3GPP TSG-T (Terminals) Meeting #16
Marco Island, FL, USA, 5 - 7 June, 2002

Tdoc TP-020104

Agenda Item: 5.2.3

Source: T2

Title: "SMS/EMS/CBS" Change Requests

Document for: Approval

Spec	CR	Rev	Rel	Subject	Cat	Vers-	Vers-	T2 Tdoc	Workitem
23.040	049	-	Rel-5	Clarification of bit value combinations within TP-PI	F	5.3.0	5.4.0	T2-020488	TEI5
23.040	050	-	Rel-5	References to the TP-RD bit	F	5.3.0	5.4.0	T2-020490	TEI5
23.040	051	-	Rel-5	TP-DCS values for SIM data download	F	5.3.0	5.4.0	T2-020528	TEI5
23.040	052	-	R99	Clarification of the requirement for type 0 Short Messages	F	3.8.0	3.9.0	T2-020578	TEI
23.040	053	-	Rel-4	Clarification of the requirement for type 0 Short Messages	A	4.6.0	4.7.0	T2-020579	TEI4
23.040	054	-	Rel-5	Clarification of the requirement for type 0 Short Messages	C	5.3.0	5.4.0	T2-020580	TEI5
23.040	055	-	Rel-5	Occurrence of the Reply Address Element	F	5.3.0	5.4.0	T2-020565	TEI5
23.040	056	-	Rel-5	WVG Corrections and Clarifications	F	5.3.0	5.4.0	T2-020552	MESS5-EMS
23.040	057	-	Rel-5	WVG Corrections and Clarifications	F	5.3.0	5.4.0	T2-020553	MESS5-EMS
23.040	058	-	Rel-5	WVG Clarifications for websafe color	F	5.3.0	5.4.0	T2-020554	MESS5-EMS
23.040	059	-	Rel-5	Add repeat and bouncing to Standard Animation for consistency with Simple Animation	F	5.3.0	5.4.0	T2-020568	MESS5-EMS
23.040	060	-	Rel-5	Allow angle applied to special shape grid for consistency with other special shape elements	F	5.3.0	5.4.0	T2-020567	MESS5-EMS
23.041	009	-	R99	Update of references	F	3.4.0	3.5.0	T2-020512	TEI
23.041	010	-	Rel-4	Update of references	F	4.2.0	4.3.0	T2-020509	TEI4

3GPP TSG-T2 #17
Vancouver, BC, Canada
13 -17 May 2002

T2-020488

CR-Form-v5

CHANGE REQUEST

⌘ **23.040** **CR** **049** ⌘ **rev** **-** ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification of bit value combinations within TP-PI
Source:	⌘	T2
Work item code:	⌘	TEI5
Date:	⌘	03/05/2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Ambiguity of the meaning of certain bit value combinations
Summary of change:	⌘	Clarify how to proceed if there is content in an SM acknowledgement but no indication about its coding
Consequences if not approved:	⌘	Ambiguity remains

Clauses affected:	⌘	9.2.3.27
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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 or the RP-ERROR as indicated in clauses 9.2.2.1a~~,~~ and 9.2.2.2a or the RP-DATA as indicated in clause ~~and~~ 9.2.2.3.

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 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 the TP-UDL bit is set to “1” but the TP-DCS bit is set to “0” then the receiving entity shall for TP-DCS assume a value of 0x00, i.e. the 7bit default alphabet.

If a Reserved bit is set to "1" then the receiving entity shall ignore the setting. The setting of this bit shall mean that additional information will follow the TP-User-Data, so a receiving entity shall discard any octets following the TP-User-Data.

3GPP TSG-T2 #17
Vancouver, BC, Canada
13 -17 May 2002

T2-020490

CR-Form-v5

CHANGE REQUEST

⌘ **23.040** **CR** **050** ⌘ **rev** **-** ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	References to the TP-RD bit
Source:	⌘	T2
Work item code:	⌘	TEI5
Date:	⌘	03/05/2002
Category:	⌘	**F**
Release:	⌘	REL-5

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R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Section 9.2.3.6 is contradictory to section 9.2.2.4: There is a reference to the TP-RD bit which is not defined for an SMS-COMMAND.
Summary of change:	⌘	Section 9.2.3.6 no longer refers to section 9.2.2.4
Consequences if not approved:	⌘	Contradiction remains

Clauses affected:	⌘	9.2.3.6
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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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

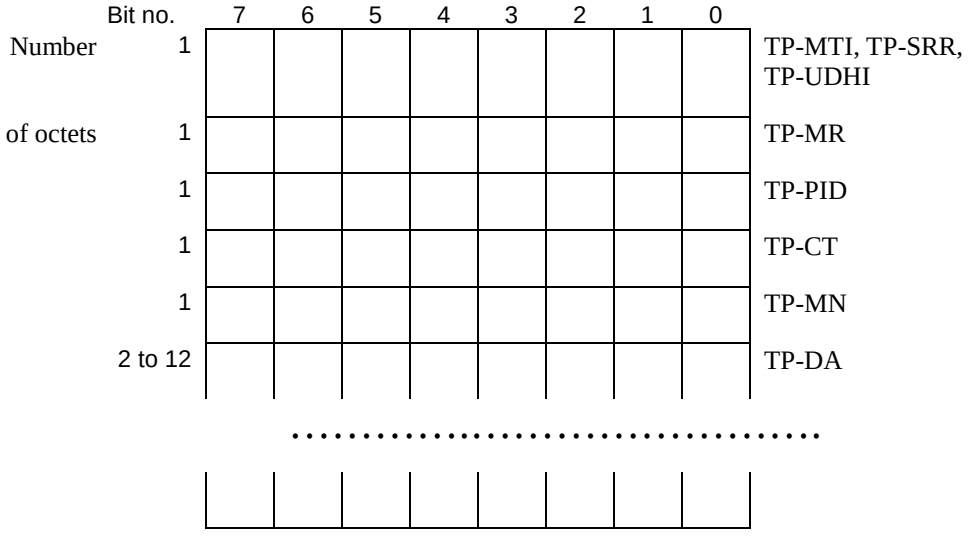
1) Provision: Mandatory (M) or Optional (O).

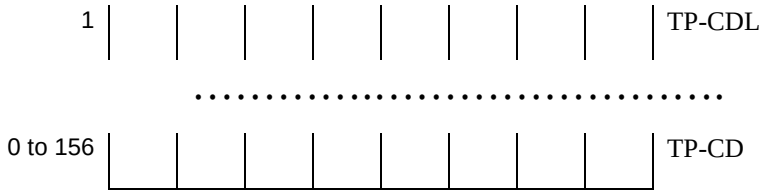
2) Representation: Integer (I), bit (b), 2bits (2b), octet (o).

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.

9.2.3.6 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 (U)SIM (see GSM TS 51.011 [16] and 3GPP 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 (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 response or an RP-ERROR with an appropriate cause value (see 3GPP TS 24.011 [13]) is received in response to an SMS-SUBMIT~~ or SMS-COMMAND~~, then the MS shall 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 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), 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 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 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. In the case of a discarded SMS-SUBMIT~~ or SMS-COMMAND~~, the SC should respond with an RP-ERROR, in which case the RP-ERROR shall include a SMS-SUBMIT-REPORT with TP-FCS indicating “SM Rejected – Duplicate SM”. In some cases, for backward compatibility with earlier phases and versions of this specification, the SC may be configured to respond with an RP-ACK.

The SMS-STATUS-REPORT also contains a TP-Message-Reference field. The value sent to the MS 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.

3GPP TSG-T2 #17
Vancouver, BC, Canada
13 -17 May 2002

T2-020528

CR-Form-v5

CHANGE REQUEST

⌘ **23.040** **CR** **051** ⌘ **rev** **-** ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	TP-DCS values for SIM data download
Source:	⌘	T2
Work item code:	⌘	TEI5
Date:	⌘	03/05/2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
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C *(functional modification of feature)*
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Use one of the following releases:
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R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Section 9.2.3.9 is contradictory to section 4 of 23.038 which lists a lot more 8bit TP-DCS values than just two. Section 9.2.3.9 is also contradictory to section 7.1.1.1 of 31.111 which refers to class 2 SMs in general.
Summary of change:	⌘	Remove incomplete list of only two 8bit values. Remove restriction to download only 8bit SMs.
Consequences if not approved:	⌘	Contradictions remain.

Clauses affected:	⌘	9.2.3.9
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.2.3.9 TP-Protocol-Identifier (TP-PID)

The TP-Protocol-Identifier parameter serves the purposes indicated in clause 3.2.3. It consists of one octet, and the bits in the octet are used as follows:

The MS shall interpret reserved, obsolete, 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/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..011101	Reserved
011110	Enhanced Message Service (Obsolete)
011111	Return Call Message
100000..111011	Reserved
111100	ANSI-136 R-DATA
111101	ME Data download
111110	ME De-personalization Short Message
111111	(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 (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 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 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 3GPP TS 22.022 [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 3GPP TS 22.022 [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 3GPP TS 22.022 [25].

(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 (U)SIM using the mechanism described in GSM TS 51.011 [16] and 3GPP 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 (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. However it has to be noted that MEs based on releases of this specification earlier than REL-5 may allow only 8 bit message class 2 with bit coding 11110110 or 00010110 for (U)SIM Data download.

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 should normally be set to message class 1. If the DCS is set to message class 1 and no application in the ME exists, which is able to process the short message, the ME may discard the short message. The entire user data field is available for ME data download. The TPDU parameters required for the

SMS-DELIVER should be passed transparently by all involved SCs, so no TPDU parameter in the entire short message is modified, other than the changes required to convert an SMS-SUBMIT into an SMS-DELIVER.

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 (U)SIM using the mechanism described in GSM TS 11.14 [16] and 3GPP 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. However it has to be noted that MEs based on releases of this specification earlier than REL-5 may allow only 8 bit message class 2 with bit coding 11110110 or 00010110 for ANSI-136 R-DATA.

3GPP TSG-T2 Meeting #17
Vancouver, Canada, 13 - 17 May 2002

Tdoc T2-020578

CR-Form-v5.1

CHANGE REQUEST

⌘ **TS 23.040** **CR** **052** ⌘ **rev** **-** ⌘ Current version: **3.8.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification of the requirement for type 0 Short Messages
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	15.05.2002
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
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D *(editorial modification)*
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R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Type 0 SMS is currently a big item, since its purpose is to check whether the MS is reachable in the network and/or to cause signalling (e.g. receive a measurement report) from the MS. Many services are making use of the type 0 SMS, e.g. Location Based Services, Voicemail Notification and so on. However, the ME's behaviour for receiving type 0 short messages is unclear and may cause customer affecting misbehaviour.
Summary of change:	⌘	Addition of clarification of the requirement for type 0 Short Messages: It is highly recommended that the ME shall discard the content of a Short Message type 0
Consequences if not approved:	⌘	There will be no recommendation to the ME's behaviour for receiving type 0 short messages. It remains unclear and may cause customer affecting misbehaviour.

Clauses affected:	⌘	9.2.3.9
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

9.2.3.9 TP-Protocol-Identifier (TP-PID)

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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/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..011101	Reserved
011110	Enhanced Message Service (Obsolete)
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	(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.

NOTE: It is highly recommended that the MS discards the type 0 short message. This means that the MS is able to receive the type 0 short message irrespective of whether there is memory available in the (U)SIM or ME or not, the MS does not indicate the receipt of the type 0 short message to the user, and the message is not stored in the (U)SIM or ME.

The Replace Short Message feature is optional for the ME and the (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 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 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 3GPP TS 22.022 [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 3GPP TS 22.022 [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 3GPP TS 22.022 [25].

(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 (U)SIM using the mechanism described in GSM TS 11.11 [16] and 3GPP 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 (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 should normally be set to message class 1. If the DCS is set to message class 1 and no application in the ME exists, which is able to process the short message, the ME may discard the short message. The entire user data field is available for ME data download. The TPDU parameters required for the SMS-DELIVER should be passed transparently by all involved SCs, so no TPDU parameter in the entire short message is modified, other than the changes required to convert an SMS-SUBMIT into an SMS-DELIVER.

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 (U)SIM using the mechanism described in GSM TS 11.14 [16] and 3GPP 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.

3GPP TSG-T2 Meeting #17
Vancouver, Canada, 13 - 17 May 2002

Tdoc T2-020579

CR-Form-v5.1

CHANGE REQUEST

⌘ **TS 23.040** **CR** **053** ⌘ **rev** **-** ⌘ Current version: **4.6.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification of the requirement for type 0 Short Messages
Source:	⌘	T2
Work item code:	⌘	TEI4
Date:	⌘	15.05.2002
Category:	⌘	**A**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	Type 0 SMS is currently a big item, since its purpose is to check whether the MS is reachable in the network and/or to cause signalling (e.g. receive a measurement report) from the MS. Many services are making use of the type 0 SMS, e.g. Location Based Services, Voicemail Notification and so on. However, the ME's behaviour for receiving type 0 short messages is unclear and may cause customer affecting misbehaviour.
Summary of change:	⌘	Addition of clarification of the requirement for type 0 Short Messages: It is highly recommended that the ME shall discard the content of a Short Message type 0
Consequences if not approved:	⌘	There will be no recommendation to the ME's behaviour for receiving type 0 short messages. It remains unclear and may cause customer affecting misbehaviour.

Clauses affected:	⌘	9.2.3.9
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

9.2.3.9 TP-Protocol-Identifier (TP-PID)

The TP-Protocol-Identifier parameter serves the purposes indicated in clause 3.2.3. It consists of one octet, and the bits in the octet are used as follows:

The MS shall interpret reserved, obsolete, 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/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..011101	Reserved
011110	Enhanced Message Service (Obsolete)
011111	Return Call Message
100000..111011	Reserved
111100	ANSI-136 R-DATA
111101	ME Data download
111110	ME De-personalization Short Message
111111	(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.

NOTE: It is highly recommended that the MS discards the type 0 short message. This means that the MS is able to receive the type 0 short message irrespective of whether there is memory available in the (U)SIM or ME or not, the MS does not indicate the receipt of the type 0 short message to the user, and the message is not stored in the (U)SIM or ME.

The Replace Short Message feature is optional for the ME and the (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 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 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 3GPP TS 22.022 [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 3GPP TS 22.022 [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 3GPP TS 22.022 [25].

(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 (U)SIM using the mechanism described in 3GPP TS 51.011 [16] and 3GPP 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 (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 should normally be set to message class 1. If the DCS is set to message class 1 and no application in the ME exists, which is able to process the short message, the ME may discard the short message. The entire user data field is available for ME data download. The TPDU parameters required for the SMS-DELIVER should be passed transparently by all involved SCs, so no TPDU parameter in the entire short message is modified, other than the changes required to convert an SMS-SUBMIT into an SMS-DELIVER.

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 (U)SIM using the mechanism described in 3GPP TS 51.011 [16] and 3GPP 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.

3GPP TSG-T2 Meeting #17
Vancouver, Canada, 13 - 17 May 2002

Tdoc T2-020580

CR-Form-v5.1

CHANGE REQUEST

⌘ **TS 23.040** **CR** **054** ⌘ **rev** **-** ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification of the requirement for type 0 Short Messages
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	15.05.2002
Category:	⌘	C
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
REL-4 *(Release 4)*
REL-5 *(Release 5)*

Reason for change:	⌘	Type 0 SMS is currently a big item, since its purpose is to check whether the MS is reachable in the network and/or to cause signalling (e.g. receive a measurement report) from the MS. Many services are making use of the type 0 SMS, e.g. Location Based Services, Voicemail Notification and so on. However, the ME's behaviour for receiving type 0 short messages is unclear and may cause customer affecting misbehaviour.
Summary of change:	⌘	Changing of the requirement for type 0 Short Messages: The ME shall discard the content of a Short Message type 0
Consequences if not approved:	⌘	The ME's behaviour for receiving type 0 short messages remains unclear and may cause customer affecting misbehaviour.

Clauses affected:	⌘	9.2.3.9
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

9.2.3.9 TP-Protocol-Identifier (TP-PID)

The TP-Protocol-Identifier parameter serves the purposes indicated in clause 3.2.3. It consists of one octet, and the bits in the octet are used as follows:

The MS shall interpret reserved, obsolete, 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/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..011101	Reserved
011110	Enhanced Message Service (Obsolete)
011111	Return Call Message
100000..111011	Reserved
111100	ANSI-136 R-DATA
111101	ME Data download
111110	ME De-personalization Short Message
111111	(U)SIM Data download

A short message type 0 indicates that the ME must acknowledge receipt of the short message but ~~may~~ shall discard its contents. This means that

- the MS shall be able to receive the type 0 short message irrespective of whether there is memory available in the (U)SIM or ME or not,
- the MS shall not indicate the receipt of the type 0 short message to the user,
- the short message shall neither be stored in the (U)SIM nor ME.

The Replace Short Message feature is optional for the ME and the (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 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 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 3GPP TS 22.022 [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 3GPP TS 22.022 [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 3GPP TS 22.022 [25].

(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 (U)SIM using the mechanism described in GSM TS 51.011 [16] and 3GPP 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 (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 should normally be set to message class 1. If the DCS is set to message class 1 and no application in the ME exists, which is able to process the short message, the ME may discard the short message. The entire user data field is available for ME data download. The TPDU parameters required for the SMS-DELIVER should be passed transparently by all involved SCs, so no TPDU parameter in the entire short message is modified, other than the changes required to convert an SMS-SUBMIT into an SMS-DELIVER.

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 (U)SIM using the mechanism described in GSM TS 11.14 [16] and 3GPP 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.

3GPP TSG-T2 #17
Vancouver, BC, Canada
13 -17 May 2002

T2-020565

CR-Form-v5

CHANGE REQUEST

⌘ **23.040** **CR** **055** ⌘ **rev** **-** ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Occurrence of the Reply Address Element
Source:	⌘	T2
Work item code:	⌘	TEI5
Date:	⌘	03/05/2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Reduction of complexity of implementation
Summary of change:	⌘	Additional statement where to place the Reply Address IE in Concatenated SMs
Consequences if not approved:	⌘	Implementation complexity remains

Clauses affected:	⌘	9.2.3.24.10.1.15
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.2.3.24.10.1.15 Reply Address Element

Only one alternate Reply Address Element can be integrated in a message. In the case the Reply Address Element is part of a Concatenated SM this IE shall occur in its first segment only.

Octet 1..n Alternate Reply Address encoded as specified for address fields in clause 9.1.2.5

When this IE is received in a message, replies to this message should take place by default using the address specified in this IE instead of the regular message TP-OA.

NOTE: Despite the fact that MMI aspects of the ME are out of the scope of the present document, it must be mentioned that this mechanism might open the door to potential abuse. It is desirable that the user is made aware in some way that the reply address of the incoming message is different from the originator's one, and that the user is presented with the original TP-OA address to identify the sender of the SM .

3GPP TSG-T2 #17
Vancouver, BC, Canada
13 -17 May 2002

T2-020552

CR-Form-v5

CHANGE REQUEST

⌘ **23.040** **CR** **056** ⌘ rev ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	WVG Corrections and Clarifications
Source:	⌘	T2
Work item code:	⌘	MESS5-EMS
Date:	⌘	14/05/2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	The current version of WVG in EMS specification contains errors, which need to be corrected.
Summary of change:	⌘	Various corrections in both BNF and the description are made.
Consequences if not approved:	⌘	Incorrect data format may lead to unsuccessful implementation.

Clauses affected:	⌘	Annex G.2.4, G.2.5, G.2.7, G2.8.2
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	None

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

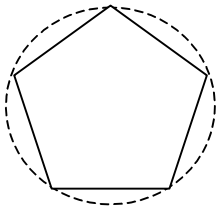
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

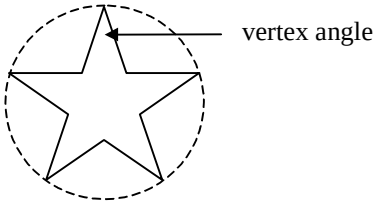
G.2.4 Special Shape Elements

There are 3 types of special shapes. Each shape has a reference point that determines its position. All special shapes ~~except Grid~~ have the reference point at its center. Shapes may have other parameters. These shapes include:

- **Regular Polygon:** a regular polygon has equal length of all its edges. In its original position, the bottom edge of the regular polygon should be aligned horizontally. A rotate angle can be optionally specified. Regular Polygon parameters include the number of vertex, the diameter of the reference circle and angle of rotation.



- **Star:** a star is defined by the number of corner vertex, the diameter of the reference circle, vertex angle and angle of rotation. In its original position, the bottom edge, which formed by two vertexes of the star, should be aligned horizontally. A rotate angle can be optionally specified. Vertex angles are predefined as 0, 36, 60, 90 degrees.



If the vertex angle is 0, a single line from center to vertex shall be drawn.

- **Grid:** a grid is a number of evenly distributed perpendicular lines. Its parameters include height, width, number of rows and columns (up to 16).

A special shape element has its reference point at its center.

G.2.5 Text Element

WVG supports text display inside the drawing. However it supports only the default font. To avoid inconsistency on different terminals, it is recommended to use vector based font. Text can be placed in a drawing with position, font size and rotate angle. Like other elements, text has attributes of line style, line color, line width. It can also be animated.

Control characters are ignored when the text is rendered except for the CR (Carriage Return). The CR indicates the text followed by should be displayed at the next line position. Multi-line text should be left aligned. There is no character spacing and line spacing defined. Recommended character spacing is 10% of the text height. Recommended line spacing is 20% of the text height.

~~When text encoding is GSM 7-bit, SMS character packing is used as defined in 3GPP TS 23.038 [9].~~

A text element has its reference point at top-left corner.

G.2.7 Reuse Element

~~There are two usages of Reuse Element. The first is to repeat a set of elements in the bit-stream and the second is to display an element or group with a transform applied.~~

~~**Repeat:**~~

~~When the Encoder sees a set of elements that are identical to a previous set of elements, it replaces the latter set of elements with a Reuse element, so that encoded bit stream size will be minimized. A Reuse element uses the element_index and number_of_elements to repeat. When the Decoder see the Reuse Element, it will replace it with the set of elements that the Reuse element represents.~~

> ~~NOTE: When calculating the element index of an element that follows a Reuse element in this case, the decoder should not count the Reuse element just as one element. Rather, the decoder should count the Reuse element it as the number of elements it represents. In other words, the index of elements after a Reuse Element in the bit-steam will be unchanged, so that another Reuse Element, which has an element_index, doesn't need to be changed after a Reuse replaces a number of elements.~~

~~One Reuse element can replace a maximum of 8 original elements.~~

~~**Display:**~~

Reuse Element can be used to display an element or a group of elements with a transform and/or changed attributes and/or display an array. Whether a Reuse Element references a group or a basic element depends on the element type that the element_index in the Reuse Element points to. When reuse array is specified, the referenced element or group of elements is duplicated in rows and columns. The reference point of a reused array is at the reference point of the top-left element in ~~center of~~ the array.

G.2.8.2 Standard Animation Element

An Standard Animation Element contains animation information such as begin transform position, end transform position, begin color~~attribute~~, end color~~attribute~~, begin time, end time, etc. This allows one animation element to represent a series of related images, which results in significant compression of the data stream. The WVG player interpolates between the beginning state and end state to achieve animation.

Animation Elements are not allowed inside Groups. Animation Rotation ranges from 0 to 360 degrees in both clockwise and counter-clockwise directions.

G.6 Data Format BNF

The following notation is used in this document for BNF syntax:

< >	Enclose term names
|	Separates alternatives (exclusive OR)
[ ]	Square brackets enclose optional items in syntax descriptions.
{ }	{} Term enclosed is used zero or more times
()	() Enclose groups of alternative terms
…	From … to
;	Start with comments
0	Bit value 0 in bit stream
1	Bit value 1 in bit stream
‘ ‘	Terminator described by enclosed text

Notes for reading the BNF.

1. The bit value appearing at the left in the BNF indicates it is arranged in the front in the bit stream.
2. Notation 00…11 is equivalent to (00 | 01 | 10 | 11)
3. Notation (0 | 1 <val>) is used in the BNF in many occurrences for optionally omitting a value. In this example, it indicates either a specific value <val> can be used, or it can be omitted when default value can be used. The bit value 0 or 1 indicates if <val> is specified.

WVG (Wireless Vector Graphics)

<WVG> ::= (0 <character size WVG>) | (1 <standard WVG>)

<character size WVG> ::= <character size WVG header> <line elements>

<standard WVG> ::= <standard WVG header> <elements>

Common

<text code mode> ::= 0 | 1 *; 0 for 7-bit GSM character set. 1 for 16-bit UCS-2*

<string length> ::= ‘unsigned 8-bit integer’ *; number of GSM or UCS-2 characters*
; GSM extension characters are counted as one character
; <string length> = 0 means null string

<char> ::= ‘unsigned ~~8~~ 7 bit integer’ *; 7-bit GSM character value*
~~; using GSM message packing into 8 bits~~
| unsigned 16 bit integer’ *; 16-bit UCS-2 value*
; ~~terminated by 0x00 or 0x0000.~~ Control characters are prohibited.

<mask> := 0 | 1 *; 0 for false, 1 for true*

<hint> := 0 | 1 *; 0 for false, 1 for true*

Character Size WVG Header

<character size WVG header> ::= (0 (<aspect ratio> <line element mask> <relative use>
<parameters X-0> <parameters Y-0>))
; standard header
| (1 (<line element mask> <relative use> <MaxXYInBits0>))
; compact header. In this case, x and y grid are same,
; default peak value 1.0, default aspect ratio1:1.

