ETSI TS 122 146 V15.0.0 (2019-07)

TECHNICAL SPECIFICATION

Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
LTE;
Multimedia Broadcast/Multicast Service (MBMS);
Stage 1
(3GPP TS 22.146 version 15.0.0 Release 15)

Reference

RTS/TSGS-0122146vf00

Keywords

GSM,LTE,UMTS

ETSI

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Contents

Foreword

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Introduction

Broadcast and Multicast are methods for transmitting data-grams from a single source to several destinations (point-to-multipoint). To date, release-4 and release-99 define two services in this respect:

A cell broadcast service (CBS) allowing for low bit-rate data to be transmitted to all subscribers in a set of given cells over a shared broadcast channel. This service offers a message-based service [5,6]

An IP-Multicast service allowing for mobile subscribers to receive multicast traffic. This service does not allow for multiple subscribers to share radio or core network resources and as such does not offer any advantages as far as resource utilization within the PLMN and over the radio access network. [3,4]

It is envisaged that for some applications, multiple users can receive the same data at the same time. The benefit of multicast and broadcast in the network is that the data is sent once on each link. For example, an SGSN will send data once to an RNC regardless of the number of Node Bs and UEs that wish to receive it. The benefit of multicast and broadcast on the air interface is that many users can receive the same data on a common channel, thus not clogging up the air interface with multiple transmissions of the same data.

With increasing use of high bandwidth applications in third generation mobile systems, especially with a large number of users receiving the same high data rate services, efficient information distribution is essential. Thus, broadcast and multicast are techniques to decrease the amount of data within the network and use resources more efficiently

1 Scope

This Technical specification defines the stage one description of the Broadcast and Multicast Services for the 3GPP System. Stage one is the set of requirements which shall be supported for the provision of Broadcast and Multicast services, seen primarily from the subscriber's and service providers' points of view.

Note: Non-3GPP access systems may provide MBMS transport service, but this is not in the scope of this specification.

This TS includes information applicable to network operators, content providers, and terminal and network manufacturers.

This TS contains the core requirements for Multicast and Broadcast Services, which are sufficient to provide a complete service.

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] RFC 1112: "Host extensions for IP multicasting", RFC 1920:" Internet official protocol standards", RFC 1458: "Requirements for multicast protocols", RFC 1301: "Multicast transport protocol"

[3] 3GPP TS 22.060: "General Packet Radio Service (GPRS); Service description; Stage 1".

[4] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[5] 3GPP TS 25.324: "Broadcast/Multicast Control BMC"

[6] 3GPP TS 23.041: "Technical Realization of Cell Broadcast Service (CBS)"

[7] 3GPP TS 22.246: "MBMS User Services".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the definitions in 3GPP TR 21.905 [1] as well as the following definitions apply.

Broadcast service area: The area in which a specific broadcast service is available. It is defined individually per broadcast service. The broadcast service area may represent the coverage area of the entire PLMN, or part(s) of the PLMN's coverage area. The broadcast service area is the sum of all local broadcast areas offering the same service.

Local Broadcast Area: The area of a broadcast service, where the service content is the same. One broadcast service may have different content in different local broadcast areas.

Broadcast mode: The part of MBMS that supports broadcast services.

Broadcast service: A unidirectional point-to-multipoint service in which data is efficiently transmitted from a single source to multiple UEs in the associated broadcast service area. Broadcast services may be received by all users who have enabled the specific broadcast service locally on their UE and who are in the broadcast area defined for the service.

Broadcast session: A continuous and time-bounded reception of a broadcast service by the UE. A single broadcast service can only have one broadcast session at any time. A broadcast service may consist of multiple successive broadcast sessions.

Mobile Station (MS): Defined in 3GPP TS 24.002. (The abbreviation "UE" in this specification refers both to MS and User Equipment.)

Multicast transmission activation: The process by which the network activates the transmission of Multicast data.

Multicast service area: The area in which a specific multicast service is available. It is defined individually per multicast service. The multicast service area may represent the coverage area of an entire PLMN, or part(s) of the PLMN's coverage area. The multicast service area is the sum of all local multicast areas offering the same service.

Local multicast area: The area of a multicast service, where the service content is the same. One multicast service may have different content in different local multicast areas.

Multicast mode: The part of MBMS that supports multicast services.

Multicast joining: The process by which a user joins a multicast group.

Multicast session: A continuous and time-bounded reception of a multicast service by the UE. A single multicast service can only have one multicast session at any time. A multicast service may consist of multiple successive multicast sessions.

