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**Universal Mobile Telecommunications System (UMTS);
Radio Interface for Broadcast/Mulicast Services
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Postal address
F-06921 Sophia Antipolis Cedex - FRANCE

Office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16
Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Internet
secretariat@etsi.fr
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Foreword

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Contents

Foreword

This Technical Specification has been produced by the 3GPP.

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

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document provides the description of the Broadcast/Multicast Control Protocol (BMC). This protocol adapts broadcast and multicast services on the radio interface.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

[1]   3G TS 25.322: "RLC Protocol Specification"

[2]   3G TS 25.301: "Radio Interface Protocol Architecture"

[3]   3G TS 23.041: "Technical realisation of Cell Broadcast Service (CBS)"

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

CB message: User data as transmitted from Cell Broadcast Centre to UE (BMC SDU).

CB repetition period: Period after which a CB message should be broadcast if more than one repetitions are requested.

Number of Broadcast Requested: Number of broadcasts requested for a CB message. This number is infinite or finite.

DRX Schedule Period: Schedule period as optionally requested by the CBC (unit: seconds).

Reserved CB Capacity: Percentage of the capacity reserved for CB messages with category HIGH on the allocated radio resources CTCH, FACH and S-CCPCH. This parameter can be set optionally by the CBC.

CTCH Block Set: Subset of the transport block set of FACH on which the CTCH used for CBS is mapped uniquely.

CBS schedule period: Finite sequence of CTCH Block Sets of variable length in which scheduled CB messages are broadcast.

3.3 Abbreviations

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

AS	Access Stratum
BMC	Broadcast/Multicast Control
C-SAP	Control Service Access Point
CBC	Cell Broadcast Centre
CBS	Cell Broadcast Service
CTCH	Common Traffic Channel
CTCH-BS	CTCH Block Set
FACH	Forward Access Channel
IE	Information Element

kbps   kilo-bits per second
L1   Layer 1 (physical layer)
L2   Layer 2 (data link layer)
L3   Layer 3 (network layer)
MAC   Medium Access Control
NAS   Non Access Stratum
NSAPI   Network layer Service Access Point
PDCP   Packet Data Convergence Protocol
RLC   Radio Link Control
RRC   Radio Resource Control
UE   User Equipment

4   General

4.1   Model of BMC

Broadcast/Multicast Control (BMC) is a sublayer of L2 that exists in the User-Plane only. It is located above RLC. The L2/BMC sublayer is assumed as transparent for all services except broadcast/multicast.

Figure 4.1-1 shows the model of the L2/BMC sublayer within the UTRAN radio interface protocol architecture.

At the UTRAN side, the BMC sublayer shall consist of one BMC protocol entity per cell. Each BMC entity requires a single CTCH, which is provided by the MAC sublayer, through the RLC sublayer. The BMC requests the Unacknowledged Mode service of the RLC.