; Note: character size WVG always use compact coordinate mode

<line element mask> ::= <mask> *; true for at least one polyline element in the drawing*
<mask> *; true for at least one circular polyline element in the drawing*
<mask> *; true for at least one Bezier polyline element in the drawing*

<relative use> ::= 0 | 1 *; 0 for all points use absolute coordinates,*
; 1 for at least one point uses relative coordinate (offset mode)

<parameters X-0> ::= <MaxXInBits0> <peak description>

<parameters Y-0> ::= <MaxYInBits0> <peak description>

<MaxXInBits0> ::= <bits indicator >

<MaxXInBits0> ::= <bits indicator >

<MaxXYInBits0> ::= <bits indicator >

<bits indicator> ::= 00…11 *; 00 for 3 bits (max value 7), 01 for 4 bits (max value 15)*
;10 for 5 bits (max value 31), 11 for 6 bits (max value 63)
<peak description> ::= 00…11 *; 00: peak value 1.0, no peak position required*
; 01: peak value 1.5, peak position 0.5
; 10: peak value 1.5, peak position 0.3333
; 11: peak value 1.5, peak position 0.6667

Character Size WVG Elements

<line elements> ::= <number of line elements> <line element> { <line element> }

<number of line elements> ::= 'unsigned 7-bit integer' *; maximum 127 elements*

<line element> ::= <line header>
(<polyline element> | <circular polyline element> |<Bezier polyline element>)

<line header> ::= <line element type> [<point mode>] *; appear when <relative use> = 1*

<line element type> ::= *; empty, when <line element mask> = 100, 010 or 100*
0 | 1 *; when <line element mask> = 011, 110, 110 or 101*
; 0 for the firstelement with mask value 1 in the <line element mask>
; 1 for the second element with mask value 1 in <line element mask>
00..11 *; 00 for polyline, 01 for circular polyline, 10 for Bezier polyline*
; (when <line element mask> = 111>)

<point mode> ::= 0 | (1 <offset bit use>) *; 0 for use of absolute coordinate for <Next Point>*
; 1 for using relative coordinate (offset mode) for <Next Point>

Standard WVG Header

<standard WVG header> ::= <general info> <color configuration> <codec parameters> <animation settings>

<general info> ::= <version> 0 | (1 <text code mode> <author string> <title string> <time stamp>)

<version> ::= 0000…1111

<author string> ::= 0 | (1 <string length> <char> { <char> })

<title string> := 0 | (1 <string length> <char> { <char> })

<time stamp> ::= 0 | (1 <year> <month> <day> <hour> <minute> <second>)

<year> ::='signed_13_bit_integer'

<month> ::='unsigned_4_bit_integer' ; range 1-12

<day> ::= 'unsigned_5_bit_integer' ; range 1-31

<hour> ::= 'unsigned_5_bit_integer' ; range 0-23

<minute> ::= 'unsigned_6_bit_integer' ; range 0-59

<second> ::= 'unsigned_6_bit_integer' ; range 0-59>

Color

<color configuration> ::= <color scheme> <default colors>

```
<color scheme> ::=      00                          ; black and white
                  |     010                         ; 2-bit gray scale
                  |     011                         ; 2-bit predefined color. 4 color value 00, 01, 10, 11 are
                                                    ; mapped to RGB color (0,0,0255,255,255), (255,0,0),
                                                    ; (0,255,0) and
                                                    ; (0,0,255) respectively
                  |     100                         ; 6-bit RGB color
                  |     101                         ; W3C websafe color
                  |     1100 <6-bit color palette>  ; 6-bit RGB color using 2nd color palette
                  |     1101 <8-bit color palette>  ; W3C websafe color using 2nd  palette
                  |     1110                        ; for 12 bits color mode
                  |     1111                        ; for 24 bits color mode

<6-bit color palette> ::= 00000…11111               ; A value equal to "number of color" - 1.
                                                    ; Maximum 32 color entries
                      {<6-bit RGB color>}           ; specify color value from 0 to "number of color"-1

<8-bit color palette> ::= 0000000…1111111           ; A value equal to "number of color" - 1.
                                                    ; Maximum 128 color entries
                      { <8-bit websafe color> }     ;specify color value from 0 to "number of color"-1

                                ; Note: the decoder will decide number of bits used by <indexed
                                ; RGB/websafe color> <indexed color> use 1 to 7 bits if <number of
                                ; color> is  2, 3…4, 5…8, 9…16, 17…32, 33…64, 65…128.

<draw color> ::=        <b/w color>                 ; when color scheme is 00
                  |     <grayscale>                 ; when color scheme is 010
                  |     <2-bit predefined color>    ; when color scheme is 011
                  |     <6-bit RGB color>           ; when color scheme is 100
                  |     <8-bit websafe color>       ; when color scheme is 101
                  |     <indexed RGB color>         ; when color scheme is 1100
                  |     <indexed websafe color>     ; when color scheme is 1101
                  |     <12 bit RGB color>          ; when color scheme is 1110
                  |     <24 bit RGB color>          ; when color scheme is 1111

<b/w color> ::= 0 |     ; white
                1       ; black

<grayscale> ::= 00…11   ; 00 for 24-bit RGB color (0,0,0),          01 for 24-bit RGB color (85,85,85)
                        ; 10 for 24-bit RGB color (170,170,170), 11 for 24-bit RGB color (255,255,255)

<2-bit predefined color> ::= 00…11      ;00 for 24-bit RGB color (255,255,2550,0,0), 01 for 24-bit RGB color
(255,0,0)
                                        ;10 for 24-bit RGB color (0,255,0), 11 for 24-bit RGB color (0,0,255)

<6-bit RGB color> ::= <2-bit R> <2-bit G> <2-bit B>

<indexed RGB color> ::= (0 | 1) | 00…11 | 000…111 | 0000…1111 | 00000…11111

                        ; map to 6-bit RGB color value defined in <6-bit color palette>

<8-bit websafe color> ::= 00000000…11111111

<indexed websafe color> ::= (0 | 1) | 00…11 | 000…111 | 0000…1111 |

                        00000…11111 | 000000…111111 | 0000000…1111111

                        ; map to 8-bit websafe color value defined in <8-bit color palette>
```

<2-bit R> ::= <2-bit color value> *; Red color value*

<2-bit G> ::= <2-bit color value> *; green color value*

<2-bit B> ::= <2-bit color value> *; blue color value*

<2-bit color value> ::= 00…11 *; 00, 01, 10 and 11 for color value 0, 85, 170 and 255*
; defined in 0-255 color range respectively

<12-bit RGB color> ::= <4-bit R> <4-bit G> <4-bit B> ;

<4-bit R> ::= <4-bit color value> *; Red color value*

<4-bit G> ::= <4-bit color value> *; green color value*

<4-bit B> ::= <4-bit color value> *; blue color value*

<4-bit color value> ::= 0000…1111 *; multiply by ~~left shift by 4~~ 17 to convert to ~~24~~ 8 bit color value*

<24-bit RGB color> ::= <8-bit R> <8-bit G> <8-bit B> ;

<8-bit R> ::= <8-bit color value> *; Red color value*

<8-bit G> ::= <8-bit color value> *; green color value*

<8-bit B> ::= <8-bit color value> *; blue color value*

<8-bit color value> ::= 00000000…1111111 *; intensity value of color value*

<default colors> := (0 | (1 <default line color>)) *; use black when first bit is 0*
(0 | (1 <default fill color>)) *; use black when first bit is 0*
(0 | (1 <background color>)) *; use white when first bit is 0*
; If above color(s) are not
; specified, use BLACK as <default line color> and <default fill color>, and use
; WHITE as <background color>.

<default line color> ::= <draw color>

<default fill color> ::= <draw color>

<background color> ::= <draw color>

Codec Parameters

<codec parameters> ::= <element mask> <attribute mask> <generic parameters>
<coordinate parameters>

<coordinate parameters> ::= (0 <flat coordinate parameters>) *; flat coordinate mode*
| (1 <compact coordinate parameters>) *; compact coordinate mode*

<element mask> ::= <mask> *; true for at least one local envelop element in the drawing*
<mask> *; true for at least one polyline element in the drawing*
<mask> *; true for at least one circular polyline element in the drawing*
<mask> *; true for at least one Bezier polyline element in the drawing*
<mask> *; true for at least one simple shape element in the drawing*
<mask> *; true for at least one reuse element in the drawing*
<mask> *; true for at least one group element in the drawing*
<mask> *; true for at least one animation element in the drawing*
(0 | (1 *; extension bit. 1 for rare masks are followed by*
<mask> *; true for at least one polygon element in the drawing*
<mask> *; true for at least one special shape element in the drawing*
<mask> *; true for at least one frame element in the drawing*
<mask> *; true for at least one text element in the drawing*
<mask> *; true for at least one extended element in the drawing*
~~<mask> ; reserved~~
~~<mask> ; reserved~~
) *;The decoder should decide how many bits to be used by <element type>*

) *; according to number of "1"s in the <element mask>. Number of bits*
; used by <element type> can be 0 (if only one "1" in <element mask>),
; 1 (if 2 "1"s), 2 (if 3 or 4 "1"s), 3 (if 5-8 "1"s) or 4(if more than 8
; "1"s). Value of <element type> that is to represent a specific element
; type is same as the order of the specific mask in the <element mask>
; that represents this type of element. For example, if <element mask> is
; 1100000000010000, <element type> will use 2 bits and value 00, 01, 10
; (11 is not used) represent circular polyline, rectangle and animation
; elements respectively.

<attribute masks> ::= <line type mask> <line width mask> <line color mask> <fill mask>

<line type mask> ::= <mask> ; *true when at least one element uses line type attribute*

<line width mask> ::= <mask> ; *true when at least one element uses line width attribute*

<fill mask> ::= <mask> ; *true when at least one element uses fill attribute*

<line color mask> ::= <mask> ; *true when at least one element uses line color*

Generic Parameters

<generic parameters> ::= (0 | (1 <angle resolution> <angle in bits>) *; 0 for default (22.5 degree, 3 bits)*
(0 | (1 <scale resolution> <scale in bits>) *; 0 for default (1/4, 3 bits)*
(0 | (1 <index in bits>) *; 0 for default (both 3 bits)*
[<curve offset in bits>]
; <curve offset in bits> appear when <mask> for <circular polyline element>
; or <polygon element> is true

<angle resolution> ::= 00…11 *; 00 for angle unit is 1.40625 degree; 01 for angle unit is 5.625 degree*
; ~~01~~ 10 for angle unit is 11.25 degree; 11 for angle unit is 22.5 degree

<angle in bits> ::= 000…111 *; number of bits used by <angle value> is from ~~2~~ 1 to ~~9~~ 8 bits*

<angle value> ::= '~~un~~signed angleInBits+~~2~~1-bit integer'
; angle unit is decided by <angle resolution>

<scale resolution> ::= 00..11 *; 00 for 1/4 as scale unit. 01 for 1/16 as scale unit*
; 10 for 1/64 as scale unit; 11 for 1/256 as scale unit

<scale in bits> ::= 0000…1111 ; *number of bits used by <scale value> is from ~~3~~ 1 to ~~10~~ 16 bits*

<scale value> ::= 'signed scaleInBits+~~3~~1-bits integer'
; scale unit is decided by <scale resolution>
; scale value include a sign bit

<index in bits> ::= 0000…1111 *; number of bits used by <index> are from ~~3~~ 1 to ~~10~~ 16 bits*

<index> ::= <index value>

<index value> ::= 'unsigned IndexInBits+~~3~~1-bit integer'

<curve offset in bits> ::= 0 | 1 *; 0 for using 4 bits (15 levels)*
; 1 for using 5 bits (31 levels)

Compact Coordinate Parameters

<compact coordinate parameters> ::= <aspect ratio> <TransXYInBits1> *; 0 for default aspect ratio 1:1*
<parameters X-1> <parameters Y-1> <redefine resolution hint>

<aspect ratio> ::= 00 | *; aspect ratio = 1:1*
((01 *; aspect ratio = 4:3*
| 10 *; aspect ratio = 16:9*
| 1100 *; aspect ratio = 64:27*
| 1101 *; aspect ration = 256:81*
| 1110 *; aspect ration = 1024:243*
| 1111 *; aspect ration = 4096:729*
) [<display orientation>] *; <display orientation> appears when standard WVG*
) *; character size WVG uses landscape as default*

<display orientation > ::= 0 | 1 *; 0 for landscape, 1 for portrait*

<parameters X-1> ::= <MaxXInBits1> <coordinate parameters>

<parameters Y-1> ::= <MaxYInBits1> <coordinate parameters>

<coordinate parameters> ::= 00 | (<peak value> <peak position> <peak width>)
; peak value default to 1.0 when 00 is defined

<MaxXInBits1> ::= 00…11 *; the number of grid lines*

<MaxYInBits1> ::= 00…11 *; the number of grid lines*
; 00 for 15, 01 for 31,10 for 63, 11 for 127

<peak value> ::= ~~00~~01…11 ; *~~00 for1.0,~~ 01 for 1.5, 10 for 2.0, 11 for 2.5*
~~; if , <peak value> is 00, <peak position>,~~
~~; <peak width> and <transition width> are ignored.~~

<peak position> ::= 0000…1100 *; 0-12. Peak position = value/12 from envelope left.*
| 1101 *; reserved*
| 1110 *; reserved*
| 1111 *; reserved*

<peak width> ::= 00…11 *; 00 for 0.3, 01 for 0.4, 10 for 0.5, 11 for 0.6*
;<peak width> value are to the scale of total global envelope width.

<redefine resolution hint> ::= <hint> ; *true when at least one element uses 'redefine resolution'attribute*

<TransXYInBits1> ::= 00..11 *; number of bits to encode translation and center of transform*

; 00 for 5 bits, 01 for 6 bits, 10 for 7 bits, 11 for 8 bits

Flat Coordinate Parameters

<flat coordinate parameters> ::= <drawing width> (0 | 1 (<drawing height>)) *; 0 means height = width*
<MaxXInBits2><MaxYInBits2> < XYAllPositive>
<TransXYInBits2> <NumPointsInBits>
<OffsetXInBitsLevel1> <OffsetYInBitsLevel1>
<OffsetXInBitsLevel2> <OffsetYInBitsLevel2>

<drawing width> ::= 'unsigned 16-bit integer'

<drawing height> ::= 'unsigned 16-bit integer'

<MaxXInBits2> ::= 'unsigned_4_bit_integer'

; number of bits to encode X coordination

<MaxYInBits2> ::= 'unsigned_4_bit_integer'

; number of bits to encode Y coordination

<XYAllPositive> ::= "unsigned_1_bit_integer'

; 0 means not all x/y are positive

; 1 means all x/y are positive

<TransXYInBits2> ::= 'unsigned_4_bit_integer' *; number of bits to encode translation and center of transform*

<OffsetXInBitsLevel1> ::= 'unsigned_4_bit_integer'

<OffsetYInBitsLevel1> ::= 'unsigned_4_bit_integer'

<OffsetXInBitsLevel2> ::= 'unsigned_4_bit_integer'

<OffsetYInBitsLevel2> ::= 'unsigned_4_bit_integer'

<NumPointsInBits> ::= 'unsigned_4_bit_integer'

Animation Settings

<animation settings> ::= [<animation mode>] *;appear when <animation element> exist*

~~[<frame timing>] ; appear when <frame element> exist~~

<animation mode> ::= 0 | 1 *; 0 for simple animation; 1 for standard animation*

~~<frame timing> ::= 0 | (1 ; 0 means infinite delay between frames,~~

~~; 1 means reserved~~

Element

<elements> := <number of elements> <element> { <element> }

<number of elements> ::= (0 'unsigned 7-bit integer')

| (1 'unsigned 15-bit integer')

<element> := <element type> (<basic element> |
<frame element> | <group element> | <re-use element> |
<animation element> | <extended element> | <local envelop element>)

<element type> ::= | 0…1 | 00..11 | 000…111 | 0000…1111 *; empty is allowed*

; decided by <element mask>. Please refer to <element mask>

<animation element> := <simple animation element> | <standard animation element>

; if <animation mode> is 0, all animation elements in the drawing are <simple animation element>
; if <animation mode> is 1, all animation elements in the drawing are <standard animation element>

<basic element>::= <basic element header> (<polyline element> | <circular polyline element>

| <Bezier polyline element> | <polygon element> | <simple shape element>

| <special shape element> | <text element>)

Basic Element Header

~~<basic element header> ::= [<resolution redefinition>] ; appear when in compact coordinate mode~~
~~(0 | (1<offset bit use>))~~
~~; specify measurement mode for <Next Point> <width> <height> and <diameter>~~
~~; etc. the 0|1 indicator only exist in compact coordinate mode~~
~~; in compact coordinate mode, 0 for absolute mode, 1 for offset mode~~

<basic element header> ::= (<offset bit use> *; when in flat coordinate mode*
| <resolution and offset bit>) *; when in compact coordinate mode*
[0 | (1<attributes set>)] *; appears when <attribute masks> does not equal*
; to 0000
; 0 for *using default attributes defined in <drawing header>*
; 1 for u*sing the following specific attributes*

<Offset Bit Use> ::= <Offset X Use><Offset Y Use>

<Offset X Use> ::= 0 | 1

; when in compact coordinate mode, 0 means offset X will use 3 bits.,

1 means use 4 bits

; when in flat coordinate mode, 0 means offset X will use <OffsetXInBitsLevel1>,

1 means use <OffsetXInBitsLevel2>

<Offset Y Use> ::= 0 | 1

; when in compact coordinate mode, 0 means offset X will use 3 bits,

1 means use 4 bits

; when in flat coordinate mode, 0 means offset X will use <OffsetYInBitsLevel1>,

1 means use <OffsetYInBitsLevel2>

~~<resolution redefinition>::= ; ; empty, do not redefine resolution~~
~~; when <redefine resolution hint> is false or in local scope~~

~~| 0 ; do not redefine resolution~~
~~; when <redefine resolution hint> is true and in global scope~~

~~| (1 <coordinate resolution>) ; redefine resolution~~
~~; when <redefine resolution hint> is true and in global scope~~

<resolution and offset bit>::= (0 | (1<offset bit use>)
; only when <redefine resolution hint> is false or in local scope
; 0 for absolute coordinate, 1 for relative coordinates
| (0 (0 | (1<offset bit use>))
; when <redefine resolution hint> is true and in global scope
; 0 for absolute coordinate, 1 for relative coordinates
| (1 <coordinate resolution> <offset bit use>)
; when <redefine resolution hint> is true and in global scope
; redefine resolution, always use relative coordinates

<coordinate resolution> ::= 000…111 ; decide the grid line interval by a scale of width
; or height of the global envelope whichever is short.
; 0-7 for 1/27, 1/32, 1/38, 1/48, 1/64,
; 1/85, 1/128 and 1/160 respectively

~~; after definition, the element still use <MaxXInBits1>,~~
~~; <MaxYInBits1>, <MaxYInBits2>,<MaxXInBits2>,~~
~~<MaxXInBits1> unless it uses offset mode~~

Element Attributes

<attribute set> ::= [<line type>] ; appear when <line type mask> is true
[<line width>] ; appear when <line width mask> is true
[0 | (1 <line color>)] ; appear when <line color mask> is true and
; <line width> is not zero
[0 | (1 ; 0 for no fill; 1 for with fill
(0 | (1 <fill color>)) ; use <default fill color> if <fill color> absent
) ; appear when <fill mask> is true
] ; Note: line type and fill are not used by <text element> but still exist here,

<line width> ::= 00…11 ; 00 for no line, 01 for Fine, 10 for medium, 11 for thick
; 00 is only valid with fill

<line type> ::= 00…11 ; 0 for solid, 1 for dash line, 2 for dotted line

<fill color > ::= <draw color>

<line color> ::= <draw color>

<OverrideAttributeSet> ::= 0 | (1 <line type>)
0 | (1 <line width>)
0 | (1 <line color>)
0 | (1 <fill>)
0 | (1 <fill color>)
; 0 for no overriding, 1 for overriding with specified attribute

<fill> ::= 0 | 1 ; 0 means no fill, 1 means fill

Transform

Note: signed integers use Two's Complement representation.

<Transform> ::= ~~((0 <point>) | (1~~<TranslateX><TranslateY>~~)) ; mandatory new position using two ways~~

0 | (1 <Angle> <ScaleX><ScaleY> < CX>< CY>) ;
optional other transforms~~<Angle> <ScaleX><ScaleY> < CX>< CY>)~~

~~; Default rotation and scale center of <basic element> is the first point of lines, center of rectangle, ; ellipse and special shapes. Default rotation and scale center of <group element> is the rotation and ; scale center of the first basic element in the group.~~

<Angle> ::= 0 | (1 <Angle Value>) *; 0 means angle will use default value which is 0*

<TranslateX> ::= 0 | (1 <TranslateX Value>) *; 0 means translate x will use default value which is 0*

<TranslateX Value> ::= 'signed_TransXYInBits2_bit integer' *; when in flat coordinate mode*

| 'signed TransXYInBits1+~~4~~ 5 bit integer' *; when in compact coordinate mode*

<TranslateY> ::= 0 | (1 <TranslateY Value>) *; 0 means translate y will use default value which is 0*

<TranslateY Value> ::= 'signed_TransXYInBits2_bit integer' *; when in flat coordinate mode*

| 'signed TransXYInBits1+45-bit integer' *; when in compact coordinate mode*

<ScaleX> ::= 0 | (1<Scale value>) *; 0 means scale will use default value which is 1.0*
<ScaleY>::= 0 | (1 <Scale value>) *; 0 means scale will use default value which is same as ; absolute value of <ScaleX>*

<CX> ::= 0 | (1 <CX value>) *; translation of rotation and scale center; 0 means it will use default ; value which is 0*

<CX value> ::= 'signed_TransXYInBits2_bit integer' *; when in flat coordinate mode*

| ~~'signed TransXYInBits1+4-bit integer'~~<X> *; when in compact coordinate mode*

<CY> ::= 0 | (1 <CY value>) *; 0 means it will use default value which is 0*

<CY value> ::= 'signed_TransXYInBits2_bit integer' *; when in flat coordinate mode*

| ~~'signed TransXYInBits1+5-bit integer'~~<Y> *; when in compact coordinate mode*

Polyline Element

<polyline element> ::= [<numberOfPoints>] <First Point> { <Next Point> } [<point terminator>]
; specifies a start point, zero or many intermediate points and an end point.
; <numberOfPoints> appears only when in flat coordinate mode
; <point terminator> appears only when in compact coordinate mode

<point terminator> ::= 111…111 *; Absolute mode in character size WVG. Same number of ; bits of <MaxXInBits0> or <MaxXYInBits0>*

| 1111…1111111 *; Absolute mode in standard WVG. Same number of bits of ; <MaxXInBits1>or <MaxLocalXYInBits>*

| (100 | 1000) *; Offset mode (relative).*

Circular Polyline Element

Note: signed integers use Two's Complement representation.

<circular polyline element> ::= <curve hint> [<numberOfPoints>] <FirstP~~oint~~> <curve offset> <point> { <curve offset> <~~point~~NextPoint> } [<offset terminator>]

; <numberOfPoints> appears only when use
; flat coordinate mode
; <offset terminator> appears only when use

; compact coordinate mode

<curve hint> ::= <hint>

<curve offset> ::= (0 | (1 <curve offset value>)) *; when <curve hint> is true*

| <curve offset value> *; when <curve hint> is false*

<offset value> ::= 'signed 4-bit integer' *; when <curve offset in bits> = 0 ; or in character size WVG*

| 'signed 5-bit integer' *; when <curve offset in bits> = 1*

; Curve offset ratio r = e/L
; Where e is actual curve offset(can be positive or negative),

; L is distance between adjacent nodes
*; We use a signed integer value v to represent. v = round(r*k);*
; Where k = 2^n - 2 (n is number of bits used for <offset value>)

<offset terminator> ::= (1 <curve offset bits>) *; when <curve hint> is true*
| < curve offset bits > *; when <curve hint> is false*

<curve offset bits> ::= 1000 *; when <offset in bits> = 0*
| 10000 *; when <offset in bits> = 1*

Bezier Polyline Element

<Bezier polyline element> ::= [<NumberOfPoints>]
<First Point> {~~[~~<OnCurve>~~]~~ <Next Point>} [1 <point terminator>]

; Same data format for PolyBezCurve, and PolygonBezCurve

; <numberOfPoints> appears only when in flat coordinate moed

; "1 <point terminator>" appears only when in compact coordinate mode

<NumberOfPoints> ::= 'unsigned_NumberOfPointsInBits_bit integer'

<OnCurve> ::= 0 | 1

; 0 – off curve

; 1 – on curve

Polygon Element

Polygon element is actually a closed polyline (including circular and Bezier polyline)

<polygon element> ::= (00 <polyline element>) | (01 <circular polyline element>)
| (10 <Bezier polyline element>)

Simple Shape Element

<simple shape element> ::= (0 <rectangle element>) | (1 <ellipse element>)

<rectangle element>::=<Point><Width><Height><rounded flag> ~~(0 | (1~~ <Angle>~~))~~

<ellipse element>::=<Point><Width><Height> ~~(0 | (1~~ <Angle>~~))~~

<Width> ::= <X> | <Offset X> *; decided by measurement mode (see <basic element header>)*

<Height>::= 0 | (1 <HeightValue>) *; 0 means the height is same as width, height will not be encoded*

<HeightValue> ::= <Y> | <Offset Y>~~ | <Y>~~ *; decided by measurement mode (see <basic element header>)*

<rounded flag> ::= 0 | 1 *; 0 for straight corner, 1 for rounded corner*

Special Shape Element

<special shape element> ::= <point>
00 (<vertex> < diameter > ~~(0 | ((1~~ <angle>~~))~~ *; regular polygon*
| 01 (<vertex> <vertex angle> < diameter > ~~(0 | (1~~ <angle>~~))~~ *; star*
| 10 (<rectangle size> <rows> <columns>) *; grid*
| 11 *; reserved*

<diameter > ::= <X> | <Offset X> *; diameter of circle or vertex*

<rectangle size>::= <width> <height>

<vertex> ::= 000…111 *; number of vertex = <vertex> + 3*

<vertex angle> ::= 00…11 *; 00 for 0 degree, 01 for 36 degree*
; 10 for 60 degree, 11 for 90 degree

<rows> ::= 0000…1111 *; rows = <rows> + 1*

<columns> ::= 0000…1111 *; columns = <columns> + 1*

Text Element

<text element> ::= <point> <font size> <angle> <text code mode> <string length> { <char> }

; <point> is top-left corner of the text.

<font size> ::= <Y> | <Offset Y>

Local Envelop Element

<local envelop element> ::= (0 <local envelope description> <point>)
; local start
; <point> is top- left corner of the local envelope in global coordinates.
; Elements in the local envelope scope use local coordinates and measurements

| 1 *; local end*

<local envelope description> ::= ~~<direction>~~ <coordinate resolution> <MaxLocalXYInBits>

~~<direction> ::= 00 | *; x and y axis are at same direction of the global envelop*~~
~~01 | *; x axis is at negative direction of x axis of the global envelop, and y at same direction*~~
~~10 | *; x and y axis are at negative direction of the global envelop*~~
~~11 *; y axis is at negative direction of y axis of the global envelop, and x at same direction*~~

<MaxLocalXYInBits> ::= 00…11 *; 00 for 3 bits(max value 7), 01 for 4 bits (max value 15),*
10 for 5 bits (max value 31), 11 for 6 bits (max value 63)

Group Element

<group element> ::= (0 (0 | (1 <transform>)) <display>) *; start of group. Transform is optional*
| 1 *; end of group*

<display> ::= 0 | 1 *; 0 – no display when render; 1 – display when render*

Re-use Element

<re-use element> ::= <element index> *; point to the element to be re-used*
; only <basic element>,<group element> and
; <re-use element> can be reused
~~(0 <number of elements>) *; simple repeat (usually used in multi-frame cases)*~~
| ~~(1 *; re-use with changes*~~
<transform>
~~*; re-use with transformation*~~
~~0 | (1 <array parameter>)~~ *; array. It should be performed as the last step*
0 | (1 <OverrideAttributeSet>)
~~)~~

<element index> ::= <index value> *; the element sequence number in whole drawing*

~~<number of elements>::='unsigned 3-bits integer' *; number of elements will be repeated when encode*~~

<array parameter> ::= <columns> [<array width>] <rows> [< array height>] ~~<columns> [<width>]~~

; <array height> indicates whole height of the array, appears when <rows> is non-zero

; element interval at X direction equals to <width>/<columns>

; <array width> indicates whole width of the array, appears when <columns> is non-zero

; element interval at Y direction equals to <height>/<rows>

; The top left element in the array is at the position specified in <transform>

<array width> ::= <X> ; if the element is in globale scope in compact coordinate mode, use unit of ; (global envelope width/ (number of X grid lines –1))

<array height>::= 0 | (1 <Y>) ; 0 means the height is same as width, height will not be encoded

; if the element is in globale scope in compact coordinate mode, use unit of ; (global envelope height/ (number of Y grid lines –1))

~~<OverrideAttributeSet> ::= <AttributeSet> ; override attributes~~

Frame Element

<Frame> ::= <KeepLastFrameContentFlag><HasFilledColorFlag>[<Filled Color>]

<KeepLastFrameContentFlag>::='unsigned 1-bit integer'

; keep the image of the last frame on the screen, or clear it
; value 0 - Do not keep last frame content.
; value 1 - Keep last frame content.

<HasFilledColorFlag> ::='unsigned 1-bit integer'

; value 0 - no filled color
; value 1 - has filled color

<Filled Color>::=<draw color>

; new background color for the frame

Simple Animation Element

<simple animation element> ::= <cycle type>
(0 | (1 <visibility parameter>)
(0 | (1 <transform>) ; begin transform
(0 | (1 <transform>) ; end transform
(0 | 1) ; 0 for no bouncing. 1 for bouncing
~~(0 | 1~~ <rotation direction>~~)~~ ~~;0 for no rotation or specified by <transform>.~~
~~; 1 for round rotation and will override angles defined in~~
~~; <transform>~~
<round rotation flag>
; all animation actions use reference point of the animated <basic element> being reused
; or the reference point of the first element in the animated <group element>

<round rotation flag> ::= 0 | 1 ; 0 for no round rotation.
; 1 for round rotation and will override angles defined in <transform>

<cycle type> ::= 0 | 1 ; 0 indicates short animation cycle; 1 indicates long animation cycle

<visibility parameter> ::= <visibility timing>

<visibility timing> ::= 0000…1111 | 00000000…11111111
; One blinking cycle is divided into four equal time steps for short
; animation cycle or eight steps for long animation cycle. <visibility timing> is a map of time steps in
; which 0 represents invisible and 1 represents visible. Note that in above map, consequence time steps
; is from left to right, or from first order to later order in bit stream.

<rotation direction> ::= 0 | 1 ; 1 for clockwise rotating. 0 for counter-clockwise rotating

Standard Animation Element

<standard animation element>::= <element index> <BeginTransform><EndTransform><Rotation Direction>

<Round> 0 | (1 <Begin~~Attribute~~Color><~~EndAttribute~~EndColor>) <BeginTime><Duration><ExistAfter>

<BeginTransform> ::= 0 | (1<Transform>)

;0 – means use (start from) default transform:
; Angle=0, TranslateX=0, TranslateY=0, ScaleX=256, ScaleY=256, Cx=0, Cy=0
;1 – means Transform follows

<EndTransform> ::= 0 | (1 <Transform>)

;0 – means use (end at) default transform
; Angle=0, TranslateX=0, TranslateY=0, ScaleX=256, ScaleY=256, Cx=0, Cy=0

;1 – means Transform follows

<Rotation Direction> ::= 0 | 1 ;0 – counter clockwise

;1 – clockwise

<Round> ::= 0 | 1 ;0 – no rotation ~~rotate 360 degrees~~

;1 – rotate 360 degrees~~no rotation~~

<Begin Color ~~Attribute~~> ::= (0 | (1 ~~<Attribute Set>~~<line color>)) (0 | (1 <fill color>))
;0 – use default ~~attribute set~~colors ~~(starts from current attribute set)~~

;1 – ~~Attribute Set follows~~ use specified colors

<End Color ~~Attribute~~> ::= (0 | (1 ~~<Attribute Set>~~<line color>)) (0 | (1 <fill color>))
;0 – use default ~~attribute set~~colors ~~(ends at the current attribute set)~~

;1 –~~Attribute Set follows~~ use specified colors

<BeginTime> ::= 'unsigned 12-bit integer'

<Duration> ::= 'unsigned 12-bit integer'

<ExistAfter> :: = 0 | 1 ; 0 – animation element will disappear after the animation is finished

; 1 – animation element will persist after the animation is finished

Extended Element

<Extended> ::= <SizeOfSize><Size><ExtendedElementType>{<payload>}

<SizeOfSize>::='unsigned_5_bit integer'

; the bit size of the Size field

<Size>::='unsigned-<SizeOfSize>-bit integer'

; size of extended element data after ExtendedElementType, in bytes

<ExtendedElementType>::='unsigned_8_bit integer'

; element type of extended element

<payload>::='unsigned_8_bit integer'

; encoded extended element data. The size should be the same as the Size field of Extended, above.