Multimedia Broadcast/Multicast Service (MBMS): A unidirectional point-to-multipoint service in which data is transmitted from a single source entity to a group of users in a specific area. The MBMS has two modes: Broadcast mode and Multicast mode.

Multicast group: A group of users that have an activated MBMS in multicast mode and therefore are ready to or are receiving data transmitted by this service. The multicast group is a subset of the **Multicast subscription group**. Multicast subscription group members may join the corresponding multicast group.

Multicast service: A unidirectional point-to-multipoint service in which data is efficiently transmitted from a single source to a multicast group in the associated multicast service area. Multicast services can only be received by such users that are subscribed to the specific multicast service and have joined the multicast group associated with the specific service.

Multicast subscription: The process by which a user subscribes or is subscribed to a multicast subscription group and thereby is authorised to join certain multicast services. Multicast subscription is performed either upon user selection or due to home environment initiation.

Multicast Subscription Group: A group of users who are subscribed to a certain MBMS in multicast mode and therefore authorised to join and receive multicast services associated with this group.

User Equipment: defined in TS 21.905. An occurrence of a User Equipment is an MS for GSM as defined in TS 24.002.

3.2 Abbreviations

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

MBMS	Multimedia Broadcast/Multicast Service
MS	Mobile Station
UE	User Equipment

4 General description of a multimedia broadcast/multicast service (MBMS)

Point to multipoint services exist today which allow data from a single source entity to be transmitted to multiple endpoints. These services are expected to be used extensively over wireless networks, hence there is a need for a capability in the PLMN to efficiently support them. The Multimedia Broadcast/Multicast Service (MBMS) will provide this capability for such broadcast/multicast services provided by the home environment and other VASPs.

The MBMS is a unidirectional point to multipoint bearer service in which data is transmitted from a single source entity to multiple recipients. It is anticipated that other services will use these bearer capabilities.

MBMS also enables an IMS application located on an application server to send multimedia to a set of IMS users in the service area by means of MBMS bearer service.

3GPP has defined two modes of operation:

- the broadcast mode

- the multicast mode.

4.1 MBMS broadcast mode

The broadcast mode is a unidirectional point-to-multipoint transmission of multimedia data (e.g. text, audio, picture, video) from a single source entity to all users in a broadcast service area. The broadcast mode is intended to efficiently use radio/network resources e.g. data is transmitted over a common radio channel. Data is transmitted in the broadcast service area as defined by the network (Home environment).

MBMS data transmission should adapt to different RAN capabilities or different radio resource availability, e.g. by reducing the bitrate of the MBMS data. The selection and description of an appropriate mechanism is subject to MBMS stage 2.

Figure 1 gives an example of how a network can be configured to broadcast a variety of high bit rate services to users within the associated broadcast service area.

A broadcast service received by the UE, involves one or more successive broadcast sessions. A broadcast service might, for example, consist of a single on-going session (e.g. a media stream) or may involve several intermittent sessions over an extended period of time (e.g. messages).
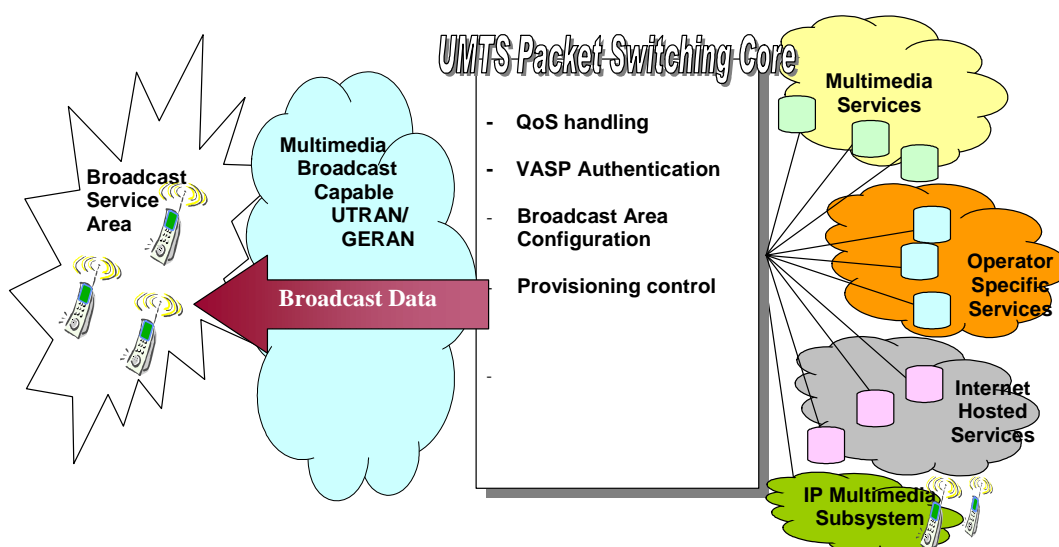

Figure 1: Example of Multicast Broadcast Mode Network

The broadcast mode should not be confused with the existing Cell Broadcast service (CBS) which is currently used for low bit rate services (messaging) whilst the broadcast mode enables the broadcast of multimedia services (Audio, Video etc).