It is assumed that there is a function in the RNC above BMC that resolves the geographical area information of the CB message (or, if applicable, performs evaluation of a cell list) received from the Cell Broadcast Centre (CBC). A BMC protocol entity serves only those messages at BMC-SAP that are to be broadcast into a specified cell.
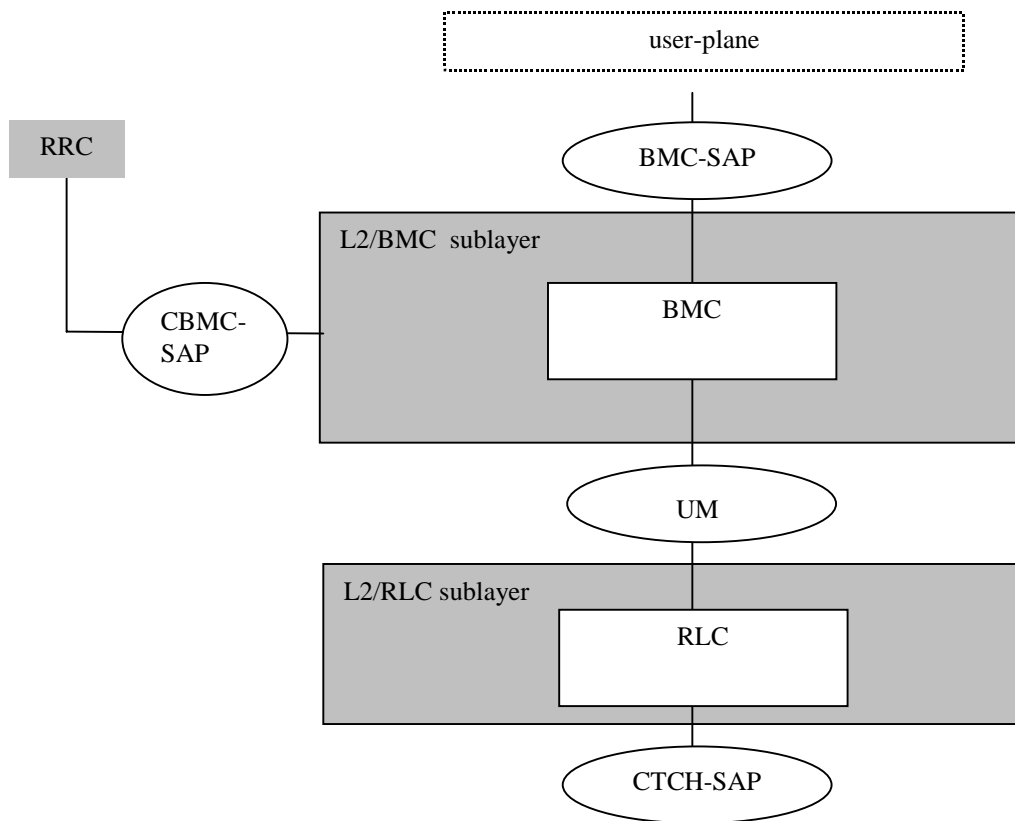

Figure 4.1-1: BMC protocol model

5 Functions

The functions are specified in TS 25.301. They are:

- Storage of Cell Broadcast Messages

- Traffic volume monitoring and radio resource request for CBS

- Scheduling of BMC messages

- Transmission of BMC messages to UE

- Delivery of Cell Broadcast messages to upper layer (NAS)

6 Services provided to Upper Layers

The BM-SAP provides a broadcast/multicast transmission service in the user plane on the radio interface for common user data in unacknowledged mode.

NOTE: This chapter depends on the specification of the CBC-RNC-interface protocol (TS of RAN WG 3) and the requirements of the CB application and the underlying interfaces (TS 023.041 under specification of T WG 2 SWG 3). RAN WG 2 has based its work on the available specifications.

The BMC sublayer interacts with other entities as illustrated in figure 1 of chapter 4. The interactions with the upper layer/U-plane and the RRC layer are specified in terms of primitives where the primitives represent the logical exchange of information and control between the BMC sublayer and higher layers. They do not specify or constrain implementations. The (adjacent) layers connect to each other through Service Access Points (SAPs).

Three types of primitives are used for this document, as follows.

- **REQUEST:**
  This type is used when a higher layer is requesting a service from a lower layer

- **INDICATION:**
  This type is used by a lower layer providing a service to notify its higher layer of activities concerning that higher layer

- **CONFIRM:**
  This type is used by a lower layer providing the requested service to confirm to the higher layer that the activity has been completed.

The primitives defined below are for communications between upper layer and BMC, as well as RRC and BMC in the same protocol stack.

For the BMC sublayer two sets of primitives are defined

- **Primitives between BMC and upper layer (U-plane):**

  BMC - Generic name - Type: Parameters

- **Primitives between BMC and the RRC entity:**

  CBMC - Generic name - Type: Parameters.

7 Services expected from RLC

The BMC uses the unacknowledged mode service of the RLC sublayer.

See [1] TS 25.322 RLC Protocol Specification for details.