Position and Measurement

Note: signed integers use Two's Complement representation.

<First Point>::=<point> ; first point of a polyline or polygon (including circular and
; Bezier polygons)

<Next Point> ::= <point> | ; when use absolute mode

<Offset> ; when use offset mode

<point> ::= <X> <Y>

<X> ::= 'signed MaxXInBits2-bit integer' ; when in flat coordinate mode and <XYAllPositive> = 0

| 'unsigned MaxXInBits2-bit integer' ; when in flat coordinate mode and <XYAllPositive> = 1

| 'unsigned MaxXInBits1+4-bit integer' ; when in compact coordinate mode and in global scope

| ‘unsigned MaxLocalXYInBits+43-bit integer’ *; when in compact coordinate mode and in local scope*

| ‘unsigned MaxXInBits0+3-bit integer’ *; when in character size WVG (use standard header)*

| ‘unsigned MaxXYBits0+3-bit integer’ *; when in character size WVG (use compact header)*

<Y> ::= ’signed MaxYInBits2-bit integer’ *; when in flat coordinate mode and <XYAllPositive> = 0*

| ’unsigned MaxYInBits2-bit integer’ *; when in flat coordinate mode and <XYAllPositive> = 1*

| ‘unsigned MaxYInBits1+4-bit integer’ *; when in compact coordinate mode and in global scope*

| ‘unsigned MaxLocalXYInBits+43-bit integer’ *; when in compact coordinate mode and in local scope*

| ‘unsigned MaxYInBits0+3-bit integer’ *; when in character size WVG (use standard header)*

| ‘unsigned MaxXYBits0+3-bit integer’ *; when in character size WVG (use compact header)*

; Note: in compact coordinate mode,<X> and <Y> do not use the maximum number of the unsigned integer

<Offset> ::= <Offset X> <Offset Y>

<Offset X> ::= <signed offset X> *; when used by <Next Point>*

| <unsigned offset X> *; when used in other cases*

<Offset Y> ::= <signed offset Y> *; when used by <Next Point>*

| <unsigned offset Y> *; when used in other cases*

<signed offset X> = ’signed OffsetXInBitsLevel1-bit integer’

;when in flat coordinate mode and <offset bit use> = 0

| ’signed ~~OffsetYInBitsLevel2~~OffsetXInBitsLevel2-bit integer’

;when in flat coordinate mode and <offset bit use> = 1

| ‘signed 3-bit integer’ *;when in compact coordinate mode and <offset bit use> = 0*

| ‘signed 4-bit integer’ *;when in compact coordinate mode and <offset bit use> = 0*

<signed offset Y> = ’signed OffsetYInBitsLevel1-bit integer’

;when in flat coordinate mode and <offset bit use> = 0

| ’signed OffsetYInBitsLevel2-bit integer’

;when in flat coordinate mode and <offset bit use> = 1

| ‘signed 3-bit integer’ *;when in compact coordinate mode and <offset bit use> = 0*

| ‘signed 4-bit integer’ *;when in compact coordinate mode and <offset bit use> = 0*

<unsigned offset X> ::= ’unsigned OffsetXInBitsLevel1-bit integer’

;when in flat coordinate mode and <offset bit use> = 0

| ’unsigned OffsetXInBitsLevel2-bit integer’

;when in flat coordinate mode and <offset bit use> = 1

| ‘unsigned 3-bit integer’ *;when in compact coordinate mode and <offset bit use> = 0*

| ‘unsigned 4-bit integer’ *;when in compact coordinate mode and <offset bit use> = 1*

<unsigned offset Y> ::= ’unsigned OffsetYInBitsLevel1-bit integer’

;when in flat coordinate mode and <offset bit use> = 0

| ’unsigned OffsetYInBitsLevel2-bit integer’

;when in flat coordinate mode and <offset bit use> = 1

| ‘unsigned 3-bit integer’ *;when in compact coordinate mode and <offset bit use> = 0*

| ‘unsigned 4-bit integer’ *;when in compact coordinate mode and <offset bit use> = 1*

3GPP TSG-T2 #17 ***T2-020553***

Vancouver, Canada, May 13-17, 2001

CR-Form-v5

CHANGE REQUEST

⌘ **23.040** **CR** **057** ⌘ rev ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	WVG Corrections and Clarifications
Source:	⌘	T2
Work item code:	⌘	MESS5-EMS
Date:	⌘	15/05/2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	The current version of WVG in EMS specification contains ambiguities, which need to be clarified.
Summary of change:	⌘	Clarifications in both BNF and the description are made.
Consequences if not approved:	⌘	Incorrect data format may lead to unsuccessful implementation.

Clauses affected:	⌘	Annex G
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	None

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

Annex G (Normative):
WVG (Wireless Vector Graphics) Data Format

WVG (Wireless Vector Graphics) is a compact binary data format for vector graphics. WVG data is represented by a bit stream, composed of a header, codec parameters and graphical elements. The bit representation of the drawing and contained graphical elements is designed such that the bit stream can be optimized for smallest possible size.

G.1 Introduction

G.1.1 Standard and Character Size WVG Elements

A Standard WVG element is defined by the complete WVG specification. Using a set of the WVG specification with a set of default values, a simplified vector graphics can be used to represent a simple and small vector graphics or glyph. Character Size WVG elements can be included in normal text to represent a handwritten character or symbols that are not supported by character coding system and the font library.

G.1.2 Compression Methods

A combination of compression methods is used in the WVG to achieve the best compression ratio for simple vector graphics and animations. They include:

- **Switchable Linear or Non-linear coordination system**: when graphical elements in a drawing are not evenly distributed, the representation of coordinates can be optimized using a non-linear coordinate system (uneven coordinates)
- **Bit packing**: variable number of bits to represent a number. The number of bits used in WVG can vary from 1 bit to 16 bits.
- **Local envelope**: use a dedicated coordinate system to describe elements in a small area using relatively small coordinate numbers
- **Variable resolution**: in coordinates, sizes, angles, scale and etc, different resolutions can be used for a graphical element to save the number of bits needed for representing a value.
- **Palettes**: color and element ID can be mapped using a palette defined in the drawing header. This also saves the number of bits for representing a color value and an element ID.
- **Default values**: many values can be omitted to use default values. E.g. when no color scheme is defined, the data describes a mono drawing
- **Default Animation Timing**: in addition to standard time based animation, WVG uses a simplified animation model. In Simple Animation mode, no timing is needed for describing animations. Instead, a cycle is defined to describe the timing for these animations.

G.1.3 Coordinate Systems

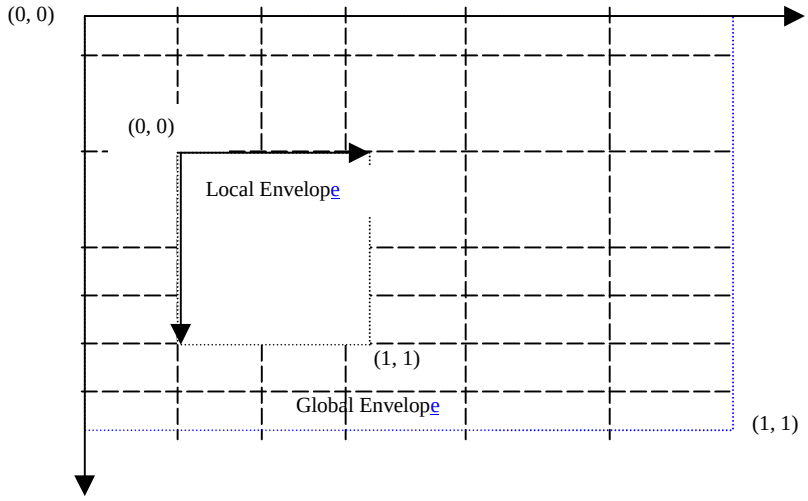
There are two coordinate systems used in WVG, namely Compact Coordinate System and Flat Coordinate System.

G.1.3.1 Compact Coordinate System

In compact coordinate system, a drawing area is defined as rectangle area called envelope. There are two types of envelopes, global envelope and local envelope. The global envelope is a base area in which the drawing is contained. There is only one global envelope. A local envelope is a square area completely or partially within the global envelope. There is no specific global envelope size specified in the data format. The physical display size is decided at rendering time.

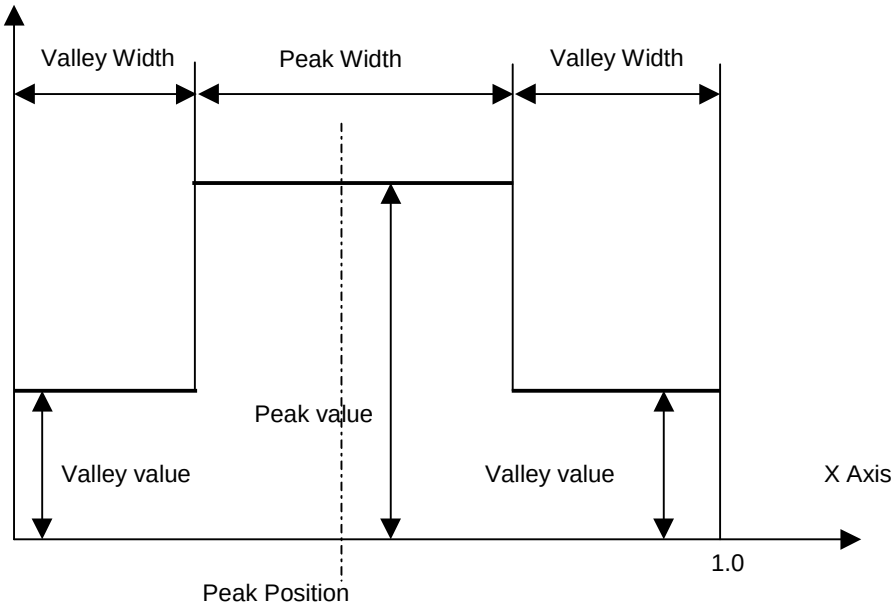
The aspect ratio and orientation are defined in the data header and should be maintained when the drawing is displayed.

Aspect ratios include 1:1, 4:3, 16:9 up to 1024: 729 (height:width), in both portrait and landscape orientation. Aspect ratio for Characters Size WVG elements only has landscape orientation.



In Compact Coordinate System, coordinates are restricted to certain positions which are the cross points of a grid. The grid is defined in the WVG data header, set by a group of parameters. The grid lines along with x axis or y axis may be unevenly distributed.

The global grid can be described using a curve shown above.



There are one peak and two valleys in the curve. The definition of the curve is:

- Peak position: the central position of a peak
- Peak value: a value equal or larger than 1.0
- Peak width: a value less than 1.0
- All valleys should have the same value
- The total area enclosed by the curve and the x-axis from 0.0 to 1.0 is always equating to 1.0

The curve can be uniquely defined by peak position, peak value and peak width. Once the parameters are determined, other values such as valley value can be calculated. Once a curve is given, grid line positions can be calculated according to the following function:

$$\int_0^{Xk} d(x)dx = \frac{k}{n-1}$$

Where X_k is the position of the k^{th} grid line, where n is total number of grid lines. d(x) is the curve function described in this document.

In Standard WVG, the curve parameters are preset as follows.

Variable parameters:

- Number of grid lines: 15, 31, 63 or 127
- Peak value: 1.0, 1.5, 2.0 and 2.5
- Peak position: 13 options from 0.0(0/12), 0.083333(1/12), 0.166667(2/12) to 1.0(12/12)
- Peak width: 0.3, 0.4, 0.5 and 0.6

When a portion of a peak exceeds the global envelope only the part within the global envelope is valid.

For Character Size WVG or glyph, the parameters are set as follows.

Predefined parameters:

- Peak width: 0.4

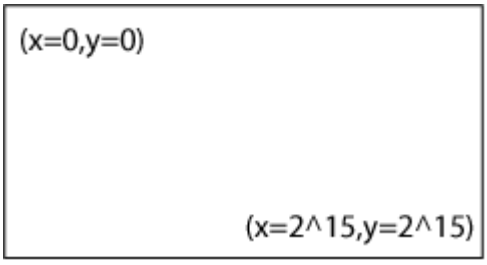
Variable parameters:

- Number of grid lines: 7, 15, 31 or 63
- Peak value: 1.0 or 1.5
- Peak position: 0.3333(1/3), 0.5, 0.6667(2/3)

When using relative coordinates in Compact Coordinate System (refer to G1.3.3), some elements may be specified with specific resolution, which is independent of the global resolution. There are 8 predefined resolutions available for "re-definition resolution", there are 1/27, 1/38, 1/48, 1/64, 1/85, 1/128 and 1/160 of the length of the shorter global envelope edge. Re-definition of resolution only applies to elements in global scope.

G.1.3.2 Flat Coordinate System

The Flat Coordinate System is a 16 bit signed coordinate system with the top left coordinate of the screen being defined as (x=0,y=0) and the bottom right coordinate being described as (x=2^15, y = 2^15). Note that this expresses the dynamic range of the coordinate system, however it does not mean that all drawings are of this size.



G.1.3.3 Coordinate Values

Coordinate values may be represented using two methods: absolute coordinate and relative coordinate.

Absolute Coordinate: an absolute coordinate is a pair of x and y coordinate number. In WVG Compact Coordinate System, absolute coordinate values are the coordinate grid line numbers and are always positive.

Relative Coordinate: the relative coordinate is used only in lines and transform. If the start point is defined by an absolute coordinate, subsequent points can be described by relative coordinates, which are relative grid units from the previous point. A relative coordinate is signed, and it may be positive or negative. A relative coordinate may be used in both global and local coordinate systems. A relative coordinate may exceed the scope of the local envelope that defines the start point of the line.

G.1.4 Color Schemes

WVG supports the following color schemes.

- Black and White (2 Colors): black and white color.
- 2-bit Grayscales: four grayscales are defined as (0,0,0), (85,85,85), (170,170,170) and (255,255,255) in 24-bit RGB color format.
- 4 Default Colors
- 6-bit RGB Color: it is similar to 24-bit RGB color definition but uses only 2 bits to represent a single color, in which value 0, 1,2 and 3 represent 8-bit color value 0, 85, 170 and 255 respectively.
- 6-bit RGB Color Using 2nd Palette
- 8-bit W3C websafe color
- 12-bit and 24-bit RGB color

There are 2 optional drawing pens in WVG, stroke pen and fill pen. Stroke pen and fill pen can be specified with one of the colors defined using the scheme. When the stroke pen is not defined, BLACK should be used for strokes. When the fill pen is not defined, no fill should be applied.

G.1.5 Rendering Model

WVG uses painter model. The elements appears in the later position in the WVG bit stream will overrides the overlapped portion of the elements which appear in the front in the bit stream.

G.2 Graphical Elements

WVG defines a set of graphical and animation elements. Among them, line, shape and text elements are the building blocks to form a drawing. These elements can be transformed, grouped and animated. There are also special elements that are auxiliary.

G.2.1 Line Elements

There are 3 types of lines: polyline, circular polyline and bezier polyline. A polyline can represent a dot when there is only a start point defined.

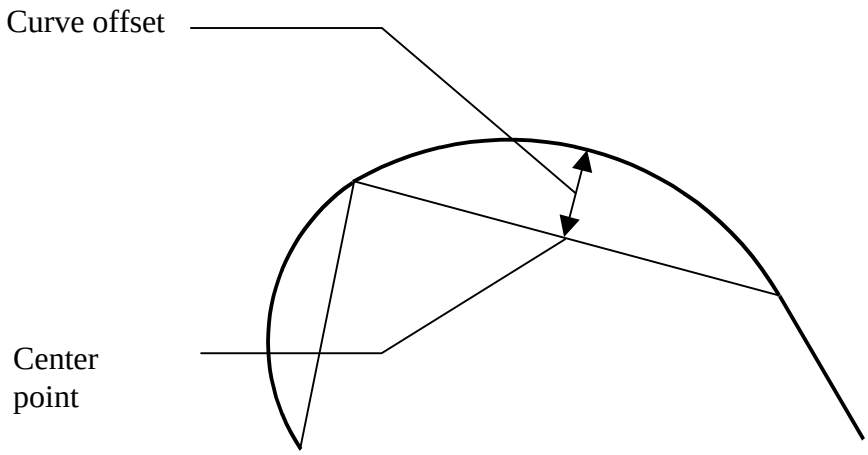
A line element has its reference point at the starting point. A reference point of an element specifies the location of the element.

G.2.1.1 Polyline

Polyline is a set of straight lines connecting a sequence of points. When there is only one point, it is defined as a Dot.

G.2.1.2 Circular Polyline

Circular Polyline is a line that contains at least one circular curve segment. The curve segment connects two adjacent points by a circular arc. The curve segment is determined by the two adjacent points and a curve offset (the perpendicular distance from the center of the line connecting the adjacent points to the circular arc).



Curve offset values are within the range – 0.5 to 0.5, inclusive. A value of 0.5 or – 0.5 identifies that the curve offset equals half of length of the connecting line. The value indicates that the curve is close to a half circle. A positive value indicates that the curve is at the left side of the base line viewed from the curve direction. A negative value indicates that the curve is at the right side of the base line viewed from the curve direction.

G.2.1.3 Bezier Polyline

A Bezier Polyline contains one or more off curve control points in between on curve points. Bezier curves can be filled to create curved shapes and are common in generalized Font representations.

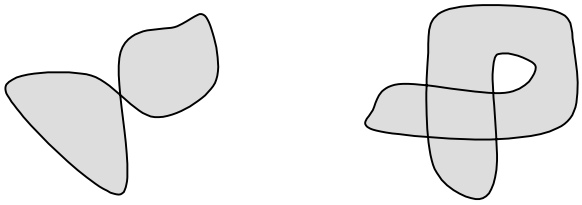
All line elements have direction from the start point to the end point.

Color fill may apply to a line. Refer to G.2.1.4.

G.2.1.4 Auto-Closure of A Line

When a line is specified with the Fill attribute, the line is considered as a closed line, which connects the start point and the end point using a straight line. The enclosed area of a closed line can be used for color fill.

The enclosed area is based on Nonzero fill rule. Following are two examples in which the light color indicates the enclosed area.



G.2.2 Polygon Elements

Polygon elements are closed representations of polyline, circular polyline and Bezier polyline elements. Polygons may have separate line and fill colors or may not be filled at all.

Polygon elements use the Nonzero fill rule for enclosed areas and can be used for color file.

A polygon element has its reference point at the starting point.

G.2.3 Simple Shape Elements

Simple Shapes are rectangles and ellipses. A simple shape is defined by width, height, center point, and angle of rotation. The angle parameter defines how much the shape should be rotated about its center from a horizontal axis drawn through its center. Note that angle units are specified in the main header.~~There are two types of simple shape elements: ellipse and rectangle.~~

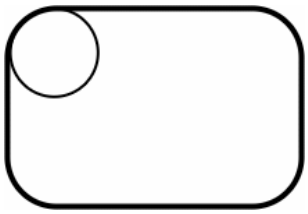
G.2.3.1 Ellipse

Ellipses are defined by their major axis~~e~~, minor axis~~e~~, center and angle of rotation. Circles are considered a special case of ellipse in which the major and minor axis are the same length.

G.2.3.2 Rectangle

Rectangles are represented by their center, ~~length~~width, height, and rotation angle. Squares are considered special rectangles in which the ~~length~~ width and height are identical.

When the "round corner" indicator is set, the corner of the rectangle should be rounded. There is no specific radius of the round corner is defined. The recommended radius of the rounded corner should be 20% of the length of the shorter edge of the rectangle or the square.

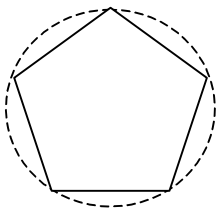


A simple shape element has its reference point at its center.

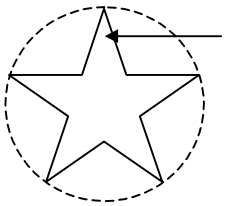
G.2.4 Special Shape Elements

There are 3 types of special shapes. These shapes are Regular Polygons, Stars, and Grids. Each shape has a reference point that determines its position for the purpose of transformations such as detailed in G2,8,1 and G,4. ~~All special shapes except Grid have the reference point at its center.~~ Shapes may have other parameters. These shapes include:

- **Regular Polygon:** a regular polygon has equal length of all its edges. In its original position, the bottom edge of the regular polygon should be aligned horizontally. A rotate angle can be optionally specified. Regular Polygon parameters include the number of vertex, the diameter of the reference circle and angle of rotation.



- **Star:** a star is defined by the number of corner vertex, the diameter of the reference circle, vertex angle and angle of rotation. In its original position, the bottom edge, which formed by two vertexes of the star, should be aligned horizontally. A rotate angle can be optionally specified. Vertex angles are predefined as 0, 36, 60, 90 degrees.



If the vertex angle is 0, a single line from center to vertex shall be drawn.

- **Grid:** a grid is a number of evenly distributed perpendicular lines. Its parameters include height, width, number of rows and columns (up to 16).

A special shape element has its reference point at its center.

G.2.5 Text Element

WVG supports text display inside the drawing. However it supports only the default font. To avoid inconsistency on different terminals, it is recommended to use vector based font. Text can be placed in a drawing with position, font size and rotate angle. Like other elements, text has attributes of line style, line color, line width. It can also be animated.

Control characters are ignored when the text is rendered except for the CR (Carriage Return). The CR indicates the text followed by should be displayed at the next line position. Multi-line text should be left aligned. There is no character spacing and line spacing defined. Recommended character spacing is 10% of the text height. Recommended line spacing is 20% of the text height.

When text encoding is GSM 7-bit, SMS character packing is used as defined in 3GPP TS 23.038 [9].

A text element has its reference point at top-left corner.

G.2.6 Group Elements

A set of elements can be grouped together.
The Group element is used to mark the start and end of grouped elements. A group of elements starts with a Group element which has the end-group indicator off, followed by a list of elements in the group, and ends with an Group element which has the end-group indicator on. Groups can be nested. Implementation must support at least 2 levels of nested group.

Group (start)
Element 1
Element 2
……
    Group (start)
    Element a
    Element b
    ……
    Group (end)
Element n
Element n+1
…..
Group (end)

~~A group of elements starts with a Group element, which is followed by a list of the elements in the group, and ends with an End_Group element. Two levels of grouping is allowed.~~

~~Group 1~~
~~Element 1~~
~~Element 2~~
~~……~~
    ~~Group 2~~
    ~~Element a~~
    ~~Element b~~

~~……~~
~~End Group~~
~~Element n~~
~~Element n+1~~
~~…..~~
~~End Group~~

~~A group element has its reference point at the reference point of its first element in the group.~~

G.2.7 Reuse Element

There are two usages of Reuse Element. The first is to repeat a set of elements in the bit-stream and the second is to display an element or group with a transform applied.

Repeat:

When the Encoder sees a set of elements that are identical to a previous set of elements, it replaces the latter set of elements with a Reuse element, so that encoded bit stream size will be minimized. A Reuse element uses the element_index and number_of_elements to repeat. When the Decoder see the Reuse Element, it will replace it with the set of elements that the Reuse element represents.

> NOTE: When calculating the element index of an element that follows a Reuse element in this case, the decoder should not count the Reuse element just as one element. Rather, the decoder should count the Reuse element it as the number of elements it represents. In other words, the index of elements after a Reuse Element in the bit-steam will be unchanged, so that another Reuse Element, which has an element_index, doesn't need to be changed after a Reuse replaces a number of elements.

One Reuse element can replace a maximum of 8 original elements.

Display:

Reuse Element can be used to display an element or a group of elements with a transform and/or changed attributes and/or display an array. Whether a Reuse Element references a group or a basic element depends on the element type that the element_index in the Reuse Element points to. When reuse array is specified, the referenced element or group of elements is duplicated in rows and columns. The reference point of a reused array is at the center of the array.

G.2.8 Animation Elements

There are two types of animation elements, Simple Animation Element and Standard Animation Element. In the data format, a~~n~~ simple animation element is followed by another element or a group element that the animation applies to. ~~An animation element cannot be followed by another animation element.~~ A standard animation element has pointer or index that points to another element or a group element.

G.2.8.1 Simple Animation Elements

Simple animation is defined for WVG. All animation timing is based on an "Animation Cycle". WVG animation is repetitive. After completion of playing one cycle, a subsequent cycle play commences immediately.

There are two types of animation cycles defined, short cycle and long cycle. The time length of animation cycles are not defined. The time length of a long cycle should be twice the length of a short cycle. Recommended short cycle should collapses for 1 second and long cycle pay for 2 seconds.

There are two types of animations.

Visibility: an element can be visible or invisible during a specific cycle segments. A short cycle is divided into 4 time segments equally and a long cycle is divided into 8 time segments equally.

In the following example, a visibility for short cycle animation is defined. The element to be animated will blink following the pattern defined in the Visibility field below. Bit 1 indicates the element should be displayed during the time segment. Bit 0 indicates it should not be displayed during the time segment.

0	1	0	1

In the following example, a visibility for long cycle animation is defined. The element to be animated will blink following the pattern defined in the Visibility field below.

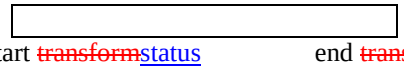
1	0	1	0	1	1	1	1

Round Rotation: an element can be rotated at clockwise or counter-clockwise directions.

Transform: a start and an end transform can be applied to an element to describe the start and end position of a rotate, a scale, a translate animation or any combination of these action. When a transform element is omitted, it defaults to use the element's original position. An animation element must include at least one transform element. The animated element can also be a group to allow the animation action applied to a group of elements.

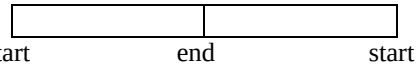
In Simple Animation, a transform from start position to end position should be completed in one cycle. A bounced flag can be turned on to allow "bouncing" animation. A bounced transform transforms the element from start position to end position in one cycle.

Transform in a short cycle:



start transformstatus end transformstatus

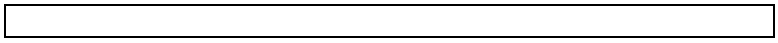
Bounced Transform in a short cycle:



start end start

statustransform statustransform statustransform

Transform in a long cycle:



start transformstatus end statustransform

Bounced Transform in a long cycle:

start end start

statustransform reserve statustransform statustransform

Visibility and transform animation can be applied to the same element.

G.2.8.2 Standard Animation Element

An A Standard Animation Element contains animation information such as begin transform position, end transform position, begin attribute, end attribute, begin time, end time, etc. This allows one animation element to represent a series of related images, which results in significant compression of the data stream. The WVG player interpolates between the beginning state and end state to achieve animation.

Animation Elements are not allowed inside Groups. Animation Rotation ranges from 0 to 360 degrees in both clockwise and counter-clockwise directions.

G.2.9 Frame Element

Frame element is as a marker of the start of a new frame. All elements before a Frame element belong to previous frame. The delay between two frames is defined as an infinite time interval. This means says that once a frame marker is reached, the elements that have been displayed on the screen at this time will stay on the screen until the user requests that the next frame should be displayed. The idea is that one can have multiple "pages" of graphics, such as a multi-page cartoon. The user can then study the first page and when finish can press a button (or trigger some other event) to

see the next page of the cartoon. The mechanism of the user event is not defined and is left up to the application developer.
Here are parameters of a Frame Element:

- Keep last frame contents (or not). Zero means not keeping last frame contents, otherwise all the contents of previous frame will be kept.
- Fill in a new background color (or not). Zero means no new fill color is needed for this frame, otherwise a new background color will be used.
- New Background color.

A Frame element cannot appear in an element group. Reuse and Animation elements can not apply to a Frame element.

