Technical Specification Group Services and System Aspects
Meeting #13, Beijing, China, 24-27 September 2001

TSGS#13(01)0443

Source:	**SA1**
Title:	**Stage 1 description of Multimedia Broadcast/Multicast Service (22.146 v2.0.0) for approval**
Document for:	**Approval**
Agenda Item:	**7.1.3**

3GPP TS 22.146 V2.0.0 (2001-09)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects;
Multimedia Broadcast/Multicast Service;
Stage 1
(Release 5)

Keywords
UMTS, service, multicast, broadcast

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword....4
Introduction....4
1 Scope....5
2 References....5
3 Definitions, symbols and abbreviations....5
3.1 Definitions....5
3.2 Abbreviations....6
4 General description....6
4.1 Multimedia broadcast/multicast service (MBMS)....6
4.1.1 Introduction....6
4.1.2 MBMS broadcast mode....6
4.1.3 MBMS multicast mode....7
4.1.3.1 Subscription and Activation....7
5 High level requirements....7
5.1 Broadcast mode....7
5.1.1 Home environment requirements....7
5.1.2 User requirements for MBMS....8
5.2 Multicast mode....8
5.2.1 Home environment requirements....8
5.2.2 User requirements for MBMS....9
5.3 Availability....10
6 Security....10
7 Charging....10
7.1 Broadcast mode....10
7.2 Multicast mode....10
Annex A (informative): Change history....12

Foreword

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

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

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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 UMTS (UTRAN and GERAN). 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.

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

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

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

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

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions 3GPP TR 21.905 [1] apply.

Broadcast area: a geographical area in which the broadcast service is available. The broadcast area may represent the entire PLMN, or a subset of it.

Broadcast mode: the mode of the Multimedia Broadcast/Multicast service which provides efficient support within the PLMN of broadcast services.

Broadcast service: the end user service that is supported by the broadcast mode of Multimedia Broadcast/Multicast service.

Multicast activation: The process by which a user joins a multicast group as a member and hence activates reception of multicast data transmitted as part of a multicast mode MBMS service. Multicast activation is performed either upon user selection of a multicast service or due to home environment initiated activation.

Multicast area: a geographical area in which the multicast service is available. The multicast area may represent an entire PLMN, may span several PLMNs, or may be a subset of a PLMN.

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. When using MBMS all group members in a area may receive the same data over a common radio channel.

Multicast group: A group of users that are ready to or are receiving any multicast traffic transmitted as part of a multicast mode MBMS service. The multicast group is a subset of the **Multicast subscription group**. Multicast subscription group members join the multicast group by activating the multicast service.

Multicast service: the end user service that is supported by the multicast mode of Multimedia Broadcast/Multicast service.

Multicast subscription: The process by which a user subscribes or is subscribed to a multicast service and multicast subscription group and thereby is authorised to activate certain multicast services.

Multicast Subscription Group: A group of users who have been subscribed to a multicast mode MBMS service and are therefore authorised to activate and receive multicast services associated with this group.

3.2 Abbreviations

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

MBMS Multimedia Broadcast/Multicast Service

4 General description

4.1 Multimedia broadcast/multicast service (MBMS)

4.1.1 Introduction

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 an unidirectional point to multipoint service in which data is transmitted from a single source entity. There are two modes of operation:

- the broadcast mode

- the multicast mode.

NOTE: The reception of the traffic in the multicast and broadcast modes is not guaranteed. If this is required, it may be built into the application layer and hence is outside the scope of this TS.

4.1.2 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 area or areas. The broadcast mode is intended to efficiently

use radio/network resources e.g. it could transmit the data over a common radio channel. Data is transmitted to broadcast areas as defined by the network (Home environment).

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 may have the option to enable/disable the reception of these broadcast.

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

It is expected that charging data for the end user will not be generated for this mode.

4.1.3 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 area. The multicast mode is intended to efficiently use radio/network resources e.g. it could transmit the data over a common radio channel. Data is transmitted to multicast areas 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 area which contain members of a multicast group.

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 activation of the service. The subscription and activation maybe made by 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.

