260. Their use in signalling transitions between the 3 groups are shown in the table B.3.

Table B.3: Character Group ID 1 (decimal)

	New Group		
Current Group	0	1	2
0		260	259
1	260		259
2	260	259	

The fold tables and Group Membership bit flags are set out in the following table B.4.

Table B.4: fold tables and Group Membership bit flags

Char	Value	Group 0 Fold Table	Group 1 Fold Table	Group 2 Fold Table	Group 2 Member	Group 1 Member	Group 0 Member
	012	034	012	012	1	0	0
<SP>	032	032	032	032	1	1	1
!	033	118	033	033	1	0	0
"	034	034	034	012	0	1	1
#	035	102	035	035	1	0	0
%	037	113	037	037	1	0	0
&	038	111	038	038	1	0	0
'	039	039	039	039	1	1	1
(	040	116	040	040	1	0	0
)	041	117	041	041	1	0	0
*	042	110	042	042	1	0	0
+	043	119	043	043	1	0	0
,	044	044	044	062	0	1	1
-	045	120	045	045	1	0	0
.	046	046	046	046	1	1	1
/	047	114	047	047	1	0	0
0	048	101	048	048	1	0	0
1	049	097	049	049	1	0	0
2	050	105	050	050	1	0	0
3	051	099	051	051	1	0	0
4	052	112	052	052	1	0	0
5	053	100	053	053	1	0	0
6	054	107	054	054	1	0	0
7	055	104	055	055	1	0	0
8	056	103	056	056	1	0	0
9	057	109	057	057	1	0	0
:	058	098	058	058	1	0	0
;	059	106	059	059	1	0	0
<	060	122	060	060	1	0	0
=	061	121	061	061	1	0	0
>	062	044	062	062	1	0	0
?	063	063	063	093	0	1	1
A	065	097	065	065	0	1	0
B	066	098	066	066	0	1	0
C	067	099	067	067	0	1	0
D	068	100	068	068	0	1	0
E	069	101	069	069	0	1	0
F	070	102	070	070	0	1	0
G	071	103	071	071	0	1	0
H	072	104	072	072	0	1	0
I	073	105	073	073	0	1	0
J	074	106	074	074	0	1	0
K	075	107	075	075	0	1	0
L	076	108	076	076	0	1	0
M	077	109	077	077	0	1	0
N	078	110	078	078	0	1	0
O	079	111	079	079	0	1	0
P	080	112	080	080	0	1	0
Q	081	113	081	081	0	1	0
R	082	114	082	082	0	1	0
S	083	115	083	083	0	1	0
T	084	116	084	084	0	1	0
U	085	117	085	085	0	1	0
V	086	118	086	086	0	1	0
W	087	119	087	087	0	1	0
X	088	120	088	088	0	1	0

(continued)

Table B.4 (concluded): fold tables and Group Membership bit flags

Char	Value	Group 0 Fold Table	Group 1 Fold Table	Group 2 Fold Table	Group 2 Member	Group 1 Member	Group 0 Member
Y	089	121	089	089	0	1	0
Z	090	122	090	090	0	1	0
[	091	108	091	091	1	0	0
]	093	063	093	093	1	0	0
a	097	097	065	049	0	0	1
b	098	098	066	058	0	0	1
c	099	099	067	051	0	0	1
d	100	100	068	053	0	0	1
e	101	101	069	048	0	0	1
f	102	102	070	035	0	0	1
g	103	103	071	056	0	0	1
h	104	104	072	055	0	0	1
i	105	105	073	050	0	0	1
j	106	106	074	059	0	0	1
k	107	107	075	054	0	0	1
l	108	108	076	091	0	0	1
m	109	109	077	057	0	0	1
n	110	110	078	042	0	0	1
o	111	111	079	038	0	0	1
p	112	112	080	052	0	0	1
q	113	113	081	037	0	0	1
r	114	114	082	047	0	0	1
s	115	115	083	156	0	0	1
t	116	116	084	040	0	0	1
u	117	117	085	041	0	0	1
v	118	118	086	033	0	0	1
w	119	119	087	043	0	0	1
x	120	120	088	045	0	0	1
y	121	121	089	061	0	0	1
z	122	122	090	060	0	0	1
£	156	115	156	156	1	0	0

NOTE: The characters "<SP>" are used to represent the "space" character.

Characters with any other value in the range 0 to 255 are not a member of any group and therefore the fold table values will be equal to the character value in all cases.

Character Group ID >1 (decimal)

No other Character Groups are defined and all other values are reserved.

B.5 Huffman Initializations

Huffman Initialization ID 0 (decimal)

The Huffman Initialization is rendered in Character Set ID 2 (decimal) = Code Page 437.

The Options value indicates that both character and control symbol updating are enabled.

As described is subclause 6.7.1, the tables below include initialization values for *all* control symbols that *might* occur in conjunction with the use of this Huffman Initialization. However, initialization values for control symbols that *cannot* occur for a *particular* use of this Huffman Initialization are identified as part of the Huffman initialization process and are *not* added to the Huffman tree as described in subclause 6.7.2.

The Character Group ID value is 1.

Character Group Processing is disabled:

The number of frequency initializations is 4.

The initial frequencies are:

Table B.5: Character Group Processing is disabled: initial frequencies

Symbol	Value	Frequency
New UCS2 Row	266	1
Keyword	258	1
New 8bit	257	1
New 7bit	256	1

Character Group Processing is enabled:

The number of frequency initializations is 6.

The initial frequencies are:

Table B.6: Character Group Processing is enabled: initial frequencies

Symbol	Value	Frequency
New UCS2 Row	266	1
Change CG1	260	1
Change CG0	259	1
Keyword	258	1
New 8bit	257	1
New 7bit	256	1

Huffman Initialization ID 1 (decimal)

The Huffman Initialization is rendered in Character Set ID 2 (decimal) = Code Page 437.

The Options value indicates that both character and control symbol updating are enabled.

As described is subclause 6.7.1, the tables below include initialization values for *all* control symbols that *might* occur in conjunction with the use of this Huffman Initialization. However, initialization values for control symbols that *cannot* occur for a *particular* use of this Huffman Initialization are identified as part of the Huffman initialization process and are *not* added to the Huffman tree as described in subclause 6.7.2.

The Character Group ID value is 1.

Character Group Processing is disabled:

The number of frequency initializations is 32.

The initial frequencies are:

Table B.7: Character Group Processing is disabled: initial frequencies

Symbol	Value	Frequency
New UCS2 Row	266	00001
z	122	00001
Keyword	258	00001
q	113	00001
j	106	00003
x	120	00003
New 7bit	256	00003
New 8bit	257	00003
v	118	00008
w	119	00010
b	098	00010
y	121	00011
f	102	00011
u	117	00012
.	046	00014
m	109	00016
g	103	00017
k	107	00017
h	104	00018
d	100	00024
p	112	00029
c	099	00029
i	105	00030
r	114	00038
l	108	00038
s	115	00040
n	110	00048
t	116	00050
o	111	00055
<SP>	032	00060
a	097	00066
e	101	00079

NOTE: In the above table, the characters "<SP>" are used to represent the "space" character.

Character Group Processing is enabled:

The number of frequency initializations is 34.

The initial frequencies are:

Table B.8: Character Group Processing is enabled: initial frequencies

Symbol	Value	Frequency
New UCS2 Row	266	00001
Change CG1	260	00001
z	122	00001
Keyword	258	00001
q	113	00002
j	106	00003
x	120	00003
New 7bit	256	00003
New 8bit	257	00003
v	118	00008
w	119	00010
b	098	00010
Change CG0	259	00010
y	121	00011
f	102	00013
u	117	00013
.	046	00015
m	109	00017
g	103	00017
k	107	00019
h	104	00020
d	100	00026
p	112	00030
c	099	00030
i	105	00031
r	114	00040
l	108	00040
s	115	00045
n	110	00050
t	116	00053
o	111	00054
<SP>	032	00058
a	097	00064
e	101	00077

Note in the above table, the characters "<SP>" are used to represent the "space" character.

Huffman Initialization ID >1 (decimal)

No other Huffman Initializations are defined and all other values are reserved.

Annex C (normative): Italian Language parameters

Annex under development

Annex D (normative): French Language parameters

Annex under development

Annex E (normative): Spanish Language parameters

Annex under development

Annex F (normative): Dutch Language parameters

Annex under development

Annex G (normative): Swedish Language parameters

Annex under development

Annex H (normative): Danish Language parameters

Annex under development

Annex J (normative): Portuguese Language parameters

Annex under development

Annex K (normative): Finnish Language parameters

Annex under development

Annex L (normative): Norwegian Language parameters

Annex under development

Annex M (normative): Greek Language parameters

Annex under development

Annex N (normative): Turkish Language parameters

Annex under development

Annex P (normative): Reserved

Annex under development

Annex Q (normative): Reserved

Annex under development

Annex R (normative): Default Parameters for Unspecified Language

R.1 Compression Language Context

CLC Value: 15 (decimal)

This specifies the following items as defaults:

1)	Language	Unspecified
2)	Character set GSM 7 bit-default alphabet	Character Set ID 1 (decimal) = ~~GSM TS 03.38~~3G TS 23.038 [1]
3)	Punctuator ID	0 (decimal)
4)	Keyword Dictionary ID	0 (decimal)
5)	Character Group ID	0 (decimal)
6)	Huffman Initialization ID	0 (decimal)

R.2 Punctuators

Punctuator ID 0 (decimal)

This punctuator ID has the special meaning that no punctuator is defined (or therefore enabled) and the value of bit 2 of octet 1 of the CH is always to be interpreted as zero.

Punctuator ID >0 (decimal)

No other punctuators are defined and all other values are reserved.

R.3 Keyword Dictionaries

Keyword Dictionary ID 0 (decimal)

This Keyword Dictionary ID has the special meaning that no Keyword Dictionary is defined (or therefore enabled) and the value of bit 1 of octet 1 of the CH is always to be interpreted as zero.

Keyword Dictionary ID >0 (decimal)

No other Keyword Dictionaries are defined and all other values are reserved.

R.4 Character Groups

Character Group ID 0 (decimal)

This Character Group ID has the special meaning that no Character Group is defined (or therefore enabled) and the value of bit 0 of octet 1 of the CH is always to be interpreted as zero.

Character Group ID >0 (decimal)

No other Character Groups are defined and all other values are reserved.

R.5 Huffman Initializations

Huffman Initialization ID 0 (decimal)

Only control symbols are included in this initialization. It's rendition is therefore independent of character set.

The Options value indicates that both character and control symbol updating are enabled.

As described is subclause 6.7.1, the tables below include initialization values for *all* control symbols that *might* occur in conjunction with the use of this Huffman Initialization. However, initialization values for control symbols that *cannot* occur for a *particular* use of this Huffman Initialization are identified as part of the Huffman initialization process and are *not* added to the Huffman tree as described in subclause 6.7.2.

Character Group Processing is always disabled:

The number of frequency initializations is 4.

The initial frequencies are:

Table R.1: Character Group Processing is always disabled: initial frequencies

Symbol	Value	Frequency
New UCS2 Row	266	1
Keyword	258	1
New 8bit	257	1
New 7bit	256	1

Character Group Processing can not be enabled therefore:

The number of frequency initializations is 0.

Huffman Initialization ID >0 (decimal)

No other Huffman Initializations are defined and all other values are reserved.

3GPP TSG-T2 #7 / ETSI
Ystad, SWEDEN, 22-26 November 1999

TSGT2#7(99)1074

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.005	**CR**	**001**	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-T#6	for approval	X	strategic	*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic	

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source: T2 **Date:** 22/06/99

Subject: Adaptations for UMTS

Work item: TEI

Category: *(only one category shall be marked with an X)*

F	Correction		Phase 2	
A	Corresponds to a correction in an earlier release		Release 96	
B	Addition of feature		Release 97	
C	Functional modification of feature		Release 98	
D	Editorial modification	X	Release 99	X
			Release 00	

Reason for change: This specification has been transferred from SMG to 3GPP. Therefore, adaptations for UMTS are required.

Clauses affected:

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

~~Introduction~~

~~The present document includes references to features which were introduced into the GSM Technical specifications after Release 96 of GSM Phase 2+. The text that is relevant, if the feature is supported, is marked with designators.~~

~~The following table lists all features that were introduced after Release 96 and have impacted this specification:~~

~~Feature~~	~~Designator~~
~~Technical enhancement and improvement: New optional command~~	~~$(TEI R97)$~~
~~Enhanced Validity Period Format~~	~~$(EVPF)$~~

0 Scope

This Technical Specification (TS) defines three interface protocols for control of SMS functions within a GSM/UMTS mobile telephone from a remote terminal via an asynchronous interface.

Clause 2 defines a binary protocol (“Block Mode”). The protocol includes error protection and is suitable for use where the link may not be completely reliable. It will be of particular use where control of remote devices is required. Efficient transfer of binary encoded user data is possible.

Clause 3 defines a character-based interfaced based on “AT” commands (“Text Mode”). This mode is suitable for unintelligent terminals or terminal emulators, and for application software built on command structures like those defined in V.25ter. Some of the commands defined in clause 3 will also be useful for implementations of clause 2 and/or clause 4, for example enabling an indication of incoming SMS messages.

Clause 4 defines a character-based interface with hex-encoded binary transfer of message blocks (“PDU Mode”). This mode is suitable for software drivers based on AT command structures which do not understand the content of the message blocks and can only pass them between the MT and “upper level” software resident in the TE.

In all three modes, the terminal is considered to be in control for SMS/CBS transactions.

This specification considers the mobile termination to be a single entity. Other 3GPP/GSM ~~GSM~~ Technical Specifications describe the split of functionality between the mobile equipment and ~~SIM~~(U)SIM.

The three “modes” referred to above, are represented in figure 0.1.

The “Block mode” is a self contained mode in its own right, and when entered, control will remain within that mode until the procedures to exit the mode are executed, after which control is returned to the V.25ter “command” state or “on-line command” state.

The “Text” and “PDU” modes are not in themselves V.25ter states but are simply sets of commands which will operate in either the V.25ter “command” state or “on-line command” state. The “Text” and “PDU” modes are transitory states and after each operation, control is automatically returned to the V.25ter “command” state or “on-line command” state. Whilst in the V.25ter command state, the MS is available to handle incoming and outgoing calls such as Data or Facsimile.

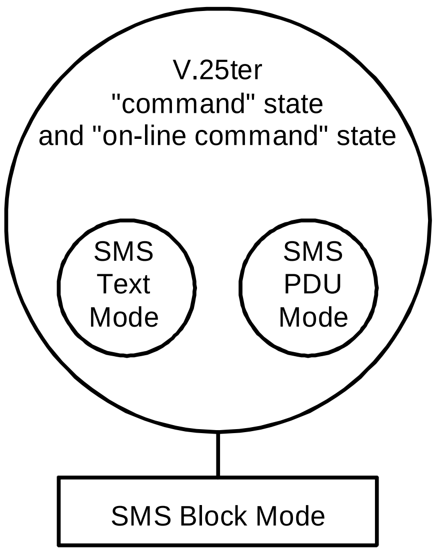


Figure 0.1: Block, Text and PDU modes

In the “Block mode” and “PDU” mode a mobile is not permitted to modify any component of an SMS/CBS message received from the air interface or an SMS message received from a TE, before passing it on, except where ~~GSM 03.40~~3G TS 23.040 [3] or ~~GSM 03.41~~3G TS 23.041 [4] defines a “component modification facility” and where this “component modification facility” is supported by the mobile. In the Text Mode the mobile may be unable to display characters coded in particular coding schemes. In this case, the mobile shall behave as described in ~~GSM 03.38~~3G TS 23.038 [2] and assume the coding scheme to be the GSM ~~Default~~7 bit default a~~A~~lphabet.

0.1 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms"~~ / 3G TS 25.990 Vocabulary for UMTS~~.

[2] ~~GSM 03.38~~3G TS 23.038: "~~Digital cellular telecommunications system (Phase 2+);~~ Alphabets and language-specific information".

[3] ~~GSM 03.40~~3G TS 23.040: "~~Digital cellular telecommunications system (Phase 2+);~~ Technical realization of the Short Message Service (SMS) ~~Point-to-Point (PP)~~".

[4] ~~GSM 03.41~~3G TS 23.041: "~~Digital cellular telecommunications system (Phase 2+);~~ Technical realization of the ~~Short Message Service~~ Cell Broadcast Service (CBS~~SMSCB~~)".

[5] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[6] ~~GSM 04.11~~3G TS 24.011: "~~Digital cellular telecommunications system (Phase 2+); Point-to-Point (PP)~~ Short Message Service (SMS) support on mobile radio interface".

[7] ~~GSM 04.12~~3G TS 24.012: "~~Digital cellular telecommunications system (Phase 2+); Short Message Service~~ Cell Broadcast Service(CBS~~SMSCB~~) support on the mobile radio interface".

[8] ~~GSM 07.01~~3G TS 27.001: "~~Digital cellular telecommunications system (Phase 2+);~~ General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[9] ~~GSM 07.07~~3G TS 27.007: "~~Digital cellular telecommunications system (Phase 2+);~~ AT command set for ~~GSM Mobile~~3GPP User Equipment (U~~M~~E)".

[10] GSM 11.11: "Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface".~~ UMTS equivalent ???????????????~~

[11] CCITT Recommendation V.25ter: “Serial Asynchronous Automatic Dialling And Control”

[12] CCITT Recommendation V.24: "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment".

[13] CCITT Recommendation E.164: "Numbering plan for the ISDN era".

[14] CCITT Recommendation E.163: "Numbering plan for the international telephone service".

[15] 3G TR~~S~~ 25.990 "~~UMTS~~ Vocabulary"

[16] 3G TS 31.102: "Characteristics of the USIM application"

0.2 Abbreviations

Abbreviations used in this specification are listed in GSM 01.04. [1] and ~~/~~ 3G T~~S~~R 25.990. [15]~~.~~

Additionally, the following abbreviation is used:

EVPF -Enhanced Validity Period Format

~~TE. (Terminal Equipment) , ME and MT Are these terms used in UMTS ??????~~

1 Reference configuration

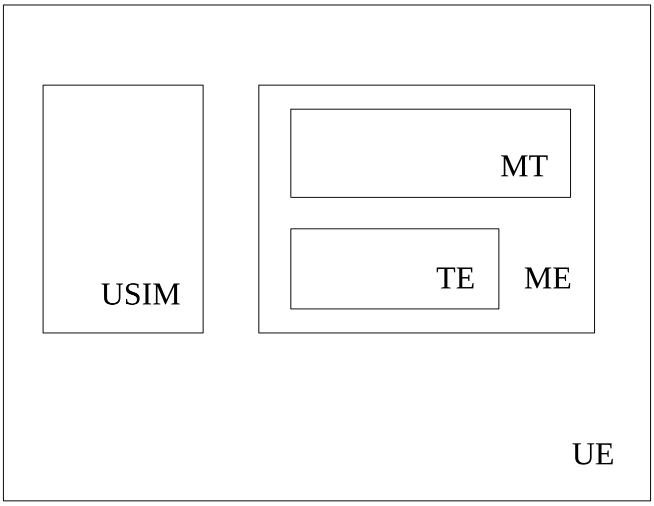


Figure 1: Reference configuration

The ~~mobile termination~~ User Equipment (UE) consists of the mobile equipment (ME) and the ~~SIM~~(U)SIM. Messages may be stored in either, but this specification does not distinguish between messages stored in the ~~SIM~~(U)SIM or in the ME. The management of message storage in the two parts of the UE ~~mobile termination~~ is a matter for the UE ~~mobile termination~~ implementation.

1.1 V.24 Interface Circuits

The operation of the CCITT V.24 blue book interface circuits for SMS is shown in table 1.1.

Table 1.1: Use of V.24 interface circuits

V.24 CIRCUIT	DESCRIPTION	TE to MT	MT to TE
CT102	signal ground	x	x
CT103	TXD	x	
CT104	RXD		x
CT105	RTS	x	
CT106	CTS		x
CT107	DSR		x
CT108.2	DTR	x	
CT109	DCD		x

NOTE: CT105 at the TE is connected to CT133 at the MT

1.1.1 Circuit definitions for the SMS Block mode

CT103

All commands from the TE to the MT are transferred across this circuit. Inband flow control is not permitted during Block Mode.

CT104

All responses/indications from the MT to the TE are transferred across this circuit. Inband flow control is not permitted during Block Mode.

CT105

This circuit allows the TE to flow control the MT when in the Block Mode and at other times if hardware flow control is enabled.

CT106

This circuit allows the MT to flow control the TE when in the Block Mode and at other times if hardware flow control is enabled.

CT107

This circuit shall be set to the ON condition before entry into the Block Mode, and shall remain in the ON condition during Block Mode. If the TE detects that this circuit returns to the OFF condition during the block mode then the TE shall return CT108.2 to the OFF condition and exit the Block Mode.

CT108.2

This circuit shall be set in the ON condition before the AT+CESP command is sent from the TE to begin the Block Mode, and shall be maintained in the ON condition during the Block Mode. It shall be returned to the OFF condition after the command 'END SMS MODE' has been accepted and acknowledged by the MT. If the MT detects that this circuit returns to the OFF condition during the Block Mode then the MT shall exit the Block Mode.

CT109

This circuit shall be set to the ON condition before entry into the Block Mode and remain in the ON condition during the Block Mode. If the TE detects that this circuit returns to the OFF condition during the Block Mode then the TE shall return CT108.2 to the OFF condition and shall exit the Block Mode.

1.1.2 Circuit definitions for the SMS Text and PDU modes

Only circuits CT102, CT103 and CT104 are mandatory for the Text and PDU modes. The functionality and operation of other circuits shall be in accordance with V.25ter.

2 SMS Block Mode

2.1 Beginning and ending of SMS/CBS Block Mode

2.1.1 Beginning SMS/CBS Block Mode

As described in ~~GSM 07.01~~3G TS 27.001 [8], the DTE/DCE interface is normally associated with the terminal adaptation function (TAF), if such a function is available. When no data connection is in progress, and the terminal equipment wishes to enter SMS/CBS mode, the command 'AT+CESP' shall be issued by the TE through the DTE/DCE interface requesting that the Block mode protocol described in this specification is to be used. The syntax of this command is further described in subclause 3.2.4 later. The syntax for these commands is derived from V.25ter, i.e. the command is encoded as an IA5 character string together with delimiters as described in V.25ter.

Upon receipt of this command, the mobile termination shall respond as follows:

If the mobile termination supports SMS/CBS block mode commands, responses and indications as described in this technical specification, it shall respond with 'OK' (or 0) and enter the SMS/CBS mode.

If the mobile termination does not support SMS/CBS block mode commands, responses and indications as described in this technical specification, it shall respond with 'ERROR' (or 4) and remain in the current mode..

Terminal software shall wait a short time (e.g. 5 seconds) for the ‘OK’ (0) or ‘ERROR’ (4) response. If neither response is received before the timeout then the terminal software shall assume that the block mode has been entered. The terminal software may then submit its first block mode command. If no response is received to this command then the terminal software shall proceed as described below in subclause 2.2 (i.e. repeat the command 3 times and then exit the block mode).

If the SMS/CBS block mode command is accepted by the mobile termination, then all further commands, responses and indications shall be as defined in clause 2 of this technical specification. These SMS/CBS mode commands, responses and indications use 8-bit encoded data and not IA5 characters.

2.1.2 Returning from SMS/CBS Block Mode To Default Mode

When the terminal equipment wishes to return to default mode from SMS/CBS mode, it shall issue the command 'END SMS MODE', described in subclause 2.4.1.11. The mobile termination shall respond with 'OK' (or 0) to indicate that the DTE/DCE interface has returned to default mode. The TE shall change back to default mode whether or not such a response is received.

The TE may also indicate that it has exit from the SMS/CBS mode through the use of CT 108/2 (see subclause 1.1)

If an incoming data call arrives while the DTE/DCE interface is set to SMS/CBS mode, then the mobile termination may autonomously issue the 'END SMS MODE' indication (subclause 2.4.2.11) and revert to default mode in order to connect the data call through the TAF.

The MT may exit from SMS/CBS mode autonomously if the power to the MT is switched off and then on again. In addition, the MT manufacturer may provide MMI to change the mode back to the default mode. In the latter case, the MT shall issue the 'END SMS MODE' indication (subclause 2.4.2.11) and exit the SMS/CBS mode immediately.

The MT may also indicate that it has exit from the SMS/CBS mode through the use of CT 107 and CT 109 (see subclause 1.1).

A BREAK condition in either direction at the DTE/DCE interface shall cause the TE and the MT to exit from the SMS/CBS block mode and return to the default mode.

In the event where the TE or the MT find themselves unable to recover from a protocol error then either entity may exit the SMS/CBS mode using any of the mechanisms described above. Confirmation of default mode operation will be achieved through the use of AT commands and responses.

2.2 Protocol description

The communication path between the MT and the TE across the DTE/DCE interface should be quite reliable if it uses a short wire link. However, to ensure that the low error rate does not cause malfunction, the following error protection scheme is provided.

Each message sent from the MT to the TE or vice-versa consists of a data block (DATA) and block check sum (BCS, see figure 2.2.1). In the following description the notation DLE, STX, NUL and ETX refer to control characters having the values 10 02 00 and 03 hexadecimal respectively.

<-----------------DATA-----------------> <- BCS ->

DLE 10H	STX 02H	Message content	DLE 10H	ETX 03H	BCS MSB	BCS LSB

Figure 2.2.1: Format of DTE/DCE interface messages

The data block consists of a start transmission sequence, set to 00010000 00000010 (10 02 hex), the message content as defined below and an end transmission sequence, set to 00010000 00000011 (10 03 hex). The least significant bit of each octet is always transmitted first.

The block check sum is calculated at the transmitter by adding all of the octets in the message content modulo 65536. Each bit of the 16-bit result is then inverted, and 1 is added to the answer.

During transmission of the message content and the BCS octets, any occurrence of the value 10 hex (DLE) shall result in an additional 'stuffing' octet of value 00 hex (NUL) being transmitted immediately following the octet containing 10 hex. This is to ensure that the start and end markers are unambiguous. The receiver shall remove stuffing octets by discarding any octet of value 00 hex (NUL) which immediately follows an octet of value 10 hex (DLE).

After removal of any stuffing octets, the receiver can check the BCS by adding all of the octets in the message content and the 16-bit BCS modulo 65536. The correct result is 0000 hex. If any message is received with an incorrect BCS, then the message is discarded. No response is sent over the DTE/DCE interface, but an indication may be provided to higher layers within the receiving entity.

The transmitter shall only send DLE when it is followed by STX, NUL or ETX. Therefore, if the receiver sees a DLE followed by anything else then the receiver shall assume that some data has been lost, and shall start to search for the start marker. An unexpected end marker at the receiver shall also result in a search for a start marker. A start marker shall always be treated as the start of a new block, regardless of which state the receiver is in.

Examples of state diagrams for a block receiver to implement this procedure are given in Annex B, together with an example of coding and decoding a message.

Only one Command/Response transaction shall be permitted at any one time from any sending or receiving entity. It shall however be possible for a Command/Response transaction from one entity to be initiated even if there is a Command/Response transaction in progress from the other entity.

If an immediate response is expected to a message sent over the DTE/DCE interface, then the sending entity shall wait 10 seconds. If no response is received within this time, the sending entity shall repeat the message. The message shall be repeated a maximum of 3 times, after which the sending entity shall exit from the SMS/CBS mode and provide an error indication to the user.

If a message cannot be understood by the receiving entity even though it has a correct BCS, then it shall return an UNABLE TO PROCESS message with cause value 'Command not understood'. The receipt of an UNABLE TO PROCESS message should not in itself initiate re-transmission although re-transmission may take place due to the timeout mechanism described earlier since an UNABLE TO PROCESS is deemed to be an invalid response. The ‘Cause’ may however be referred to a higher layer. An UNABLE TO PROCESS shall not be sent as the result of an incorrect BCS.

2.3 Requesting messages already held in the Mobile Termination

The TE may request the MT to provide SMS or CBS messages already stored. The TE will either request all messages, or request a list of messages and subsequently ask for specific messages.

At the start of the SMS/CBS mode session, the MT shall number all messages contiguously, starting with message number 1. These "Short Message References" are only valid for a single SMS/CBS MODE session and should not be confused with the ~~GSM 03.40~~3G TS 23.040 [3] TP-Message-Reference. Each message retains its Short Message Reference for the duration of the SMS/CBS mode session. New messages will normally be given the lowest previously-unused Short Message Reference. However, if all Short Message References have been used then the MT may reallocate Short Message References previously allocated to now-deleted messages.

Short Message Reference 0 signifies that there are no messages in the MT. The value of 0 is used under the following conditions:

- When an INSERT SMS command is used to transfer an SM over the air interface and not store it in the MT then the MT will return a Short Message Reference of 0 in the REQUEST CONFIRMED response and the ensuing INSERT SMS COMPLETE / INSERT SMS FAILURE indications.
- For Class 0 SM’s which are not stored in the MT
- For TE specific SM’s which are not stored in the MT

If Message number 0 is requested by the TE, the MT will always return an error cause, but will also include the highest valid Short Message Reference (see subclause 2.3.2.1 below).

2.3.1 Requesting List Of Messages

The TE may request the MT to provide a list of SMS and CBS messages currently stored in the mobile termination. This is achieved by the LIST REQUEST command (subclause 2.4.1.1). The MT divides the messages stored into groups of 5 (called pages) and transfers the first 5 in a MESSAGE LIST response (subclause 2.4.2.1) containing message references allocated by the MT, plus the relevant header information described in ~~GSM 03.40~~3G TS 23.040 [3]/24.011 [6]~~04.11~~ and ~~GSM 03.41~~3G TS 23.041 [4] / 24.012 [7]~~04.12~~.

If there are no messages stored in the MT, then the MESSAGE LIST response shall be empty.

The TE may then request further groups of up to 5 messages by repeating the LIST REQUEST command for pages 2,3, and so on. The MT will indicate that there are no more pages by responding with an empty MESSAGE LIST response.

2.3.2 Requesting Transfer Of Messages

The TE may request the transfer of one or more messages by means of the commands described below. The MT does not delete messages which have been transferred. Messages can only be deleted by the DELETE MESSAGE command (subclause 2.4.1.9).

2.3.2.1 Requesting Transfer Of A Specific Message

The TE may request the MT to transfer a specific message by sending the GET MESSAGE command (subclause 2.4.1.2), including the appropriate message reference. The MT will provide the full message including header in a MESSAGE response (subclause 2.4.2.2). If the message reference is unallocated, then the GET MESSAGE FAILURE response is returned with cause 'No such message' and the highest valid Message Reference (subclause 2.4.2.3).

