ETSI TS 143 246 V13.0.0 (2016-01)

Digital cellular telecommunications system (Phase 2+);
Multimedia Broadcast/Multicast Service (MBMS)
in the GERAN;
Stage 2
(3GPP TS 43.246 version 13.0.0 Release 13)

Reference

RTS/TSGG-0143246vd00

Keywords

GSM

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - 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

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Contents

Foreword

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

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1 Scope

The present document is part of the Release 6 "**Introduction of the Multimedia Broadcast Multicast Service (MBMS) in GERAN**" work item and it is linked to the corresponding 3GPP TS 22.146: "Multimedia Broadcast/Multicast Service (MBMS); Stage 1" [3] and 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description" [5].

The purpose of the present document is to provide a stage 2 description of the changes required in existing specifications for the "**Introduction of the Multimedia Broadcast Multicast Service (MBMS) in GERAN**" feature for Release 6.

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. 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 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[2] 3GPP TS 23.107: "Quality of Service (QoS) concept and architecture".

[3] 3GPP TS 22.146: "Multimedia Broadcast/Multicast Service (MBMS); Stage 1".

[4] 3GPP TS 22.246: "Multimedia Broadcast/Multicast Service (MBMS) user services; Stage 1".

[5] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description".

[6] 3GPP TR 25.992: "Multimedia Broadcast/Multicast Service (MBMS); UTRAN/GERAN requirements".

[7] 3GPP TS 25.346: "Introduction of Multimedia Broadcast/Multicast Service (MBMS) in the Radio Access Network (RAN); Stage 2".

[8] 3GPP TS 45.002: "Multiplexing and multiple access on the radio path".

[9] 3GPP TS 45.008: "Radio subsystem link control".

[10] 3GPP TS 43.022: "Functions related to Mobile Station (MS) in idle mode and group receive mode".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 22.146 [3] and the following apply.

Dedicated MBMS Notification: A mechanism in the network that allows the network to notify mobile stations in dedicated mode of starting MBMS multicast sessions.

MBMS radio bearer: In *A/Gb mode*, an MBMS radio bearer is defined as "point-to-multipoint".

MBMS channel: An MBMS channel consists of the physical resources assigned to one (several) MBMS service(s). In *A/Gb mode*, an MBMS channel carries one (several) MBMS radio bearer(s) and may be on one (several) PDCH(s) with GPRS and/or EGPRS TBF(s).

MBMS session: Defined in 3GPP TS 22.146 [3].

MBMS service: Defined in 3GPP TS 22.146 [3].

MBMS service class: An MBMS service class is defined as either Background or Streaming, according to 3GPP TS 23.107 [2].

MBMS notification: Defined in 3GPP TS 23.246 [5].

3.2 Abbreviations

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

BM-SC	Broadcast/Multicast Service Centre
MBMS	Multimedia Broadcast/Multicast Service
MPRACH	MBMS Packet Random Access Channel
p-t-p	point-to-point
p-t-m	point-to-multipoint
TMGI	Temporary Mobile Group Identifier

4 MBMS GERAN Architecture

4.1 General

One new transmission mode exists to provide the MBMS service:

- Point-to-multipoint transmission (p-t-m)

Point-to-multipoint transmission is used to transfer MBMS specific information between the network and an unspecified number of mobile stations. It is used for both broadcast and multicast modes of MBMS.

4.2 GERAN A/Gb mode architecture

4.2.1 Protocol structure

No modifications are required to the GPRS protocol stack (see 3GPP TS 23.060) for MBMS. However, some of the radio protocols in the GERAN will require modifications to support MBMS p-t-m bearers.

4.2.2 void

4.2.3 MBMS reception

Table 4.2.3.1 shows whether a mobile station can support MBMS data reception according to its mode (packet idle mode, packet transfer mode, dedicated mode or dual transfer mode) at the time of the MBMS bearer establishment i.e. immediately prior to MBMS reception.