An example of a service using the broadcast mode could be advertising or a welcome message to the network. As not all users attached to the network may wish to receive these messages then the user shall be able to enable/disable the reception of these broadcast service on his UE.

The broadcast mode differs from the multicast mode in that there is no specific requirement to activate or subscribe to the MBMS in broadcast mode.

The broadcast mode should allow terminals to minimise their power consumption.

It is expected that charging data for the end user will not be generated for this mode at MBMS Transport Service layer. Charging data related to security procedures for the end user at MBMS User Service layer may be generated, cf. clause 7. The reception of the traffic in the broadcast mode is not guaranteed. The receiver may be able to recognize data loss.

4.2 MBMS multicast mode

The multicast mode allows the unidirectional point-to-multipoint transmission of multimedia data (e.g. text, audio, picture, video) from a single source point to a multicast group in a multicast service area. The multicast mode is intended to efficiently use radio/network resources e.g. data is transmitted over a common radio channel. Data is transmitted in the multicast service area as defined by the network (Home environment). In the multicast mode there is the possibility for the network to selectively transmit to cells within the multicast service area which contain members of a multicast group.

MBMS data transmission should adapt to different RAN capabilities or different radio resource availability, e.g. by reducing the bitrate of the MBMS data. The selection and description of an appropriate mechanism is subject to MBMS stage 2.

A multicast service received by the UE, involves one or more successive multicast sessions. A multicast service might, for example, consist of a single on-going session (e.g. a multimedia stream) or may involve several intermittent multicast sessions over an extended period of time (e.g. messages).

An example of a service using the multicast mode could be a football results service for which a subscription is required.

Unlike the broadcast mode, the multicast mode generally requires a subscription to the multicast subscription group and then the user joining the corresponding multicast group. The subscription and group joining may be made by the PLMN operator, the user or a third party on their behalf (e.g. company). Unlike the broadcast mode, it is expected that charging data for the end user will be generated for this mode at MBMS Transport Service layer. Charging data related to security procedures for the end user at MBMS User Service layer may be generated, cf. clause 7.
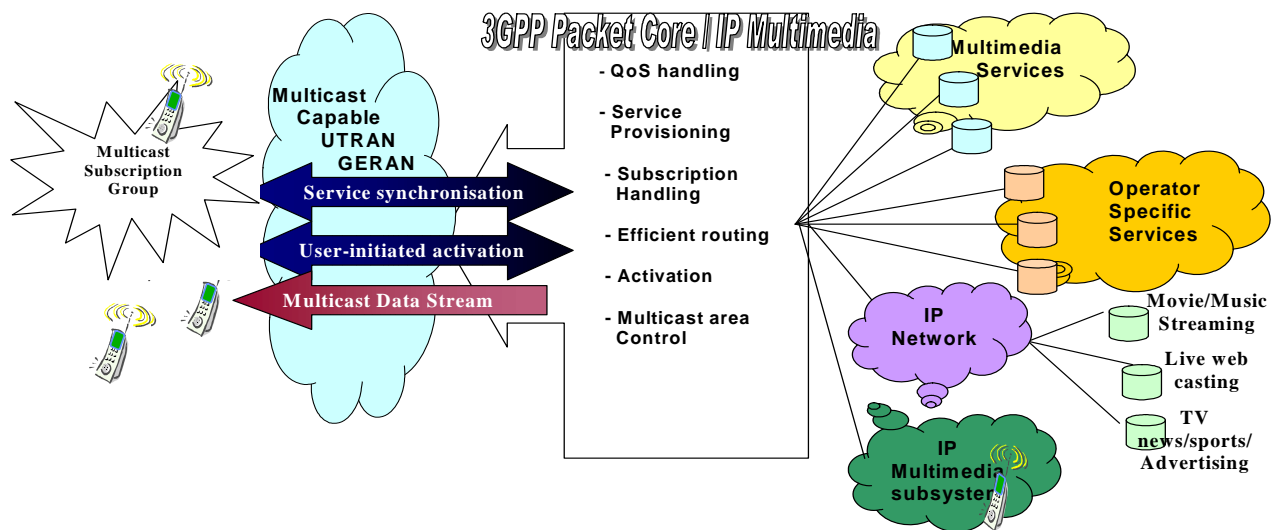
Figure 2: Example of Multicast Mode Network

Reception of multicast services cannot be guaranteed over the access network. For many applications and services guaranteed data reception may be carried out by higher layer services or applications which make use of MBMS.

