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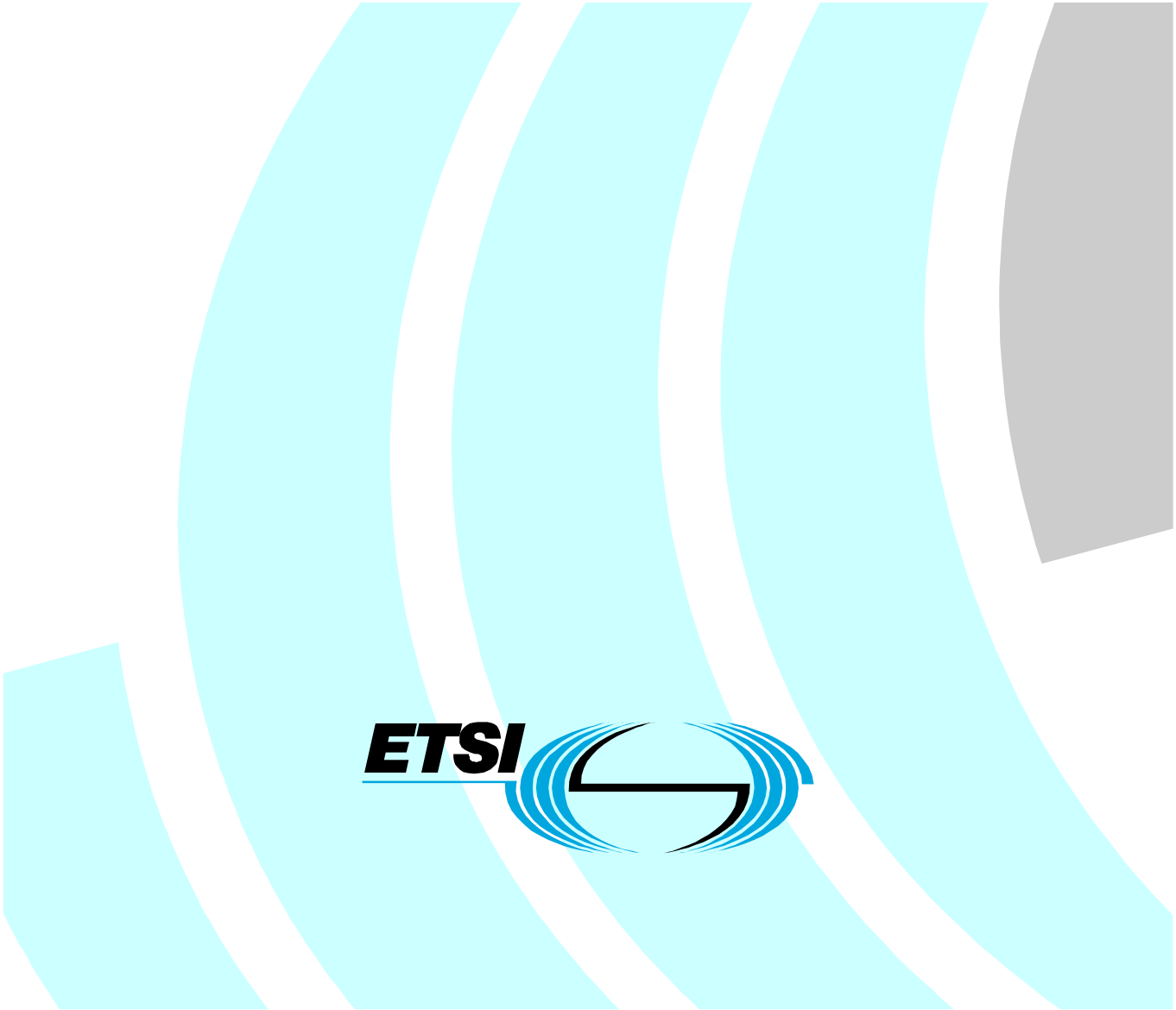
Technical Specification

Satellite Earth Stations and Systems (SES);
Satellite Component of UMTS/IMT-2000;
Multimedia Broadcast/Multicast Services;
Part 2: Architecture and functional description



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document is part 2 of a multi-part deliverable covering Satellite Earth Stations and Systems (SES); Satellite Component of UMTS/IMT-2000; Multimedia Broadcast/Multicast Services, as identified below:

Part 1: "Services definitions";

Part 2: "Architecture and functional description";

Part 3: "Introduction in the Radio Access Network (RAN)";

Part 4: "Interworking with terrestrial UMTS networks";

Part 5: "Performances over the radio interface";

Part 6: "Security".

Introduction

S-UMTS stands for the Satellite component of the Universal Mobile Telecommunication System. S-UMTS systems will complement the terrestrial UMTS (T-UMTS) and inter-work with other IMT-2000 family members through the UMTS core network. S-UMTS will be used to deliver 3rd generation mobile satellite services (MSS) utilizing either low (LEO) or medium (MEO) earth orbiting, or geostationary (GEO) satellite(s). S-UMTS systems are based on terrestrial 3GPP specifications and will support access to GSM/UMTS core networks.

NOTE 1: The term T-UMTS will be used in the present document to further differentiate the Terrestrial UMTS component.

Due to the differences between terrestrial and satellite channel characteristics, some modifications to the terrestrial UMTS (T-UMTS) standards are necessary. Some specifications are directly applicable, whereas others are applicable with modifications. Similarly, some T-UMTS specifications do not apply, whilst some S-UMTS specifications have no corresponding T-UMTS specification.

- Since S-UMTS is derived from T-UMTS, the organization of the S-UMTS specifications closely follows the original 3rd Generation Partnership Project (3GPP) structure.

An S-UMTS system is defined by the combination of a family of S-UMTS specifications and 3GPP specifications, as follows:

- If an S-UMTS specification exists it takes precedence over the corresponding 3GPP specification (if any). This precedence rule applies to any references in the corresponding 3GPP specifications.