G.2.10 Local Element

This element defines the size and position of a local envelope.

The local envelope is a square area whose top-left corner is defined as the origin for its x and y-axis. The number of grid lines are pre-defined to 7, 15, 31 and 63. The resolution is constant in a local grid which is pre-defined at 1/27, 1/32, 1/48, 1/64, 1/85, 1/128, and 1/160 of the local envelope width. Actual envelope size can be determined by number of grid lines and grid resolution. The position of the local envelope is determined by the local envelope origin that falls at a coordinate within the global envelope.

A local element cannot appear in between another local start and local end element.

G.2.11 Extended Element

The Extended Element is defined to create objects which are not part of the base parsing level of defined objects in this specification and as a future proof method of expansion as defined by 3GPP technical committees. The Extended Element is intended for resolving problems in the current release. It may also be possible to use the Extended Element for potential enhancements in future releases. If the decoder encounters an Extended Element and the Extended Element Type is unrecognized, it can gracefully skip this element by seeking past it in the bitstream, and continuing decoding at the next element in the bitstream.

An Extended Element contains the size of the Extended Element, the Extended Element type, and a series of bytes representing the payload data. The size field represents the payload data size in bytes. Note that when reading the payload data, bit alignment should be assumed (not byte alignment).

G.3 Element Attributes

Each element has a number of attributes such as pen color, fill color and line width used for stroking. The following elements Line, Polygon, Shape and Text elements ~~can be applied with~~ have the ~~following~~ listed attributes.

- Line width: 3 levels (fine, medium, thick). Default is fine.
- Line style: 4 types (solid, dash, dot and reserved). Default is solid.
- ~~line~~ pen color and fill color

Line Width
There are 4 line width settings defined, namely No Line, Fine, Medium and Thick. No specific width is defined for Fine, Medium and Thick. Recommended line widths are 1% or one pixel, 2% and 4% of the shorter dimension of the drawing. Line width for Fine, Medium and Thick should be at least 1 pixel. E.g., in a 120x80 pixel screen, the line width may appear as 1 pixel, 2 pixels and 3 pixels.

Line Type:
Dash Line: a dash line should start with a solid segment of the line. The length of the solid segments is recommended to be 4 to 6 times of the line width. The space between two solid segments is recommended to be 3-4 times of the line width.

Dotted Line: a dotted line is a string of circular dot on the path of a line. It is recommended that the diameter of rounded dot is same as the line width. The space between two dots shall be between 1 to 2 dot diameters.

Line Cap:
Line cap is Circular.

Line Joint:
Line joint is Round for line joint.

G.4 Element Transform

The Transform element is used to scale, rotate, or translate any single element or group of elements. Multiple transforms may be applied in succession to any element by standard matrix concatenation. The ~~T~~transform element ~~can~~ may be included in Group, Reuse and Animation elements and applied to line, polygon, shape, text and group elements. ~~Supported transforms include rotate, translate and scale.~~ The sequence of applying ~~those~~ transform operations is scale->rotate->translate.

G.5 Character Size WVG Element

The Character Size WVG, or glyph is a subset variation of WVG. Character Size WVG uses a compact coordinate system with a half resolution global grid (7, 15, 31 and 63 grid lines), default color (monochrome), line elements (polyline, circular polyline and Bezier polyline) and a simplified drawing header.

G.6 Data Format BNF

The following notation is used in this document for BNF syntax:

< >	Enclose term names
|	Separates alternatives (exclusive OR)
[ ]	Square brackets enclose optional items in syntax descriptions.
{ }	{} Term enclosed is used zero or more times
()	() Enclose groups of alternative terms
…	From … to
;	Start with comments
0	Bit value 0 in bit stream
1	Bit value 1 in bit stream
‘ ‘	Terminator described by enclosed text

Notes for reading the BNF.

1. The bit value appearing at the left in the BNF indicates it is arranged in the front in the bit stream.
2. Notation 00…11 is equivalent to (00 | 01 | 10 | 11)
3. Notation (0 | 1 <val>) is used in the BNF in many occurrences for optionally omitting a value. In this example, it indicates either a specific value <val> can be used, or it can be omitted when default value can be used. The bit value 0 or 1 indicates if <val> is specified.
4. signed integers use Two's Complement representation.

WVG (Wireless Vector Graphics)

<WVG> ::= (0 <character size WVG>) | (1 <standard WVG>)

<character size WVG> ::= <character size WVG header> <line elements>

<standard WVG> ::= <standard WVG header> <elements>

Common

<text code mode> ::= 0 | 1 *; 0 for 7-bit GSM character set. 1 for 16-bit UCS-2*

<char> ::= ‘unsigned 8 bit integer’ *; 7-bit GSM character value*
; Extension table are supported but the Another Extension
; and the Page
; Break are not supported.
; using GSM message packing into 8 bits
| unsigned 16 bit integer’ *; 16-bit UCS-2 value*
; terminated by 0x00 or 0x0000. CR is supported but other cControl characters are ~~prohibited~~ not supported (ignored when processed).

<mask> := 0 | 1 *; 0 for false, 1 for true*

<hint> := 0 | 1 *; 0 for false, 1 for true*

Character Size WVG Header

<character size WVG header> ::= 0 (<aspect ratio> <line element mask> <relative use>
<parameters X-0> <parameters Y-0>)
; standard header

| 1 (<line element mask> <relative use> <MaxXYInBits0>)
; compact header. In this case, x and y grid are same,
; default peak value 1.0, default aspect ratio1:1.

; Note: character size WVG always use compact coordinate mode

<line element mask> ::= <mask> *; true for at least one polyline element in the drawing*
<mask> *; true for at least one circular polyline element in the drawing*
<mask> *; true for at least one Bezier polyline element in the drawing*

<relative use> ::= 0 | 1 *; 0 for all points use absolute coordinates,*

; 1 for at least one point uses relative coordinate (offset mode)

<parameters X-0> ::= <MaxXInBits0> <peak description>

<parameters Y-0> ::= <MaxYInBits0> <peak description>

<MaxXInBits0> ::= <bits indicator >

<MaxXInBits0> ::= <bits indicator >

<MaxXYInBits0> ::= <bits indicator >

<bits indicator> ::= 00…11 *; 00 for 3 bits (max value 7), 01 for 4 bits (max value 15)*
;10 for 5 bits (max value 31), 11 for 6 bits (max value 63)
<peak description> ::= 00…11 *; 00: peak value 1.0, no peak position required*
; 01: peak value 1.5, peak position 0.5
; 10: peak value 1.5, peak position 0.3333
; 11: peak value 1.5, peak position 0.6667

Character Size WVG Elements

<line elements> ::= <line element> { <line element> }

<line element> ::= <line header>
(<polyline element> | <circular polyline element> |<Bezier polyline element>)

<line header> ::= <line element type> [<point mode>] *; appear when <relative use> = 1*

<line element type> ::= *; empty, when <line element mask> = 100, 010 or 100*
0 | 1 *; when <line element mask> = 011, 110, 110 or 101*
; 0 for the firstelement with mask value 1 in the <line element mask>
; 1 for the second element with mask value 1 in <line element mask>
00..11 *; 00 for polyline, 01 for circular polyline, 10 for Bezier polyline*
; (when <line element mask> = 111>)

<point mode> ::= 0 | (1 <offset bit use>) *; 0 for use of absolute coordinate for <Next Point>*
; 1 for using relative coordinate (offset mode) for <Next Point>

Standard WVG Header

<standard WVG header> ::= <general info> <color configuration> <codec parameters> <animation settings>

<general info> ::= <version> 0 | (1 <text code mode> <author string> <title string> <time stamp>)

<version> ::= 0000…1111

<author string> ::= 0 | (1 <char> { <char> })

<title string> := 0 | (1 <char> { <char> })

<time stamp> ::= 0 | (1 <year> <month> <day> <hour> <minute> <second>)

<year> ::='signed_13_bit_integer'

<month> ::='unsigned_4_bit_integer' ; range 1-12

<day> ::= 'unsigned_5_bit_integer' ; range 1-31

<hour> ::= 'unsigned_5_bit_integer' ; range 0-23

<minute> ::= 'unsigned_6_bit_integer' ; range 0-59

<second> ::= 'unsigned_6_bit_integer' ; range 0-59>

Color

<color configuration> ::= <color scheme> <default colors>

```
<color scheme> ::=      00                          ; black and white
                  |     010                         ; 2-bit gray scale
                  |     011                         ; 2-bit predefined color. 4 color value 00, 01, 10, 11 are
                                                    ; mapped to RGB color (0,0,0), (255,0,0),
                                                    ; (0,255,0) and
                                                    ; (0,0,255) respectively
                  |     100                         ; 6-bit RGB color
                  |     101                         ; W3C-websafe color
                  |     1100 <6-bit color palette>  ; 6-bit RGB color using 2nd color palette
                  |     1101 <8-bit color palette>  ; W3C-websafe color using 2nd palette
                  |     1110                        ; for 12 bits color mode
                  |     1111                        ; for 24 bits color mode

<6-bit color palette> ::= 00000…11111               ; number of color.
                                                    Maximum 32 color entries
                  {<6-bit RGB color>}               ; specify color value from 0 to "number of color"-1

                                                    <8-bit color palette> ::= 0000000…1111111
                                                    ; number of color. Maximum 128 color entries
                  { <8-bit websafe color> }         ;specify color value from 0 to "number of color"-1

                        ; Note: the decoder will decide number of bits used by <indexed
                        ; RGB/websafe color> <indexed color> use 1 to 7 bits if <number of
                        ; color> is 2, 3…4, 5…8, 9…16, 17…32, 33…64, 65…128.

<draw color> ::=        <b/w color>                 ; when color scheme is 00
                  |     <grayscale>                 ; when color scheme is 010
                  |     <2-bit predefined color>    ; when color scheme is 011
                  |     <6-bit RGB color>           ; when color scheme is 100
                  |     <8-bit websafe color>       ; when color scheme is 101
                  |     <indexed RGB color>         ; when color scheme is 1100
                  |     <indexed websafe color>     ; when color scheme is 1101
                  |     <12 bit RGB color>          ; when color scheme is 1110
                  |     <24 bit RGB color>          ; when color scheme is 1111

<b/w color> ::= 0 |     ; white
                  1     ; black

<grayscale> ::= 00…11   ; 00 for 24-bit RGB color (0,0,0),          01 for 24-bit RGB color (85,85,85)
                        ; 10 for 24-bit RGB color (170,170,170), 11 for 24-bit RGB color (255,255,255)

<2-bit predefined color> ::= 00…11      ;00 for 24-bit RGB color (0,0,0), 01 for 24-bit RGB color (255,0,0)
                                        ;10 for 24-bit RGB color (0,255,0), 11 for 24-bit RGB color (0,0,255)

<6-bit RGB color> ::= <2-bit R> <2-bit G> <2-bit B>

<indexed RGB color> ::= (0 | 1) | 00…11 | 000…111 | 0000…1111 | 00000…11111

                        ; map to 6-bit RGB color value defined in <6-bit color palette>

<8-bit websafe color> ::= 00000000…11111111

<indexed websafe color> ::= (0 | 1) | 00…11 | 000…111 | 0000…1111 |

                        00000…11111 | 000000…111111 | 0000000…1111111

                        ; map to 8-bit websafe color value defined in <8-bit color palette>
```

<2-bit R> ::= <2-bit color value> *; Red color value*

<2-bit G> ::= <2-bit color value> *; green color value*

<2-bit B> ::= <2-bit color value> *; blue color value*

<2-bit color value> ::= 00…11 *; 00, 01, 10 and 11 for color value 0, 85, 170 and 255*
; defined in 0-255 color range respectively

<12-bit RGB color> ::= <4-bit R> <4-bit G> <4-bit B> ;

<4-bit R> ::= <4-bit color value> *; Red color value*

<4-bit G> ::= <4-bit color value> *; green color value*

<4-bit B> ::= <4-bit color value> *; blue color value*

<4-bit color value> ::= 0000…1111 *; left shift by 4 to convert to 24 bit color value*

<24-bit RGB color> ::= <8-bit R> <8-bit G> <8-bit B> ;

<8-bit R> ::= <8-bit color value> *; Red color value*

<8-bit G> ::= <8-bit color value> *; green color value*

<8-bit B> ::= <8-bit color value> *; blue color value*

<8-bit color value> ::= 00000000…1111111 *; intensity value of color value*

<default colors> := (0 | (1 <default line color>)) *; use black when first bit is 0*
(0 | (1 <default fill color>)) *; use black when first bit is 0*
(0 | (1 <background color>)) *; use white when first bit is 0*
; If above color(s) are not
; specified, use BLACK as <default line color> and <default fill color>, and use
; WHITE as <background color>.

<default line color> ::= <draw color>

<default fill color> ::= <draw color>

<background color> ::= <draw color>

Codec Parameters

<codec parameters> ::= <element mask> <attribute mask> <generic parameters>
<coordinate parameters>

<coordinate parameters> ::= (0 <flat coordinate parameters>) *; flat coordinate mode*
| (1 <compact coordinate parameters>) *; compact coordinate mode*

<element mask> ::= <mask> *; true for at least one local envelope element in the drawing*
<mask> *; true for at least one polyline element in the drawing*
<mask> *; true for at least one circular polyline element in the drawing*
<mask> *; true for at least one Bezier polyline element in the drawing*
<mask> *; true for at least one simple shape element in the drawing*
<mask> *; true for at least one reuse element in the drawing*
<mask> *; true for at least one group element in the drawing*
<mask> *; true for at least one animation element in the drawing*
(0 | (1 *; extension bit. 1 for rare masks are followed by*
<mask> *; true for at least one polygon element in the drawing*
<mask> *; true for at least one special shape element in the drawing*
<mask> *; true for at least one frame element in the drawing*
<mask> *; true for at least one text element in the drawing*
<mask> *; true for at least one extended element in the drawing*
<mask> *; reserved*

<mask> *; reserved*
) *;The decoder should decide how many bits to be used by <element type>*
) *; according to number of "1"s in the <element mask>. Number of bits*
; used by <element type> can be 0 (if only one "1" in <element mask>),
; 1 (if 2 "1"s), 2 (if 3 or 4 "1"s), 3 (if 5-8 "1"s) or 4(if more than 8
; "1"s). Value of <element type> that is to represent a specific element
; type is same as the order of the specific mask in the <element mask>
; that represents this type of element. For example, if <element mask> is
; 011~~00000~~000010~~000~~, <element type> will use 2 bits and value 00, 01, 10
; (11 is not used) represent polyline, circular polyline~~, rectangle~~ and animation
; elements respectively.

; Note that <mask> for local envelope has no meanings when in flat
; coordinate mode but still
~~;~~ exists

<attribute masks> ::= <line type mask> <line width mask> <line color mask> <fill mask>

<line type mask> ::= <mask> ; *true when at least one element uses line type attribute*

<line width mask> ::= <mask> ; *true when at least one element uses line width attribute*

<fill mask> ::= <mask> ; *true when at least one element uses fill attribute*

<line color mask> ::= <mask> ; *true when at least one element uses line color*

Generic Parameters

<generic parameters> ::= (0 | (1 <angle resolution> <angle in bits>) *; 0 for default (22.5 degree, 3 bits)*
(0 | (1 <scale resolution> <scale in bits>) *; 0 for default (1/4, 3 bits)*
(0 | (1 <index in bits>) *; 0 for default (both 3 bits)*
[<curve offset in bits>]
; <curve offset in bits> appear when <mask> for <circular polyline element>
; or <polygon element> is true

<angle resolution> ::= 00…11 *; 00 for angle unit is 1 degree; 01 for angle unit is 5.625 degree*
; 01 for angle unit is 11.25 degree; 11 for angle unit is 22.5 degree

<angle in bits> ::= 000…111 *; number of bits used by <angle value> is from 2 to 9 bits*

<angle value> ::= 'unsigned angleInBits+2-bit integer'
; angle unit is decided by <angle resolution>
; 0 degree is defined as positive direction of the X axis and
; positive angle value is clockwise.

; -180 degree is represented by maximum negative digit

<scale resolution> ::= 00..11 *; 00 for 1/4 as scale unit. 01 for 1/16 as scale unit*
; 10 for 1/64 as scale unit; 11 for 1/256 as scale unit

<scale in bits> ::= 000…111 ; *number of bits used by <scale value> is from 3 to 10 bits*

<scale value> ::= 'signed scaleInBits+3-bits integer'
; scale unit is decided by <scale resolution>
; negative scale value means scaling at~~include a sign bit~~
; opposite direction

<index in bits> ::= 000…111 *; number of bits used by <index> are from 3 to 10 bits*

<index> ::= <index value>

<index value> ::= 'unsigned IndexInBits+3-bit integer'

<curve offset in bits> ::= 0 | 1 *; 0 for using 4 bits (15 levels)*
; 1 for using 5 bits (31 levels)

Compact Coordinate Parameters

<compact coordinate parameters> ::= <aspect ratio> <TransXYInBits1> *~~; 0 for default aspect ratio 1:1~~*
<parameters X-1> <parameters Y-1> <redefine resolution hint>

<aspect ratio> ::= 00 | ; *aspect ratio = 1:1*
((01 ; *aspect ratio = 4:3*
| 10 ; *aspect ratio = 16:9*
| 1100 ; *aspect ratio = 64:27*
| 1101 ; *aspect ration = 256:81*
| 1110 ; *aspect ration = 1024:243*
| 1111 ; *aspect ration = 4096:729*
) [<display orientation>] ; *<display orientation> appears ~~when~~ in standard WVG*
) ; *character size WVG uses landscape ~~as default~~only*

<display orientation > ::= 0 | 1 ; *0 for landscape, 1 for portrait*

<parameters X-1> ::= <MaxXInBits1> <coordinate parameters>

<parameters Y-1> ::= <MaxYInBits1> <coordinate parameters>

<coordinate parameters> ::= <peak value> <peak position> <peak width>

<MaxXInBits1> ::= 00…11 ; *Number of bits used by <X>. ~~It decidesthe~~*

; *This determines the number of grid lines in the X direction.*

<MaxYInBits1> ::= 00…11 ; *Number of bits used by <Y>. ~~It decides the number of grid lines~~*

; *This determines the number of grid lines in the Y direction.*

; *00 for 15, 01 for 31,10 for 63, 11 for 127*

<peak value> ::= 00…11 ; *00 for1.0, 01 for 1.5, 10 for 2.0, 11 for 2.5*
; *if , <peak value> is 00, <peak position>,*
; *<peak width> and <transition width> are ignored.*

<peak position> ::= 0000…1100 ; *0-12. Peak position = value/12 from envelope left.*
| 1101 ; *reserved*
| 1110 ; *reserved*
| 1111 ; *reserved*

<peak width> ::= 00…11 ; *00 for 0.3, 01 for 0.4, 10 for 0.5, 11 for 0.6*

;*<peak width> value are to the scale of total global envelope width.*
; *10 (0.5) and 11 (0.6) are not allowed when <peak value> is 11 (2.5)*
; *11 (0.6) is not allowed when <peak value> is 10 (2.0)*

<redefine resolution hint> ::= <hint> ; *true when at least one element uses 'redefine resolution'attribute*

<TransXYInBits1> ::= 00..11 ; *number of bits to encode translation and center of transform*

; *00 for 5 bits, 01 for 6 bits, 10 for 7 bits, 11 for 8 bits*

; *In global scope and at X axis, it uses unit of (global envelope width/ (number of X grid lines –1))*
; *In global scope and at Y axis, it uses unit of (global envelope height/ (number of Y grid lines –1))*
; *In local scope, its unit is same as local coordinate unit.*

Flat Coordinate Parameters

<flat coordinate parameters> ::= <drawing width> (0 | 1 (<drawing height>)) ; *0 means height = width*
<MaxXInBits2><MaxYInBits2> < XYAllPositive>
-<TransXYInBits2>
<OffsetXInBitsLevel1> <OffsetYInBitsLevel1>
<OffsetXInBitsLevel2> <OffsetYInBitsLevel2>

<drawing width> ::= 'unsigned 16-bit integer'

<drawing height> ::= 'unsigned 16-bit integer'

<MaxXInBits2> ::= 'unsigned_4_bit_integer'

; *number of bits to encode X coordination*

<MaxYInBits2> ::= 'unsigned_4_bit_integer'

; number of bits to encode Y coordination

<XYAllPositive> ::= ”unsigned_1_bit_integer’

; 0 means not all x/y are positive

; 1 means all x/y are positive

<TransXYInBits2> ::= ‘unsigned_4_bit_integer’ *; number of bits to encode translation and center of transform*

<OffsetXInBitsLevel1> ::= ‘unsigned_4_bit_integer’

<OffsetYInBitsLevel1> ::= ‘unsigned_4_bit_integer’

<OffsetXInBitsLevel2> ::= ‘unsigned_4_bit_integer’

<OffsetYInBitsLevel2> ::= ‘unsigned_4_bit_integer’

<NumPointsInBits> ::= ‘unsigned_4_bit_integer’

Animation Settings

<animation settings> ::= [<animation mode>] *;appear when <animation element> exist*

[<frame timing>] *; appear when <frame element> exist*

<animation mode> ::= 0 | 1 *; 0 for simple animation; 1 for standard animation*

<frame timing> ::= 0 | (1 *; 0 means infinite delay between frames,*

; 1 means reserved

Element

<elements> := <element> { <element> }

<element> := <element type> (<basic element> |
<frame element> | <group element> | <re-use element> |
<animation element> | <extended element> | <local envelope element>)

<element type> ::= | 0…1 | 00..11 | 000…111 | 0000…1111 *; empty is allowed*

; decided by <element mask>. Please refer to <element mask>

<animation element> := <simple animation element> | <standard animation element>

; if <animation mode> is 0, all animation elements in the drawing are <simple animation element>
; if <animation mode> is 1, all animation elements in the drawing are <standard animation element>

<basic element>::= <basic element header> (<polyline element> | <circular polyline element>

| <Bezier polyline element> | <polygon element> | <simple shape element>

| <special shape element> | <text element>)

Basic Element Header

<basic element header> ::= [<resolution redefinition>] *; appear when using global coordinates*
; in compact coordinate mode

(0 | (1<offset bit use>))

; specify measurement mode for <Next Point> <width> <height> and <diameter>
; etc. Flat coordinate mode always uses offset mode. Compact coordinate
; mode with redefined resolution always uses offset mode too.~~the 0|1 indicator only exist in compact coordinate mode~~
~~; in compact coordinate mode, 0 for absolute mode, 1 for offset mode~~

[0 | (1<attributes set>)] *; appears when <attribute masks> does not equal*
; to 0000

; 0 for *using default attributes defined in <drawing header>*
; 1 for u*sing the following specific attributes*

<Offset Bit Use> ::= <Offset X Use><Offset Y Use>

<Offset X Use> ::= 0 | 1

; when in compact coordinate mode, 0 means offset X will use 3 bits.,

1 means use 4 bits

; when in flat coordinate mode, 0 means offset X will use <OffsetXInBitsLevel1>,

1 means use <OffsetXInBitsLevel2>

<Offset Y Use> ::= 0 | 1

; when in compact coordinate mode, 0 means offset X will use 3 bits,

1 means use 4 bits

; when in flat coordinate mode, 0 means offset X will use <OffsetYInBitsLevel1>,

1 means use <OffsetYInBitsLevel2>

<resolution redefinition>::= ; *; empty, do not redefine resolution*
; when <redefine resolution hint> is false or in local scope

| 0 *; do not redefine resolution*
; when <redefine resolution hint> is true and in global scope

| (1 <coordinate resolution>) *; redefine resolution*
; when <redefine resolution hint> is true and in global scope

<coordinate resolution> ::= 000…111 *; decide the grid line interval by a scale of width*
; or height of the global envelope whichever is short.
; 0-7 for 1/27, 1/32, 1/38, 1/48, 1/64,
; 1/85, 1/128 and 1/160 respectively

~~*; after definition, the element still use <MaxXInBits1>,*~~
~~*; <MaxYInBits1>, <MaxYInBits2>,<MaxXInBits2>,*~~
~~*<MaxXInBits1> unless it uses offset mode*~~

Element Attributes

<attribute set> ::= [<line type>] *; appear when <line type mask> is true*
[<line width>] *; appear when <line width mask> is true*
[0 | (1 <line color>)] *; appear when <line color mask> is true and*
; <line width> is not zero
; 0 for <default line color>, 1 for specified color
[0 | (1 *; 0 for no fill; 1 for with fill*
~~,~~ (0 | (1 <fill color>)) *; 0 for <default fill color>, 1 for specified color*
~~*; use <default fill color> if <fill color> absent*~~
) *; appear when <fill mask> is true*
] *; Note: line type and ~~fill~~ line width are not used by <text element> but*
; still exist here.~~,~~ If not filled, then background of text output will
; be transparent. If filled, then fill color will be used as text background.

<line width> ::= 00…11 *; 00 for no line, 01 for Fine, 10 for medium, 11 for thick*
; 00 is only valid ~~when <fill color> is specified~~with fill

<line type> ::= 00…11 *; 0 for solid, 1 for dash line, 2 for dotted line*

<fill color > ::= <draw color>

<line color> ::= <draw color>

Transform

~~*Note: signed integers use Two's Complement representation.*~~

<Transform> ::= ((0 <point>) | (1<TranslateX><TranslateY>)) *; mandatory new position using two ways*

0 | (1 <ScaleX><ScaleY> < CX>< CY>) *; optional other transforms*<Angle>

; Default rotation and scale center of <basic element> is the first point of lines, center of rectangle,
; ellipse and special shapes. Default rotation and scale center of <group element> is the rotation and
; scale center of the first basic element in the group.

<Angle> ::= 0 | (1 <Angle Value>) *; 0 means angle will use default value which is 0*

<TranslateX> ::= 0 | (1 <TranslateX Value>) *; 0 means translate x will use default value which is 0*

<TranslateX Value> ::= 'signed_TransXYInBits2_bit integer' *; when in flat coordinate mode*

| 'signed TransXYInBits1+4 integer' *; when in compact coordinate mode*

<TranslateY> ::= 0 | (1 <TranslateY Value>) *; 0 means translate y will use default value which is 0*

<TranslateY Value> ::= 'signed_TransXYInBits2_bit integer' *; when in flat coordinate mode*

| 'signed TransXYInBits1+4-bit integer' *; when in compact coordinate mode*

<ScaleX> ::= 0 | (1<Scale value>) *; 0 means scale will use default value which is 1.0*
<ScaleY>::= 0 | (1 <Scale value>) *; 0 means scale will use default value which is same as*
; absolute value of <ScaleX>

<CX> ::= 0 | (1 <CX value>) *; translation of rotation and scale center; 0 means it will use default*
; value which is at the left border of the drawing (x=0 in the flat
; coordinate system or the global envelope)~~0~~

<CX value> ::= 'signed_TransXYInBits2_bit integer' *; when in flat coordinate mode*

| ~~'signed TransXYInBits1+4-bit integer'~~ *; when in compact coordinate mode*

<CY> ::= 0 | (1 <CY value>) *; 0 means it will use default value which is*
; (y=0 in the flat coordinate system or the global envelope)~~0~~

<CY value> ::= 'signed_TransXYInBits2_bit integer' *; when in flat coordinate mode*

| 'signed TransXYInBits1+5-bit integer' *; when in compact coordinate mode*

Polyline Element

<polyline element> ::= [<numberOfPoints>] <First Point> { <Next Point> } [<point terminator>]
; specifies a start point, zero or many intermediate points and an end point.
; <numberOfPoints> appears only when in flat coordinate mode
; <point terminator> appears only when in compact coordinate mode

<point terminator> ::= 111…111 *; Absolute mode in character size WVG. Same number of*
; bits of <MaxXInBits0> or <MaxXYInBits0>

| 1111…1111111 *; Absolute mode in standard WVG. Same number of bits of*
; <MaxXInBits1>or <MaxLocalXYInBits>

| (100 | 1000) *; Offset mode (relative).*
; use 100 when <Offset X Use> = 0
; use 1000 when <Offset X Use> = 1

Circular Polyline Element

~~*Note: signed integers use Two's Complement representation.*~~

<circular polyline element> ::= <curve hint> [<numberOfPoints>] <point> <curve offset> <point>
{ <curve offset> <point> } [<offset terminator>]

; <numberOfPoints> appears only when use

; *flat coordinate mode*
; *<offset terminator> appears only when use*

; *compact coordinate mode*

<curve hint> ::= <hint>

<curve offset> ::= (0 | (1 <curve offset value>)) ; *when <curve hint> is true*
| <curve offset value> ; *when <curve hint> is false*

<offset value> ::= 'signed 4-bit integer' ; *when <curve offset in bits> = 0*
; *or in character size WVG*
| 'signed 5-bit integer' ; *when <curve offset in bits> = 1*
; *Curve offset ratio r = e/L*
; *Where e is actual curve offset(can be positive or negative),*
; *L is distance between adjacent nodes*
; *We use a signed integer value v to represent. v = round(r*k);*
; *Where k = 2^n - 2 (n is number of bits used for <offset value>)*

<offset terminator> ::= (1 <curve offset bits>) ; *when <curve hint> is true*
| < curve offset bits > ; *when <curve hint> is false*

<curve offset bits> ::= 1000 ; *when <curve offset in bits> = 0*
| 10000 ; *when <curve offset in bits> = 1*

Bezier Polyline Element

<Bezier polyline element> ::= [<NumberOfPoints>]
<First Point> {[<OnCurve>] <Next Point>} [1 <point terminator>]

; *Same data format for PolyBezCurve, and PolygonBezCurve*

; *<numberOfPoints> appears only when in flat coordinate moed*

; *"1 <point terminator>" appears only when in compact coordinate mode*

<NumberOfPoints> ::= 'unsigned_NumberOfPointsInBits_bit integer'

<OnCurve> ::= 0 | 1

; *0 – off curve*

; *1 – on curve*

Note: only cubic and quadratic Bezier curves are supported. It means only one or two successive off-curve points are allowed. The first point of a curve must be on-curve. The last point must also be on-curve if it is Bezier polyline but is not necessary for Bezier polygon.