2.3.2.2 Requesting Transfer Of All Messages

The TE may request the MT to transfer all messages by sending the GET FIRST MESSAGE command (subclause 2.4.1.3), followed by the appropriate number of GET NEXT MESSAGE commands (subclause 2.4.1.4).

The MT shall be able to transfer all messages one-by-one, starting with the 'first' and continuing with the 'next'. The precise ordering of the messages is left to the MT implementation.

If the MT exits from SMS/CBS mode for any reason, then this information need not be retained.

On receipt of the GET FIRST MESSAGE command, the MT shall set a pointer to the first message, and transfer this message using the MESSAGE response as described in subclause 2.3.2.1.

On receipt of the GET NEXT MESSAGE command, the MT shall move the pointer to the first available message after the last message transferred (using either GET FIRST MESSAGE, GET MESSAGE or GET NEXT MESSAGE), and transfer this message using the MESSAGE response as described in subclause 2.3.2.1.

If the MT receives a GET NEXT MESSAGE command when all messages have been transferred to the TE, or there are no messages stored in the MT, then the GET MESSAGE FAILURE response shall be provided with the cause 'No such message' (see subclause 2.4.2.3).

If the TE receives an out of sequence message then it shall attempt to transfer the missing message using the GET MESSAGE command before continuing with GET NEXT MESSAGE. If this attempt fails with the cause 'no such message', it means that the message has been deleted, or it has been lost due to a failure at the MT.

The MT includes a LAST SHORT MESSAGE REFERENCE in the GET MESSAGE FAILURE response. This is so that the TE can detect whether or not the last short message was received in error.

If the MT receives a GET NEXT MESSAGE command prior to receiving a GET FIRST MESSAGE or GET MESSAGE command, then it shall continue as if the command had been GET FIRST MESSAGE (i.e. provide the 'first' message and continue with the 'next' on receipt of the subsequent GET NEXT MESSAGE command).

2.3.3 Requesting Diversion Of Incoming Messages

The TE may request the MT to transfer SMS or CBS messages directly from the air interface to the DTE/DCE interface, by the following procedures. If messages are diverted then they are not stored in the MT. If messages are diverted and there is no communication path to the TE (e.g. because it has been disconnected), the diversion shall be cancelled.

2.3.3.1 Requesting SMS Messages

The TE may request an indication of arrival of incoming SMS messages, or the direct transfer of incoming SMS messages.

The TE requests new SMS messages by the TRANSFER INC SMS command (subclause 2.4.1.5). This command will be sent with parameters indicating whether all incoming SMS messages are to be transferred, or only those indicated as being for the TE.

The MT shall confirm receipt of this command with a REQUEST CONFIRMED message provided there is memory available to store SM's in the ME or the ~~SIM~~(U)SIM. If there is no memory available, the MT shall respond with 'unable to process' with a cause value No memory.

The MT shall transfer incoming messages by the INC MESSAGE indication (subclause 2.4.2.4).

For an INC MESSAGE which contains a Short Message (SMS) info element id, the TE shall acknowledge receipt of the INC MESSAGE with an ACKNOWLEDGE MESSAGE (subclause 2.4.1.12). The MT should not send another INC MESSAGE which contains a Short Message (SMS) info element id to the TE whilst it is waiting for an ACKNOWLEDGE MESSAGE.

In the event of the MT not receiving an ACKNOWLEDGE MESSAGE within a time specified by the MT manufacturer the MT shall exit the SMS mode automatically after 'n' attempts to send the INC MESSAGE (where n is a number specified by the MT manufacturer). The MT should attempt to store the unacknowledged SM or Status Report (contained in the INC MESSAGE) in the MT or on the ~~SIM~~(U)SIM as appropriate.

The ACKNOWLEDGE MESSAGE sent from the TE to the MT must not delay the MT sending the RP-ACK defined in 3G TS 23.040 [3] ~~GSM 03.40~~ (to the SC) for longer than the RP-ACK timeout specified in ~~GSM 04.08~~~~3G TS 24.008~~GSM 04.08 [5].

The TE requests the cessation of incoming message transfer by the same command, indicating no incoming messages. The transfer of messages will automatically cease on exit of the SMS/CBS mode. Transfer shall not recommence until a new request is issued by the TE.

2.3.3.2 Requesting CBS Messages

The TE may request the transfer of all cell broadcast messages directly from the air interface to the DTE/DCE interface. This is achieved by the use of the TRANSFER INC CBS message (subclause 2.4.1.7).

The MT shall confirm receipt of this command with a REQUEST CONFIRMED message.

After receipt of this command, the MT shall transfer all CBS pages as they arrive on the air interface, using the INC MESSAGE indication (subclause 2.4.2.4).

While the CBS pages are being transferred, any other indication or response required to be sent to the TE will take precedence over the CBS pages. However, the MT shall not interrupt the transfer of a page to send other information within the SMS/CBS mode (ie. the MT shall wait until a page boundary).

The transfer of messages will automatically cease on exit of the SMS/CBS mode. Transfer shall not recommence until a new request is issued by the TE.

2.3.3.3 Requesting indication of message arrival

If the TE requires an indication of incoming message arrival, the INDICATE INC SMS command (subclause 2.4.1.6) shall be used.

The MT shall confirm receipt of this command with a REQUEST CONFIRMED message.

After receipt of this command, the MT shall indicate all incoming messages in the specified categories (unless they are directly transferred) with the MESSAGE ARRIVED indication (subclause 2.4.2.5). This indication shall be of the same format as the MESSAGE LIST response described in subclause 2.3.1.

The TE shall acknowledge receipt of the MESSAGE ARRIVED with an ACKNOWLEDGE MESSAGE. (subclause 2.4.1.12). The MT should not send another MESSAGE ARRIVED to the TE whilst it is waiting for an ACKNOWLEDGE MESSAGE.

In the event of the MT not receiving an ACKNOWLEDGE MESSAGE within a time specified by the MT manufacturer the MT shall exit the SMS mode automatically after 'n' attempts to send the MESSAGE ARRIVED (where n is a number specified by the MT manufacturer). The MT should attempt to store the unacknowledged SM or Status Report in the MT or on the ~~SIM~~(U)SIM as appropriate.

The ACKNOWLEDGE MESSAGE sent from the TE to the MT must not delay the MT sending the RP-ACK defined in ~~GSM 03.40~~3G TS 23.040 [3] (to the SC) for longer than the RP-ACK timeout specified in the ~~GSM 04.08~~~~3G TS 24.008~~GSM 04.08 [5].

The TE requests the cessation of incoming message indication by the INDICATE INC SMS command, with the 'no incoming messages' parameter.

2.3.4 Requesting Transfer Into Mobile Termination

The TE may request transfer of SMS messages into the mobile termination. Cell broadcast messages cannot be transferred in this direction.

The TE shall use the INSERT SMS command (subclause 2.4.1.8) to transfer the message. This command shall indicate whether the message is to be stored in the MT, sent over the air interface or both. The command shall include the full SMS message and header as described in ~~GSM 03.40~~3G TS 23.040 [3], except for the message reference and message type indication (which are allocated by the MT).

Only one INSERT SMS command may be outstanding at any given instant. An INSERT SMS is deemed complete when an INSERT SMS COMPLETE or an INSERT SMS FAILURE indication has been received irrespective of whether an intermediate REQUEST CONFIRMED has been received.

Upon receipt of an INSERT SMS command, the MT shall act in the following way:

If the TE requested the MT to store the message, the MT shall attempt to store the message. If the attempt is successful, the MT shall return an INSERT SMS COMPLETE indication (subclause 2.4.2.6), including the message reference allocated by the MT. If the attempt fails (eg. due to lack of memory), the MT shall return an INSERT SMS FAILURE indication (subclause 2.4.2.7), providing a cause for the failure.

If the TE requested the MT to send the message, the MT shall respond immediately with a REQUEST CONFIRMED message, and attempt to send the message. If the send attempt subsequently succeeds, the MT shall send an INSERT SMS COMPLETE indication, including the message references allocated by the MT. If the send attempt subsequently fails, the MT shall return an INSERT SMS FAILURE indication, providing a cause for the failure.

If the TE requested the MT to store and send the message, the MT shall first attempt to store the message. If no storage is available, the MT shall return an INSERT SMS FAILURE indication (subclause 2.4.2.7) and shall not attempt to send the message. If storage is available, the MT shall store the message and then respond with a REQUEST CONFIRMED message. If the send attempt is successful, the MT shall return an INSERT SMS COMPLETE indication (subclause 2.4.2.6), including the message references allocated by the MT. If the transmission of the message fails, then the MT shall return an INSERT SMS FAILURE indication (subclause 2.4.2.7). This will show that the send attempt failed and provide a cause. After that the MT shall delete the stored message.

2.3.5 Requesting Deletion Of Messages

The TE may request deletion of SMS or CBS messages from the store in the MT. This is achieved by the DELETE MESSAGE command (subclause 2.4.1.9). The command will include a message reference, as defined by the MT and provided in the message list.

Upon receipt of this command, the MT shall attempt to delete the message. If successful, the MT shall return a DELETE MESSAGE COMPLETE indication (subclause 2.4.2.8). If not successful, the MT shall return a DELETE MESSAGE FAILURE indication (subclause 2.4.2.9).

On successful deletion of an SM or CBS message the Page Index (see 2.5.2.10) and the Index Count (see 2.5.2.8) shall be re-assigned so that their values are contiguous (i.e. there are no gaps in either parameter). The original short message Reference values remain unchanged.

2.4 Message functional definitions and contents

This subclause provides an overview of the message structure to be used over the DTE/DCE interface in SMS/CBS block mode. Each message definition includes a brief description of the use of the message, and a table showing all the information elements which may be included in the message. If an entity receives a message containing more information elements than expected then the receiving entity shall ignore the additional information elements. For each information element the following data are provided:

Reference - this indicates where the detailed description of each element can be found.

Presence:

M Mandatory must always be present
receiver: If not present, consider message erroneous

C Conditional presence depending on e.g.
a) value of other element
b) presence of optional element
receiver: If not present when condition met, consider message
erroneous
O Optional presence is a choice of the sender
receiver: present or not, accept message

Format:

T Type only, fixed length, only IEI
V Value only, fixed length, no IEI included
TV Type and value, fixed length, IEI included
LV Length and value, variable length, no IEI included and Length indicator included
TLV Type, Length and Value, variable length, IEI and length indicator included

Length - this indicates the length of the information element in octets.

2.4.1 Commands Issued By The Terminal Equipment

Table 2.4.1 summarises the commands which may be issued by the TE.

Table 2.4.1: Commands which may be issued by the TE

	Reference
LIST REQUEST	2.4.1.1
GET MESSAGE	2.4.1.2
GET FIRST MESSAGE	2.4.1.3
GET NEXT MESSAGE	2.4.1.4
TRANSFER INC SMS	2.4.1.5
INDICATE INC SMS	2.4.1.6
TRANSFER INC CBS	2.4.1.7
INSERT SMS	2.4.1.8
DELETE MESSAGE	2.4.1.9
UNABLE TO PROCESS	2.4.1.10
END SMS MODE	2.4.1.11
ACKNOWLEDGE MESSAGE	2.4.1.12

2.4.1.1 List Request

This message is sent by the TE to the MT to request a list of messages stored in the MT.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Page Index	2.5.2.10	M	V	1

2.4.1.2 Get Message

This message is sent by the TE to the MT to request transfer of a specific SMS or CBS message stored in the MT.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Short Message Reference	2.5.2.1	M	V	1

2.4.1.3 Get First Message

This message is sent by the TE to the MT to request transfer of the first available SMS or CBS message stored in the MT.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1

2.4.1.4 Get Next Message

This message is sent by the TE to the MT to request transfer of the next available SMS or CBS message stored in the MT.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1

2.4.1.5 Transfer Inc SMS

This message is sent by the TE to the MT to request the direct transfer of incoming messages from the air interface to the TE.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
SMS Transfer Type	2.5.2.2	M	V	1

2.4.1.6 Indicate Inc SMS

This message is sent by the TE to the MT to request that the MT indicates when an incoming message arrives.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Indication Type	2.5.2.3	M	V	1

2.4.1.7 Transfer Inc CBS

This message is sent by the TE to the MT to request transfer of all cell broadcast messages directly from the air interface to the DTE/DCE interface.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
CBS Transfer Type	2.5.2.9	M	V	1

2.4.1.8 Insert SMS

This message is sent by the TE to the MT to request the transfer of an SMS TPU to the MT memory or across the air interface. The TPDU is formatted in exactly the same way as described in ~~TS 03.40~~3G TS 23.040 [3]. Where the TPDU includes a TP-Message-Reference which is to be incremented by the MT for every outgoing message, the TP-Message-Reference provided by the TE will be overwritten by the MT before transmission of the message. The value provided by the TE is discarded by the MT and has no significance.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Insert Type	2.5.2.4	M	V	1
RP-Destination-Address	~~GSM 04.11~~3G TS 24.011 [6]	M	LV	1-12 a)
SMS-TPDU	~~GSM 03.40~~3G TS 23.040 [3]	M	V	max 164

a) If no RP-Destination-Address is to be transferred then the length is set to 0. In this case, the MT inserts the default SC address.

2.4.1.9 Delete message

This message is sent from the TE to the MT to request deletion of a specific SMS or CBS message held in the MT.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Short Message Reference	2.5.2.1	M	V	1

2.4.1.10 Unable to process

This response is sent from the TE to the MT to indicate that the MT's message could not be processed.

Information element	Preference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Cause	2.5.2.7	M	V	1

2.4.1.11 End SMS Mode

This message is sent from the TE to the MT to terminate the SMS/CBS mode of the DTE/DCE interface.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1

2.4.1.12 Acknowledge Message

This message is sent from the TE to the MT to acknowledge receipt of a INC MESSAGE or MESSAGE ARRIVED which contains a Short Message (SMS) info element id, (e.g. a Short Message or a Status Report but not a CBS message.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
SM-Deliver-Ack	2.5.2.14	O	TLV	2 to 160

2.4.2 Responses/Indications Issued By The MT

Table 2.4.2 summarises the responses/indications which may be issued by the MT.

Table 2.4.2: Responses/Indications which may be issued by the MT

	Reference
MESSAGE LIST	2.4.2.1
MESSAGE	2.4.2.2
GET MESSAGE FAILURE	2.4.2.3
INC MESSAGE	2.4.2.4
MESSAGE ARRIVED	2.4.2.5
INSERT SMS COMPLETE	2.4.2.6
INSERT SMS FAILURE	2.4.2.7
DELETE MESSAGE COMPLETE	2.4.2.8
DELETE MESSAGE FAILURE	2.4.2.9
UNABLE TO PROCESS	2.4.2.10
END SMS MODE	2.4.2.11
REQUEST CONFIRMED	2.4.2.12

2.4.2.1 Message List

This response is sent from the MT to the TE on receipt of a LIST REQUEST from the TE.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Page Index	2.5.2.10	M	V	1
Index Count	2.5.2.8	M	V	1
Short Message Index (1)	2.5.2.5	O	TLV	8-48
Short Message Index (2)	2.5.2.5	O	TLV	8-48
:	:	:	:	:
Short Message Index (n)	2.5.2.5	O	TLV	8-48

The number of Short Message Indices included in the message may be 0, 1, 2, 3, 4 or 5.

2.4.2.2 Message

This response is sent from the MT to the TE when a short message has been requested.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Short Message Data	2.5.2.6	M	TLV	28-181

2.4.2.3 Get Message Failure

This response is sent from the MT to the TE when a request for a short message cannot be fulfilled.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Last Short Message	2.5.2.11	M	V	1
Cause	2.5.2.7	M	V	1

2.4.2.4 Inc Message

This indication is sent from the MT to the TE after the MT has been requested to transfer messages of certain categories immediately upon receipt.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Short Message Data	2.5.2.6	M	TLV	28-181

2.4.2.5 Message Arrived

This indication is sent from the MT to the TE after the MT has been requested to provide an indication of the receipt of certain categories of incoming message.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Short Message Index	2.5.2.5	M	TLV	8-48

2.4.2.6 Insert SMS Complete

This response is sent by the MT to the TE to indicate that the TE's request to insert a message has been completed.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Short Message Reference	2.5.2.1	M	V	1
TP-Message Reference	~~GSM 03.40~~3G TS 23.040 [3]	C a)	V	1
SM-Submit-Ack	2.5.2.15	O	TLV	2 to 160

a) The TP-Message Reference is only included if the message had been requested to be transferred over the air interface.

2.4.2.7 Insert SMS Failure

This response is sent from the MT to the TE to indicate that the attempt to insert an SMS message failed.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Cause	2.5.2.7	M	V	1-2
TP-Failure Cause	2.5.2.13	O	TLV	4
Short Message Reference	2.5.2.1	O	TV	2

2.4.2.8 Delete Message Complete

This response is sent from the MT to the TE to indicate that the request to delete a message from the MT store has been completed.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Short Message Reference	2.5.2.1	M	V	1

2.4.2.9 Delete Message Failure

This response is sent from the MT to the TE to indicate that the request to delete a message from the MT store failed.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Short Message Reference	2.5.2.1	M	V	1
Cause	2.5.2.7	M	V	1

2.4.2.10 Unable To Process

This response is sent from the MT to the TE to indicate that the TE's request could not be processed.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Cause	2.5.2.7	M	V	1

2.4.2.11 End SMS Mode

This indication is sent from the MT to the TE when the MT autonomously exits from SMS/CBS mode.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Cause	2.5.2.7	M	V	1

2.4.2.12 Request Confirmed

This indication is sent from the MT to the TE to indicate that the MT has received the request from the TE and will perform the requested function.

Information element	Reference	Presence	Format	Length
Message Type	2.5.1	M	V	1
Confirm Type	2.5.2.12	M	V	1
Short Message Reference	2.5.2.1	O	TV	2

2.5 General message format and information elements coding

This subclause describes the content of messages for the SMS/CBS mode of the DTE/DCE interface. Within the figures in this subclause, the bit designated "bit 1" is transmitted first, followed by bits 2,3,4 etc. Similarly, the octet shown at the top of each figure is sent first.

2.5.1 Message Type

The purpose of the message type is to identify the function of the message being sent. The message type is coded as shown in figure 2.5.1 and table 2.5.1.

Bit 8 is reserved for possible future use as an extension bit.

8	7	6	5	4	3	2	1	
0	Message Type							octet 1

Figure 2.5.1: Message Type

Table 2.5.1: Message Types

8	7	6	5	4	3	2	1	
0	0	0	-	-	-	-	-	Commands/ Responses issued by TE
0	0	0	0	0	0	0	0	LIST REQUEST
0	0	0	0	0	0	0	1	GET MESSAGE
0	0	0	0	0	0	1	0	GET FIRST MESSAGE
0	0	0	0	0	0	1	1	GET NEXT MESSAGE
0	0	0	0	0	1	0	0	TRANSFER INC SMS
0	0	0	0	0	1	0	1	INDICATE INC SMS
0	0	0	0	0	1	1	0	TRANSFER INC CBS
0	0	0	0	0	1	1	1	INSERT SMS
0	0	0	0	1	0	0	0	DELETE MESSAGE
0	0	0	0	1	0	0	1	UNABLE TO PROCESS
0	0	0	1	1	1	1	0	END SMS MODE
0	0	0	1	1	1	1	1	ACKNOWLEDGE MESSAGE
0	0	1	-	-	-	-	-	Responses/Indications issued by MT
0	0	1	0	0	0	0	0	MESSAGE LIST
0	0	1	0	0	0	0	1	MESSAGE
0	0	1	0	0	0	1	0	GET MESSAGE FAILURE
0	0	1	0	0	0	1	1	INC MESSAGE
0	0	1	0	0	1	0	0	MESSAGE ARRIVED
0	0	1	0	0	1	0	1	INSERT SMS COMPLETE
0	0	1	0	0	1	1	0	INSERT SMS FAILURE
0	0	1	0	0	1	1	1	DELETE MESSAGE COMPLETE
0	0	1	0	1	0	0	0	DELETE MESSAGE FAILURE
0	0	1	0	1	0	0	1	UNABLE TO PROCESS
0	0	1	0	1	0	1	0	REQUEST CONFIRMED
0	0	1	1	1	1	1	1	END SMS MODE

All other values are reserved. If a reserved Message Type is received then the receiving entity shall return “Unable to Process” with Cause “Command not understood”.

2.5.2 Other Information Elements

Other information elements follow the general coding principles specified in ~~GSM 04.08~~~~3G TS 24.008~~GSM 04.08 [5], and are described in the following subclauses.

2.5.2.1 Short Message Reference

The Short Message Reference uniquely identifies a short message stored in the MT. It is an 8 bit number and is allocated by the MT.

The Short Message Reference information element is coded as shown in figure 2.5.2 and table 2.5.2.

8	7	6	5	4	3	2	1	
0	0 Short Message Reference info element id	0	0	0	0	0	0	octet 1
Short Message Reference value								octet 2

Figure 2.5.2: Short Message Reference information element

Table 2.5.2: Short Message Reference information element

Short Message Reference value (octet 2). In the Short Message Reference value field bit 8 of octet 2 is the most significant bit and bit 1 of octet 2 is the least significant bit. Short Message Reference values are allocated by the MT.

2.5.2.2 SMS Transfer Type

The SMS Transfer Type indicates to the MT which SMS messages are required to be transferred to the TE.

The SMS Transfer Type information element is coded as shown in figure 2.5.3 and table 2.5.3.

8	7	6	5	4	3	2	1	
0	0 SMS Transfer Type info element ident	0	0	0	0	0	1	octet 1
0 Reserved	0	0	0	0	SMS Txfr Type value			octet 2

Figure 2.5.3: SMS Transfer Type information element

Table 2.5.3: SMS Transfer Type information element

SMS Txfr Type value (octet 2). The SMS txfr type is coded as follows: bit 2 bit 1 0 0 Transfer no SMS messages 0 1 Transfer SMS messages marked as TE-specific 1 0 Reserved 1 1 Transfer all SMS messages Bit 3 shows whether to transfer SMS-STATUS-REPORTS Bit 3 0 Do not transfer SMS-STATUS-REPORTS 1 Transfer SMS-STATUS-REPORTS A receiving entity shall ignore the setting of bits 8-4. If bit 2 is set to 1 and bit 1 is set to 0 then the receiving entity shall return “Unable to Process” with cause “Command Not Understood”

2.5.2.3 Indication Type

The Indication Type tells the MT when to notify the TE that an incoming message has been received.

The Indication Type information element is coded as shown in figure 2.5.4 and table 2.5.4.

8	7	6	5	4	3	2	1	
0	0 Indication Type info element identifier	0	0	0	0	1	0	octet 1
0 Reserved	0	0	0	Indication Type value				octet 2

Figure 2.5.4: Indication Type information element

Table 2.5.4: Indication Type information element

Indication Type value (octet 2).

The indication type is coded as follows:

bit 3	bit 2	bit 1	
0	0	0	Indicate no messages
0	0	1	Reserved
0	1	0	Indicate all SMS messages
0	1	1	Indicate SMS messages marked as TE-specific
1	0	0	Indicate all CBS messages
1	0	1	Indicate CBS messages marked as TE-specific
1	1	0	Indicate all CBS and SMS messages
1	1	1	Indicate SMS and CBS messages marked as TE-specific

Bit 4 shows whether or not to indicate SMS reports:

bit 4	
0	Do not indicate SMS reports
1	Indicate SMS reports

A receiving entity shall ignore the setting of bits 8-5. If bits 3 and 2 are set to 0 and bit 1 is set to 1 then the receiving entity shall return “Unable to Process” with cause “Command Not Understood”.

2.5.2.4 Insert Type

The Insert Type tells the MT what to do with the short message arriving from the TE.

The Insert Type information element is coded as shown in figure 2.5.5 and table 2.5.5

8	7	6	5	4	3	2	1	
0	0	0	0	0	0	1	1	octet 1
	Insert Type info element identifier							
0	0	0	0	0	0	Insert Type value		octet 2
Reserved								

Figure 2.5.5: Insert Type information element

Table 2.5.5: Insert Type information element

Insert Type value (octet 2). The insert type is coded as follows: bit 2 bit 1 0 0 Reserved 0 1 Store the short message in the MT 1 0 Send the short message over the air 1 1 Store the short message in the MT and send it over the air A receiving entity shall ignore the setting of bits 8-3. If bits 2 and 1 are set to 0 then the receiving entity shall return “Unable to Process” with cause “Command Not Understood”

2.5.2.5 Short Message Index

The Short Message Index provides information about each individual short message currently stored in the MT. Two types of Short Message index are provided; one for SMS and one for CBS.

The Short Message Index (SMS) information element is coded as shown in figure 2.5.6 and table 2.5.6. A Short Message Index may be an SMS-SUBMIT, an SMS-DELIVER or an SMS-STATUS-REPORT.

The Short Message Index (CBS) information element is coded as shown in figure 2.5.7 and table 2.5.7.

8	7	6	5	4	3	2	1	
0	0 Short Message Index (SMS) info element id	0	0	0	1	0	0	octet 1
Length of Short Message Index								octet 2
Short Message Reference value								octet 3
Short Message Status								octet 4
Service Centre Address								octets 5-n
Short Message Header (SMS)								octets n+1 - n+31

Figure 2.5.6: Short Message Index (SMS) information element

n can take a value between 5 and 18 (inclusive)

Table 2.5.6: Short Message Index (SMS) information element

Short Message Reference value (octet 3).

The Short Message Reference value is coded as specified in table 2.5.2.

Short Message Status (octet 4).

The Short Message Status is coded as follows:

8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	0	Not read/not sent
0	0	0	0	0	0	0	1	Read/Sent
0	0	0	0	0	1	0	0	Not Read
0	0	0	0	0	1	0	1	Read
0	0	0	0	0	1	1	0	Not Sent
0	0	0	0	0	1	1	1	Sent

All other values are reserved.

The receiving entity shall ignore the setting of bits 8-4.
In addition, if bit 3 is set to 0 then a receiving entity shall ignore the setting of bit 2. Where bit 3 is set to 0, if the message is mobile originated then bit 1 indicates whether the message has been sent to the network. If the message is mobile terminated then bit 1 indicates whether the message has been read.

Service Centre Address (Octets 5-n).

The Service Centre Address is coded as the RP-Origination or RP-Destination address specified in ~~GSM 04.11~~3 TS 24.011 [6]. If the short message is mobile originated, the address will be the RP-Destination address. If the short message is mobile terminated, the address will be the RP-Origination address. The address is of variable length, 1-12 octets.

Short Message Header (SMS) (Octets n+1 - n+31).

The Short Message Header (SMS) is coded as a TPDU as described in ~~GSM 03.40~~3G TS 23.040 [3]. In the case of SMS-DELIVER or SMS-SUBMIT, the TP-User-Data is not included, but the TP-User-Data-Length is included. The Short Message Header is of variable length, 6-31 octets.

8	7	6	5	4	3	2	1	
0	0 Short Message Index (CBS) info element id	0	0	0	1	0	1	octet 1
Short Message Reference value								octet 2
Short Message Header (CBS)								octets 3-8

Figure 2.5.7: Short Message Index (CBS) information element

Table 2.5.7: Short Message Index (CBS) information element

Short Message Reference value (octet 2). The Short Message Reference value is coded as specified in table 2.5.2. Short Message Header (CBS) (Octets 3-8). The Short Message Header (CBS) is coded as described in ~~GSM 03.41~~3G TS 23.041. [4], including SEQUENCE NUMBER, MESSAGE IDENTIFIER, ALPHABET IDENTIFIER and PAGE PARAMETER, but excluding the characters of the message.

2.5.2.6 Short Message Data

The Short Message Data information element is a copy of a short message currently stored in the MT. Two types of Short Message Data information element are provided; one for SMS and one for CBS.

The Short Message Data (SMS) information element is coded as shown in figure 2.5.8 and table 2.5.8. Short Message Data may be an SMS-SUBMIT, an SMS-DELIVER or an SMS-STATUS-REPORT.

The Short Message Data (CBS) information element is coded as shown in figure 2.5.9 and table 2.5.9.

8	7	6	5	4	3	2	1	
0	0	0	0	0	1	1	0	octet 1
	Short Message Data (SMS) info element id							
Length of Short Message Data								octet 2
Short Message Reference value								octet 3
Short Message Status								octet 4
Service Centre Address								octets 5-n
Short Message (SMS)								octets n+1-n+164

Figure 2.5.8: Short Message Data (SMS) information element

n can take a value between 5 and 18 (inclusive)

Table 2.5.8: Short Message (SMS) information element

Short Message Reference value (octet 3).

The Short Message Reference value is coded as specified in table 2.5.2.

Short Message Status (octet 4).

The Short Message Status is coded as follows:

8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	0	Not read/not sent
0	0	0	0	0	0	0	1	Read/Sent
0	0	0	0	0	1	0	0	Not Read
0	0	0	0	0	1	0	1	Read
0	0	0	0	0	1	1	0	Not Sent
0	0	0	0	0	1	1	1	Sent

All other values are reserved.

The receiving entity shall ignore the setting of bits 8-4.
In addition, if bit 3 is set to 0 then a receiving entity shall ignore the setting of bit 2.

Where bit 3 is set to 0, if the message is mobile originated then bit 1 indicates whether the message has been sent to the network. If the message is mobile terminated then bit 1 indicates whether the message has been read.

Service Centre Address (Octets 5-n).

The Service Centre Address is coded as the RP-Origination-Address or RP-Destination Address specified in ~~GSM 03.40~~3G TS 23.040 [3].
If the short message is mobile originated, the address will be the RP-Destination address. If the short message is mobile terminated, the address will be the RP-Origination Address. The address is of variable length, 1-12 octets.

Short Message (SMS) (Octets n+1 - n+164).

The Short Message (SMS) is coded as a TPDU as described in ~~GSM 03.40~~3G TS 23.040 [3].
The Short Message is of variable length, 6-164 octets.

8	7	6	5	4	3	2	1	
0	0	0	0	0	1	1	1	octet 1
	Short Message Data (CBS) info element id							
Short Message Reference value								octet 2
Short Message (CBS)								octets 3-90

Figure 2.5.9: Short Message Data (CBS) information element

Table 2.5.9: Short Message Data (CBS) information element

Short Message Reference value (octet 2). The Short Message Reference value is coded as specified in table 2.5.2. Short Message (CBS) (Octets 3-90). The Short Message (CBS) is coded as described in ~~GSM 03.41~~3G TS 23.041 [4], including SEQUENCE NUMBER, MESSAGE IDENTIFIER, ALPHABET IDENTIFIER, PAGE PARAMETER and CHARACTERS OF THE MESSAGE.

2.5.2.7 Cause

The Cause information element provides more detail as to why an error has occurred.
The Cause information element is coded as shown in figure 2.5.10 and table 2.5.10.