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

4.1.3.1 Subscription and Activation

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

1 The user must subscribe or be subscribed to a multicast subscription group and thereby becomes a member of that group.

2 The user must activate or the Home Environment must activate on behalf of the user the selected service and hence join the multicast group.

3. The user may leave the multicast group, i.e. select to stop receiving the data.

4. The subscriber may unsubscribe from the service and hence leave the multicast subscription group.

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

5 High level requirements

5.1 Broadcast mode

5.1.1 Home environment requirements

- Broadcast areas

The PLMN operator shall be able to provision one or more broadcast areas to support broadcast services. It shall be possible to provision and transmit one or more broadcast services for each broadcast area.

The broadcast area may be smaller than a cell.

An operator should also be able to control the size of Broadcast Area according to the traffic congestion or radio resources in the cell.

- Quality of service

The PLMN operator shall be able to configure the quality of service for individual broadcast services.

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 e.g. in the case of traffic congestion, select which service is downgraded.

- 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 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 services

The broadcast mode shall be independent of the type of service being transmitted, and permit support of all data types e.g. Audio, Data, video. A minimum number of data types may need to be identified to enable interoperability.

- Sources of 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)

5.1.2 User requirements for MBMS

- User mobility

The user shall be able to continue receiving broadcast services throughout the broadcast 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 the session in the target cell.

- User selectivity

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

5.2 Multicast mode

5.2.1 Home environment requirements

- Multicast areas

The PLMN operator shall be able to provision one or more multicast areas to support multicast services. It shall be possible to provision and transmit one or more multicast services for each multicast area.

The size of the multicast area may be smaller than a cell.

An operator should also be able to control the size of Multicast Area e.g. according to the traffic congestion or radio resources in an individual cell, set of cells within the multicast area.

- 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 identify and assign members of a multicast subscription group. The home environment shall be able to assign a multicast subscription group to a multicast service. The home environment shall be able to accept or reject an application to join a multicast subscription group.

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.

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 e.g. in the case of traffic congestion, select service is blocked.

- Network and radio efficiency

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

Within the multicast area, the network may distribute the data across the whole multicast area or parts of the area. The decision to distribute to only parts of the multicast 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 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, and permit support of all data types e.g. Audio, Data, video. 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).

5.2.2 User requirements for MBMS

- User mobility

The user shall be able to continue receiving multicast services throughout the multicast area.. 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.

Editor's note: Is loss of data during change of cell acceptable?

- User selectivity

The user shall be able to select between different multicast services provided to the user and can receive simultanously more than one 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.

- 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 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

In general, multicast or broadcast services should be available for all users that are registered in a PLMN. This should include UEs in idle/standby and connected/ready modes.

Availability of a service might not be uniform over the whole broadcast/multicast area at any given time, but can differ from one cell to another depending on available resources. (e.g. no service, service with downgraded QoS). In the case of downgraded QoS, the home environment should be able to determine the service level given and only part of the service functionality may then be available in that part of the broadcast/multicast area. [e.g. instead of transmitting video clip, only the music is transmitted], etc).

Editors' note: need to determine what is meant here as it depends on who is able to downgrade the services.

In case of roaming, a user should also be able to subscribe and activate to Multicast Services that are provided locally in the visited network.

6 Security

The multicast mode shall be able to ensure that only those users who are entitled to receive it may do so.

Editor's note: the requirement may be modified based on the use cases. Need to determine if it is necessary to be able to turn on/off the security mechanism to restrict who receives the data.

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.

7.2 Multicast mode

It shall be possible to collect 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.

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

- usage duration
- time of membership to multicast subscription group
- time of membership to multicast group
- volume of contents

- activation/deactivation of service

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

Billing issues are out of scope of this TS.

Annex A (informative): Change history

It is usual to include an annex (usually the final annex of the document) for specifications under TSG change control which details the change history of the specification using a table as follows:

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
July 2001	SA1#13				Creation of TS		0.1.0
July 2001	SA1#13	22.146			Output version from SA1 #13	0.1.0	1.0.0