Technical Specification Group Services and System Aspects Meeting #28, 06 - 08 June 2005, Quebec, Canada

TSGS#28(05)0340

Source: **SA WG2**

Title: **CRs to TS 23.246: Various Technical Corrections (MBMS and TEI6) (Rel-6)**

Document for: **Approval**

Agenda Item: **7.2.3**

SA Doc	TS No.	CR No	Rev	Rel	Cat	Subject	Vers Cur	SA2 Doc	WI	Clauses affected
SP-050340	23.246	0142	3	Rel-6	F	Extension of the use of MBMS support indication from SGSN to UE	6.6.0	S2-051418	MBMS	5.2, 5.4, 8.10; 8.11
This CR collides with CR0152 for changes in subclauses 8.9 and 8.9a. To treat this dependency, this CR has been revised to remove all the modification within subclauses 8.9 and 8.9a where the dependency exist. Furthermore CR0152 has been revised to includes all the modifications that have been removed from this CR.										
SP-050340	23.246	0144	1	Rel-6	F	Clarification of the TMGI	6.6.0	S2-051462	MBMS	2, 6.4
SP-050340	23.246	0148	3	Rel-6	F	MBMS Join clarification	6.6.0	S2-050961	TEI6	4.4.1.2, 4.4.1.3, 4.4.1.4, 4.4.3.1a, 4.4.3.2
SP-050340	23.246	0152	4	Rel-6	F	UE needs to join again for MBMS bearer service it has locally deactivated	6.6.0	S2-051417	TEI6	8.9, new 8.9a
This CR0152r4 collides with CR0142r2 for changes in subclauses 8.9 and 8.9a. To treat this dependency, this CR has been revised to include modifications of CR0142r2 limited to subclauses 8.9 and 8.9a. In addition CR0142r2 is revised in CR0142r3 to remove the changes that are included in the present CR.										
SP-050340	23.246	0153	1	Rel-6	F	On Estimated Session Duration	6.6.0	S2-051392	MBMS	8.3
SP-050340	23.246	0155	2	Rel-6	F	Corrections to MBMS	6.6.0	S2-051416	MBMS	4.2, 5.7, 6.3, 8.1, 8.2, 8.3, 8.4, 8.5, 8.7, 8.8

3GPP TSG-SA2 Meeting #46 **Tdoc S2-051418**
Athens, Greece: 9 May – 13 May, 2005

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.246** **CR** **0142** ⌘ **rev** **3** ⌘ Current version: **6.6.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME [X] Radio Access Network ☐ Core Network [X]

Title:	⌘	Extension of the use of MBMS support indication from SGSN to UE
Source:	⌘	SA WG2
Work item code:	⌘	MBMS ***Date:*** ⌘
Category:	⌘	**F** ***Release:*** ⌘ Rel-6

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:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	The current specification describes how the UE can optimize its behaviour by knowing whether the network support or not MBMS services, thanks to a feature support indication (or the absence of it) sent by the SGSN to the UE. Two scenarios have been updated accordingly: Inter-SGSN Routing Area Update and Inter SGSN Serving RNS Relocation. Both scenarios only cover the case where this feature indication is sent at the time of the Routing Area Updating procedure but it is believed is not limited to this procedure. Indeed the UE can as well optimize its behaviour by knowing whether the network on which it just registered does or does not support MBMS services. Therefore this CR completes the description to cover the case of registration .i.e. normal GPRS attach and combined GPRS attach.
Summary of change:	⌘	Correction to clarify further the existing text about the MBMS feature support indication and additionally to cover registration procedures i.e. normal GPRS attach and combined GPRS attach procedures.
Consequences if not approved:	⌘	The SGSN misses the opportunity to inform the UE about its MBMS capability at registration time.

Clauses affected:	⌘	5.2, 5.4, 8.10; 8.11 (see other comments)

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications	⌘	TS 24.008
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	This CR collides with CR152 for changes in subclauses 8.9 and 8.9a. To treat this dependency, this CR has been revised to remove all the modification within subclauses 8.9 and 8.9a where the dependency exist. Furthermore CR152 has been revised to includes all the modifications that have been removed from this CR.

NEXT CHANGE

5.2 User Equipment

The UE shall support functions for the activation/deactivation of the MBMS bearer service.

Once a particular MBMS bearer service is activated, no further explicit user request is required to receive MBMS data although the user may be notified that data transfer is about to start.

The UE shall support security functions as appropriate for MBMS.

The UE should, depending on terminal capabilities, be able to receive MBMS user service announcements, paging information (non MBMS specific) and support simultaneous services (for example the user can originate or receive a call or send and receive messages whilst receiving MBMS video content). Reception of this paging or announcements may however, create losses in the MBMS data reception. The MBMS user service should be able to cope with such losses.

The UE shall be able to synchronise with the SGSN, which of its MBMS UE contexts are still active.

Depending upon terminal capability, UEs may be able to store MBMS data. This may involve DRM but this is out of scope of this specification.

The MBMS Session Identifier contained in the notification to the UE shall enable the UE to decide whether it needs to ignore the forthcoming transmission of MBMS session (e.g. because the UE has already received this MBMS session).

NEXT CHANGE

5.4 SGSN

The SGSN's role within the MBMS architecture is to perform MBMS bearer service control functions for each individual UE and to provide MBMS transmissions to UTRAN/GERAN.

The SGSN shall provide support for intra-SGSN and inter-SGSN mobility procedures. Specifically this requires the SGSN to store a user-specific MBMS UE context for each activated multicast MBMS bearer service and to pass these contexts to the new SGSN during inter-SGSN mobility procedures.

The SGSN shall be able to indicate its MBMS support to the UE as well as it shall be able to synchronise with the UE, which of the UE's MBMS UE contexts are still active.

The SGSN shall be able to generate charging data per multicast MBMS bearer service for each user. The SGSN does not perform on-line charging for either the MBMS bearer service or the MBMS user service (this is handled in the BM-SC).

The SGSN shall be able to establish Iu and Gn bearers shared by many users upon receiving a session start from the GGSN. Likewise, the SGSN shall be able to tear down these bearers upon instruction from the GGSN.

NEXT CHANGE

8.10 Inter SGSN Routeing Area Update

This procedure describes the handling of MBMS bearer services when an MBMS UE performs a Routeing Area Update and the serving SGSN changes. It bases on the Inter SGSN Routeing Area Update procedure specified in TS 23.060. The procedure is performed regardless whether MBMS sessions are ongoing or not. The handling of any PDP contexts established by the UE is not changed compared to the procedure without MBMS. The procedure described below does

not show all details of the Routeing Area update procedure. Only for the MBMS specific additions the steps are described.

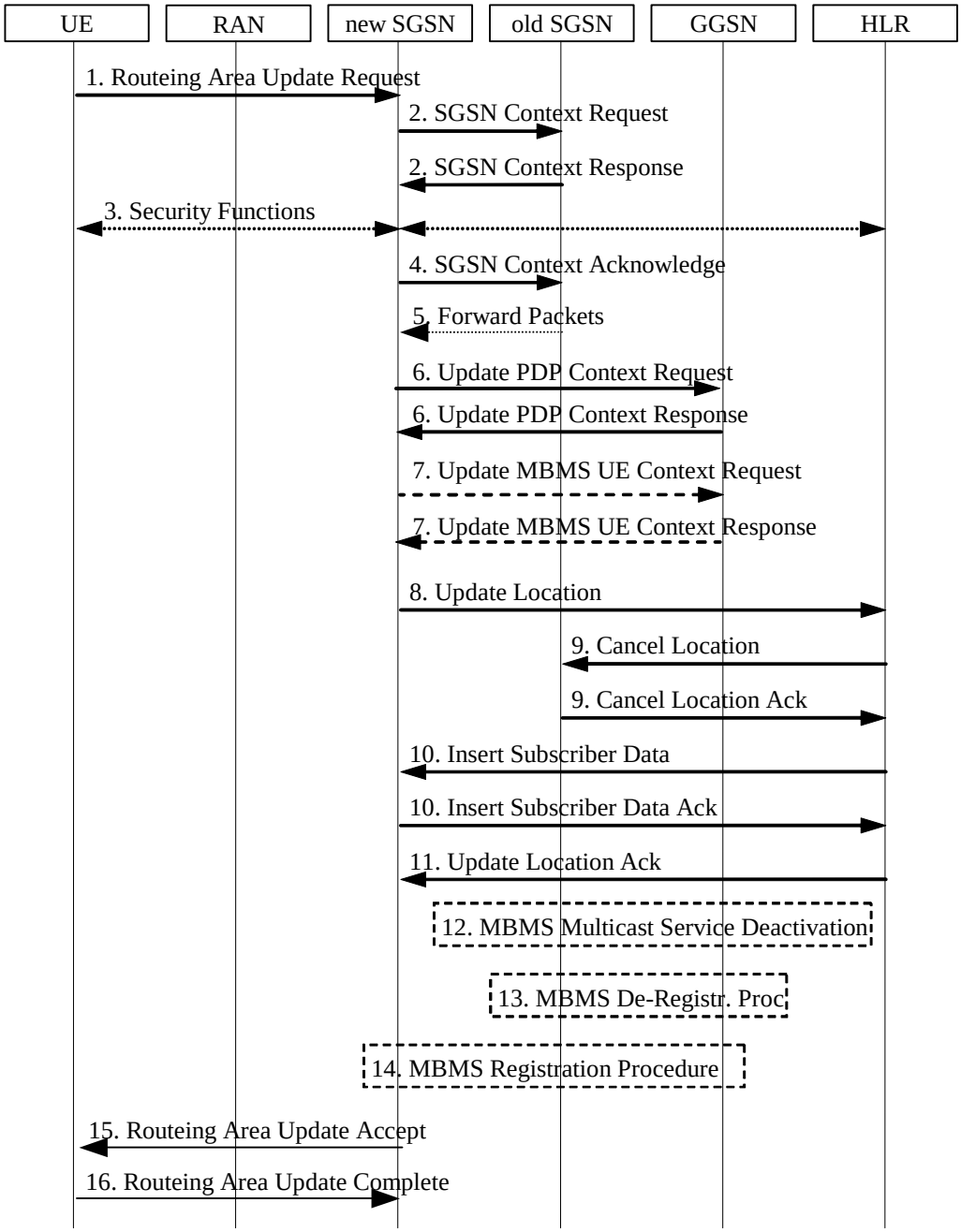

Figure 14: Inter SGSN Routeing Area Update

2) The old SGSN includes the transfer of the MBMS UE Context(s).

7) For the MBMS UE context(s) received in step 2) the new SGSN sends Update MBMS UE Context Request (Serving network identity) to the GGSNs concerned. The GGSNs update their MBMS UE Context fields and return Update MBMS UE Context Response. The GGSN sends updated Serving network identity to the BM-SC.

12) In case the new SGSN indicated no MBMS support in step 2) the old SGSN deactivates all MBMS UE context(s) of the UE in SGSN, GGSN and BM-SC by initiating deactivation procedure(s) as described in clause “8.7 MBMS Multicast Service Deactivation”.

13) If the old SGSN does not have any more MBMS UE Contexts for the MBMS bearer service(s) and the "list of downstream nodes" in the corresponding MBMS Bearer Context is empty, the SGSN initiates the MBMS De-Registration Procedure. See subclause "MBMS De-Registration Procedure".

14) The new SGSN verifies for each MBMS UE Context received whether it has a corresponding MBMS Bearer Context. For each MBMS Bearer Context that the SGSN does not already have the SGSN creates an MBMS Bearer Context (in "Standby" state) initiates the MBMS Registration Procedure. See subclause "MBMS Registration Procedure".

15) An SGSN without MBMS support does not indicate MBMS feature support in the Routing Area Update Accept message. ~~This indicates to the UE that MBMS bearers are no longer supported, which may allow the UE to use point-to-point bearers for MBMS data transfer.~~ On the other hand if the SGSN supports MBMS, ~~T~~the Routing Area Update Accept indicates to the UE that the network supports MBMS. ~~The UE then knows it can continue to use already activated MBMS bearers or activate new MBMS bearers.~~

NEXT CHANGE

8.11 Inter SGSN Serving RNS Relocation Procedure

This procedure is performed when the SGSN changes due to SRNS relocation. It bases on the SRNS Relocation procedure specified in 3GPP TS 23.060. The procedure is performed regardless whether MBMS sessions are ongoing or not. The handling of any PDP contexts established by the UE is not changed compared to the procedure without MBMS. The procedure described below does not show all details of the SRNS relocation procedure. Only for the MBMS specific additions the steps are described.