Polygon Element

Polygon element is actually a closed polyline (including circular and Bezier polyline)

<polygon element> ::= (00 <polyline element>) | (01 <circular polyline element>)
| (10 <Bezier polyline element>)

Simple Shape Element

<simple shape element> ::= (0 <rectangle element>) | (1 <ellipse element>)

<rectangle element>::=<Point><Width><Height><rounded flag> (0 | (1 <Angle>))

<ellipse element>::=<Point><Width><Height> (0 | (1 <Angle>))

<Width> ::= <X> | <Offset X> ~~———~~ ; *<Offset X> is used when <Offset Bit Use> exists in the <basic element header>*
; *if the element is in global scope in compact coordinate mode, use unit of*
; *(global envelope width/ (number of X grid lines –1))*~~*decided by measurement mode (see <basic element header>)*~~

<Height>::= 0 | (1 <HeightValue>) ; *0 means the height is same as width, height will not be encoded*

<HeightValue> ::= <Y> | <Offset Y>~~| <Y>~~ ; *<Offset Y> is used when <Offset Bit Use> exists in the <basic element header>~~decided by measurement mode (see <basic element header>)~~*

; *if the element is in global scope in compact coordinate mode, use unit of ; (global envelope height/ (number of Y grid lines –1))*

<rounded flag> ::= 0 | 1 ; *0 for straight corner, 1 for rounded corner*

Special Shape Element

<special shape element> ::= <point>
00 (<vertex> < diameter > (0 | ((1 <angle>)) ; *regular polygon*
| 01 (<vertex> <vertex angle> < diameter > (0 | (1 <angle>)) ; *star*
| 10 (<rectangle size> <rows> <columns>) ; *grid*
| 11 ; ~~*reserved*~~*not used*

<diameter > ::= <X> | <Offset X> ; *diameter of circle or vertex*

; *<Offset X> is used when <Offset Bit Use> exists in the <basic element*

; *header>*

; *if the element is in global scope in compact coordinate mode, use unit of ; (global envelope width/ (number of X grid lines –1))*

<rectangle size>::= <width> <height>

<vertex> ::= 000…111 ; *number of vertex = <vertex> + 3*

<vertex angle> ::= 00…11 ; *00 for 0 degree, 01 for 36 degree*
; *10 for 60 degree, 11 for 90 degree*

<rows> ::= 0000…1111 ; *rows = <rows> + 1*

<columns> ::= 0000…1111 ; *columns = <columns> + 1*

Text Element

<text element> ::= <point> <font size> <angle> <text code mode> { <char> }

; *<point> is top-left corner of the text.*

<font size> ::= <Y> | <Offset Y> ; *<Offset Y> is used when <Offset Bit Use> exists in the <basic element*

; *header>*

; *if the element is in global scope in compact coordinate mode, use unit of ; (global envelope height/ (number of Y grid lines –1))*

Local Envelope Element

<local envelope element> ::= (0 <local envelope description> <point>)
; *local start*
; *<point> is top- left corner of the local envelope in global coordinates.*
; *Elements in the local envelope scope use local coordinates and measurements*

| 1 ; *local end*

<local envelope description> ::= <direction> <coordinate resolution> <MaxLocalXYInBits>

<direction> ::= 00 | ; *x and y axis are at same direction of the global envelop*
01 | ; *x axis is at negative direction of x axis of the global envelop, and y at same direction*
10 | ; *x and y axis are at negative direction of the global envelop*
11 ; *y axis is at negative direction of y axis of the global envelop, and x at same direction*

<MaxLocalXYInBits> ::= 00…11 ; *00 for 3 bits(max value 7), 01 for 4 bits (max value 15),*

10 for 5 bits (max value 31), 11 for 6 bits (max value 63)

Group Element

<group element> ::= (0 (0 | (1 <transform>)) <display>) *; start of group. Transform is optional*

| 1 *; end of group*

<display> ::= 0 | 1 *; 0 – no display when render; 1 – display when render*

Re-use Element

<re-use element> ::= <element index> *; point to the element to be re-used*
; only <basic element>,<group element> and
; <re-use element> can be reused
(0 <number of elements>) ; *simple repeat (usually used in multi-frame cases)*
| (1 *; re-use with changes*
<transform>
; re-use with transformation
0 | (1 <array parameter>) *; array. It should be performed as the last step*
0 | (1 <OverrideAttributeSet>)
)

<element index> ::= <index value> *; the element sequence number in whole drawing. Start from 0.*

<number of elements>::='unsigned 3-bits integer' *; number of elements will be repeated when encode*

<array parameter> ::= <rows> [<height>] <columns> [<width>]

; <height> indicates whole height of the array, appears when <rows> is non-zero

; <width> indicates whole width of the array, appears when <columns> is non-zero

<OverrideAttributeSet> ::= <AttributeSet> *; override attributes*

Frame Element

<Frame> ::= <KeepLastFrameContentFlag><HasFilledColorFlag>[< *fill color* ~~Filled Color~~>]

; <fill color> is new background color for the frame

<KeepLastFrameContentFlag>::='unsigned 1-bit integer'

; keep the image of the last frame on the screen, or clear it
; value 0 - Do not keep last frame content.
; value 1 - Keep last frame content.

<HasFilledColorFlag> ::='unsigned 1-bit integer'

; value 0 - no filled color
; value 1 - has filled color

~~<Filled Color>::=<draw color>~~

~~*; new background color for the frame*~~

Simple Animation Element

<simple animation element> ::= <cycle type>
(0 | (1 <visibility parameter>)
(0 | (1 <transform>) *; begin transform*
(0 | (1 <transform>) *; end transform*
(0 | 1) *; 0 for no bouncing. 1 for bouncing*
(0 | 1 <rotation direction>) *;0 for no rotation or specified by <transform>.*
; 1 for round rotation and will override angles defined in
; <transform>

~~; all animation actions use reference point of the animated <basic element> being reused~~
~~; or the reference point of the first element in the animated <group element>~~

<cycle type> ::= 0 | 1 *; 0 indicates short animation cycle; 1 indicates long animation cycle*

<visibility parameter> ::= <visibility timing>

<visibility timing> ::= 0000…1111 | 00000000…11111111
; One blinking cycle is divided into four equal time steps for short
; animation cycle or eight steps for long animation cycle. <visibility timing> is a map of time steps in
; which 0 represents invisible and 1 represents visible. Note that in above map, consequence time steps
; is from left to right, or from first order to later order in bit stream.

<rotation direction> ::= 0 | 1 ; 1 for clockwise rotating. 0 for counter-clockwise rotating

Note: for all individual values in the transform, linear interpolation is used.

Standard Animation Element

<standard animation element>::= <element index> <BeginTransform><EndTransform><Rotation Direction>
<Round><Begin Attribute><EndAttribute><BeginTime><Duration><ExistAfter>

<BeginTransform> ::= 0 | (1<Transform>) *; begin position*

;0 – means use (start from) default transform:
; Angle=0, TranslateX=0, TranslateY=0, ScaleX=256, ScaleY=256, Cx=0, Cy=0
;1 – means Transform follows

<EndTransform> ::= 0 | (1 <Transform>) *; end position*

;0 – means use (end at) default transform
; Angle=0, TranslateX=0, TranslateY=0, ScaleX=256, ScaleY=256, Cx=0, Cy=0

;1 – means Transform follows

<Rotation Direction> ::= 0 | 1 *;0 – counter clockwise*

;1 – clockwise

<Round> ::= 0 | 1 *;0 – rotate 360 degrees*

;1 – no rotation

<BeginAttribute> ::= 0 | (1 <Attribute Set>)

;0 – use default attribute set (starts from current attribute set)

;1 – Attribute Set follows

<EndAttribute> ::= 0 | (1 <Attribute Set>)

;0 – use default attribute set (ends at the current attribute set)

;1 –Attribute Set follows

<BeginTime> ::= 'unsigned 12-bit integer' *;<BeginTime> is in units of 10ms*

<Duration> ::= 'unsigned 12-bit integer' *; <Duration> is in units of 10ms*

<ExistAfter> :: = 0 | 1 *; 0 – animation element will disappear after the animation is finished*

; 1 – animation element will persist after the animation is finished

Note: for all individual values in the transform, linear interpolation is used. Similarity, color interpolation uses linear RGB color space. Out of range color values are allowed.

Extended Element

<Extended> ::= <SizeOfSize><Size><ExtendedElementType>{<payload>}

<SizeOfSize>::='unsigned_5_bit integer'

; the bit size of the Size field

<Size>::='unsigned-<SizeOfSize>-bit integer'

; size of extended element data after ExtendedElementType, in bytes

<ExtendedElementType>::='unsigned_8_bit integer'

; element type of extended element

<payload>::='unsigned_8_bit integer'

; encoded extended element data. The size should be the same as the Size field of Extended, above.

Position and Measurement

~~*Note: signed integers use Two's Complement representation.*~~

<First Point>::=<point> *; first point of a polyline or polygon (including circular and*
; Bezier polygons)

<Next Point> ::= <point> | *; when use absolute mode*

<Offset> *; when use offset mode*

; in flat coordinate system, only offset mode is used.

<point> ::= <X> <Y>

<X> ::= 'signed MaxXInBits2-bit integer' *; when in flat coordinate mode and <XYAllPositive> = 0*

| 'unsigned MaxXInBits2-bit integer' *; when in flat coordinate mode and <XYAllPositive> = 1*

| 'unsigned MaxXInBits1+4-bit integer' *; when in compact coordinate mode and in global scope*

| 'unsigned MaxLocalXYInBits+4-bit integer' *; when in compact coordinate mode and in local scope*

| 'unsigned MaxXInBits0+3-bit integer' *; when in character size WVG (use standard header)*

| 'unsigned MaxXYBits0+3-bit integer' *; when in character size WVG (use compact header)*

<Y> ::= 'signed MaxYInBits2-bit integer' *; when in flat coordinate mode and <XYAllPositive> = 0*

| 'unsigned MaxYInBits2-bit integer' *; when in flat coordinate mode and <XYAllPositive> = 1*

| 'unsigned MaxYInBits1+4-bit integer' *; when in compact coordinate mode and in global scope*

| 'unsigned MaxLocalXYInBits+4-bit integer' *; when in compact coordinate mode and in local scope*

| 'unsigned MaxYInBits0+3-bit integer' *; when in character size WVG (use standard header)*

| 'unsigned MaxXYBits0+3-bit integer' *; when in character size WVG (use compact header)*

; Note: in compact coordinate mode,<X> and <Y> do not use the maximum number of the unsigned integer

<Offset> ::= <Offset X> <Offset Y>

<Offset X> ::= <signed offset X> *; when used by <Next Point>*

| <unsigned offset X> *; when used in other cases*

<signed offset X> = 'signed OffsetXInBitsLevel1-bit integer'

;when in flat coordinate mode and <offset bit use> = 0

| 'signed OffsetYInBitsLevel2-bit integer'

;when in flat coordinate mode and <offset bit use> = 1

| 'signed 3-bit integer' *;when in compact coordinate mode and <offset bit use> = 0*

| 'signed 4-bit integer' *;when in compact coordinate mode and <offset bit use> = 0*

<unsigned offset Y> ::= 'unsigned OffsetYInBitsLevel1-bit integer'

;when in flat coordinate mode and <offset bit use> = 0

| 'unsigned OffsetYInBitsLevel2-bit integer'

;when in flat coordinate mode and <offset bit use> = 1

| 'unsigned 3-bit integer' *;when in compact coordinate mode and <offset bit use> = 0*

| 'unsigned 4-bit integer' *;when in compact coordinate mode and <offset bit use> = 1*

3GPP TSG-T2 #17 ***T2-020554***

Vancouver, Canada, May 13-17, 2001

CR-Form-v5

CHANGE REQUEST

⌘ **23.040** **CR** **058** ⌘ rev ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network ☐ Core Network ☐

Title:	⌘	WVG Clarifications for websafe color
Source:	⌘	T2
Work item code:	⌘	MESS5-EMS
Date:	⌘	15/05/2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	The current version of WVG in EMS specification contains ambiguities in the websafe color palette, which need to be clarified.
Summary of change:	⌘	Clarifications in both BNF and the description are made.
Consequences if not approved:	⌘	Incorrect data format may lead to interoperability display inconsistencies when using 8 bit color mode.

Clauses affected:	⌘	Annex G 1.4, G.6, G.7 added
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	None

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

Annex G (Normative):
WVG (Wireless Vector Graphics) Data Format

WVG (Wireless Vector Graphics) is a compact binary data format for vector graphics. WVG data is represented by a bit stream, composed of a header, codec parameters and graphical elements. The bit representation of the drawing and contained graphical elements is designed such that the bit stream can be optimized for smallest possible size.

G.1.4 Color Schemes

WVG supports the following color schemes.

- Black and White (2 Colors): black and white color.
- 2-bit Grayscales: four grayscales are defined as (0,0,0), (85,85,85), (170,170,170) and (255,255,255) in 24-bit RGB color format.
- 4 Default Colors
- 6-bit RGB Color: it is similar to 24-bit RGB color definition but uses only 2 bits to represent a single color, in which value 0, 1,2 and 3 represent 8-bit color value 0, 85, 170 and 255 respectively.
- 6-bit RGB Color Using 2nd Palette
- 8-bit ~~W3C~~ websafe color
- 12-bit and 24-bit RGB color

There are 2 optional drawing pens in WVG, stroke pen and fill pen. Stroke pen and fill pen can be specified with one of the colors defined using the scheme. When the stroke pen is not defined, BLACK should be used for strokes. When the fill pen is not defined, no fill should be applied.

G.6 Data Format BNF

…

Color

<color configuration> ::= <color scheme> <default colors>

```
<color scheme> ::=      00                          ; black and white
                  |     010                         ; 2-bit gray scale
                  |     011                         ; 2-bit predefined color. 4 color value 00, 01, 10, 11 are
                                                    ; mapped to RGB color (0,0,0), (255,0,0), (0,255,0) and
                                                    ; (0,0,255) respectively
                  |     100                         ; 6-bit RGB color
                  |     101                         ; ~~W3C~~ websafe color
                  |     1100 <6-bit color palette>  ; 6-bit RGB color using 2nd color palette
                  |     1101 <8-bit color palette>  ; ~~W3C~~ websafe color using 2nd  palette
                  |     1110                        ; for 12 bits color mode
                  |     1111                        ; for 24 bits color mode

                                                    <6-bit color palette> ::= 00000…11111
                                                    ; number of color. Maximum 32 color entries
                        {<6-bit RGB color>}         ; specify color value from 0 to "number of color"-1

                                                    <8-bit color palette> ::= 0000000…1111111
                                                    ; number of color. Maximum 128 color entries
                        { <8-bit websafe color> }   ;specify color value from 0 to "number of color"-1

                                    ; Note: the decoder will decide number of bits used by <indexed
                                    ; RGB/websafe color> <indexed color> use 1 to 7 bits if <number of
                                    ; color> is  2, 3…4, 5…8, 9…16, 17…32, 33…64, 65…128.

<draw color> ::=        <b/w color>                 ; when color scheme is 00
                  |     <grayscale>                  ; when color scheme is 010
                  |     <2-bit predefined color>     ; when color scheme is 011
                  |     <6-bit RGB color>            ; when color scheme is 100
                  |     <8-bit websafe color>        ; when color scheme is 101
                  |     <indexed RGB color>          ; when color scheme is 1100
                  |     <indexed websafe color>      ; when color scheme is 1101
                  |     <12 bit RGB color>           ; when color scheme is 1110
                  |     <24 bit RGB color>           ; when color scheme is 1111

<b/w color> ::= 0 |     ; white
                1       ; black

<grayscale> ::= 00…11   ; 00 for 24-bit RGB color (0,0,0),          01 for 24-bit RGB color (85,85,85)
                        ; 10 for 24-bit RGB color (170,170,170), 11 for 24-bit RGB color (255,255,255)

<2-bit predefined color> ::= 00…11      ;00 for 24-bit RGB color (0,0,0), 01 for 24-bit RGB color (255,0,0)
                                        ;10 for 24-bit RGB color (0,255,0), 11 for 24-bit RGB color (0,0,255)

<6-bit RGB color> ::= <2-bit R> <2-bit G> <2-bit B>

<indexed RGB color> ::= (0 | 1) | 00…11 | 000…111 | 0000…1111 | 00000…11111

                        ; map to 6-bit RGB color value defined in <6-bit color palette>

<8-bit websafe color> ::= 00000000…11111111

                        ; See G.7 for websafe color palette definition

<indexed websafe color> ::= (0 | 1) | 00…11 | 000…111 | 0000…1111 |

                        00000…11111 | 000000…111111 | 0000000…1111111

                        ; map to 8-bit websafe color value defined in <8-bit color palette>
```

<2-bit R> ::= <2-bit color value> *; Red color value*

<2-bit G> ::= <2-bit color value> *; green color value*

<2-bit B> ::= <2-bit color value> *; blue color value*

<2-bit color value> ::= 00…11 *; 00, 01, 10 and 11 for color value 0, 85, 170 and 255*
; defined in 0-255 color range respectively

<12-bit RGB color> ::= <4-bit R> <4-bit G> <4-bit B> ;

<4-bit R> ::= <4-bit color value> *; Red color value*

<4-bit G> ::= <4-bit color value> *; green color value*

<4-bit B> ::= <4-bit color value> *; blue color value*

<4-bit color value> ::= 0000…1111 *; left shift by 4 to convert to 24 bit color value*

<24-bit RGB color> ::= <8-bit R> <8-bit G> <8-bit B> ;

<8-bit R> ::= <8-bit color value> *; Red color value*

<8-bit G> ::= <8-bit color value> *; green color value*

<8-bit B> ::= <8-bit color value> *; blue color value*

<8-bit color value> ::= 00000000…1111111 *; intensity value of color value*

<default colors> := (0 | (1 <default line color>)) *; use black when first bit is 0*
(0 | (1 <default fill color>)) *; use black when first bit is 0*
(0 | (1 <background color>)) *; use white when first bit is 0*
; If above color(s) are not
; specified, use BLACK as <default line color> and <default fill color>, and use
; WHITE as <background color>.

<default line color> ::= <draw color>

<default fill color> ::= <draw color>

<background color> ::= <draw color>

Codec Parameters

…

G.7 Web Safe Color Palette

Websafe color palette can be defined as in following C syntax using 24-bit RGB color (in form of {red, blue, green}). The first index of the array indicates value of <8-bit websafe color>

```
int websafePalette[256][3] =
{
 { 255, 255, 255 }, { 255, 204, 255 }, { 255, 153, 255 }, { 255, 102, 255 },
 { 255,  51, 255 }, { 255,   0, 255 }, { 255, 255, 204 }, { 255, 204, 204 },
 { 255, 153, 204 }, { 255, 102, 204 }, { 255,  51, 204 }, { 255,   0, 204 },
 { 255, 255, 153 }, { 255, 204, 153 }, { 255, 153, 153 }, { 255, 102, 153 },
 { 255,  51, 153 }, { 255,   0, 153 }, { 204, 255, 255 }, { 204, 204, 255 },
 { 204, 153, 255 }, { 204, 102, 255 }, { 204,  51, 255 }, { 204,   0, 255 },
 { 204, 255, 204 }, { 204, 204, 204 }, { 204, 153, 204 }, { 204, 102, 204 },
 { 204,  51, 204 }, { 204,   0, 204 }, { 204, 255, 153 }, { 204, 204, 153 },
 { 204, 153, 153 }, { 204, 102, 153 }, { 204,  51, 153 }, { 204,   0, 153 },
```

```
 { 153, 255, 255 }, { 153, 204, 255 }, { 153, 153, 255 }, { 153, 102, 255 },
 { 153,  51, 255 }, { 153,   0, 255 }, { 153, 255, 204 }, { 153, 204, 204 },
 { 153, 153, 204 }, { 153, 102, 204 }, { 153,  51, 204 }, { 153,   0, 204 },
 { 153, 255, 153 }, { 153, 204, 153 }, { 153, 153, 153 }, { 153, 102, 153 },
 { 153,  51, 153 }, { 153,   0, 153 }, { 102, 255, 255 }, { 102, 204, 255 },
 { 102, 153, 255 }, { 102, 102, 255 }, { 102,  51, 255 }, { 102,   0, 255 },
 { 102, 255, 204 }, { 102, 204, 204 }, { 102, 153, 204 }, { 102, 102, 204 },
 { 102,  51, 204 }, { 102,   0, 204 }, { 102, 255, 153 }, { 102, 204, 153 },
 { 102, 153, 153 }, { 102, 102, 153 }, { 102,  51, 153 }, { 102,   0, 153 },
 {  51, 255, 255 }, {  51, 204, 255 }, {  51, 153, 255 }, {  51, 102, 255 },
 {  51,  51, 255 }, {  51,   0, 255 }, {  51, 255, 204 }, {  51, 204, 204 },
 {  51, 153, 204 }, {  51, 102, 204 }, {  51,  51, 204 }, {  51,   0, 204 },
 {  51, 255, 153 }, {  51, 204, 153 }, {  51, 153, 153 }, {  51, 102, 153 },
 {  51,  51, 153 }, {  51,   0, 153 }, {   0, 255, 255 }, {   0, 204, 255 },
 {   0, 153, 255 }, {   0, 102, 255 }, {   0,  51, 255 }, {   0,   0, 255 },
 {   0, 255, 204 }, {   0, 204, 204 }, {   0, 153, 204 }, {   0, 102, 204 },
 {   0,  51, 204 }, {   0,   0, 204 }, {   0, 255, 153 }, {   0, 204, 153 },
 {   0, 153, 153 }, {   0, 102, 153 }, {   0,  51, 153 }, {   0,   0, 153 },
 { 255, 255, 102 }, { 255, 204, 102 }, { 255, 153, 102 }, { 255, 102, 102 },
 { 255,  51, 102 }, { 255,   0, 102 }, { 255, 255,  51 }, { 255, 204,  51 },
 { 255, 153,  51 }, { 255, 102,  51 }, { 255,  51,  51 }, { 255,   0,  51 },
 { 255, 255,   0 }, { 255, 204,   0 }, { 255, 153,   0 }, { 255, 102,   0 },
 { 255,  51,   0 }, { 255,   0,   0 }, { 204, 255, 102 }, { 204, 204, 102 },
 { 204, 153, 102 }, { 204, 102, 102 }, { 204,  51, 102 }, { 204,   0, 102 },
 { 204, 255,  51 }, { 204, 204,  51 }, { 204, 153,  51 }, { 204, 102,  51 },
 { 204,  51,  51 }, { 204,   0,  51 }, { 204, 255,   0 }, { 204, 204,   0 },
 { 204, 153,   0 }, { 204, 102,   0 }, { 204,  51,   0 }, { 204,   0,   0 },
 { 153, 255, 102 }, { 153, 204, 102 }, { 153, 153, 102 }, { 153, 102, 102 },
 { 153,  51, 102 }, { 153,   0, 102 }, { 153, 255,  51 }, { 153, 204,  51 },
 { 153, 153,  51 }, { 153, 102,  51 }, { 153,  51,  51 }, { 153,   0,  51 },
 { 153, 255,   0 }, { 153, 204,   0 }, { 153, 153,   0 }, { 153, 102,   0 },
 { 153,  51,   0 }, { 153,   0,   0 }, { 102, 255, 102 }, { 102, 204, 102 },
 { 102, 153, 102 }, { 102, 102, 102 }, { 102,  51, 102 }, { 102,   0, 102 },
 { 102, 255,  51 }, { 102, 204,  51 }, { 102, 153,  51 }, { 102, 102,  51 },
 { 102,  51,  51 }, { 102,   0,  51 }, { 102, 255,   0 }, { 102, 204,   0 },
 { 102, 153,   0 }, { 102, 102,   0 }, { 102,  51,   0 }, { 102,   0,   0 },
 {  51, 255, 102 }, {  51, 204, 102 }, {  51, 153, 102 }, {  51, 102, 102 },
 {  51,  51, 102 }, {  51,   0, 102 }, {  51, 255,  51 }, {  51, 204,  51 },
 {  51, 153,  51 }, {  51, 102,  51 }, {  51,  51,  51 }, {  51,   0,  51 },
 {  51, 255,   0 }, {  51, 204,   0 }, {  51, 153,   0 }, {  51, 102,   0 },
 {  51,  51,   0 }, {  51,   0,   0 }, {   0, 255, 102 }, {   0, 204, 102 },
 {   0, 153, 102 }, {   0, 102, 102 }, {   0,  51, 102 }, {   0,   0, 102 },
 {   0, 255,  51 }, {   0, 204,  51 }, {   0, 153,  51 }, {   0, 102,  51 },
 {   0,  51,  51 }, {   0,   0,  51 }, {   0, 255,   0 }, {   0, 204,   0 },
 {   0, 153,   0 }, {   0, 102,   0 }, {   0,  51,   0 }, {  17,  17,  17 },
 {  34,  34,  34 }, {  68,  68,  68 }, {  85,  85,  85 }, { 119, 119, 119 },
 { 136, 136, 136 }, { 170, 170, 170 }, { 187, 187, 187 }, { 221, 221, 221 },
 { 238, 238, 238 }, { 192, 192, 192 }, { 128,   0,   0 }, { 128,   0, 128 },
 {   0, 128,   0 }, {   0, 128, 128 }, {   0,   0,   0 }, {   0,   0,   0 },
 {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 },
 {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 },
 {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 },
 {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 },
 {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 }, {   0,   0,   0 }
};
```

3GPP TSG-T2 #17 ***T2-020568***

Vancouver, Canada, May 13-17, 2001

CR-Form-v5

CHANGE REQUEST

⌘ **23.040** **CR** **059** ⌘ rev ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network ☐ Core Network ☐

Title:	⌘	Add repeat and bouncing to Standard Animation for consistency with Simple Animation
Source:	⌘	T2
Work item code:	⌘	MESS5-EMS
Date:	⌘	15/05/2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	Increase consistency in the spec.
Summary of change:	⌘	Repeat and bouncing animation added for Standard Animation
Consequences if not approved:	⌘	Implementation may be more complex if inconsistency exists.

Clauses affected:	⌘	Annex G.6
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	None

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

G.6 Data Format BNF

…

Standard Animation Element

<standard animation element>::= <element index> <BeginTransform><EndTransform><Rotation Direction>

<Round><Begin Attribute><EndAttribute><BeginTime><Duration><ExistAfter>

<BeginTransform> ::= 0 | (1<Transform>)

;0 – means use (start from) default transform:
; Angle=0, TranslateX=0, TranslateY=0, ScaleX=256, ScaleY=256, Cx=0, Cy=0
;1 – means Transform follows

<EndTransform> ::= 0 | (1 <Transform>)

;0 – means use (end at) default transform
; Angle=0, TranslateX=0, TranslateY=0, ScaleX=256, ScaleY=256, Cx=0, Cy=0

;1 – means Transform follows

<Rotation Direction> ::= 0 | 1 *;0 – counter clockwise*

;1 – clockwise

<Round> ::= 0 | 1 *;0 – rotate 360 degrees*

;1 – no rotation

<BeginAttribute> ::= 0 | (1 <Attribute Set>)

;0 – use default attribute set (starts from current attribute set)

;1 – Attribute Set follows

<EndAttribute> ::= 0 | (1 <Attribute Set>)

;0 – use default attribute set (ends at the current attribute set)

;1 –Attribute Set follows

<BeginTime> ::= 'unsigned 12-bit integer'

<Duration> ::= 'unsigned 12-bit integer'

<ExistAfter> :: = 0 | (1 <AnimationRepeat>) *; 0 – animation element will disappear after the animation is finished*

; 1 – animation element will persist after the animation is finished

<AnimationRepeat>::= 0 | (1 <Bouncing>) *; 0 – no repeat, animated element will stay*
; at <EndTransform>

; 1 – animation will repeat, duration will be <Duration>

<Bouncing>:= 0 | 1 *; 0 – no bouncing, animation will repeat as from begin*
; position to end position
; 1 – repeat with bouncing. Animation will be
; repeated as end position ->
; begin position, then begin position->end position,
; then end position->begin position …

Extended Element

…

3GPP TSG-T2 #17 ***T2-020567***

Vancouver, Canada, May 13-17, 2001

CR-Form-v5

CHANGE REQUEST

⌘ **23.040** **CR** **060** ⌘ rev ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network ☐ Core Network ☐

Title:	⌘	Allow angle applied to special shape grid for consistency with other special shape elements
Source:	⌘	T2
Work item code:	⌘	MESS5-EMS
Date:	⌘	May 2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	Increase consistency in the spec.
Summary of change:	⌘	Angle applied to all special shapes
Consequences if not approved:	⌘	Implementation may be more complex if inconsistency exists.