8 Elements for layer-to-layer communication

8.1 Service Primitives between RRC and BMC

8.1.1 Primitives

The primitives supported at CBMC-SAP between RRC and BMC are shown in Table 8.1.1-1.

Table 8.1.1-1: Primitives between BMC and RRC

Generic Name	Parameters
CBMC-Measurement-IND	CB-Traffic-Volume
CBMC-Rx-IND	Action, DRX selection
CBMC-Config-REQ	CTCH configuration

8.1.1.1 CBMC-Measurement-IND

The CBMC-Measurement-IND primitive is used by BMC to indicate the CB traffic volume.

Primitive Type: indication.

Parameters:

> CB-Traffic-Volume

8.1.1.2 CBMC-Rx-IND

The CBMC-Rx-IND primitive is used by BMC to indicate to RRC whether CB message reception shall start or stop and indicate when CB messages of interest are arriving in the next CBS schedule period.

Primitive Type: indication.

Parameters:

> Action
>
> DRX selection

8.1.1.3 CBMC-Config-REQ

The CBMC-Config-REQ primitive is used by RRC to inform the BMC about the setting of the CTCH configuration.

Primitive Type: indication.

Parameters:

> CTCH configuration

8.1.2 Parameters

8.1.2.1 CB-Traffic-Volume

Expected CTCH transmission rate [kbps]

Value set: 0,1,..,32

8.1.2.2   Action

Start CBS reception

Stop CBS reception

8.1.2.3   DRX selection

List of absolute CTCH BS indices which are of interest and which should be received by Layer 1

8.1.2.4   CTCH configuration

Current CTCH-BS index , $1 \leq i \leq 256$.

FACH identification.

Transport Format Set of the allocated FACH (TB size, TBS size, TTI).

Reserved CTCH transmission rate [kbps]: 0,1,..,32

8.2   Service Primitives between upper layer (U-plane) and BMC

8.2.1   Primitives

The primitives supported at BMC-SAP between BMC and upper layer (U-plane) are shown in Table 8.2.1-1.

Table 8.2.1-1: Primitives between BMC and upper layer

Legend: [ ] optional parameters

Generic Name	Parameters
BMC-Data-REQ	CB-Message-ID, [, Old-Serial-Number], New-Serial-Number, Data-Coding-Scheme, CB-Data , [Category], Repetition-Period, Number-of-Broadcasts-Requested
BMC-Data-IND	CB-Message-ID, Serial-Number, Data-Coding-Scheme, CB-Data
BMC-Data-CNF	CB-Message-ID, Serial-Number
BMC-Congestion-IND	
BMC-Normal-IND	
BMC-Activation-REQ	CB-Message-ID (n times)
BMC-Deactivation-REQ	CB-Message-ID (n times)
BMC-DRX-REQ	CB-DRX-Schedule-Period, Reserved-CB-Capacity
BMC-Error-IND	Cause
BMC-Data41-REQ	Transport Layer Message, Broadcast Address
BMC-Data41-IND	Transport Layer Message,
BMC-Error41-IND	Error Type

8.2.1.1 Primitives used in relation to UMTS Core Network

8.2.1.1.1 BMC-Data-REQ

The BMC-Data-REQ primitive is used by upper layer to request repeated transmission of CB messages.

Primitive Type: request.

Parameters:

CB-Message-ID,

[Old-Serial-Number],

New-Serial-Number,

Data-Coding-Scheme,

CB-Data

[Category],

Repetition-Period,

Number-of-Broadcasts-Requested

8.2.1.1.2 BMC-Data-IND

The BMC-Data-IND primitive is used to indicate received CB messages (i.e. CB Data) to upper layer.

Primitive Type: indication.

Parameters:

CB-Message-ID

Serial-Number,

Data-Coding-Scheme,

CB-Data

8.2.1.1.3 BMC-Data-CNF

The BMC-Data-CNF primitive is used to indicate the complete broadcast of CB messages.

Primitive Type: confirmation.