8	7	6	5	4	3	2	1	
0	0	0	0	1	0	0	0	octet 1
	Cause information element identifier							
0 ext	Cause value							octet 2
~~04.11~~ 3G TS 24.011 [6] RP-Cause value								octet 3

Figure 2.5.10: Cause information element

Table 2.5.10: Cause information element

Cause value (octet 2).

The cause is coded as follows:

8	7	6	5	4	3	2	1		
0	0	0	0	0	0	0	0		No such message
							-		- no short message exists with the provided shortmessage reference
0	0	0	0	0	0	0	1		No memory
							-		- the short message cannot be stored due to lack of memory
0	0	0	0	0	0	1	0		No air interface
							-		- submission of the short message cannot be attempted because the mobile is out of coverage
0	0	0	0	0	0	1	1		Receiving entity busy
							-		- the request was not fulfilled because the Receiving entity is busy on another task
0	0	0	0	0	1	0	0		Command not understood
							-		- error in the coding of the command, or command belongs to higher version of protocol of protocol than that implemented
0	0	0	0	0	1	0	1		Incoming data call
							-		- Incoming data call forces MT to exit from SMS mode
0	0	0	0	0	1	1	0		User-invoked exit
							-		- User has taken MT out of SMS by MMI
0	0	0	0	0	1	1	1		Other error
							-		- Any other error not covered here1 0 0 0 0 1 1 1
Message Transfer failed									
							-		- The SMS transfer to the SC failed and the ~~04.11~~3G TS 24.011 [6] error cause is provided in octet 3

All other values are reserved.
A receiving entity shall treat any reserved codings as “other error”.

~~04.11~~3G TS 24.011 [6] RP-Cause value (octet 3)

If this element is included then bit 8 of octet 2 is set to '1'. The error cause included in the RP-Cause over the air interface is directly mapped into this element. This element is only included if the MT attempts to send a short message to the network and that send attempt fails.

2.5.2.8 Index Count

The Index Count identifies the number of short message indices contained in a MESSAGE LIST response from the MT to the TE. It is an 8 bit number.

The Index Count information element is coded as shown in figure 2.5.11 and table 2.5.11.

8	7	6	5	4	3	2	1	
0	0	0	0	1	0	0	1	octet 1
	Index Count information element ident							
Index Count value								octet 2

Figure 2.5.11: Index Count information element

Table 2.5.11: Index Count information element

Index Count value (octet 2). In the Index Count field bit 8 of octet 2 is the most significant bit and bit 1 of octet 2 is the least significant bit.

2.5.2.9 CBS Transfer Type

The CBS Transfer Type indicates to the MT which CBS messages are required to be transferred to the TE.

The CBS Transfer Type information element is coded as shown in figure 2.5.12 and table 2.5.12.

8	7	6	5	4	3	2	1	
0	0	0	0	1	0	1	0	octet 1
	CBS Transfer Type info element ident							
0	0	0	0	0	0	CBS Txfr Type value		octet 2
Reserved								

Figure 2.5.12: CBS Transfer Type information element

Table 2.5.12: CBS Transfer Type information element

CBS Txfr Type value (octet 2). The CBS txfr type is coded as follows: bit 2 bit 1 0 0 Transfer no CBS messages 0 1 Transfer CBS messages marked as TE-specific 1 0 Reserved 1 1 Transfer all CBS messages A receiving entity shall ignore the setting of bits 8-3. If bit 2 is set to 1 and bit 1 is set to 0 then the receiving entity shall return “Unable to Process” with cause “Command Not Understood”

2.5.2.10 Page Index

The Page Index indicates to the MT which Page of SMS Indices is required to be transferred. It also indicates to the TE which Page of SMS Indices is being transferred.

The Page Index information element is coded as shown in figure 2.5.13 and table 2.5.13.

8	7	6	5	4	3	2	1	
0	0	0	0	1	0	1	1	octet 1
	Page Index info element ident							
0	0	Page Index value						octet 2
Reserved								

Figure 2.5.13: Page Index information element

Table 2.5.13: Page Index information element

Page Index value (octet 2). In the Page Index field bit 6 of octet 2 is the most significant bit and bit 1 of octet 2 is the least significant bit. The Page Index can have a value from 1 to 51. A receiving entity shall ignore the setting of bits 8 and 7. If the Page Index field has a value of 0 or a value greater than 51 then the receiving entity shall return “Unable to Process” with cause “Command Not Understood”

2.5.2.11 Last Short Message

The Last Short Message field indicates to the TE the highest value of Short Message Reference which points to a valid message stored in the MT. The value 0 signifies that there are no short messages stored in the MT.

The Last Short Message information element is coded as shown in figure 2.5.14 and table 2.5.14.

8	7	6	5	4	3	2	1	
0	0	0	0	1	1	0	0	octet 1
	Last Short Message info element ident							
Last Short Message value								octet 2

Figure 2.5.14: Last Short Message information element

Table 2.5.14: Last Short Message information element

Last Short Message value (octet 2). In the Last Short Message field bit 8 of octet 2 is the most significant bit and bit 1 of octet 2 is the least significant bit. The Last Short Message can have a value from 0 to 255.

2.5.2.12 Confirm Type

The Confirm Type field indicates the message to which the REQUEST CONFIRM is a response.

The Confirm Type information element is coded as shown in figure 2.5.15 and table 2.5.15.

8	7	6	5	4	3	2	1	
0	0	0	0	1	1	0	1	octet 1
	Confirm Type info element ident							
Confirm Type value								octet 2

Figure 2.5.15: Confirm Type information element

Table 2.5.15: Confirm Type information element

Confirm Type value (octet 2). The Confirm Type is coded as follows: 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 Confirm request to transfer incoming SMS messages 0 0 0 0 0 0 1 0 Confirm request to transfer incoming CBS messages 0 0 0 0 0 0 1 1 Confirm request to indicate arrival of messages in MT 0 0 0 0 0 1 0 0 Confirm request to attempt to send short message (actual send is confirmed later: see subclause 3.3) All other values are reserved. If any reserved value is received then the receiving entity shall return “Unable to Process” with cause value “Command Not Understood”.

2.5.2.13 TP-Failure Cause

This optional field is present if provided by the Relay Layer. The TP-Failure Cause is provided from the Service Centre and indicates to the TE the reason why the delivery of the message was unsuccessful. The TP-Failure cause information element is coded as shown in figure 2.5.16 and
table 2.5.16.

8	7	6	5	4	3	2	1	
0	0	0	0	1	1	1	0	octet 1
	Cause information element identifier							
Length of Failure cause field								octet 2
Failure cause								octets 3-4

Figure 2.5.16: TP-Failure Cause information element

Table 2.5.16: TP-Failure Cause information element

Failure cause (octet 3-4) The failure cause contained in this field is directly mapped from the TP-Failure Cause (TP-FCS) field of the SMS-SUBMIT-REPORT message defined in ~~GSM 03.40~~3G TS 23.040 [3].

2.5.2.14 SM-Deliver-Ack

This optional field is sent from the TE to the MT to convey the information to be inserted into the SMS-DELIVER-REPORT RP-ACK TPDU sent by the MT to the SC as defined in ~~GSM 03.40~~3G TS 23.040 [3].

8	7	6	5	4	3	2	1	
0	0	0	0	1	1	1	1	octet 1
	SM-DELIVER-ACK information element identifier							
Length of SMS-DELIVER-REPORT RP-ACK Field								octet 2
03.40 SMS-DELIVER-REPORT RP-ACK								octets 3-166

2.5.2.15 SM-Submit-Ack

This optional field is sent from the MT to the TE to convey the information to be inserted into the SMS-SUBMIT-REPORT RP-ACK TPDU sent by the SC to the MT as defined in 3G TS 23.040 [3]~~GSM 03.40~~.

8	7	6	5	4	3	2	1	
0	0	0	1	0	0	0	0	octet 1
	SM-SUBMIT-ACK information element identifier							
Length of SMS-SUBMIT-REPORT RP-ACK Field								octet 2
03.40 SMS-SUBMIT-REPORT RP-ACK								octets 3-166

3 Text Mode

3.1 Parameter Definitions

The following parameters are used in the subsequent clauses which describe all commands. The formats of integer and string types referenced here are defined in V.25ter. The default values are for command parameters, not for result code parameters.

Message Storage Parameters

`<index>` integer type; value in the range of location numbers supported by the associated memory

`<mem1>` string type; memory from which messages are read and deleted (commands List Messages `+CMGL`, Read Message `+CMGR` and Delete Message `+CMGD`); defined values (others are manufacturer specific):

`"BM"` broadcast message storage

`"ME"` ME message storage

`"MT"` any of the storages associated with ME

`"SM"` ~~SIM~~(U)SIM message storage

`"TA"` TA message storage

`"SR"` status report storage

`<mem2>` string type; memory to which writing and sending operations are made (commands Send Message from Storage `+CMSS` and Write Message to Memory `+CMGW`)); refer `<mem1>` for defined values

`<mem3>` string type; memory to which received SMs are preferred to be stored (unless forwarded directly to TE; refer command New Message Indications `+CNMI`); refer `<mem1>` for defined values; received CBMs are always stored in `"BM"` (or some manufacturer specific storage) unless directly forwarded to TE; received status reports are always stored in `"SR"` (or some manufacturer specific storage) unless directly forwarded to TE

`<stat>` integer type in PDU mode (default 0), or string type in text mode (default `"REC UNREAD"`); indicates the status of message in memory; defined values:

0 `"REC UNREAD"` received unread message (i.e. new message)

1 `"REC READ"` received read message

2 `"STO UNSENT"` stored unsent message (only applicable to SMs)

3 `"STO SENT"` stored sent message (only applicable to SMs)

4 `"ALL"` all messages (only applicable to `+CMGL` command)

`<total1>` integer type; total number of message locations in `<mem1>`

`<total2>` integer type; total number of message locations in `<mem2>`

`<total3>` integer type; total number of message locations in `<mem3>`

<used1> integer type; number of messages currently in <mem1>

<used2> integer type; number of messages currently in <mem2>

<used3>integer type; number of messages currently in <mem3>

Message Data Parameters

<ackpdu> ~~GSM 03.40~~3G TS 23.040 [3] RP-User-Data element of RP-ACK PDU; format is same as for <pdu> in case of SMS, but without ~~GSM 04.11~~3G TS 24.011 [6] SC address field and parameter shall be bounded by double quote characters like a normal string type parameter

<alpha> string type alphanumeric representation of <da> or <oa> corresponding to the entry found in MT phonebook; implementation of this feature is manufacturer specific; used character set should be the one selected with command Select TE Character Set +CSCS (see definition of this command in ~~TS 07.07~~3G TS 27.007 [9])~~)~~

<cdata> ~~GSM 03.40~~3G TS 23.040 [3] TP-Command-Data in text mode responses; ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))

<ct> ~~GSM 03.40~~3G TS 23.040 [3] TP-Command-Type in integer format (default 0)

<da> ~~GSM 03.40~~3G TS 23.040 [3] TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in~~ TS 07.07~~3G TS 27.007 [9]); type of address given by <toda>

<data> In the case of SMS: ~~GSM 03.40~~3G TS 23.040 [3] TP-User-Data in text mode responses; format:

- if <dcs> indicates that ~~GSM 03.38~~3G TS 23.038 [2] GSM 7 bit default alphabet is used and <fo> indicates that ~~GSM 03.40~~3G TS 23.040 [3] TP-User-Data-Header-Indication is not set:
  - if TE character set other than "HEX" (refer command Select TE Character Set +CSCS in ~~TS 07.07~~3G TS 27.007 [9]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A
  - if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Π (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55))
- if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that ~~GSM 03.40~~3G TS 23.040 [3] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))

In the case of CBS: ~~GSM 03.41~~3G TS 23.041 [4] CBM Content of Message in text mode responses; format:

- if <dcs> indicates that ~~GSM 03.38~~3G TS 23.038 [2] GSM 7 bit default alphabet is used:
  - if TE character set other than "HEX" (refer command +CSCS in ~~GSM 07.07~~3G TS 27.007 [9]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A
  - if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number
- if <dcs> indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number

<dcs> depending on the command or result code: ~~GSM 03.38~~3G TS 23.038 [2] SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme in integer format

<dt> ~~GSM 03.40~~3G TS 23.040 [3] TP-Discharge-Time in time-string format: "yy/MM/dd,hh:mm:ss±zz", where characters indicate year (two last digits), month, day, hour, minutes, seconds and time zone. E.g. 6th of May 1994, 22:10:00 GMT+2 hours equals to "94/05/06,22:10:00+08"

<fo> depending on the command or result code: first octet of ~~GSM 03.40~~3G TS 23.040 [3] SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND (default 2) in integer format

<length> integer type value indicating in the text mode (+CMGF=1) the length of the message body <data> > (or <cdata>) in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length)

<mid> ~~GSM 03.41~~3G TS 23.041 [4] CBM Message Identifier in integer format

<mn> ~~GSM 03.40~~3G TS 23.040 [3] TP-Message-Number in integer format

<mr> ~~GSM 03.40~~3G TS 23.040 [3] TP-Message-Reference in integer format

<oa> ~~GSM 03.40~~3G TS 23.040 [3] TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in TS 07.07); type of address given by <tooa>

<page> ~~GSM 03.41~~3G TS 23.041 [4] CBM Page Parameter bits 4-7 in integer format

<pages> ~~GSM 03.41~~3G TS 23.041 [4] CBM Page Parameter bits 0-3 in integer format

<pdu> In the case of SMS: ~~GSM 04.11~~3G TS 24.011 [6] SC address followed by ~~GSM 03.40~~3G TS 23.040 [3] TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))

In the case of CBS: ~~GSM 03.41~~3G TS 23.041 [4] TPDU in hexadecimal format

<pid> ~~GSM 03.40~~3G TS 23.040 [3] TP-Protocol-Identifier in integer format (default 0)

<ra> ~~GSM 03.40~~3G TS 23.040 [3] TP-Recipient-Address Address-Value field in string format; BCD numbers (or GSM ~~default~~7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in ~~TS 07.07~~3G TS 27.007 [9]); type of address given by <tora>

<sca> ~~GSM 04.11~~3G TS 24.011 [6] RP SC address Address-Value field in string format; BCD numbers (or GSM ~~default~~7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in ~~TS 07.07~~3G TS 27.007 [9]); type of address given by <tosca>

<scts> ~~GSM 03.40~~3G TS 23.040 [3] TP-Service-Centre-Time-Stamp in time-string format (refer <dt>)

<sn> ~~GSM 03.41~~3G TS 23.041 [4] CBM Serial Number in integer format

<st> ~~GSM 03.40~~3G TS 23.040 [3] TP-Status in integer format

<toda> ~~GSM 04.11~~3G TS 24.011 [6] TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129)

<tooa> ~~GSM 04.11~~3G TS 24.011 [6] TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>)

`<tora>` ~~GSM 04.11~~3G TS 24.011 [6] TP-Recipient-Address Type-of-Address octet in integer format (default refer `<toda>`)

`<tosca>` ~~GSM 04.11~~3G TS 24.011 [6] RP SC address Type-of-Address octet in integer format (default refer `<toda>`)

`<vp>` depending on SMS-SUBMIT `<fo>` setting: ~~GSM 03.40~~3G TS 23.040 [3] TP-Validity-Period either in integer format (default 167) or in time-string format (refer `<dt>`)

`<vp>` depending on SMS-SUBMIT `<fo>` setting: ~~GSM 03.40~~3G TS 23.040 [3] TP-Validity-Period either in integer format (default 167), in time-string format (refer `<dt>`), or if ~~$(~~EVPF~~)~~$ is supported, in enhanced format (hexadecimal coded string with double quotes)

3.2 General Configuration Commands

3.2.1 Select Message Service +CSMS

Parameter Command Syntax

Command	Possible response(s)
+CSMS=<service>	+CSMS: <mt>,<mo>,<bm> *+CMS ERROR: <err>*
+CSMS?	+CSMS: <service>,<mt>,<mo>,<bm>
+CSMS=?	+CSMS: (list of supported <service>s)

Description

Set command selects messaging service `<service>`. It returns the types of messages supported by the ME: `<mt>` for mobile terminated messages, `<mo>` for mobile originated messages and `<bm>` for broadcast type messages. If chosen service is not supported by the ME (but is supported by the TA), final result code `+CMS ERROR: <err>` shall be returned. See chapter Message Service Failure Result Code for a list of `<err>` values.

Also read command returns supported message types along the current service setting.

Test command returns a list of all services supported by the TA.

Defined Values

`<service>`:

0 ~~GSM 03.40~~3G TS 23.040 [3] and ~~03.41~~3G TS 23.041 [4] ~~(the syntax of SMS AT commands is compatible with GSM 07.05 Phase 2 version 4.7.0; Phase 2+ features which do not require new command syntax may be supported (e.g. correct routing of messages with new Phase 2+ data coding schemes))~~

1 ~~GSM 03.40~~3G TS 23.040 [3] and ~~03.41~~3G TS 23.041 [4] ~~(the syntax of SMS AT commands is compatible with GSM 07.05 Phase 2+ version;~~ the requirement of `<service>` setting 1 is mentioned under corresponding command descriptions)

2...127 reserved

128... manufacturer specific

`<mt>`, `<mo>`, `<bm>`:

0 type not supported

1 type supported

Implementation

Mandatory.

3.2.2 Preferred Message Storage +CPMS

Parameter Command Syntax

Command	Possible response(s)
+CPMS=<mem1>[,<mem2>[,<mem3>]]	+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3> *+CMS ERROR: <err>*
+CPMS?	+CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> *+CMS ERROR: <err>*
+CPMS=?	+CPMS: (list of supported <mem1>s),(list of supported <mem2>s),(list of supported <mem3>s)

Description

Set command selects memory storages <mem1>, <mem2> and <mem3> to be used for reading, writing, etc. If chosen storage is not appropriate for the ME (but is supported by the TA), final result code +CMS ERROR: <err> shall be returned. See chapter Message Service Failure Result Code for a list of possible <err> values.

Test command returns lists of memory storages supported by the TA.

Implementation

Mandatory.

3.2.3 Message Format +CMGF

Parameter Command Syntax

Command	Possible response(s)
+CMGF=[<mode>]	
+CMGF?	+CMGF: <mode>
+CMGF=?	+CMGF: (list of supported <mode>s)

Description

Set command tells the TA, which input and output format of messages to use. <mode> indicates the format of messages used with send, list, read and write commands and unsolicited result codes resulting from received messages. Mode can be either PDU mode (entire TP data units used) or text mode (headers and body of the messages given as separate parameters). Text mode uses the value of parameter <chset> specified by command Select TE Character Set +CSCS to inform the character set to be used in the message body in the TA-TE interface.

Test command returns supported modes as a compound value.

Defined Values

<mode>:

0 PDU mode (default when implemented)

1 text mode

Implementation

Mandatory also when only one mode implemented.

3.2.4 Enter SMS Block Mode Protocol +CESP

Action Command Syntax

Command	Possible response(s)
+CESP	
+CESP=?	

Description

Execution command sets the TA in SMS block protocol mode. The TA shall return OK (or 0) to confirm acceptance of the command prior to entering the block mode (see subclause 2.1.1). The final result code OK (or 0) shall be returned when the block mode is exited.

NOTE: Commands following +CESP in the AT command line must not be processed by the TA.

Implementation

Mandatory when block mode implemented.

3.2.5 Message Service Failure Result Code +CMS ERROR

Final result code +CMS ERROR: <err> indicates an error related to mobile equipment or network. The operation is similar to ERROR result code. None of the following commands in the same command line is executed. Neither ERROR nor OK result code shall be returned. ERROR is returned normally when error is related to syntax or invalid parameters.

Defined Values

<err> values used by common messaging commands:

0...127	~~GSM 04.11~~3G TS 24.011 [6] Annex E-2 values~~ Check if Annex ref is still valid in UMTS spec. ????????~~
128...255	~~GSM 03.40~~3G TS 23.040 [3] subclause 9.2.3.22 values~~. Not a good idea to reference sub clause. Is it correct in UMTS spec?????~~
300	ME failure
301	SMS service of ME reserved
302	operation not allowed
303	operation not supported
304	invalid PDU mode parameter
305	invalid text mode parameter
310	~~SIM~~(U)SIM not inserted
311	~~SIM~~(U)SIM PIN required
312	PH-~~SIM~~(U)SIM PIN required
313	~~SIM~~(U)SIM failure
314	~~SIM~~(U)SIM busy
315	~~SIM~~(U)SIM wrong
316	~~SIM~~(U)SIM PUK required
317	~~SIM~~(U)SIM PIN2 required
318	~~SIM~~(U)SIM PUK2 required
320	memory failure
321	invalid memory index
322	memory full
330	SMSC address unknown
331	no network service
332	network timeout
340	no +CNMA acknowledgement expected
500	unknown error
...511	other values in range 256...511 are reserved
512...	manufacturer specific

Implementation

Mandatory.

3.2.6 Informative Examples

Setting up a TA supporting ~~GSM~~ SMS:

```
AT+CSMS=?                        (inquiry of available services in TA)
+CSMS: (0)                       (only GSM 07.05 Phase 2 compatible SMS command set implemented)
OK
AT+CSMS=0;+CPMS=?                (set GSM SMS; query available memories)
+CSMS: 1,1,1                 (all MT, MO and CBM supported)
+CPMS: ("BM","ME","SM"),("ME","SM"),("ME","SM") (CBM, ME and SIM(U)SIM memories
OK                                for reading, ME and SIM(U)SIM memories for writing)
AT+CPMS="ME","ME","ME";+CMGF=?       (set ME memory; query available message formats)
+CPMS: "ME",5,99,"ME",5,99,"ME",5,99 (five messages in ME, 99 total space)
+CMGF: (0,1)                         (both text and PDU mode implemented)
OK
AT+CMGF=1;+CSCS=?                (select text mode; query available TE character sets)
+CSCS: ("IRA","PCCP437","8859-1")
OK
AT+CSCS="PCCP437"                (select PC code page 437)
OK
```

3.3 Message Configuration Commands

3.3.1 Service Centre Address +CSCA

Parameter Command Syntax

Command	Possible response(s)
+CSCA=<sca>[,<tosca>]	
+CSCA?	+CSCA: <sca>,<tosca>
+CSCA=?	

Description

Set command updates the SMSC address, through which mobile originated SMs are transmitted. In text mode, setting is used by send and write commands. In PDU mode, setting is used by the same commands, but only when the length of the SMSC address coded into `<pdu>` parameter equals zero.

Implementation
Mandatory.

3.3.2 Set Text Mode Parameters +CSMP

Parameter Command Syntax

Command	Possible response(s)
+CSMP=[<fo>[,<vp>[,<pid>[,<dcs>]]]]	
+CSMP?	+CSMP: <fo>,<vp>,<pid>,<dcs>
+CSMP=?	

Description

Set command is used to select values for additional parameters needed when SM is sent to the network or placed in a storage when text format message mode is selected. It is possible to set the validity period starting from when the SM is received by the SMSC (`<vp>` is in range 0... 255) or define the absolute time of the validity period termination (`<vp>` is a string). The format of `<vp>` is given by `<fo>`. If TA supports the ~~enhanced validity period format~~ ~~(~~$(EVPF~~)~~$, see ~~GSM 03.40)~~3G TS 23.040 [3], it shall be given as a hexadecimal coded string (refer e.g. `<pdu>`) with double quotes.

NOTE: When storing a SMS-DELIVER from the TE to the preferred memory storage in text mode (refer command Write Message to Memory `+CMGW`), `<vp>` field can be used for `<scts>`.

Implementation
Mandatory when text mode implemented.

3.3.3 Show Text Mode Parameters +CSDH

Parameter Command Syntax

Command	Possible response(s)
`+CSDH=[<show>]`	
`+CSDH?`	`+CSDH: <show>`
`+CSDH=?`	`+CSDH:` (list of supported `<show>`s)

Description

Set command controls whether detailed header information is shown in text mode result codes.

Test command returns supported values as a compound value.

Defined Values

<show>:

0 do not show header values defined in commands +CSCA and +CSMP (<sca>, <tosca>, <fo>, <vp>, <pid> and <dcs>) nor <length>, <toda> or <tooa> in +CMT, +CMGL, +CMGR result codes for SMS-DELIVERs and SMS-SUBMITs in text mode; for SMS-COMMANDs in +CMGR result code, do not show <pid>, <mn>, <da>, <toda>, <length> or <cdata>

1 show the values in result codes

Implementation

Mandatory when text mode implemented.

3.3.4 Select Cell Broadcast Message Types +CSCB

Parameter Command Syntax

Command	Possible response(s)
`+CSCB=[<mode>[,<mids>[,<dcss>]]]`	
`+CSCB?`	`+CSCB: <mode>,<mids>,<dcss>`
`+CSCB=?`	`+CSCB:` (list of supported `<mode>`s)

Description

Set command selects which types of CBMs are to be received by the ME.

Test command returns supported modes as a compound value.

Defined Values

<mode>:

0 message types specified in <mids> and <dcss> are accepted

1 message types specified in <mids> and <dcss> are not accepted

<mids>: string type; all different possible combinations of CBM message identifiers (refer <mid>) (default is empty string); e.g. "0,1,5,320-478,922"

<dcss>: string type; all different possible combinations of CBM data coding schemes (refer <dcs>) (default is empty string); e.g. "0-3,5"

Implementation

Optional.

3.3.5 Save Settings +CSAS

Action Command Syntax

Command	Possible response(s)
`+CSAS[=<profile>]`	*+CMS ERROR: <err>*
`+CSAS=?`	`+CSAS: (`list of supported `<profile>`s`)`

Description

Execution command saves active message service settings to a non-volatile memory. A TA can contain several profiles of settings. Settings specified in commands Service Centre Address `+CSCA`, Set Message Parameters `+CSMP` and Select Cell Broadcast Message Types `+CSCB` (if implemented) are saved. Certain settings may not be supported by the storage (e.g. ~~SIM~~(U)SIM SMS parameters) and therefore can not be saved. See chapter Message Service Failure Result Code for `<err>` values.

Test command shall display the supported profile numbers for reading and writing of settings.

Defined Values

`<profile>`:

0...255 manufacturer specific profile number where settings are to be stored

Implementation

Optional.

3.3.6 Restore Settings +CRES

Action Command Syntax

Command	Possible response(s)
`+CRES[=<profile>]`	*+CMS ERROR: <err>*
`+CRES=?`	`+CRES: (`list of supported `<profile>`s`)`

Description

Execution command restores message service settings from non-volatile memory to active memory. A TA can contain several profiles of settings. Settings specified in commands Service Centre Address `+CSCA`, Set Message Parameters `+CSMP` and Select Cell Broadcast Message Types `+CSCB` (if implemented) are restored. Certain settings may not be supported by the storage (e.g. ~~SIM~~(U)SIM SMS parameters) and therefore can not be restored. See chapter Message Service Failure Result Code for `<err>` values.

Defined Values

`<profile>`:

0...255 manufacturer specific profile number from where settings are to be restored

Implementation

Optional.

3.3.7 Informative Examples

Figure 1 illustrates an example setup of a TE-TA-ME system for ~~GSM~~ SMS. Location of volatile and non-volatile parameter memories, and the operations to change the parameter values are shown. `+CSMP` is used to set the text mode header values of SMS-SUBMIT (or SMS-DELIVER when received message is written from TE to a storage). The volatile memory may as well be in the ME, or when no volatile memory is used, `+CSMP`, `+CSCA` and `+CSCB` settings are stored directly to non-volatile memory of ME.

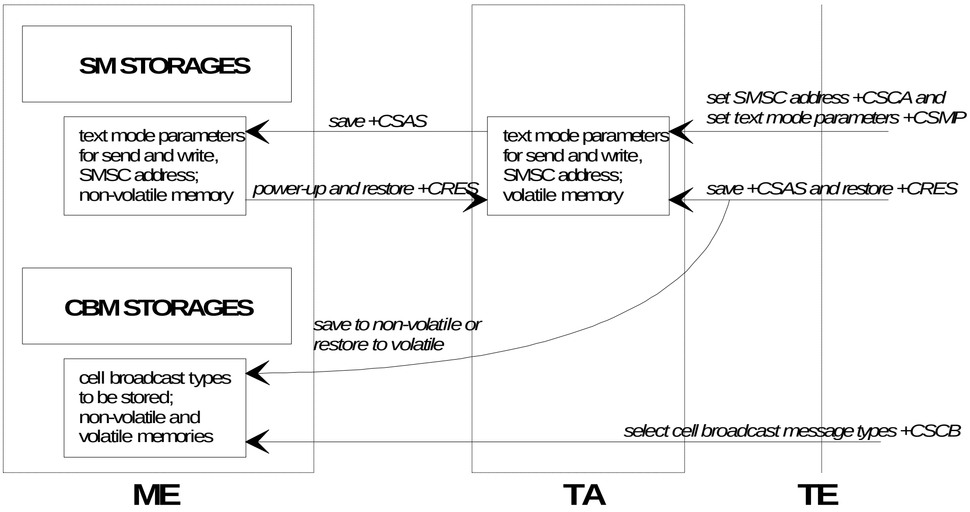


Figure 1: Message service parameter procedures

In this example, the volatile parameter settings of TA are used to construct messages in text mode. SMSC address setting is used also in PDU mode. The next example illustrates a session to restore the message parameters from the ME to the TA, and to set up the CBM identifiers (and languages) which are wanted to be received:

```
AT+CRES                       (restore settings from non-volatile memory to volatile memory)
OK
AT+CSMP?;+CSCA?               (query SM parameters)
+CSMP: 17,167,0,0             (default values for SMS-SUBMIT)
+CSCA: "+358501234567",145    (SMSC address)
OK
AT+CSDH=1                     (show all headers in text mode)
OK
AT+CSCB=1                     (all CBMs are accepted)
OK
```

3.4 Message Receiving and Reading Commands

3.4.1 New Message Indications to TE +CNMI

Parameter Command Syntax

Command	Possible response(s)
+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]	*+CMS ERROR: <err>*
+CNMI?	+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr>
+CNMI=?	+CNMI: (list of supported <mode>s),(list of supported <mt>s),(list of supported <bm>s),(list of supported <ds>s),(list of supported <bfr>s)

Description

Set command selects the procedure, how receiving of new messages from the network is indicated to the TE when TE is active, e.g. DTR signal is ON. If TE is inactive (e.g. DTR signal is OFF), message receiving should be done as specified in ~~GSM 03.38~~3G TS 23.038 [2].

NOTE: When DTR signal is not available or the state of the signal is ignored (V.25ter command &D0), reliable message transfer can be assured by using +CNMA acknowledgement procedure.

<mode> controls the processing of unsolicited result codes specified within this command, <mt> sets the result code indication routing for SMS-DELIVERs, <bm> for CBMs and <ds> for SMS-STATUS-REPORTs. <bfr> defines the handling method for buffered result codes when <mode> 1, 2 or 3 is enabled. If ME does not support requested item (although TA does), final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for a list of <err> values.