NOTE 2: Any references to 3GPP specifications within the S-UMTS specifications are not subject to this precedence rule. For example, an S-UMTS specification may contain specific references to the corresponding 3GPP specification.

- If an S-UMTS specification does not exist, the corresponding 3GPP specification may or may not apply. The exact applicability of the complete list of 3GPP specifications will be defined at a later stage.

1 Scope

The present document describes architectural solution and functionalities for the S-MBMS bearer service.

2 Void

3 Definitions and abbreviations

3.1 Definitions

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

Intermediate Module Repeater: terrestrial repeater which acts as a radio relay between satellite signal and UE in areas where satellite signal is not available (tunnels, etc.)

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

S-MBMS Service Announcement: mechanism to allow users to be informed about the S-MBMS user services availability

S-MBMS Service Area: area within which data of a specific S-MBMS session are sent

NOTE: Each individual S-MBMS session of an S-MBMS Bearer Service may be sent to a different S-MBMS Service Area.

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

3.2 Abbreviations

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

ACLR	Adjacent Channel Leakage Ratio
APN	Access Point Name
BCF	Base Common Functions
BM-SC	Broadcast Multicast-Service Centre
CBC	Cell Broadcast Centre
CS	Circuit Switched
DRM	Digital Right Management
EVM	Error Vector Magnitude
FDM	Frequency Division Multiplexing
FSS	Fixed Satellite Service
GEO	Geostationary Earth Orbit
GGSN	Gateway GPRS Support Node
GNSS	Global Navigation Satellite System
HTTP	HyperText Transfer Protocol
IMR	Intermediate Module Repeater
LEO	Low Earth Orbit
MBMS	Multimedia Broadcast Multicast Service
MEO	Medium Earth Orbit
MIKEY	Multimedia Internet KEYing
MMS	Multimedia Message Service
MSS	Mobile Satellite Service

O&M	Operation & Maintenance
OSA-SCS	Open Service Architecture-Specific Convergence Sublayer
PA	Power Amplifier
PDP	Packet Data Protocol
PPDR	Public Protection Disaster Relief
PS RAB	Packet Switching Radio Access Bearer
PS	Packet Switched
QoS	Quality of Service
RAN	Radio Access Network
RNC	Radio Network Control
RNG	Radio Network Gateway
S-MBMS	Satellite-Multimedia Broadcast Multicast Service
SRNC	Satellite Radio Network Control
TMGI	Temporary Mobile Group Identity
T-UMTS	Terrestrial-UMTS
UDP	User Datagram Protocol
UE	User Equipment
USRAN	UMTS Satellite Radio Access Network
UTRAN	UMTS Terrestrial Radio Access Network
WAP	Wireless Application Protocol
W-CDMA	Wideband-Code Division Multiple Access

4 S-MBMS Architecture

4.1 Overview

S-MBMS is point-to-multipoint service in which data is transmitted from a single source (satellite) to multiple recipients (UEs under spot coverage). Transmitting data to multiple recipients via satellite allows radio resource use optimization to be compared to T-UMTS.

S-MBMS bearer service offers two modes:

- Broadcast mode;
- Multicast mode.

S-MBMS architecture is based on UTRAN MBMS one, and operated in the PS domain.

4.2 Reference Architecture Model

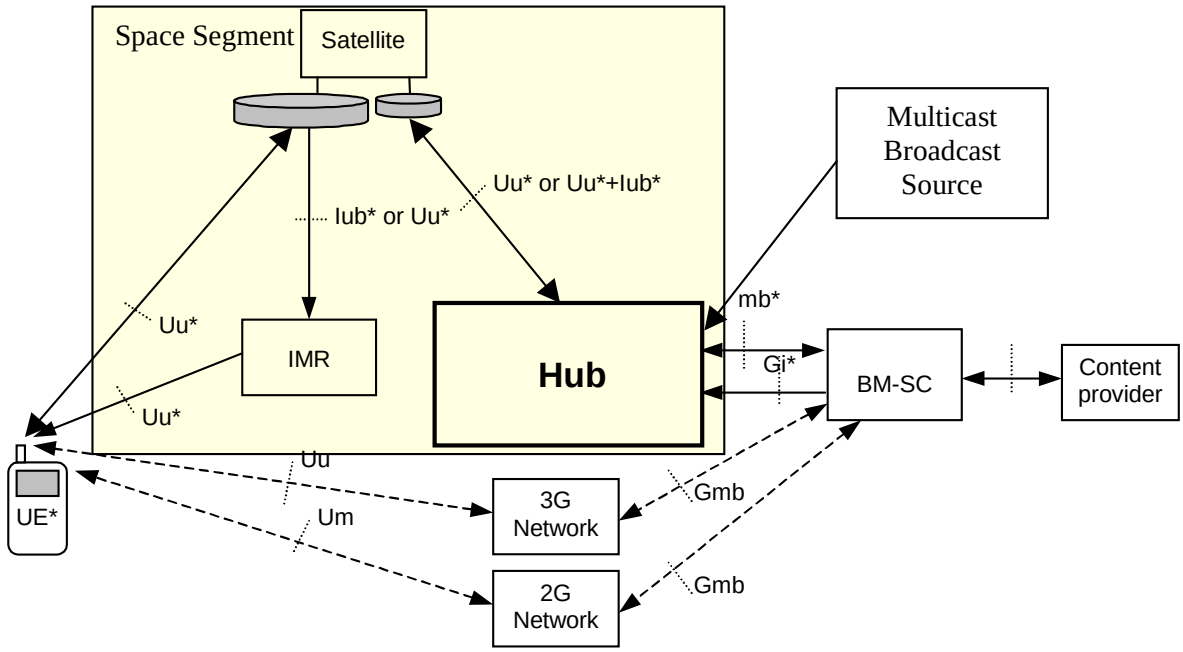

Figure 4.1: Reference architecture to support MBMS

Multi-mode UE (i.e. satellite and terrestrial 2G/3G radio access enabled) may be developed without additional chain, in that case there is no simultaneous reception/transmission through both satellite and terrestrial modes.