Parameters:

CB-Message-ID

Serial-Number

8.2.1.1.4 BMC-Congestion-IND

The BMC-Congestion-IND primitive is used to indicate to upper layer (BM-IWF) that the BMC entity is congested.

Primitive Type: indication.

Parameters: None.

8.2.1.1.5 BMC-Normal-IND

The BMC-Normal-IND primitive is used to indicate to upper layer (BM-IWF) that the BMC has recovered from a congestion situation and is operating normal.

Primitive Type: indication.

Parameters: None.

8.2.1.1.6 BMC-Activation-REQ

The BMC-Activation-REQ primitive is used to request CB message reception and to notify which CB messages are of interest and shall be delivered to the upper layer.

Primitive Type: request.

Parameters:

> CB-Message-ID (n times)

8.2.1.1.7 BMC-Deactivation-REQ

The BMC-Deactivation-REQ primitive is used to request stop of reception of listed CB messages. If no more CB messages are to be received, CB message reception shall stop. .

Primitive Type: request.

Parameters:

> CB-Message-ID (n times)

8.2.1.1.8 BMC-DRX-REQ

The BMC-DRX-REQ primitive is used to command CBS discontinuous reception (CB DRX).

Primitive Type: request.

Parameters:

> CB-DRX-Schedule-Period
>
> Reserved-CB-Capacity

8.2.1.1.9 BMC-Error-IND

The BMC-Error-IND primitive is used to indicate unsuccessful operations of the BMC entity requested.

Primitive Type: indication.

Parameters:

> Cause

8.2.1.2 Primitives used for ANSI-41 Core Network

8.2.1.2.1 BMC-Data41-REQ

The BMC-Data41-REQ primitive is used by upper layer (Transport Layer) to request repeated transmission of CBS messages if the source is ANSI-41 core network.

Primitive Type: request.

Parameters:

Transport Layer Message

Broadcast Address

8.2.1.2.2 BMC-Data41-IND

The BMC-Data-IND primitive is used to indicate received CB messages to upper layer (Transport Layer) if the source is ANSI-41 core network.

Primitive Type: indication.

Parameters:

Transport Layer Message

8.2.1.2.3 BMC-Error41-IND

The BMC-Error-IND primitive is used to report BMC Layer Error to the upper layer (Transport Layer) if the source is ANSI-41 core network.

Primitive Type: indication.

Parameters:

Error Type

8.2.2 Parameters

8.2.2.1 CB-Message-ID

Part of the CB message identification describing the type of CB message.
This parameter is described in 3G TS 23.041.

8.2.2.2 Serial Number

Part of the CB message identification describing variants of a CB message.
This parameter is described in 3G TS 23.041.

8.2.2.3 Data-Coding-System

Data coding system applied to the CB information.
This parameter is described in 3G TS 23.038 and 3G TS 23.041.

8.2.2.4 CB-Data

CB information to be broadcast

NOTE: The relation to GSM CBS pages can be found in 3G TR 25.925 or 3G TS 23.041.

8.2.2.5 Category

Indicates the category (priority) of the CB message.
Values:
HIGH (CB message is to be broadcast at the earliest opportunity in the reserved CB capacity of the current CB DRX schedule period.
NORMAL (default) (CB messages to be broadcast according to the associated repetition period.
BACKGROUND (CB message to be broadcast in the CB capacity not occupied by HIGH or NORMAL CB messages within a CB DRX schedule period.

This parameter is described in 3G TS 23.041.

8.2.2.6 Repetition-Period

Indicates the period of time after which broadcast of the CB message should be repeated.
This parameter is described in 3G TS 23.041.

>   NOTE: For GSM, the repetition period is a multiple of 1.883 seconds (cf.3G TS 23.041).

8.2.2.7 Number-of-Broadcasts-Requested

Number of times a CB message is to be broadcast.
Values:
0   indefinitely
n, $1 \leq n \leq 65535$ finite number of times to be broadcast

This parameter is described in 3G TS 23.041.