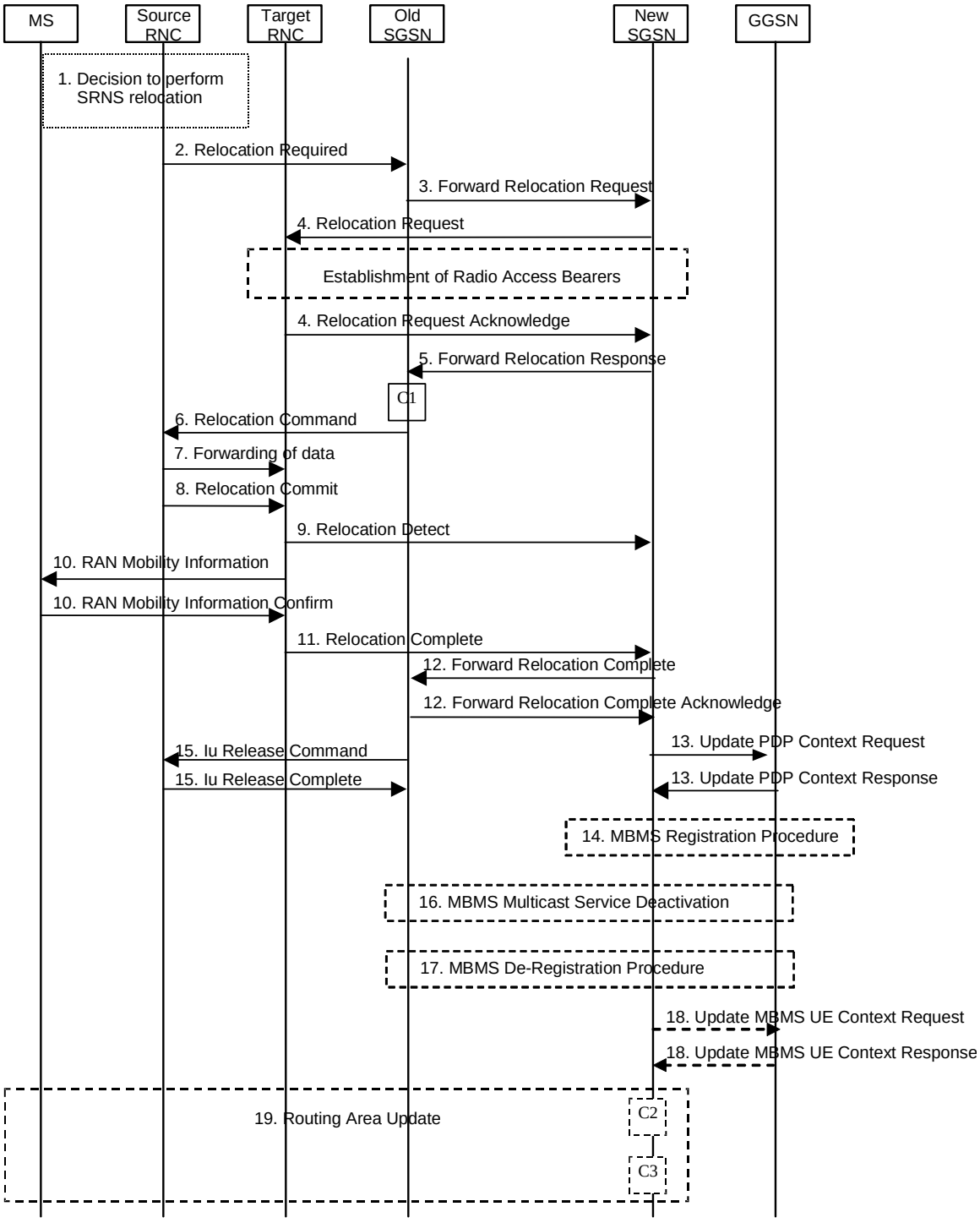

Figure 15: SRNS Relocation Procedure

3) The old SGSN transfers the MBMS UE Context(s). in the Forward Relocation Request message to the new SGSN

5) An MBMS supporting SGSN indicates its MBMS support in the Forward Relocation Response message.

14) In case the new SGSN supports MBMS it verifies for each MBMS UE Context received whether it has a corresponding MBMS Bearer Context. For each MBMS Bearer Context not yet existing in the SGSN the SGSN creates an MBMS Bearer Context (in "Standby" state) and initiates the MBMS Registration Procedure. See subclause "MBMS Registration Procedure".

16) In case the new SGSN indicated no MBMS support in step 3) the old SGSN deactivates all MBMS UE contexts of the UE in SGSN, GGSN and BMSC by initiating deactivation procedure(s) as described in clause “8.7 MBMS Multicast Service Deactivation”.

17) If the old SGSN does not have any more MBMS UE Contexts for this MBMS bearer service and the "list of downstream nodes" in the corresponding MBMS Bearer Context is empty, the SGSN initiates the MBMS De-Registration Procedure. See subclause "MBMS De-Registration Procedure".

18) In case the new SGSN supports the MBMS it sends Update MBMS UE Context Request to the GGSNs concerned. The GGSNs update their MBMS UE Context fields and return Update MBMS UE Context Response.

19) An SGSN without MBMS support does not indicate MBMS feature support in the Routing Area Update Accept message. ~~This indicates to the UE that MBMS bearers are no longer supported, which may allow the UE to use point-to-point bearers for MBMS data transfer.~~ On the other hand if the SGSN supports MBMS, ~~T~~the Routing Area Update Accept indicates to the UE that the network supports MBMS. ~~The UE then knows it can continue to use already activated MBMS bearers or activate new MBMS bearers.~~

END OF THE CHANGES

3GPP TSG-SA2 Meeting #42
Beijing, China, 4 - 8 April 2005.

S2-051462
(revision of S2-050586)

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CHANGE REQUEST

⌘ **23.246** **CR** **0144** ⌘ **rev** **1** ⌘ Current version: **6.6.0** ⌘

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Proposed change affects: | UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Clarification of the TMGI
Source:	⌘	SA WG2
Work item code:	⌘	MBMS
Date:	⌘	23/03/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

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:
Ph2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*
Rel-7 *(Release 7)*

Reason for change:	⌘	There is information in the definition of TMGI which is also present in the Numbering, Addressing and Identification specification, 3GPP TS 23.003.
Summary of change:	⌘	Removal of duplicated information and an addition to the references section of 3GPP TS 23.003.
Consequences if not approved:	⌘	Multiple definitions of TMGI, although in-alignment today, will ultimately diverge at some stage in the future leading to mis-aligned specifications.

Clauses affected:	⌘	2, 6.4

		Y	N		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	There is no dependancy on a CR to the Numbering, Addressing and Identification specification as the definition of the structure already exists.

****** First Modified Section ******

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 TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.146: "Multimedia Broadcast/Multicast Service; Stage 1".

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

[4] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[5] 3GPP TS 33.246: "Security of Multimedia Broadcast/Multicast Service"

[6] 3GPP TS 22.246: "Multimedia Broadcast/~~Multicase~~ Multicast Service (MBMS) user services".

[7] 3GPP TS 26.346: "MBMS: Protocols and Codecs".

[8] void

[9] void

[10] 3GPP TS 25.346: "Introduction of the Multimedia Broadcast Multicast Service (MBMS) in the Radio Access Network".

[11] 3GPP TS 43.246: "Technical Specification Group GSM/EDGE Radio Access Network; Multimedia Broadcast Multicast Service (MBMS) in the GERAN".

[12] 3GPP TS 23.125: "Overall high level functionality and architecture impacts of flow based charging; Stage 2~~Flow Based Charging~~".

[xx] 3GPP TS 23.003: "Numbering, addressing and identification".

****** Last Modified Section ******

6.4 Temporary Mobile Group Identity

Temporary Mobile Group Identity (TMGI) is used for MBMS notification purpose. The BM-SC allocates a globally unique TMGI per MBMS bearer service. ~~The TMGI contains two parts: Globally unique MCC/MNC (PLMN ID) and a local MBMS bearer service identity that is unique within the PLMN.~~ The structure of the TMGI is defined in 3GPP TS 23.003 [xx].

For Multicast MBMS bearer services the TMGI ~~will be~~is transmitted to UE via the MBMS Multicast Service Activation procedure. For Broadcast Service the TMGI can be obtained via service announcement see ~~"~~ " Service Announcement~~".~~ ".

The TMGI is a radio resource efficient MBMS bearer service identification, which is equivalent to the MBMS bearer service identification consisting of IP multicast address and APN.

3GPP TSG-SA WG2 Meeting #45
Beijing, China, 4th - 9th April 2005.

Tdoc ⌘S2-050961

CR-Form-v7

CHANGE REQUEST

⌘ **23.246** **CR** **0148** ⌘ **rev** **3** ⌘ Current version: **6.6.0** ⌘

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Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☒

Title:	⌘	Join clarification
Source:	⌘	SA WG2
Work item code:	⌘	MBMS
Date:	⌘	8/04/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

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)*
Rel-6	*(Release 6)*

Reason for change:	⌘	In the specification of the MBMS User Service, it is defined that a user service can be carried by one or more MBMS bearer services. In current TS 23.246 it needs to be clarified that multiple MBMS bearer services may together provide ONE user service.
Summary of change:	⌘	A clarifying sentences and a new subclause are added to the MBMS Service Priovision subclause.
Consequences if not approved:	⌘	Misalignment between S2 and S4/S1 specifications.

Clauses affected:	⌘	4.4.1.2, 4.4.1.3, 4.4.1.4, 4.4.3.1a, 4.4.3.2

Other specs affected:	⌘	Y	N		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	

First Change

4.4 MBMS Service Provision

4.4.1 MULTICAST MODE

Reception of an MBMS MULTICAST service is enabled by certain procedures that are illustrated in the Figure below.

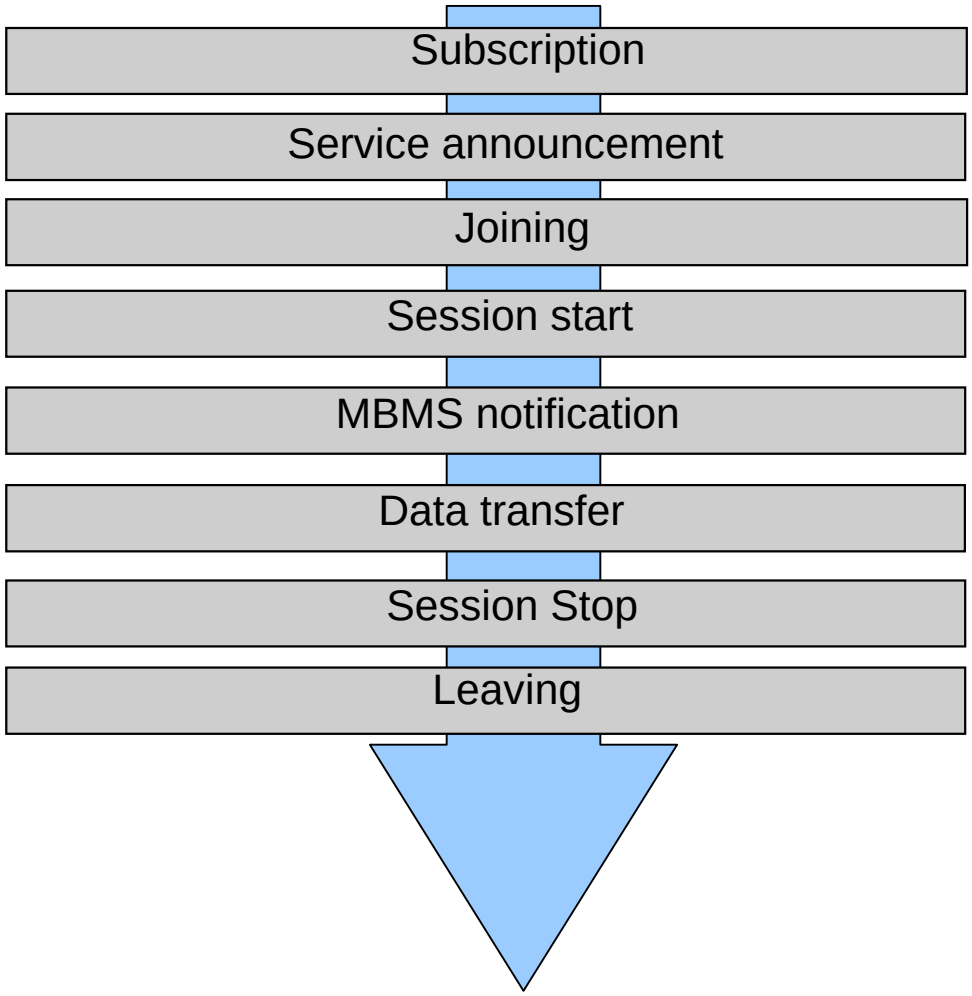

Figure 2: Phases of MBMS Multicast service provision

The phases subscription, joining and leaving are performed individually per user. The other phases are performed for a service, i.e. for all users interested in the related service. The sequence of phases may repeat, e.g. depending on the need to transfer data. Also subscription, joining, leaving, service announcement as well as MBMS notification may run in parallel to other phases.

This is illustrated with the following example of timeline:

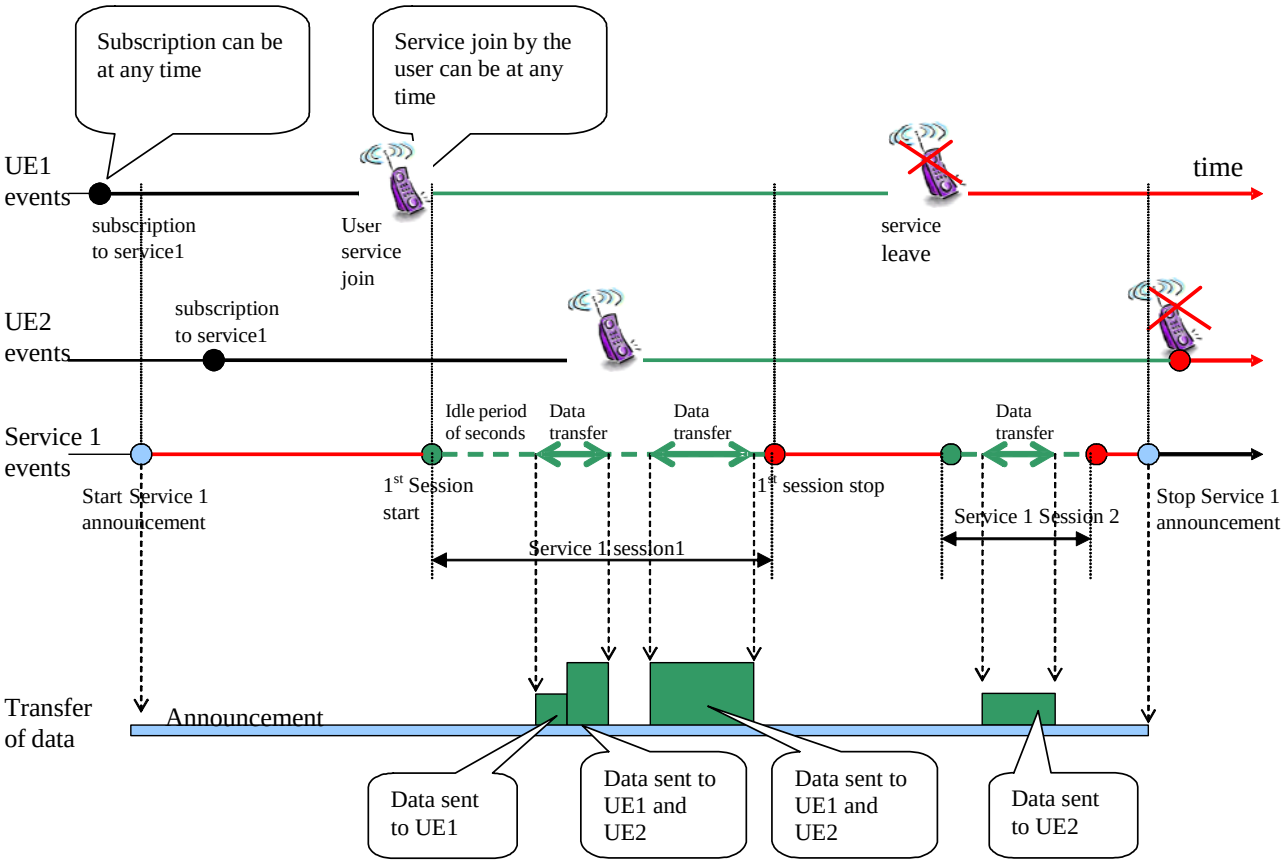

Figure 3: Timeline example

4.4.1.1 Subscription

Establishes the relationship between the user and the service provider, which allows the user to receive the related MBMS multicast service.

