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Abstract of document:

This document is part of the Release 6"**Introduction of the Multimedia Broadcast Multicast Service (MBMS) in RAN**" and it is linked to the corresponding TS 22.146 "Multimedia Broadcast Multicast Service; Stage-1" and the SA2 WI "Multimedia Broadcast/Multicast Service Architecture" the work of which is reflected in TR 23.846.

The purpose of the present document is to help the TSG RAN specify the changes to existing specifications and potentially identify new ones that are needed for the introduction of the "**Introduction of the Multimedia Broadcast Multicast Service (MBMS) in RAN**" feature for Release 6.

Changes since last presentation to TSG RAN2 #36:

The TS has been endorsed by RAN2#36 (as version 161) and it is considered as stable enough to be presented to RAN#20 for information and approval.

Outstanding Issues:

Items for FFS as well as empty sub-sections are indicated in the attached TS.

Contentious Issues:

3GPP TS 25.346 V2.0.0 (2003-06)

Technical Report

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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

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Foreword

This Technical Report 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.

1. Scope

This document is part of the Release 6"**Introduction of the Multimedia Broadcast Multicast Service (MBMS) in RAN**" and it is linked to the corresponding TS 22.146 "Multimedia Broadcast Multicast Service; Stage-1" [2] and the SA2 WI "Multimedia Broadcast/Multicast Service Architecture" the work of which is reflected in TR 23.846 [3].

The purpose of the present document is to help the TSG RAN and TSG GERAN specify the changes to existing specifications and potentially identify new ones that are needed for the introduction of the6"**Introduction of the Multimedia Broadcast Multicast Service (MBMS) in RAN**" feature for Release 6.

2. References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] 3GPP TR 21.905: "3G Vocabulary".

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

[3] 3GPP TR 23.846: "Multimedia Broadcast Multicast Service; Architecture and Functional Description"

[4] 3GPP TR 25.992: "Multimedia Broadcast Multicast Service (MBMS); UTRAN/GERAN Requirements"

3. Definitions, symbols and abbreviations

3.1 Definitions

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

Example: text used to clarify abstract rules by applying them literally.

3.2 Symbols

3.3 Abbreviations

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

MBMS	Multimedia Broadcast Multicast Service
MCCH	MBMS Control Channel
MTCH	MBMS Traffic Channel
p-t-p	Point-to-Point
p-t-m	Point-to-Multipoint

4. Background and Introduction

Following RAN/SA#15 it was concluded that the service requirements [2] of MBMS are considered as stable enough and the work on the architectural aspects have progressed to the extend that the work in RAN can be initiated.

5. MBMS UTRAN Architecture

5.1 MBMS UTRAN Architecture Principles

5.1.1 One Context per MBMS Service in CRNC

Each RNC-controlling cells within an MBMS service area will maintain an MBMS service context for each MBMS service.

1 Each CRNC MBMS service context is associated with an MBMS service ID.

2 The CRNC MBMS service context will contain a list of connected mode UEs which are present in each cell of the CRNC and which have activated an MBMS service. The list will include at least the U-RNTI of the UEs.

NOTE: the current assumption is that the MBMS service context in the CRNC contains no information about Idle mode UEs prior to MBMS user plane establishment.

3 The CRNC MBMS service context is established when the MBMS Iu bearer is established between the RNC and the SGSN for a specific MBMS service.

4 Associated functionalities:

4.1 Bearer type selection for MBMS transmissions based on information in the CRNC MBMS service context. The decision process will require inter-working with radio resource management and with the UE's SRNC in the case of p-t-p bearers.

4.2 MBMS RB control for p-t-m bearers in each cell, based on information in the CRNC MBMS service context.

4.3 Update of the MBMS service context when a connected mode UE, which has activated an MBMS service, has entered a cell. Update of the MBMS service context via Iur is [FFS].

4.4 Update of the MBMS service context when a connected mode UE, which has activated an MBMS service, has left a cell. Update of the MBMS service context via Iur is [FFS].

5.1.2 One Iu flow per RNC per MBMS Service

For each MBMS service, data is transferred via an MBMS RAB between the UE and the SGSN. For each MBMS service, data is transferred via one MBMS Iu bearer between RNC and the SGSN in the whole service area.

1 One MBMS Iu bearer is established per MBMS service at MBMS Session Start or when the RNC needs to send data on the radio interface due to the presence of UEs.

2 Regarding Iu flex, the current working assumption in SA2 is that the RNC is permitted to receive multiple Iu flows and decides to take one of them. This is [FFS].

3 Because of the dedicated channels and Iur mobility, there is a need to send MBMS data to an RNC which is not necessarily part of the service area. This is [FFS].

4 The MBMS Iu bearer on Iu is established per MBMS service and not per UE individually.

5 Each connected mode UE, with an activated MBMS service, will have it's UE context bind to the MBMS Iu bearer.

6 There could be several MBMS RBs linked to one MBMS Iu bearer (i.e. one MBMS Iu bearer on Iu can be mapped to multiple DTCH and/or or p-t-m traffic channels over the air-interface).

5.1.3 Iu Flow can be Mapped on p-t-m Connection

The service specific MBMS RAB on Iu can be mapped on p-t-m bearers in order to provide MBMS data via common channels.

1 The MBMS control function in the CRNC may decide to establish a p-t-m connection, if the number of multicast users in a cell exceeds a certain operator-defined threshold.

2 The MBMS control function in the CRNC may decide to establish a p-t-m connection depending on the congestion scenario expected for a specific cell (e.g. in hotspot areas where no bearer type switching is needed).

3 The MBMS control function in the CRNC establishes an MBMS RB by sending service specific signalling messages (e.g. MBMS RB Setup message) to all the UEs in the cell listening to either an existing or a new (e.g. NCCH: Notifications Common Control Channel) common control channel. UEs with activated service(s) may then execute the RB set-up.

4 MBMS data is transferred on a common transport channel to all the UEs which have executed the RB setup. It is for [FFS] whether the CTCH is suitable or there is the need to define a new common traffic channel for MBMS.

5 The MBMS control function in the CRNC releases the MBMS RB (e.g. MBMS RB Release) when the data transfer has been finished or it has been interrupted by the CRNC.