8.2.2.8 CB-DRX-Schedule-Period

Indication of the CB DRX schedule period length.
This parameter is described in 3G TS 23.041.

>   NOTE: When CBC is commanding a schedule period it has used the timing given in GSM 04.12. A conversion
>   function is described in 3G TS 25.401 (ffs.).

8.2.2.9 Reserved-CB-Capacity

Indicates the capacity reserved for CB messages with Category = HIGH or new CB messages.
This parameter is described in 3G TS 23.041.

8.2.2.10 Cause

>   CB message already stored.

>   Old CB message not stored.

8.2.2.11 Transport Layer Message

This parameter is described in TIA/EIA-637-A.

8.2.2.12 Broadcast Address

This parameter is described in TIA/EIA-637-A.

8.2.2.13 Error Type

The error codes shall be SMS_CauseCode values as defined in the SMS_CauseCode Table in TIA/EIA-41-D.

9 Procedures

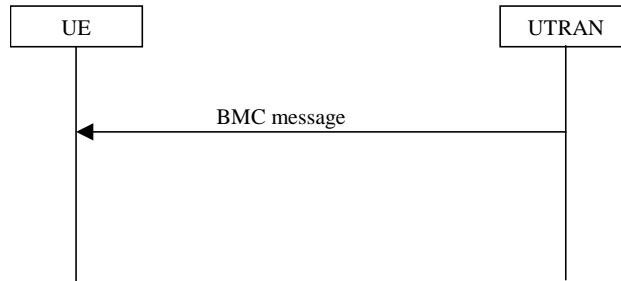## 9.1 BMC Message Broadcast

Figure 9.1-1: Procedure for broadcast of BMC messages

This procedure is used for broadcasting BMC messages from the network to UEs in a cell. A UE supporting Cell Broadcast Service (CBS) shall be capable to receive BMC messages in the Idle mode and in CELL_PCH and URA_PCH RRC-states of Connected mode.

Two types of BMC messages are identified: CBS Message and Schedule Message.

9.2 Generation of Schedule message

> NOTE: Principles and examples are described in 3G TR 25.925.

This procedure calculates the CBS schedule periods and assigns BMC messages (i.e. CBS Messages and Schedule Messages) to the CBS schedule periods and gives an indication which of the CTCH Block Sets containing part of or complete BMC messages has the status "new".

Algorithms used for scheduling are implementation dependent and thus do not need to be specified. Some parameters may be set by CBC or O&M system.

CTCH Block Sets are indicated in a New Message Bitmap IE of BMC Schedule Message as new (bit position of a CTCH Block Set is set to value "1") when one of the following conditions is met:

> The CTCH Block Set contains part of or a complete BMC message which
> was either not sent during the previous CBS schedule period,
> or sent unscheduled during the preceding CBS schedule period;
> or, the CTCH Block Set is indicated as of free usage, reading advised,
> or it contains the Schedule Message partly or complete of the following CBS schedule period.

Other BMC messages sent in the same CBS schedule messages are indicated as "old" (bit position of CTCH Block Set containing this message partly or complete is set to value 0).

The indication "new" is set both for the first transmission of a BMC message in the CBS schedule period or a repetition of it within the CBS schedule period.

The input parameters of the scheduling procedure are set by CBC or RRC or by the O&M system for the BMC.

The CBC input parameters are:

> CB messages (i.e. BMC SDUs),
> CM Message Identifier per CB message,
> Serial Number per CB message,
> CB repetition period per CB message,
> Number of Broadcast Requested per CB message,
> DRX Schedule Period (cell related parameter) requested optionally,
> Reserved CB Capacity (cell related parameter) requested optionally.

The RRC input parameters are:

Sizes of CTCH Block Sets,

Timing of CTCH Block Set sequence.

The O&M (BMC) input parameters are:

Reserved CB Capacity, to be used when CBC has not set this parameter.

9.3   Traffic volume measurement

The BMC entity on the network side predicts periodically the expected amount of CBS traffic volume (unit: kbps) which is needed for transmission of CB messages currently and indicates this to RRC.