Service Subscription is the agreement of a user to receive service(s) offered by the operator. Subscription information is recorded in the BM-SC. Subscription information and other BM-SC functionality may be on separate entities, which is enabled by proxy capability of the Gmb interface.

Note: procedures for the subscription phase are out of scope of this specification.

4.4.1.2 Service announcement

MBMS user service announcement/discovery mechanisms shall allow users to request or be informed about the range of MBMS user services available. This includes operator specific MBMS user services as well as services from content providers outside of the PLMN. Service announcement is used to distribute to users information about the service, parameters required for service activation (e.g. IP multicast address(es)) and possibly other service related parameters (e.g. service start time).

Operators/service providers may consider several service discovery mechanisms. This could include standard mechanisms such as SMS, or depending on the capability of the terminal, applications that encourage user interrogation. The method chosen to inform users about MBMS user services may have to account for the user' s location, (e.g. current cell, in the HPLMN or VPLMN). Users who have not already subscribed to a MBMS user service should also be able to discover MBMS user services.

The following could be considered useful for MBMS user service announcement mechanisms (not exhaustive): -

- SMS Cell Broadcast to advertise MBMS Multicast and Broadcast user services

- MBMS Broadcast mode to advertise MBMS Multicast and Broadcast user Services
- MBMS Multicast mode to advertise MBMS Multicast user Services
- PUSH mechanism (WAP, SMS-PP, MMS)
- URL (HTTP, FTP)

The details of the MBMS service announcement mechanisms are out of scope of this specification, but MBMS shall allow the utilisation of solutions using IETF protocols.

Service announcement is further defined within MBMS User Service specifications 3GPP TS 26.346 [7].

4.4.1.3 Joining

Joining (i.e. MBMS multicast activation by the user) is the process by which a subscriber joins (becomes a member of) a multicast group, i.e. the user indicates to the network that he/she wants to receive Multicast mode data of a specific MBMS bearer service. An MBMS user service may also be carried by more than one MBMS bearer service. In that case the MBMS user service part in the UE initiates the relevant MBMS bearer services to receive the service (see subclause 8.2).

4.4.1.4 Session Start

Session Start is the point at which the BM-SC is ready to send data. This can be identified with the start of a "Multicast session" as defined in 3GPP TS 22.146 [2]. Session Start occurs independently of activation of the service by the user – i.e. a given user may activate the service before or after Session Start. Session Start is the trigger for bearer resource establishment for MBMS data transfer. If an MBMS user service is carried by more than one MBMS bearer service, a Session Start message is sent for each MBMS bearer service. In that case the UE may need to initiate the reception of multiple relevant MBMS bearer services to receive the MBMS user service.

4.4.1.5 MBMS notification

Informs the UEs about forthcoming (and potentially about ongoing) MBMS multicast data transfer.

4.4.1.6 Data transfer

It is the phase when MBMS data are transferred to the UEs.

4.4.1.7 Session Stop

It is the point at which the BM-SC determines that there will be no more data to send for some period of time – this period being long enough to justify removal of bearer resources associated with the session. At Session Stop, the bearer resources are released.

4.4.1.8 Leaving

Leaving (i.e. MBMS multicast deactivation by the user) is the process by which a subscriber leaves (stops being a member of) a multicast group, i.e. the user no longer wants to receive Multicast mode data of a specific MBMS bearer service.

4.4.2 Multicast Mode timeline

4.4.2.1 Period between Service Announcement and Session Start

The service announcement may contain a schedule of Session Start times and may be sent some time before the service is due to start. So, this time period could be hours, days or even weeks.

4.4.2.2 Period between Service Announcement and Service Subscription

Service Subscription can be done anytime before or after Service announcement.

4.4.2.3 Period between Service Announcement and Joining

The Joining time is chosen by the user and/or UE possibly in response to a Service Announcement. Users will typically join at the time of their choosing so that the period between announcement and joining may be very long or very short. In order to avoid overload situations being caused by many users attempting to join in a short period of time, the UE shall be able to use parameters sent by the BM-SC in the service announcement to randomise the joining time.

4.4.2.4 Period between Joining and Session Start

Some MBMS bearer services may be 'always on'. In this case, Joining can take place immediately after Service Announcement and possibly many hours before, or after, Session Start.

In other cases, if a Session Start time is known, Joining may take place immediately before Session Start or after Session Start. For these services, the announcement may contain some indication of a time period which users and UEs should use to choose a time to Join the MBMS bearer service.

4.4.2.5 Period between Session Start and First Data Arrival

Session Start indicates that the transmission is about to start. The time delay between a Session Start indication and actual data should be long enough for the network actions required at Session Start to take place e.g. provision of service information to the UTRAN, establishment of the bearer plane.

Session Start may be triggered by an explicit notification from the BM-SC. In the case of bearer plane resources which are set-up after the start of session data transmission, the network is not required to buffer the session data and loss of data can be assumed.

4.4.2.6 Period between Session Start and Session Stop

When the BM-SC knows that there is no more data to be sent for a "long idle period", it should indicate Session Stop to the network, causing the release of bearer resources. However, if this idle period with no data is short, this may not be appropriate as it brings more signalling and processing.

The duration of this "long idle period" is implementation dependent. The order of magnitude should be defined to take into account network constraints (including UTRAN, GERAN, and CN).

If the BM-SC wants to use session repetition identification on the MBMS bearer service level, the BM-SC must stop the MBMS session before starting the next MBMS user service session for that TMGI.

4.4.3 BROADCAST MODE

An example for the phases of MBMS broadcast service provision is described in the figure below:

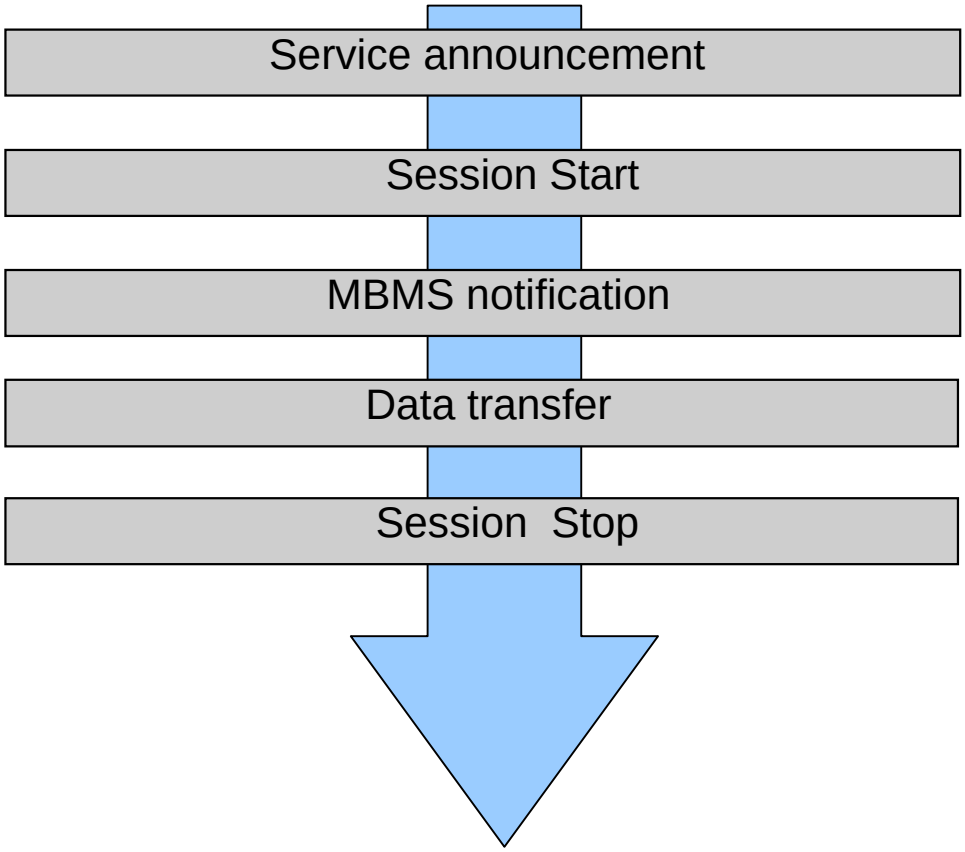

Figure 4: Phases of MBMS broadcast service provision

The sequence of phases may repeat, e.g. depending on the need to transfer data. It is also possible that the service announcement and MBMS notification phase may run in parallel with other phases, in order to inform UEs which have not yet received the related service.

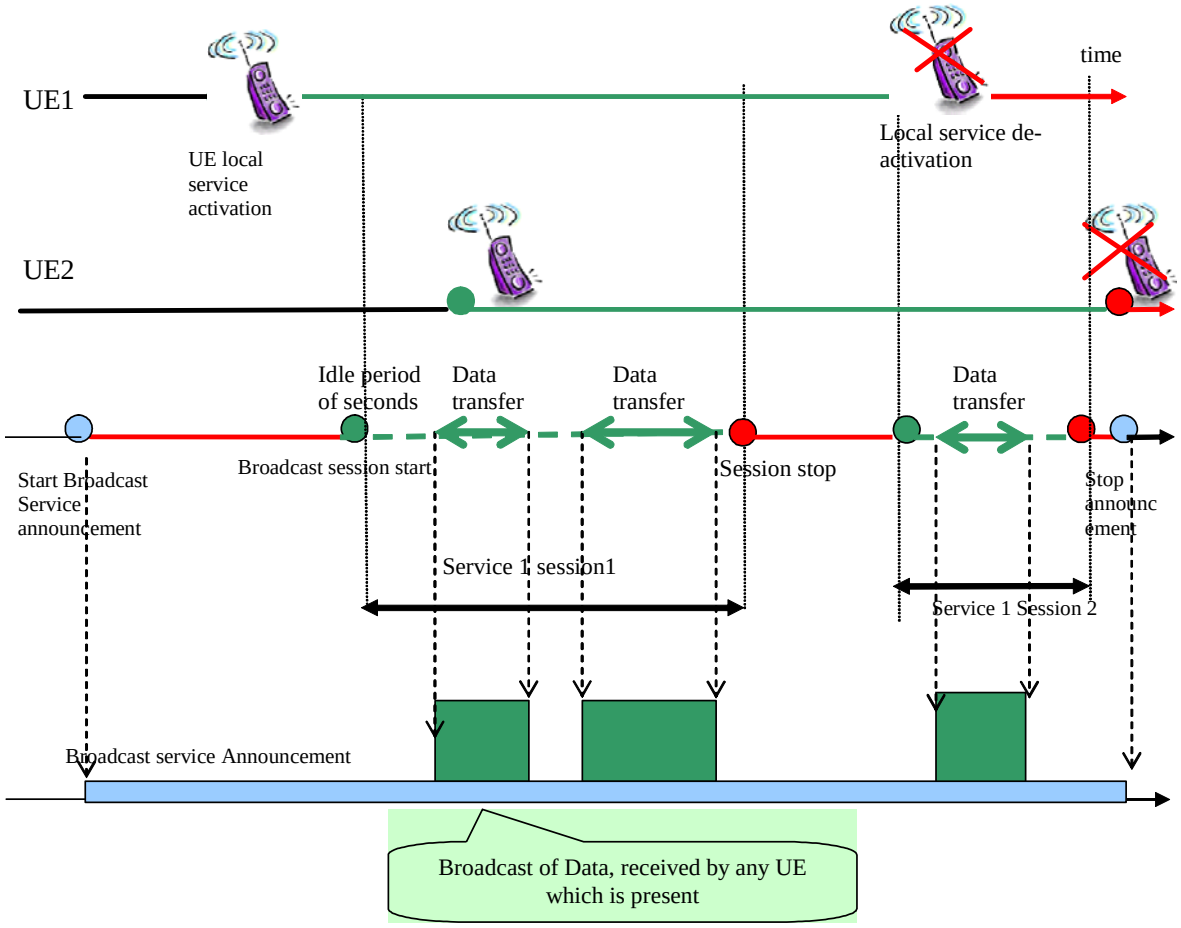

Figure 5: Broadcast service timeline

4.4.3.1 Service announcement

Informs UEs about forthcoming MBMS user services. Also see section on Multicast mode (4.4.1.2)

4.4.3.1a UE local service activation

The MBMS user service part in the UE initiates reception of the MBMS bearer service to receive an MBMS user service. In case one MBMS user service is carried by more than one MBMS bearer service, the UE may need to initiate the reception of multiple relevant MBMS bearer services to receive the MBMS user service (see subclause 8.12).

4.4.3.2 Session Start

Session Start is the point at which the BM-SC is ready to send data. This can be identified with the start of a "Broadcast session" as defined in 3GPP TS 22.146 [2]. Session Start occurs independently of Service Activation by the user – i.e. a given user may activate the service before or after the start of the session. Session Start is the trigger for bearer resource establishment for MBMS data transfer. If an MBMS user service is carried by more than one MBMS bearer service, a Session Start message is sent for each MBMS bearer service. In that case the UE may need to initiate the reception of multiple relevant MBMS bearer services to receive the MBMS user service.

4.4.3.3 MBMS notification

Informs the UEs about forthcoming (and potentially about ongoing) MBMS broadcast data transfer.

4.4.3.4 Data transfer

It is the phase when MBMS data are transferred to the UEs.

4.4.3.5 Session Stop

It is the point at which the MBMS user service determines that there will be no more data to send for some period of time – this period being long enough to justify removal of bearer resources associated with the service. At Session Stop, the bearer resources are released.