6 p-t- p transmission of MBMS data should use the DTCH as defined for other dedicated services.

7 p-t-m reception applies to all RRC states and modes, subject to UE capability.

5.1.4 Counting

A notification can be generated in the RNC and can be transmitted before, as well as, during the transmission of a specific MBMS service data. It is used to notify a given MBMS service group of subscribers/UEs and not individual ones.

In cells where selection between MBMS p-t-m and p-t-p channels is expected to be performed (i.e. operator defined user threshold ? 0) for specific services, counting may be performed.

1. The need for counting is indicated in the notification, and achieved by requesting UEs, belonging to the same MBMS service group, to establish an RRC connection.

2. The exact number of UEs that need to be brought to RRC connected mode is an RRM issue.

3. Since it is desirable in a specific cell, to avoid bringing a large number of UEs for counting purposes to RRC connected mode at the same time (RACH load, etc), RRM can control the load due to the RRC connection establishment requests, by setting an access "probability factor".

4. Following counting, the number of subscribers that need to be maintained in RRC connected mode or for which the RNC releases their connection, is also an RRM issue.

5. For a given MBMS service, the counting indication in the notification can be switched on and off, on per-cell basis.

6. The RNC may use notification to indicate counting during transmission of the MBMS service (term used is re-counting).

7. The RNC will receive via Iu from CN information (service ID) about UEs who are in RRC Connected mode, and have joined the service. This information can be used for counting purposes.

8. The possibility for the RNC to receive the service Id in the RRC Connection request is [FFS] This option would allow once RNC has completed counting, to abort the RRC connection establishment, requested in the notification, prior to the establishment of the RRC connection. Security and potential integrity protection issues need to be addressed.

5.1.5 UE Linking

UE Linking denotes the process where a UE is linked to an MBMS service context in the SRNC when the UE is moved to PMM CONNECTED and sets up a ps RAB or when the UE joins the service and is in PMM CONNECTED due to an existing PS RAB. This can happen at any point in time during the whole service availability (i.e. before, during and between Sessions). Keeping UEs in PMM CONNECTED only for MBMS between sessions is implementation specific. The UE linking will be performed via UE dedicated Iu procedures. An entry for the UE will be added to the MBMS service context in the SRNC. If the MBMS service context doesn't exist yet it needs to be created.

In case the UE consumes radio resources from a drift RNC, the UE Linking needs to be performed via Iur. It is [FFS] when the UE Linking via Iur is performed.

NOTE: The MBMS Attach/Detach procedure provides the UE Linking/Unlinking functionality via Iur.

NOTE: An additional function needs to be provided to unlink a UE from an MBMS service context via Iu.

5.1.6 Session Start and Session Stop

At session start and session stop the RNC will receive an respective indication from the CN. The session start indication shall contain the Service Id and Service characteristics. The session start indication triggers the RNC to notify a given MBMS service group of subscribers/UEs of the session start.

NOTE: Whether the session start procedure serves to setup the MBMS Iu bearer is [FFS].

NOTE: Whether the session stop procedure serves to release the MBMS Iu bearer is [FFS].

5.2 Protocol structure

5.2.1 MBMS User Plane Protocol Stack Architecture

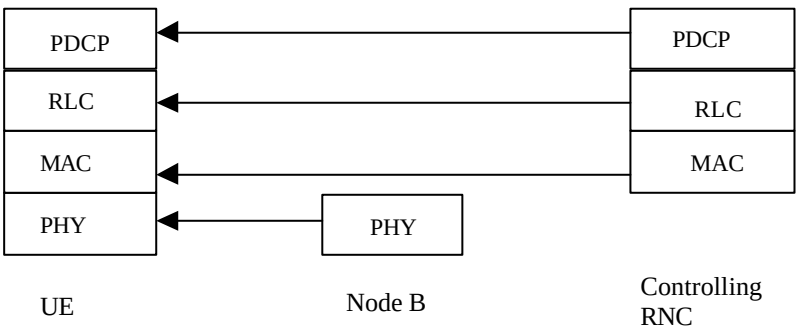

Figure 1. Protocol Stack for MTCH

Figure 1 illustrates the protocol termination for MTCH in MBMS.

The MBMS functionalities required to be included in "PDCP" sublayer-2 are [FFS]. Also the need for a new syblayer-2 is [FFS].

5.2.2 MBMS Control Plane Protocol Stack Architecture

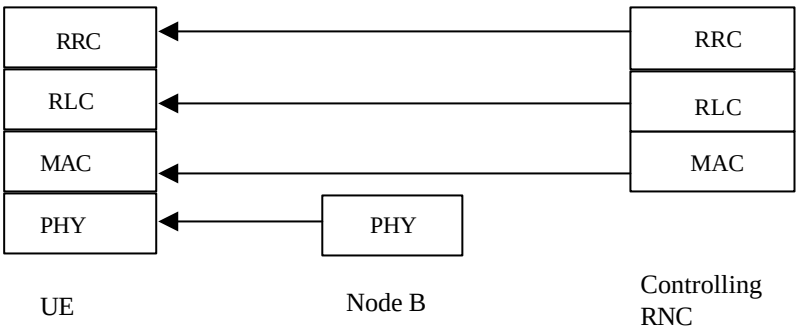

Figure 2. Protocol Stack for MCCH

Figure 2 illustrates the protocol termination for MCCH in MBMS.

MBMS functionalities are included in MAC and RRC.