The Gateway controls the broadcast transmission in one or several spot beams. It builds the S-UMTS standardized W-CDMA carriers, in PS domain.

The architecture is designed to allow several Gateway to share the system capacity and several BM-SC to share the capacity managed by the Gateway.

Gmb interface provides access to the control plane functions, Gi provides access to the bearer plane.

A particular instance of an S-MBMS Bearer Service is identified by an IP Multicast Address and an APN Network Identifier. Gi reference point is addressed for delivering IP Multicast datagrams to Gateway. See TS 125 106 (see Bibliography).

IMRs may be deployed for ensuring coverage continuity in areas where the satellite signal is deeply obstructed. They may be co-sited with 3G base stations.

A Multicast/Broadcast Source may be connected directly to the Gateway, by-passing BM-SC (e.g. for PPDR).

4.3 S-MBMS Specific Reference points

4.3.1 Gmb

Gmb reference point is addressed for signalling between Gateway and BM-SC, i.e. control plane.

Two types of signalling are exchanged:

- S-MBMS bearer service specific signalling:
  - The Gateway establishes the S-MBMS bearer context and registers at BM-SC.
  - The Gateway or the BM-SC releases the S-MBMS bearer context and de-register the Gateway from the BM-SC.
  - The BM-SC indicates session start and stop to the Gateway including session attributes like QoS or S-MBMS service area.
- User specific signalling:
  - The BM-SC authorizes the user specific S-MBMS multicast service activation (joint) at the Gateway.
  - The Gateway report to the BM-SC the successful user specific S-MBMS multicast activation (join) to allow the BM-SC to synchronize the BM-SC UE S-MBMS context and charging with the S-MBMS UE contexts in the Gateway.
  - The Gateway reports to the BM-SC when a user specific S-MBMS multicast service is released or deactivated to synchronize BM-SC UE S-MBMS contexts and charging with the S-MBMS UE contexts in the Gateway.

The BM-SC initiates the deactivation of a user specific S-MBMS bearer service when the S-MBMS user service is terminated.

4.4 S-MBMS Service Provision

4.4.1 Multicast mode

Reception of an S-MBMS Multicast service is enabled by procedures which require a reliable return link.

Return link may be provided by either S-UMTS or T-UMTS or another mobile & wireless technology.

Phases and procedures of S-MBMS multicast service provision are compliant with TS 123 246 (see Bibliography).

4.4.2 Broadcast Mode

Phases and procedures of S-MBMS broadcast service provision are compliant with reference TS 123 246 (see Bibliography).

5 Functional Entities to Support S-MBMS

5.1 Broadcast-Multicast Service Centre (BM-SC)

The BM-SC provides functions for S-MBMS user service provisioning and delivery. It may serve as an entry point for content provider S-MBMS transmissions, used to authorize and initiate S-MBMS Bearer Services within the spot coverage area and can be used to schedule and deliver S-MBMS transmissions.

The BM-SC is a functional entity, which must exist for each S-MBMS User Service.

It consists of five sub-functions:

- Membership function.
- Session and Transmission function.
- Proxy and Transport function.
- Service Announcement function.
- Security function.

BM-SC functions structure is illustrated in figure 5.1.

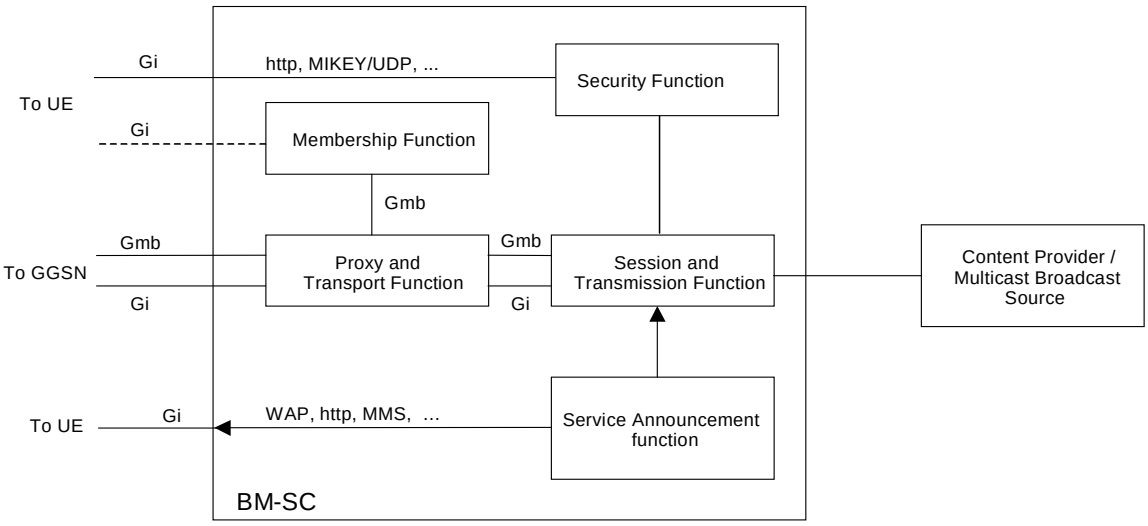

Figure 5.1: M-SC functional structure

BM-SC functions are compliant with TS 123 246 (see Bibliography).

5.2 User Equipment

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

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

The UE shall support security functions as appropriate for S-MBMS.

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

Some UE depending upon terminal capability may be able to store S-MBMS data. This may involve DRM but this is out of scope of the present document.

The S-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 S-MBMS session (e.g. because the UE has already received this S-MBMS session).

The protocol stack is compliant with MBMS (3GPP R6) protocol stack specification (see TS 123 246 in Bibliography).