End Of Changes

3GPP TSG-SA2 Meeting #46 **Tdoc S2-051417**
Athens, Greece: 9 May – 13 May, 2005

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.246** **CR** **0152** ⌘ **rev** **4** ⌘ Current version: **6.6.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☒

Title:	⌘	UE have to join again to activate locally deactivated MBMS bearer services
Source:	⌘	SA WG2
Work item code:	⌘	MBMS
Date:	⌘	
Category:	⌘	**F**
Release:	⌘	Rel-6

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:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	Under certain circumstances for instance following Inter-SGSN changes from SGSNs supporting or not supporting MBMS or when the old SGSN failed to transfer the MBMS UE Contexts to the new SGSN, the MBMS UE context(s) both in the UE and in the CN may be out of sync or deactivated even if the UE remains join for the considered MBMS bearer services. The out of sync situation is addressed during the Routing Area Update procedure thanks to the MBMS UE Context synchronisation procedure; UE and CN will locally deactivate out of sync MBMS UE contexts. However it is not clear in the specification how MBMS bearer services can be activated again if the UE wish to.
Summary of change:	⌘	Text is added to clarify that the UE has to join again if it wants to activate the MBMS bearer services which have been deactivated following an MBMS UE context synchronisation procedure.
Consequences if not approved:	⌘	The specification is unclear and may lead to incomplete or different implementation of MBMS

Clauses affected:	⌘	Subclauses 8.9, new 8.9a (see other comments)
Other specs affected:	⌘	Y N ☐ ☒ Other core specifications ☐ ☒ Test specifications ☐ ☒ O&M Specifications
	⌘	
Other comments:	⌘	This CR collides with CR142r2 for changes in subclauses 8.9 and 8.9a. To treat this dependency, this CR has been revised to include modifications of CR142r2 limited to subclauses 8.9 and 8.9a. In addition CR142r2 is revised in CR142r3 to remove the changes that are included in the present CR.

********** FIRST CHANGE **********

8.9 MBMS UE Context Synchronisation Procedure

The Routing Area Update procedure transfers the MBMS UE Context status between UE and SGSN. This MBMS UE Context status identifies MBMS UE contexts, which are lost or deactivated only on one side. All MBMS UE Contexts, which are active on one side only ~~should~~ shall be deactivated locally. ~~The UE may activate the related MBMS bearer service again~~. If the UE wishes to re-activate the related MBMS bearer service, it shall join the MBMS bearer service again. See subclause 8.2 "MBMS Multicast Service Activation".~~An SGSN that supports MBMS indicates that support to the UE during Routing Area Update and GPRS Attach procedures.~~

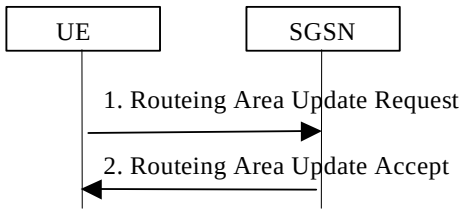

Figure 13b. MBMS UE Context Synchronisation procedure

1) The UE sends Routeing Area Update Request to the SGSN. It includes the MBMS UE Context status, which indicates the UE's active MBMS UE Contexts.

2) The SGSN sends Routeing Area Update Accept to the UE. It includes the MBMS UE Context status, which indicates the UE's MBMS UE Contexts that are stored in the SGSN. ~~And, the SGSN indicates MBMS support to the UE.~~

8.9a MBMS feature support indication

An SGSN that supports MBMS shall indicate MBMS feature support to the UE during Routing Area Update procedure in the Routing Area Update Accept message and during GPRS attach procedure in the Attach Accept message. The UE then knows it can use already activated MBMS bearers, or activate new MBMS bearers according to subclause 8.2 "MBMS Multicast Service Activation".

An SGSN that does not support MBMS will not indicate MBMS feature support to the UE. This indicates to the UE that MBMS bearers are no longer supported, which may allow the UE to use point-to-point bearers for MBMS data transfer. In this case, the UE shall deactivate all active MBMS UE Contexts locally.

********** END OF THE CHANGES *********

3GPP TSG-SA WG2 Meeting #46
Athens, Greece, 9th May – 13th May 2005

Tdoc ⌘S2-051392
Rev of S2-051058

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.246** **CR** **0153** ⌘**rev** **1** ⌘ Current version: **6.6.0** ⌘

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Proposed change affects: | UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	On Estimated Session Duration
Source:	⌘	SA WG2
Work item code:	⌘	MBMS
Date:	⌘	02/05/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

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:
Ph2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*
Rel-7 *(Release 7)*

Reason for change:	⌘	In sect. 8.3, 2nd paragraph, the estimated session duration is considered as an optional MBMS session attribute, since it is provided "if available". However, GERAN mobility procedures in MBMS allow a mobile station to request a session in a cell whilst the session duration timer inside the mobile station is running (this timer is based on the MBMS Session Duration). This allows for preventing a mobile station from indefinitely requesting a session that has already stopped. A mandatory presence of such IE in the MBMS SESSION START REQUEST message was thus agreed at SA2#45 (LS S2-050946), as it is essential in GERAN for the proper operation of both the mobile station and the access network.
Summary of change:	⌘	In sect. 8.3, it is clarified that MBMS Session Duration IE is mandatory in the MBMS SESSION START REQUEST (text "if available" is deleted).
Consequences if not approved:	⌘	The MS would perform random access on the (P)RACH of any re-selected cell supporting MBMS procedures, for the duration of the MBMS service, causing both battery consumption and potential (P)RACH congestion.

Clauses affected:	⌘	8.3

		Y	N		
Other specs affected:	⌘		X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	Related Stage 3 CR: 43.246 CR0019 was approved at GERAN#23 (GP-050309)

BEGIN OF 1st CHANGE

8.3 MBMS Session Start Procedure

The BM-SC initiates the MBMS Session Start procedure when it is ready to send data. This is a request to activate all necessary bearer resources in the network for the transfer of MBMS data and to notify interested UEs of the imminent start of the transmission.

Through this procedure, MBMS session attributes such as QoS, MBMS service Area, estimated session duration ~~if available~~ are provided to the GGSN(s) and SGSN(s) that have previously registered for the corresponding MBMS bearer service and to all BSCs/RNCs that are connected to a registered SGSN. In addition the procedure allocates the bearer plane to all registered GGSNs and all registered SGSNs and to BSCs/RNCs that respond to the session start accordingly.

After sending the Session Start Request message the BM-SC waits for a configurable delay before sending MBMS data. This delay should be long enough to avoid buffering of MBMS data in entities other than the BM-SC, i.e. the delay should allow the network to perform all procedures required to enable MBMS data transfer before the BM-SC sends MBMS data. For example notification of UEs and radio bearer establishment should be performed before MBMS data arrive in the RAN. The delay may be in the region of multiple seconds or tens of seconds. It may be useful for the BM-SC to be able to configure different delays for MBMS bearer services on 2G and 3G, respectively.

For multicast MBMS bearer services the registration of SGSNs and GGSNs is initiated by MBMS multicast Service Activation procedures, Inter SGSN Routeing Area Update procedures, Inter SGSN Serving RNS Relocation procedure and performed by MBMS Registration procedures.

For broadcast MBMS bearer services the list of downstream nodes of BM-SC and GGSN are achieved in the following ways:

– The list of downstream nodes for GGSN will be sent from the BM-SC to the GGSN in the Session Start Request.

Normally, the GGSN contained in the "list of downstream nodes" for BM-SC is the default GGSN (or two for resilience).

The overall Session Start procedure is presented in the following figure:

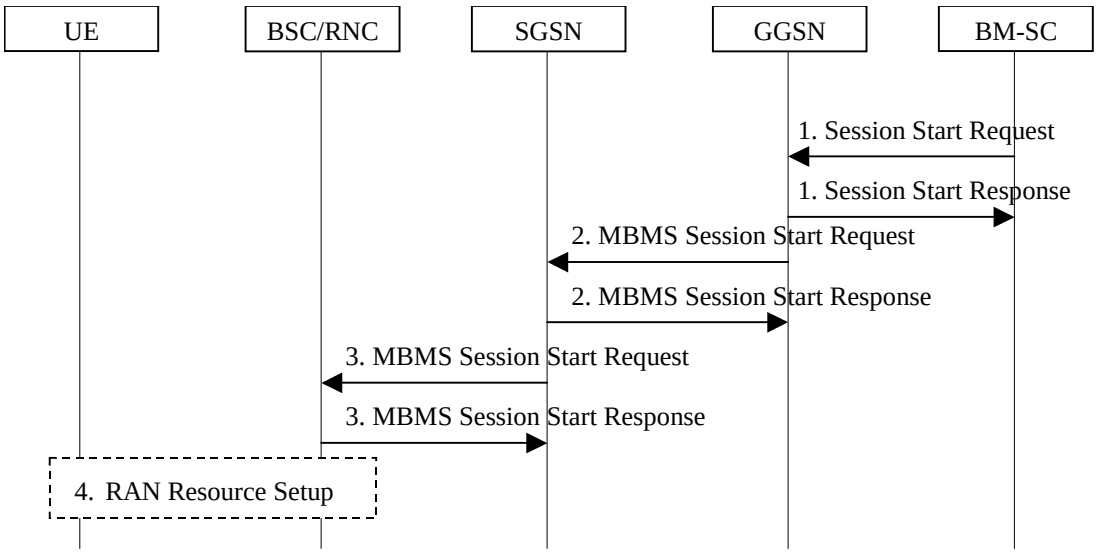

Figure 8 Session Start procedure

1. The BM-SC Session and Transmission function sends a Session Start Request message to indicate the impending start of the transmission and to provide the session attributes (TMGI, QoS, MBMS service Area, Session identifier, estimated session duration, broadcast/multicast, list of downstream nodes for GGSN (Broadcast only) …) and the 2G/3G indicator. The message is sent to the BM-SC Proxy and Transport function, which then forwards it to the GGSNs listed in the “list of downstream nodes” parameter of the corresponding MBMS Bearer

Context. The BM-SC Proxy and Transport function sets the state attribute of its MBMS Bearer Context to 'Active'. For a broadcast MBMS bearer service the GGSN creates an MBMS bearer context. The GGSN stores the session attributes and the list of downstream nodes in the MBMS Bearer Context, sets the state attribute of its MBMS Bearer Context to 'Active' and sends a Session Start Response message to the BM-SC. Proxy and Transport function which forwards it to the BM-SC Session and Transmission function. The BM-SC Proxy and Transport function copies Session Start Requests to the BM-SC Membership function for charging purposes.

2. The GGSN sends an MBMS Session Start Request message containing the session attributes (TMGI, QoS, MBMS service Area, Session identifier, estimated session duration, broadcast/multicast, …) and the 2G/3G indicator to the SGSNs listed in the "list of downstream nodes" parameter of the corresponding MBMS Bearer Context. For a broadcast MBMS bearer service the SGSN creates an MBMS bearer context. The SGSN stores the session attributes and the 2G/3G indicator in the MBMS Bearer Context, sets the state attribute of its MBMS Bearer Context to 'Active' and responds with an MBMS Session Start Response message providing the TEID for bearer plane that the GGSN shall use for forwarding the MBMS data. For MBMS bearer service a SGSN receiving multiple MBMS Session Start Request messages establishes only one bearer plane with one GGSN.

3. The SGSN sends an MBMS Session Start Request message including the session attributes (TMGI, QoS, MBMS service Area, Session identifier, estimated session duration, broadcast/multicast, …) to each BSC and/or each RNC that is connected to this SGSN. The 2G/3G indicator shall be used by the SGSN to determine whether the MBMS Session Start Request message is sent only to BSCs, or only to RNCs, or to both RNCs and BSCs. For a multicast MBMS bearer service the SGSN may include the number of PMM-IDLE UEs that have joined the MBMS bearer service in each RA. For a broadcast MBMS bearer service the BSC/RNC creates an MBMS Service Context. The BSC in Iu mode/RNC stores the session attributes in the MBMS Service Context, sets the state attribute of its MBMS Service Context to 'Active' and responds with an MBMS Session Start Response message and the RNC includes the TEID in the MBMS Session Start Response message for the Iu bearer plane that the SGSN shall use for forwarding the MBMS data. A BSC in Gb mode which does not serve the MBMS Service Area may decide not to store the session attributes and not to set the state of its MBMS Service Context to 'Active'. A BSC/RNC receiving multiple MBMS Session Start Request messages establishes only one bearer plane with one SGSN.

4. The BSC/RNC establishes the necessary radio resources for the transfer of MBMS data to the interested UEs.

Note: The upstream node normally provides the MBMS Session Start Request message once per MBMS session to a downstream node. Due to "Intra Domain Connection of RAN Nodes to Multiple Core Network Nodes" however, a BSC/RNC may receive the MBMS Session Start Request message from several SGSNs.

END OF CHANGE

3GPP TSG SA WG2 Architecture, S2#46 — S2-051416
9 - 13 May 2005, Athens, Greece — rev of S2-051393

CR-Form-v7.1

CHANGE REQUEST

⌘ 23.246 CR 0155 ⌘ rev 2 ⌘ Current version: 6.6.0 ⌘

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Proposed change affects: UICC apps⌘ ☐ ME [X] Radio Access Network [X] Core Network [X]

Title:	⌘	Corrections
Source:	⌘	SA WG2
Work item code:	⌘	MBMS — **Date:** ⌘ 12/05/2005
Category:	⌘	F — **Release:** ⌘ Rel-6

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:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	The existing stage 2 specification contains some errors. The details are described below.
Summary of change:	⌘	1) in section 4.2 and 5.7, OSA SCS is removed. 2) in section 6.3 an undefined term is replaced. 3) in 8.1.1 an abbreviation is replaced. 4) in step 1 in section 8.2, text wrongly implies that IMS signalling PDP context can be used for MBMS IP signalling.Text in step 15 is made mandatory. 5) text in section 8.3 is clarified and BSC behaviour made more exact. 6) a reference to Gmb is added to step 4 of section 8.4. 7) in section 8.5, (because 8.3 permits the SGSN to signal to a BSC even if it has no users) the BSC must acknowledge release when it has no context. 8) in section 8.7 step 9, an incorrect example is corrected. 9) requirements in section 8.8 are clarified.
Consequences if not approved:	⌘	Stage 3 interworking problems may occur.

Clauses affected:	⌘	4.2, 5.7, 6.3, 8.1, 8.2, 8.3, 8.4, 8.5, 8.7, 8.8,

Other specs affected: ⌘	Y	N		
	?		Other core specifications	⌘ Stage 2 corrections may impact stage 3.
		X	Test specifications	
		X	O&M Specifications	

Other comments:	⌘	

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions defined in 3GPP TR 21.905 [1] and 3GPP TS 22.146 [2] and the following apply:

MBMS Service Announcement: Mechanism to allow users to be informed about the MBMS user services available.

MBMS Bearer Service: the service provided by the PS Domain to MBMS User Services to deliver IP multicast datagrams to multiple receivers using minimum network and radio resources.