Test command gives the settings supported by the TA as compound values.

NOTE: Command Select Message Service `+CSMS` should be used to detect ME support of mobile terminated SMs and CBMs, and to define whether a message routed directly to TE should be acknowledged or not (refer command `+CNMA`).

Defined Values

`<mode>` (refer figure 2;

NOTE: The buffering mechanism may as well be located in the ME; the setting affects only to unsolicited result codes specified within this command):

0 Buffer unsolicited result codes in the TA. If TA result code buffer is full, indications can be buffered in some other place or the oldest indications may be discarded and replaced with the new received indications.

1 Discard indication and reject new received message unsolicited result codes when TA-TE link is reserved (e.g. in on-line data mode). Otherwise forward them directly to the TE.

2 Buffer unsolicited result codes in the TA when TA-TE link is reserved (e.g. in on-line data mode) and flush them to the TE after reservation. Otherwise forward them directly to the TE.

3 Forward unsolicited result codes directly to the TE. TA-TE link specific inband technique used to embed result codes and data when TA is in on-line data mode.

NOTE: It is possible that ME/TA result code buffer is in volatile memory. In this case messages may get lost if the power of ME/TA is switched off before codes are sent to TE. Thus, it is not recommended to use direct message routing (`<mt>`=2 or 3, `<bm>`=2 or 3, or `<ds>`=1) with `<mode>` value 0 or 2.

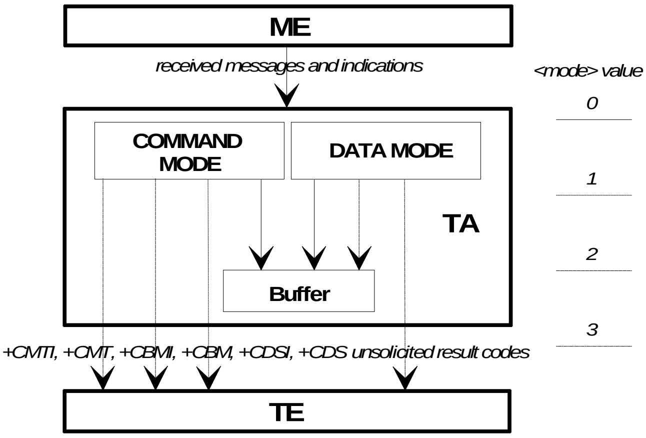


Figure 2: <mode> parameter

`<mt>` (the rules for storing received SMs depend on its data coding scheme (refer ~~GSM 03.38~~3G TS 23.038 [2]), preferred memory storage (`+CPMS`) setting and this value; refer table 1;

NOTE: If AT command interface is acting as the only display device, the ME must support storing of class 0 messages and messages in the message waiting indication group (discard message); refer table 2):

0 No SMS-DELIVER indications are routed to the TE.

1 If SMS-DELIVER is stored into ME/TA, indication of the memory location is routed to the TE using unsolicited result code:

`+CMTI: <mem>,<index>`

2 SMS-DELIVERs (except class 2 messages and messages in the message waiting indication group (store message)) are routed directly to the TE using unsolicited result code:

`+CMT: [<alpha>],<length><CR><LF><pdu>` (PDU mode enabled) or

`+CMT: <oa>, [<alpha>],<scts>`*`[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]`*`<CR><LF><data>` (text mode enabled; about parameters in italics, refer command Show Text Mode Parameters +CSDH)

If ME has its own display device then class 0 messages and messages in the message waiting indication group (discard message) may be copied to both ME display and to TE. In this case, ME shall send the acknowledgement to the network (refer table 2).

Class 2 messages and messages in the message waiting indication group (store message) result in indication as defined in `<mt>`=1.

3 Class 3 SMS-DELIVERs are routed directly to TE using unsolicited result codes defined in `<mt>`=2. Messages of other data coding schemes result in indication as defined in `<mt>`=1.

Table 1: <mt> parameter

<mt>	Receiving procedure for different message data coding schemes (refer ~~GSM 03.38~~3G TS 23.038 [2])
0	no class: as in ~~GSM 03.38~~3G TS 23.038 [2], but use <mem3> as preferred memory class 0: as in ~~GSM 03.38~~3G TS 23.038 [2], but use <mem3> as preferred memory if message is tried to be stored class 1: as in ~~GSM 03.38~~3G TS 23.038 [2], but use <mem3> as preferred memory class 2: as in ~~GSM 03.38~~3G TS 23.038 [2] class 3: as in ~~GSM 03.38~~3G TS 23.038 [2], but use <mem3> as preferred memory message waiting indication group (discard message): as in ~~GSM 03.38~~3G TS 23.038 [2], but use <mem3> as preferred memory if message is tried to be stored message waiting indication group (store message): as in ~~GSM 03.38~~3G TS 23.038 [2], but use <mem3> as preferred memory
1	as <mt>=0 but send indication if message stored successfully
2	no class: route message to TE class 0: as in ~~GSM 03.38~~3G TS 23.038 [2], but also route message to TE and do not try to store it in memory class 1: route message to TE class 2: as <mt>=1 class 3: route message to TE message waiting indication group (discard message): as in ~~GSM 03.38~~3G TS 23.038 [2], but also route message to TE and do not try to store it in memory message waiting indication group (store message): as <mt>=1
3	class 3: route message to TE others: as <mt>=1

Table 2: SMS-DELIVER result code and acknowledgement summary

<mt>	no class or class 1	class 0 or message waiting indication group (discard)	class 2 or message waiting indication group (store)	class 3
1	+CMTI	[+CMTI[1)]]	+CMTI	+CMTI
2	+CMT & +CNMA[3)]	+CMT [& +CNMA[2)]]	+CMTI	+CMT & +CNMA[3)]
3	+CMTI	[+CMTI[1)]]	+CMTI	+CMT & +CNMA[3)]

1) result code is sent when ME does not have other display device than AT interface
2) acknowledgement command must be sent when +CSMS <service> value equals 1 and ME does not have other display device than AT interface
3) acknowledgement command must be sent when +CSMS <service> value equals 1

<bm> (the rules for storing received CBMs depend on its data coding scheme (refer ~~GSM 03.38~~3G TS 23.038 [2]), the setting of Select CBM Types (+CSCB) and this value; refer table 3):

0 No CBM indications are routed to the TE.

1 If CBM is stored into ME/TA, indication of the memory location is routed to the TE using unsolicited result code:

+CBMI: <mem>,<index>

2 New CBMs are routed directly to the TE using unsolicited result code:

+CBM: <length><CR><LF><pdu> (PDU mode enabled)

or

+CBM: <sn>,<mid>,<dcs>,<page>,<pages><CR><LF><data> (text mode enabled)

If ME supports data coding groups which define special routing also for messages other than class 3 (e.g. ~~SIM~~(U)SIM specific messages), ME may choose not to route messages of such data coding schemes into TE (indication of a stored CBM may be given as defined in <bm>=1).

3 Class 3 CBMs are routed directly to TE using unsolicited result codes defined in <bm>=2. If CBM storage is supported, messages of other classes result in indication as defined in <bm>=1.

Table 3: <bm> parameter

<bm>	Receiving procedure for different message data coding schemes (refer ~~GSM 03.38~~3G TS 23.038 [2])
0	all schemes: as in ~~GSM 03.38~~3G TS 23.038 [2]; if CBM storage is supported, store message to "BM" (or some manufacturer or data coding scheme specific memory)
1	all schemes: as <bm>=0 but send indication if message stored successfully
2	all schemes: route message to TE unless ME has detected a special routing to somewhere else (e.g. to ~~SIM~~(U)SIM; an indication may be sent if message stored successfully)
3	class 3: route message to TE others: as <bm>=1 (if CBM memory storage is supported)

<ds>:

0 No SMS-STATUS-REPORTs are routed to the TE.

1 SMS-STATUS-REPORTs are routed to the TE using unsolicited result code:

+CDS: <length><CR><LF><pdu> (PDU mode enabled)

or

+CDS: <fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> (text mode enabled)

2 If SMS-STATUS-REPORT is stored into ME/TA, indication of the memory location is routed to the TE using unsolicited result code:

+CDSI: <mem>,<index>

Table 4: SMS-STATUS-REPORT result code and acknowledgement summary

<ds>	result codes and commands
1	+CDS & +CNMA[1)]
2	+CDSI
1) acknowledgement command must be sent when +CSMS <service> value equals 1	

<bfr>:

0 TA buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1...3 is entered (OK response shall be given before flushing the codes).

1 TA buffer of unsolicited result codes defined within this command is cleared when <mode> 1...3 is entered.

Implementation

Mandatory when any of the new message indications implemented.

3.4.2 List Messages +CMGL

Action Command Syntax

Command	Possible response(s)
+CMGL[=<stat>]	**if text mode (+CMGF=1), command successful and SMS-SUBMITs and/or SMS-DELIVERs:** +CMGL: <index>,<stat>,<oa/da>,[<alpha>],[<scts>]*[,<tooa/toda>,* *<length>]*<CR><LF><data>[<CR><LF> +CMGL: <index>,<stat>,<da/oa>,[<alpha>],[<scts>]*[,<tooa/toda>,* *<length>]*<CR><LF><data>[...]] **if text mode (+CMGF=1), command successful and SMS-STATUS-REPORTs:** +CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> [<CR><LF> +CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> [...]] **if text mode (+CMGF=1), command successful and SMS-COMMANDs:** +CMGL: <index>,<stat>,<fo>,<ct>[<CR><LF> +CMGL: <index>,<stat>,<fo>,<ct>[...]] **if text mode (+CMGF=1), command successful and CBM storage:** +CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages> <CR><LF><data>[<CR><LF> +CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages> <CR><LF><data>[...]] **otherwise:** *+CMS ERROR: <err>*
+CMGL=?	+CMGL: (list of supported <stat>s)

Description

Execution command returns messages with status value <stat> from message storage <mem1> to the TE. About text mode parameters in italics, refer command Show Text Mode Parameters +CSDH. If status of the message is 'received unread', status in the storage changes to 'received read'. If listing fails, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for <err> values.

NOTE: If the selected <mem1> can contain different types of SMs (e.g. SMS-DELIVERs, SMS-SUBMITs, SMS-STATUS-REPORTs and SMS-COMMANDs), the response may be a mix of the responses of different SM types. TE application can recognize the response format by examining the third response parameter.

Test command shall give a list of all status values supported by the TA.

Implementation

Optional.

3.4.3 Read Message +CMGR

Action Command Syntax

Command	Possible response(s)
`+CMGR=<index>`	**if text mode (`+CMGF=1`), command successful and SMS-DELIVER:** `+CMGR: <stat>,<oa>,[<alpha>],<scts>`*`[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]`*`<CR><LF><data>` **if text mode (`+CMGF=1`), command successful and SMS-SUBMIT:** `+CMGR: <stat>,<da>,[<alpha>]`*`[,<toda>,<fo>,<pid>,<dcs>,[<vp>],<sca>,<tosca>,<length>]`*`<CR><LF><data>` **if text mode (`+CMGF=1`), command successful and SMS-STATUS-REPORT:** `+CMGR: <stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>` **if text mode (`+CMGF=1`), command successful and SMS-COMMAND:** `+CMGR: <stat>,<fo>,<ct>`*`[,<pid>,[<mn>],[<da>],[<toda>],<length><CR><LF><cdata>]`* **if text mode (`+CMGF=1`), command successful and CBM storage:** `+CMGR: <stat>,<sn>,<mid>,<dcs>,<page>,<pages><CR><LF><data>` **otherwise:** *`+CMS ERROR: <err>`*
`+CMGR=?`	

Description

Execution command returns message with location value `<index>` from message storage `<mem1>` to the TE. About text mode parameters in italics, refer command Show Text Mode Parameters `+CSDH`. If status of the message is 'received unread', status in the storage changes to 'received read'. If reading fails, final result code `+CMS ERROR: <err>` is returned. See chapter Message Service Failure Result Code for `<err>` values.

Implementation

Optional.

3.4.4 New Message Acknowledgement to ME/TA +CNMA

Action Command Syntax

Command	Possible response(s)
if text mode (`+CMGF=1`): `+CNMA`	*`+CMS ERROR: <err>`*
`+CNMA=?`	

Description

Execution command confirms correct reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer command `+CNMI` tables 2 and 4). This acknowledgement command (causing ME to send RP-ACK to the network) shall be used when `+CSMS` parameter `<service>` equals 1. TA shall not send another `+CMT` or `+CDS` result code to TE before previous one is acknowledged.

If ME does not get acknowledgement within required time (network timeout), ME should send RP-ERROR to the network. ME/TA shall automatically disable routing to TE by setting both `<mt>` and `<ds>` values of `+CNMI` to zero.

If command is executed, but no acknowledgement is expected, or some other ME related error occurs, final result code `+CMS ERROR: <err>` is returned. See chapter Message Service Failure Result Code for a list of `<err>` values.

NOTE: In case that a directly routed message must be buffered in ME/TA (possible when `+CNMI` parameter `<mode>` equals 0 or 2) or AT interpreter remains too long in a state where result codes cannot be sent to TE (e.g. user is entering a message using `+CMGS`), acknowledgement (RP-ACK) must be sent to the network without waiting `+CNMA` command from TE. Later, when buffered result codes are flushed to TE, TE must send `+CNMA` acknowledgement for each result code. In this way, ME/TA can determine if message should be placed in non-volatile memory and routing to TE disabled (`+CNMA` not received). Refer command `+CNMI` for more details how to use `<mode>` parameter reliably.

Implementation

Mandatory when `<service>` value 1 of command Select Message Service `+CSMS` is supported.

3.4.5 Informative Examples

Message forwarding is done as illustrated in figure 3. Optional `+CNMA` acknowledgement procedure is not presented. In this example, there is no TA memory for messages and result code buffer is situated in TA. The routing of message waiting indication group (discard message) SMS-DELIVERs equal to class 0 messages, and the routing of message waiting indication group (store message) SMS-DELIVERs equal to class 2 messages.

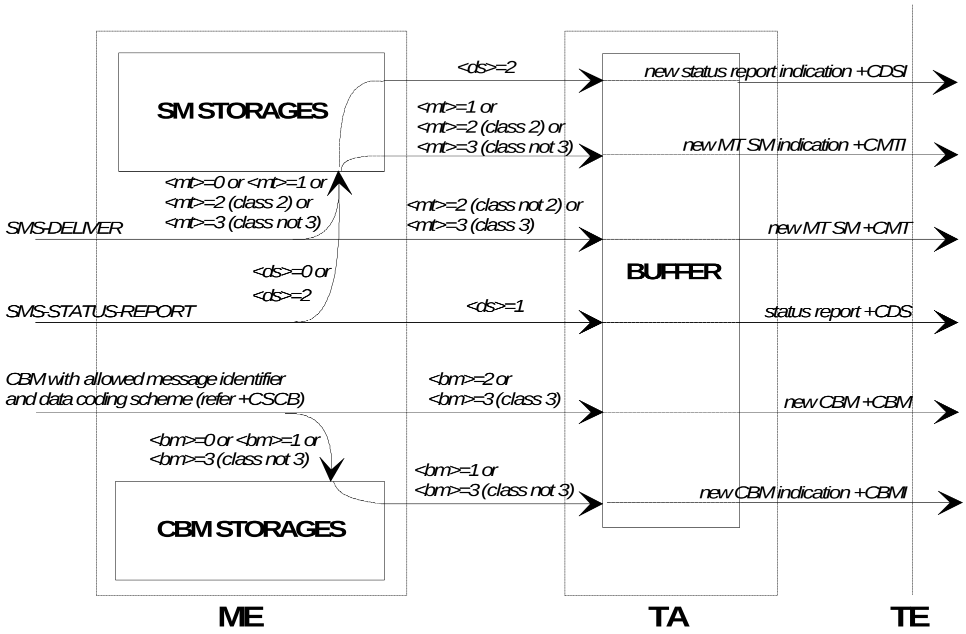


Figure 3: Message receiving procedures

Setting new message indications:

```
AT+CNMI=?           (query new message unsolicited result code modes)
+CNMI: (0-2),(0-3),(0-3),(0,1),(0,1)
OK
AT+CNMI=2,1,0,1,0   (send SM and status report indications to TE
OK                   when TA in command mode, otherwise buffer)
```

In this example, the TA is set so that it should send an unsolicited result code `+CMTI: <mem>,<index>` to the TE when a new SMS-DELIVER is received from the network and stored successfully to storage `<mem>`, and an unsolicited result code `+CDS:...` when a SMS-STATUS-REPORT is received. These result codes are routed to the TE when TA is in command mode, but buffered when in on-line data mode. Now, if new SM is received, it can be read as follows (text mode with no detailed header information; GSM ~~default~~7 bit default alphabet used in message body):

```
+CMTI: "ME",2       (new message received in index 2)
AT+CMGR=2           (read the message)
+CMGR: "REC UNREAD","+358507654321","Mr. Jones","95/07/03,17:38:15+04"
This is the Mr. Jones testing
OK
```

In the next example all messages of storage `<mem1>` are listed (text mode with no detailed header information; GSM ~~default~~7 bit default alphabet used in message bodies):

```
AT+CMGL="ALL"       (read all SMs)
+CMGL: 1,"REC READ","+358501234567","Mr. Smith","95/07/03,17:45:03+04"
This is the body of the message.
+CMGL: 2,"STO UNSENT","+358501234567","Mr. Smith",
This is the body of the reply.
OK
```

The next example shows a method to read new CBMs received from the network (text mode; GSM ~~default~~7 bit default alphabet used in message bodies):

```
AT+CNMI=2,,2,,0                    (CBMs will be sent to the TE)
OK
AT+CPMS="BM";+CMGL  (select CBM memory for reading; list all unread CBMs)
+CMGL: 1,"REC UNREAD",100,40,1,3    (first page of three page weather information)
Weather in Finland 3rd of July 1995
+CMGL: 2,"REC UNREAD",100,40,2,3    (second page of three page weather information)
Helsinki: cloudy, snow storms, -20 degrees Celsius, wind -14 m/s NE
+CMGL: 3,"REC UNREAD",100,40,3,3    (third page of three page weather information)
Tampere: sunny, 40 degrees Celsius, wind 1 m/s SW
OK
```

3.5 Message Sending and Writing Commands

3.5.1 Send Message +CMGS

Action Command Syntax

Command	Possible response(s)
if text mode (+CMGF=1): +CMGS=<da>[,<toda>]<CR> ***text is entered***<ctrl-Z/ESC>	**if text mode (+CMGF=1) and sending successful:** +CMGS: <mr>[,<scts>] **if sending fails:** *+CMS ERROR: <err>*
+CMGS=?	

Description

Execution command sends message from a TE to the network (SMS-SUBMIT). Message reference value <mr> is returned to the TE on successful message delivery. Optionally (when +CSMS <service> value is 1 and network supports) <scts> is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for a list of <err> values. This command should be abortable.

Description

Execution command sends message from a TE to the network (SMS-SUBMIT). Message reference value <mr> is returned to the TE on successful message delivery. Value can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for a list of <err> values. This command should be abortable.

- entered text (3G TS 23.040 [3]~~GSM 03.40~~ TP-Data-Unit) is sent to address <da> and all current settings (refer Set Text Mode Parameters +CSMP and Service Centre Address +CSCA) are used to construct the actual PDU in ME/TA
- the TA shall send a four character sequence <CR><LF><greater_than><space> (IRA 13, 10, 62, 32) after command line is terminated with <CR>; after that text can be entered from TE to ME/TA
- the DCD signal shall be in ON state while text is entered
- the echoing of entered characters back from the TA is controlled by V.25ter echo command E
- the entered text should be formatted as follows:
  - if <dcs> (set with +CSMP) indicates that ~~GSM 03.38~~3G TS 23.038 [2] GSM 7 bit default alphabet is used and <fo> indicates that 3G TS 23.040 [3]~~GSM 03.40~~ TP-User-Data-Header-Indication is not set:
    - if TE character set other than "HEX" (refer command Select TE Character Set +CSCS in ~~TS 07.07~~3G TS 27.007 [9]): ME/TA converts the entered text into the GSM 7 bit default alphabet according to rules of Annex A; backspace can be used to delete last character and carriage returns can be used (previously mentioned four character sequence shall be sent to the TE after every carriage return entered by the user)

- if TE character set is "HEX": the entered text should consist of two IRA character long hexadecimal numbers which ME/TA converts into the ~~to 7-bit characters of~~ GSM 7 bit default alphabet characters. (e.g. 17 (IRA 49 and 55) will be converted to character Π (GSM 7 bit default alphabet 23))

- if <dcs> indicates that 8-bit or UCS2 data coding scheme is used or <fo> indicates that ~~GSM 03.40~~3G TS 23.040 [3] TP-User-Data-Header-Indication is set: the entered text should consist of two IRA character long hexadecimal numbers which ME/TA converts into 8-bit octet (e.g. two characters 2A (IRA 50 and 65) will be converted to an octet with integer value 42)

- sending can be cancelled by giving <ESC> character (IRA 27)
- <ctrl-Z> (IRA 26) must be used to indicate the ending of the message body

Implementation

Optional.

3.5.2 Send Message from Storage +CMSS

Action Command Syntax

Command	Possible response(s)
+CMSS=<index>[,<da>[,<toda>]]	**if text mode (+CMGF=1) and sending successful:** +CMSS: <mr>[,<scts>] **if sending fails:** *+CMS ERROR: <err>*
+CMSS=?	

Description

Execution command sends message with location value <index> from preferred message storage <mem2> to the network (SMS-SUBMIT or SMS-COMMAND). If new recipient address <da> is given given for SMS-SUBMIT, it shall be used instead of the one stored with the message. Reference value <mr> is returned to the TE on successful message delivery. Optionally (when +CSMS <service> value is 1 and network supports) <scts> is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for a list of <err> values. This command should be abortable.

Implementation

Optional.

3.5.3 Write Message to Memory +CMGW

Action Command Syntax

Command	Possible response(s)
if text mode (+CMGF=1): +CMGW[=<oa/da>[,<tooa/toda>[,<stat>]]]<CR> ***text is entered***<ctrl-Z/ESC>	+CMGW: <index> *+CMS ERROR: <err>*
+CMGW=?	

Description

Execution command stores message (either SMS-DELIVER or SMS-SUBMIT) to memory storage <mem2>. Memory location <index> of the stored message is returned. By default message status will be set to 'stored unsent', but parameter <stat> allows also other status values to be given. The entering of text is done similarly as specified in command Send Message +CMGS. If writing fails, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for <err> values.

NOTE: SMS-COMMANDs and SMS-STATUS-REPORTs can not be stored in text mode.

Implementation

Optional.

3.5.4 Delete Message +CMGD

Action Command Syntax

Command	Possible response(s)
+CMGD=<index>[,<delflag>]	*+CMS ERROR: <err>*
+CMGD=?	+CMGD: (list of supported <index>s)[,(list of supported <delflag>s)]

Description

Execution command deletes message from preferred message storage <mem1> location <index>. If <delflag> is present and not set to 0 then the ME shall ignore <index> and follow the rules for <delflag> shown below. If deleting fails, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for <err> values.

Test command shows the valid memory locations and optionally the supported values of <delflag>.

<delflag>: an integer indicating multiple message deletion request as follows:

0 (or omitted)	Delete the message specified in <index>
1	Delete all read messages from preferred message storage, leaving unread messages and stored mobile originated messages (whether sent or not) untouched
2	Delete all read messages from preferred message storage and sent mobile originated messages, leaving unread messages and unsent mobile originated messages untouched
3	Delete all read messages from preferred message storage, sent and unsent mobile originated messages leaving unread messages untouched.
4	Delete all messages from preferred message storage including unread messages.

Implementation

Optional.

3.5.5 Send Command +CMGC

Action Command Syntax

Command	Possible response(s)
if text mode (+CMGF=1): +CMGC=<fo>,<ct>[,<pid>[,<mn>[,<da>[,<toda>]]]]<CR> ***text is entered***<ctrl-Z/ESC>	**if text mode (+CMGF=1) and sending successful:** +CMGC: <mr>[,<scts>] **if sending fails:** *+CMS ERROR: <err>*
+CMGC=?	

Description

Execution command sends a command message from a TE to the network (SMS-COMMAND). The entering of text (3G TS 23.040 [3]~~GSM 03.40~~ TP-Command-Data) is done similarly as specified in command Send Message +CMGS, but the format is fixed to be a sequence of two IRA character long hexadecimal numbers which ME/TA converts into 8-bit octets (refer +CMGS). Message reference value <mr> is returned to the TE on successful message delivery. Optionally (when +CSMS <service> value is 1 and network supports) <scts> is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code `+CMS ERROR: <err>` is returned. See chapter Message Service Failure Result Code for a list of `<err>` values. This command should be abortable.

Implementation
Optional.

3.5.6 More Messages to Send +CMMS ~~$(TEI R97)$~~

Parameter Command Syntax

Command	Possible response(s)
`+CMMS=[<n>]`	
`+CMMS?`	`+CMMS: <n>`
`+CMMS=?`	`+CMMS:` (list of supported `<n>`s)

Description

Set command controls the continuity of SMS relay protocol link. When feature is enabled (and supported by network) multiple messages can be sent much faster as link is kept open.

Test command returns supported values as a compound value.

Defined Values

`<n>`:

0 disable

1 keep enabled until the time between the response of the latest message send command (`+CMGS`, `+CMSS`, etc.) and the next send command exceeds 1-5 seconds (the exact value is up to ME implementation), then ME shall close the link and TA switches `<n>` automatically back to 0

2 enable (if the time between the response of the latest message send command and the next send command exceeds 1-5 seconds (the exact value is up to ME implementation), ME shall close the link but TA shall not switch automatically back to `<n>`=0)

Implementation
Optional.

3.5.7 Informative Examples

Figure 4 is an example of a TE-TA-ME setup when messages are sent to network or stored to ME. The volatile memory may as well be in the ME, or a non-volatile memory may be used instead when constructing messages.

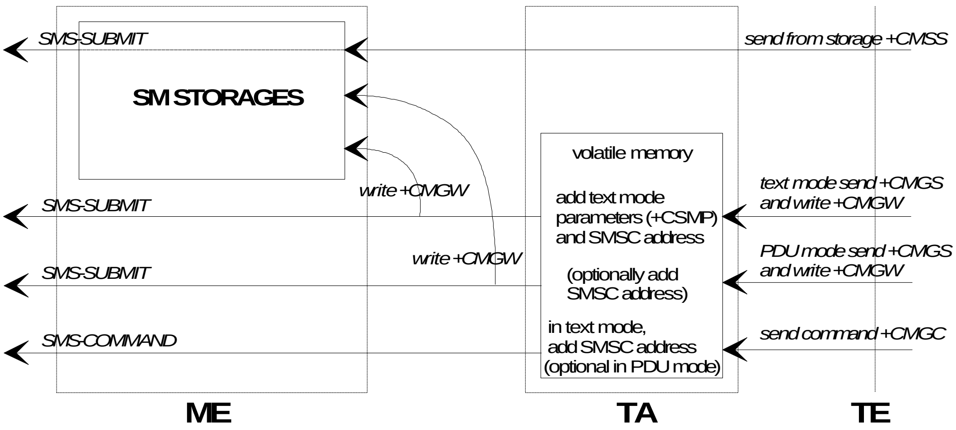


Figure 4: Message service send and write procedures

An example of sending a GSM 7 bit default alphabet message in text mode and a SMS-STATUS-REPORT is wanted:

```
AT+CNMI?                    (check that status reports are routed to TE)
+CNMI: 2,1,0,1,0
OK
AT+CSMP=32,167,0,0          (status report wanted; otherwise default settings)
OK
AT+CMGS="+358501234567"     (start editing a message)
> This the first line.      (edit first line and press carriage return)
> This is the last line.^Z  (edit second line and send message by pressing control-Z)
+CMGS: 10                   (success: message reference 10 returned from SMSC)
OK
+CDS: 2,10,"+358501234567",145,"95/07/04/13:12:14+04",
"95/07/04/13:12:20+04",0    (status report of successful message delivery received)
```

Storing an unsent message in memory, sending it from there, and deleting it:

```
AT+CPMS?                (check memory settings)
+CPMS: "ME",4,10,"ME",4,10,"ME",4,10
OK
AT+CMGW="9501231234"    (write message)
> This is the message body^Z
+CMGW: 7                (index number in storage returned)
OK
AT+CMSS=7               (send from storage)
+CMSS: 12               (success: reference value 12 sent from SC)
OK
AT+CMGD=7               (delete message)
OK
```

4 PDU Mode

The PDU mode uses the same commands and responses as the Text Mode described in clause 3. However, the following commands and responses have a different format. In the PDU mode, a complete SMS Message including all header information is passed as a binary string. This binary string is composed of hexadecimal IA5 characters as defined in clause 3 above under “Message Data Parameters”.

4.1 List Messages +CMGL

Action Command Syntax

Command	Possible response(s)
+CMGL[=<stat>]	**if PDU mode (+CMGF=0) and command successful:** +CMGL: <index>,<stat>,[<alpha>],<length><CR><LF><pdu> [<CR><LF>+CMGL:<index>,<stat>,[<alpha>],<length><CR><LF><pdu> [...]] **otherwise:** *+CMS ERROR: <err>*
+CMGL=?	+CMGL: (list of supported <stat>s)

Description

Execution command returns messages with status value <stat> from preferred message storage <mem1> to the TE. Entire data units <pdu> are returned. If status of the message is 'received unread', status in the storage changes to 'received read'. If listing fails, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for <err> values.

Test command shall give a list of all status values supported by the TA.

Implementation

Optional.

4.2 Read Message +CMGR

Action Command Syntax

Command	Possible response(s)
`+CMGR=<index>`	**if PDU mode (`+CMGF=0`) and command successful:** `+CMGR: <stat>,[<alpha>],<length><CR><LF><pdu>` **otherwise:** *`+CMS ERROR: <err>`*
`+CMGR=?`	

Description

Execution command returns message with location value `<index>` from preferred message storage `<mem1>` to the TE. Status of the message and entire message data unit `<pdu>` is returned. If status of the message is 'received unread', status in the storage changes to 'received read'. If reading fails, final result code `+CMS ERROR: <err>` is returned. See chapter Message Service Failure Result Code for `<err>` values.

Implementation

Optional.

4.3 Send Message +CMGS

Action Command Syntax

Command	Possible response(s)
if PDU mode (`+CMGF=0`): `+CMGS=<length><CR>` ***`PDU is given`***`<ctrl-Z/ESC>`	**if PDU mode (`+CMGF=0`) and sending successful:** `+CMGS: <mr>[,<ackpdu>]` **if sending fails:** *`+CMS ERROR: <err>`*
`+CMGS=?`	

Description

Execution command sends message from a TE to the network (SMS-SUBMIT). Message reference value `<mr>` is returned to the TE on successful message delivery. Optionally (when `+CSMS` `<service>` value is 1 and network supports) `<ackpdu>` is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code `+CMS ERROR: <err>` is returned. See chapter Message Service Failure Result Code for a list of `<err>` values. This command should be abortable.