The algorithms used for traffic volume prediction are implementation dependent and thus do not need to be specified. Some parameters may be set by O&M system. The algorithms depend on the chosen algorithms for CB message scheduling (cf. Section 9.2).

9.4   BMC message reception

The BMC entity on the UE side evaluates received BMC Schedule Messages and takes decisions which BMC messages should be received. The reception of a BMC message is indicated to RRC if the CTCH Block Sets carrying this BMC message are indicated as new. If the upper layer has requested reception of individual CB messages when in status "old", the reception of these BMC messages are also indicated to RRC .

If not otherwise requested by upper layers, only those CB messages received in BMC CBS Messages should be delivered to upper layers for which the Serial Number associated with the CB message has changed. This implies that the BMC has to store the last received Serial Number of each CB message activated by upper layers.

10   BMC Messages

A BMC message is equivalent with a BMC PDU. There are two types of BMC messages defined, CBS messages, which carry cell broadcast data from higher layer, and *Schedule messages*, which provide information for support of Discontinuous Reception (DRX) of cell broadcast data at the UE.

10.1   BMC CBS Message

The CBS Message carries the cell broadcast data and the identification and coding information of it.

RLC-SAP: UM

Logical channel: CTCH

Direction: UTRAN → UE

Table 10.1-1: CBS Message

Information Element	Presence	Multi	IE type and reference	Semantics description
Message Type	M		Sec. 11.1	
CB Message ID	M		Sec. 11.2	
Serial Number	M		Sec. 11.3	
Data Coding Scheme	M		Sec. 11.4	
CB Data	M		Sec. 11.5	

10.2   BMC Schedule Message

The BMC Schedule Message describes for the succeeding CBS schedule period the time locations for each CBS Message and the location of the Schedule Message of the following CBS schedule period .

RLC-SAP: UM

Logical channel: CTCH

Direction: UTRAN → UE

Table 10.2-1: Schedule Message

Information Element	Presence	Multi	IE type and reference	Semantics description
Message Type	M		Sec. 11.1	
Offset to Begin CTCH BS index	M		Sec. 11.6	
Length of CBS Scheduling Period	M		Sec. 11.7	
New Message Bitmap	M		Sec. 11.8	
New Message Description	O		Sec. 11.9	
Other Message Description	M		Sec. 11.10	

11 Information Elements

11.1 Message Type

Table 11.1-1: Message Type IE

IE/Group name	Presence	Multi	IE type and reference	Semantics description
Message Type	M		Enumerated (0 .. 255)	

Coding of Message Type

Table 11.1-2: Coding of Message Type IE

1	CBS Message
2	Schedule Message
0, 3 .. 255	Reserved for future use

11.2 CB Message ID

Table 11.2-1: CB Message ID IE

IE/Group name	Presence	Multi	IE type and reference	Semantics description
Message Type	M		Enumerated (0 .. 2^{16}-1) 3G TS 23.041	Identification of source and type of CBS message

11.3 Serial Number

Table 11.3-1: Serial Number IE

IE/Group Name	Presence	Multi	IE Type and reference	Semantics description
Serial Number			Enumerated (0 .. 2^{16}-1) 3G TS 23.041	Identification of variations of a CBS message (part of the overall CBS message identification)

11.4   CB Coding Scheme

Table 11.4-1: CB Coding Scheme IE

IE/Group name	Presence	Multi	IE type and reference	Semantics description
CB Coding Scheme	M		Enumerated (0 .. 2^8-1) 3G TS 23.038 3G TS 23.041	Identification of the alphabet/coding and the language applied

11.5   CB Data

Table 11.5-1: CB Data IE

IE/Group name	Presence	Multi	IE type and reference	Semantics description
CB Data	M		Bitstring	Content of CBS message

NOTE: The length of the bit string is less or equal to 1246 octets when a GSM CBS message is broadcast.