MBMS User Service: the MBMS service provided to the end user by means of the MBMS Bearer Service and possibly other capabilities.

MBMS Service Area: The area within which data of a specific MBMS session are sent. Each individual MBMS session of an MBMS Bearer Service may be sent to a different MBMS Service Area. This MBMS Service Area is the same or a subset of the Multicast or Broadcast Service Area as defined in 3GPP TS 22.146 [2]. An MBMS Service Area smaller than the Multicast or Broadcast Service Area is typically used for localized services.

3.2 Abbreviations

For the purposes of the present document, the abbreviations in 3GPP TR 21.905 [1] and 3GPP TS 22.146 [2] apply.

TMGI	Temporary Mobile Group Identity
TPF	Traffic Plane Function

4 MBMS Architecture

4.1 Overview

MBMS is a point-to-multipoint service in which data is transmitted from a single source entity to multiple recipients. Transmitting the same data to multiple recipients allows network resources to be shared.

The MBMS bearer service offers two modes:

- Broadcast Mode
- Multicast Mode

MBMS architecture enables the efficient usage of radio-network and core-network resources, with an emphasis on radio interface efficiency.

MBMS is realised by the addition of a number of new capabilities to existing functional entities of the 3GPP architecture and by addition of a number of new functional entities.

The existing PS Domain functional entities (GGSN, SGSN, UTRAN, GERAN and UE) are enhanced to provide the MBMS Bearer Service. In the bearer plane, this service provides delivery of IP Multicast datagrams from the Gi reference point to UEs with a specified Quality of Service. In the control plane, this service provides mechanisms for:

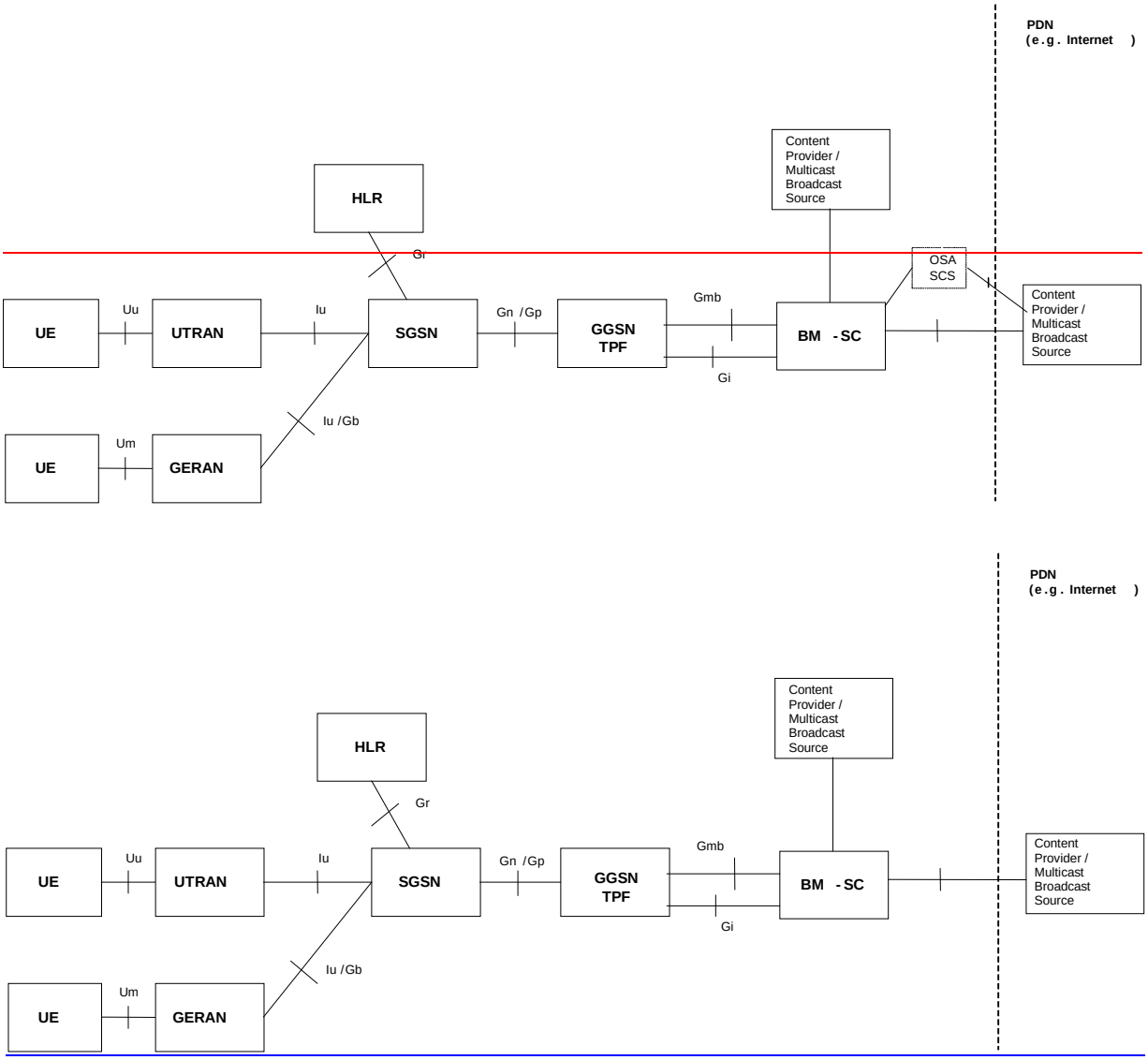
- managing the MBMS bearer service activation status of UEs (in the case of multicast mode)
- outsourcing authorisation decisions to the MBMS User Service (i.e. to the BM-SC) (in the case of multicast mode)
- providing control of session initiation/termination by the MBMS User Service and managing bearer resources for the distribution of MBMS data (in the case or multicast and broadcast modes)

A particular instance of the MBMS Bearer Service is identified by an IP Multicast Address and an APN Network Identifier.

The boundary of the MBMS Bearer Service is the Gmb and Gi reference points as shown in Figure 1 below. The former provides access to the control plane functions and the latter the bearer plane.

A functional entity, the Broadcast Multicast Service Centre (BM-SC) provides a set of functions for MBMS User Services. BM-SC functions for different MBMS User Services may be supported from the same or different physical network elements.

4.2 Reference Architecture Model



Note 1: network entities and reference points solely used by the MBMS user service (e.g. for service announcement as described in section 4.4.1.2) are not shown in this figure.
Note 2: Gp applies only when SGSN and GGSN are in different PLMNs.

Figure 1: Reference architecture to support the MBMS bearer service

********** 2nd change **********

5.6 MBMS Data Sources and Content Provider

The reference point from the content provider to the BM-SC is not standardised by 3GPP in this release of the specification.

5.7 Other Functional Element

5.7.1 Void

5.7.2 CBC

The Cell Broadcast Centre (CBC) may be used to announce MBMS user services to the users.

~~5.7.3 OSA-SCS~~

~~The BM-SC might use OSA-SCS to interact with third parties which is FFS.~~

********** 3rd change **********

6.3 Quality-of-Service

It shall be possible for the network to control quality-of-service parameters for sessions of multicast and broadcast MBMS bearer services. All QoS attributes related to the UMTS bearer service described in 3GPP TS 23.107 [3] are applicable to MBMS bearer services. Compared to point-to-point bearer services the following limitations exist:

- For **traffic class**, only the background and streaming classes shall be supported.
- For **SDU error ratio**, only higher values are supported, i.e. the values describing higher numbers of lost or corrupted SDUs (actual values are for the background and streaming classes are 10^{-2} and 10^{-1}).
- For **maximum bit-rate**, see the values described in 3GPP TS 22.246 [6].
- For **Guaranteed bit rate** of the Streaming Traffic Class: depending on radio resource usage by other services, some cells of the MBMS Service Area may not have sufficient resources available for a MBMS Session. The RAN may decide not to establish RB in cells where requested resources are not available. The RAN does not reject a MBMS Session Start Request message even if one or more cells do not have enough resources to establish radio bearers.

MBMS bearer services of background class are best suited for the transport of MBMS user services such as messaging or downloading. Buffering, shaping schemes and packet dropping may be applied to the traffic flow to adapt to the available resources and changing network conditions. The total transfer time is not critical for background class bearer services since the content must normally have been received in totality and stored in the UE before the user can access it.

MBMS bearer services of streaming class are best suited for the transport of MBMS user services such as streaming. As for point-to-point bearer services, the network should minimise the packet transfer delay of streaming class bearer services as far as possible. Packet dropping should be the preferred traffic conditioning action applied to the traffic flow to adapt to the available resources.

The principle difference between background and streaming classes for MBMS is the support of a guaranteed bit-rate in the streaming case. No indication is provided to the UE in cases where the RAN cannot provide the requested QoS. As a result, some UEs may not receive the MBMS session or parts of it. For background class, the RAN may continue to distribute data in congestion conditions but at potentially high packet loss rates, therefore the MBMS user service will have to provide sufficient redundancy within the data to be able to cope with the high packet loss.

MBMS user services that would normally use MBMS bearer services of background class may however decide to use a streaming class MBMS bearer service if the MBMS user service cannot cope with high packet loss.

The Allocation and Retention Priority of the MBMS bearer service allows for prioritisation between MBMS bearer services, and between MBMS bearer services and non MBMS bearer services.

As the MBMS bearer service transfers data to many UEs in parallel and because of the lack of feedback channel on radio level low SDU error ratios are difficult to achieve. When the resulting packet error ratio is not suitable for the

MBMS user service or when prevention of data loss is required, an MBMS user service may perform retransmission of MBMS data over a point-to-point PDP contextbearer services.

********** 4th change **********

8 MBMS Procedures

8.1 MBMS Notification

8.1.1 Iu mode notification (UTRAN and GERAN)

When an MBMS Session starts, UEs interested in the MBMS bearer service (PMM-CONNECTED UEs and PMM-IDLE UEs) shall be notified.

MBMS Session attributes such as Session Identifier and MBMS Service Area(s) are made available in all interested RNCs during the Session Start procedure.

For radio efficiency reasons, the UTRAN may select on a per cell basis whether to establish point-to-point or point-to-multipoint links for the distribution of MBMS data to the UEs.

In order to perform this selection, the UTRAN requests a proportion of UEs to move to PMM-CONNECTED mode by means of MBMS notification sent in the MBMS service Area.

The exact number of UEs moved to PMM-CONNECTED mode is a decision of the RAN node. It is not necessary for all UEs to move to PMM-CONNECTED mode in order for the RAN to decide to use point-to-multipoint, other UEs may remain in PMM-IDLE state. This is a UTRAN choice (based on Radio Resource Management criteria).

Following the decision to set up point-to-point or point-to-multipoint links, the number of UEs that need to be maintained in PMM-CONNECTED mode or moved to PMM-IDLE mode for MBMS data reception is also a decision of the RAN node.

8.1.2 A/Gb mode notification (GERAN)

When an MBMS Session starts, UEs interested in the MBMS bearer service and that are in READY or STANDBY states shall be notified. The MBMS notification triggers detection or counting of UEs per cell for selection of the most appropriate MBMS radio bearer.

MBMS Session attributes such as Session Identifier, MBMS Service Area, QoS are made available in all interested BSCs that are connected to a registered SGSN by the Session Start procedure.

8.2 MBMS Multicast Service Activation

The MBMS multicast service activation procedure registers the user in the network to enable the reception of data from a specific multicast MBMS bearer service. The activation is a signalling procedure between the UE and the network. The procedure establishes MBMS UE contexts in UE, SGSN and GGSN and Iu mode BSC/RNC for each activated multicast MBMS bearer service comparable to regular PDP contexts.

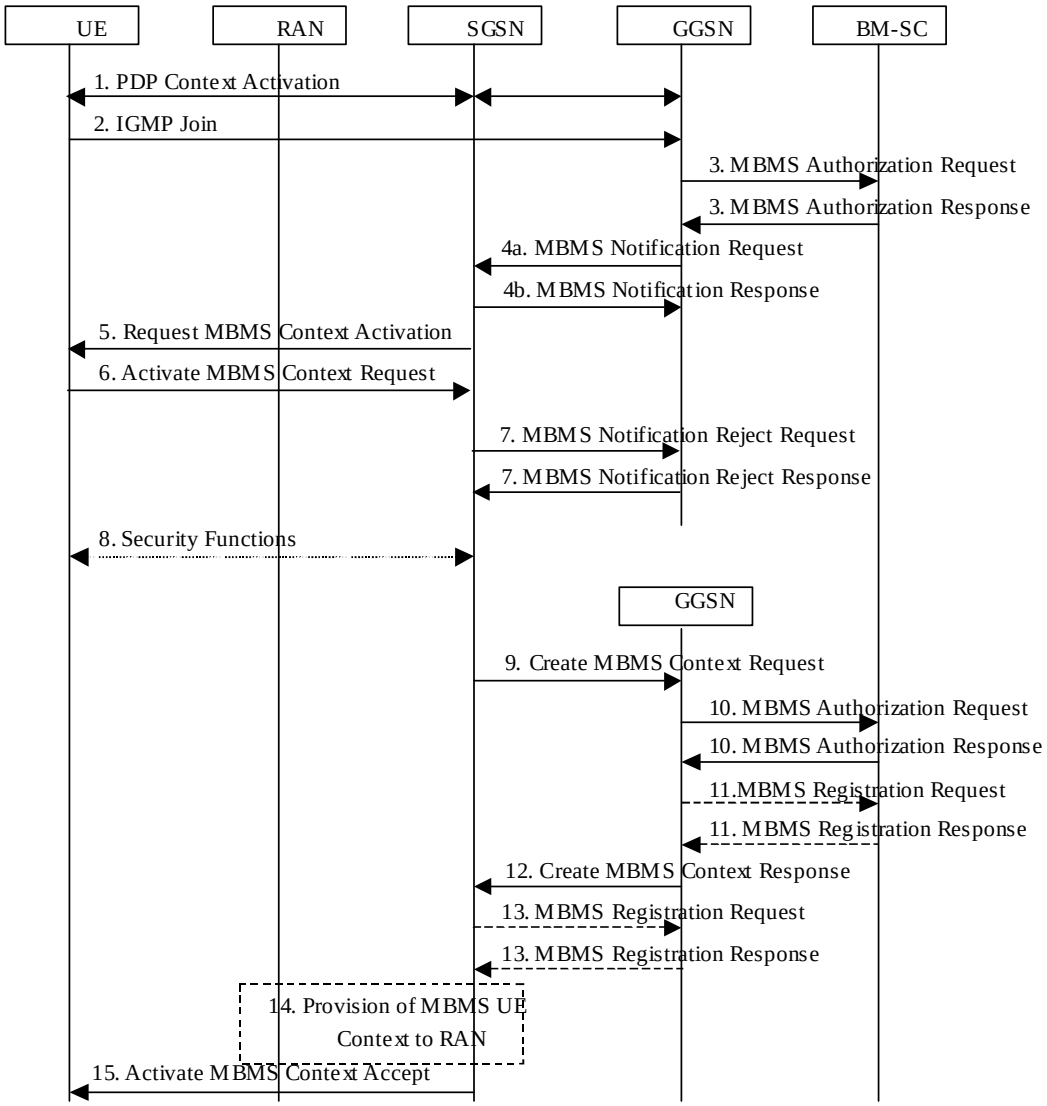


Figure 7: The activation of an MBMS multicast service

1. The UE activates a general purpose ~~default, typically best-effort~~ PDP context if one is not already established. ~~This can be a PDP context used for basic IP services like WAP or Internet access, or it might be the signalling PDP context used for IMS access.~~

2. The UE sends an IGMP (IPv4) or MLD (IPv6) Join message over the default PDP context to signal its interest in receiving a particular multicast MBMS bearer service identified by an IP multicast address.