Multicast mode should allow terminals to minimise their power consumption.

The multicast mode defined in this specification should not be confused with IP Multicast (RFC s 1112, 1301, 1458, 1920 [2]). There are similarities between these two services and such similarities may be exploited in 3GPP networks given that 3GPP multicast mode has been defined with consideration to maximizing efficiency on the radio interface and of network resources.

Multicast mode shall be inter-operable with IETF IP Multicast. This could allow the best use of IP service platforms to help maximize the availability of applications and content so that current and future services can be delivered in a more resource efficient manner. Figure 2 above shows a general high level overview of multicast mode network.

4.2.1 Multicast subscription and reception

The following is the expected sequence for the user to be able to access the MBMS multicast mode:

1   The user subscribes or is subscribed to a multicast subscription group which is uniquely identified and thereby becomes a member of that group. The subscription may be continuous (e.g. as defined by the subscriber's contract), time-limited, or generated by the subscriber on a one-time basis. The subscription to multicast services shall not be further standardized.

2   The user discovers, or becomes aware (e.g. via service announcements), that there are multicast services currently active, or multicast services that will become active at some time later, at the user's current location.

3a) The user selects a multicast service and hence the user joins the corresponding multicast group. The user should be able to join a multicast service as soon as possible after announcement of the service.

3b) As an alternative, the Home Environment can join the user to the selected multicast group on behalf of the user, that has previously subscribed to this multicast group.

Signalling exchange between the UE and the network might not be necessary in some cases, e.g. in the case of network congestion.

4   If the transmission is not already in progress the network starts transmitting the corresponding multicast content. Alternatively, the transmission may start at a later time.

5   The network may optionally select to set up unicast (point to point) connections to some users e.g. if there are insufficient users to justify multicasting

6   The UE starts receiving the multicast data associated with the multicast group(s) it has joined

7   The user may choose to stop receiving a selected multicast service and thereby leaves the multicast group. The user may also select to continue (or not) to receive service announcements for this multicast subscription group.

8   The user may unsubscribe or be unsubscribed from the multicast subscription group and stop receiving both the multicast data and future service announcements for this multicast subscription group.

The home environment shall be able to remove a user from a multicast group (deactivation) and if required remove the subscriber from the multicast subscription group (un-subscription). This is required to allow the operator to bar service.

4.3   Discovery and announcement of MBMS services

The user shall be able to find out or be informed about MBMS services available in the network. The network shall support service announcements both for the broadcast and multicast mode of MBMS in order to enable the user to be informed about the MBMS services available currently, or some time later.. Users should also be able to discover and monitor MBMS service availability e.g. using a URL.

5   High level requirements

5.1   Broadcast mode

5.1.1   Home environment requirements

-    Broadcast services

    The PLMN operator shall be able to provision one or more broadcast services within his PLMN.

    The operators sharing a network shall be able to provide one or more broadcast services for their own subscribers and inbound roamers from roaming partners only. This shall be applicable for sharing of radio network and for sharing of radio network and the core network entities connected to the radio network.

    A broadcast area is configured individually for each broadcast service. Broadcast areas associated with different broadcast services are independent of each other and may overlap.

    A broadcast service shall be able to distribute different content data to different locations, i.e. local broadcast areas, within the broadcast service area as shown in figure 3. This allows the user to receive broadcast data depending on his location (e.g. a "nationwide traffic service" with localized traffic reports). Only one location specific version of content data is distributed to each of the individual local broadcast areas, i.e. in any location a user will never receive different content data from a single broadcast service.

    It shall be possible to define a broadcast service for only the subscribers and inbound roamers of one of the operators sharing network. The broadcast services transmitted in a broadcast service area of operator A shall only be available to the subscribers and inbound roamers of operator A. The broadcast areas of different sharing operators may cover the same geographical area. This shall be applicable for sharing of radio network and for sharing of radio network and the core network entities connected to the radio network.
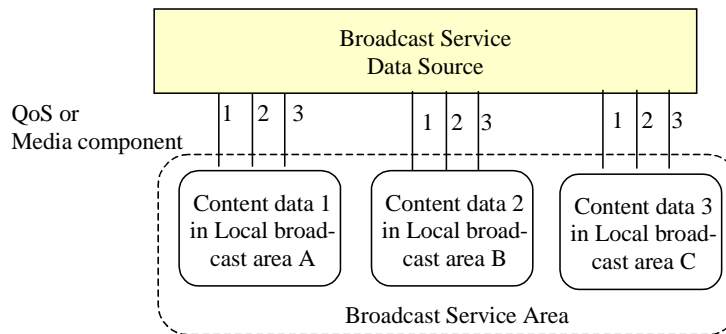
Figure 3 Broadcast Service with different content data for different locations

- Quality of service

    The PLMN operator shall be able to configure the quality of service for each individual broadcast service. It should be possible to adapt the MBMS data transmission to different RAN capabilities or different radio resource availability.