5.3 MAC architecture

5.3.1 UTRAN MAC Architecture to support MBMS

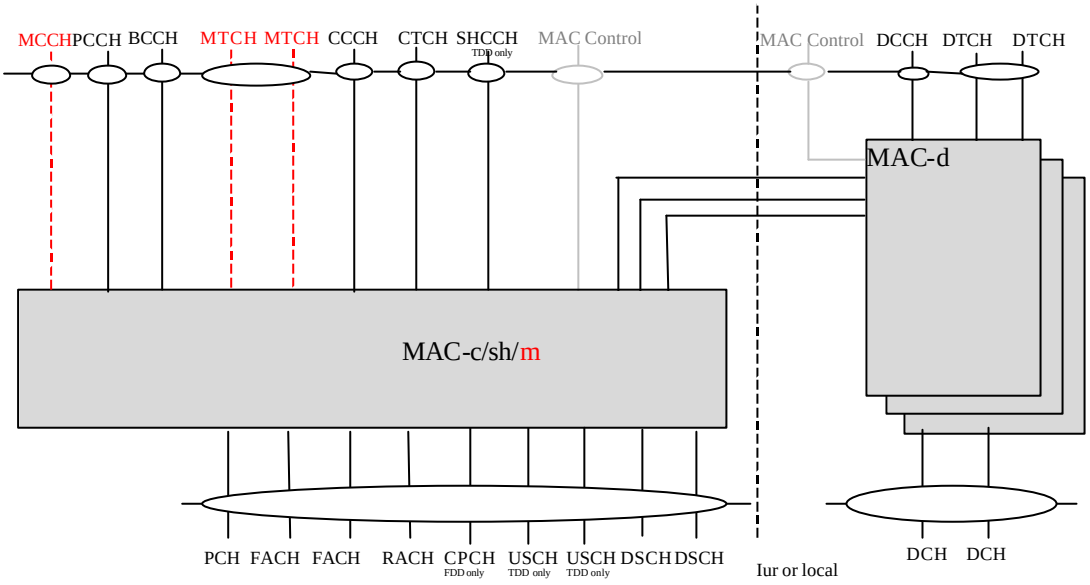

Figure 3: UTRAN MAC architecture

To support MBMS user and control plane transmission, a multicast functionality is added in the MAC c/sh, entitled "MAC m", to take care of scheduling of MBMS related transport channels. In addition, two logical channels are considered for MBMS: MCCH and MTCH. Both logical channels are mapped on FACH.

5.3.1.1 MBMS Control Channel (MCCH)

This logical channel is defined as a p-t-m downlink channel for transfer of control plane information between network and UEs in RRC Connected or Idle Mode. The control plane information on this channel is MBMS specific and is sent to UEs in a cell with an activated (joined) MBMS service. Whether MCCH is a new or an existing channel is [FFS].

NOTE: If it unidentified that the only control info needed are related to notifications, then the channel can be called NCCH (Notifications Common Control Channel) as it has earlier been proposed.

5.3.1.2 MBMS Traffic Channel (MTCH)

This logical channel is defined as a p-t-m downlink channel for transfer of user plane information between network and UEs in RRC Connected or Idle Mode. The user plane information on this channel is MBMS specific and is sent to UEs in a cell with an activated MBMS service. Whether MTCH is a new or an existing channel (e.g. CTCH) is [FFS]. In the case of using CTCH is it [FFS] if the existing CTCH will be used or a second multicast-specific CTCH is needed.

NOTE: Channel names provided are provisional, Figure 3 is expected to change according to the final decision on adapting new or existing multicast logical channels.

5.3.2 MAC-c/sh/m architecture: UTRAN side

Figure 4 illustrates the MAC-m additions to the MAC-c/sh architecture in the UTRAN side, needed to transmit MBMS data over a common transport channel (FACH).

MAC-c/sh/m is located in the controlling RNC. The following functionalities are covered:

- Scheduling – Priority Handling: This function manages common transport resources between MBMS and non-MBMS data flow(s) according to their priority [FFS].
- TCTF MUX: This function handles insertion of the TCTF field in the MAC header and also the respective mapping between logical channels (i.e. MTCH and MCCH) and transport channels. The TCTF field indicates which type of logical channel (i.e. MTCH and MCCH) is used.
- Addition of MBMS-ID: For p-t-m type of logical channels, the MBMS-ID field in the MAC header is used to distinguish between MBMS services.
- TFC selection: Transport format combination selection is done for a common transport channel (FACH) mapped to MTCH and MCCH.

There is one MAC-c/sh/m entity in the UTRAN for each cell.

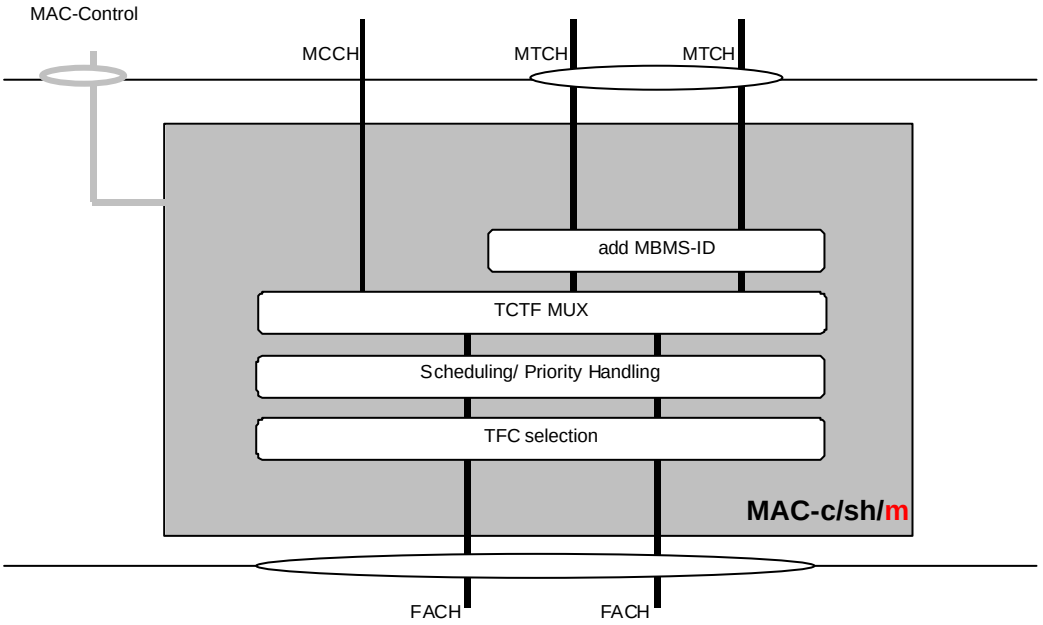

Figure 4. UTRAN side MAC-m architecture additions to MAC-c/sh

5.3.3 MAC-c/sh/m architecture: UE side

Figure 5 illustrates the MAC-m additions to the MAC-c/sh architecture in the UE side, needed to receive MBMS data over a transport channel (FACH).