Table 4.2.3.1: MBMS radio bearer available according to initial MAC mode and MBMS service

	Packet idle mode **(GMM-Standby or GMM-Ready)**	Packet transfer mode	Dedicated mode	Dual transfer mode
MBMS multicast	**p-t-m**	**p-t-p repair**	**p-t-p repair (1)**	**p-t-p repair**
MBMS broadcast	**p-t-m**	**Not specified (2)**	**Not specified (3)**	**Not specified (3)**

1) A mobile station is moved to dual transfer mode on establishment of a TBF to request an MBMS p-t-p repair.

2) Support is optional in the mobile station.

3) Note that an MBMS broadcast service is only available on a p-t-m radio bearer.

4.3 GERAN Iu mode architecture

4.3.1 Protocol structure

No modifications are required to the GPRS protocol stack (see 3GPP TS 23.060 [1]) for MBMS. However, some of the radio protocols in the GERAN will require modifications to support MBMS p-t-m bearers.

4.3.2 void

4.3.3 MBMS reception

Table 4.3.3.1 shows which type of MBMS radio bearer shall be assigned to the mobile station according to its RRC and MAC states at the time of the MBMS bearer establishment i.e. immediately prior to MBMS reception.

Table 4.3.3.1: MBMS radio bearer available according to initial MAC and RRC states and MBMS service

	RRC-Idle	**RRC-GRA_PCH**	**RRC-Cell_Shared**		**RRC-Cell_Dedicated**	
	MAC-Idle	**MAC-Idle**	**MAC-Idle**	**MAC-Shared**	**MAC-Dedicated**	**MAC-DTM**
MBMS multicast	p-t-m p-t-p (1)	Not available (2)	p-t-m p-t-p (1)	p-t-p	p-t-p (3)	p-t-p
MBMS broadcast	p-t-m	p-t-m	p-t-m	Not specified (4)	Not specified (5)	Not specified (5)

1) A mobile station is moved to MAC-Shared state on establishment of an MBMS p-t-p radio bearer

2) A mobile station is moved to RRC-Cell_Shared state on establishment of an MBMS radio bearer (p-t-m or p-t-p)

3) A mobile station is moved to MAC-DTM state on establishment of an MBMS p-t-p radio bearer if it has no other PS connections established

4) Support is optional in the mobile station

5) Note that an MBMS broadcast service is only available on a p-t-m radio bearer

5. MBMS channel structure

5.1 Logical channels

For MBMS p-t-m transmission, the traffic data is carried on PDTCH (see 3GPP TS 45.002 [8]), whereas the control data is carried on PACCH (see 3GPP TS 45.002 [8]).

A new logical channel is defined, the MPRACH, which may be used during the initial counting procedure (see sub-clause 6.1.1.3). On the MPRACH, Packet Access Bursts or Extended Packet Access Bursts can be transmitted.

5.2 Physical channels

5.2.1 General

MBMS p-t-m radio bearers are transmitted on PDCH (see 3GPP TS 45.002 [8]).

On a PDCH it shall be possible to multiplex different MBMS p-t-m radio bearers and GPRS and/or EGPRS TBFs using TFI.

5.2.2 Coding schemes

The existing GPRS and EGPRS coding schemes are used for MBMS.

An MBMS-capable mobile station shall support CS-1 to CS-4 and MCS-1 to MCS-9 in the downlink. A network supporting MBMS may support only some of the coding schemes.

5.2.3 Mapping of MPRACH onto physical channels

The MPRACH may be mapped on any uplink PDCH.

The MPRACH is dynamically allocated in groups of four MPRACH blocks By (y=4x+i, i=0 ,.., 3) corresponding to one PDCH block Bx (x=0,...,11), indicated by a USF. The value of the USF allocated to the mobile station is signalled by the network in the notification message.

6 MBMS procedures in GERAN

6.1 Resource management procedures

6.1.1 Session start

6.1.1.1 General

Upon receiving an MBMS SESSION START REQUEST message (or an MBMS SESSION UPDATE REQUEST message for an ongoing MBMS broadcast session with an updated MBMS service area) from the SGSN, if the network controls cells in the MBMS service area the network creates an MBMS Service Context (if not yet available for the ongoing MBMS broadcast session), and acknowledges the SGSN using an MBMS SESSION START RESPONSE message (or an MBMS SESSION UPDATE RESPONSE message). The network may receive an Allocation/Retention Priority associated with the MBMS session in the MBMS SESSION START REQUEST message (or in the MBMS SESSION UPDATE REQUEST message).