    The home environment shall be able to set priority to select which simultaneous broadcast services are supported when there is a limit on the resources available.-

- Network and radio efficiency

    The PLMN operator shall be able to use network and radio resources in an efficient manner.

NOTE: Allocation of resources based on actual need in the broadcast service area is not applicable for the broadcast mode.

    The operator shall be able to schedule a certain broadcast service at pre-determined times.

- Types of data services

    MBMS in The broadcast mode shall be transparent for the transferred data packets independent of the type of service being transmitted, will support a number of services, and permit support of and therefore transfer all data types e.g. Audio, Data, Video or combinations thereof. A minimum number of data types may need to be identified to enable interoperability.

- Sources of data services

    In addition to supporting their own broadcast services the PLMN shall as well support broadcast services from third parties (i.e. HE-VASPs or VASPs or IMS server)

- Broadcast service announcements

    The PLMN operator shall be able to provide service announcements for a broadcast service within and outside of the broadcast area defined for the service.

5.1.2   User requirements for MBMS

- User mobility

    The user shall be able to continue receiving broadcast services throughout the broadcast service area. For example, in case of handover and presuming that a certain broadcast service is offered in the target cell, it should be possible for the user to continue receiving the service in the target cell.

- User selectivity

    The user shall be able to discover what broadcast services are available at the user's current location and outside of the current location.

 The user shall be able to enable/disable the reception of specific broadcast services and can receive simultaneously more than one MBMS service.

The user may be able to define service preference for reception. A priority procedure may be implemented to allow the user to select between simultaneous broadcast services e.g. while receiving commercial broadcast service a new broadcast service may interrupt this.

While receiving one or more broadcast services, it shall be possible for the user to be informed about incoming voice calls or the availability of other MBMS services.

Dependent on terminal capabilities, it shall be possible for the user to participate in other services, while simultaneously participating in MBMS services. For example the user can originate or receive a call or send and receive messages whilst receiving advertisements.

5.2 Multicast mode

5.2.1 Home environment requirements

- Multicast services

The PLMN operator shall be able to provision one or more multicast services. A multicast area is configured individually for each multicast service. Multicast areas associated with different multicast services are independent of each other and may overlap.

Multicast service areas may cover part(s) of one or more PLMNs.

 A multicast service shall be able to distribute different content data to different locations, i.e. local multicast areas, within the multicast service area as shown in figure 4. This allows the user to receive multicast data depending on his location (e.g. a "nationwide traffic service" with localized traffic reports) Only one version of location specific content data is distributed to each of the individual local multicast areas, i.e. in any location a user will never receive different content data from a single multicast service.
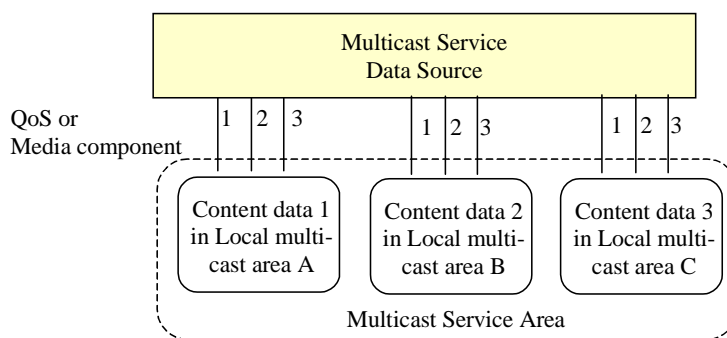

Figure 4 Multicast Service with different content data for different locations

- Multicast subscription groups and multicast groups

The PLMN operator shall be able to provision one or more multicast subscription groups. The home environment shall be able to make a user a member of a multicast subscription group (subscription).

On receipt of a request to join a multicast group, the PLMN shall check that the user is a member of the applicable multicast subscription group. The home environment shall be able to join users to the multicast group e.g. at the request of the subscriber.