The following functionalities are covered:

- TCTF DEMUX: This function handles detection and deletion of the TCTF field in the MAC header, and also the respective mapping between logical channels (i.e. MTCH and MCCH) and transport channels. The TCTF field indicates which type of logical channel (i.e. MTCH and MCCH) is used.
- Reading of MBMS-ID: The MBMS-ID identifies data to a specific MBMS service.

There is one MAC-c/sh/m entity in each UE.

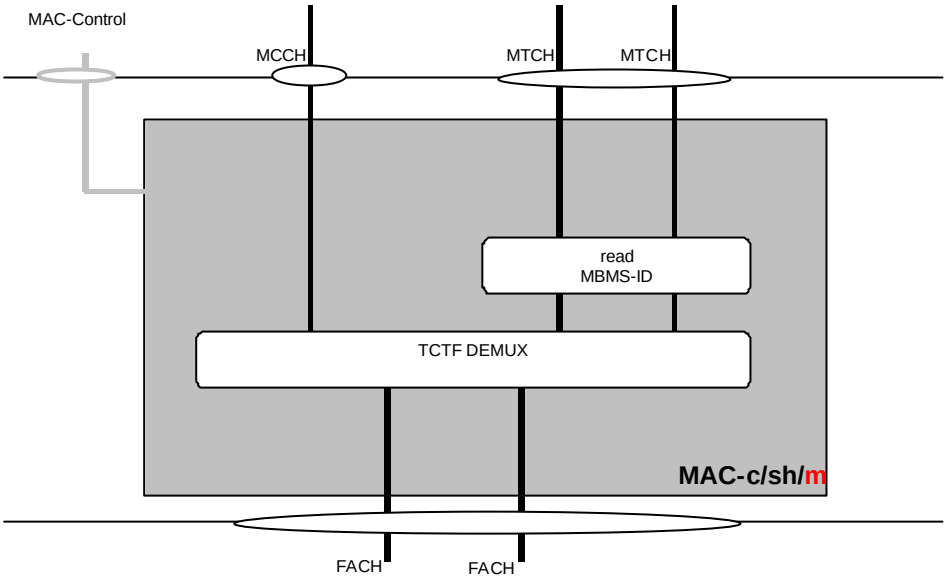

Figure 5. UE side MAC-m additions to MAC-c/sh

5.4 MBMS Reception in RRC States/Modes

The following descriptions add MBMS specific processes to be considered for each RRC State/Mode.

The BCCH contains information regarding the MCCH, while the latter contains information on the MTCH.

In the sub-sections below, how and when the UE reads the MCCH (e.g. usage of discontinuous reception, etc) is [FFS].

5.4.1 MBMS Reception in RRC Idle Mode

In idle mode, the UE shall:

- if the UE supports MBMS and
- if the UE has activated an MBMS service and this service is available in the cell where the UE is situated, i.e. MTCH and MCCH are available
  - act on RRC messages received on MCCH and:
  - if the MBMS service requires the establishment of an RRC Connection [FFS]:
    - inform upper layers that the MBMS Service requires the establishment of an RRC Connection,
  - if the MBMS service does not require the establishment of an RRC Connection [FFS]:
    - listen to the common transport channel on which the MTCH is mapped.

5.4.2 MBMS Reception in RRC Connected Mode: URA_PCH state

In URA_PCH, the UE shall:

- if the UE supports MBMS and

- if the UE has activated an MBMS service and this service is available in the URA where the UE is situated, i.e. MTCH and MCCH are available

  - act on RRC messages received on MCCH,

  - for each MBMS service that the UE has activated and where transmission on a MTCH is indicated in the MCCH, listen to the common transport channel on which the MTCH is mapped,

    NOTE: reception of multiple MBMS services is subject to UE capability; selection between these when needed is [FFS].

  - if on the MCCH is indicated that the MBMS service in the cell requires a cell update:

    - initiate a cell update procedure. The cause to be used in the cell update procedure is [FFS].

5.4.3 MBMS Reception in RRC Connected Mode: CELL_PCH state

In CELL_PCH, the UE shall:

- if the UE supports MBMS and

- if the UE has activated an MBMS service and this service is available in the cell where the UE is situated, i.e. MTCH and MCCH are available

  - act on RRC messages received on MCCH

  - listen to the common transport channel on which the MTCH is mapped,

5.4.4 MBMS Reception in RRC Connected Mode: CELL_FACH state

In CELL_FACH, the UE shall:

- if the UE supports MBMS and

- if the UE has activated an MBMS service and this service is available in the cell where the UE is situated, i.e. MTCH and MCCH are available

  - act on RRC messages received on MCCH

  - listen to the common transport channel on which the MTCH is mapped (for UEs with this capability),

NOTE: For UEs in CELL_FACH, UTRAN may decide to send MBMS data over DTCH.

5.4.5 MBMS Reception in RRC Connected Mode: CELL_DCH state

In CELL_DCH, the UE shall,

- if the UE supports MBMS and

- if the UE has activated an MBMS service and this service is available in the cell where the UE is situated, i.e. MTCH and MCCH are available and

- if the UE has the capabilities:

  - act on RRC messages received on MCCH

  - listen to the common transport channel on which the MTCH is mapped.

NOTE: For UEs in CELL_DCH, UTRAN may decide to send MBMS data over DTCH

5.5 MBMS Physical layer model

6. MBMS Channel Structure

6.1 Logical channels

6.2 Transport Channels

6.3 Physical Channels

7. UTRAN Signalling Flows for MBMS

7.1 MBMS RNC Signalling Flows

7.1.1 MBMS Service Context Establishment over Iu

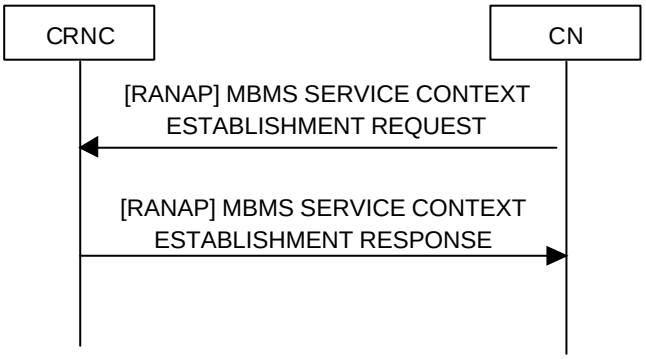

Figure 6: MBMS Service Context Establishment signalling flow. Successful operation.