- `<length>` must indicate the number of octets coded in the TP layer data unit to be given (i.e. SMSC address octets are excluded)
- the TA shall send a four character sequence `<CR><LF><greater_than><space>` (IRA 13, 10, 62, 32) after command line is terminated with `<CR>`; after that PDU can be given from TE to ME/TA
- the DCD signal shall be in ON state while PDU is given
- the echoing of given characters back from the TA is controlled by V.25ter echo command `E`
- the PDU shall be hexadecimal format (similarly as specified for `<pdu>`) and given in one line; ME/TA converts this coding into the actual octets of PDU
- when the length octet of the SMSC address (given in the PDU) equals zero, the SMSC address set with command Service Centre Address `+CSCA` is used; in this case the SMSC Type-of-Address octet shall not be present in the PDU, i.e. TPDU starts right after SMSC length octet
- sending can be cancelled by giving `<ESC>` character (IRA 27)
- `<ctrl-Z>` (IRA 26) must be used to indicate the ending of PDU

Implementation

Optional.

4.4 Write Message to Memory +CMGW

Action Command Syntax

Command	Possible response(s)
if PDU mode (+CMGF=0): +CMGW=<length>[,<stat>]<CR>***PDU is given***<ctrl-Z/ESC>	+CMGW: <index> *+CMS ERROR: <err>*
+CMGW=?	

Description

Execution command stores a message to memory storage <mem2>. Memory location <index> of the stored message is returned. By default message status will be set to 'stored unsent', but parameter <stat> allows also other status values to be given. (ME/TA manufacturer may choose to use different default <stat> values for different message types.) The entering of PDU is done similarly as specified in command Send Message +CMGS. If writing fails, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for <err> values.

Implementation

Optional.

4.5 Send Command +CMGC

Action Command Syntax

Command	Possible response(s)
if PDU mode (+CMGF=0): +CMGC=<length><CR> ***PDU is given***<ctrl-Z/ESC>	**if PDU mode (+CMGF=0) and sending successful:** +CMGC: <mr>[,<ackpdu>] **if sending fails:** *+CMS ERROR: <err>*
+CMGC=?	

Description

Execution command sends a command message from a TE to the network (SMS-COMMAND). The entering of PDU is done similarly as specified in command Send Message +CMGS. Message reference value <mr> is returned to the TE on successful message delivery. Optionally (when +CSMS <service> value is 1 and network supports) <ackpdu> is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for a list of <err> values. This command should be abortable.

Implementation

Optional.

4.6 New Message Acknowledgement to ME/TA +CNMA

Action Command Syntax

Command	Possible response(s)
if PDU mode (+CMGF=0): +CNMA[=<n>[,<length>[<CR> ***PDU is given***<ctrl-Z/ESC>]]]	*+CMS ERROR: <err>*
+CNMA=?	**if PDU mode (+CMGF=0):** +CNMA: (list of supported <n>s)

Description

Execution command confirms reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer command +CNMI tables 2 and 4). This acknowledgement command shall be used when +CSMS parameter <service> equals 1. In PDU mode, it is possible to send either positive (RP-ACK) or negative (RP-ERROR) acknowledgement to the network. Parameter <n> defines which one will be sent. Optionally (when <length> is greater than zero) an acknowledgement TPDU (SMS-DELIVER-REPORT for RP-ACK or RP-ERROR) may be sent to the network. The entering of PDU is done similarly as specified in command Send Message +CMGS, except that the format of <ackpdu> is used instead of <pdu> (i.e. SMSC address field is not present). PDU shall not be bounded by double quotes. TA shall not send another +CMT or +CDS result code to TE before previous one is acknowledged.

If ME does not get acknowledgement within required time (network timeout), ME should send RP-ERROR to the network. ME/TA shall automatically disable routing to TE by setting both <mt> and <ds> values of +CNMI to zero.

If command is executed, but no acknowledgement is expected, or some other ME related error occurs, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for a list of <err> values.

NOTE: In case that a directly routed message must be buffered in ME/TA (possible when +CNMI parameter <mode> equals 0 or 2) or AT interpreter remains too long in a state where result codes cannot be sent to TE (e.g. user is entering a message using +CMGS), acknowledgement (RP-ACK) must be sent to the network without waiting +CNMA command from TE. Later, when buffered result codes are flushed to TE, TE must send +CNMA[=0] acknowledgement for each result code. In this way, ME/TA can determine if message should be placed in non-volatile memory and routing to TE disabled (+CNMA[=0] not received). Refer command +CNMI for more details how to use <mode> parameter reliably.

Test command returns a list of supported <n> values. If the only value supported is 0, the device does not support sending of TPDU.

Defined Values

<n>:

0 command operates similarly as defined for the text mode

1 send RP-ACK (or buffered result code received correctly)

2 send RP-ERROR (if PDU is not given, ME/TA shall send SMS-DELIVER-REPORT with 3G TS 23.040 [3]~~GSM 03.40~~ TP-FCS value set to ‘FF’ (unspecified error cause))

Implementation

Mandatory when <service> value 1 of command Select Message Service +CSMS is supported.

4.7 Send Message from Storage +CMSS

Action Command Syntax

Command	Possible response(s)
+CMSS=<index>[,<da>[,<toda>]]	**if PDU mode (+CMGF=0) and sending successful:** +CMSS: <mr>[,<ackpdu>] **if sending fails:** *+CMS ERROR: <err>*
+CMSS=?	

Description

Execution command sends message with location value `<index>` from message storage `<mem2>` to the network (SMS-SUBMIT or SMS-COMMAND). If new recipient address `<da>` is given for SMS-SUBMIT, it shall be used instead of the one stored with the message. Reference value `<mr>` is returned to the TE on successful message delivery. Optionally (when `+CSMS` `<service>` value is 1 and network supports) `<ackpdu>` is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code `+CMS ERROR: <err>` is returned. See chapter Message Service Failure Result Code for a list of `<err>` values. This command should be abortable.

Implementation

Optional.

Annex A (Normative):
Character Set Conversions for SMS Text Mode

The following conversions to and from ~~GSM 03.38~~3G TS 23.038 [2] GSM 7 bit default alphabet are defined:

TE char set	bits/char	Commands
PC Code Page 437	8	`+CMGF=1;+CSCS="PCCP437"`
PC Danish/Norwegian	8	`+CMGF=1;+CSCS="PCDN"`
ISO 8859 Latin 1	8	`+CMGF=1;+CSCS="8859-1"`
IRA	7	`+CMGF=1;+CSCS="IRA"`
GSM 7 bit default alphabet	7	`+CMGF=1;+CSCS="GSM"`

The tables below show which GSM 7 bit default alphabet ~~7 bit GSM~~ value corresponds to the 7 or 8 bit value of external character set. The TE character set value is computed by adding column value, 00H through F0H (70H for 7 bits/char), with the row value (00H through 0FH). All values are in hexadecimal, but the H suffix is not used. When text mode is implemented, it is mandatory for a TA to have at least one conversion which include the conversion table of IRA (e.g. PC Code Page 437 does). Additional conversions can be defined by manufacturers. It is manufacturer specific if the TE set is actually converted to GSM 7 bit default alphabet set in the TA or in the ME, and if the TE set is converted to a ME specific set in the TA before converting it to GSM 7 bit default alphabet set when message is sent to the network. It is recommended that characters which cannot be converted to GSM 7 bit default alphabet set are deleted.

Conversion from IRA to GSM 7 bit default alphabet:

	00	10	20	30	40	50	60	70
00	-	-	20	30	00	50	-	70
01	-	-	21	31	41	51	61	71
02	-	-	22	32	42	52	62	72
03	-	-	23	33	43	53	63	73
04	-	-	02	34	44	54	64	74
05	-	-	25	35	45	55	65	75
06	-	-	26	36	46	56	66	76
07	-	-	27	37	47	57	67	77
08	-	-	28	38	48	58	68	78
09	-	-	29	39	49	59	69	79
0A	LF	-	2A	3A	4A	5A	6A	7A
0B	-	-	2B	3B	4B	-	6B	-
0C	-	-	2C	3C	4C	-	6C	-
0D	CR-	-	2D	3D	4D	-	6D	-
0E	-	-	2E	3E	4E	-	6E	-
0F	-	-	2F	3F	4F	11	6F	-

Conversion from PCCP437 (PC-8 Code Page 437) to GSM 7 bit default alphabet:

	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
00	-	-	20	30	00	50	-	70	09	1F	61[10]	-	-	-	-	-
01	-	-	21	31	41	51	61	71	7E	1D	69[11]	-	-	-	1E	-
02	-	-	22	32	42	52	62	72	05	1C	6F[12]	-	-	-	13	-
03	-	-	23	33	43	53	63	73	61[1]	6F[7]	75[13]	-	-	-	-	-
04	-	-	02	34	44	54	64	74	7B	7C	7D	-	-	-	18	-
05	-	5F	25	35	45	55	65	75	7F	08	5D	-	-	-	-	-
06	-	-	26	36	46	56	66	76	0F	75[8]	-	-	-	-	-	-
07	-	-	27	37	47	57	67	77	09[2]	06	-	-	-	-	-	-
08	-	-	28	38	48	58	68	78	65[3]	79[9]	60	-	-	-	12	-
09	-	-	29	39	49	59	69	79	65[4]	5C	-	-	-	-	19	-
0A	LF	-	2A	3A	4A	5A	6A	7A	04	5E	-	-	-	-	15	-
0B	-	-	2B	3B	4B	-	6B	-	69[5]	-	-	-	-	-	-	-
0C	-	-	2C	3C	4C	-	6C	-	69[6]	01	-	-	-	-	-	-
0D	CR	-	2D	3D	4D	-	6D	-	07	03	40	-	-	-	-	-
0E	-	-	2E	3E	4E	-	6E	-	5B	-	-	-	-	-	-	-
0F	-	-	2F	3F	4F	11	6F	-	0E	-	-	-	-	-	-	-

[1] : â ⇨ a [2] : ç ⇨ Ç [3] : ê ⇨ e [4] : ë ⇨ e [5] : ï ⇨ i

[6] : î ⇨ i [7] : ô ⇨ o [8] : û ⇨ u [9] : ÿ ⇨ y [10] : á ⇨ a

[11] : í ⇨ i [12] : ó ⇨ o [13] : ú ⇨ u

Conversion from PCDN (PC-8 Danish/ Norwegian) to GSM 7 bit default alphabet:

	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
00	-	-	20	30	00	50	-	70	09	1F	61[10]	-	-	-	-	-
01	-	-	21	31	41	51	61	71	7E	1D	69[11]	-	-	-	1E	-
02	-	-	22	32	42	52	62	72	05	1C	6F[12]	-	-	-	13	-
03	-	-	23	33	43	53	63	73	61[1]	6F[7]	75[13]	-	-	-	-	-
04	-	-	02	34	44	54	64	74	7B	7C	7D	-	-	-	18	-
05	-	5F	25	35	45	55	65	75	7F	08	5D	-	-	-	-	-
06	-	-	26	36	46	56	66	76	0F	75[8]	-	-	-	-	-	-
07	-	-	27	37	47	57	67	77	09[2]	06	-	-	-	-	-	-
08	-	-	28	38	48	58	68	78	65[3]	79[9]	60	-	-	-	12	-
09	-	-	29	39	49	59	69	79	65[4]	5C	-	-	-	-	19	-
0A	LF	-	2A	3A	4A	5A	6A	7A	04	5E	-	-	-	-	15	-
0B	-	-	2B	3B	4B	-	6B	-	69[5]	0C	-	-	-	-	-	-
0C	-	-	2C	3C	4C	-	6C	-	69[6]	01	-	-	-	-	-	-
0D	CR	-	2D	3D	4D	-	6D	-	07	0B	40	-	-	-	-	-
0E	-	-	2E	3E	4E	-	6E	-	5B	-	-	-	-	-	-	-
0F	-	-	2F	3F	4F	11	6F	-	0E	-	-	-	-	-	-	-

[1] : â ⇨ a [2] : ç ⇨ Ç [3] : ê ⇨ e [4] : ë ⇨ e [5] : ï ⇨ i

[6] : î ⇨ i [7] : ô ⇨ o [8] : û ⇨ u [9] : ÿ ⇨ y [10] : á ⇨ a

[11] : í ⇨ i [12] : ó ⇨ o [13] : ú ⇨ u

Conversion from 8859-1 (ISO 8859 Latin 1) to GSM 7 bit default alphabet:

	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
00	-	-	20	30	00	50	-	70	-	-	-	-	41[1]	-	7F	-
01	-	-	21	31	41	51	61	71	-	-	40	-	41[2]	5D	61[20]	7D
02	-	-	22	32	42	52	62	72	-	-	-	-	41[3]	4F[12]	61[21]	08
03	-	-	23	33	43	53	63	73	-	-	01	-	41[4]	4F[13]	61[22]	6F[29]
04	-	-	02	34	44	54	64	74	-	-	24	-	5B	4F[14]	7B	6F[30]
05	-	-	25	35	45	55	65	75	-	-	03	-	0E	4F[15]	0F	6F[31]
06	-	-	26	36	46	56	66	76	-	-	-	-	1C	5C	1D	7C
07	-	-	27	37	47	57	67	77	-	-	5F	-	09	-	09[23]	-
08	-	-	28	38	48	58	68	78	-	-	-	-	45[5]	0B	04	0C
09	-	-	29	39	49	59	69	79	-	-	-	-	1F	55[16]	05	06
0A	LF	-	2A	3A	4A	5A	6A	7A	-	-	-	-	45[6]	55[17]	65[24]	75[32]
0B	-	-	2B	3B	4B	-	6B	-	-	-	-	-	45[7]	55[18]	65[25]	75[33]
0C	-	-	2C	3C	4C	-	6C	-	-	-	-	-	49[8]	5E	07	7E
0D	CR	-	2D	3D	4D	-	6D	-	-	-	-	-	49[9]	59[19]	69[26]	79[34]
0E	-	-	2E	3E	4E	-	6E	-	-	-	-	-	49[10]	-	69[27]	-
0F	-	-	2F	3F	4F	11	6F	-	-	-	-	60	49[11]	1E	69[28]	79[35]

[1] : À ⇨ A [2] : Á ⇨ A [3] : Â ⇨ A [4] : Ã ⇨ A [5] : È ⇨ E

[6] : Ê ⇨ E [7] : Ë ⇨ E [8] : Ì ⇨ I [9] : Í ⇨ I [10] : Î ⇨ I

[11] : Ï ⇨ I [12] : Ò ⇨ O [13] : Ó ⇨ O [14] : Ô ⇨ O [15] : Õ ⇨ O

[16] : Ù ⇨ U [17] : Ú ⇨ U [18] : Û ⇨ U [19] : Ý ⇨ Y [20] : á ⇨ a

[21] : â ⇨ a [22] : ã ⇨ a [23] : ç ⇨ Ç [24] : ê ⇨ e [25] : ë ⇨ e

[26] : í ⇨ i [27] : î ⇨ i [28] : ï ⇨ i [29] : ó ⇨ o [30] : ô ⇨ o

[31] : õ ⇨ o [32] : ú ⇨ u [33] : û ⇨ u [34] : ý ⇨ y [35] : ÿ ⇨ y

Conversions from GSM ~~default~~7 bit default alphabet to above character sets are otherwise straightforward, but no conversions of the characters listed below tables are applied.

Annex B (Informative): Example of processing a data block

B.1 Example state diagrams for the block receiver

The state diagrams on the following two pages show how the receiver component at the block level could work. In this example the received octets are processed in two stages.

Stage 1 is a low level function which detects the unique start and end markers, and removes any stuffing octets. The results of this stage are passed to stage 2. Any unexpected octet value after a DLE will be indicated as 'abort'.

Stage 2 assembles the message content and the BCS octets, using octets passed from stage 1 and the 'start' and 'end' indications. A 'start' will always reset the process to state 1 from any state. An 'abort' will always cause a return to state 0 where a 'start' will be awaited. When an 'end' is received in state 1, the following two octets are checked as the BCS. If the BCS is correct, the message content is passed to another stage of the receiver for processing of the message content.

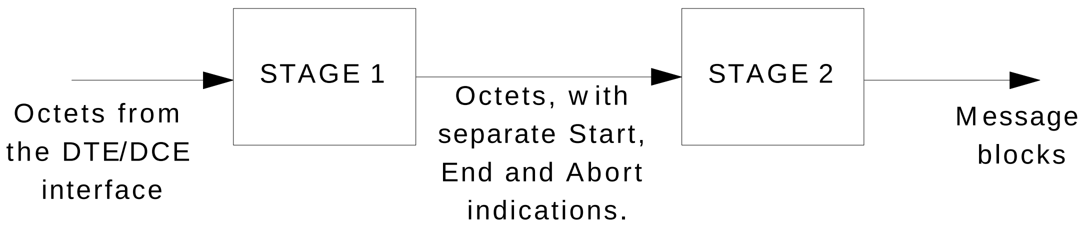
B.2 Example of coding and decoding a data block

The last page of this annex shows the coding of an example message at a transmitter, and the decoding stages at a receiver which has the two stages of processing as described above.

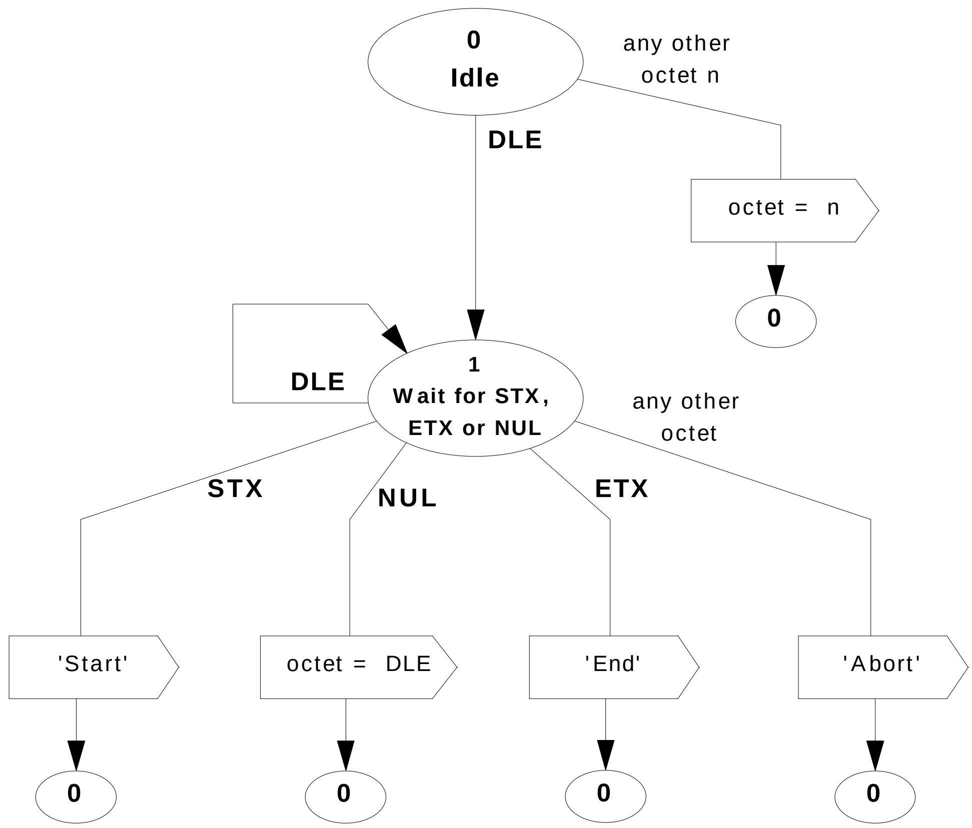
In this example, the message content and the BCS both contain an octet with a value of 10 hex. Therefore the message as transmitted over the interface has additional stuffing octets (00 hex) inserted after these octets. The receiver first detects the start and end markers, and removes the stuffing octets. Finally the BCS is checked.

EXAMPLE STATE DIAGRAMS FOR THE BLOCK RECEIVER

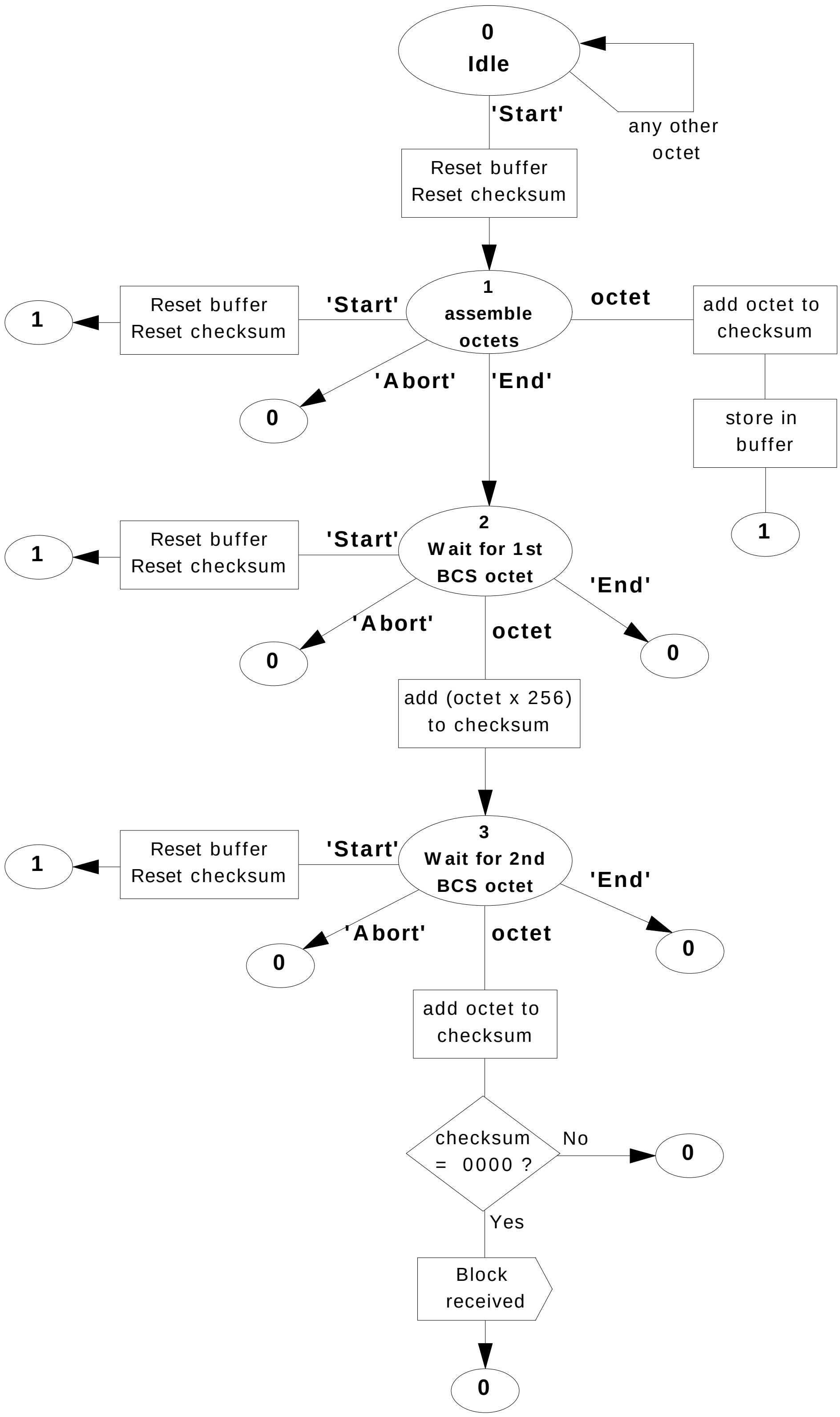
The block receiver can be considered as two stages. Stage 1 detects start and end markers, and removes stuffing characters. Stage 2 assembles the received message and checks the BCS.



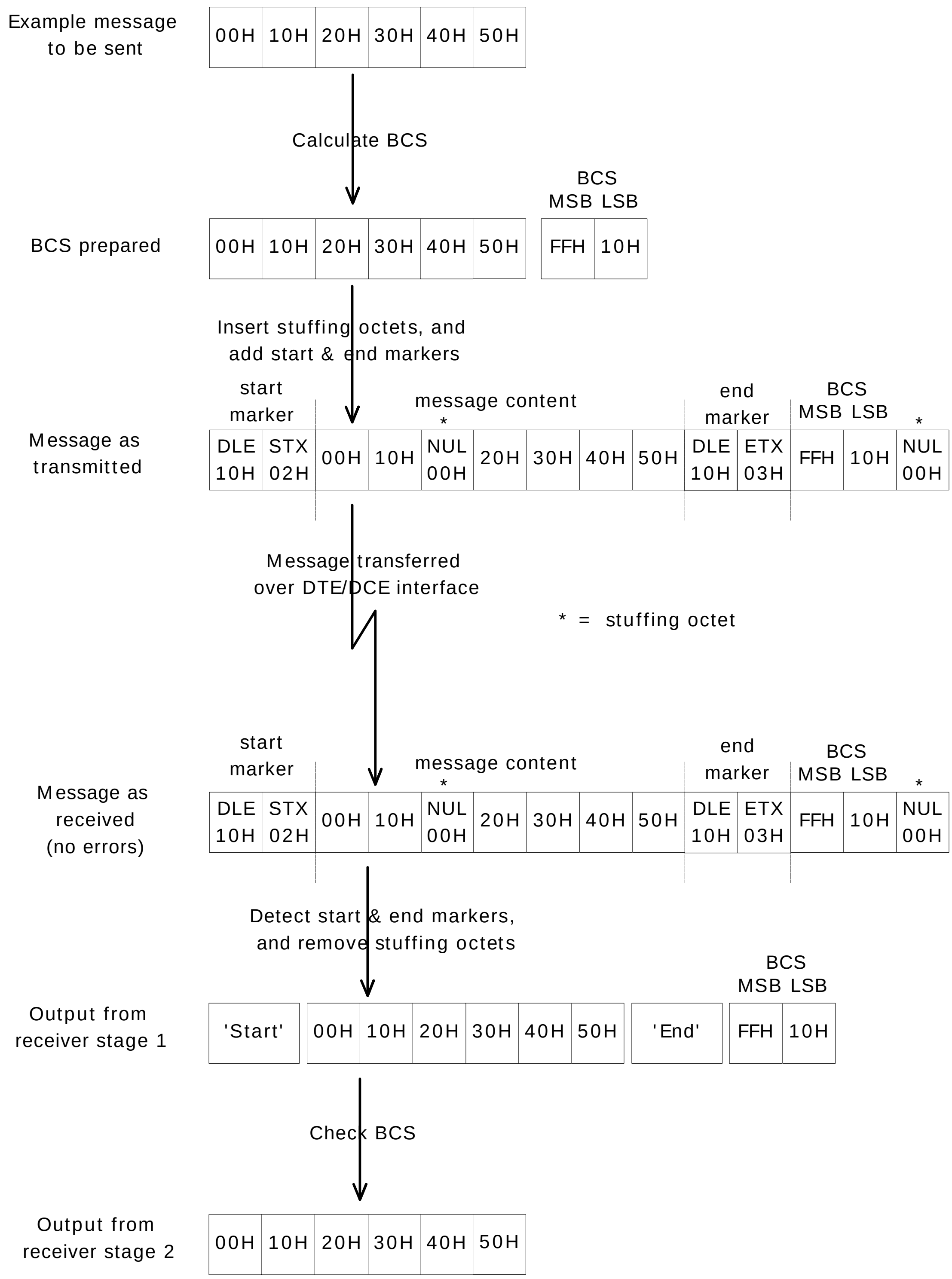
STATE TRANSITIONS IN STAGE 1



STATE TRANSITIONS IN STAGE 2



Example of coding / decoding a message
at the DTE/DCE interface



3GPP-T2/SMG4 Meeting #7
Ystad, Sweden, 22-26 November 1999

Document T2-991049
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.007	**CR**	**016**	Current Version:	3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-T#6	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio		Core Network	

Source: T2 **Date:** 23 nov 1999

Subject: Clarification to result codes for +CLIP +CCWA

Work item: TEI

Category:
(only one category shall be marked with an X)

F	Correction	X	**Release:** Phase 2	
A	Corresponds to a correction in an earlier release		Release 96	
B	Addition of feature		Release 97	
C	Functional modification of feature		Release 98	
D	Editorial modification		Release 99	X
			Release 00	

Reason for change: Clarification on <number> and <type> parameters values in the +CLIP +CCWA result codes when CLI is withheld by the originator or not available due to interworking problems or limitations of originating network.

Clauses affected: 7.6, 7.11

Other specs affected:

Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

2 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 02.02: "Digital cellular telecommunication system (Phase 2+); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[2] GSM 02.03: "Digital cellular telecommunication system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 02.81: "Digital cellular telecommunication system (Phase 2+); Line identification supplementary services - Stage 1".

[4] GSM 02.82: "Digital cellular telecommunication system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 1".

[5] GSM 02.83: "Digital cellular telecommunication system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".

[6] GSM 02.88: "Digital cellular telecommunication system (Phase 2+); Call Barring (CB) supplementary services - Stage 1".

[7] GSM 03.03: "Digital cellular telecommunication system (Phase 2+); Numbering, addressing and identification".

[8] GSM 04.08: "Digital cellular telecommunication system (Phase 2+); Mobile radio interface layer 3 specification".

[9] GSM MoU SE.13, GSM MoU Permanent Reference Document SE.13: "GSM Mobile Network Codes and Names".

[10] ITU-T Recommendation E.212: "Identification plan for land mobile stations".

[11] ITU-T Recommendation T.31: "Asynchronous facsimile DCE control, service class 1".

[12] ITU-T Recommendation T.32: "Asynchronous facsimile DCE control, service class 2".

[13] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information exchange".

[14] ITU-T Draft new Recommendation V.25ter: "Serial asynchronous automatic dialling and control".

[15] Telecommunications Industry Association TIA IS-99: "Data Services Option Standard for Wideband Spread Spectrum Digital Cellular System".

[16] Telecommunications Industry Association TIA IS-135: "800 MHz Cellular Systems, TDMA Services, Async Data and Fax".

[17] Portable Computer and Communications Association PCCA STD-101 Data Transmission Systems and Equipment: "Serial Asynchronous Automatic Dialling and Control for Character Mode DCE on Wireless Data Services".

[18] GSM 04.22: "Digital cellular telecommunication system (Phase 2+); Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[19] GSM 02.30: "Digital cellular telecommunication system (Phase 2+); Man Machine Interface (MMI) of the Mobile Station (MS)".

[20] GSM 05.08: "Digital cellular telecommunication system (Phase 2+); Radio subsystem link control".