- Quality of service

The PLMN operator shall be able to configure the quality of service for individual multicast services. It should be possible to adapt the MBMS data transmission to different RAN capabilities or different radio resource availability.

As part of the same service, it should be possible for the operator to provide the UEs with multiple successive sessions with different quality-of-service for each session.

The home environment shall be able to set priority to select which simultaneous multicast services are supported when there is a limit on the resources available.

- Network and radio efficiency

The PLMN operator shall be able to use network and radio resources in an efficient manner.

Within the multicast service area, the network may distribute the data across the whole multicast service area or parts of the area. The decision to distribute to only parts of the multicast service area may be based on: a) multicast group members are present in a given part of the multicast area b) resources are not available in parts of the multicast service area.

The operator shall be able to schedule a certain multicast service at pre-determined times.

- Types of services

The multicast mode shall be independent of the type of service being transmitted, will support a number of services, and permit support of all data types e.g. Audio, Data, Video or combinations thereof. A minimum number of data types may need to be identified to enable interoperability

- Sources of services

In addition to supporting their own multicast services the PLMN shall as well support multicast services by third parties (i.e. HE-VASPs or VASPs or IMS server).

- Multicast service announcements

The PLMN operator shall be able to provide service announcements for a multicast service within and outside of the multicast area defined for the service.

5.2.2 User requirements for MBMS

- User mobility

The user shall be able to continue receiving multicast services throughout the multicast service area in which the service is provided. For example, in case of handover and presuming that a certain multicast service is offered in the target cell, it should be possible for the user to continue the session in the target cell. It is possible that data loss will occur due to user mobility.

- User selectivity

The user shall be able to discover what multicast services are available at the user's current location and outside of the current location. The user shall be able to select between different multicast services provided to the user and can receive simultaneously more than one MBMS service.

The user may be able to define service preference for reception. A priority procedure may be implemented to allow the user to select between simultaneous broadcast/multicast services e.g. while receiving commercial broadcast service a new multicast service may interrupt this.

While receiving PS or CS services, it shall be possible for the user to receive notification of MBMS multicast sessions.

Note: This may depend on the capability of the UE in some access system.

While receiving one or more multicast services it shall be possible for the user to be informed about incoming voice calls or the availability of other MBMS services.

Dependent on terminal capabilities, it shall be possible for the user to participate in other services, while simultaneously participating in MBMS services. For example the user can originate or receive a call or send and receive messages whilst receiving MBMS video content.

- Multicast subscription groups and multicast groups

The subscriber shall be able to subscribe to or unsubscribe from a multicast subscription group. (The subscription mechanism is outside the scope of this TS.)

The user shall be able to join a multicast group only if he is a member of the applicable multicast subscription group. The user shall be able to leave a multicast group if he is a member of that group.

5.3 Availability

If provided by the network MBMS in broadcast mode shall be available to all users in the broadcast service areas that are registered/attached to a PLMN.

If provided by the network, MBMS in multicast mode shall be available to all users that are registered/attached to a PLMN.

MBMS services (multicast or broadcast mode) shall be available via GERAN, UTRAN, E-UTRAN.

It is possible to prevent access to the content of the MBMS multicast / broadcast data by UEs that do not register to the PLMNs that deliver the MBMS service (including case when these PLMNs and the RPLMN of the UE are part of the same network sharing infrastructure). Access prevention could be done by application layer means (e.g. application layer ciphering).

Within the broadcast or multicast service area, it shall be possible to inform users of up-coming MBMS sessions which they may receive. This may be useful e.g. to initiate UE processes for the reception of MBMS data.

In case of roaming a user should also be able to subscribe and join Multicast Services that are provided in the home network and visited network, as allowed by the user's home environment.

6 Security

It shall be possible to ensure that only those users who are entitled to receive a specific MBMS service may do so. It should be possible to choose whether a given MBMS service is to be delivered with or without ensured group security.

If a terminal supports MBMS, then it shall support UICC based key management and all the function and interfaces required for it. In addition, ME key management shall be supported. If the UICC is capable of MBMS key management, ME key management shall not be activated.

7 Charging

7.1 Broadcast mode

It shall be possible to collect charging information for the transmission of broadcast services to enable billing of broadcast services providers e.g. billing 3rd parties for advertising.

Examples of the type of the charging information that could be collected include:

- usage duration

- volume of contents

The above list of possible charging mechanisms is neither complete nor exhaustive.

It shall be possible to collect subscriber charging information for the end user (including roaming situations) based on security procedures (e.g. key management) for the receipt of broadcast data on a per broadcast service basis.

7.2 Multicast mode

It shall be possible to collect charging information for the transmission of multicast services to enable billing of multicast services providers e.g. billing 3rd parties for advertising.