5.2.1 Multi-mode UE

Two types of Multi-mode UE are defined:

- Type I:
  - **Satellite enabled UE:** multi-mode 2G/3G UE with additional frequency agility extension of the RF part to the MSS frequency band. UE is able to perform parallel idle mode, i.e. maintaining either GSM activity or UMTS activity during S-MBMS reception. In this category, two subtypes are defined : basic and enhanced. The basic type 1 do not have a dedicated receiver for S-MBMS and is then required to switch from UMTS terrestrial to S-MBMS satellite reception. The enhanced type 1 has a dedicated reception chain for satellite purpose and is then able to receive S-MBMS data flow without any interruption of connection to terrestrial networks.
- Type II:
  - **S-MBMS nomadic UE:** a device dedicated to satellite signal reception is interconnected to an external 2G/3G UE via a short range wireless or wire-line interface. This kind of terminal may be designed for installation in vehicle or for user having a mobile of previous generation.

For handheld UE, the existing 2G/3G antenna subsystem should be reused.

For vehicular UE, dedicated antenna subsystem will be used and could consist in using two separate antenna units (one for satellite reception and one for terrestrial reception) each using the suitable polarization type.

5.3 Intermediate Module Repeater (IMR)

IMR receives signal from the space segment and re-amplifies it. They possibly can be deployed to offer deep indoor coverage and increase throughput where satellite signal is not 100 % available.

Several IMR solutions are envisaged:

- on-channel repeater;
- frequency conversion repeater;
- Node B based repeater;
- Evolved Node B based repeater.

IMRs will be installed on urban/suburban areas and can be co-located or potentially integrated in T-UMTS node Bs.

5.3.1 Common requirements

Some of the requirements from TS 125 106 (see Bibliography) are applicable to every IMR solution and among them:

- spectrum emission mask;
- Adjacent Channel Leakage power Ratio (ACLR):
  - > 45 dB for 5 MHz offset;
  - > 50 dB for 10 MHz offset;
- Error Vector Magnitude (EVM) < 17,5 %;
- peak code domain error < -33 dB;
- spurious emissions.

IMR should be able to support at least 1 FDM with several channelization codes in the MSS downlink bandwidth.

5.3.2 Frequency conversion repeater

The frequency conversion repeater receives the satellite signal in FSS frequency bands, amplifies and retransmits in MSS band.

It implements frequency conversion from FSS to MSS bands.

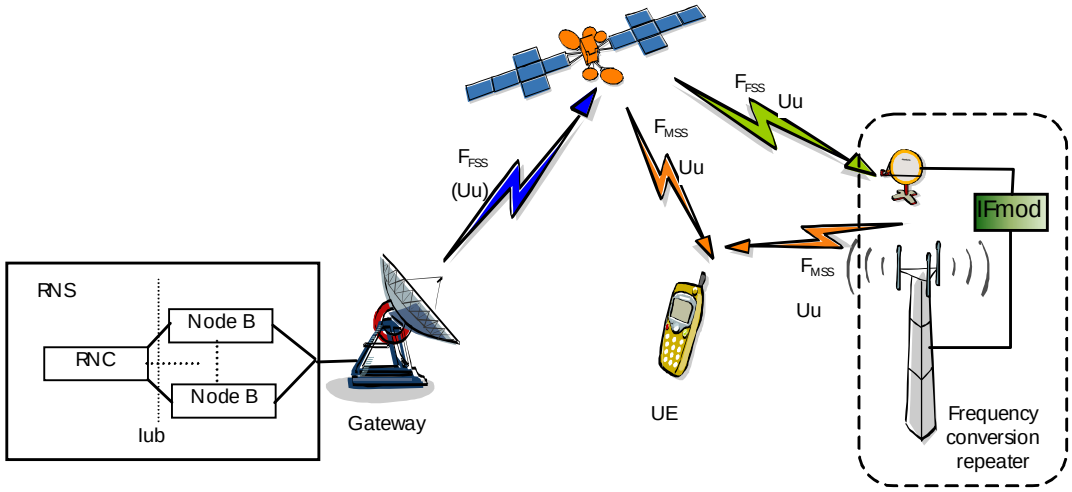

Figure 5.2: Frequency conversion repeater

Frequency conversion repeater is built with:

- Rx front end including flat panel or reflector antenna sub-system in FSS bands.
- Amplification chain.
- Tx front end including omni or sectored antenna.
- O&M module and a wireline/less modem for site supervision and equipment monitoring.
- Output power (@ the PA output) and Tx antenna gain : total Tx power ranges 30 dBm to 35 dBm, Tx antenna gain typically 15 dB ((sectored antenna).

5.3.3 On-channel repeater

The on-channel repeater receives the satellite signal in MSS band, amplifies and retransmits on the same frequency slot(s).

Due to the required isolation between Rx and Tx, on-channel repeater targets limited coverage like in-building, tunnel, underground, etc.

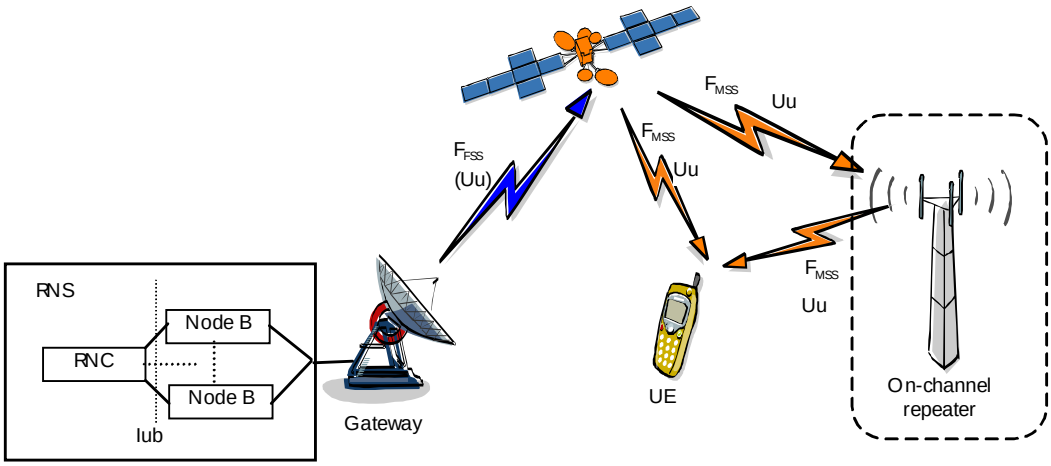

Figure 5.3: On channel repeater

On-channel repeater is built with:

- Rx front end including flat panel or reflector antenna sub-system.
- Amplification chain.
- Tx front end including omni or sectored antenna.
- O&M module and a wireline/less modem for site supervision and equipment monitoring.
- Output power (@ the PA output) and Tx antenna gain : total Tx power up to 30 dBm, Tx antenna gain typically 15 dB ((sectored antenna).

5.3.4 Node B-based repeater

Node B-based repeater is based on the reuse of a 3GPP standardized Node B.

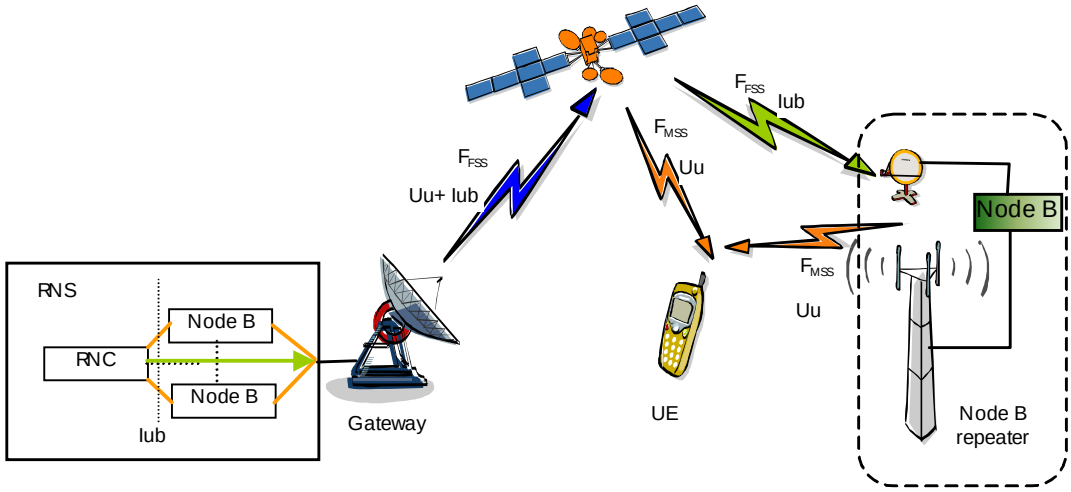

Figure 5.4: Node B-based repeater

Node B-based repeater and RNC are interfaced via satellite, i.e. some of the Iub interface features are implemented over a satellite radio link. When this satellite radio link is unidirectional, adaptation to Iub protocols is required.

Node B in the satellite gateway addresses signal processing of the satellite cell, while IMR addresses signal processing of the terrestrial repeater cell.

Co-ordination of satellite spot and terrestrial repeater cells is done at the Iub level.

Node B-based repeater is built with:

- HTI Rx (Gateway To IMR Receiver) module receiving satelltie carriers transmitted by the IMR Tx module in the Gateway:
  - Rx front end including flat panel or reflector antenna sub-system in FSS bands;
  - demodulation/decoding of the satellite carriers for the provision of the Iub protocol messages;
  - interconnection to the "enabled satellite" Node B modem via an interface supporting the 3GPP standardized Iub protocol;
  - A GNSS receiver providing time and frequency reference to the HTI Rx module.
- A Satellite-enabled modem delivering the W-CDMA carriers. It is interconnected with the RNC via an equipment called Base Common Functions (BCF) that support the 3GPP standardized Iub protocol and O&M protocol to configure the Node B modem and monitor its operation.
- A RF Tx section for the amplification of the satellite carriers and the up-conversion to the MSS bands.
- Output power (@ the PA output) and Tx antenna gain: total Tx power up to 43 dBm, Tx antenna gain typically 15 dB ((sectored antenna).

5.3.5 Evolved Node B-based repeater

Evolved Node B-based repeater is based on the reuse of a 3GPP standardized Node B+ (see TS 123 125 in Bibliography).

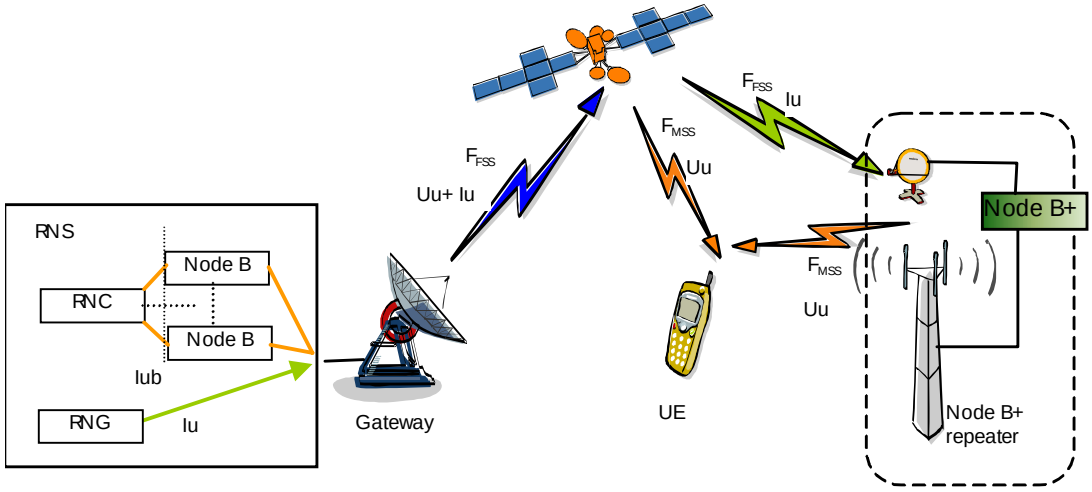

Figure 5.5: Evolved Node B-based repeater

Evolved Node B-based repeater and RNC are interfaced via satellite, i.e. some of the Iu interface features are implemented over a satellite radio link. When this satellite radio link is unidirectional, adaptation to Iu protocols is required.