[21] GSM 02.85: "Digital cellular telecommunication system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 1".

[22] GSM 02.84: "Digital cellular telecommunication system (Phase 2+); MultiParty (MPTY) supplementary services - Stage 1".

[23] GSM 02.90: "Digital cellular telecommunication system (Phase 2+); Stage 1 description of Unstructured Supplementary Service Data (USSD)".

[24] GSM 07.05: "Digital cellular telecommunication system (Phase 2+); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".

[25] GSM 03.38: "Digital cellular telecommunication system (Phase 2+); Alphabet and language specific information".

[26] GSM 02.24: "Digital cellular telecommunication system (Phase 2+); Description of Charge Advice Information (CAI)".

[27] GSM 02.86: "Digital cellular telecommunication system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 1".

[28] GSM 11.11: "Digital cellular telecommunication system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM-ME) interface".

[29] GSM 02.34: "Digital cellular telecommunication system (Phase 2+); High Speed Circuit Switched Data (HSCSD) - Stage 1”.

[30] GSM 02.91: “Digital cellular telecommunication system (Phase 2+); Explicit Call Transfer (ECT) supplementary service - Stage 1”.

[31] GSM 02.72: “Digital cellular telecommunication system (Phase 2+); Call Deflection (CD) supplementary service - Stage 1”.

[32] ISO/IEC10646: "Universal Multiple-Octet Coded Character Set (UCS)”; UCS2, 16 bit coding.

[33] GSM 02.22: “Digital cellular telecommunication system (Phase 2+); Personalisation of GSM Mobile Equipment (ME) Mobile functionality specification”.

[34] GSM 07.60: "Digital cellular telecommunication system (Phase 2+); General requirements on Mobile Stations (MS) supporting General Packet Radio Bearer Service (GPRS)".

[35] CCITT Recommendation V.110: "Support of data terminal equipments (DTEs) with V-Series interfaces by an integrated services digital network".

[36] CCITT Recommendation V.120: "Support by an ISDN of data terminal equipment with V-Series type interfaces with provision for statistical multiplexing".

[37] ITU-T Recommendation X.31: "Support of packet mode terminal equipment by an ISDN".

[38] GSM 05.05: “Digital cellular telecommunication system (Phase 2+); Radio transmission and reception”.

[39] GSM 09.61: "Digital cellular telecommunication system (Phase 2+); General Packet Radio Service (GPRS); Interworking between the Public Land Mobile Network (PLMN) supporting GPRS and Packet Data Networks (PDN)".

[x1] 3G TS 23.081: "3rd Generation Partnership Project; Technical Specification Group Core Network; Line identification supplementary services - Stage 2".

7.6 Calling line identification presentation +CLIP

Table 39: +CLIP parameter command syntax

Command	Possible response(s)
+CLIP=[<n>]	
+CLIP?	+CLIP: <n>,<m>
+CLIP=?	+CLIP: (list of supported <n>s)

Description

This command refers to the GSM supplementary service CLIP (Calling Line Identification Presentation) that enables a called subscriber to get the calling line identity (CLI) of the calling party when receiving a mobile terminated call. Set command enables or disables the presentation of the CLI at the TE. It has no effect on the execution of the supplementary service CLIP in the network.

When the presentation of the CLI at the TE is enabled (and calling subscriber allows), `+CLIP: <number>,<type>[,<subaddr>,<satype>[,[<alpha>][,<CLI validity>]]]` response is returned after every `RING` (or `+CRING: <type>`; refer subclause "Cellular result codes +CRC") result code sent from TA to TE. It is manufacturer specific if this response is used when normal voice call is answered.

Read command gives the status of <n>, and also triggers an interrogation of the provision status of the CLIP service according GSM 02.81 [3] (given in <m>).Test command returns values supported by the TA as a compound value.

Defined values

<n> (parameter sets/shows the result code presentation status in the TA):

<u>0</u> disable

1 enable

<m> (parameter shows the subscriber CLIP service status in the network):

0 CLIP not provisioned

1 CLIP provisioned

2 unknown (e.g. no network, etc.)

<number>: string type phone number of format specified by <type>

<type>: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7)

<subaddr>: string type subaddress of format specified by <satype>

<satype>: type of subaddress octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.8)

<alpha>: optional string type alphanumeric representation of <number> corresponding to the entry found in phonebook; used character set should be the one selected with command Select TE Character Set +CSCS

<CLI validity>:

0 CLI valid

1 CLI has been withheld by the originator.

2 CLI is not available due to interworking problems or limitations of originating network.

<u>When CLI is not available (<CLI validity>=2), <number> shall be an empty string (“”) and <type> value will not be significant. Nevertheless, TA may return the recommended value **128** for <type> ((TON/NPI unknown in accordance with GSM 04.08 [8] subclause 10.5.4.7).</u>

When CLI has been withheld by the originator, (<CLI validity>=1) and the CLIP is provisioned with the "override category" option (refer GSM 02.81[3] and 3G TS 23.081[x1]), <number> and <type> is provided. Otherwise, TA shall return the same setting for <number> and <type> as if the CLI was not available.

Implementation

Optional.

7.11 Call waiting +CCWA

Table 44: +CCWA parameter command syntax

Command	Possible response(s)
+CCWA=[<n>[,<mode>[,<class>]]]	*+CME ERROR: <err>* **when <mode>=2 and command successful** +CCWA: <status>,<class1> [<CR><LF>+CCWA: <status>,<class2> [...]]
+CCWA?	+CCWA: <n>
+CCWA=?	+CCWA: (list of supported <n>s)

Description

This command allows control of the Call Waiting supplementary service according to GSM 02.83 [5]. Activation, deactivation and status query are supported. When querying the status of a network service (<mode>=2) the response line for 'not active' case (<status>=0) should be returned only if service is not active for any <class>. Parameter <n> is used to disable/enable the presentation of an unsolicited result code +CCWA: <number>,<type>,<class>,[<alpha>][,<CLI validity>] to the TE when call waiting service is enabled. Command should be abortable when network is interrogated.

The interaction of this command with other commands based on other GSM supplementary services is described in the GSM standard.

Test command returns values supported by the TA as a compound value.

Defined values

<n> (sets/shows the result code presentation status in the TA):

0 disable

1 enable

<mode> (when <mode> parameter is not given, network is not interrogated):

0 disable

1 enable

2 query status

<class*x*> is a sum of integers each representing a class of information (default 7):

1 voice (telephony)

2 data (refers to all bearer services; with <mode>=2 this may refer only to some bearer service if TA does not support values 16, 32, 64 and 128)

4 fax (facsimile services)

8 short message service

16 data circuit sync

32 data circuit async

64 dedicated packet access

128 dedicated PAD access

`<status>`:

0 not active

1 active

`<number>`: string type phone number of calling address in format specified by `<type>`

`<type>`: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7)

`<alpha>`: optional string type alphanumeric representation of `<number>` corresponding to the entry found in phonebook; used character set should be the one selected with command Select TE Character Set `+CSCS`

`<CLI validity>`:

0 CLI valid

1 CLI has been withheld by the originator.

2 CLI is not available due to interworking problems or limitations of originating network.

When CLI is not available (`<CLI validity>`=2), `<number>` shall be an empty string (“”) and `<type>` value will not be significant. Nevertheless, TA may return the recommended value **128** for <type> ((TON/NPI unknown in accordance with GSM 04.08 [8] subclause 10.5.4.7).

When CLI has been withheld by the originator, (`<CLI validity>`=1) and the CLIP is provisioned with the “override category” option (refer GSM 02.81[3] and 3G TS 23.081[x1]), <number> and <type> is provided. Otherwise, TA shall return the same setting for <number> and <type> as if the CLI was not available.

Implementation

Optional.

3GPP/SMG Meeting #7
Ystad, Sweden, 22-26 Nov 1999

Document* *T2-991050
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.007	**CR**	**017**	Current Version:	3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-T#6	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source:	T2	**Date:**	18.11.99
Subject:	AT command for Frame Tunnelling Mode (FTM)		
Work item:	Frame Tunnelling Mode		

Category: *(only one category shall be marked with an X)*

F	Correction		Phase 2	
A	Corresponds to a correction in an earlier release		Release 96	
B	Addition of feature	X	Release 97	
C	Functional modification of feature		Release 98	
D	Editorial modification		Release 99	X
			Release 00	

Release:

Reason for change: FTM may be used when a mobile user connects to an Internet Service Provider using the PPP. (For further info on FTM see the WI description, T2-990964). This CR proposes to expand the +CBST command in order to enable the user to select FTM.

Clauses affected: 2, 3.1 and 6.7

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	N3-99273 (27.001), N3-99274(29.007)
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

2 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 02.02: "Digital cellular telecommunication system (Phase 2+); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[2] GSM 02.03: "Digital cellular telecommunication system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 02.81: "Digital cellular telecommunication system (Phase 2+); Line identification supplementary services - Stage 1".

[4] GSM 02.82: "Digital cellular telecommunication system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 1".

[5] GSM 02.83: "Digital cellular telecommunication system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".

[6] GSM 02.88: "Digital cellular telecommunication system (Phase 2+); Call Barring (CB) supplementary services - Stage 1".

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[8] GSM 04.08: "Digital cellular telecommunication system (Phase 2+); Mobile radio interface layer 3 specification".

[9] GSM MoU SE.13, GSM MoU Permanent Reference Document SE.13: "GSM Mobile Network Codes and Names".

[10] ITU-T Recommendation E.212: "Identification plan for land mobile stations".

[11] ITU-T Recommendation T.31: "Asynchronous facsimile DCE control, service class 1".

[12] ITU-T Recommendation T.32: "Asynchronous facsimile DCE control, service class 2".

[13] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information exchange".

[14] ITU-T Draft new Recommendation V.25ter: "Serial asynchronous automatic dialling and control".

[15] Telecommunications Industry Association TIA IS-99: "Data Services Option Standard for Wideband Spread Spectrum Digital Cellular System".

[16] Telecommunications Industry Association TIA IS-135: "800 MHz Cellular Systems, TDMA Services, Async Data and Fax".

[17] Portable Computer and Communications Association PCCA STD-101 Data Transmission Systems and Equipment: "Serial Asynchronous Automatic Dialling and Control for Character Mode DCE on Wireless Data Services".

[18] GSM 04.22: "Digital cellular telecommunication system (Phase 2+); Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[19] GSM 02.30: "Digital cellular telecommunication system (Phase 2+); Man Machine Interface (MMI) of the Mobile Station (MS)".

[20] GSM 05.08: "Digital cellular telecommunication system (Phase 2+); Radio subsystem link control".

[21] GSM 02.85: "Digital cellular telecommunication system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 1".

[22] GSM 02.84: "Digital cellular telecommunication system (Phase 2+); MultiParty (MPTY) supplementary services - Stage 1".

[23] GSM 02.90: "Digital cellular telecommunication system (Phase 2+); Stage 1 description of Unstructured Supplementary Service Data (USSD)".

[24] GSM 07.05: "Digital cellular telecommunication system (Phase 2+); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".

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[36] CCITT Recommendation V.120: "Support by an ISDN of data terminal equipment with V-Series type interfaces with provision for statistical multiplexing".

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[39] GSM 09.61: "Digital cellular telecommunication system (Phase 2+); General Packet Radio Service (GPRS); Interworking between the Public Land Mobile Network (PLMN) supporting GPRS and Packet Data Networks (PDN)".

[40] 3G TS 27.001: “3rd Generation Partnership Project; Technical Specification Group Core Network; General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)”.

[41] 3G TS 29.007: “3rd Generation Partnership Project; Technical Specification Group Core Network; General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

3 Abbreviations and definitions

3.1 Abbreviations

For the purposes of this TS, the following abbreviations apply:

AT	ATtention; this two-character abbreviation is always used to start a command line to be sent from TE to TA
BCD	Binary Coded Decimal
ETSI	European Telecommunications Standards Institute
FTM	Frame Tunnelling Mode (refer 3G TS 27.001 [40] and 3G TS 29.007[41])
HSCSD	High Speed Circuit Switched Data
IHOSS	Internet Hosted Octet Stream Service
IMEI	International Mobile station Equipment Identity
IRA	International Reference Alphabet (ITU-T T.50 [13])
IrDA	Infrared Data Association
ISO	International Standards Organisation
ITU-T	International Telecommunication Union - Telecommunications Standardization Sector
ME	Mobile Equipment, e.g. a GSM phone (equal to MS; Mobile Station)
MoU	Memorandum of Understanding (GSM operator joint)
OSP	Octet Stream Protocol
OSP:IHOSS	Octet Stream Protocol for Internet Hosted Octet Stream Service
PCCA	Portable Computer and Communications Association
RDI	Restricted Digital Information
RLP	Radio Link Protocol
SIM	Subscriber Identity Module
TA	Terminal Adaptor, e.g. a GSM data card (equal to DCE; Data Circuit terminating Equipment)
TE	Terminal Equipment, e.g. a computer (equal to DTE; Data Terminal Equipment)
TIA	Telecommunications Industry Association
UDI	Unrestricted Digital Information

6.7 Select bearer service type +CBST

Table 1: +CBST parameter command syntax

Command	Possible response(s)
`+CBST=[<speed>[,<name>[,<ce>]]]`	
`+CBST?`	`+CBST: <speed>,<name>,<ce>`
`+CBST=?`	`+CBST:` (list of supported `<speed>`s)`,`(list of supported `<name>`s)`,`(list of supported `<ce>`s)

Description

Set command selects the bearer service `<name>` with data rate `<speed>`, and the connection element `<ce>` to be used when data calls are originated (refer GSM 02.02 [1]). Values may also be used during mobile terminated data call setup, especially in case of single numbering scheme calls (refer `+CSNS`).

Test command returns values supported by the TA as compound values.

Defined values

NOTE: The default values of the subparameters are manufacturer specific since they depend on the purpose of the device and data services provided by it. Not all combinations of these subparameters are supported by GSM (refer GSM 02.02 [1]).

`<speed>`:

0	autobauding (automatic selection of the speed; this setting is possible in case of 3.1 kHz modem and non-transparent service)
1	300 bps (V.21)
2	1200 bps (V.22)
3	1200/75 bps (V.23)
4	2400 bps (V.22bis)
5	2400 bps (V.26ter)
6	4800 bps (V.32)
7	9600 bps (V.32)
12	9600 bps (V.34)
14	14400 bps (V.34)
15	19200 bps (V.34)
16	28800 bps (V.34)
34	1200 bps (V.120)
36	2400 bps (V.120)
38	4800 bps (V.120)
39	9600 bps (V.120)
43	14400 bps (V.120)
47	19200 bps (V.120)
48	28800 bps (V.120)
49	38400 bps (V.120)
50	48000 bps (V.120)
51	56000 bps (V.120)
65	300 bps (V.110)
66	1200 bps (V.110)
68	2400 bps (V.110 or X.31 flag stuffing)
70	4800 bps (V.110 or X.31 flag stuffing)
71	9600 bps (V.110 or X.31 flag stuffing)
75	14400 bps (V.110 or X.31 flag stuffing)
79	19200 bps (V.110 or X.31 flag stuffing)
80	28800 bps (V.110 or X.31 flag stuffing)
81	38400 bps (V.110 or X.31 flag stuffing)
82	48000 bps (V.110 or X.31 flag stuffing)

83	56000 bps (V.110 or X.31 flag stuffing; this setting can be used in conjunction with asynchronous non-transparent UDI or RDI service in order to get FTM)
84	64000 bps (X.31 flag stuffing; this setting can be used in conjunction with asynchronous non-transparent UDI service in order to get FTM)
115	56000 bps (bit transparent)
116	64000 bps (bit transparent)

also all other values below 128 are reserved by this TS

`<name>`:

0	data circuit asynchronous (UDI or 3.1 kHz modem)
1	data circuit synchronous (UDI or 3.1 kHz modem)
2	PAD Access (asynchronous) (UDI)
3	Packet Access (synchronous) (UDI)
4	data circuit asynchronous (RDI)
5	data circuit synchronous (RDI)
6	PAD Access (asynchronous) (RDI)
7	Packet Access (synchronous) (RDI)

also all other values below 128 are reserved by this TS

`<ce>`:

0	transparent
1	non-transparent
2	both, transparent preferred
3	both, non-transparent preferred

Implementation

Mandatory when data calls implemented.

3GPP-T2/SMG4 Meeting #7
Ystad, Sweden, 22-26 November 1999

Document T2-991128
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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27.007 CR 018 Current Version: 3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-T#6	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source: T2 **Date:** 26 nov 1999

Subject: New AT command for application protocols activation

Work item: TEI

Category:				**Release:**		
	F	Correction			Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature	X		Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: Needed when the link between TE and ME does not provide itself a mean by which a client device wants to establish a protocol connection and/or an associated level of service with a remote server device

Clauses affected: 8.XX

Other specs affected:				
	Other 3G core specifications		→ List of CRs:	
	Other GSM core specifications		→ List of CRs:	
	MS test specifications		→ List of CRs:	
	BSS test specifications		→ List of CRs:	
	O&M specifications		→ List of CRs:	

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

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- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
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[11] ITU-T Recommendation T.31: "Asynchronous facsimile DCE control, service class 1".

[12] ITU-T Recommendation T.32: "Asynchronous facsimile DCE control, service class 2".

[13] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information exchange".

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[39] GSM 09.61: "Digital cellular telecommunication system (Phase 2+); General Packet Radio Service (GPRS); Interworking between the Public Land Mobile Network (PLMN) supporting GPRS and Packet Data Networks (PDN)".

[x1] Infrared Data Association; Specification of Ir Mobile Communications (IrMC) version 1.1, March 01,1999

[x2] IrDA Object Exchange Protocol version 1.2, March 18, 1999

8.XX Enter protocol mode+CPROT

Table XX : +CPROT parameter command syntax

Command	Possible response(s)
+CPROT=<proto>[,<version>[,<lsap1>[,...[<lsapN>]]]]	CONNECT NO CARRIER OK ERROR *+CME ERROR: <err>*
+CPROT?	+CPROT : <proto>[,<version>[,<lsap1>[,...[,<lsapN]]]]
+CPROT=?	+CPROT: <proto1>[,(list of supported <version>s)[,(list of supported <lsap1>s)[,...[,(list of supported <lsapN>s)]]]] [<CR><LF> +CPROT : <proto2>[,(list of supported <version>s)[,(list of supported <lsap1>s)[,...[,(list of supported <lsapN>s)]]]]] [...]]]]]

Description

Set command informs TA that TE wants to establish a peer-to-peer protocol <proto> or upper layer connection (indicating by the <lsap>s setting) with the ME on the link from which the command was received.
This command can be used in case the link between TE and ME does not provide itself such a mechanism.

If ME has succeeded in establishing a logical link between application protocols and external interface, it will send CONNECT message to the TE. Otherwise, the NO CARRIER response will be returned.

If the CONNECT response is received, TE can start sending <proto> or upper layer frames.

The connection shall always return for <proto> mode when the protocol session is ended. When the ME receives a disconnect request from its peer entity, it will process it and send OK response to the TE indicating its capability for receiving new AT commands. Since <proto> or upper layers can be accessed in other ways, TA must have pre-knowledge of the fact that connection is initiated with AT+CPROT command. This means that switch to <proto> mode must include some sort of notification to the protocol entity.

This command can be aborted by sending a <proto> or upper layer disconnection frame. In that case, ME will return in command mode by sending the OK response.

Refer subclause 9.2 for possible <err> values.

Read command return the current <proto> optionally including <version> and <lsapI> settings.

Test command returns values supported by the TA as a compound value.

Defined values

`<proto>`

0 OBEX (refer.[x2])

…15reserved by this TS

16... manufacturer specific

`<version>:` version number of `<proto>`. The total number of characters, including line terminators, in the information text shall not exceed 2048 characters.

`<lsap1>:` defines a level of service or application protocol on the top of `<proto>` layer. It may refer to services or protocols defined in other standards development organisations (SDOs).

1 IrMC level 1 (Minimum Level) Only .(refer [x1] subclause 2.9.4)

2 IrMC level 1 and 2 (Minimum and Access Levels) Only. .(refer [x1] subclause 2.9.4)

4 IrMC level 1, 2 and 3 (Minimum, Access, Index Levels) Only- implies static index support. .(refer [x1] subclause 2.9.4)

8 IrMC level 1, 2 and 4 (Minimum, Access and Sync Levels) Only-implies unique index support. .(refer [x1] subclause 2.9.4)

10 IrMC level 1, 2, 3 and 4 (Minimum, Access, Index and Sync Levels)-implies support of static and unique index. .(refer [x1] subclause 2.9.4)

…15 reserved by this TS

16... manufacturer specific

`<lsap2>...<lsapN>`

In case <lsapN>,<lsapN+1> received in the +CPROT command identifies protocol layers, the protocol identified by N+1 shall be on the top of the protocol identified by N on a framework point of view.

0…15 reserved by this TS

16... manufacturer specific

Implementation

Optional.

3GPP TSG-T WG2 /SMG4 Meeting #7
Ystad, Sweden, 22-26 Nov 1999

Document T2-99954
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.007	**CR**	**019**	Current Version:	3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-T #6	for approval	**X**	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source: T2 **Date:** 1999-11-18

Subject: AT-commands for Enhanced QoS Support management.

Work item: Enhanced QoS Support in GPRS.

Category:				**Release:**		
	F	Correction			Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category shall be marked with an X)	B	Addition of feature	**X**		Release 97	
	C	Functional modification of feature			Release 98	
	D	Editorial modification			Release 99	**X**
					Release 00	

Reason for change: The ability to support enhanced QoS in UMTS has been incorporated in the main specifications of UMTS packet domain. This CR updates the 27.007 accordingly. It also updates the 27.007 ch 10 to have it in line with the 23.060 vocabulary.

Clauses affected: 10, 10.1, 10.1.2-10.1.6, 10.1.8-10.1.13, 10.1.15, 10.2, 10.2.1, 10.2.1.1, 10.2.2, 10.2.2.1. In addition the following new sections have been added: 10.1.t-10.1.z.

Other specs affected:				
	Other 3G core specifications		→ List of CRs:	
	Other GSM core specifications		→ List of CRs:	
	MS test specifications		→ List of CRs:	
	BSS test specifications		→ List of CRs:	
	O&M specifications		→ List of CRs:	

Other comments: Refer to 3G TS 23.060 for a description of the enhanced QoS support.

help.doc

<--------- double-click here for help and instructions on how to create a CR.

10 Commands for ~~GPRS~~UMTS Packet Domain

This clause defines commands that a TE may use to control a ~~GPRS~~ MT supporting packet switched services. Other aspects of a ~~GPRS~~Packet Domain MT are described in 3G TS ~~GSM 0~~27.060 [34].

It is anticipated that ~~GPRS~~Packet Domain MTs will vary widely in functionality. At one extreme, a ~~class A~~ MT supporting CS/PS or class-A mode of operation might support multiple PDP types as well as circuit switched data, and use multiple external networks and QoS profiles. At the other extreme a ~~class C~~ MT supporting only PS or class-C mode of operation might support only a single PDP type using a single external network, and rely on the HLR to contain the PDP context definition.

A comprehensive set of Packet Domain~~GPRS~~-specifc commands is defined in clause 10.1 to provide the flexibility needed by the more complex MT. The commands are designed to be expandable to accommodate new PDP types and interface protocols, merely by defining new values for many of the parameters. Multiple contexts may be activated if the interface link-layer protocol is able to support them. The commands use the extended information and error message capabilities described in this specification.

For MTs of intermediate complexity, most commands have simplified forms where certain parameters may be omitted.

For the simplest MTs, and for backwards compatibility with existing communications software, it is possible to control access to the Packet Domain~~GPRS~~ using existing modem-compatible commands. A special dial-string syntax is defined for use with the D command. This "modem compatible" mode of operation is described in subclause 10.2.

A discussion on the interaction of the AT commands, Packet Domain~~GPRS~~ Management and Packet Data Protocols, together with examples of command sequences for a number of applications may be found in 3G TS ~~GSM 0~~27.060 [34].

10.1 Commands specific to MTs supporting the ~~GPRS~~Packet Domain

10.1.1 Define PDP Context +CGDCONT

Table 1: +CGDCONT parameter command syntax

Command	Possible response(s)
+CGDCONT=[<cid> [,<PDP_type> [,<APN> [,<PDP_addr> [,<d_comp> [,<h_comp> [,<pd1> [,…[,pdN]]]]]]]]]	OK ERROR
+CGDCONT?	+CGDCONT: <cid>, <PDP_type>, <APN>,<PDP_addr>, <data_comp>, <head_comp>[,<pd1>[,…[,pdN]]] [<CR><LF>+CGDCONT: <cid>, <PDP_type>, <APN>,<PDP_addr>, <data_comp>, <head_comp>[,<pd1>[,…[,pdN]]] [...]]
+CGDCONT=?	+CGDCONT: (range of supported <cid>s), <PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s)[,(list of supported <pd1>s)[,…[,(list of supported <pdN>s)]]] [<CR><LF>+CGDCONT: (range of supported <cid>s), <PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s)[,(list of supported <pd1>s)[,…[,(list of supported <pdN>s)]]] [...]]

Description

The set command specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter, `<cid>`. The number of PDP contexts that may be in a defined state at the same time is given by the range returned by the test command.

A special form of the set command, +CGDCONT= `<cid>` causes the values for context number `<cid>` to become undefined.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, `<PDP_type>`, the parameter value ranges for each `<PDP_type>` are returned on a separate line.

Defined values

`<cid>`: (PDP Context Identifier) a numeric parameter which specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value = 1) is returned by the test form of the command.

`<PDP_type>`: (Packet Data Protocol type) a string parameter which specifies the type of packet data protocol

X25	ITU-T/CCITT X.25 layer 3
IP	Internet Protocol (IETF STD 5)
OSPIH	Internet Hosted Octet Stream Protocol
PPP	Point to Point Protocol (IETF STD 51)

`<APN>`: (Access Point Name) a string parameter which is a logical name that is used to select the GGSN or the external packet data network.

If the value is null or omitted, then the subscription value will be requested.

<PDP_`address>`: a string parameter that identifies the MT in the address space applicable to the PDP.

If the value is null or omitted, then a value may be provided by the TE during the PDP startup procedure or, failing that, a dynamic address will be requested.

The read form of the command will continue to return the null string even if an address has been allocated during the PDP startup procedure. The allocated address may be read using the +CGPADDR command.

`<d_comp>`: a numeric parameter that controls PDP data compression
0 - off (default if value is omitted)
1 - on
Other values are reserved.

`<h_comp>`: a numeric parameter that controls PDP header compression
0 - off (default if value is omitted)
1 - on
Other values are reserved.

NOTE. At present only one data compression algorithm (V.42bis) is provided in SNDCP. If and when other algorithms become available, a command will be provided to select one or more of these.

`<pd1>`, … `<pdN>`: zero to N string parameters whose meanings are specific to the <PDP_type>

For PDP type OSP:IHOSS the following parameters are defined:

<pd1> = <host>	the fully formed domain name extended hostname of the Internet host
<pd2> = <port >	the TCP or UDP port on the Internet host
<pd3> = <protocol>	the protocol to be used over IP on the Internet - "TCP" or "UDP

Implementation

Mandatory unless only a single subscribed context is supported.

10.1.t Define Secondary PDP Context +CGDSCONT

Table 2: +CGDSCONT parameter command syntax

Command	Possible response(s)
+CGDSCONT=[<cid> ,<p_cid> [,<d_comp> [,<h_comp>]]]	OK ERROR
+CGDSCONT?	+CGDSCONT: <cid>, <p_cid>, <data_comp>, <head_comp> [<CR><LF>+CGDSCONT: <cid>, <p_cid>, <data_comp>, <head_comp> [...]]
+CGDSCONT=?	+CGDSCONT: (range of supported <cid>s), (list of <cid>s for active primary contexts), <PDP_type>,,,(list of supported <d_comp>s), (list of supported <h_comp>s) [<CR><LF>+CGDCONT: (range of supported <cid>s), (list of <cid>s for active primary contexts) ,<PDP_type>,,,(list of supported <d_comp>s), (list of supported <h_comp>s) [...]]

Description

The set command specifies PDP context parameter values for a Secondary PDP context identified by the (local) context identification parameter, `<cid>`. The number of PDP contexts that may be in a defined state at the same time is given by the range returned by the test command.

A special form of the set command, +CGDSCONT= `<cid>` causes the values for context number `<cid>` to become undefined.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, `<PDP_type>`, the parameter value ranges for each `<PDP_type>` are returned on a separate line.

Defined values

`<cid>`: (PDP Context Identifier) a numeric parameter which specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value = 1) is returned by the test form of the command.

`<p_cid>`: (Primary PDP Context Identifier) a numeric parameter which specifies a particular PDP context definition which has been specified by use of the +CGDCONT command. The parameter is local to the TE-MT interface. The list of permitted values is returned by the test form of the command.

`<PDP_type>`: (Packet Data Protocol type) a string parameter which specifies the type of packet data protocol

X25	ITU-T/CCITT X.25 layer 3
IP	Internet Protocol (IETF STD 5)
OSPIH	Internet Hosted Octet Stream Protocol
PPP	Point to Point Protocol (IETF STD 51)

`<d_comp>`: a numeric parameter that controls PDP data compression (applicable to GPRS only)
0 - off (default if value is omitted)
1 - on
Other values are reserved.

`<h_comp>`: a numeric parameter that controls PDP header compression
0 - off (default if value is omitted)

1 - on
Other values are reserved.

NOTE. At present only one data compression algorithm (V.42bis) is provided in SNDCP. If and when other algorithms become available, a command will be provided to select one or more of these. (GPRS only)

Implementation

Optional.