3. The GGSN sends an MBMS Authorization Request seeking authorization for the activating UE to receive data. The authorization decision, which may be based on subscription data in the BM-SC, Membership function is provided in the MBMS Authorization Response together with the APN to be used for creation of the MBMS UE context. If the MBMS Authorization Response indicates that the UE is not authorized to receive the MBMS data the process terminates with no additional message exchange.

4a. The GGSN sends an MBMS Notification Request (IP multicast address, APN, Linked NSAPI) to the SGSN. Linked NSAPI is set equal to the NSAPI of the PDP context over which the Join request was received. The IP multicast address is the one requested by the UE in the Join request. The APN may be different from the APN to which the default PDP context has been activated. In any case, the APN may resolve to a GGSN that is different from the GGSN receiving the IGMP/MLD Join request. The GGSN starts a MBMS Activation Timer as GGSN may receive no response, e.g. in case SGSN or UE does not support MBMS.

4b. The SGSN sends a MBMS Notification Response (Cause) to the GGSN that sent the MBMS Notification Request, where Cause shall indicate whether or not the MBMS context activation will proceed. Upon reception of the response message with Cause indicating unsuccessful operation the GGSN should not send any further MBMS Notification Request messages. The procedure is then terminated.

5. The SGSN sends a Request MBMS Context Activation (IP multicast address, APN, Linked NSAPI, TI) to the UE to request it to activate an MBMS UE Context. Linked NSAPI allows the UE to associate the MBMS UE Context with the PDP context over which it sent the IGMP/MLD Join message in step 2. TI was chosen by the SGSN and contains a value not used by any other activated PDP context and MBMS UE context for this UE.

6. The UE creates an MBMS UE context and sends an Activate MBMS Context Request (IP multicast address, APN, MBMS_NSAPI, MBMS bearer capabilities) to the SGSN. The IP multicast address identifies the MBMS multicast service, which the UE wants to join/activate. An APN may indicate a specific GGSN. The MBMS bearer capabilities indicate the maximum QoS the UE can handle. The MBMS_NSAPI was chosen by the UE and contains a value not used by any other activated PDP context and MBMS UE context for this UE. If the SGSN has the MBMS Bearer Context information for this MBMS bearer service, the SGSN should verify the UE's MBMS bearer capabilities. If the SGSN determines that the UE's MBMS bearer capabilities are less than the Required MBMS Bearer Capabilities, it shall reject the request for activation of an MBMS context with an appropriate cause.

7. If the MBMS UE Context was not established, the SGSN sends a MBMS Notification Reject Request (Cause) to the GGSN that sent the MBMS Notification Request, where Cause shall indicate the reason why the MBMS UE Context could not be established. The GGSN then sends a MBMS Notification Reject Response back to the SGSN. This should prevent further sending of MBMS Notification Request messages. The procedure is then terminated.

8. Security Functions may be performed, e.g. to authenticate the UE.

9. The SGSN creates an MBMS UE context and sends a Create MBMS Context Requests (IP multicast address, APN, MBMS_NSAPI, IMSI, MSISDN, RAI) to the GGSN.

10. The GGSN sends an MBMS Authorization Request (IMSI, MSISDN, RAI) seeking authorization for the activating UE. The authorization decision is provided in the MBMS Authorization Response. The BM-SC creates an MBMS UE Context.

11. If the GGSN does not have the MBMS Bearer Context information for this MBMS bearer service, the GGSN sends a MBMS Registration Request to the BM-SC. See subclause "MBMS Registration Procedure".

    If no TMGI has been allocated for this MBMS bearer service, the BM-SC will allocate a new TMGI. This TMGI will be passed to GGSN and SGSN via the MBMS Registration Response message and further to UE via Activate MBMS Context Accept message.

    The BM-SC responds with a MBMS Registration Response containing the MBMS Bearer Context information for this MBMS bearer service and adds the identifier of the GGSN to the "list of downstream nodes" parameter in its MBMS Bearer Context. See subclause "MBMS Registration Procedure".

12. The GGSN creates an MBMS UE context and sends a Create MBMS Context Response to the SGSN.

13. If the SGSN does not have the MBMS Bearer Context information for this MBMS bearer service, the SGSN sends a MBMS Registration Request to the GGSN. See subclause "MBMS Registration Procedure".

    The GGSN responds with a MBMS Registration Response containing the MBMS Bearer Context information for this MBMS bearer service and adds the identifier of the SGSN to the "list of downstream nodes" parameter in its MBMS Bearer Context. See subclause "MBMS Registration Procedure".

14. The SGSN provides Iu mode RAN with the MBMS UE Context(s) if at least one PS RAB is established for the UE.

15. The SGSN sends an Activate MBMS Context Accept (TMGI, MBMS bearer capabilities) to the UE. The MBMS bearer capabilities indicate the maximum QoS that is used by this MBMS bearer service and the UE may take it into account when further MBMS bearer services are activated. If it was not possible to verify the UE's MBMS bearer capabilities in Step 6, the UE's MBMS bearer capabilities shall~~will~~ be verified now. If the SGSN determines that the UE's MBMS bearer capabilities are lower than the Required MBMS Bearer Capabilities the SGSN rejects the request for activation of an MBMS context indicating an appropriate cause and starts the deactivation of the already established MBMS UE contexts.

8.3 MBMS Session Start Procedure

The BM-SC initiates the MBMS Session Start procedure when it is ready to send data. This is a request to activate all necessary bearer resources in the network for the transfer of MBMS data and to notify interested UEs of the imminent start of the transmission.

Through this procedure, MBMS session attributes such as QoS, MBMS service Area, estimated session duration if available are provided to the GGSN(s) and SGSN(s) that have previously registered for the corresponding MBMS bearer service and to all BSCs/RNCs that are connected to a registered SGSN. In addition the procedure allocates the bearer plane to all registered GGSNs and all registered SGSNs and to BSCs/RNCs that respond to the session start request message~~accordingly~~.

After sending the Session Start Request message the BM-SC waits for a configurable delay before sending MBMS data. This delay should be long enough to avoid buffering of MBMS data in entities other than the BM-SC, i.e. the delay should allow the network to perform all procedures required to enable MBMS data transfer before the BM-SC sends MBMS data. For example notification of UEs and radio bearer establishment should be performed before MBMS data arrive in the RAN. The delay may be in the region of multiple seconds or tens of seconds. It may be useful for the BM-SC to be able to configure different delays for MBMS bearer services on 2G and 3G, respectively.

For multicast MBMS bearer services the registration of SGSNs and GGSNs is initiated by MBMS multicast Service Activation procedures, Inter SGSN Routeing Area Update procedures, Inter SGSN Serving RNS Relocation procedure and performed by MBMS Registration procedures.

For broadcast MBMS bearer services the list of downstream nodes of BM-SC and GGSN are achieved in the following ways:

– The list of downstream nodes for GGSN will be sent from the BM-SC to the GGSN in the Session Start Request.

Normally, the GGSN contained in the "list of downstream nodes" for BM-SC is the default GGSN (or two for resilience).

The overall Session Start procedure is presented in the following figure:

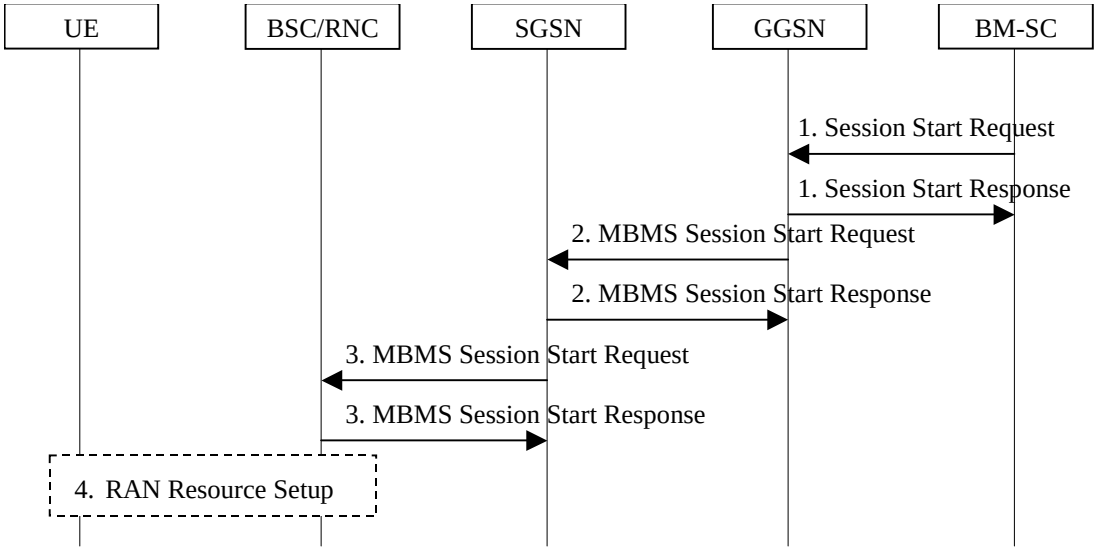


Figure 8 Session Start procedure

1. The BM-SC Session and Transmission function sends a Session Start Request message to indicate the impending start of the transmission and to provide the session attributes (TMGI, QoS, MBMS service Area, Session identifier, estimated session duration, broadcast/multicast, list of downstream nodes for GGSN (Broadcast only) …) and the 2G/3G indicator. The message is sent to the BM-SC Proxy and Transport function, which then forwards it to the GGSNs listed in the “list of downstream nodes” parameter of the corresponding MBMS Bearer Context. The BM-SC Proxy and Transport function sets the state attribute of its MBMS Bearer Context to ‘Active’. For a broadcast MBMS bearer service the GGSN creates an MBMS bearer context. The GGSN stores the session attributes and the list of downstream nodes in the MBMS Bearer Context, sets the state attribute of its MBMS Bearer Context to ‘Active’ and sends a Session Start Response message to the BM-SC. Proxy and

Transport function which forwards it to the BM-SC Session and Transmission function. The BM-SC Proxy and Transport function copies Session Start Requests to the BM-SC Membership function for charging purposes.

2. The GGSN sends an MBMS Session Start Request message containing the session attributes (TMGI, QoS, MBMS service Area, Session identifier, estimated session duration, broadcast/multicast, …) and the 2G/3G indicator to the SGSNs listed in the "list of downstream nodes" parameter of the corresponding MBMS Bearer Context. For a broadcast MBMS bearer service the SGSN creates an MBMS bearer context. The SGSN stores the session attributes and the 2G/3G indicator in the MBMS Bearer Context, sets the state attribute of its MBMS Bearer Context to 'Active' and responds with an MBMS Session Start Response message providing the TEID for bearer plane that the GGSN shall use for forwarding the MBMS data. For MBMS bearer service a SGSN receiving multiple MBMS Session Start Request messages establishes only one bearer plane with one GGSN.

3. The SGSN sends an MBMS Session Start Request message including the session attributes (TMGI, QoS, MBMS service Area, Session identifier, estimated session duration, broadcast/multicast, …) to each BSC and/or each RNC that is connected to this SGSN. The 2G/3G indicator shall be used by the SGSN to determine whether the MBMS Session Start Request message is sent only to BSCs, or only to RNCs, or to both RNCs and BSCs. For a multicast MBMS bearer service the SGSN may include the number of PMM-IDLE UEs that have joined the MBMS bearer service in each RA. For a broadcast MBMS bearer service the BSC/RNC creates an MBMS Service Context. The BSC in Iu mode/RNC stores the session attributes in the MBMS Service Context, sets the state attribute of its MBMS Service Context to 'Active' and responds with an MBMS Session Start Response message and the RNC/Iu mode BSC includes the TEID in the MBMS Session Start Response message for the Iu bearer plane that the SGSN shall use for forwarding the MBMS data. A BSC in Gb mode which does not serve the MBMS Service Area need~~may decide~~ not ~~to~~ store the session attributes~~, and not to set the state of its MBMS Service Context to 'Active'~~. A BSC/RNC receiving multiple MBMS Session Start Request messages establishes only one bearer plane with one SGSN.

4. The BSC/RNC establishes the necessary radio resources for the transfer of MBMS data to the interested UEs.

Note: The upstream node normally provides the MBMS Session Start Request message once per MBMS session to a downstream node. Due to "Intra Domain Connection of RAN Nodes to Multiple Core Network Nodes" however, a BSC/RNC may receive the MBMS Session Start Request message from several SGSNs.

8.4 MBMS Registration Procedure

The MBMS Registration is the procedure by which a downstream node informs an upstream node that it would like to receive session attributes and data for a particular MBMS bearer service in order to distribute it further downstream. This procedure builds up a distribution tree for the delivery of MBMS session attributes and data from the BM-SC to the UEs interested in the service. This procedure results in the set-up of a corresponding MBMS Bearer Context in the nodes along the distribution tree, but it does not result in the establishment of bearer plane which will be established by the Session Start procedure.

The MBMS Registration procedure is initiated:

- When the first MBMS UE Context for a particular MBMS bearer service is created in the SGSN or GGSN (see subclause "MBMS UE Context") and the corresponding MBMS Bearer Context is not already established in the node;

- When an MBMS Registration Request for a particular MBMS bearer service is received from a downstream node but the corresponding MBMS Bearer Context is not established in the node; or

- When a DRNC detects that it hosts UEs interested in the MBMS bearer service.