Node B in the satellite gateway addresses signal processing of the satellite cell, while IMR addresses signal processing of the terrestrial repeater cell.

Co-ordination of satellite spot and terrestrial repeater cells is done at the Iu interface level as shown in figure 5.5.

Evolved Node B-based repeater is built with:

- HTI Rx (Hub To IMR Receiver) module receiving satelltie carriers transmitted by the IMR Tx module in the Gateway:
  - Rx front end including flat panel or reflector antenna sub-system in FSS bands.
  - Demodulation/decoding of the satellite carriers for the provision of a Iu protocol messages.

  - Interconnection to Node B+ via an interface supporting the 3GPP standardized Iu protocol.
  - A GNSS receiver providing time and frequency reference to the HTI Rx module.
- RAN radio protocols (L1, L2 and L3) both in control and user planes.
- A Satellite-enabled modem delivering the W-CDMA carriers.
- O&M protocol to configure the Node B modem and monitor its operation.
- A RF Tx section for the amplification of the satellite carriers and the up-conversion to the MSS bands.
- Output power (@ the PA output) and Tx antenna gain: total Tx power up to typically 43 dBm, Tx antenna gain typically 15 dB ((sectored antenna).

5.4 USRAN (Gateway)

USRAN is responsible for efficiently delivering S-MBMS data to the designated S-MBMS service area.

Efficient delivery of S-MBMS data in multicast mode may require mechanisms in the USRAN, e.g. the minimum number of users within a spot prior to and during S-MBMS transmission could be used to choose an appropriate radio bearer.

S-MBMS transmissions may be initiated and terminated intermittently. USRAN shall support the initiation and termination of S-MBMS transmissions by the core-network. Further, the USRAN shall be able to receive S-MBMS data from the core-network over Iu bearers shared by many UEs.

The USRAN shall be able to transmit S-MBMS user service announcements, paging information (non S-MBMS specific) and support other services in parallel with S-MBMS (for example depending on terminal capabilities the user could originate or receive a call or send and receive messages whilst receiving S-MBMS video content).

The Gateway includes 3G RAN equipment and 3G core network functions. It collects incoming media services from the BM-SCs and generates the W-CDMA waveform and redirects signal to the satellite feeder link.

In parallel, for the feeding of IMRs (if any), Gateway functions are depending on IMR architecture:

- For Node B-based repeater, Iub information stream is modulated onto a FSS band.
- For Evolved Node B-based repeater, Iu information stream is modulated onto a FSS band.

Gateway may be shared between several operators.

Satellite spots may be managed by either a centralized Gateway or shared between several decentralised Gateways.

5.5 S-MBMS Data Sources and Content Provider

Interface between content provider and BM-SC is out of scope of the present document.

5.6 Optional Functional Element

5.6.1 CBC

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

5.6.2 OSA-SCS

The BM-SC might use OSA-SCS to interact with third parties.

6 S-MBMS attributes and Parameters

6.1 S-MBMS UE Context

The S-MBMS UE Context contains UE-specific information related to a particular S-MBMS bearer service that the UE has joined. An S-MBMS UE Context is created in the UE, the Gateway and BM-SC when the UE joins an S-MBMS bearer service via a reliable return link.

In the UE and Gateway , the S-MBMS UE Context is stored as part of the MM Context for the UE. There is one S-MBMS UE Context per S-MBMS bearer service that the UE has joined.

The content of the S-MBMS UE Context is compliant with TS 123 246 (see Bibliography).

6.2 S-MBMS Bearer Context

The S-MBMS Bearer Context, which is referred to as S-MBMS Service Context in RAN, contains all information describing a particular S-MBMS bearer service and is created in each node involved in the delivery of the S-MBMS data.

An S-MBMS Bearer Context is created in the Gateway when the first S-MBMS UE Context is created in the node or when a downstream node requests it. The S-MBMS Bearer Context is statically configured in the BM-SC; how this is done is out of the scope of this specification.

An S-MBMS Bearer Context, once created, can be in one of two states reflecting the bearer plane resource status of the corresponding S-MBMS bearer service.

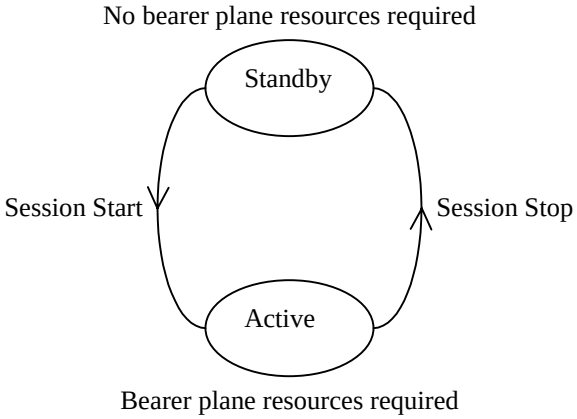

Figure 6.1: S-MBMS Bearer Context State Model

"Active" reflects the state of an S-MBMS Bearer Context in which bearer plane resources are required in the network for the transfer of S-MBMS data. This state is maintained as long as there is a corresponding S-MBMS session ongoing.

'Standby' reflects the state of an S-MBMS Bearer Context in which no bearer plane resources are required in the network for the transfer of S-MBMS data. This state is maintained as long as there is no corresponding S-MBMS session ongoing.