Clauses affected:	⌘	Annex G.2.4 and G.6
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	None

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

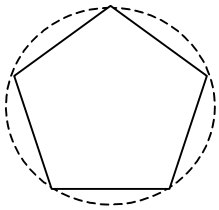
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

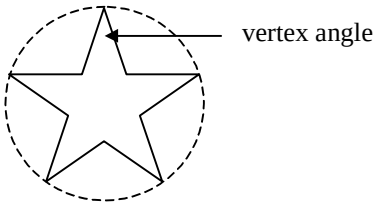
G.2.4 Special Shape Elements

There are 3 types of special shapes. Each shape has a reference point that determines its position. All special shapes have the reference point at its center. Shapes may have other parameters. These shapes include:

- **Regular Polygon:** a regular polygon has equal length of all its edges. In its original position, the bottom edge of the regular polygon should be aligned horizontally. A rotate angle can be optionally specified. Regular Polygon parameters include the number of vertex, the diameter of the reference circle and angle of rotation.



- **Star:** a star is defined by the number of corner vertex, the diameter of the reference circle, vertex angle and angle of rotation. In its original position, the bottom edge, which formed by two vertexes of the star, should be aligned horizontally. A rotate angle can be optionally specified. Vertex angles are predefined as 0, 36, 60, 90 degrees.



  If the vertex angle is 0, a single line from center to vertex shall be drawn.

- **Grid:** a grid is a number of evenly distributed perpendicular lines. Its parameters include height, width, angle and number of rows and columns (up to 16).

A special shape element has its reference point at its center.

G.6 Data Format BNF

…

Special Shape Element

<special shape element> ::= <point> <angle>
00 (<vertex> < diameter > ~~(0 | ((1 <angle>))~~ *; regular polygon*
| 01 (<vertex> <vertex angle> < diameter > ~~(0 | (1 <angle>))~~ *; star*
| 10 (<rectangle size> <rows> <columns>) *; grid*
| 11 *; reserved*

<diameter > ::= <X> | <Offset X> *; diameter of circle or vertex*

<rectangle size>::= <width> <height>

<vertex> ::= 000…111 *; number of vertex = <vertex> + 3*

<vertex angle> ::= 00…11 *; 00 for 0 degree, 01 for 36 degree*
; 10 for 60 degree, 11 for 90 degree

<rows> ::= 0000…1111 *; rows = <rows> + 1*

<columns> ::= 0000…1111 *; columns = <columns> + 1*

Text Element

…

3GPP TSG-T2 #17
Vancouver, BC, Canada
13 -17 May 2002

T2-020512

CR-Form-v5

CHANGE REQUEST

⌘ **23.041** **CR** **009** ⌘ **rev** ⌘ Current version: **3.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☐

Title:	⌘	Update of references
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	11/5/2002
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	23.041 has references to GSM specifications which have been either converted to 3GPP specifications or withdrawn
Summary of change:	⌘	Convert GSM references to 3G references, and making two references specific (adding version number of the latest exisitng version), and correcting editorial mistakes in refernces
Consequences if not approved:	⌘	wrong references will remain in the spec

Clauses affected:	⌘	
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at:
http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

1.1 References

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

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

[1] ~~GSM~~ 3GPP TR 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2] 3GPP TS 22.003: "Digital cellular telecommunication system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] 3GPP TS 23.038: "Digital cellular telecommunication system (Phase 2+); Alphabets and language-specific information".

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

[5] 3GPP TR~~S~~ 03.47 Version 7.0.0: "Digital cellular telecommunication system (Phase 2+); Example protocol stacks for interconnecting Service Centre(s) (SC) and Mobile-services Switching Centre(s) (MSC)".

[6] 3GPP TR~~S~~ 03.49 Version 7.0.0: "Digital cellular telecommunication system (Phase 2+); Example protocol stacks for interconnecting Cell Broadcast Centre (CBC) and Mobile-services Switching Centre (MSC)".

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

[8] 3GPP TS 05.02: "Digital cellular telecommunication system (Phase 2+); Multiplexing and multiple access on the radio path".

[9] 3GPP 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)".

[10] 3GPP TS 08.52: "Digital cellular telecommunication system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Interface principles".

[11] 3GPP TS 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] 3GPP TS 08.08: "MSC-BSS Interface Layer 3 specification".

[14] 3GPP TS 23.042: "Compression algorithm for text messaging services".

[15] 3GPP TS 03.48: "Digital cellular telecommunications system (Phase 2+); Security Mechanisms for the SIM application toolkit; Stage 2".

[16] 3GPP TS 25.331: "RRC Protocol Specification".

[17] 3GPP TS 25.401: "UTRAN Overall Description".

[18] 3GPP TS 31.102: "Characteristics of the USIM Application".

[19] 3GPP TS 25.324: "Radio Interface for Broadcast/Multicast Services".

[20] 3GPP TR 21.905: "3G Vocabulary".

1.2 Abbreviations

Abbreviations used in the present document are listed in ~~GSM~~3GPP TR 01.04 [1] and 3GPP TR 21.905 [20].

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 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 cells, in accordance with the CBS's coverage requirements.

A CBS 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 3GPP TS 23.038 [3]. Up to 15 of these pages may be concatenated to form a CBS messagee. Each page of such CBS message 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 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.Reception of CBS messages for a MS/UE is not a requirement if it is connected in the CS domain. It should be possible for a UE to receive messages if it is connected in the PS domain and no data is currently transmitted.

CS-Domain	CS-Connected	CS-Idle	CS-Idle
PS-Domain	-	PS-Idle	PS-Connected
Reception of CBS Message	Not possible	Possible	Depends on RRC mode

NOTE: In case the UE is in CS-Idle and PS-Connected Mode it depends on the Radio Resource Control State whether reception of CBS messages is possible. The relevant states are described in 3GPP 25.331 [16].

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 subclause 3.1 the GSM network architecture is descripted, in subclause 3.2 the UMTS network architecture.

3.1 GSM Network Architecture

The basic network structure of CBS is depicted by figure 1.

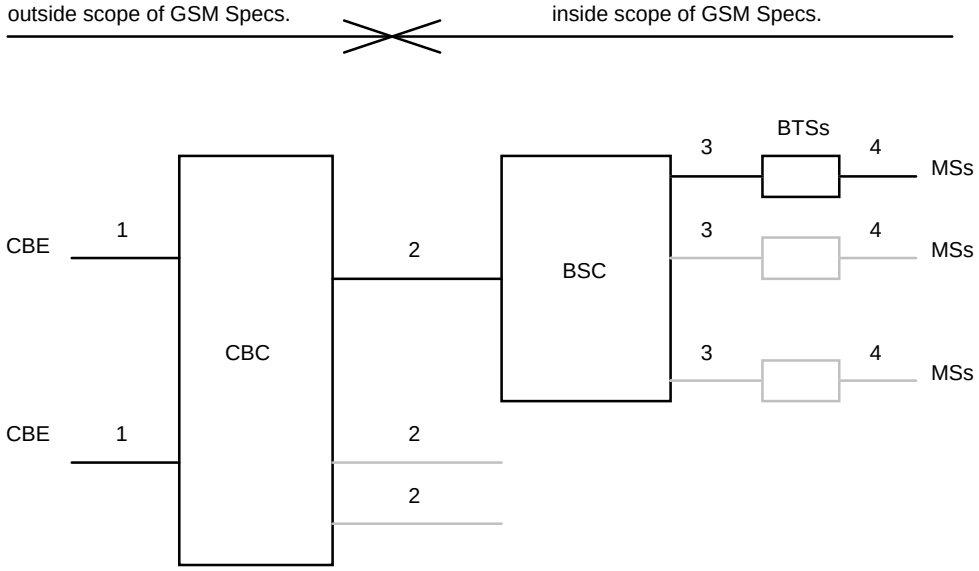


Figure 1

- message transfer on link 1 is outside the scope of ~~GSM~~ 3GPP ~~S~~specifications;
- message transfer on link 2 is described in subclause 9.1;
- message transfer on link 3 is described in ~~GSM~~3GPP TS 08.58;
- message transfer on link 4 is described in ~~GSM~~3GPP TS 04.12 and the timing of messages transferred on link 4 is described in ~~GSM~~3GPP TS 05.02.

3.2 UMTS Network Architecture

The basic network structure of CBS is depicted by figure 2.

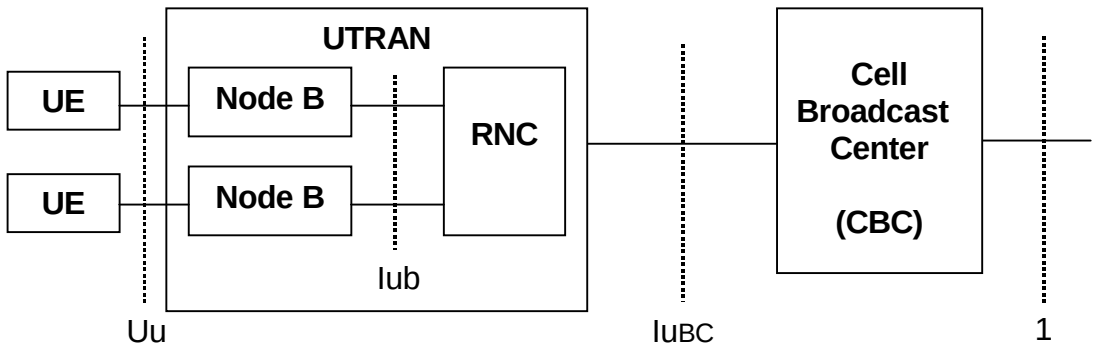


Figure 2

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 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 CBS messages including:

- allocation of serial numbers;
- modifying or deleting CBS messages held by the BSC/RNC;
- initiating broadcast by sending fixed length CBS messages to a BSC/RNC for each language provided by the cell, and where necessary padding the pages to a length of 82 octets [see ~~GSM~~3GPP TS 03.38];
- determining the set of cells 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 CBS message should commence being broadcast;
- determining the time at which a CBS message should cease being broadcast and subsequently instructing each BSC/RNC to cease broadcast of the CBS message;
- determining the period at which broadcast of the CBS message should be repeated;
- determining the cell broadcast channel, on which the 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~~3GPP TS 08.52. A RNC may interface to several Node Bs.

The BSC/RNC shall be responsible for:

BSC	RNC
interpretation of commands from the CBC;	
storage of CBS messages;	
scheduling of CBS messages on the CBCH;	Scheduling of CBS messages on the CBS related radio resources
providing an indication to the CBC when the desired repetition period cannot be achieved;	
Providing to the CBC acknowledgement of successful execution of commands received from the CBC;	
Reporting to the CBC failure when a command received from the CBC is not understood or cannot be executed;	
routing 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~~3GPP TS 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~~3GPP TS 04.12);	Generating Schedule Messages, indicating the intended schedule of transmissions (see 3GPP TS 25.324). The conversion of GSM related CB DRX Information is a function of the RNC (3GPP TS 25.401 [17]).
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~~3GPP TS 08.58);	not applicable

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~~3GPP TS 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 CBS message.]

The precise method of display of 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~~3GPP TS 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~~3GPP TS 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 CBS message which do(es) not contain cell broadcast information (see ~~GSM~~3GPP TS 04.12);	not applicable
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 blocks each 22 octets long being transferred via the BTS-MS interface (see ~~GSM~~3GPP TS 04.12).

With the SMS BROADCAST REQUEST mode of operation, the 88 octet fixed length CBS page which is specified in Subclause 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~~3GPP TS 04.12) indicating first block;

octets 23-44 are transferred in the 2nd SMS BROADCAST REQUEST

with a sequence number (see ~~GSM~~3GPP TS 04.12) indicating second block;

octets 45-66 are transferred in the 3rd SMS BROADCAST REQUEST
with a sequence number (see ~~GSM~~3GPP TS 04.12) indicating third block;

octets 67-88 are transferred in the 4th SMS BROADCAST REQUEST
with a sequence number (see ~~GSM~~3GPP TS 04.12) indicating fourth block.

Figure 3 illustrates the protocol architecture and the scope of the various ~~GSM~~ 3GPP ~~S~~specifications for the SMS BROADCAST REQUEST mode of operation.

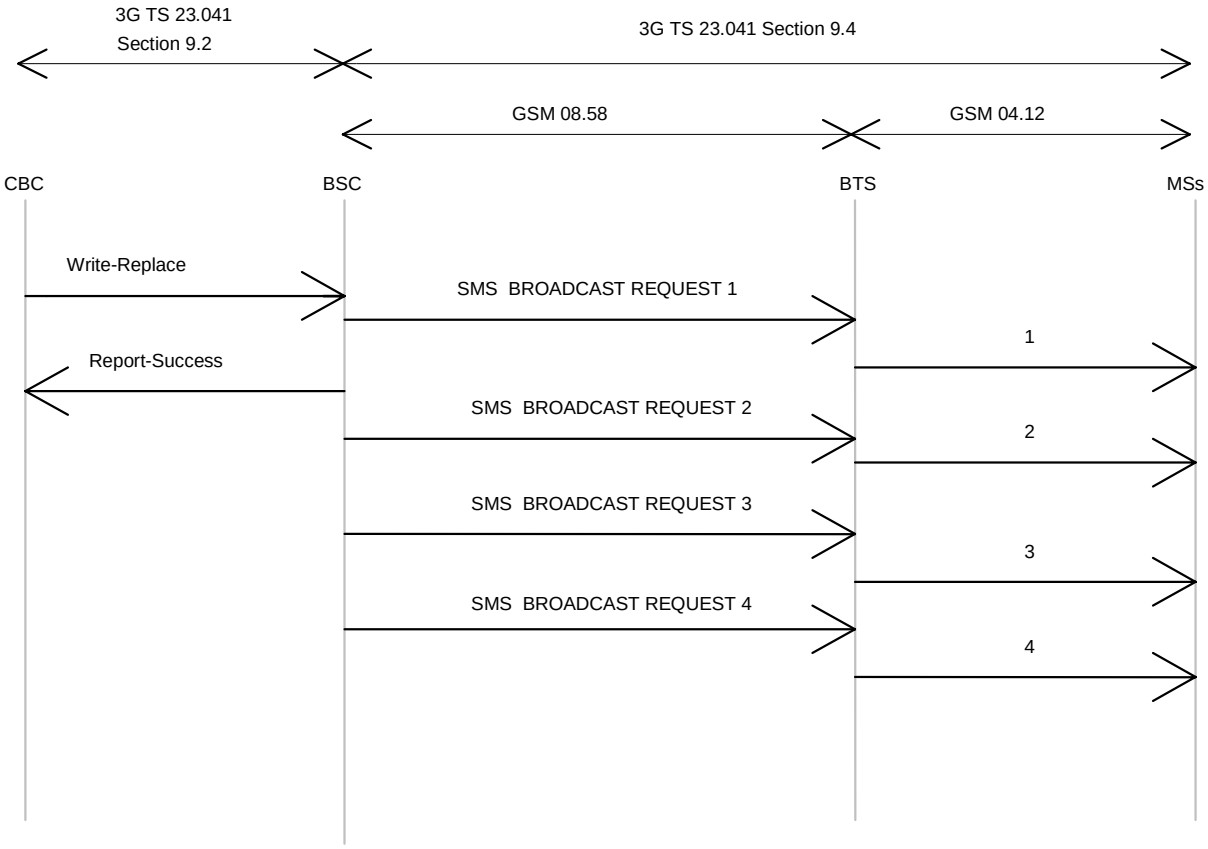


Figure 3

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~~3GPP TS 04.12) and transmits the four resulting blocks on the air.

Figure 4 illustrates the protocol architecture and the scope of the various 3GPP~~GSM~~ ~~S~~specifications for the SMS BROADCAST COMMAND mode of operation.

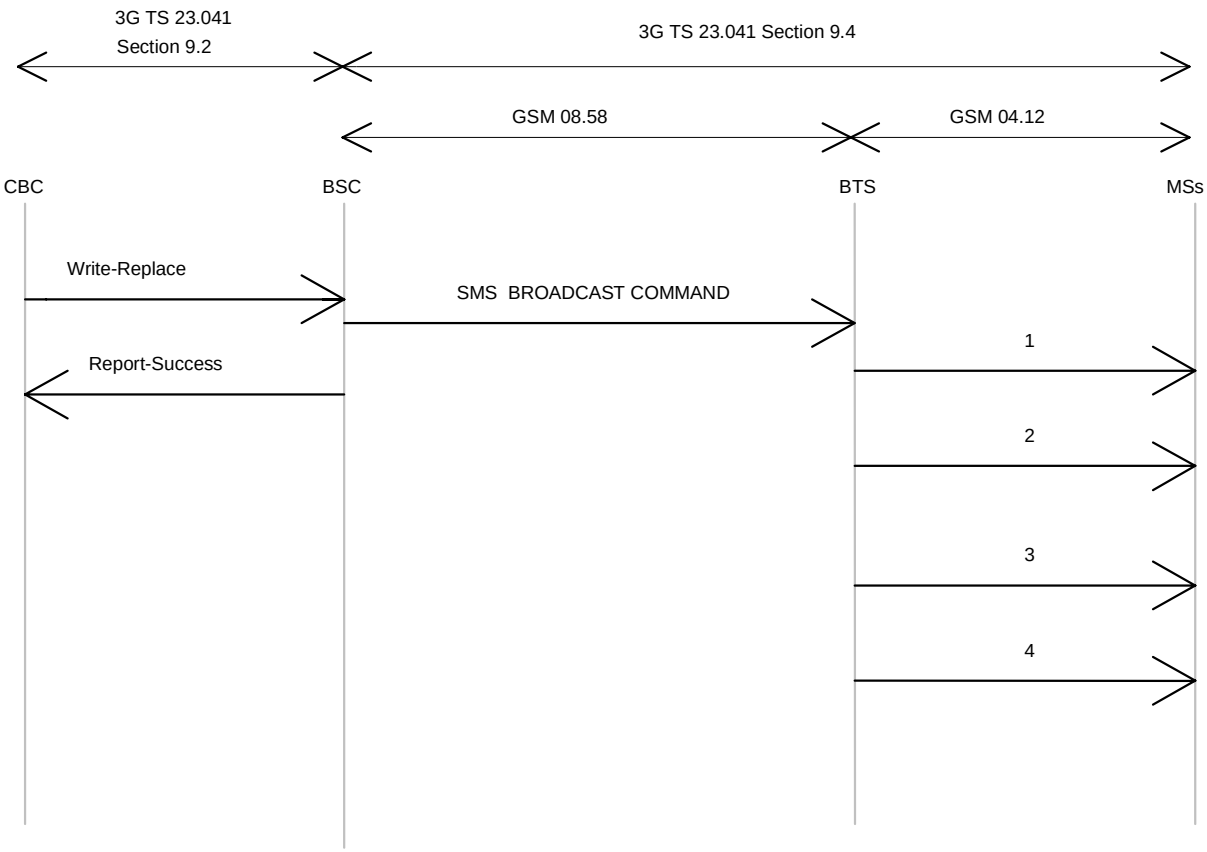
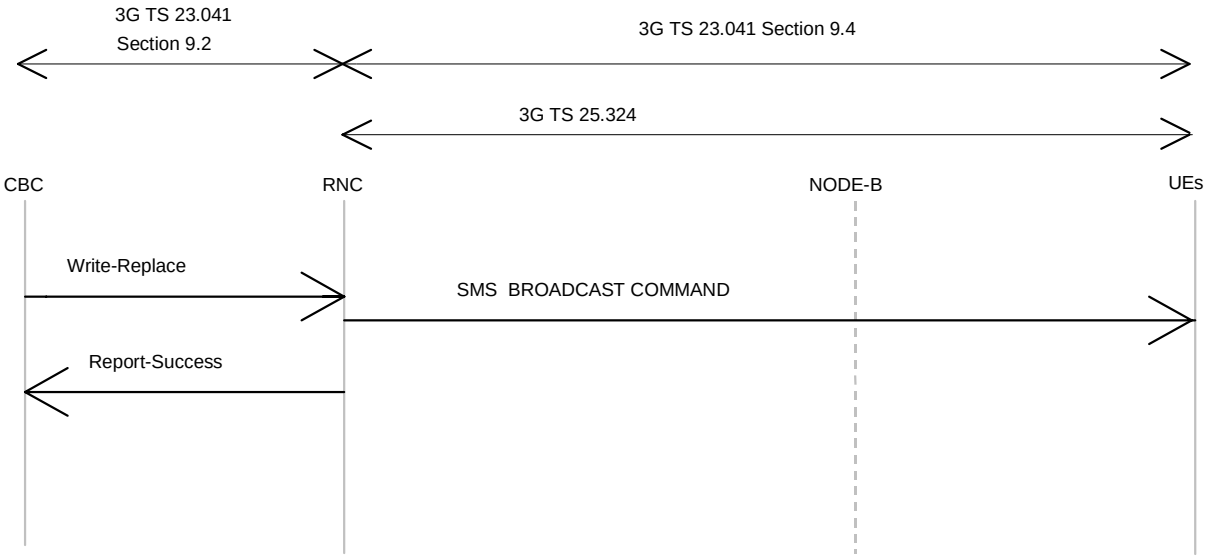


Figure 4

9.1.2 UMTS Radio Access Network

Commands interpreted by the RNC will result in one SMS BROADCAST COMMAND sent to the UE. The CBS messages are completely transparent to the Node B, i.e. no manipulation of the data like e.g. fragmentation is done at the Node B.



9.1.3 UMTS Protocol Overview

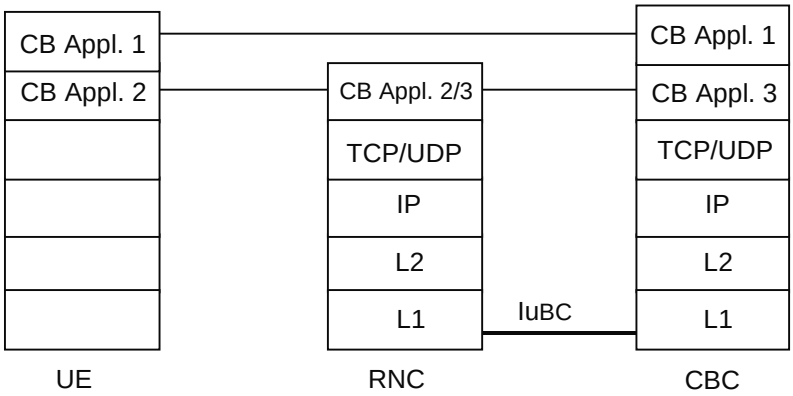


Figure 5

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/RNC interface, the service provider would be the protocol interconnecting CBC and BSC/RNC. A Primitive may therefore be viewed as an abstract, implementation independent request/indication or response/confirm interaction between the service user (CBC or BSC/RNC) and the service provider (protocol). A set of primitives for use between the CBC and BSC/RNC is specified appropriate to the functionality assigned to the CBC and BSC/RNC in clauses 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.

The following table gives an overview over the exisiting primitives:

Name	Originator	Type	Reference
WRITE-REPLACE	CBC	Request/Indication	9.2.2
KILL	CBC	Request/Indication	9.2.3
REPORT	BSC/RNC	Response/Confirm	9.2.4
STATUS-LOAD-QUERY	CBC	Request/Indication	9.2.5
STATUS-LOAD-QUERY	BSC/RNC	Response/Confirm	9.2.6
STATUS-MESSAGE-QUERY	CBC	Request/Indication	9.2.7
STATUS-MESSAGE-QUERY	BSC/RNC	Response/Confirm	9.2.8
REJECT	BSC/RNC	Response/Confirm	9.2.9
RESTART-INDICATION	BSC/RNC	Request/Indication	9.2.10
RESET	CBC	Request/Indication	9.2.11
FAILURE-INDICATION	BSC/RNC	Request/Indication	9.2.12
SET-DRX	CBC	Request/Indication	9.2.13
SET-DRX-REPORT	BSC	Response/Confirm	9.2.14
CAPACITY-INDICATION	RNC	Request/Indication	9.2.15

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. 3GPP TR ~~GSM~~ 03.49 [6] (see also annex A of the present document) 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".

9.2.1 Identification of a CBS message

In GSM 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 ».

9.2.2 WRITE-REPLACE Request/Indication

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Old-Serial-Number	9.3.2	O
New-Serial-Number	9.3.3	M
Cell-List	9.3.5.1	M
GSM only [Channel Indicator	9.3.6	O]
Category	9.3.7	O
Repetition-Period	9.3.8	M
No-of-Broadcasts-Requested	9.3.9	M
Number-of-Pages	9.3.4	M
Data Coding Scheme	9.3.18	M
CBS-Message-Information-Page 1	9.3.19	M
CBS-Message-Information-Length 1	9.3.20	M
CBS-Message-Information-Page 2	9.3.19	O
CBS-Message-Information-Length 2	9.3.20	O
:		:
CBS-Message-Information-Page n	9.3.19	O
CBS-Message-Information-Length n	9.3.20	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 [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 primitive. For these cells 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 [In the case of multipage CBS messages, the individual pages are considered as independent by the BSC scheduling algorithm].

9.2.3 KILL Request/Indication

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Old-Serial-Number	9.3.2	M
Cell-List	9.3.5.1	M
GSM only [Channel Indicator	9.3.6	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.

9.2.4 REPORT Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Serial-Number	9.3.2/9.3.3	M
GSM only [Channel Indicator	9.3.6	O]
No-of-Broadcasts-Completed-List	9.3.10	O
Failure-List	9.3.14	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.

9.2.5 STATUS-LOAD-QUERY Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.1	M
GSM only [Channel Indicator	9.3.6	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-LOAD-QUERY Response/Confirm or a REJECT primitive.

9.2.6 STATUS-LOAD-QUERY Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Radio-Resource-Loading-List	9.3.15	O
Failure-List	9.3.14	O
GSM only [Channel Indicator	9.3.6	O]

This primitive will be sent by the BSC/RNC in response to the STATUS-LOAD-QUERY Request/Indication primitive.

The 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 loadingof this particular cell. (Note that for cells with DRX the load caused by the schedule messages will be included in the load calculation). The Radio-ResourceLoading-List will not be present if all cells indicated in the related STATUS-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-LOAD-QUERY Response/Confirm will not contain the Failure-List parameter if none of the cells in the Cell-List of the related STATUS-LOAD-QUERY Request failed the requested operation.

9.2.7 STATUS-MESSAGE-QUERY Request/Indication

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Old-Serial-Number	9.3.2	M
Cell-List	9.3.5.1	M
GSM only [Channel Indicator	9.3.6	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.

9.2.8 STATUS-MESSAGE-QUERY Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Old-Serial-Number	9.3.2	M
No-of-Broadcasts-Completed-List	9.3.10	O
Failure-List	9.3.14	O
GSM only [Channel Indicator	9.3.6	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.

9.2.9 REJECT Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Cause	9.3.16	M
Diagnostic	9.3.17	O
Message-Identifier	9.3.1	O
Serial Number	9.3.2	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).

9.2.10 RESTART-INDICATION Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.2	M
Recovery Indication	9.3.20	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.

9.2.11 RESET Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.1	M

The RESET Request is used by the CBC to force one or more cells 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 BSC/RNCreceives 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.

9.2.12 FAILURE-INDICATION Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.2	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.

9.2.13 SET-DRX Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.1	M
Schedule-Period	9.3.12	O
Reserved-Slots	9.3.13	O
GSM only [Channel Indicator	9.3.6	O]

This primitive is applicable in GSM only. In UMTS DRX is a mandatory feature in the RNC and no activation/ deactivation function on CBS related radio resources controlled by the CBC is necessary.

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~~3GPP TS 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 may use default values.