The network may use the Allocation/Retention Priority to prioritise between MBMS bearer services, and between MBMS bearer services and non-MBMS bearer services. The network initiates the MBMS channel establishment in each cell belonging to the MBMS service area where the network has decided to provide this MBMS service (and where the MBMS channel has not yet been established in case of an ongoing MBMS broadcast session).

The channel establishment procedure consists of the following steps:

- the optional pre-notification of the MBMS service which is starting a data transmission;
- the notification of all MBMS users in the cell of this MBMS service;
- an optional counting procedure; and
- a channel assignment message. The type of channel assigned may depend on the number of users in the cell who respond to the notification in the counting procedure.

If counting is not required, the notification and channel assignment information may be transmitted in a single (PACKET) PAGING REQUEST message in the case of an MBMS broadcast service or an MBMS multicast service.

6.1.1.1a Pre-notification

The network may indicate the incoming notification of a given MBMS service and MBMS session by sending a pre-notification of this MBMS service and MBMS session to MBMS mobile stations in packet idle mode.

A pre-notification may be sent in PAGING REQUEST TYPE 1 or 2 messages on CCCH, or if PCCCH is present, in PACKET PAGING REQUEST message and identifies the TMGI as well as, if available, the MBMS Session Identity. Upon reception of a pre-notification for an MBMS service and MBMS session, a mobile station in packet idle mode shall enter non-DRX mode and monitor notifications as described in sub-clause 6.1.1.2 in the following cases:

- the MBMS service is a broadcast service and the mobile station is required to receive this service; or
- the MBMS service is a multicast service and the mobile station has joined this service.

6.1.1.2 Notification of session start

6.1.1.2.1 General

When the network is informed that an MBMS session is starting or an ongoing MBMS broadcast session has an updated MBMS service area, the network notifies mobile stations in packet idle mode or MAC-Idle state, and may notify mobile stations in packet transfer mode or MAC-Shared state, or mobile stations in dedicated mode or MAC-Dedicated state, or mobile stations in dual transfer mode or MAC-DTM state. The mobile stations in packet idle mode or MAC-Idle state are notified on the (P)PCH by the network. The mobile stations in packet transfer mode or MAC-Shared state and the mobile stations in dual transfer mode or MAC-DTM state may be notified on the PACCH by the network using a distribution message. The mobile stations in dedicated mode or MAC-Dedicated state may be notified on the main DCCH by the network.

The network may optionally initiate, on a per-cell basis, a counting mechanism (i.e. to count up to an operator-defined user threshold > 0) to ascertain the interest of users in each cell. This may be used in order to select the type of MBMS radio bearer (i.e. characterized by an uplink feedback channel or not) to establish. If counting is activated in a cell, mobile stations shall respond to the notification using the initial counting procedure, see sub-clause 6.1.1.3.

If counting is not activated, the network may allocate the MBMS bearer in a cell using the MBMS bearer establishment procedure, see sub-clause 6.1.1.4.

6.1.1.2.2 Mobile stations in packet idle mode or MAC-Idle state

If the network controls cells in the MBMS service area of a starting MBMS session (or of an ongoing MBMS broadcast session with an updated MBMS service area), the network initiates the MBMS notification procedure on each of these cells. A notification is sent in PAGING REQUEST TYPE 1 or 2 messages on CCCH, or if PCCCH is present, in PACKET PAGING REQUEST message and identifies the TMGI as well as, if available, the MBMS Session Identity.

A notification may include the uplink resource description for a PRACH dedicated to MBMS (MPRACH). If a PRACH is allocated in the cell, and no MPRACH Control Parameters are included in the notification message, the PRACH Control Parameters shall be used for the MPRACH. If the network wishes to allocate an MPRACH and no PRACH is allocated in the cell, the MBMS Notification message shall include the MPRACH Control Parameters. If present, MPRACH Control Parameters take precedence over PRACH Control Parameters.