This signalling flow is applicable for handling MBMS to UEs in PMM IDLE and PMM CONNECTED mode.

This signalling flow is used to establish an MBMS service context in the RNC. The signalling flow is typically initiated when an MBMS service is created (the details of when the signalling flow is initiated are to be defined in SA2).

EDITOR'S NOTE: The above needs to be clarified once SA2 has made a decision.

The MBMS SERVICE CONTEXT ESTABLISHMENT REQUEST contains the MBMS Service Id, The Service Area Information, QoS parameters. The Multicast/Broadcast Service Area Information could include a service area where UEs have to be tracked (counted), and/or a service area where this is not required.

When the Iu user plane for this MBMS RAB is established is [FFS].

NOTE: The signalling flow for linking a UE to the established MBMS service context is not yet included.

7.1.2 Channel Type Switching over Uu

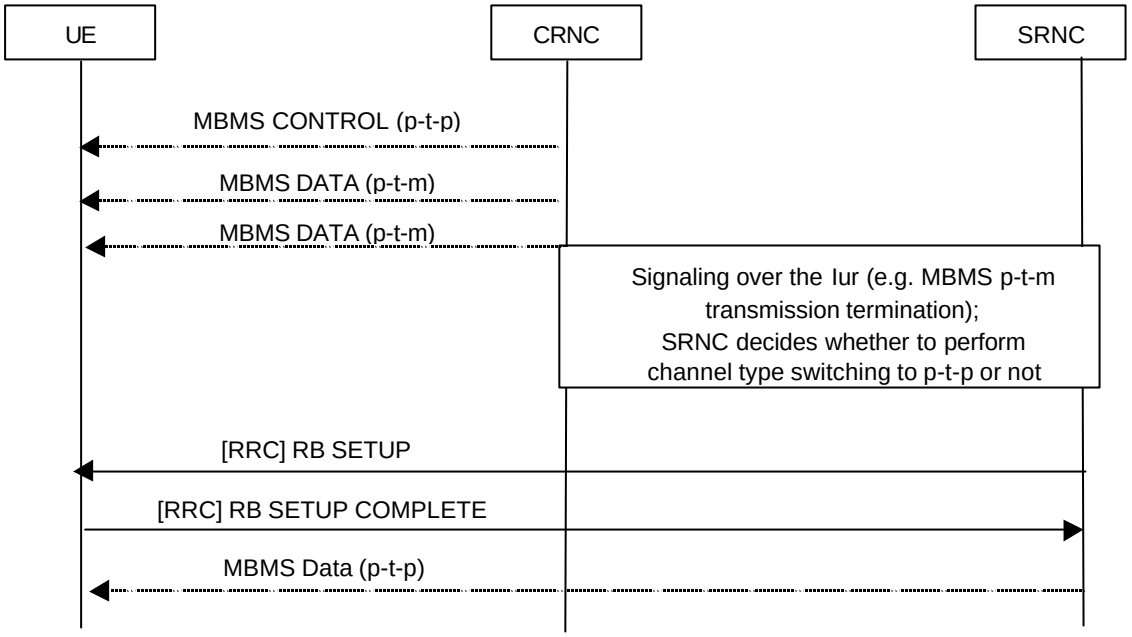

Figure 7: Channel type switching signalling flow from p-t-m to p-t-p.

The CRNC is responsible for the decision regarding having p-t-m transmission or no p-t-m transmission in a cell for a specific MBMS service. The CRNC informs all the SRNCs having UEs in that cell about its decision. The SRNC is the RNC controlling the RRC connection and RBs to a specific UE. In the example shown, the CRNC decided to no longer use p-t-m, then the SRNC decided to perform channel type switching to deliver the MBMS service over DTCH mapped on a dedicated channel. The RB SETUP message will contain the MBMS Service Id.

NOTE: the channel type switching in this case includes a change of both transport and logical channels.

7.1.3 MBMS UE Linking

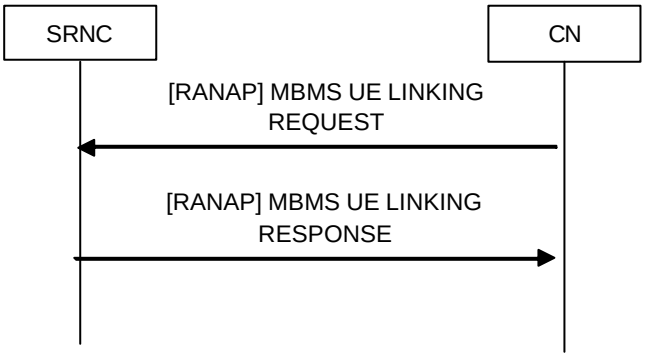

Figure 8: MBMS UE linking signalling flow

This signalling flow is only applicable for handling MBMS to UEs in PMM CONNECTED mode.

The signalling flow is used to link a specific UE to an MBMS service. The MBMS UE LINKING REQUEST message contains the list of MBMS Service Ids activated by the UE. If there has not been a MBMS service context related to the MBMS service Id then SRNC creates a MBMS service context after this procedure.

7.1.4 MBMS UE De-Linking

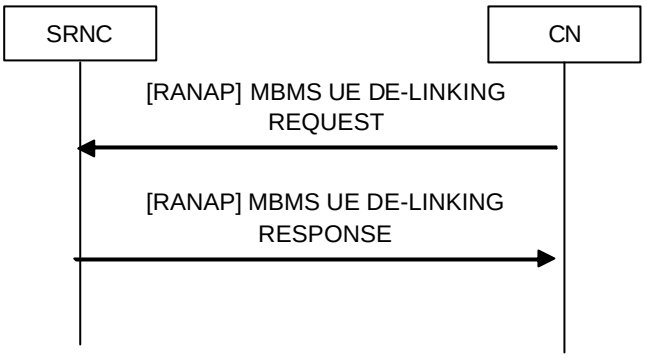

Figure 9: MBMS UE De-linking signalling flow

This signalling flow is only applicable for handling MBMS to UEs in PMM CONNECTED mode.