The content of the S-MBMS Bearer Context is compliant with TS 123 246 (see Bibliography).

6.3 Quality-of-Service (QoS)

It shall be possible for the network to control QoS parameters for sessions of multicast and broadcast S-MBMS bearer services.

The QoS attributes applicable to S-MBMS bearer services are compliant with TS 123 246 (see Bibliography).

6.4 Temporary Mobile Group Identity (TMGI)

Temporary Mobile Group Identity (TMGI) is used for S-MBMS notification purpose. The BM-SC allocates a globally unique TMGI per S-MBMS bearer service. TMGI is specified in 3GPP TR 125 897 (see Bibliography).

For Multicast S-MBMS bearer services the TMGI is transmitted to UE via the S-MBMS Multicast Service Activation procedure. For Broadcast Service the TMGI can be obtained via service announcement.

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

7 Architectural Aspects of S-MBMS User Services

S-MBMS bearers may be used in numerous ways to provide different types of applications. S-MBMS user services employ S-MBMS bearers and possibly point-to-point bearers in order to provide application data in an efficient manner. This clause is used to discuss different aspects of S-MBMS user services that directly relate to the usage of S-MBMS and point-to-point bearers. This clause is not intended to deal with the architecture and interfaces of S-MBMS user services.

7.1 Alternative User Service Support

For many S-MBMS services, it will be necessary to provide alternative means for the UE to access the service without using S-MBMS bearer capabilities. This is required, for example, after completion of the S-MBMS session for a file download to permit errors in the file to be corrected; to permit the network to charge for a successful download; to pass a decrypt key to the UE; etc. It may also be useful in cases where all or part of an S-MBMS transmission has been missed due to the UE being out of coverage, switched off etc.

Care is needed to ensure that such alternative access mechanisms do not create traffic that overloads the satellite radio interface. In the case that such alternative access requires direct interaction between the UE and a network server, one way for this load to be distributed is for the BM-SC to distribute to each UE, at activation time, one or more server addresses (from a group of addresses), along with parameter(s) that are used to generate a random time dispersion of the requests.

7.2 Access aspects of S-MBMS user services

In networks with multiple accesses, e.g. UTRAN (or GERAN) and USRAN, users may in some situations experience problems in receiving S-MBMS services. These situations include:

- An operator that has chosen to provide a service on one access only (e.g. only on USRAN), and where a UE is camping on the wrong access (i.e. on UTRAN in the previous example) when an S-MBMS session is started. This UE may miss the S-MBMS content in case there is no paging coordination.
- An operator that has chosen to provide a service with different QoS levels on USRAN and UTRAN. A UE that is changing access type during an ongoing S-MBMS session may not be able to sort the situation out and receive the S-MBMS content correctly.

8 S-MBMS procedures

8.1 S-MBMS notification

S-MBMS notification shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.2 S-MBMS Multicast Service Activation

The S-MBMS Multicast Service Activation procedure registers the user in the network to enable the reception of data from a specific multicast S-MBMS bearer service. The activation is a signalling procedure between the UE and the network. The procedure establishes S-MBMS UE contexts in UE and Hub for each activated multicast S-MBMS bearer service comparable to regular PDP contexts.

S-MBMS Multicast Service Activation shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.3 S-MBMS Session Start procedure

The BM-SC initiates the S-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 S-MBMS data and to notify interested UEs of the imminent start of the transmission.

Through this procedure, S-MBMS session attributes such as QoS, S-MBMS Service Area, estimated session duration if available are provided to the Gateway that have previously registered for the corresponding S-MBMS Bearer Service.

The Session Start procedure shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.4 S-MBMS Registration procedure

The S-MBMS Registration is the procedure by which a downstream node, i.e. the RNC module devoted to a group of satellite spot informs the upstream node (Gateway's entity above RNC module) that it would like to receive session attributes and data for a particular S-MBMS bearer service in order to distribute it further downstream. This procedure builds up a distribution tree for the delivery of S-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 S-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 S-MBMS Registration procedure is initiated:

- When the first S-MBMS UE Context for a particular S-MBMS bearer service is created in the Gateway (see clause 6.1 "S-MBMS UE Context") and the corresponding S-MBMS Bearer Context is not already established in the node;
- When an S-MBMS Registration Request for a particular S-MBMS bearer service is received from a downstream node but the corresponding S-MBMS Bearer Context is not established in the node; or
- When the RNC detects that it hosts UEs interested in the S-MBMS bearer service.

S-MBMS Registration procedure shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.5 S-MBMS Session Stop procedure

The BM-SC initiates the S-MBMS Session Stop procedure when it considers the S-MBMS session to be terminated. The session is typically terminated when there is no more S-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 Gateways that are registered for the corresponding S-MBMS bearer service.

The S-MBMS Session Stop procedure shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.6 S-MBMS De-registration procedure

8.6.1 Gateway initiated De-registration procedure

The S-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 S-MBMS bearer service anymore and therefore would like to be removed from the corresponding distribution tree.

The S-MBMS De-registration procedure is initiated:

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

The Gateway initiated De-Registration procedure shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.6.2 BM-SC initiated S-MBMS De-registration procedure

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

The BM-SC initiated De-Registration procedure shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.7 S-MBMS Multicast Service Deactivation

The multicast service deactivation is a signalling procedure between the UE and the network. The procedure removes the S-MBMS UE Context from the UE and the Gateway for a particular S-MBMS multicast service. The multicast service deactivation can be initiated by:

- The UE.
- The Gateway.
- The BM-SC.

The S-MBMS Multicast Service Deactivation procedure shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.8 S-MBMS UE Context Synchronization procedure

The Routing Area Update procedure transfers the S-MBMS UE Context status between UE and core network. This S-MBMS UE Context status identifies S-MBMS UE contexts, which are lost or deactivated only on one side. All S-MBMS UE Contexts, which are active on one side only shall be deactivated locally. If the UE wishes to re-activate the related S-MBMS bearer service, it shall join the S-MBMS bearer service again.