If a BSC 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~~3GPP TS 04.12.

If a BSC receives a SET-DRX Indication, the new DRX parameters will be applied for all cells that do not handle any broadcast message (null loading).

9.2.14 SET-DRX- REPORT Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.2	O
Failure-List	9.3.14	O
GSM only [Channel Indicator	9.3.6	O]

This primitive will be sent by the BSC 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.

9.2.15 CAPACITY-INDICATION Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.2	O
Available-Capacity	9.9.22	O

This primitive is applicable in UMTS only.

This primitive is used by the RNC to indicate a change in the available broadcast capacity per cell to the CBC.

9.3 Parameters

9.3.1 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 9.4.2.2.

9.3.2 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 9.4.2.1.

This parameter enables a particular existing CBS message, from the source/type indicated by the message identifier, to be identified.

9.3.3 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 9.4.2.1.

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.

9.3.4 Number-of-Pages

This parameter enables the number of pages in the CBS message to be indicated.

9.3.5 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~~3GPP TS 08.08 and can be identified by the CBC or BSC in LAC and CI format or CI format only.

In addition (see ~~GSM~~3GPP TS 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.

The following applies for UMTS only:

- For CBS the cells are refered to as Service Areas. As described in 3GPP TS 25.401 [17] a Service Area Identifier (SAI) is used to uniquely identify an area consisting of one or more cells belonging to the same Location Area. Such an area is called a Service Area and can be used for indicating the location of a UE to the CN.
- The Service Area Code (SAC) together with the PLMN-Id and the LAC will constitute the Service Area Identifier.
  - SAI = PLMN-Id + LAC + SAC.
- The SAC is defined by the operator, and set in the RNC via O&M.

NOTE: For CBS, a Service Area shall consist of only one Cell. The mapping of SAI onto cell is controlled by the RNC and managed by an O&M function.Given the above differences between cell identification in the two directions, a cell list sent from the CBC to the BSC/RNC has a different structure compared to a cell list sent from the BSC/RNC to the CBC. The different cell lists are described in subclauses 9.3.5.1 and 9.3.5.2.

9.3.5.1 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 Cell-Id-Discriminator has one of the following formats:

Format	Description
LAC and CI in GSM;	~~GSM~~3GPP TS 08.08 [13]
CI only;	~~GSM~~3GPP TS 08.08 [13]
all cells in the BSC/RNC belonging to a certain Location Area;	Example in 3GPP TR ~~GSM~~ 03.49 [6]
all cells in the BSC/RNC;	Example in 3GPP TR ~~GSM~~ 03.49 [6]
SAI in UMTS	3GPP TS 25.401 [17]

The Cell-identification is repeated for each cell included in the list. The Cell-List must refer to at least one cell.

9.3.5.2 Cell-List sent from BSC/RNC to CBC

The BSC/RNC to CBC Cell-List contains a sequence of cell-identifiers as defined in 9.3.11. The Cell-List must contain at least one cell-identifier as defined in 9.3.11.

9.3.6 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.

9.3.7 Category

This indicates the category of the CBS message:

- High Priority: to be broadcast at the earliest opportunity.
- Background: to be broadcast when no CBS messages of category "High Priority" or "Normal" are broadcast. 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.

9.3.8 Repetition-Period

This indicates the period of time after which broadcast of the CBS message should be repeated. The minimum period with which a CBS message consisting of one page may be broadcast over the air interface is a period of 1.883 seconds.

The value of "Repetition-Period" shall be in the range 1 to 1024 where each unit will represent the value of one minimum period.

In the event of a conflict where the BSS/RNS has more than one CBS message to send at the same time, the BSC/RNC shall decide the order of such CBS messages as an implementation matter.

NOTE: The time period 1.883 seconds approximately reflects one 8 x 51 multiframe sequence of the GSM radio interface. It is also used as minimum repetition rate in UMTS. The higher capacity of the RNS enables the CBC to send more than one CBS message consisting of one page with the minimum repetition rate to a Node B.

9.3.9 No-of-Broadcasts-Requested

This specifies the number of times the CBS message is to be broadcast.

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).

9.3.10 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 cell in the Cell-List for broadcast over the air interface.

The cells in the list are described as per subclause 9.3.11.

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.

9.3.11 Cell-Identifier

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 has one of the following formats:

Format	Description
LAC and CI in GSM	~~GSM~~3GPP TS 08.08 [13]
CI only	~~GSM~~3GPP TS 08.08 [13]
SAI in UMTS	3GPP TS 25.401 [17]

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 RNC uses the SAI format for a cell identifier in any response to the CBC.

9.3.12 Schedule-Period

The following applies for GSM only:Indicates the DRX schedule period length, see ~~GSM~~3GPP TS 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.

9.3.13 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~~3GPP TS 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.

9.3.14 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 cells in the list are described as per subclause 9.3.11.

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.

9.3.15 Radio-Resource-Loading-List

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 as per subclause 9.3.11.

Description of list elements:

PARAMETER	PRESENCE
Cell Identifier	M
Radio-Resource-Loading	M

The information above is repeated for the number of cells in the list.

To each cell in the list the information element Radio-Resource-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 Radio-Resource load.

The Radio-Resource-Loading-List must contain at least one cell.

9.3.16 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

9.3.17 Diagnostic

Provides additional information associated with Cause parameter and may contain parameter which could not be interpreted/executed.

9.3.18 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 3GPP TS 23.038 [3].

9.3.19 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 3GPP TS 23.038 [3]).

The content of a CBS-Message-Information-Page is passed transparently from the CBC to the MS/UE.

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 3GPP TS 23.038).

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 3GPP TS 23.038).

9.3.20 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.

9.3.21 Recovery-Indication

Indicates whether the CBS related data was lost or is still available.

The following values should be coded:

- Data-available;
- Data-lost.

9.3.22 Available-Capacity

This parameter is applicable for UMTS only. It indicates the capacity on the radio interface of a cell which is currrently available for CBS.

9.4 Message Format on 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~~3GPP TS 04.12.

9.4.1.1 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~~3GPP TS 04.12. This is sent on the channel allocated as CBCH by ~~GSM~~3GPP TS 05.02. The 88 octets of the CBS Message are formatted as described in 9.3.2.

9.4.1.2 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.

9.4.1.2.1 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:

Octet 1								Octet 2							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
GS		Message Code										Update Number			

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 (in GSM) (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), or
  - Service Area Wide (in UMTS) (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 Service Area as the current cell)

NOTE: According to 3GPP TS 23.003 [2] a Service Area consists of one cell only in R99.

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 in GSM, Service Area wide in UMTS
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.

9.4.1.2.2 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~~3GPP TS 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~~3GPP TS ~~03.41~~23.041 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 CBS Message Identifier for E-OTD Assistance Data message.

03E9 (hex): LCS CBS Message Identifier for DGPS Correction Data message.

03EA (hex): LCS CBS Message Identifier for GPS Ephemeris and Clock Correction Data message.

03EB (hex): LCS CBS Message Identifier for GPS Almanac and Other Data message.

03EC - 0FFF (hex): Intended for standardization in future versions of ~~GSM~~3GPP TS ~~03.41~~23.041. These values shall not be transmitted by networks that are compliant to this version of ~~GSM~~3GPP TS ~~03.41~~23.041. 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~~3GPP TS 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~~3GPP TS 03.48 [15] to the SIM (see ~~GSM~~3GPP TS 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~~3GPP TS ~~03.41~~23.041. These values shall not be transmitted by networks that are compliant to this version of ~~GSM~~3GPP TS ~~03.41~~23.041. 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~~3GPP TS ~~03.41~~23.041. These values shall not be transmitted by networks that are compliant to this version of ~~GSM~~3GPP TS ~~03.41~~23.041. 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').

9.4.1.2.3 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 3GPP TS 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_{PL} 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.

9.4.1.2.4 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).

9.4.1.2.5 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 messages which are transmitted by the RNS to the UE include two types of messages: CBS Message (user information) and Schedule Message (schedule of CBS messages).

The format of the CBS Message containing user information is described in this section and in 3GPP TS 25.324 [19].

The format of the Schedule Message is described in 3GPP TS 25.324 [19].

9.4.2.1 General Description

The CBS message is transmitted as one unit over the radio interface. On layer two of the UMTS radio interface the logical channel CTCH is used.

9.4.2.2 Message Parameter

Octet Number(s)	Parameter
1	Message Type
2 – 3	Message ID
4 – 5	Serial Number
6	Data Coding Scheme
7 – n	CB Data

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.

9.4.2.2.1 Message Type

This parameter indicates the type of a message, either a CBS message or a Schedule Message. The Coding of the Message Type is described in 3GPP TS 25.324 [19].

9.4.2.2.2 Message ID

This parameter identifies the source and type of the CBS Message (see also 3GPP TS 25.324 [19]). It is identical with the Message Identifier described in 9.4.1.2.2 with respect to its structure and possible value range.

The UE shall attempt to receive the CBS messages whose Message ID's are in the "search list". This "search list" shall contain the Message IDs stored in the EF_{CBMI}, EF_{CBMID} and EF_{CBMIR} files on the USIM (see 3GPP TS 31.102 [18]) and any Message Identifiers stored in the UE in a "list of CBS messages to be received". If the UE has restricted capabilities with respect to the number of Message ID's it can search for, the IDs stored in the USIM shall take priority over any stored in the UE.

9.4.2.2.3 Serial Number

This parameter identifies a particular CBS Message from the source and type indicated by the Message ID (see also 3GPP TS 25.324 [19]). It is identical with the Serial Number described in 9.4.1.2.1 with respect to its structure and possible value range.

9.4.2.2.4 Data Coding Scheme

This parameter identifies the the alphabet/coding and the language applied to a CBS Message as defined in 3GPP TS 23.038 [3].

When the USIM indicates one or more language preferences, the UE shall, by default, use the language(s) stored in the USIM (in the EF_{PL} file) to set any language filter mechanisms provided by the UE.

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.

9.4.2.2.5 CB Data

This parameter consists of the WRITE-REPLACE primitive parameters Number-of-Pages, CBS-Message-Information-Page and CBS-Message-Information-Length as received from the CBC (see also 3GPP TS 25.324 [19]). The CBS-Message-Information-Page contains the user information (see subclause 9.2.2).

9.5 CBS Compression

Cell Broadcast messages may be compressed in accordance with the compression algorithm described in 3GPP TS 23.042 [14].

The Data Coding Scheme parameter (see subclause 9.4.1.2.3) 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 3GPP TS 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 3GPP TS 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 3GPP TS 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 3GPP TS 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 6.

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.

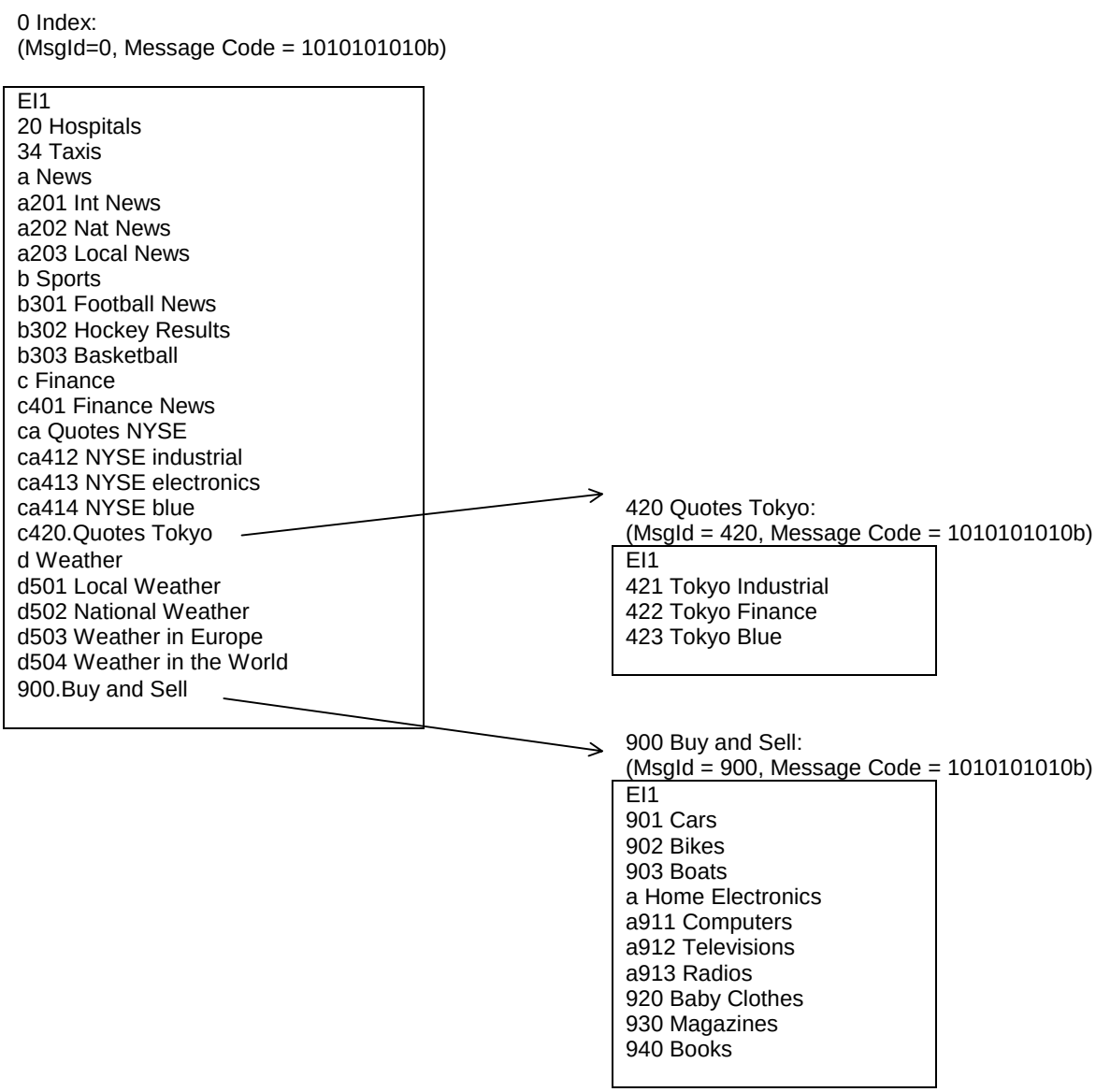

0 Index:
(MsgId=0, Message Code = 1010101010b)
EI1
20 Hospitals
34 Taxis
a News
a201 Int News
a202 Nat News
a203 Local News
b Sports
b301 Football News
b302 Hockey Results
b303 Basketball
c Finance
c401 Finance News
ca Quotes NYSE
ca412 NYSE industrial
ca413 NYSE electronics
ca414 NYSE blue
c420.Quotes 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 6

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 3GPP TR ~~GSM~~ 03.49 [6] 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 3GPP TR ~~GSM~~ 03.49 [6].

The protocol(s) between CBC and BSC should:

a) provide the service defined for the CBC-BSC interface (see clause 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 #17
Vancouver, BC, Canada
13 -17 May 2002

T2-020509

CR-Form-v5

CHANGE REQUEST

⌘ **23.041** **CR** **010** ⌘ **rev** ⌘ Current version: **4.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Update of references
Source:	⌘	T2
Work item code:	⌘	TEI4
Date:	⌘	10/5/02
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	23.041 has references to GSM specifications which have been either converted to 3GPP specifications or withdrawn
Summary of change:	⌘	Convert GSM references to 3G references, and making two references specific (adding version number of the latest exisitng version), and correcting editorial mistakes in refernces
Consequences if not approved:	⌘	wrong references will remain in the spec

Clauses affected:	⌘	
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

1.1 References

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

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

[1] ~~3GPP TS 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".~~ Void

[2] 3GPP TS 22.003: "Circuit Teleservices supported by a Public Land Mobile Network (PLMN)".

[3] 3GPP TS 23.038: "Alphabets and language-specific information".

[4] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".

[5] 3GPP TR~~S~~ 03.47 Version 7.0.0~~:~~: "Digital cellular telecommunication system (Phase 2+); Example protocol stacks for interconnecting Service Centre(s) (SC) and Mobile-services Switching Centre(s) (MSC)".

[6] 3GPP TR~~S~~ 03.49 Version 7.0.0: "Digital cellular telecommunication system (Phase 2+); Example protocol stacks for interconnecting Cell Broadcast Centre (CBC) and Base Station Controler (BSC)".

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

[8] 3GPP TS 45.002~~05.02~~: "~~Digital cellular telecommunication system (Phase 2+);~~ Multiplexing and multiple access on the radio path".

[9] 3GPP 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)".

[10] 3GPP TS 48.052~~08.52~~: "~~Digital cellular telecommunication system (Phase 2+);~~ Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Interface principles".

[11] 3GPP TS 48.058~~08.58~~: "~~Digital cellular telecommunication system (Phase 2+);~~ Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 3 specification".

[12] ITU-T Recommendation X.210: "Information technology - Open systems interconnection - Basic Reference Model: Conventions for the definition of OSI services".

[13] 3GPP TS 48.008~~08.08~~: "~~Digital cellular telecommunication system (Phase 2+);~~ Mobile-services Switching Centre - Base Station System (MSC-BSS) interface; Layer 3 specification".

[14] 3GPP TS 23.042: "Compression algorithm for text messaging services".

[15] 3GPP TS 23.048~~03.48~~: "~~Digital cellular telecommunications system (Phase 2+);~~ Security Mechanisms for the SIM application toolkit; Stage 2".

[16] 3GPP TS 25.331: "RRC Protocol Specification".

[17] 3GPP TS 25.401: "UTRAN Overall Description".

[18] 3GPP TS 31.102: "Characteristics of the USIM Application".

[19] 3GPP TS 25.324: "Broadcast/Multicast Control BMC".

[20] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[21] 3GPP TR 25.925: "Radio Interface for Broadcast/Multicast Services".

1.2 Abbreviations

For the purposes of the present dcoument, the abbreviations used are listed in ~~3GPP TS 01.04 [1] and~~ 3GPP TR 21.905 [20].

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 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 cells, in accordance with the CBS's coverage requirements.

A CBS 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 3GPP TS 23.038 [3]. Up to 15 of these pages may be concatenated to form a CBS messagee. Each page of such CBS message 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 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.Reception of CBS messages for a MS/UE is not a requirement if it is connected in the CS domain. It should be possible for a UE to receive messages if it is connected in the PS domain and no data is currently transmitted.

CS-Domain	CS-Connected	CS-Idle	CS-Idle
PS-Domain	-	PS-Idle	PS-Connected
Reception of CBS Message	Not possible	Possible	Depends on RRC mode

NOTE: In case the UE is in CS-Idle and PS-Connected Mode it depends on the Radio Resource Control State whether reception of CBS messages is possible. The relevant states are described in 3GPP TS 25.331 [16].

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 3GPP TS ~~05.02~~45.002 [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 clause 3.1 the GSM network architecture is descripted, in clause 3.2 the UMTS network architecture.

3.1 GSM Network Architecture

The basic network structure of CBS is depicted by figure 1.

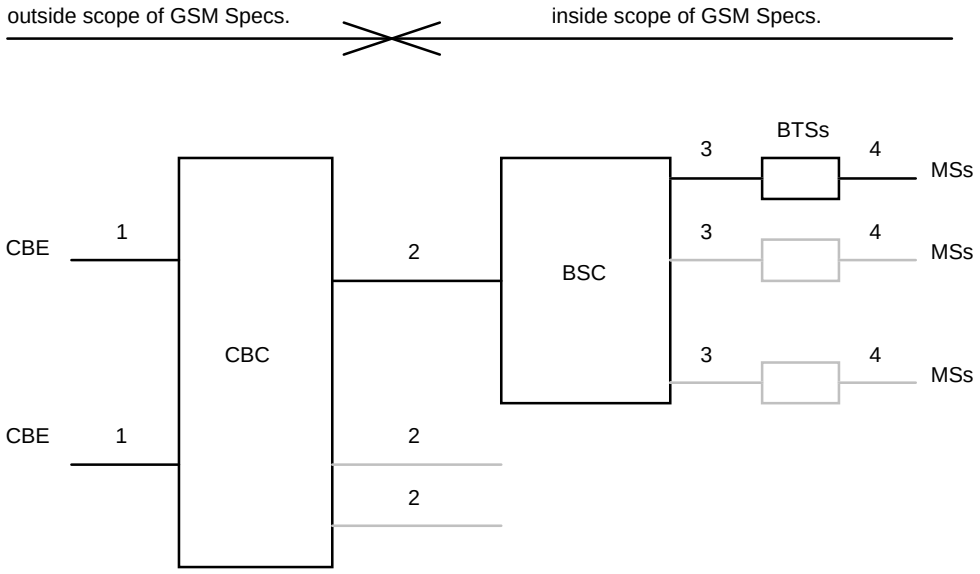


Figure 1

- message transfer on link 1 is outside the scope of GSM Specifications;
- message transfer on link 2 is described in clause 9.1;
- message transfer on link 3 is described in 3GPP TS ~~08.58~~48.058 [11];
- message transfer on link 4 is described in 3GPP TS 04.12 [7] and the timing of messages transferred on link 4 is described in 3GPP TS ~~05.02~~45.002 [8].

3.2 UMTS Network Architecture

The basic network structure of CBS is depicted by figure 2.

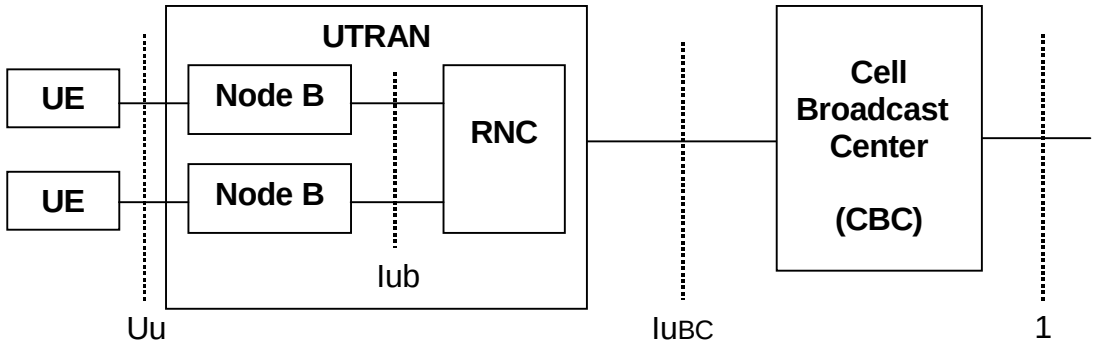


Figure 2

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 3GPP TR 25.925 [21]. 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 CBS messages) is regarded as a node outside the PLMN, only the requirements placed upon the CBC by CBS functionality are specified by the present document.

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 CBS messages including:

- allocation of serial numbers;
- modifying or deleting CBS messages held by the BSC/RNC;
- initiating broadcast by sending fixed length CBS messages to a BSC/RNC for each language provided by the cell, and where necessary padding the pages to a length of 82 octets (see 3GPP TS 23.038 [3]);
- determining the set of cells 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 CBS message should commence being broadcast;
- determining the time at which a CBS message should cease being broadcast and subsequently instructing each BSC/RNC to cease broadcast of the CBS message;
- determining the period at which broadcast of the CBS message should be repeated;
- determining the cell broadcast channel, on which the 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 3GPP ~~GSM~~ TS ~~08.52~~48.052 [10]. A RNC may interface to several Node Bs.

The BSC/RNC shall be responsible for:

BSC	RNC
interpretation of commands from the CBC;	
storage of CBS messages;	
scheduling of CBS messages on the CBCH;	Scheduling of CBS messages on the CBS related radio resources
providing an indication to the CBC when the desired repetition period cannot be achieved;	
Providing to the CBC acknowledgement of successful execution of commands received from the CBC;	
Reporting to the CBC failure when a command received from the CBC is not understood or cannot be executed;	
routing 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 3GPP TS 08.58 [11]), 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~~3GPP TS ~~04.12~~24.012);	Generating Schedule Messages, indicating the intended schedule of transmissions (see 3GPP TS 25.324 [19]). The conversion of GSM related CB DRX Information is a function of the RNC (3GPP TS 25.401 [17]).
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 3GPP TS ~~08.58~~48.058 [11]);	not applicable

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 3GPP TS ~~08.58~~48.058 [11]).

8 MS/UE Functionality

Only GSM [The MS is responsible for recombination of the blocks received via the radio path to reconstitute the CBS message.]

The precise method of display of 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 3GPP TS ~~04.12~~24.012 [7]) 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 3GPP TS ~~04.12~~24.012 [7]);	Enter CBS DRX mode based upon received Schedule Messages (see 3GPP TS 25.324)
optionally skip reception of the remaining block(s) of a CBS message which do(es) not contain cell broadcast information (see 3GPP TS ~~04.12~~24.012 [7]);	not applicable
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 1 000 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 blocks each 22 octets long being transferred via the BTS-MS interface (see 3GPP TS ~~04.12~~24.012 [7]).

With the SMS BROADCAST REQUEST mode of operation, the 88 octet fixed length CBS page which is specified in clause 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 3GPP TS ~~04.12~~24.012 [7]) indicating first block;

octets 23-44 are transferred in the 2nd SMS BROADCAST REQUEST
with a sequence number (see 3GPP TS ~~04.12~~24.012 [7]) indicating second block;

octets 45-66 are transferred in the 3rd SMS BROADCAST REQUEST
with a sequence number (see 3GPP TS ~~04.12~~24.012 [7]) indicating third block;

octets 67-88 are transferred in the 4th SMS BROADCAST REQUEST
with a sequence number (see 3GPP TS ~~04.12~~24.012 [7]) indicating fourth block.

Figure 3 illustrates the protocol architecture and the scope of the various GSM Specifications for the SMS BROADCAST REQUEST mode of operation.

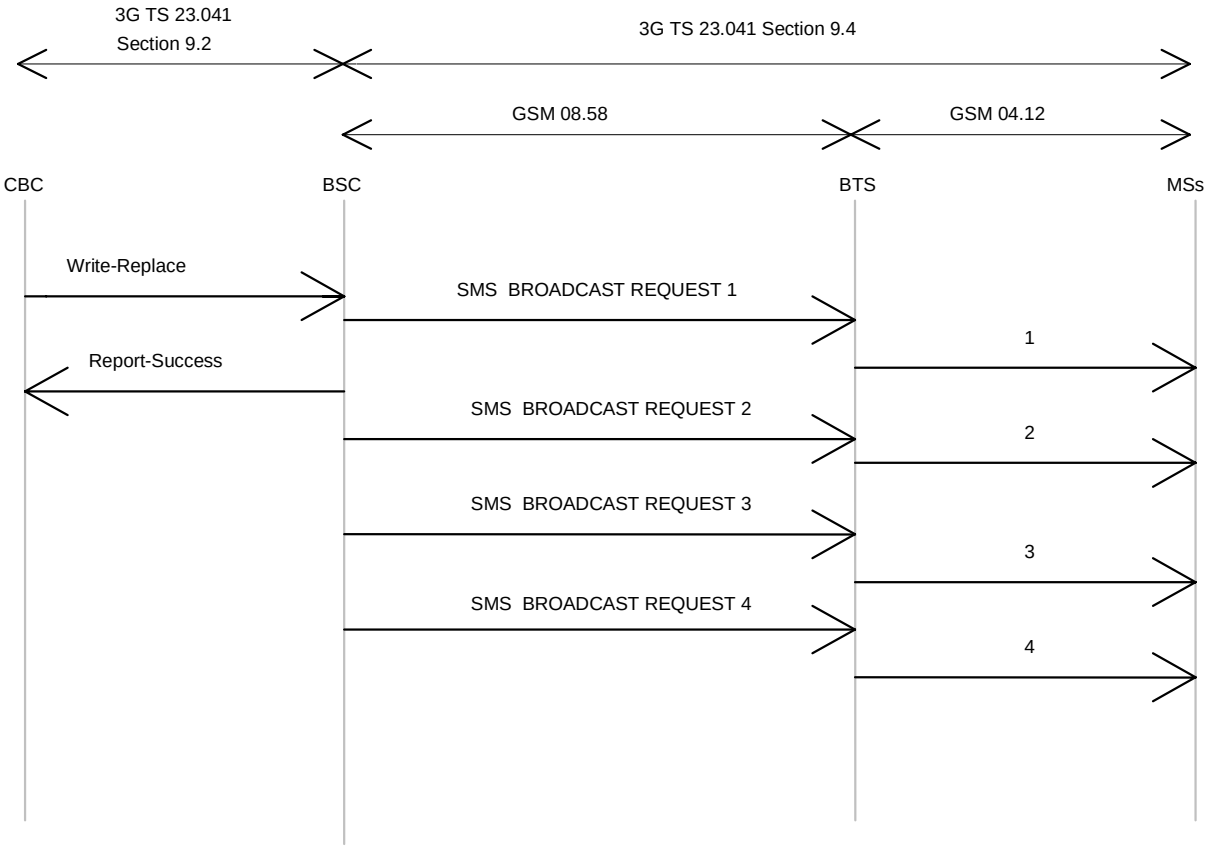


Figure 3

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 3GPP TS ~~04.12~~24.012 [7]) and transmits the four resulting blocks on the air.