The signalling flow is used to remove a specific UE from an MBMS service context. The MBMS UE DE-LINKING REQUEST message contains the list of MBMS Service Ids de-activated by the UE.

7.1.5 MBMS Attach/Detach over Iur

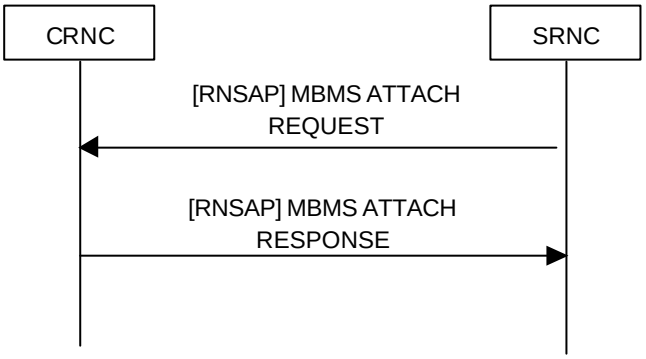

Figure 10: MBMS attach request signalling flow: Successful Operation.

This signalling flow is only applicable for handling MBMS to UEs in PMM CONNECTED mode.

The purpose of this signalling flow is to allow the CRNC to add a new UE to the total number of UEs in a given cell using a MBMS service. The signalling flow is initiated when an UE with an ongoing MBMS service enters in a new cell controlled by the CRNC. The MBMS ATTACH REQUEST contains the Cell Id of the new cell, the MBMS Service Id, the U-RNTI of the UE [FFS].

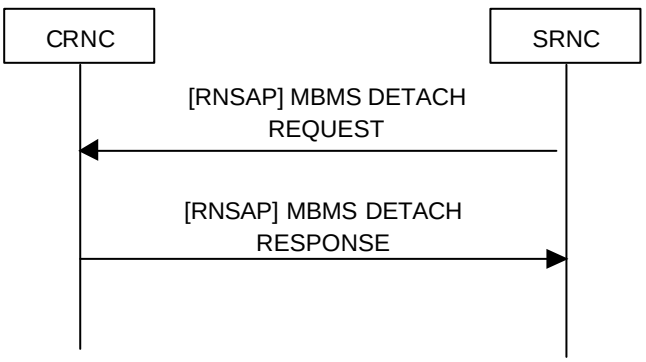

Figure 11: MBMS detach request signalling flow: Successful Operation.

This signalling flow is only applicable for handling MBMS to UEs in PMM CONNECTED mode.

The purpose of this signalling flow is to allow the CRNC to decrease the total number of UEs receiving an MBMS service in a given cell. The signalling flow is initiated when a UE with an ongoing MBMS service leaves a cell controlled by the CRNC. The MBMS DETACH REQUEST contains the Cell Id of the old cell, the MBMS Service Id, the U-RNTI of the UE [FFS].

7.1.6 MBMS p-t-m Transmission Initiation/Termination over Iur

These signalling flows need further study.

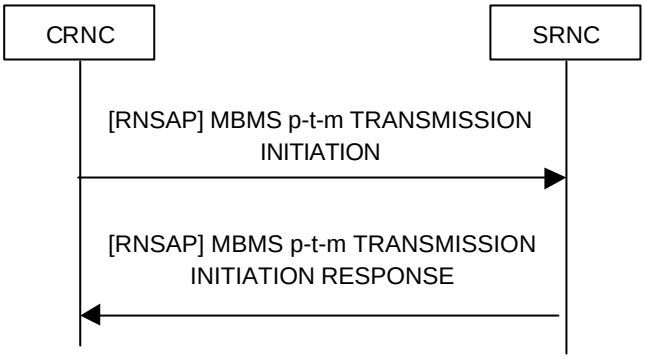

Figure 12: MBMS p-t-m transmission initiation signalling flow: Successful Operation.

This signalling flow is only applicable for handling MBMS to UEs in PMM CONNECTED mode.

The purpose of this signalling flow is that the CRNC informs the SRNC when a MBMS Service is delivered over a common transport channel in a cell under the CRNC for a UE connected to the SRNC. The MBMS p-t-m TRANSMISSION INITIATION contains either a list of U-RNTI and MBMS Service Id corresponding to the UEs connected to the SRNC or alternatively the MBMS Service Id and the Cell Id of the cells where the indicated MBMS Services are delivered in broadcast [FFS].

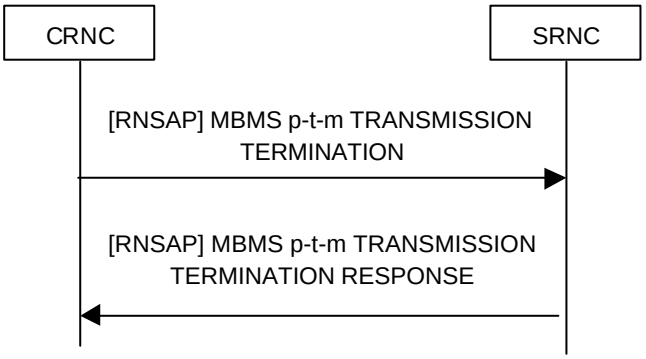

Figure 13: MBMS p-t-m transmission termination signalling flow: Successful Operation.

This signalling flow is only applicable for handling MBMS to UEs in PMM CONNECTED mode.

The purpose of this signalling flow is that the CRNC informs the SRNC when a MBMS Service is no longer delivered over a common transport channel in a cell under the CRNC for a UE connected to the SRNC. The MBMS p-t-m TRANSMISSION TERMINATION contains either a list of U-RNTI and MBMS Service Id corresponding to the UEs connected to the SRNC or alternatively the MBMS Service Id and the Cell Id of the cells where the indicated MBMS Services are delivered in p-t-m [FFS].

7.2 MBMS Uu Signalling Flows

7.2.1. MBMS Service Availability

Figure 13: MBMS service availability signalling flow

This signalling flow is applicable for handling MBMS to UEs in PMM IDLE and CONNECTED mode.