The S-MBMS UE Context Synchronization procedure shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.9 Inter-system change

Inter system change procedures shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.10 S-MBMS Broadcast Service Activation

S-MBMS Broadcast Service Activation is the procedure by which a UE locally activates a broadcast S-MBMS bearer service:

- The S-MBMS Broadcast Service Activation procedure does not register the user in the network. There is no S-MBMS bearer service specific signaling exchanged between the UE and the network.
- The Broadcast Service Activation procedure does not establish S-MBMS UE contexts in UE and Gateway.

8.11 S-MBMS Broadcast Service De-activation

The S-MBMS Broadcast Service De-activation by the UE is local to the UE, i.e. without interaction with the network.

8.12 S-MBMS Service Request procedure

For S-MBMS, when USRAN wants to count the number of users that are interested in a specific S-MBMS service which are present in a spot, it will request a percentage of the interested UEs which have access to a reliable return link to transit to PMM-CONNECTED state. The S-MBMS Service Request procedure is used by a UE in the PMM-IDLE state to move to the PMM-CONNECTED state.

The S-MBMS Service Request procedure shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.13 S-MBMS UE Linking/De-linking mechanism

UE Linking is the process by which UE S-MBMS context(s) is (are) provided to RAN.

S-MBMS UE linking procedure is performed when the UE is PMM-CONNECTED at least in the following cases:

- When a UE which has joined S-MBMS is moved to the PMM-CONNECTED state and sets up a PS RAB. This may happen at any point in time i.e. before, during and between Sessions.
- When a UE joins the service and is in the PMM-CONNECTED state due to an existing PS RAB. This may happen at any point in time i.e. before, during and between Sessions.
- When a UE is moved to the PMM-CONNECTED state only for S-MBMS purpose via Service Request procedure. This may happen at any point in time during a S-MBMS session.

The UE linking is performed to link a specific UE to an S-MBMS service. It provides the list of S-MBMS Service Ids activated by the UE to the Gateway. If no S-MBMS service context related to the S-MBMS service Id exists then Gateway creates an S-MBMS service context after this procedure.

S-MBMS UE De-linking denotes the process where a S-MBMS UE context is removed from the RAN.

S-MBMS UE De-linking procedure is performed if the UE is PMM-CONNECTED and has been already linked towards the RAN at least when it initiates S-MBMS Multicast Service Deactivation procedure. This may happen at any point in time during the whole S-MBMS service availability, i.e. before, during and between S-MBMS sessions.

The UE De-linking is performed to unlink a specific UE from a S-MBMS service. The entry for this UE is removed from the concerned S-MBMS service context(s) in the SRNC.

8.14 S-MBMS Service Request procedure

For S-MBMS, when USRAN wants to count the number of users that are interested in a specific S-MBMS service present in a spot, it will request a percentage of the interested UEs to transit to PMM-CONNECTED state. The S-MBMS Service Request procedure is used by a UE in PMM-IDLE state to move to PMM-CONNECTED state.

S-MBMS Service Request procedure shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

8.15 Notification in case of parallel services

Notification:

- of incoming CS domain call during an ongoing S-MBMS session;
- of additional S-MBMS session during an ongoing S-MBMS session;
- of Mobile Terminating PS data during an ongoing S-MBMS session;
- of S-MBMS session during an ongoing CS or PS domain connection;

shall be compliant with the procedure defined in TS 129 061 (see Bibliography).

9 Security

See TS 102 442-6 (see Bibliography).

10 Charging requirement

10.1 General

S-MBMS architecture shall support on-line and off-line charging.

It shall be possible to collect charging information for the multicast mode. It shall also be possible to collect charging information for S-MBMS services in visited networks.

S-MBMS shall collect charging information about the transmission of S-MBMS broadcast or multicast data that are provided by content or service providers (e.g. 3rd parties). This shall enable billing of broadcast and multicast content or service providers.

To enable billing of broadcast and multicast content providers, data shall be collected at the BM-SC.

NOTE: Gateway and BM-SC generate charging data for the transmitted data, always under the assumption that the UEs are within the S-MBMS service area. If the S-MBMS service area is less than the PLMN (regional spot), then there is the possibility that a UE will have moved outside the S-MBMS service area. Charging data will still be generated for that UE causing an inaccuracy in the data. This inaccuracy increases as the size of the S-MBMS service area is decreased.

10.2 Bearer level charging for S-MBMS

Bearer level charging for S-MBMS, mechanisms and functional elements are inherited from 3GPP (see TS 125 106 in Bibliography).

10.3 Application level charging for S-MBMS

Application level charging for S-MBMS is compliant with TS 129 061 (see Bibliography).

Annex A (informative): Bibliography

- ETSI TS 102 442-6 : "Satellite Earth Stations and Systems (SES); Satellite Component of UMTS/IMT-2000; Multimedia Broadcast/Multicast Service; Part 6: Security".
- ETSI TR 121 905: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Vocabulary for 3GPP Specifications (3GPP TR 21.905)".
- ETSI TS 129 061 (Release 6): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN) (3GPP TS 29.061 Release 6)".
- ETSI TS 123 246 (Release 6): "Universal Mobile Telecommunications System (UMTS); Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description (3GPP TS 23.246 Release 6)".
- ETSI TS 125 106: "Universal Mobile Telecommunications System (UMTS); UTRA repeater radio transmission and reception (3GPP TS 25.106)".
- 3GPP TR 125 897: "Feasibility Study on the Evolution of UTRAN Architecture".
- ETSI TS 123 125: "Universal Mobile Telecommunications System (UMTS); Overall high level functionality and architecture impacts of flow based charging; Stage 2 (3GPP TS 23.125)".
- ETSI TS 123 003: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Numbering, addressing and identification (3GPP TS 23.003)".

History

Document history		
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