It shall be possible to collect subscriber charging information (including roaming) for the use of the multicast mode (e.g. to enable billing to multicast services providers), as well as for the receipt of multicast data (e.g. users), on a per multicast service basis. On-line charging for multicast services should be possible as well.

Examples of the type of the charging information that could be collected include:

- multicast session duration

- time when joining and leaving a multicast subscription group, duration of membership to a multicast subscription group

- time when joining and leaving a multicast group, duration of membership to a multicast group

- multicast session volume of contents

The above list of possible charging mechanisms is neither complete nor exhaustive.

Billing issues are out of scope of this TS.

Annex A (informative):
MBMS Bit Rates

Application bit rates for user services provided over MBMS are detailed within the stage 1 specification for 3GPP TS 22.246 "MBMS User Services" [7].

Annex B (informative):
Change history

								Change history			
TSG SA#	**SA Doc.**	**SA1 Doc**	**Spec**	**CR**	**Rev**	**Rel**	**Cat**	**Subject/Comment**	**Old**	**New**	**WI**
	SA1#13		22.146					Creation of TS		0.1.0	MBMS
	SA1#13		22.146					Output version from SA1 #13	0.1.0	1.0.0	MBMS
	SA1 #13		22.146					Raised to version 2.0.0 for approval at SA #13	1.0.0	2.0.0	MBMS
SP-13	SP-010443	S1-010858	22.146					Approved at SA #13	2.0.0	5.0.0	MBMS
SP-14	SP-010678	1077	22.146	002	2	Rel-5	F	Proposed CR on changes to definitions in 22.146	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1305	22.146	003	3	Rel-5	B	Proposed CR on clarification of reliable transmission	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1075	22.146	005	1	Rel-5	F	Proposed CR on clarifications of the availability of MBMS	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1303	22.146	006	2	Rel-5	F	Proposed CR on Clarification on MBMS applicability in Gb mode	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1306	22.146	009	2	Rel-5	F	Proposed CR on data loss during handover	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1076	22.146	011	1	Rel-5	C	Proposed CR on optional privacy assurance for Multicast services	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1304	22.146	018	2	Rel-5	F	Proposed CR to 22.146: High level Diagrams of MBMS	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1065	22.146	019		Rel-5	F	CR Clarifying Service Requirements on Multicast and Broadcast Areas	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1326	22.146	020	2	Rel-5	F	Proposed CR to 22.146 MBMS	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1225	22.146	021		Rel-5	B	Multiple Areas for Multicast and Broadcast Services	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1309	22.146	022	1	Rel-5	F	MBMS service discovery	5.0.0	5.1.0	MBMS
SP-14	SP-010678	1020	22.146	023		Rel-5	F	CR to 22.146 (MBMS) UE and MS definition	5.0.0	5.1.0	MBMS
SP-15	SP-020057	S1-020125	22.146	024		Rel-5	F	CR 22.146 Rel. 5 F Area Specific QoS for Broadcast and Multicast Services	5.1.0	5.2.0	MBMS
SP-15	SP-020057	S1-020128	22.146	025		Rel-5	F	CR 22.146 Rel. 5 F Clause 4.2 Multicast mode	5.1.0	5.2.0	MBMS
SP-15	SP-020057	S1-020133	22.146	026		Rel-5	F	CR 22.146 Rel. 5 F Addition of MBMS multicast mode and broadcast mode definitions	5.1.0	5.2.0	MBMS
SP-15	SP-020057	S1-020563	22.146	027		Rel-5	B	Proposed CR on MBMS Broadcast and Multicast Sessions	5.1.0	5.2.0	MBMS
SP-15	SP-020057	S1-020565	22.146	028		Rel-5	B	Power consumption minimisation for MBMS	5.1.0	5.2.0	MBMS
SP-15	SP-020057	S1-020646	22.146	029		Rel-5	F	CR to 22.146 (MBMS stage 1) 'Editorial Change'	5.1.0	5.2.0	MBMS
SP-15	SP-020045	S1-020457	22.146	030	-	Rel-5	F	Editorial CR to correct terms and references	5.1.0	5.2.0	CORRECT
SP-16	SP-020257	S1-020892	22.146	031		Rel-6	C	Proposed CR on Multicast Joining Outside the Multicast Area	5.2.0	6.0.0	MBMS
SP-16	SP-020257	S1-021180	22.146	032		Rel-6	F	CR to 22.146: Clarification of requirement related to paging messages	5.2.0	6.0.0	MBMS
SP-17	SP-020561	S1-021473	22.146	033		Rel-6	B	Support of simultaneous services in MBMS	6.0.0	6.1.0	MBMS
SP-17	SP-020561	S1-021472	22.146	034		Rel-6	F	Proposal for Amalgamation of 1279, 1334, 1291	6.0.0	6.1.0	MBMS
SP-17	SP-020561	S1-021471	22.146	035		Rel-6	B	Proposed CR to 22.146: addition of QoS information	6.0.0	6.1.0	MBMS
SP-17	SP-020561	S1-021469	22.146	036		Rel-6	F	MBMS Editorial CR	6.0.0	6.1.0	MBMS
SP-17	SP-020561	S1-021483	22.146	037		Rel-6	F	Proposed CR 22.146 on MBMS	6.0.0	6.1.0	MBMS