The purpose of the signalling flow is for RNC to inform UE of the availability of a MBMS service in one cell. Information to be included in MBMS SERVICE AVAILABILITY is [FFS].

7.2.2. MBMS Radio Bearer Information

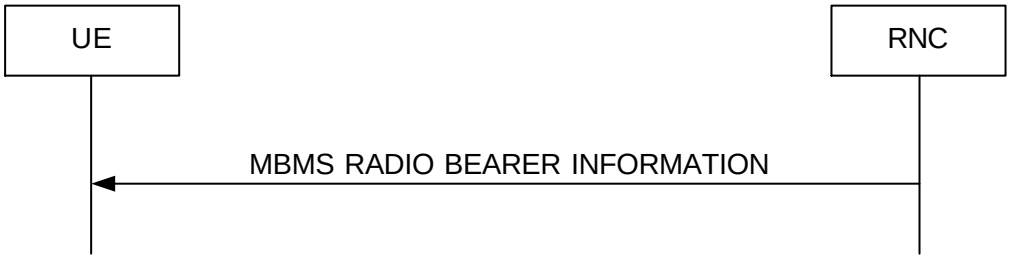

Figure 14: MBMS radio bearer information signalling flow

This signalling flow is applicable for handling MBMS to UEs in IDLE and PMM CONNECTED mode.

The purpose of the signalling flow is for the RNC to inform UE(s) regarding the MTCH radio bearer information. MBMS RADIO BEARER INFORMATION is only available for p-t-m transmission. MBMS RADIO BEARER INFORMATION includes MBMS Service Id, logical channel, transport channel and physical channel information per MBMS service. More information may be included in MBMS RADIO BEARER INFORMATION. [FFS]

8. Security for MBMS

9. Mobility Procedures for MBMS

One of the requirements in [4] is: “Data loss during cell change should be minimal”. Therefore, when the UE receiving an MBMS session in idle mode or connected mode (not including CELL_DCH) re-selects between cells , it should be possible to provide service continuity to this UE .

The following mechanism has been identified to minimise the data loss on cell change. Additional mechanisms allowing to send the MBMS bearer type notification when new mobiles arrive or leave a cell are [FFS].

9.1 Use of Periodical MBMS Channel Type Notification

In this mechanism, the cell will be periodically transmitting an MBMS Channel Type Notification from the UTRAN, informing all MBMS subscribers if it is currently configured for p-t-m transmission or p-t-p transmission. If it is configured for p-t-m transmission, the channel may also contain the Radio Bearer parameters corresponding to the TMGI of each service. Thus no UE signalling would be required towards the UTRAN.

[However, if it is necessary for the UE to instead initiate reception of the RB parameters, such a mechanism similar to the Cell Update procedure may be more suitable.]

If the cell is configured for p-t-p transmission, then the UE would perform a normal RRC connection establishment.

Additionally, the UE in a cell receiving MBMS p-t-m, could be periodically checking the MBMS Channel Type Notification in neighbour MBMS cells to acquire information about whether p-t-m or p-t-p transmission is required if it accesses that cell.

10. Resource Management for MBMS

Annex <A>: MBMS Phases in UTRAN

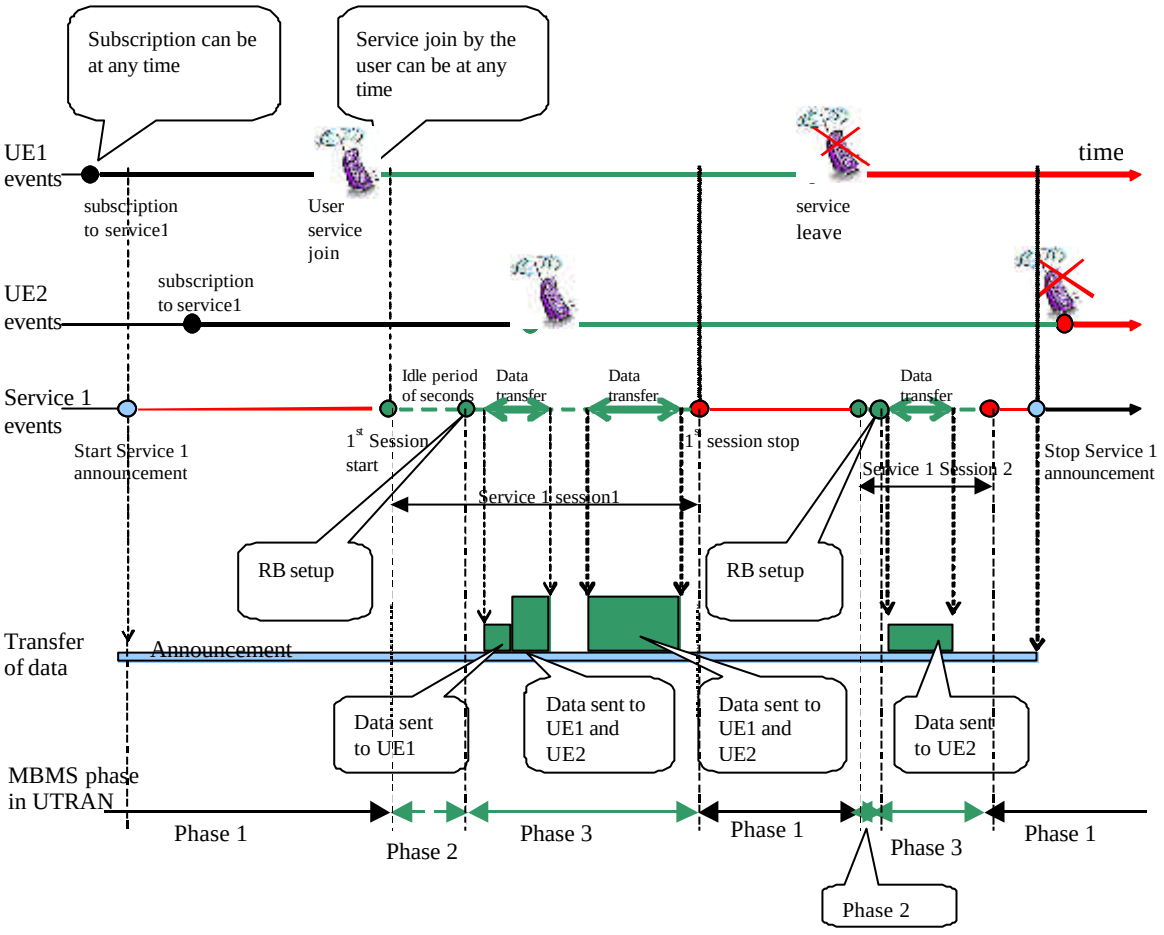

Figure 14. Timeline of MBMS Service

The UTRAN MBMS behavior is divided into 3 phases. Figure 14 illustrates the timeline of an MBMS service with regards to these phases.