NOTE: The terms 'downstream' and 'upstream' refer to the topological position of one node with respect to another and relative to the direction of the MBMS data flow, i.e. from BM-SC to UE.

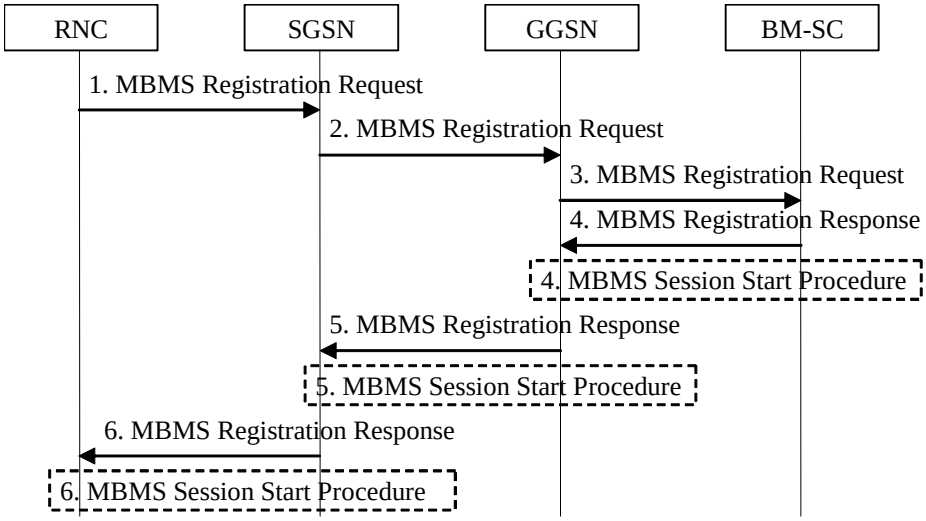


Figure 9: MBMS Registration procedure

1. When the DRNC detects that it hosts UEs interested in the MBMS bearer service, the DRNC sends a MBMS Registration Request message to its parent SGSN if not already done. How the RNC determines its parent SGSN is a matter of implementation.

2. If the SGSN has no MBMS Bearer Context for an MBMS bearer service and the SGSN receives an MBMS Registration Request from an RNC for this MBMS bearer service, or if the first MBMS UE Context is created in the SGSN for an MBMS bearer service for which the SGSN has no corresponding MBMS Bearer Context, the SGSN creates an MBMS Bearer Context (in "Standby" state) and sends an MBMS Registration request (IP multicast address, APN) message to the GGSN. How the SGSN selects a GGSN is a matter of implementation; it may for instance be based on prior signalling related to a particular UE or via APN resolution.

3. If the GGSN has no MBMS Bearer Context for an MBMS bearer service and the GGSN receives an MBMS Registration from an SGSN for this MBMS bearer service, or when the first MBMS UE Context is created in the GGSN for an MBMS bearer service for which the GGSN has no MBMS Bearer Context, the GGSN creates an MBMS Bearer Context (in "Standby" state) and sends a Registration Request (IP multicast address, APN) message to the BM-SC. Proxy and Transport function The exact nature of the signalling between GGSN and BM-SC via Gmb interface is specified in 3GPP TS 29.061 [4].

4. Upon reception of an MBMS Registration Request from a GGSN, the BM-SC Proxy and Transport function adds the identifier of the GGSN to the "list of downstream nodes" parameter in its MBMS Bearer Context and responds with a MBMS Registration Response (TMGI, Required Bearer Capabilities) message. The exact nature of the signalling between GGSN and BM-SC ~~is however FFS in general~~via Gmb interface is specified in 3GPP TS 29.061 [4]. If the MBMS Bearer Context is in the 'Active' state, the BM-SC initiates the Session Start procedure with the GGSN, as described in clause “MBMS Session Start Procedure”.

5. If the GGSN receives a Registration Request from the SGSN in step 2, the GGSN:

   - adds the identifier of the SGSN to the "list of downstream nodes" parameter in its MBMS Bearer Context,
   - responds with an MBMS Registration Response (TMGI, Required Bearer Capabilities) message, and
   - if the MBMS Bearer Context is in the 'Active' state, initiates the Session Start procedure with the SGSN, as described in clause “MBMS Session Start Procedure”.

6. If the SGSN received MBMS Registration Request from the DRNC in step 1, the SGSN:

   - adds the identifier of the RNC to the "list of downstream nodes" parameter in its MBMS Bearer Context,
   - responds with an MBMS Registration Response message, and
   - if the MBMS Bearer Context is in the 'Active' state, initiates the Session Start procedure with the DRNC, as described clause “MBMS Session Start Procedure”.

8.5 MBMS Session Stop Procedure

The BM-SC Session and Transmission function initiates the MBMS Session Stop procedure when it considers the MBMS session to be terminated. The session is typically terminated when there is no more MBMS data expected to be transmitted for a sufficiently long period of time to justify a release of bearer plane resources in the network. The procedure is propagated to all SGSNs and GGSNs that are registered for the corresponding MBMS bearer service and to BSCs/RNCs that have an established Iu bearer plane with an SGSN.

The overall MBMS Session Stop procedure is presented in the following figure:

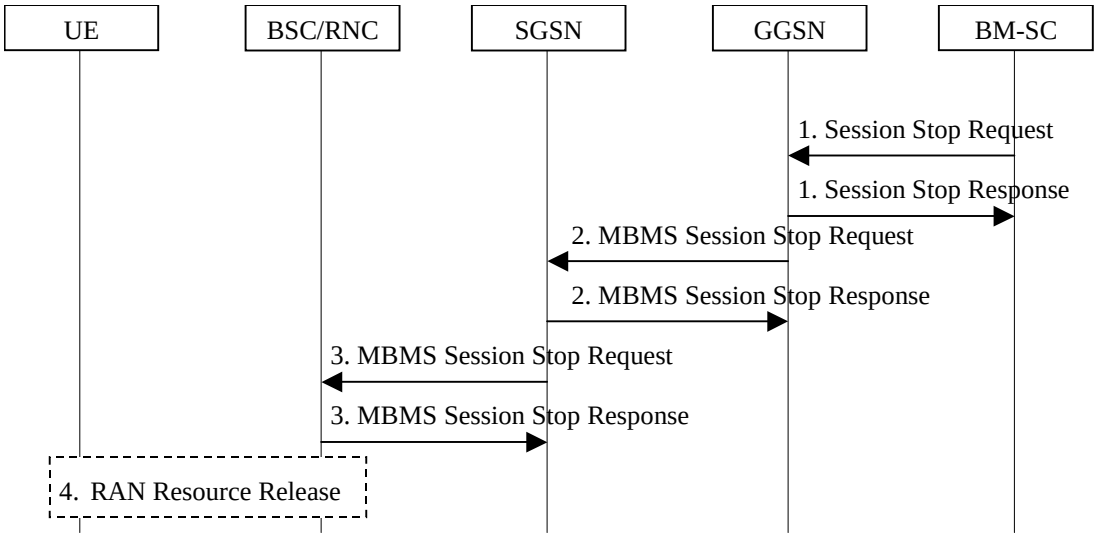


Figure 10: MBMS Session Stop procedure

1. The BM-SC Session and Transmission function sends a Session Stop Request message to the BM-SC Proxy and Transport function, which forwards it to all GGSNs listed in the "list of downstream nodes" parameter of the affected MBMS Bearer Context to indicate that the MBMS session is terminated and the bearer plane resources can be released. The BM-SC Proxy and Transport function sets the state attribute of its MBMS Bearer Context to 'Standby'. The GGSN sends a Session Stop Response message to the BM-SC Proxy and Transport function, which forwards it to the BM-SC Session and Transmission function. The BM-SC Proxy and Transport function copies Session Stop Requests to the BM-SC Membership function for charging purposes.

2. The GGSN sends an MBMS Session Stop Request message to all SGSNs that have a bearer plane established with the GGSN, releases the corresponding bearer plane resources towards these SGSNs and sets the state attribute of its MBMS Bearer Context to 'Standby'. The GGSN releases the MBMS Bearer Context in case of a broadcast MBMS bearer service.

3. The SGSN releases the TEID and bearer plane resources on which it was receiving MBMS data from the GGSN for the affected MBMS bearer service and sends an MBMS Session Stop Request message to all BSCs/RNCs that have a bearer plane established with the SGSN. The SGSN releases the MBMS Bearer Context in case of a broadcast MBMS bearer service.

4. The RNC releases the affected radio and Iu resources; the BSC releases the affected radio resources. The BSC/RNC releases the MBMS Service Context in case of a broadcast MBMS bearer service. A BSC in Gb mode shall send an acknowledgement to the SGSN even if there is no active MBMS context in the BSC.

8.6 MBMS De-Registration Procedure

8.6.0 Common MBMS De-Registration procedure

The MBMS De-Registration is the procedure by which a downstream node informs an upstream node that it does not need to receive signalling, session attributes and data for a particular MBMS bearer service anymore and therefore would like to be removed from the corresponding distribution tree.

The MBMS De-registration procedure is initiated:

- By the SGSN or GGSN when the last MBMS UE Context for a particular MBMS bearer service is deleted from the node and the "list of downstream nodes" parameter in the corresponding MBMS Bearer Context is empty;
- By the SGSN or GGSN when the last node registered in the "list of downstream nodes" de-registers from an MBMS bearer service for which there is no corresponding MBMS UE Context; or
- By the DRNC that registered at an SGSN when it deletes the associated MBMS Service Context.

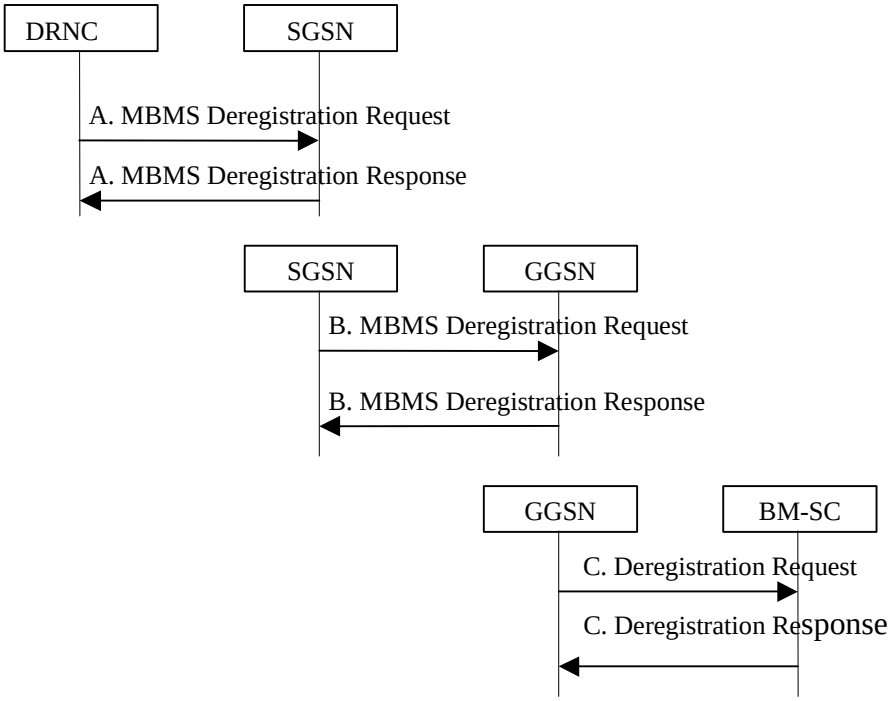


Figure 11: MBMS De-Registration Procedure

A. When the DRNC that is registered at an SGSN no longer hosts any UE interested in that MBMS bearer service, the DRNC requests the de-registration from the MBMS bearer service to its parent SGSN. As an implementation option, the DRNC may decide not to de-register from the MBMS bearer service immediately when these conditions are met, e.g. in order to avoid unnecessary signalling in the case where the RNC would again need the same MBMS bearer service shortly after.

   The SGSN removes the identifier of the RNC from the "list of downstream nodes" parameter of the affected MBMS Bearer Context and confirms the operation by sending an MBMS De-Registration Response message to the RNC. If an Iu bearer plane had been established between the DRNC and the SGSN for this MBMS bearer service, the Iu bearer plane is released.

B. When the "list of downstream nodes" of a particular MBMS Bearer Context in the SGSN becomes empty and the SGSN has no MBMS UE Contexts linked to that MBMS Bearer Context, the SGSN sends an MBMS De-Registration Request (IP multicast address, APN) message to its upstream GGSN.

   The GGSN removes the identifier of the SGSN from the "list of downstream nodes" parameter of the affected MBMS Bearer Context and confirms the operation by sending an MBMS De-Registration Response message to the SGSN. If a bearer plane had been established between the SGSN and the GGSN for this MBMS bearer service, the bearer plane is released.

C. When the "list of downstream nodes" of a particular MBMS Bearer Context in the GGSN becomes empty and the GGSN has no MBMS UE Contexts linked to that MBMS Bearer Context, the GGSN sends a De-Registration Request (IP multicast address, APN) message to the BM-SC. Proxy and Transport function If a bearer plane had been established over Gi for this MBMS bearer service, the bearer plane is released.

The BM-SC removes the identifier of the GGSN from the "list of downstream nodes" parameter of the affected MBMS Bearer Context and confirms the operation by sending a De-Registration Response message to the GGSN.

8.6.1 BM-SC initiated MBMS De-Registration Procedure

This MBMS De-Registration Procedure is initiated by BM-SC when the specific MBMS bearer service is terminated. This procedure tears down the distribution tree for the delivery of session attributes and MBMS data. This procedure results in releasing of all MBMS Bearer Contexts and associated MBMS UE Contexts in the nodes along the distribution tree.