10.1.u Traffic Flow Template +CGTFT

Table 3: +CGTFT parameter command syntax

Command	Possible Response(s)
`+CGTFT=[<cid>, [<packet filter identifier>, <evaluation precedence index> [,<source address and subnet mask> [,<protocol number (ipv4) / next header (ipv6)> [,<destination port range> [,<source port range> [,<ipsec security parameter index (spi)> [,<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask> [,<flow label (ipv6)>]]]]]]]]]`	OK ERROR
`+CGTFT?`	`+CGTFT: <cid>, <packet filter identifier>, <evaluation precedence index>, <source address and subnet mask>, <protocol number (ipv4) / next header (ipv6)>, <destination port range>, <source port range>, <ipsec security parameter index (spi)>, <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>, <flow label (ipv6)>`  `[<CR><LF>+CGTFT: <cid>, <packet filter identifier>, <evaluation precedence index>, <source address and subnet mask>, <protocol number (ipv4) / next header (ipv6)>, <destination port range>, <source port range>, <ipsec security parameter index (spi)>, <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>, <flow label (ipv6)>`  `[…]]`
`+CGTFT=?`	`+CGTFT: <PDP_type>, (list of supported <packet filter identifier>s), (list of supported <evaluation precedence index>s), (list of supported <source address and subnet mask>s), (list of supported <protocol number (ipv4) / next header (ipv6)>s), (list of supported <destination port range>s), (list of supported <source port range>s), (list of supported <ipsec security parameter index (spi)>s), (list of supported <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>s), (list of supported`

	<flow label (ipv6)>s) [<CR><LF>+CGTFT: <PDP_type>, (list of supported <packet filter identifier>s), (list of supported <evaluation precedence index>s), (list of supported <source address and subnet mask>s), (list of supported <protocol number (ipv4) / next header (ipv6)>s), (list of supported <destination port range>s), (list of supported <source port range>s), (list of supported <ipsec security parameter index (spi)>s), (list of supported <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>s), (list of supported <flow label (ipv6)>s) […]]

Description

This command allows the TE to specify a Packet Filter - PF for a Traffic Flow Template - TFT that is used in the GGSN for routing of down-link packets onto different QoS flows towards the TE. The concept is further described in the 3G TS 23.060[]. A TFT consists of from one and up to eight Packet Filters, each identified by a unique `<packet filter identifier>`. A Packet Filter also has an `<evaluation precedence index>` that is unique within all TFTs associated with all PDP contexts that are associated with the same PDP address.

The set command specifies a Packet Filters that is to be added to the TFT stored in the MT and used for the context identified by the (local) context identification parameter, `<cid>`. The specified TFT will be stored in the GGSN only at activation or MS-initiated modification of the related context. Since this is the same parameter that is used in the +CGDCONT and +CGDSCONT commands, the +CGTFT command is effectively an extension to these commands. The Packet Filters consist of a number of parameters, each of which may be set to a separate value.

A special form of the set command, +CGTFT= `<cid>` causes all of the Packet Filters in the TFT for context number `<cid>` to become undefined. At any time there may exist only one PDP context with no associated TFT amongst all PDP contexts associated to one PDP address. At an attempt to delete a TFT, which would violate this rule, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

The read command returns the current settings for all Packet Filters for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line. TFTs shall be used for PDP-type IP and PPP only. For PDP-type PPP a TFT is applicable only when IP traffic is carried over PPP. If PPP carries header-compressed IP packets, then a TFT cannot be used.

Defined values

`<cid>`: a numeric parameter which specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3G TS 23.060[] -

`<packet filter identifier>`: Numeric parameter, value range from 1 to 8.

`<source address and subnet mask>`: Consists of dot-separated numeric (0-255) parameters on the form 'a1.a2.a3.a4.m1.m2.m3.m4', for IPv4 and 'a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16.
m1.m2.m3.m4.m5.m6.m7.m8.m9.m10.m11.m12.m13.m14.m15.m16', for IPv6.

`<protocol number (ipv4) / next header (ipv6)>`: Numeric parameter, value range from 0 to 255.

`<destination port range>`: Consists of dot-separated numeric (0-65535) parameters on the form 'f.t'.

<source port range>:Consists of dot-separated numeric (0-65535) parameters on the form 'f.t'.

<ipsec security parameter index (spi)>: Hexadecimal parameter, value range from 00000000 to FFFFFFFF.

<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>: Dot-separated numeric (0-255) parameters on the form 't.m'.

<flow label (ipv6)>: Hexadecimal parameter, value range from 00000 to FFFFF. Valid for IPv6 only.

<evaluation precedence index>: Numeric parameter, value range from 0 to 255.

Some of the above listed attributes may coexist in a Packet Filter while others mutually exclude each other, the possible combinations are shown in 3G TS 23.060[].

Implementation

Optional.

10.1.2 Quality of Service Profile (Requested) +CGQREQ

Table 4: +CGQREQ parameter command syntax

Command	Possible Response(s)
+CGQREQ=[<cid> [,<precedence > [,<delay> [,<reliability.> [,<peak> [,<mean>]]]]]]	OK ERROR
+CGQREQ?	+CGQREQ: <cid>, <precedence >, <delay>, <reliability>, <peak>, <mean> [<CR><LF>+CGQREQ: <cid>, <precedence >, <delay>, <reliability.>, <peak>, <mean> […]]
+CGQREQ=?	+CGQREQ: <PDP_type>, (list of supported <precedence>s), (list of supported <delay>s), (list of supported <reliability>s) , (list of supported <peak>s), (list of supported <mean>s) [<CR><LF>+CGQREQ: <PDP_type>, (list of supported <precedence>s), (list of supported <delay>s), (list of supported <reliability>s) , (list of supported <peak>s), (list of supported <mean>s) […]]

Description

This command allows the TE to specify a Quality of Service Profile that is used when the MT sends an Activate PDP Context Request message to the network.

The set command specifies a profile for the context identified by the (local) context identification parameter, <cid>. Since this is the same parameter that is used in the ~~+CGDCONT command~~+CGDCONT and +CGDSCONT commands, the +CGQREQ command is effectively an extension to these ~~+CGDCONT command~~commands. The QoS profile consists of a number of parameters, each of which may be set to a separate value.

A special form of the set command, +CGQREQ= <cid> causes the requested profile for context number <cid> to become undefined.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line.

Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see ~~+CGDCONT command~~the +CGDCONT and +CGDSCONT commands).

The following parameters are defined in GSM 03.60 -

<precedence>: a numeric parameter which specifies the precedence class

<delay>: a numeric parameter which specifies the delay class

<reliability>: a numeric parameter which specifies the reliability class

<peak>: a numeric parameter which specifies the peak throughput class

<mean>: a numeric parameter which specifies the mean throughput class

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional. If the command is not implemented then all the values are considered to be unspecified.

10.1.3 Quality of Service Profile (Minimum acceptable) +CGQMIN

Table 5: +CGQMIN parameter command syntax

Command	**Possible Response(s)**
+CGQMIN=[<cid> [,<precedence > [,<delay> [,<reliability.> [,<peak> [,<mean>]]]]]]	OK ERROR
+CGQMIN?	+CGQMIN: <cid>, <precedence >, <delay>, <reliability>, <peak>, <mean> [<CR><LF>+CGQMIN: <cid>, <precedence >, <delay>, <reliability.>, <peak>, <mean> […]]
+CGQMIN=?	+CGQMIN: <PDP_type>, (list of supported <precedence>s), (list of supported <delay>s), (list of supported <reliability>s) , (list of supported <peak>s), (list of supported <mean>s) [<CR><LF>+CGQMIN: <PDP_type>, (list of supported <precedence>s), (list of supported <delay>s), (list of supported <reliability>s) , (list of supported <peak>s), (list of supported <mean>s) […]]

Description

This command allows the TE to specify a minimum acceptable profile which is checked by the MT against the negotiated profile returned in the Activate PDP Context Accept message.

The set command specifies a profile for the context identified by the (local) context identification parameter, <cid>. Since this is the same parameter that is used in the ~~+CGDCONT command~~+CGDCONT and +CGDSCONT commands, the +CGQMIN command is effectively an extension to these ~~+CGDCONT command~~ commands. The QoS profile consists of a number of parameters, each of which may be set to a separate value.

A special form of the set command, +CGQMIN= `<cid>` causes the minimum acceptable profile for context number `<cid>` to become undefined. In this case no check is made against the negotiated profile.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line.

Defined values

`<cid>`: a numeric parameter which specifies a particular PDP context definition (see ~~+CGDCONT command~~the +CGDCONT and +CGDSCONT commands).

The following parameters are defined in GSM 03.60 -

`<precedence>`: a numeric parameter which specifies the precedence class

`<delay>`: a numeric parameter which specifies the delay class

`<reliability>`: a numeric parameter which specifies the reliability class

`<peak>`: a numeric parameter which specifies the peak throughput class

`<mean>`: a numeric parameter which specifies the mean throughput class

If a value is omitted for a particular class then this class is not checked.

Implementation

Optional. If the command is not implemented then no check is made against the negotiated profile.

10.1.v 3G Quality of Service Profile (Requested) +CGEQREQ

Table 6: +CGEQREQ parameter command syntax

Command	Possible Response(s)
+CGEQREQ=[<cid> [,<Traffic class> [,<Maximum bitrate> [,<Guaranteed bitrate> [,<Delivery order> [,<Maximum SDU size> [,<SDU format information> [,<SDU error ratio> [,<Residual bit error ratio> [,<Delivery of erroneous SDUs> [,<Transfer delay> [,<Traffic handling priority> [,<Allocation/Retention Priority>]]]]]]]]]]]]]	OK ERROR
+CGEQREQ?	+CGEQREQ: <cid>, <Traffic class> ,<Maximum bitrate> ,<Guaranteed bitrate> ,<Delivery order> ,<Maximum SDU size> ,<SDU format information> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> ,<Allocation/Retention Priority> [<CR><LF>+CGEQREQ: <cid>, <Traffic class> ,<Maximum bitrate> ,<Guaranteed bitrate> ,<Delivery order> ,<Maximum SDU size> ,<SDU format information> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> ,<Allocation/Retention

	Priority> […]]
+CGEQREQ=?	+CGEQREQ: <PDP_type>, (list of supported <Traffic class>s) ,(list of supported <Maximum bitrate>s) ,(list of supported <Guaranteed bitrate>s) ,(list of supported <Delivery order>s) ,(list of supported <Maximum SDU size>s) ,(list of supported <SDU format information>s) ,(list of supported <SDU error ratio>s) ,(list of supported <Residual bit error ratio>s) ,(list of supported <Delivery of erroneous SDUs>s) ,(list of supported <Transfer delay>s) ,(list of supported <Traffic handling priority>s) ,(list of supported <Allocation/Retention Priority>s) [<CR><LF>+CGEQREQ: <PDP_type>, (list of supported <Traffic class>s) ,(list of supported <Maximum bitrate>s) ,(list of supported <Guaranteed bitrate>s) ,(list of supported <Delivery order>s) ,(list of supported <Maximum SDU size>s) ,(list of supported <SDU format information>s) ,(list of supported <SDU error ratio>s) ,(list of supported <Residual bit error ratio>s) ,(list of supported <Delivery of erroneous SDUs>s) ,(list of supported <Transfer delay>s) ,(list of supported <Traffic handling priority>s) ,(list of supported <Allocation/Retention Priority>s) […]]

Description

This command allows the TE to specify a UMTS Quality of Service Profile that is used when the MT sends an Activate PDP Context Request message to the network.

The set command specifies a profile for the context identified by the (local) context identification parameter, `<cid>`. The specified profile will be stored in the MT and sent to the network only at activation or MS-initiated modification of the related context. Since this is the same parameter that is used in the +CGDCONT and +CGDSCONT commands, the +CGEQREQ command is effectively an extension to these commands. The QoS profile consists of a number of parameters, each of which may be set to a separate value.

A special form of the set command, +CGEQREQ= `<cid>` causes the requested profile for context number `<cid>` to become undefined.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line.

Defined values

`<cid>`: a numeric parameter which specifies a particular PDP context definition (see +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3G TS 23.107 -

<Traffic class>: Indicates the type of application for which the UMTS bearer service is optimised.

conversational
streaming
interactive
background

<Maximum bitrate>: Indicates the maximum number of bits delivered by UMTS at a SAP within a period of time, divided by the duration of the period.

<Guaranteed bitrate>: Indicates the guaranteed number of bits delivered by UMTS at a SAP within a period of time (provided that there is data to deliver), divided by the duration of the period.

<Delivery order>: Indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.

0 - no (default if value is omitted)
1 - yes
Other values are reserved.

<Maximum SDU size>: Indicates the maximum allowed SDU size in bits.

<SDU format information>: List of possible exact sizes of SDUs in bits. If the list contains more than one value, colons separate the values.

<SDU error ratio>: Indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of $5•10^{-3}$ would be specified as '5E3'.

<Residual bit error ratio>: Indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as 'mEe'. As an example a target residual bit error ratio of $5•10^{-3}$ would be specified as '5E3'.

<Delivery of erroneous SDUs>: Indicates whether SDUs detected as erroneous shall be delivered or not.

0 - no (default if value is omitted)
1 - yes
Other values are reserved.

<Transfer delay>: Indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds. Transfer delay is specified for one or more fixed SDU sizes. If transfer delay values are specified for more than one fixed SDU size the values shall be separated by commas and be in the same order as the corresponding fixed SDU sizes specified in the <SDU format information> parameter.

<Traffic handling priority>: Numeric parameter (1,2,3,…) that specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers.

<Allocation/Retention Priority>: Numeric parameter (1,2,3,…) that specifies the relative importance compared to other UMTS bearers for allocation and retention of the UMTS bearer.

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional. If the command is not implemented then all the values are considered to be unspecified.

10.1.x 3G Quality of Service Profile (Minimum acceptable) +CGEQMIN

Table 7: +CGEQMIN parameter command syntax

Command	**Possible Response(s)**
+CGEQMIN=[<cid> [,<Traffic class> [,<Maximum bitrate> [,<Guaranteed bitrate> [,<Delivery order> [,<Maximum SDU size> [,<SDU format information> [,<SDU error ratio> [,<Residual bit	OK ERROR

error ratio> [,<Delivery of erroneous SDUs> [,<Transfer delay> [,<Traffic handling priority> [,<Allocation/Retention Priority>]]]]]]]]]]]]]	
+CGEQMIN?	+CGEQMIN: <cid>, <Traffic class> ,<Maximum bitrate> ,<Guaranteed bitrate> ,<Delivery order> ,<Maximum SDU size> ,<SDU format information> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> ,<Allocation/Retention Priority> [<CR><LF>+CGEQMIN: <cid>, <Traffic class> ,<Maximum bitrate> ,<Guaranteed bitrate> ,<Delivery order> ,<Maximum SDU size> ,<SDU format information> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> ,<Allocation/Retention Priority> […]]
+CGEQMIN=?	+CGEQMIN: <PDP_type>, (list of supported <Traffic class>s) ,(list of supported <Maximum bitrate>s) ,(list of supported <Guaranteed bitrate>s) ,(list of supported <Delivery order>s) ,(list of supported <Maximum SDU size>s) ,(list of supported <SDU format information>s) ,(list of supported <SDU error ratio>s) ,(list of supported <Residual bit error ratio>s) ,(list of supported <Delivery of erroneous SDUs>s) ,(list of supported <Transfer delay>s) ,(list of supported <Traffic handling priority>s) ,(list of supported <Allocation/Retention Priority>s) [<CR><LF>+CGEQMIN: <PDP_type>, (list of supported <Traffic class>s) ,(list of supported <Maximum bitrate>s) ,(list of supported <Guaranteed bitrate>s) ,(list of supported <Delivery order>s) ,(list of supported <Maximum SDU size>s) ,(list of supported <SDU format information>s) ,(list of supported <SDU error ratio>s) ,(list of supported <Residual bit error ratio>s) ,(list of supported <Delivery of erroneous SDUs>s) ,(list of supported <Transfer delay>s) ,(list of supported <Traffic handling priority>s) ,(list of supported <Allocation/Retention Priority>s) […]]

Description

This command allows the TE to specify a minimum acceptable profile, which is checked by the MT against the negotiated profile returned in the Activate/Modify PDP Context Accept message.

The set command specifies a profile for the context identified by the (local) context identification parameter, `<cid>`. The specified profile will be stored in the MT and checked against the negotiated profile only at activation or MS-initiated modification of the related context. Since this is the same parameter that is used in the +CGDCONT and +CGDSCONT commands, the +CGEQMIN command is effectively an extension to these commands. The QoS profile consists of a number of parameters, each of which may be set to a separate value.

A special form of the set command, +CGEQMIN= `<cid>` causes the minimum acceptable profile for context number `<cid>` to become undefined. In this case no check is made against the negotiated profile.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line.

Defined values

`<cid>`: a numeric parameter which specifies a particular PDP context definition (see +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3G TS 23.107 -

`<Traffic class>:` Indicates the type of application for which the UMTS bearer service is optimised.
conversational
streaming
interactive
background

`<Maximum bitrate>:` Indicates the maximum number of bits delivered by UMTS at a SAP within a period of time, divided by the duration of the period.

`<Guaranteed bitrate>:` Indicates the guaranteed number of bits delivered by UMTS at a SAP within a period of time (provided that there is data to deliver), divided by the duration of the period.

`<Delivery order>:` Indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.
0 - no (default if value is omitted)
1 - yes
Other values are reserved.

`<Maximum SDU size>:` Indicates the maximum allowed SDU size in bits.

`<SDU format information>:` List of possible exact sizes of SDUs in bits. If the list contains more than one value, the values shall be separated by colons.

`<SDU error ratio>:` Indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of $5\bullet10^{-3}$ would be specified as '5E3'.

`<Residual bit error ratio>:` Indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as 'mEe'. As an example a target residual bit error ratio of $5\bullet10^{-3}$ would be specified as '5E3'.

`<Delivery of erroneous SDUs>:` Indicates whether SDUs detected as erroneous shall be delivered or not.
0 - no (default if value is omitted)
1 - yes
Other values are reserved.

`<Transfer delay>:` Indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds. Transfer delay is specified for one or more fixed SDU sizes. If transfer delay values are specified for more than one fixed SDU size the values shall be separated by commas and be in the same order as the corresponding fixed SDU sizes specified in the <SDU format information> parameter.

<Traffic handling priority>: Numeric parameter (1,2,3,…) that specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers.

<Allocation/Retention Priority>: Numeric parameter (1,2,3,…) that specifies the relative importance compared to other UMTS bearers for allocation and retention of the UMTS bearer.

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional. If the command is not implemented then no check is made against the negotiated profile.

10.1.y 3G Quality of Service Profile (Negotiated) +CGEQNEG

Table 8: +CGEQNEG action command syntax

Command	Possible Response(s)
+CGEQNEG =[<cid>[,<cid>[,…]]]	+CGEQNEG: <cid>, <Traffic class> ,<Maximum bitrate> ,<Guaranteed bitrate> ,<Delivery order> ,<Maximum SDU size> ,<SDU format information> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> ,<Allocation/Retention Priority> [<CR><LF>+CGEQNEG: <cid>, <Traffic class> ,<Maximum bitrate> ,<Guaranteed bitrate> ,<Delivery order> ,<Maximum SDU size> ,<SDU format information> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> ,<Allocation/Retention Priority> […]]
+CGEQNEG=?	+CGEQNEG: (list of <cid>s associated with active contexts)

Description

This command allows the TE to retrieve the negotiated QoS profiles returned in the Activate PDP Context Accept message.

The execution command returns the negotiated QoS profile for the specified context identifiers, <cid>s. The QoS profile consists of a number of parameters, each of which may have a separate value.

The test command returns a list of <cid>s associated with active contexts.

Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3G TS 23.107 -

<Traffic class>: Indicates the type of application for which the UMTS bearer service is optimised.
conversational

streaming
interactive
background

<Maximum bitrate>: Indicates the maximum number of bits delivered by UMTS at a SAP within a period of time, divided by the duration of the period.

<Guaranteed bitrate>: Indicates the guaranteed number of bits delivered by UMTS at a SAP within a period of time (provided that there is data to deliver), divided by the duration of the period.

<Delivery order>: Indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.
0 - no (default if value is omitted)
1 - yes
Other values are reserved.

<Maximum SDU size>: Indicates the maximum allowed SDU size in bits.

<SDU format information>: List of possible exact sizes of SDUs in bits. If the list contains more than one value, colons separate the values.

<SDU error ratio>: Indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of $5 \bullet 10^{-3}$ would be specified as '5E3'.

<Residual bit error ratio>: Indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as 'mEe'. As an example a target residual bit error ratio of $5 \bullet 10^{-3}$ would be specified as '5E3'.

<Delivery of erroneous SDUs>: Indicates whether SDUs detected as erroneous shall be delivered or not.
0 - no (default if value is omitted)
1 - yes
Other values are reserved.

<Transfer delay>: Indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds. Transfer delay is specified for one or more fixed SDU sizes. If transfer delay values are specified for more than one fixed SDU size the values shall be separated by commas and be in the same order as the corresponding fixed SDU sizes specified in the <SDU format information> parameter.

<Traffic handling priority>: Numeric parameter (1,2,3,…) that specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers.

<Allocation/Retention Priority>: Numeric parameter (1,2,3,…) that specifies the relative importance compared to other UMTS bearers for allocation and retention of the UMTS bearer.

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional.

10.1.4 ~~G~~P~~R~~S attach or detach +CGATT

Table 9: CGATT action command syntax

Command	Possible Response(s)
+CGATT= [<state>]	OK ERROR
+CGATT?	+CGATT: <state>
+CGATT=?	+CGATT: (list of supported <state>s)

Description

The execution command is used to attach the MT to, or detach the MT from, the ~~GPRS~~ Packet Domain service. After the command has completed, the MT remains in V.25ter command state. If the MT is already in the requested state, the command is ignored and the OK response is returned. If the requested state cannot be achieved, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

Any active PDP contexts will be automatically deactivated when the attachment state changes to detached.

The read command returns the current ~~GPRS~~ Packet Domain service state.

The test command is used for requesting information on the supported Packet Domain~~GPRS~~ service states.

NOTE: This command has the characteristics of both the V.25ter action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

Defined Values

`<state>`: indicates the state of ~~GPRS~~ PS attachment

0 - detached

1 - attached

Other values are reserved and will result in an ERROR response to the execution command.

Implementation

Optional.

10.1.5 PDP context activate or deactivate +CGACT

Table 10: CGACT action command syntax

Command	Possible Response(s)
+CGACT=[<state> [,<cid>[,<cid>[,…]]]]	OK ERROR
+CGACT?	+CGACT: <cid>, <state> [<CR><LF>+CGACT: <cid>, <state> [...]]
+CGACT=?	+CGACT: (list of supported <state>s)

Description

The execution command is used to activate or deactivate the specified PDP context (s). After the command has completed, the MT remains in V.25ter command state. If any PDP context is already in the requested state, the state for that context remains unchanged. If the requested state for any specified context cannot be achieved, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command. If the MT is not ~~GPRS~~ PS attached when the activation form of the command is executed, the MT first performs a ~~GPRS~~ PS attach and them attempts to activate the specified contexts. If the attach fails then the MT responds with ERROR or, if extended error responses are enabled, with the appropriate failure-to-attach error message.

If no <cid>s are specified the activation form of the command activates all defined contexts.

If no <cid>s are specified the deactivation form of the command deactivates all active contexts.

An active secondary context can exist if and only if the corresponding active primary context exists. If the primary PDP context associated with a PDP address is deactivated, all the associated secondary contexts are deactivated too and the data transfer for that PDP address is disabled.

The read command returns the current activation states for all the defined PDP contexts.

The test command is used for requesting information on the supported PDP context activation states.

NOTE. This command has the characteristics of both the V.25ter action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

Defined Values

<state>: indicates the state of PDP context activation
0 - deactivated
1 - activated
Other values are reserved and will result in an ERROR response to the execution command.

<cid>: a numeric parameter which specifies a particular PDP context definition (see the +CGDCONT ~~command~~ and +CGDSCONT commands).~~+CGDCONT~~

Implementation

Optional.

10.1.z PDP Context Modify +CGCMOD

Table 11: CGCMOD action command syntax

Command	Possible Response(s)
+CGCMOD=[<cid>[,<cid>[,…]]]	OK ERROR
+CGCMOD=?	+CGCMOD: (list of <cid>s associated with active contexts)

Description

The execution command is used to modify the specified PDP context (s) with repect to QoS profiles and TFTs. After the command has completed, the MT returns to V.25ter online data state. If the requested modification for any specified context cannot be achieved, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

If no <cid>s are specified the activation form of the command modifies all active contexts.

The test command returns a list of <cid>s associated with active contexts.

Defined Values

<cid>: a numeric parameter which specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).

Implementation

Optional.

10.1.6 Enter data state +CGDATA

Table 12: +CGDATA action command syntax

Command	Possible Response(s)
+CGDATA=[<L2P> ,[<cid> [,<cid> [,…]]]]	CONNECT ERROR
+CGDATA=?	+CGDATA: (list of supported <L2P>s)

Description

The execution command causes the MT to perform whatever actions are necessary to establish communication between the TE and the network using one or more Packet Domain~~GPRS~~ PDP types. This may include performing a ~~GPRS~~ PS attach and one or more PDP context activations. If the <L2P> parameter value is unacceptable to the MT, the MT shall return an ERROR or +CME ERROR response. Otherwise, the MT issues the intermediate result code CONNECT and enters V.25ter online data state.

Commands following +CGDATA command in the AT command line shall not be processed by the MT.

The detailed behaviour after the online data state has been entered is dependent on the PDP type. It is described briefly in GSM 07.60 and in more detail in GSM 09.61 and the specifications for the relevant PDPs. ~~GPRS~~ PS attachment and PDP context activation procedures may take place prior to or during the PDP startup if they have not already been performed using the +CGATT and +CGACT commands.

If context activation takes place during the PDP startup, one or more <cid>s may be specified in order to provide the information needed for the context activation request(s).

During each PDP startup procedure the MT may have access to some or all of the following information -

The MT may have a priori knowledge, for example, it may implement only one PDP type.

The command may have provided an <L2P> parameter value.

The TE may provide a PDP type and/or PDP address to the MT during in the PDP startup procedure.

If any of this information is in conflict, the command will fail.

Any PDP type and/or PDP address present in the above information shall be compared with the PDP type and/or PDP address in any context definitions specified in the command in the order in which their <cid>s appear. For a context definition to match -

The PDP type must match exactly.

The PDP addresses are considered to match if they are identical or if either or both addresses are unspecified. For example, a PPP NCP request specifying PDP type = IP and no PDP address would cause the MT to search through the specified context definitions for one with PDP type = IP and any PDP address.

The context shall be activated using the matched value for PDP type and a static PDP address if available, together with the other information found in the PDP context definition. If a static PDP address is not available then a dynamic address is requested.

If no <cid> is given or if there is no matching context definition, the MT shall attempt to activate the context with whatever information is available to the MT. The other context parameters shall be set to their default values.

If the activation is successful, data transfer may proceed.

After data transfer is complete, and the layer 2 protocol termination procedure has completed successfully, the V.25ter command state is re-entered and the MT returns the final result code OK.

In the event of an erroneous termination or a failure to start up, the V.25ter command state is re-entered and the MT returns the final result code NO CARRIER or, if enabled, +CME ERROR. Attach, activate and other errors may be reported.

The test command is used for requesting information on the supported layer 2 protocols.

This command may be used in both normal and modem compatibility modes.

Defined Values

<L2P>: a string parameter that indicates the layer 2 protocol to be used between the TE and MT

NULL	none, for PDP type OSP:IHOSS
PPP	Point-to-point protocol for a PDP such as IP
PAD	character stream for X.25 character (triple X PAD) mode
X25	X.25 L2 (LAPB) for X.25 packet mode
M-xxxx	manufacturer-specific protocol (xxxx is an alphanumeric string)

If the value is omitted, the layer 2 protocol is unspecified. Other values are reserved and will result in an ERROR response.

<cid>: a numeric parameter which specifies a particular PDP context definition (see ~~+CGDCONT command~~the +CGDCONT and +CGDSCONT commands).

Implementation

Optional if the D (dial) command can be used to specify Packet Domain~~GPRS~~ operation.

10.1.7 Configure local Octet Stream PAD parameters +CGCLOSP

Table 13: CGCLOSP parameter command syntax

Command	Possible Response(s)
+CGCLOSP=[<parm>, <value>]	OK ERROR
+CGCLOSP?	+CGCLOSP: <parm>, <value> [<CR><LF>+CGCLOSP: <parm>, <value>> […]]
+CGCLOSP=?	+CGCLOSP: <parm>, (list of supported <value>s) [<CR><LF>+CGCLOSP: <parm>, (list of supported <value>s) […]]

Description

The set command sets the value of a specified OSP PAD parameter in the local PAD. The set of parameters to be supported is listed in the OSP protocol specification.

Setting the maximum sizes for the local Packet Assembly and Disassembly buffers will cause corresponding values for the GGSN relay buffers to be negotiated.

The read command returns, one per line, the value of each of the supported parameters.

The test command returns, one per line, the permitted range of values for each of the supported parameters.

Defined values

<parm>: a numeric parameter which specifies the PAD parameter to be configured

<value>: a numeric parameter which specifies the value to which PAD parameter is to be set

If <value> is omitted for a particular parameter then <parm> is set to the OSP-defined default, if any.

Implementation

Optional.

10.1.8 Show PDP address +CGPADDR

Table 14:+CGPADDR action command syntax

Command	Possible response(s)
+CGPADDR=[<cid> [,<cid> [,…]]]	+CGPADDR: <cid>,<PDP_addr> [<CR><LF>+CGPADDR: <cid>,<PDP_addr> [...]]

+CGPADDR=?	+CGPADDR: (list of defined <cid>s)

Description

The execution command returns a list of PDP addresses for the specified context identifiers.

The test command returns a list of defined <cid>s.

Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see ~~+CGDCONT command~~the +CGDCONT and +CGDSCONT commands). If no <cid> is specified, the addresses for all defined contexts are returned.

<PDP_address>: a string that identifies the MT in the address space applicable to the PDP. The address may be static or dynamic. For a static address, it will be the one set by the ~~+CGDCONT command~~+CGDCONT and +CGDSCONT commands when the context was defined. For a dynamic address it will be the one assigned during the last PDP context activation that used the context definition referred to by <cid>. <PDP_address> is omitted if none is available.

Implementation

Optional.

10.1.9 Automatic response to a network request for PDP context activation +CGAUTO

Table 15: CGAUTO parameter command syntax

Command	Possible response(s)
+CGAUTO=[<n>]	OK ERROR
+CGAUTO?	+CGAUTO: <n>
+CGAUTO=?	+CGAUTO: (list of supported <n>s)

Description

The set command disables or enables an automatic positive response (auto-answer) to the receipt of a Request PDP Context Activation message from the network. It also provides control over the use of the V.25ter basic commands 'S0', 'A and 'H' for handling network requests for PDP context activation. The setting does not affect the issuing of the unsolicited result code RING or +CRING.

The test command returns the values of <n> supported by the MT as a compound value.

When the +CGAUTO=0 command is received, the MT shall not perform a ~~GPRS~~ PS detach if it is attached. Subsequently, when the MT announces a network request for PDP context activation by issuing the unsolicited result code RING or +CRING, the TE may manually accept or reject the request by issuing the +CGANS command or may simply ignore the network request.

When the +CGAUTO=1 command is received, the MT shall attempt to perform a ~~GPRS~~ PS attach if it is not already attached. Failure will result in ERROR or, if enabled, +CME ERROR being returned to the TE. Subsequently, when the MT announces a network request for PDP context activation by issuing the unsolicited result code RING or +CRING to the TE, this is followed by the intermediate result code CONNECT. The MT then enters V.25ter online data state and follows the same procedure as it would after having received a +CGANS=1 with no <L2P> or <cid> values specified.