								Availability			
SP-17	SP-020561	S1-021481	22.146	038		Rel-6	C	Proposed CR to 22.146: Multicast service discovery	6.0.0	6.1.0	MBMS
SP-17	SP-020561	S1-021475	22.146	039		Rel-6	B	CR to 22.146 on MBMS Charging	6.0.0	6.1.0	MBMS
SP-19	SP-030026	S1-030154	22.146	040	-	Rel-6	C	CR to 22.146 - MBMS Cell broadcast in shared network	6.1.0	6.2.0	MBMS
SP-22	SP-030705	S1-031010	22.146	041	-	Rel-6	F	Alignment of MBMS use cases and bit rates	6.2.0	6.3.0	MBMS
SP-23	SP-040094	S1-040225	22.146	042	-	Rel-6	F	Clarification on user requirements for notification of multicast sessions	6.3.0	6.4.0	MBMS
SP-24	SP-040291	S1-040518	22.146	043	-	Rel-6	F	Addition of a concept regarding UE joining time	6.4.0	6.5.0	MBMS
SP-25	SP-040504	S1-040706	22.146	044	-	Rel-6	F	Rel-6 removal of notification requirement while receiveing PS or CS services	6.5.0	6.6.0	MBMS
SP-25	SP-040696	-	22.146	045	1	Rel-6	F	Key management priority for MBMS services	6.5.0	6.6.0	MBMS
SP-30	SP-050742	S1-051233	22.146	0046	-	Rel-7	B	Enabling IMS to use the MBMS bearer service	6.6.0	7.0.0	MBMSE
SP-31	SP-060019	S1-060305	22.146	0048	-	Rel-7	A	Alignment of 22.146 with MBMS stage 3	7.0.0	7.1.0	MBMS
SP-32	SP-060309	S1-060610	22.146	0049	-	Rel-8	B	Extends MBMS bearers to all 3GPP systems	7.1.0	8.0.0	MBMSE
SP-33	SP-060465	S1-060934	22.146	0051	-	Rel-8	A	Relaxing the current requirement that suggests a mandatory support for MBMS	8.0.0	8.1.0	MBMSE
SP-35	SP-070116	S1-070288	22.146	0052	-	Rel-8	B	Requirement of MBMS Service Subscription for Roaming Users	8.1.0	8.2.0	MBMSE
SP-36	SP-070360	S1-070788	22.146	0055	3	Rel-8	F	Explicitly define the functiion	8.2.0	8.3.0	MBMS
SP-36	SP-070361	S1-070644	22.146	0056	-	Rel-8	F	Broadcast service priority	8.2.0	8.3.0	MBMS
SP-40	SP-080306	S1-080722	22.146	0058	1	Rel-9	F	Addition of the support of eMBMS in Rel-9	8.3.0	9.0.0	AIPN-SAE
2011-03	-	-	-	-	-	-	-	Update to Rel-10 version (MCC)	9.0.0	10.0.0	
SP-54	SP-110810	S1-113183	22.146	0061	1	Rel-10	F	MBMS reception	10.0.0	10.1.0	TEI10
SP-59	-	-	-	-	-	-	-	Updated to Rel-11 version by MCC. Since an unofficial v.11.0.0 had circulated, the first Rel-11 official version is numbered v.11.1.0	10.1.0	11.1.0	
2014-10	-	-	-	-	-	-	-	Update to Rel-12 version (MCC)	11.1.0	12.0.0	
2015-12	-	-	-	-	-	-	-	Updated to Rel-13 by MCC	12.0.0	13.0.0	
2017-03	-	-	-	-	-	-	-	Updated to Rel-14 by MCC	13.0.0	14.0.0	
2019-07	-	-	-	-	-	-	-	Update to Rel-15 version (MCC)	14.0.0	15.0.0	

History

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V15.0.0	July 2019	Publication