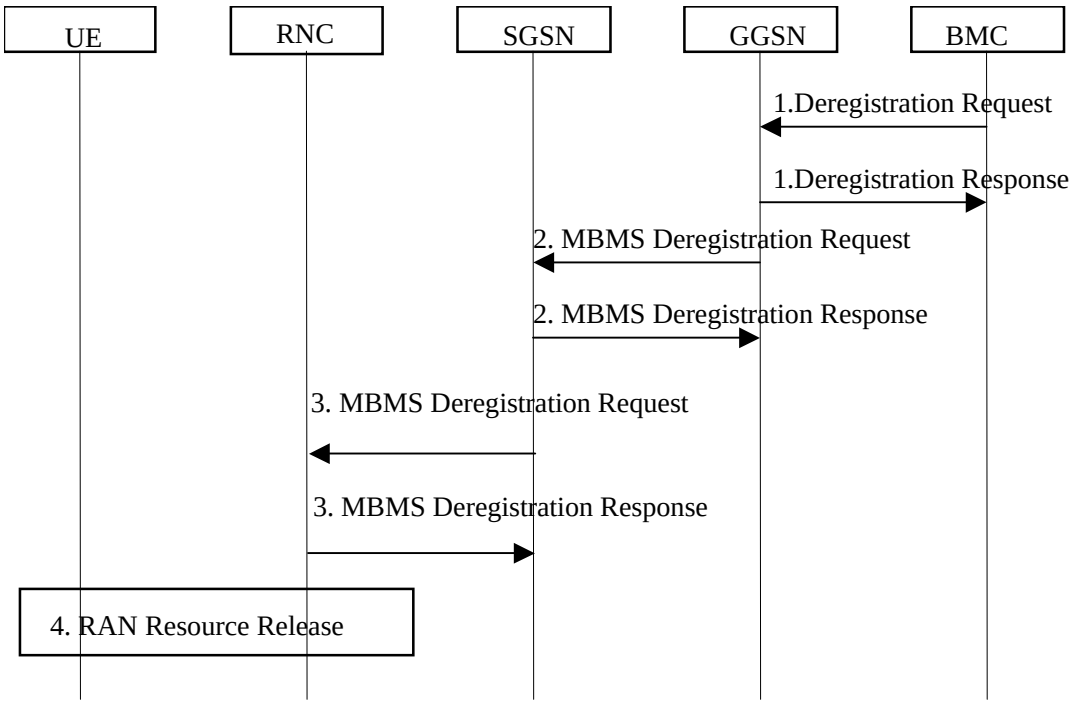


Figure 12: BM-SC initiated MBMS De-Registration Procedure

1. The BM-SC sends a De-Registration Request message to all GGSNs contained in the "list of downstream nodes" parameter of the corresponding MBMS Bearer Context to indicate the session is terminated and any related MBMS bearer resources shall be released.

   The GGSN returns a De-Registration Response message to the BM-SC. The BM-SC releases all MBMS UE Contexts and the corresponding MBMS Bearer context.

2. The GGSN sends an MBMS De-Registration Request message to all SGSNs contained in the "list of downstream nodes" parameter. of the corresponding MBMS Bearer Context. The SGSN returns an MBMS De-registration Response message to the GGSN. The GGSN releases all MBMS UE Contexts and the affected MBMS Bearer Context. If a bearer plane had been established over Gi for this MBMS bearer service, the bearer plane is released.

3. The SGSN sends an MBMS De-Registration Request message to all RNCs connected with this SGSN. The RNC returns an MBMS De-Registration Response message to the SGSN, and releases all bearer resources if the state attribute of the MBMS Service Context is ‘Active’. The SGSN releases all MBMS UE Contexts and the affected MBMS Bearer Context. If a bearer plane had been established between the SGSN and the GGSN for this MBMS bearer service, the bearer plane is released.

4. The RNC releases the affected radio resources, all MBMS UE Contexts and the MBMS Service Context. The detailed procedures are specified in 3GPP TS 25.346 [10] and 3GPP TS 43.246 [11]. RAN may notify the UEs that the MBMS Bearer service has being terminated, so that the UE can locally deactivate its MBMS UE context, detailed procedures are specified in 3GPP TS 25.346 [10] and 3GPP TS 43.246 [11].

8.7 MBMS Multicast Service Deactivation

The multicast service deactivation is a signalling procedure between the UE and the network. The procedure removes the MBMS UE Context from the UE, RAN, SGSN and GGSN for a particular MBMS multicast service. The multicast service deactivation can be initiated by:

- The UE;
- The GGSN;
- The BM-SC; or
- The SGSN

All these cases are contained in the procedure illustrated in figure 13. The UE initiated Multicast Service Deactivation starts with step 1), the BM-SC initiated Multicast Service Deactivation starts with step 3), the GGSN initiated Multicast Service Deactivation starts with step 4), the SGSN initiated Multicast Service Deactivation starts with step 5) or 9), and the MBMS UE de-linking is performed at step 7).

At GPRS detach, all MBMS UE contexts of the UE are implicitly deactivated in the UE, SGSN and GGSN, i.e. the SGSN performs the deactivation procedure starting with step 7).

If the PDP context linked to the MBMS UE context by the linked NSAPI is deactivated by the UE or SGSN or GGSN, then the SGSN shall perform the MBMS deactivation procedure starting with step 7). The UE will remove all MBMS UE Contexts locally after the Linked PDP Context was deactivated.

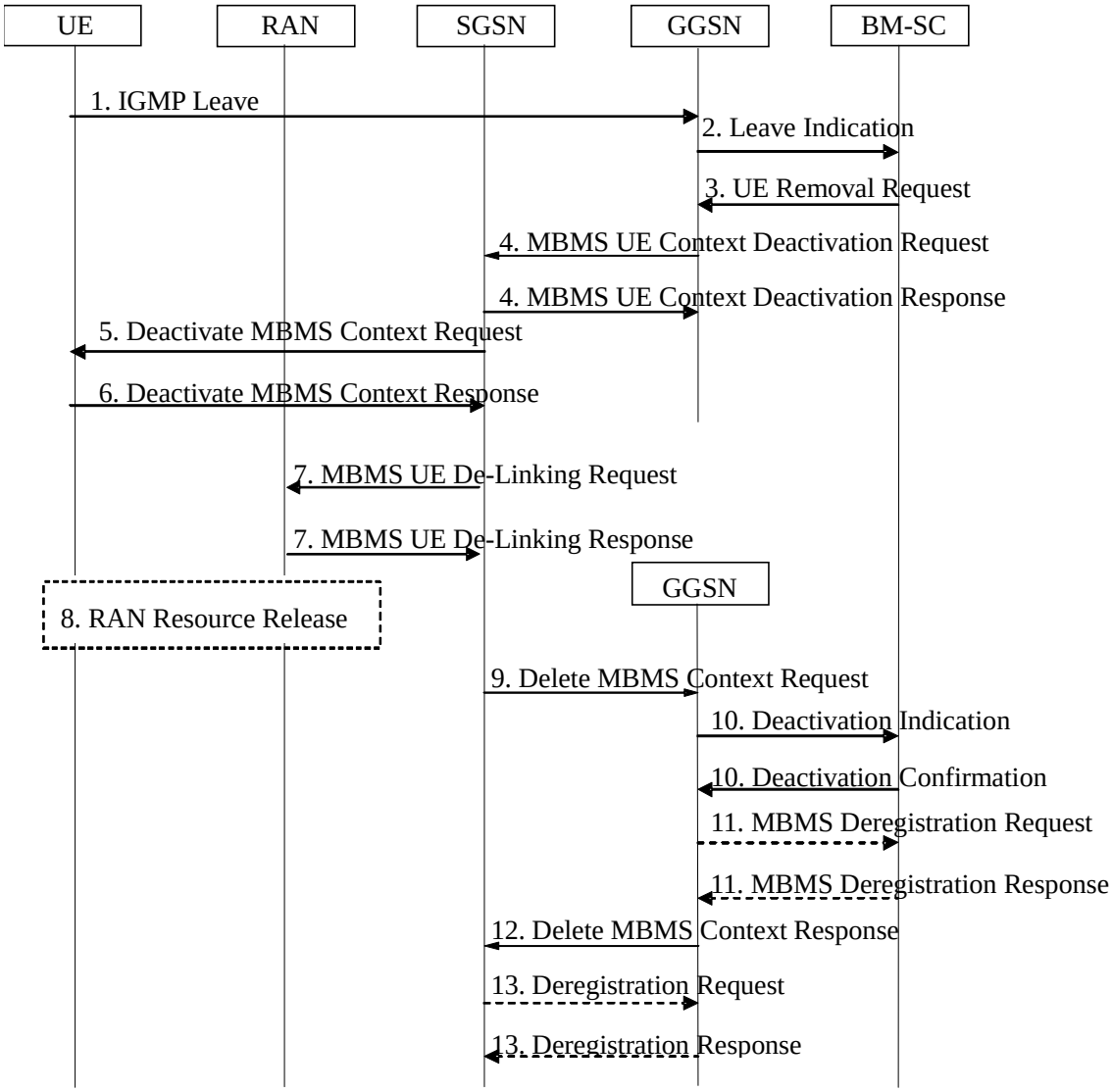


Figure 13: MBMS Multicast Service Deactivation

1. The UE sends an IGMP (IPv4) or MLD (IPv6) Leave message (here, the Leave message means Leave Group message in RFC 2236 for IGMP (IPv4) and Multicast Listener Done in RFC2710 for MLD (IPv6)) over the default PDP context to leave a particular multicast service identified by an IP multicast address.

2. The GGSN sends a Leave Indication (IP multicast address, APN,IMSI) to the BM-SC Proxy and Transport function, which forwards it to the BM-SC Membership function, indicating that the UE is requesting to leave the multicast service identified by the IP multicast address. The exact nature of the signalling between GGSN and BM-SC is specified in 3GPP TS 29.061[4].

3. Upon reception of the Leave Indication, the BM-SC Membership function verifies that the IP multicast address corresponds to a valid MBMS bearer service and sends a UE Removal Request (IP multicast address, APN, IMSI) to the GGSN that originated the Leave Indication. The APN shall be the same that was provided during service activation (see "MBMS Multicast Service Activation"). The exact nature of the signalling between GGSN and BM-SC is specified in 3GPP TS 29.061 [4]. The BM-SC Membership function may also initiate the deactivation of an MBMS UE Context for service-specific reasons (e.g. the service is terminated but the UE has not yet left the multicast group) by directly sending a UE Removal Request message to the GGSN.

4. Upon reception of the UE Removal Request or for other reasons (e.g. Error cases), the GGSN sends an MBMS UE Context Deactivation Request (IP multicast address, APN, IMSI) to the SGSN. The IP multicast address, APN and IMSI together identify the MBMS UE Context to be deleted by the SGSN. The APN is the one received in step 3. The SGSN acknowledges reception of the MBMS UE Context Deactivation Request by sending an MBMS UE Context Deactivation Response to the GGSN.

5. Upon reception of the MBMS UE Context Deactivation Request or for other reasons (e.g. due to a change in the roaming restrictions for the user) the SGSN sends a Deactivate MBMS Context Request (TI) to the UE. The TI identifies the MBMS UE Context to be deleted by the UE.

6. The UE deletes the MBMS UE Context and sends a Deactivate MBMS Context Accept (TI) to the SGSN.

7. If the UE is PMM-CONNECTED and has been already linked towards the RAN, t he SGSN sends a MBMS UE De-Linking Request to the RNC (IP multicast address, APN, TMGI). RAN deletes the MBMS UE Context and sends a MBMS UE De-Linking Response (TMGI) to the SGSN.

8. If dedicated radio resources are currently assigned to the UE for the reception of the MBMS data, the RAN releases these radio resources. If shared radio resources are currently assigned for the distribution of the MBMS data, the RAN may decide to move the remaining UEs to dedicated resources. The detailed procedures and conditions are specified in 3GPP TS 25.346 [10] and 3GPP TS 43.246 [11].

9. Upon reception of the Deactivate MBMS Context Accept or for other reasons (e.g. due to expiry of the long timer that is started upon a~~missing~~ periodic routeing area update not being received~~s~~) the SGSN sends a Delete MBMS Context Request (MBMS_NSAPI) to the GGSN that holds the MBMS UE Context. This GGSN may be different from the GGSN that receives IGMP Leave request in step 1.

10. The GGSN deletes the MBMS UE Context and sends a Deactivation Indication to the BM-SC to confirm the successful deactivation of the MBMS UE Context. The BM-SC, after receiving the Deactivation Indication, deletes the MBMS UE Context and sends a confirmation to the GGSN. The exact nature of the signalling between GGSN and BM-SC is specified in 3GPP TS 29.061[4].

11. If the GGSN does not have any more users interested in this MBMS bearer service and the "list of downstream nodes" in the corresponding MBMS Bearer Context is empty, the GGSN sends a MBMS De-Registration Request to the BM-SC Proxy and Transport function. The BM-SC Proxy and Transport function responds with a MBMS De-Registration Response and removes the identifier of the GGSN from the "list of downstream nodes" parameter in its MBMS Bearer Context. See subclause "MBMS De-Registration Procedure".

12. The GGSN confirms the deactivation of the MBMS UE Context to the SGSN by sending a Delete MBMS Context Response to the SGSN, which then deletes the MBMS UE Context.

13. If the SGSN does not have any more users interested in this MBMS bearer service and the "list of downstream nodes" in the corresponding MBMS Bearer Context is empty, the SGSN sends an MBMS De-Registration Request to the GGSN. The GGSN responds with an MBMS De-Registration Response and removes the identifier of the SGSN from the "list of downstream nodes" parameter in its MBMS Bearer Context. See subclause "MBMS De-Registration Procedure".

8.8 MBMS Session Update procedure

If the SGSN has provided a list of RAs in the MBMS Session Start Request message (even if the list was empty) and RAs are added or removed from the list, the SGSN shall use~~s~~ the MBMS Session Update procedure to inform the RNCs that the list has changed. The SGSN sends the Session Update message only to the RNCs that are affected by the list change. The procedure is used only during the session and when SGSN has already sent a MBMS Session Start Request message to the RNC.

If the SGSN has provided a list of RAs in the MBMS Session Start Request message (even if the list was empty) t~~T~~he SGSN shall~~may~~ send the Session Update to a RNC when:

- t~~T~~he first UE which have activated the service enters in a RA that is not in the list
- t~~T~~he last UE which have activated the service leaves from a RA that was in the list

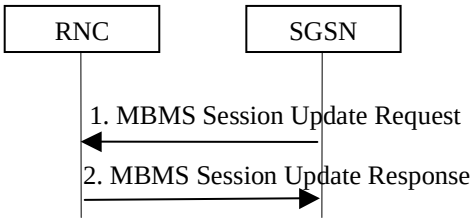


Figure 13a. Session Update procedure

1) The SGSN sends MBMS Session Update Request message to a RNC.

2) The RNC acknowledges the MBMS Session Update Request with the MBMS Session Update Response message.