Defined values

<n>:

0 turn off automatic response for Packet Domain~~GPRS~~ only
1 turn on automatic response for Packet Domain~~GPRS~~ only
2 modem compatibility mode, Packet Domain~~GPRS~~ only
3 modem compatibility mode, Packet Domain~~GPRS~~ and circuit switched calls (default)

For <n> = 0 Packet Domain~~GPRS~~ network requests are manually accepted or rejected by the +CGANS command.

For <n> = 1 Packet Domain~~GPRS~~ network requests are automatically accepted according to the description above.

For <n> = 2, automatic acceptance of Packet Domain~~GPRS~~ network requests is controlled by the 'S0' command. Manual control uses the 'A' and 'H' commands, respectively, to accept and reject Packet Domain~~GPRS~~ requests. (+CGANS may also be used.) Incoming circuit switched calls can be neither manually nor automatically answered.

For <n> = 3, automatic acceptance of both Packet Domain~~GPRS~~ network requests and incoming circuit switched calls is controlled by the 'S0' command. Manual control uses the 'A' and 'H' commands, respectively, to accept and reject Packet Domain~~GPRS~~ requests. (+CGANS may also be used.) Circuit switched calls are handled as described elsewhere in this specification.

Implementation

Optional. If not implemented, the MT shall behave according to the case of <n> = 3.

10.1.10 Manual response to a network request for PDP context activation +CGANS

Table 16: CGANS action command syntax

Command	Possible response(s)
+CGANS=[<response>, [<L2P> ,[<cid>]]]	OK ERROR
+CGANS=?	+CGANS: (list of supported <response>s), (list of supported <L2P>s)

Description

The execution command requests the MT to respond to a network request for Packet Domain~~GPRS~~ PDP context activation which has been signalled to the TE by the RING or +CRING: unsolicited result code. The <response> parameter allows the TE to accept or reject the request.

If <response> is 0, the request is rejected and the MT returns OK to the TE.

If <response> is 1, the following procedure is followed by the MT.

Commands following the +CGANS command in the AT command line shall not be processed by the MT.

If the <L2P> parameter value is unacceptable to the MT, the MT shall return an ERROR or +CME ERROR response. Otherwise, the MT issues the intermediate result code CONNECT and enters V.25ter online data state.

The detailed behaviour after the online data state has been entered is dependent on the PDP type. It is described briefly in GSM 07.60 and in more detail in GSM 09.61 and the specifications for the relevant PDPs. PDP context activation procedures shall take place prior to or during the PDP startup.

One or more <cid>s may be specified in order to provide the values needed for the context activation request.

During the PDP startup procedure the MT has the PDP type and the PDP address provided by the network in the Request PDP Context Activation message. The MT may also have some or all of the following information -

The MT may have a priori knowledge, for example, it may implement only one PDP type.

The command may have provided an <L2P> parameter value.

The TE may provide one or both of PDP type and PDP address to the MT in the PDP startup.

If any of this information is in conflict, the command will fail.

If one or more <cid> is given then an attempt shall be made to identify an appropriate context definition by matching the PDP type and PDP address in the network request with the PDP type and PDP address in each of the specified context definitions (in the order in which their <cid>s appear in the command) as follows -

The PDP type must match exactly.

The PDP addresses are considered to match if they are identical or if the address in the context definition is unspecified.

The context shall be activated using the values for PDP type and PDP address provided by the network, together with the other information found in the PDP context definition. An APN may or may not re required, depending on the application.

If no <cid> is given or if there is no matching context definition, the MT will attempt to activate the context using the values for PDP type and PDP address provided by the network, together with any other relevant information known to the MT. The other context parameters will be set to their default values.

If the activation is successful, data transfer may proceed.

After data transfer is complete, and the layer 2 protocol termination procedure has completed successfully, the V.25ter command state is re-entered and the MT returns the final result code OK

In the event of an erroneous termination or a failure to startup, the V.25ter command state is re-entered and the MT returns the final result code NO CARRIER or, if enabled, +CME ERROR. Attach, activate and other errors may be reported. It is also an error to issue the +CGANS command when there is no outstanding network request.

NOTE: This is not the same as if the MT issues a +CGDATA (or +CGACT) command after receiving a +CRING unsolicited result code. A +CGDATA (or +CGACT) does not command the MT to acknowledge the network request but rather to make a new request for context activation. The network request would be ignored.

The test command returns the values of `<response>` and `<L2P>` supported by the MT as compound values.

This command may be used in both normal and modem compatibility modes.

Defined values

`<response>`: is a numeric parameter which specifies how the request should be responded to.

0 reject the request
1 accept and request that the PDP context be activated

If `<response>` is omitted it is assumed to be 0. Other values are reserved and will result in the ERROR response.

`<L2P>`: a string parameter which indicates the layer 2 protocol to be used (see +CGDATA command).

`<cid>`: a numeric parameter which specifies a particular PDP context definition (see ~~+CGDCONT command~~the +CGDCONT and +CGDSCONT commands).

Implementation

Optional.

10.1.11 GPRS mobile station class +CGCLASS (GPRS only)

Table 17: CGCLASS parameter command syntax

Command	Possible Response(s)
+CGCLASS= [<class>]	OK ERROR
+CGCLASS?	+CGCLASS: <class>
+CGCLASS=?	+CGCLASS: (list of supported <class>s)

Description

The set command is used to set the MT to operate according to the specified GPRS mobile class. If the requested class is not supported, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

The read command returns the current GPRS mobile class.

The test command is used for requesting information on the supported GPRS mobile classes.

Defined Values

<class>: a string parameter which indicates the GPRS mobile class (in descending order of functionality)

A	class A (highest)
B	class B
C	class C in GPRS and circuit switched alternate mode
CG	class C in GPRS only mode
CC	class C in circuit switched only mode (lowest)

Other values are reserved and will result in an ERROR response to the set command.

If the MT is GPRS attached when the set command is issued with a <class> = CC specified, a detach request shall be sent to the network.

Implementation

Optional.

10.1.12 Configure local triple-X PAD parameters +CGCLPAD (GPRS only)

Table 18: CGCLPAD parameter command syntax

Command	**Possible Response(s)**
+CGCLPAD=[<parm>, <value>]	OK ERROR
+CGCLPAD?	+CGCLPAD: <parm>, <value> [<CR><LF>+CGCLPAD: <parm>, <value>> […]]
+CGCLPAD=?	+CGCLPAD: <parm>, (list of supported <value>s) [<CR><LF>+CGCLPAD: <parm>, (list of supported <value>s) […]]

Description

The set command sets the value of a specified X.3 PAD parameter in the local PAD. A minimum set of parameters to be supported is listed in GSM 07.60.

The read command returns, one per line, the value of each of the supported parameters.

The test command returns, one per line, the permitted range of values for each of the supported parameters.

Defined values

<parm>: a numeric parameter which specifies the X.3 parameter to be configured

<value>: a numeric parameter which specifies the value to which the X.3 parameter is to be set

If <value> is omitted for a particular class then <parm> is set to the X.3-defined default, if any.

Implementation

Optional.

10.1.13 Packet Domain~~GPRS~~ event reporting +CGEREP

Table 19: CGEREP parameter command syntax

Command	Possible response(s)
+CGEREP=[<mode>[,<bfr>]]	OK ERROR
+CGEREP?	+CGEREP: <mode>,<bfr>
+CGEREP=?	+CGEREP: (list of supported <mode>s),(list of supported <bfr>s)

Description

Set command enables or disables sending of unsolicited result codes, `+CGEV: XXX` from MT to TE in the case of certain events occurring in the Packet Domain~~GPRS~~ MT or the network. `<mode>` controls the processing of unsolicited result codes specified within this command. `<bfr>` controls the effect on buffered codes when `<mode>` 1 or 2 is entered. If a setting is not supported by the MT, `ERROR` or `+CME ERROR:` is returned.

Read command returns the current mode and buffer settings

Test command returns the modes and buffer settings supported by the MT as compound values.

Defined values

`<mode>`:

0 buffer unsolicited result codes in the MT; if MT result code buffer is full, the oldest ones can be discarded. No codes are forwarded to the TE.

1 discard unsolicited result codes when MT-TE link is reserved (e.g. in on-line data mode); otherwise forward them directly to the TE

2 buffer unsolicited result codes in the MT when MT-TE link is reserved (e.g. in on-line data mode) and flush them to the TE when MT-TE link becomes available; otherwise forward them directly to the TE

`<bfr>`:

0 MT buffer of unsolicited result codes defined within this command is cleared when `<mode>` 1 or 2 is entered

1 MT buffer of unsolicited result codes defined within this command is flushed to the TE when `<mode>` 1 or 2 is entered (`OK` response shall be given before flushing the codes)

Defined events

The following unsolicited result codes and the corresponding events are defined -

`+CGEV: REJECT <PDP_type>, <PDP_addr>`

A network request for PDP context activation occurred when the MT was unable to report it to the TE with a +CRING unsolicited result code and was automatically rejected.

`+CGEV: NW REACT  <PDP_type>, <PDP_addr>, [<cid>]`

The network has requested a context reactivation. The `<cid>` that was used to reactivate the context is provided if known to the MT.

`+CGEV: NW DEACT  <PDP_type>, <PDP_addr>, [<cid>]`

The network has forced a context deactivation. The `<cid>` that was used to activate the context is provided if known to the MT.

`+CGEV: ME DEACT  <PDP_type>, <PDP_addr>, [<cid>]`

The mobile equipment has forced a context deactivation. The `<cid>` that was used to activate the context is provided if known to the MT.

`+CGEV: NW DETACH`

The network has forced a ~~GPRS~~ PS detach. This implies that all active contexts have been deactivated. These are not reported separately.

`+CGEV: ME DETACH`

The mobile equipment has forced a ~~GPRS~~ PS detach. This implies that all active contexts have been deactivated. These are not reported separately.

`+CGEV: NW CLASS <class>`

The network has forced a change of MS class. The highest available class is reported (see +CGCLASS).

`+CGEV: ME CLASS <class>`

The mobile equipment has forced a change of MS class. The highest available class is reported (see +CGCLASS).

Implementation

Optional.

10.1.14 GPRS network registration status +CGREG

Table 20: CGREG parameter command syntax

Command	Possible response(s)
`+CGREG=[<n>]`	
`+CGREG?`	`+CGREG: <n>,<stat>[,<lac>,<ci>]` `+`*`CME ERROR: <err>`*
`+CGREG=?`	`+CGREG: (`list of supported `<n>`s`)`

Description

The set command controls the presentation of an unsolicited result code `+CGREG: <stat>` when `<n>`=1 and there is a change in the MT's GPRS network registration status, or code `+CGREG: <stat>[,<lac>,<ci>]` when `<n>`=2 and there is a change of the network cell.

NOTE. If the GPRS MT also supports circuit mode services, the +CREG command and +CREG: result code apply to the registration status and location information for those services.

The read command returns the status of result code presentation and an integer `<stat>` which shows whether the network has currently indicated the registration of the MT. Location information elements `<lac>` and `<ci>` are returned only when `<n>`=2 and MT is registered in the network.

Defined values

`<n>`:

0 disable network registration unsolicited result code

1 enable network registration unsolicited result code `+CGREG: <stat>`

2 enable network registration and location information unsolicited result code `+CGREG: <stat>[,<lac>,<ci>]`

`<stat>`:

0 not registered, ME is not currently searching a new operator to register to

1 registered, home network

2 not registered, but ME is currently searching a new operator to register to

3 registration denied

4 unknown

5 registered, roaming

`<lac>`: string type; two byte location area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

`<ci>`: string type; two byte cell ID in hexadecimal format

Implementation

Optional.

10.1.15 Select service for MO SMS messages +CGSMS

Table 21: CGSMS parameter command syntax

Command	**Possible Response(s)**
+CGSMS= [<service>]	OK ERROR
+CGSMS?	+CGSMS: <service>
+CGSMS=?	+CGSMS: (list of currently available <service>s)

Description

The set command is used to specify the service or service preference that the MT will use to send MO SMS messages.

The read command returns the currently selected service or service preference.

The test command is used for requesting information on the currently available services and service preferences.

Defined Values

`<service>`: a numeric parameter which indicates the service or service preference to be used

0 Packet Domain~~GPRS~~

1 circuit switched

2 Packet Domain~~GPRS~~ preferred (use circuit switched if GPRS not available)

3 circuit switched preferred (use Packet Domain~~GPRS~~ if circuit switched not available)

Other values are reserved and will result in an ERROR response to the set command.

Implementation

Optional.

10.2 Modem compatibility commands

This subclause describes how existing AT commands, designed for use with a modem, may be used to control a Packet Domain~~GPRS~~ MT. This is to provide backwards compatibility with existing communications software. For new applications it is recommended that the Packet Domain~~GPRS~~-specific commands, described in previous subclauses, be used.

10.2.1 MT originated PDP context activation

In this mode of operation, the MT behaves like an originating modem and accepts the normal V.25ter commands associated with placing and clearing a call. If Packet Domain~~GPRS~~-specific configuration commands are required, they may be sent to the MT as part of the modem initialisation commands.

10.2.1.1 Request Packet Domain~~GPRS~~ service 'D'

Table 22: D command syntax

Command	**Possible Response(s)**
`D*<GPRS_SC>[*[<called_address>][*[<L2P>][*[<cid>]]]]#`	CONNECT ERROR

Description

This command causes the MT to perform whatever actions are necessary to establish communication between the TE and the external PDN.

The V.25ter 'D' (Dial) command causes the MT to enter the V.25ter online data state and, with the TE, to start the specified layer 2 protocol. The MT shall return CONNECT to confirm acceptance of the command prior to entering the V.25ter online data state. No further commands may follow on the AT command line.

The detailed behaviour after the online data state has been entered is dependent on the PDP type. It is described briefly in clauses 8 (for X.25) and 9 (for IP) of GSM 07.60. ~~GPRS~~ PS attachment and PDP context activation procedures may take place prior to or during the PDP startup if they have not already been performed using the +CGATT and +CGACT commands.

When the layer 2 protocol has terminated, either as a result of an orderly shut down of the PDP or an error, the MT shall enter V.25ter command state and return the NO CARRIER final result code.

If `<called address>` is supported and provided, the MT shall automatically set up a virtual call to the specified address after the PDP context has been activated.

If `<L2P>` and `<cid>` are supported, their usage shall be the same as in the +CGDATA command. The +CGDCONT, +CGQREQ, etc. commands may be used in the modem initialisation AT command string to set values for for PDP type, APN, QoS etc..

If `<L2P>` is not supported or is supported but omitted, the MT shall use a layer 2 protocol appropriate to the PDP type.

If `<cid>` is not supported or is supported but omitted, the MT shall attempt to activate the context using:

(a) any information provided by the TE during the PDP startup procedure, e.g. the TE may provide a PDP type and/or PDP address to the MT,

or, (b) a priori knowledge, e.g. the MT may implement only one PDP type, or, (c) using the 'Empty PDP type' (GSM 04.08). (No PDP address or APN shall be sent in this case and only one PDP context subscription record shall be present in the HLR for this subscriber.)

This command may be used in both normal and modem compatibility modes.

NOTE. The dial string conforms to the syntax specified in GSM 02.30.

Defined Values

`<GPRS_SC>`: (GPRS Service Code) a digit string (value 99) which identifies a request to use the ~~GPRS~~ Packet Domain service

`<called_address>`: a string that identifies the called party in the address space applicable to the PDP. For communications software that does not support arbitrary characters in the dial string, a numeric equivalent may be used. Also, the character comma ',' may be used as a substitute for the character period '.'.
For PDP type OSP:IHOSS, the following syntax may be used for `<called_address>`:
[<host>][@[<port>][@[<protocol>]]]
where <host>, <port> and <protocol> are defined in the +CGDCONT description. For communications software that does not support arbitrary characters in the dial string, a numeric equivalent to the hostname may be used. However, this should be avoided if at all possible.

`<L2P>`: a string which indicates the layer 2 protocol to be used (see +CGDATA command). For communications software that does not support arbitrary characters in the dial string, the following numeric equivalents shall be used:

0	NULL
1	PPP
2	PAD
3	X25
9yyyy	M-xxxx

Other values are reserved and will result in an ERROR response

`<cid>`: a digit string which specifies a particular PDP context definition (see ~~+CGDCONT command~~the +CGDCONT and +CGDSCONT commands).

Implementation

Optional if the +CGDATA command is supported. If the D command is provided, then support for `<called_address>`, `<L2P>` and `<cid>` are optional. If they are not supported but values are provided by the TE, the values shall be ignored and this shall not constitute an error.

10.2.2 Network requested PDP context activation

In this mode of operation, the MT behaves like an answering modem and accepts the normal V.25ter commands associated with answering a call. If Packet Domain~~GPRS~~-specific configuration commands are required, they may be sent to the MT as part of the modem initialisation commands.

The +CGAUTO command is used to select modem compatibility mode.

10.2.2.1 Automatic response to a network request for PDP context activation 'S0'

The V.25ter 'S0=n' (Automatic answer) command may be used to turn off (n=0) and on (n>0) the automatic response to a network request for a PDP context activation.

When the 'S0=n' (n>0) command is received, the MT shall attempt to perform a ~~GPRS~~ PS attach if it is not already attached. Failure will result in ERROR being returned to the TE. Subsequently, the MT will announce a network request for PDP context activation by issuing the unsolicited result code RING to the TE, followed by the intermediate result code CONNECT. The MT then enters V.25ter online data state and follows the same procedure as it would after having received a +CGANS=1 with no <L2P> or <cid> values specified.

NOTE. The 'S0=n' (n=0) command does not perform an automatic ~~GPRS~~ PS detach.

Implementation

Optional.

10.2.2.2 Manual acceptance of a network request for PDP context activation 'A'

The V.25ter 'A' (Answer) command may be used to accept a network request for a PDP context activation announced by the unsolicited result code RING. The MT responds with CONNECT, enters V.25ter online data state and follows the same procedure as it would after having received a +CGANS=1 with no <L2P> or <cid> values specified. It is an error to issue the 'A' command when there is no outstanding network request.

Implementation

Optional.

10.2.2.3 Manual rejection of a network request for PDP context activation 'H'

The V.25ter 'H' or 'H0' (On-hook) command may be used to reject a network request for PDP context activation announced by the unsolicited result code RING. The MT responds with OK. It is an error to issue the 'H' command when there is no outstanding network request.

NOTE: This is an extension to the usage of the 'H' command that is described in ITU-T V.25ter.

Implementation

Optional.

93GPP TSG-T WG2 meeting #7
Ystad, Sweden, 22-26 November 1999

Document T2-99957
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.007	**CR**	**020**	Current Version: 3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑　　*↑ CR number as allocated by MCC support team*

For submission to: T#6	for approval	X	strategic		*(for SMG*
list expected approval meeting # here ↑	for information		non-strategic	X	*use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG　*The latest version of this form is available from:* ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source: T2　　**Date:** 1999-11-19

Subject: Packet Domain ATD command syntax

Work item: GPRS

Category:

F	Correction		
A	Corresponds to a correction in an earlier release		
B	Addition of feature		
C	Functional modification of feature	X	
D	Editorial modification		

(only one category shall be marked with an X)

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: Adds a new ' GPRS Service Code ' for the 'D' command that is intended for IP based services only (PDP types 'IP' and 'PPP'). The new service code allows for a more user friendly dialling string.

Clauses affected: New section 10.2.1.2

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments: There are two accompanying CRs for R'97 and R'98 too.

help.doc

<--------- double-click here for help and instructions on how to create a CR.

10.2.1.2 Request GPRS IP service 'D'

Table 1: D command syntax

Command	Possible Response(s)
`D*<GPRS_SC_IP>[*<cid>]#`	CONNECT ERROR

Description

This command causes the MT to perform whatever actions are necessary to establish communication between the TE and the external PDN.

The V.25ter 'D' (Dial) command causes the MT to enter the V.25ter online data state and, with the TE, to start the specified layer 2 protocol. The MT shall return CONNECT to confirm acceptance of the command prior to entering the V.25ter online data state. No further commands may follow on the AT command line.

The detailed behaviour after the online data state has been entered is described briefly in clause 9, for IP, of GSM 07.60. GPRS attachment and PDP context activation procedures may take place prior to or during the PDP startup if they have not already been performed using the +CGATT and +CGACT commands.

When the layer 2 protocol has terminated, either as a result of an orderly shut down of the PDP or an error, the MT shall enter V.25ter command state and return the NO CARRIER final result code.

If `<cid>` is supported, its usage shall be the same as in the +CGDATA command. The +CGDCONT, +CGQREQ, etc. commands may be used in the modem initialisation AT command string to set values for for PDP type, APN, QoS etc..

If `<cid>` is not supported or is supported but omitted, the MT shall attempt to activate the context using:

(a) any information provided by the TE during the PDP startup procedure, e.g. the TE may provide a PDP type and/or PDP address to the MT,

or, (b) a priori knowledge, e.g. the MT may implement only one PDP type,

or, (c) using the 'Empty PDP type' (GSM 04.08). (No PDP address or APN shall be sent in this case and only one PDP context subscription record shall be present in the HLR for this subscriber.)

This command may be used in both normal and modem compatibility modes.

NOTE. The dial string conforms to the syntax specified in GSM 02.30.

Defined Values

`<GPRS_SC_IP>`: (GPRS Service Code for IP) a digit string (value 98) which identifies a request to use the GPRS with IP (PDP types IP and PPP)

`<cid>`: a digit string which specifies a particular PDP context definition (see +CGDCONT command).

Implementation

Optional if the +CGDATA command is supported. If the D command is provided, then support for `<cid>` is optional. If it is not supported but a value is provided by the TE, the value shall be ignored and this shall not constitute an error.

3GPP TSG-T2 meeting #6
Ystad, Sweden, 22-26 November 1999

Document T2-99958
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.007 CR 021 Current Version: 3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-T#6	for approval	X	strategic	(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source: T2 **Date:** 26/09/1999

Subject: Additional parameter for +CBST

Work item: Technical Enhancements

Category:				**Release:**		
	F	Correction			Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature	X		Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: To select the bearer services, 33600 bps (V.34),PIAFS32K and PIAFS64K.

Clauses affected: 6.7

Other specs affected:			
	Other 3G core specifications		→ List of CRs:
	Other GSM core specifications		→ List of CRs:
	MS test specifications		→ List of CRs:
	BSS test specifications		→ List of CRs:
	O&M specifications		→ List of CRs:

Other comments: T2 99721(Presentation to PHS/PIAFS – slides)

help.doc

<--------- double-click here for help and instructions on how to create a CR.

6.7 Select bearer service type +CBST

Table 1: +CBST parameter command syntax

Command	Possible response(s)
+CBST=[<speed>[,<name>[,<ce>]]]	
+CBST?	+CBST: <speed>,<name>,<ce>
+CBST=?	+CBST: (list of supported <speed>s),(list of supported <name>s),(list of supported <ce>s)

Description

Set command selects the bearer service <name> with data rate <speed>, and the connection element <ce> to be used when data calls are originated (refer GSM 02.02 [1]). Values may also be used during mobile terminated data call setup, especially in case of single numbering scheme calls (refer +CSNS).

Test command returns values supported by the TA as compound values.

Defined values

NOTE: The default values of the subparameters are manufacturer specific since they depend on the purpose of the device and data services provided by it. Not all combinations of these subparameters are supported by GSM (refer GSM 02.02 [1]).

<speed>:

0	autobauding (automatic selection of the speed; this setting is possible in case of 3.1 kHz modem and non-transparent service)
1	300 bps (V.21)
2	1200 bps (V.22)
3	1200/75 bps (V.23)
4	2400 bps (V.22bis)
5	2400 bps (V.26ter)
6	4800 bps (V.32)
7	9600 bps (V.32)
12	9600 bps (V.34)
14	14400 bps (V.34)
15	19200 bps (V.34)
16	28800 bps (V.34)
17	33600 bps (V.34)
34	1200 bps (V.120)
36	2400 bps (V.120)
38	4800 bps (V.120)
39	9600 bps (V.120)
43	14400 bps (V.120)
47	19200 bps (V.120)
48	28800 bps (V.120)
49	38400 bps (V.120)
50	48000 bps (V.120)
51	56000 bps (V.120)
65	300 bps (V.110)
66	1200 bps (V.110)
68	2400 bps (V.110 or X.31 flag stuffing)
70	4800 bps (V.110 or X.31 flag stuffing)
71	9600 bps (V.110 or X.31 flag stuffing)
75	14400 bps (V.110 or X.31 flag stuffing)
79	19200 bps (V.110 or X.31 flag stuffing)
80	28800 bps (V.110 or X.31 flag stuffing)
81	38400 bps (V.110 or X.31 flag stuffing)
82	48000 bps (V.110 or X.31 flag stuffing)
83	56000 bps (V.110 or X.31 flag stuffing)
115	56000 bps (bit transparent)
116	64000 bps (bit transparent)

120 32000 bps(PIAFS32k)

121 64000 bps(PIAFS64k)

also all other values below 128 are reserved by this TS

`<name>`:

0	data circuit asynchronous (UDI or 3.1 kHz modem)
1	data circuit synchronous (UDI or 3.1 kHz modem)
2	PAD Access (asynchronous) (UDI)
3	Packet Access (synchronous) (UDI)
4	data circuit asynchronous (RDI)
5	data circuit synchronous (RDI)
6	PAD Access (asynchronous) (RDI)
7	Packet Access (synchronous) (RDI)

also all other values below 128 are reserved by this TS

`<ce>`:

0	transparent
1	non-transparent
2	both, transparent preferred
3	both, non-transparent preferred

Implementation

Mandatory when data calls implemented.

3GPP TSG-T2 meeting #6
Ystad, Sweden, 22-26 November 1999

Document ***T2-99960***

e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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27.007	**CR**	**022**	Current Version:	3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-T#6	for approval	X	strategic		(for SMG
list expected approval meeting # here ↑		for information		non-strategic		use only)

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio		Core Network	

Source:	T2	**Date:**	17/11/1999

Subject: Add new AT command (+CDIP) to inform the called line identification

Work item: Technical Enhancements

Category:	F	Correction		**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature	X		Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: This change is related to a network service that provides multiple phone numbers to an MT. This command provides notification of the "called line identification" of called subscriber to a TE during the RING.
Note: +CDIP is similar function as +CLIP which provides notification of the "calling line identification" during the RING.

Clauses affected: 7. Network service related commands

Other specs affected:	Other 3G core specifications		→ List of CRs:	
	Other GSM core specifications		→ List of CRs:	
	MS test specifications		→ List of CRs:	
	BSS test specifications		→ List of CRs:	
	O&M specifications		→ List of CRs:	

Other comments: +CDIP unsolicited result code is added to ANNEX B (Summary of result codes).

help.doc

<--------- double-click here for help and instructions on how to create a CR.

7.X Called line identification presentation +CDIP

Table XX: +CDIP parameter command syntax

Command	Possible response(s)
`+CDIP=[<n>]`	
`+CDIP?`	`+CDIP: <n>,<m>`
`+CDIP=?`	`+CDIP:` (list of supported `<n>`s)

Description

This command related to a network service that provides “multiple called numbers (called line identifications) service” to an MT. This command enables a called subscriber to get the called line identification of the called party when receiving a mobile terminated call. Set command enables or disables the presentation of the called line identifications at the TE.

When the presentation of the called line identification at the TE is enabled, `+CDIP:<number>,<type>[,<subaddr>,<satype>]` response is returned after every `RING` (or `+CRING: <type>`; refer subclause "Cellular result codes +CRC") result code sent from TA to TE. It is manufacturer specific if this response is used when normal voice call is answered.

Read command gives the status of `<n>`, and also triggers an interrogation of the provision status of the “multiple called numbers” service. Test command returns values supported by the TA as a compound value.

Defined values

`<n>` (parameter sets/shows the result code presentation status in the TA):

0 disable

1 enable

`<m>` (parameter shows the subscriber “multiple called numbers” service status in the network):

0 “multiple called numbers service” is not provisioned

1 “multiple called numbers service” is provisioned

2 unknown (e.g. no network, etc.)

`<number>`: string type phone number of format specified by `<type>`

`<type>`: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7)

`<subaddr>`: string type subaddress of format specified by `<satype>`

`<satype>`: type of subaddress octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.8)

Implementation

Optional.

Annex B (normative): Summary of result codes

V.25ter [14] result codes which can be used in GSM and codes defined in this TS:

Table B.1: Result codes

Verbose result code (V.25ter command V1 set)	Numeric (V0 set)	Type	Description
+CCCM: <ccm>	as verbose	unsolicited	refer subclause 7.15 $(AT R97)$
+CCWA: <number>,<type>,<class>[,<alpha>]	as verbose	unsolicited	refer subclause 7.11
+CCWV	as verbose	unsolicited	refer subclause 8.28
+CDEV: <elem>,<text>	as verbose	unsolicited	refer subclause 8.10
+CDIP:<number>,<type>[,<subaddr>,<satype>]	as verbose	unsolicited	refer subclause 7.x (TBD)
+CIEV: <ind>,<value>	as verbose	unsolicited	refer subclause 8.10
+CKEV: <key>,<press>	as verbose	unsolicited	refer subclause 8.10
+CLAV: <code>	as verbose	unsolicited	refer subclause 8.
+CLIP: <number>,<type>[,<subaddr>,<satype>[,<alpha>]]	as verbose	unsolicited	refer subclause 7.6
+CME ERROR: <err>	as verbose	final	refer subclause 9.2
+COLP: <number>,<type>[,<subaddr>,<satype>[,<alpha>]]	as verbose	intermediate	refer subclause 7.8
+CR: <type>	as verbose	intermediate	refer subclause 6.8
+CREG: <stat>[,<lac>,<ci>]	as verbose	unsolicited	refer subclause 7.2
+CRING: <type>	as verbose	unsolicited	refer subclause 6.11
+CSSI: <code1>[,<index>]	as verbose	intermediate	refer subclause 7.16
+CSSU: <code2>[,<index>[,<number>,<type>[,<subaddr>,<satype>]]]	as verbose	unsolicited	refer subclause 7.16
+CUSD: <m>[,<str>,<dcs>]	as verbose	unsolicited	refer subclause 7.14
+DR: <type>	as verbose	intermediate	refer subclause 6.13
+ILRR: <rate>	as verbose	intermediate	refer subclause 4.3
BUSY	6	final	busy signal detected
CONNECT	1	intermediate	connection has been established
CONNECT <text>	manufacturer specific	intermediate	as CONNECT but manufacturer specific <text> gives additional information (e.g. connection data rate)
ERROR	4	final	command not accepted
NO ANSWER	7	final	connection completion timeout
NO CARRIER	3	final	connection terminated
NO DIALTONE	5	final	no dialtone detected
OK	0	final	acknowledges execution of a command line
RING	2	unsolicited	incoming call signal from network