Figure 4 illustrates the protocol architecture and the scope of the various GSM Specifications for the SMS BROADCAST COMMAND mode of operation.

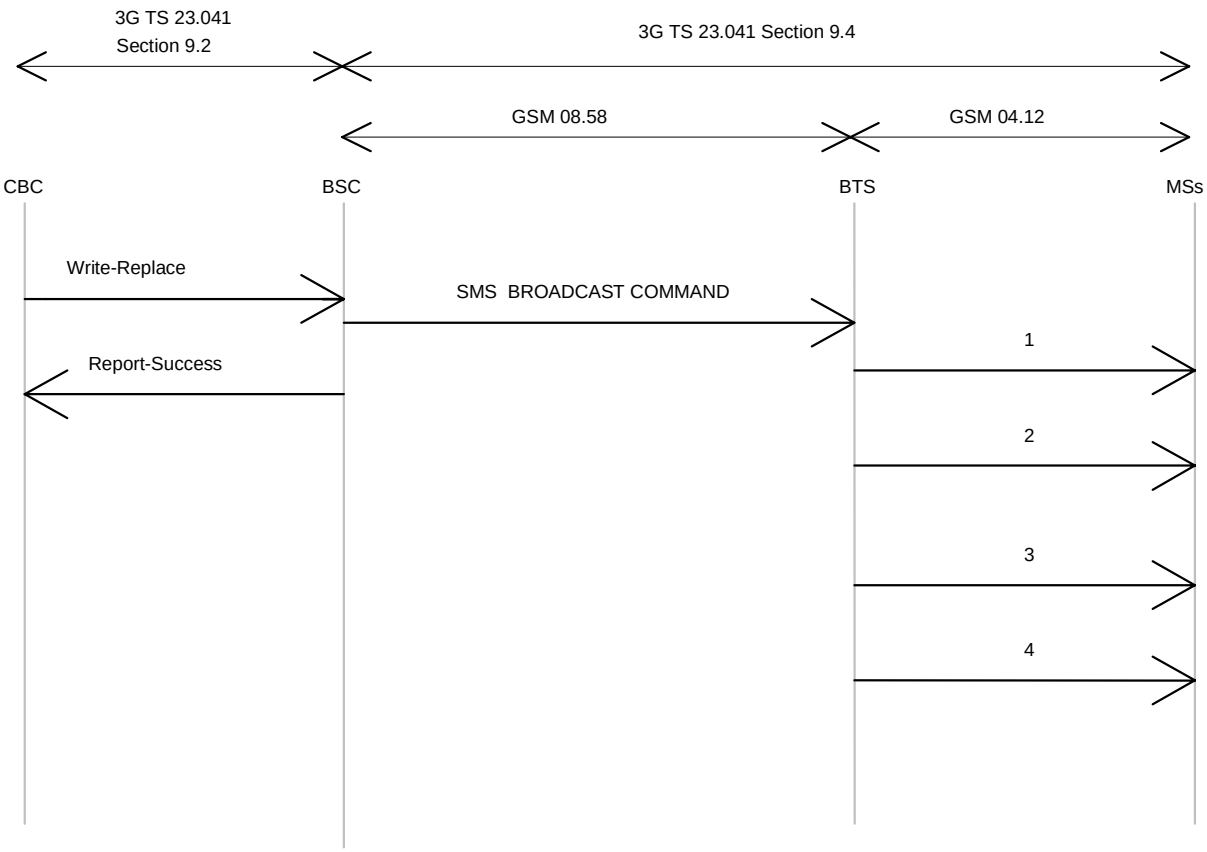


Figure 4

9.1.2 UMTS Radio Access Network

Commands interpreted by the RNC will result in one SMS BROADCAST COMMAND sent to the UE. The CBS messages are completely transparent to the Node B, i.e. no manipulation of the data like e.g. fragmentation is done at the Node B.

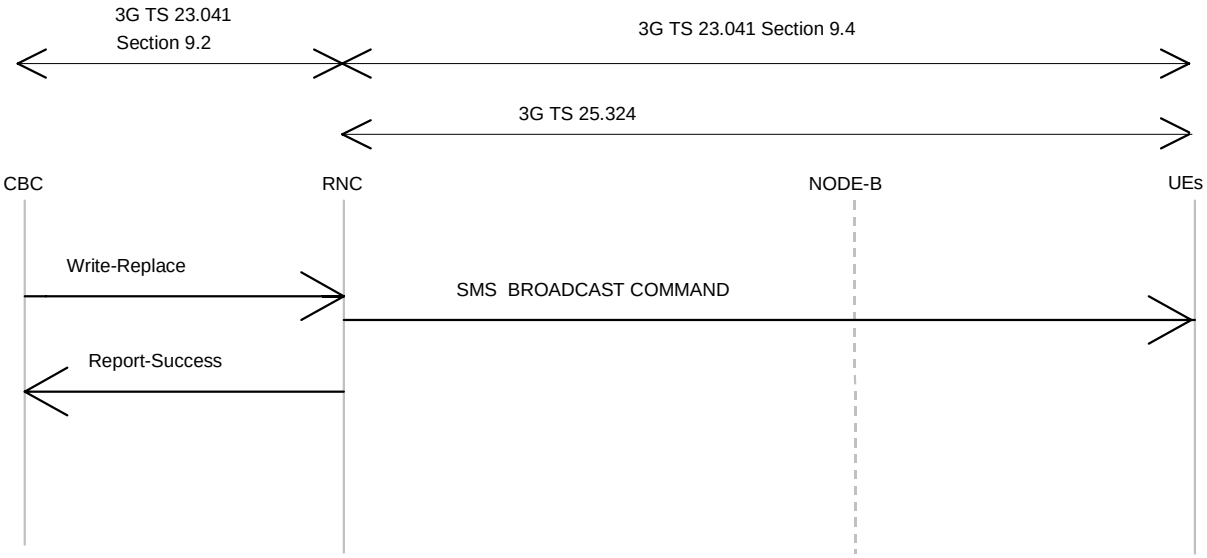


Figure 4a

9.1.3 UMTS Protocol Overview

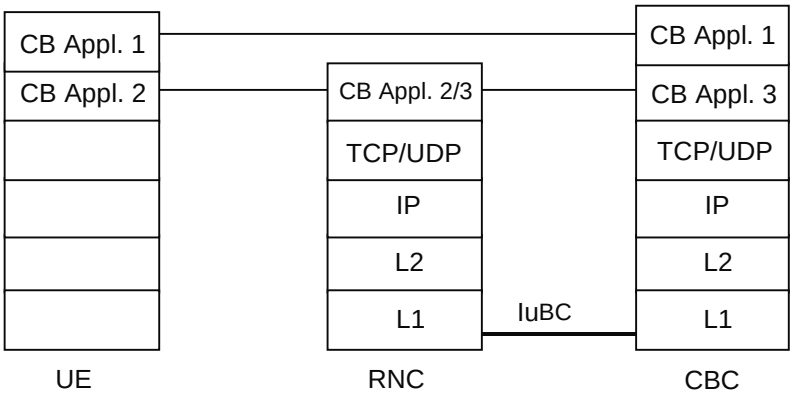


Figure 5

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 ITU-T Recommendation X.210). For the CBC-BSC/RNC interface, the service provider would be the protocol interconnecting CBC and BSC/RNC. A Primitive may therefore be viewed as an abstract, implementation independent request/indication or response/confirm interaction between the service user (CBC or BSC/RNC) and the service provider (protocol). A set of primitives for use between the CBC and BSC/RNC is specified appropriate to the functionality assigned to the CBC and BSC/RNC in clauses 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.

The following table gives an overview over the exisiting primitives:

Name	Originator	Type	Reference
WRITE-REPLACE	CBC	Request/Indication	9.2.2
KILL	CBC	Request/Indication	9.2.3
REPORT	BSC/RNC	Response/Confirm	9.2.4
STATUS-LOAD-QUERY	CBC	Request/Indication	9.2.5
STATUS-LOAD-QUERY	BSC/RNC	Response/Confirm	9.2.6
STATUS-MESSAGE-QUERY	CBC	Request/Indication	9.2.7
STATUS-MESSAGE-QUERY	BSC/RNC	Response/Confirm	9.2.8
REJECT	BSC/RNC	Response/Confirm	9.2.9
RESTART-INDICATION	BSC/RNC	Request/Indication	9.2.10
RESET	CBC	Request/Indication	9.2.11
FAILURE-INDICATION	BSC/RNC	Request/Indication	9.2.12
SET-DRX	CBC	Request/Indication	9.2.13
SET-DRX-REPORT	BSC	Response/Confirm	9.2.14
CAPACITY-INDICATION	RNC	Request/Indication	9.2.15

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. 3GPP TR~~S~~ 03.49 [6] (see also annex A of the present document) 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".

9.2.1 Identification of a CBS message

In GSM 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".

9.2.2 WRITE-REPLACE Request/Indication

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Old-Serial-Number	9.3.2	O
New-Serial-Number	9.3.3	M
Cell-List	9.3.5.1	M
GSM only [Channel Indicator	9.3.6	O]
Category	9.3.7	O
Repetition-Period	9.3.8	M
No-of-Broadcasts-Requested	9.3.9	M
Number-of-Pages	9.3.4	M
Data Coding Scheme	9.3.18	M
CBS-Message-Information-Page 1	9.3.19	M
CBS-Message-Information-Length 1	9.3.20	M
CBS-Message-Information-Page 2	9.3.19	O
CBS-Message-Information-Length 2	9.3.20	O
:		:
CBS-Message-Information-Page n	9.3.19	O
CBS-Message-Information-Length n	9.3.20	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 [The CBS message will be broadcasted on the channel derived by the Channel Indicator (see the clause 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 primitive. For these cells 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 clause.

This primitive is responded by a REPORT or REJECT primitive.

NOTE: GSM only [In the case of multipage CBS messages, the individual pages are considered as independent by the BSC scheduling algorithm].

9.2.3 KILL Request/Indication

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Old-Serial-Number	9.3.2	M
Cell-List	9.3.5.1	M
GSM only [Channel Indicator	9.3.6	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.

9.2.4 REPORT Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Serial-Number	9.3.2/9.3.3	M
GSM only [Channel Indicator	9.3.6	O]
No-of-Broadcasts-Completed-List	9.3.10	O
Failure-List	9.3.14	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.

9.2.5 STATUS-LOAD-QUERY Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.1	M
GSM only [Channel Indicator	9.3.6	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-LOAD-QUERY Response/Confirm or a REJECT primitive.

9.2.6 STATUS-LOAD-QUERY Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Radio-Resource-Loading-List	9.3.15	O
Failure-List	9.3.14	O
GSM only [Channel Indicator	9.3.6	O]

This primitive will be sent by the BSC/RNC in response to the STATUS-LOAD-QUERY Request/Indication primitive.

The 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 loadingof this particular cell.

NOTE: For cells with DRX the load caused by the schedule messages will be included in the load calculation.

The Radio-ResourceLoading-List will not be present if all cells indicated in the related STATUS-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-LOAD-QUERY Response/Confirm will not contain the Failure-List parameter if none of the cells in the Cell-List of the related STATUS-LOAD-QUERY Request failed the requested operation.

9.2.7 STATUS-MESSAGE-QUERY Request/Indication

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Old-Serial-Number	9.3.2	M
Cell-List	9.3.5.1	M
GSM only [Channel Indicator	9.3.6	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.

9.2.8 STATUS-MESSAGE-QUERY Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Message-Identifier	9.3.1	M
Old-Serial-Number	9.3.2	M
No-of-Broadcasts-Completed-List	9.3.10	O
Failure-List	9.3.14	O
GSM only [Channel Indicator	9.3.6	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.

9.2.9 REJECT Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Cause	9.3.16	M
Diagnostic	9.3.17	O
Message-Identifier	9.3.1	O
Serial Number	9.3.2	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).

9.2.10 RESTART-INDICATION Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.2	M
Recovery Indication	9.3.20	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.

9.2.11 RESET Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.1	M

The RESET Request is used by the CBC to force one or more cells 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 BSC/RNCreceives 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.

9.2.12 FAILURE-INDICATION Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.2	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 clause 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: A Failure-Indication may be triggered by a RESET Request. This allows to recover from situations, where a PDU occasionally may be lost.

9.2.13 SET-DRX Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.1	M
Schedule-Period	9.3.12	O
Reserved-Slots	9.3.13	O
GSM only [Channel Indicator	9.3.6	O]

This primitive is applicable in GSM only. In UMTS DRX is a mandatory feature in the RNC and no activation/ deactivation function on CBS related radio resources controlled by the CBC is necessary.

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~~3GPP TS ~~04.12~~24.012. 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 may use default values.

If a BSC receives a SET-DRX Indication, the new DRX parameters will be taken into account starting from the next schedule period in each cell, see 3GPP TS ~~04.12~~24.012 [7].

If a BSC receives a SET-DRX Indication, the new DRX parameters will be applied for all cells that do not handle any broadcast message (null loading).

9.2.14 SET-DRX- REPORT Response/Confirm

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.2	O
Failure-List	9.3.14	O
GSM only [Channel Indicator	9.3.6	O]

This primitive will be sent by the BSC 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.

9.2.15 CAPACITY-INDICATION Request/Indication

PARAMETER	REFERENCE	PRESENCE
Cell-List	9.3.5.2	O
Available-Capacity	9.9.22	O

This primitive is applicable in UMTS only.

This primitive is used by the RNC to indicate a change in the available broadcast capacity per cell to the CBC.

9.3 Parameters

9.3.1 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 clause 9.4.2.2.

9.3.2 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 clause 9.4.2.1.

This parameter enables a particular existing CBS message, from the source/type indicated by the message identifier, to be identified.

9.3.3 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 clause 9.4.2.1.

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.

9.3.4 Number-of-Pages

This parameter enables the number of pages in the CBS message to be indicated.

9.3.5 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 3GPP TS ~~08.08~~48.008 [13] and can be identified by the CBC or BSC in LAC and CI format or CI format only.

In addition (see 3GPP TS ~~08.08~~48.008 [13]) 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.

The following applies for UMTS only:

- For CBS the cells are refered to as Service Areas. As described in 3GPP TS 25.401 [17] a Service Area Identifier (SAI) is used to uniquely identify an area consisting of one or more cells belonging to the same Location Area. Such an area is called a Service Area and can be used for indicating the location of a UE to the CN.
- The Service Area Code (SAC) together with the PLMN-Id and the LAC will constitute the Service Area Identifier.
  - SAI = PLMN-Id + LAC + SAC.
- The SAC is defined by the operator, and set in the RNC via O&M.

NOTE: For CBS, a Service Area shall consist of only one Cell. The mapping of SAI onto cell is controlled by the RNC and managed by an O&M function.Given the above differences between cell identification in the two directions, a cell list sent from the CBC to the BSC/RNC has a different structure compared to a cell list sent from the BSC/RNC to the CBC. The different cell lists are described in clauses 9.3.5.1 and 9.3.5.2.

9.3.5.1 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 Cell-Id-Discriminator has one of the following formats:

Format	Description
LAC and CI in GSM;	~~GSM~~3GPP TS ~~08.08~~48.008 [13]
CI only;	~~GSM~~3GPP TS ~~08.08~~48.008 [13]
all cells in the BSC/RNC belonging to a certain Location Area;	Example in ~~GSM~~3GPP TR 03.49 [6]
all cells in the BSC/RNC;	Example in 3GPP TR ~~GSM~~ 03.49 [6]
SAI in UMTS	3GPP TS 25.401 [17]

The Cell-identification is repeated for each cell included in the list. The Cell-List must refer to at least one cell.

9.3.5.2 Cell-List sent from BSC/RNC to CBC

The BSC/RNC to CBC Cell-List contains a sequence of cell-identifiers as defined in clause 9.3.11. The Cell-List must contain at least one cell-identifier as defined in clause 9.3.11.

9.3.6 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.

9.3.7 Category

This indicates the category of the CBS message:

- High Priority: to be broadcast at the earliest opportunity.
- Background: to be broadcast when no CBS messages of category "High Priority" or "Normal" are broadcast. 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.

9.3.8 Repetition-Period

This indicates the period of time after which broadcast of the CBS message should be repeated. The minimum period with which a CBS message consisting of one page may be broadcast over the air interface is a period of 1.883 s.

The value of "Repetition-Period" shall be in the range 1 to 1 024 where each unit will represent the value of one minimum period.

In the event of a conflict where the BSS/RNS has more than one CBS message to send at the same time, the BSC/RNC shall decide the order of such CBS messages as an implementation matter.

NOTE: The time period 1.883 s approximately reflects one 8 x 51 multiframe sequence of the GSM radio interface. It is also used as minimum repetition rate in UMTS. The higher capacity of the RNS enables the CBC to send more than one CBS message consisting of one page with the minimum repetition rate to a Node B.

9.3.9 No-of-Broadcasts-Requested

This specifies the number of times the CBS message is to be broadcast.

The parameter may take any value up to 65535 (this maximum allows the CBS message to be broadcast approximately every 1.883 s for more than 24 h). 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).

9.3.10 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 cell in the Cell-List for broadcast over the air interface.

The cells in the list are described as per clause 9.3.11.

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.

9.3.11 Cell-Identifier

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 has one of the following formats:

Format	Description
LAC and CI in GSM	~~GSM~~3GPP TS ~~08.08~~48.008 [13]
CI only	~~GSM~~3GPP TS ~~08.08~~48.008 [13]
SAI in UMTS	3GPP TS 25.401 [17]

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 RNC uses the SAI format for a cell identifier in any response to the CBC.

9.3.12 Schedule-Period

The following applies for GSM only:Indicates the DRX schedule period length, see 3GPP TS ~~04.12~~24.012 [7].

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.

9.3.13 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 3GPP TS ~~04.12~~24.012 [7].

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.

9.3.14 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 cells in the list are described as per clause 9.3.11.

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.

9.3.15 Radio-Resource-Loading-List

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 as per clause 9.3.11.

Description of list elements:

PARAMETER	PRESENCE
Cell Identifier	M
Radio-Resource-Loading	M

The information above is repeated for the number of cells in the list.

To each cell in the list the information element Radio-Resource-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 Radio-Resource load.

The Radio-Resource-Loading-List must contain at least one cell.

9.3.16 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

9.3.17 Diagnostic

Provides additional information associated with Cause parameter and may contain parameter which could not be interpreted/executed.

9.3.18 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 3GPP TS 23.038 [3].

9.3.19 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 3GPP TS 23.038 [3]).

The content of a CBS-Message-Information-Page is passed transparently from the CBC to the MS/UE.

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 3GPP TS 23.038 [3]).

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 3GPP TS 23.038 [3]).

9.3.20 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.

9.3.21 Recovery-Indication

Indicates whether the CBS related data was lost or is still available.

The following values should be coded:

- Data-available;
- Data-lost.

9.3.22 Available-Capacity

This parameter is applicable for UMTS only. It indicates the capacity on the radio interface of a cell which is currrently available for CBS.

9.4 Message Format on 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 clause.

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 3GPP TS ~~04.12~~24.012 [7].

9.4.1.1 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 3GPP TS ~~04.12~~24.012 [7]. This is sent on the channel allocated as CBCH by 3GPP TS ~~05.02~~45.002 [8]. The 88 octets of the CBS Message are formatted as described in clause 9.3.2.

9.4.1.2 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.

9.4.1.2.1 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:

Octet 1								Octet 2							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
GS		Message Code										Update Number			

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 (in GSM) (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), or
  - Service Area Wide (in UMTS) (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 Service Area as the current cell)

NOTE: According to 3GPP TS 23.003 [2] a Service Area consists of one cell only.

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 clause 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 in GSM, Service Area wide in UMTS
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.

9.4.1.2.2 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~~3GPP TS 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~~3GPP TS 23.041 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 CBS Message Identifier for E-OTD Assistance Data message.

03E9 (hex): LCS CBS Message Identifier for DGPS Correction Data message.

03EA (hex): LCS CBS Message Identifier for GPS Ephemeris and Clock Correction Data message.

03EB (hex): LCS CBS Message Identifier for GPS Almanac and Other Data message.

03EC - 0FFF (hex): Intended for standardization in future versions of ~~GSM 03.41~~3GPP TS 23.041. These values shall not be transmitted by networks that are compliant to this version of ~~GSM 03.41~~3GPP TS 23.041. 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~~3GPP TS 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~~3GPP TS ~~03.48~~23.048 [15] to the SIM (see ~~GSM~~3GPP TS 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~~3GPP TS 23.041. These values shall not be transmitted by networks that are compliant to this version of ~~GSM 03.41~~3GPP TS 23.041. 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~~3GPP TS 23.041. These values shall not be transmitted by networks that are compliant to this version of ~~GSM 03.41~~3GPP TS 23.041. 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 00000000 0000(decimal '000').
0000 00000000 0001(decimal '001').
0000 00000000 0010(decimal '002').
0000 00000000 0011(decimal '003').
: : :
: : :
0000 00111110 0111(decimal '999').

9.4.1.2.3 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 3GPP TS 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_{PL} 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.

9.4.1.2.4 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).

9.4.1.2.5 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 messages which are transmitted by the RNS to the UE include two types of messages: CBS Message (user information) and Schedule Message (schedule of CBS messages).

The format of the CBS Message containing user information is described in this clause and in 3GPP TS 25.324 [19].

The format of the Schedule Message is described in 3GPP TS 25.324 [19].

9.4.2.1 General Description

The CBS message is transmitted as one unit over the radio interface. On layer two of the UMTS radio interface the logical channel CTCH is used.

9.4.2.2 Message Parameter

Octet Number(s)	Parameter
1	Message Type
2 – 3	Message ID
4 – 5	Serial Number
6	Data Coding Scheme
7 – n	CB Data

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.

9.4.2.2.1 Message Type

This parameter indicates the type of a message, either a CBS message or a Schedule Message. The Coding of the Message Type is described in 3GPP TS 25.324 [19].

9.4.2.2.2 Message ID

This parameter identifies the source and type of the CBS Message (see also 3GPP TS 25.324 [19]). It is identical with the Message Identifier described in clause 9.4.1.2.2 with respect to its structure and possible value range. Within a multi technology network of one operator, e.g. GSM combined with UMTS, the values identifying a given topic shall be identical for both the Message ID and the Message Identifier described in 9.4.1.2.2.

The UE shall attempt to receive the CBS messages whose Message ID's are in the "search list". This "search list" shall contain the Message IDs stored in the EF_{CBMI}, EF_{CBMID} and EF_{CBMIR} files on the USIM (see 3GPP TS 31.102 [18]) and any Message Identifiers stored in the UE in a "list of CBS messages to be received". If the UE has restricted capabilities with respect to the number of Message ID's it can search for, the IDs stored in the USIM shall take priority over any stored in the UE.

9.4.2.2.3 Serial Number

This parameter identifies a particular CBS Message from the source and type indicated by the Message ID (see also 3GPP TS 25.324 [19]). It is identical with the Serial Number described in clause 9.4.1.2.1 with respect to its structure and possible value range.

9.4.2.2.4 Data Coding Scheme

This parameter identifies the the alphabet/coding and the language applied to a CBS Message as defined in 3GPP TS 23.038 [3].

When the USIM indicates one or more language preferences, the UE shall, by default, use the language(s) stored in the USIM (in the EF_{PL} file) to set any language filter mechanisms provided by the UE.

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.

9.4.2.2.5 CB Data

This parameter consists of the WRITE-REPLACE primitive parameters Number-of-Pages, CBS-Message-Information-Page and CBS-Message-Information-Length as received from the CBC (see also 3GPP TS 25.324 [19]). The CBS-Message-Information-Page contains the user information (see clause 9.2.2).

9.5 CBS Compression

Cell Broadcast messages may be compressed in accordance with the compression algorithm described in 3GPP TS 23.042 [14].

The Data Coding Scheme parameter (see clause 9.4.1.2.3) 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 3GPP TS 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 3GPP TS 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 3GPP TS 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 3GPP TS 23.042 [14] 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 clause. 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 clause. 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 6.

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.

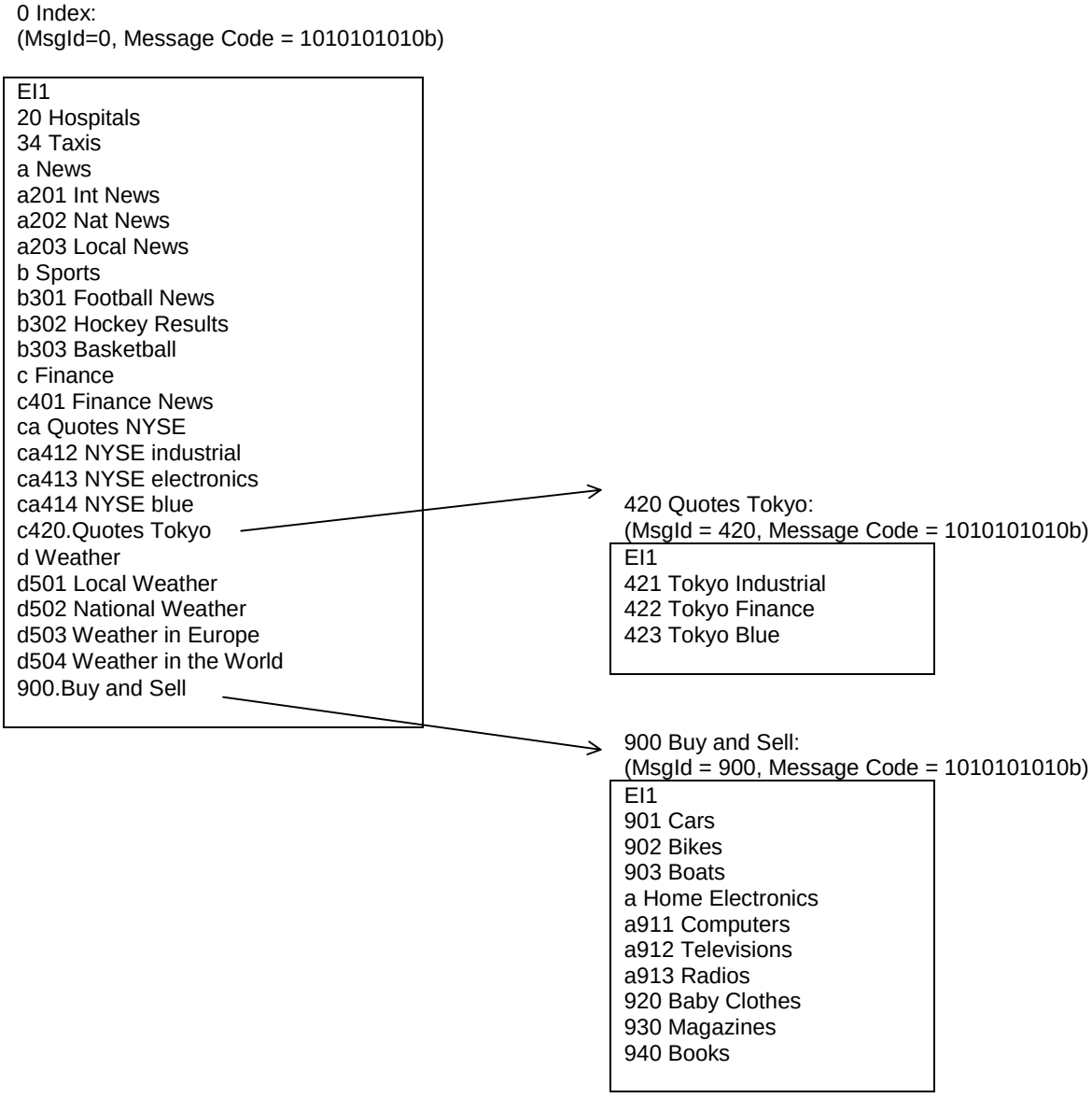

0 Index:
(MsgId=0, Message Code = 1010101010b)
EI1
20 Hospitals
34 Taxis
a News
a201 Int News
a202 Nat News
a203 Local News
b Sports
b301 Football News
b302 Hockey Results
b303 Basketball
c Finance
c401 Finance News
ca Quotes NYSE
ca412 NYSE industrial
ca413 NYSE electronics
ca414 NYSE blue
c420.Quotes 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 6

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~~ 3GPP TR 03.49 [6] 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 3GPP TR~~S~~ 03.49 [6].

The protocol(s) between CBC and BSC should:

a) provide the service defined for the CBC-BSC interface (see clause 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. ITU-T Number 7 Stack).