A1. MBMS Phase 1

A cell stays in phase 1, if there is no ongoing session for the MBMS service, or if it does not belong to the service area of the service.

. A UE that has joined an MBMS service may regularly try to receive MBMS notification in a cell [FFS]. At this phase the UE does not request service delivery to UTRAN.

A2. MBMS Phase 2

This phase starts when UTRAN receives the MBMS "session start" from CN, and ends when UTRAN initially sets up MBMS radio bearer for the session, or decides not to set up the MBMS radio bearer in a cell.

In this phase, UTRAN transmits notification to UEs about the incoming service and could perform counting procedure to decide the type of MBMS radio bearer. UTRAN decides whether to set up p-t-m, p-t-p radio bearer or no radio bearer, based on the number of UEs that expected to receive the service in the cell. A UE that has joined a MBMS service acts on a RRC message in MCCH.

A3. MBMS Phase 3

This phase starts after initial MBMS radio bearer setup and ends when UTRAN receives the MBMS "session stop" from CN.

In this phase, UTRAN transmits the data for the MBMS service received from CN using, if any, the established radio bearer. If there is no set-up radio bearer, UTRAN waits for service delivery request from UE. Recounting and radio bearer reconfiguration can be performed during this phase.

UTRAN behavior in this phase can be divided into three states: no transmission, p-t-p transmission, and p-t-m transmission. Each cell belonging to the same service area, can be in any of three states. With the variation of the number of UEs, the state of a cell can change between the three states. UTRAN may broadcast the state of each cell.

1) No Transmission: In this state of a cell, there is no established radio bearer because there is no UE who wants to receive the service. An MBMS-joined UE in idle mode that moves into the cell of this state requests service delivery to UTRAN.

2) P-t-p Transmission: In this state of a cell, p-t-p radio bearer is established. A UE that has joined a MBMS service can receive MBMS data over p-t-p radio bearer if there is MBMS data to receive.

3) P-t-m Transmission: In this state of a cell, p-t-m radio bearer is established. A UE that has joined a MBMS service can receive MBMS data over p-t-m radio bearer if there is MBMS data to receive.

A4. MBMS Phases and Status Parameters

Table 1 lists the MBMS parameters that need to be broadcast in each MBMS phase. The list is [FFS]

	Phase 1	Phase 2	Phase 3	Description
Service ID	X	O	O	Identity of the Service
Transmission State	X	X	O (NONE/p-t-p/p-t-m)	State of the cell for MBMS transmission
Counting	X	O (On/Off)	O (On/Off)	Whether counting procedure is going on.

Table 1. MBMS Status Parameters

1) Service ID: This parameters indicates is the identity of the service concerned.

2) Transmission state: This parameter indicates to UE(s) the state of the concerned cell while it is in phase 3. According to this parameter, UE entering the cell starts re-configuration of the radio bearer, or requests service delivery to UTRAN. Specifically, if this parameter is set to "p-t-m", UE receives service over p-t-m radio bearer and if set to "p-t-p", UE receives service over p-t-p radio bearer. If it is set to NONE, UE has to request UTRAN to deliver the service.

3) Counting: The counting parameter informs UEs whether counting is required (and is going on) or not. If this parameter is set to "ON", UE should perform RRC connection procedure.

Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
8/02	RAN2#31	R2-021846					0.0.1
9/02	RAN2#32	R2-020590			Skeleton Endorsed with some changes in sections from RAN2#31	0.0.1	1.0.0
11/02	RAN2#33	R2-022927			No MBMS Discussions		
1/03	RAN2/3 MBMS	R2-030006			R2-022644 and R2-022699	1.0.0	1.1.0

	AdHoc						
2/03	RAN2#34	R2-030122			Inclusion of R2-030010, R2-030050, figure from R2-030015, mechanism 1 from R2-030062, + editorial changes + principles in section 5.1.3	1.1.0	1.4.0
4/03	RAN2#35	R2-030707			Inclusion of R2-030010 + section 5.1.4 based on agreed bullet points from RAN2#34 + correction of version numbering + addition of "change history" section.	1.4.0	1.5.0
5/03	RAN2/3AdHoc	R2-030882			-R2-030907 "Functional Description on MAC-c/sh/m". -R2-030902 on the "MBMS Control Plane Protocol Stack". -R2-030910 on MBMS UTRAN Phases in Annex A. -R3-030584: only inclusion of sections: 7.1.3 and 7.1.4. In 7.1.3 there is one additional comment regarding the addition of "PMM" whever CONNECTED mode" is mentioned. -R3-030614: Addition of chapter 5.1.x -R3-030615: changes in section 5.1.2. -R3-030615: proposed section 5.1 was reworded.	1.5.0	1.6.0
5/03	RAN2#36				- Inclusion of contribution R2-03930, sections: 7.2.1.1 and 7.2.1.2 from decisions from RAN2/3 MBMS adhoc. - Use of term "MBMS service context" instead of "MBMS context" throughout the document. - Correction of spelling mistake in figure 1: "Protocol Stack for MCTCH" should be: "Protocol Stack for MTCH". - Revision of Appendix A "MBMS Phase 1": Part of the second paragraph has been deleted due to concerns from RAN3. - During the RAN2 MBMS AdHoc it was decided that MCCH and MTCH are to be mapped on FACH. This decision is captured at the bottom of 5.3.1 by adding the sentence "Both logical channels are mapped on FACH". FACH is also mentioned is several places in 5.3.2 (MAC Architecture) as an example (e.g. FACH). The "e.g." has now been deleted.	1.6.0	1.6.1