11.6   Offset to Begin CTCH Block Set Index

Table 11.6-1: Offset to Begin CTCH Block Set Index IE

IE/Group name	Presence	Multi	IE type and reference	Semantics description
Offset to Begin CTCH BS Index	M		Enumerated (1..255)	Pointer to the first CTCH BS of the next CBS Schedule Period relative to the CTCH BS index of the current BMC Schedule Message

11.7   Length of CBS Schedule Period

Table 11.7-1: Length of CBS Schedule Period IE

Information Element/Group name	Presence	Multi	IE type and reference	Semantics description
Length of CBS Schedule Period	M		Enumerated (0..255)	Number of consecutive CTCH BS of the next CBS Schedule Period. Together with Offset to Begin CTCH BS Index it points to the end of the CBS schedule period.

11.8 New Message Bitmap

Table 11.8-1: New Message Bitmap IE

Information Element/Group name	Presence	Multi	IE type and reference	Semantics description
New Message Bitmap	M		Bitmap	Bitmap indicating CTCH BS which contains new CBS Messages completely or partly

Coding of New Message Bitmap

Table 11.8-2: Coding of New Message Bitmap IE

CTCH BS index B	CTCH BS index B+1	CTCH BS index B+2	...					1
								2
								...
	...	CTCH BS index E-1	CTCH BS index E	0	0	0	0	n
Legend: B First CTCH BS index of the CBS schedule period, $1 \leq B \leq 256$ E Last CTCH BS index of the CBS schedule period, E = B + Length of CBS Schedule Period – 1								

CTCH BS Index i:
Bit i of the New CBS Message Bitmap refers to the content of CTCH BS index i. Its meaning is as follows:

1 The CTCH BS index i contains a BMC Message partly or completely which
was either not sent during the previous schedule period,
or sent unscheduled during the preceding schedule period;
or, the CTCH BS is indicated as of free usage, reading advised.
The value is 1 both for the first transmission of a given BMC message in the CBS schedule period or a repetition of it within the CBS schedule period.

0 The CTCH BS is such that value 1 is not suitable.

The length of the New Message Bitmap is given by the IE Length of CBS Schedule Period. If it is not a multiple of 8 the remaining bit positions are padded with "0".

11.9 New Message Description

Table 11.9-1: New Message Description IE

IE/Group Name	Presence	Multi	IE Type and reference	Semantics description
Message Description Type	M	0,..,16		0: Repetition of new BMC message within schedule period 1: New message 2: Reading advised 3: Reading optional
CB-Message-ID	C MDT		Enumerated $(0 .. 2^{16}-1)$ 3G TS 25.041	
Offset to CTCH BS index of first transmission	C MDT		Enumerated (0..255)	

Table 11.9-2: Conditions

Condition	Explanation
MDT	If Message Description Type = 0 then: the Offset to CTCH BS index of first transmission IE is included pointing to the CTCH BS index where the BMC message is transmitted the first time within the schedule period. If Message Description Type = 1 then: the CB-Message-Id IE is included

11.10   Other Message Description

Table 11.10-1: Other Message Description IE

IE/Group Name	Presence	Multi	IE Type and reference	Semantics description
Message Description Type	M	0,..,16		3: Reading optional 4: Repetition of old BMC message within schedule period 5: Old message
CB-Message-ID	C MDT		Enumerated (0 .. 2^{16}-1) 3G TS 25.041	
Offset to CTCH BS index of first transmission	C MDT		Enumerated (0..255)	

Table 11.10-2: Conditions

Condition	Explanation
MDT	If Message Description Type = 4 then: the Offset to CTCH BS index of first transmission IE is included pointing to the CTCH BS index where the BMC message is transmitted the first time within the schedule period. If Message Description Type = 5 then: the CB-Message-Id IE is included

Annex A (informative): Change history

Change history					
TSG-RAN#	Version	CR	Tdoc RAN	New Version	Subject/Comment
RAN_06	-	-	RP-99647	3.0.0	Approved at TSG-RAN #6 and placed under Change Control

History

Document history		
V3.0.0	January 2000	Publication