TSG-RAN Meeting #27 **RP-050080**
Tokyo, Japan, 09-11 March 2005 **Agenda item 9.4**

Source: TSG-RAN WG2

Title: 25.346 CRs to Rel-6 on MBMS

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level	Workitem
25.346	010	-	Rel-6	Introduction of MBMS Frequency dispersion	F	6.3.0	6.4.0	R2-050657	MBMS-RAN
25.346	011	-	Rel-6	Correction on MBMS multiplexing and soft combining in TDD	F	6.3.0	6.4.0	R2-050658	MBMS-RAN
25.346	012	-	Rel-6	Clarification to UE capabilities to consider MCCH reception and selective/soft combining requirements	F	6.3.0	6.4.0	R2-050649	MBMS-RAN
25.346	013	-	Rel-6	Extending the counting procedure for UEs in CELL_PCH/FACH state and introducing UE initialised p-t-p setup request	F	6.3.0	6.4.0	R2-050647	MBMS-RAN
25.346	015	-	Rel-6	Introduction of new procedures in MBMS stage 2 spec	F	6.3.0	6.4.0	R2-050709	MBMS-RAN

3GPP TSG-RAN WG2 Meeting #46
Scottsdale, USA, 14th-18th of February

Tdoc ⌘R2-050657

CR-Form-v7.1

CHANGE REQUEST

⌘ **25.346** **CR** **010** ⌘ **rev** **-** ⌘ Current version: **6.3.0** ⌘

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

Title:	⌘	Introduction of MBMS Frequency dispersion
Source:	⌘	RAN WG2
Work item code:	⌘	MBMS-RAN
Date:	⌘	February/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	It is assumed that there are a high number of UEs in the preferred layer after session stop. Therefore downlink radio resource in the MBMS preferred layer could be easily depleted compared with other frequency layers even if UTRAN accepts the same number of UE connections.
Summary of change:	⌘	UTRAN should indicate UEs to disperse across the available frequencies after session stop. Upon receiving the indication, UE shall randomly re-select the frequency layer according to its capability.
Consequences if not approved:	⌘	Possibility of overloading would be increased in the preferred layer after session stop.

Clauses affected:	⌘	New subclause: 11.3

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

Other comments: ⌘

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

11.3 Frequency layer Dispersion

Frequency Layer Dispersion (FLD) denotes the process where the UTRAN redistributes UEs across the frequencies. UTRAN can use FLD per MBMS session.

The request to perform dispersion can be signalled to UEs by the CRNC after the session stop is received over Iu interface. The UEs shall take into account this request whenever it is signalled on the MCCH.

For FDD, the FLD is applicable in Idle mode, URA_PCH, CELL_PCH and CELL_FACH states.

For TDD, the FLD is applicable in Idle mode, URA_PCH and CELL_PCH states.

The UE shall ignore Sintersearch parameter for re-selecting frequency layer when FLD is signalled. On the re-selected layer the UE shall apply the Sintersearch parameter.

The need for a pseudo-random function to determine the re-selected frequency is FFS. If a pseudo-random function is needed, it shall be left to the UE implementation.

The details of the mechanism are defined in stage 3.

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CHANGE REQUEST

⌘ **25.346** **CR** **011** ⌘ **rev** **-** ⌘ Current version: **6.3.0** ⌘

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

Title:	⌘	Correction on MBMS multiplexing and soft combining in TDD
Source:	⌘	RAN WG2
Work item code:	⌘	MBMS-RAN
Date:	⌘	09/02/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

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R96 *(Release 1996)*
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R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*
Rel-7 *(Release 7)*

Reason for change:	⌘	1) The sub-clause 5.3.1 defines the protocol stack for MTCH, with mandatory PDCP functionality, even though it is clear that MBMS ptm transmission would be possible without header compression. Thus PDCP layer is present only if header compression is performed. 2) The caption of the Figure 5.3.2 presenting protocol stack for MBMS control plane does not include MSCH, even though similar protocol stack is used for MCCH and MSCH. 3) The sub-clause 5.4.2 defines that in soft combining the combinable S-CCPCH shall have same TFC during the TTIs when L1 combining is used. However, this is not correct for TrCH combining utilised in TDD. 4) The sub-clauses 6.2.1.1, 6.2.1.2, and 6.2.1.3 does not clearly define the TCTF field usage for MBMS logical channels in point-to-multipoint transmission.
Summary of change:	⌘	1) The Figure 5.3.1 is modified so that PDCP layer is optional and it is included if it is configured by the CRNC 2) MSCH is included in the caption of the Figure 5.3.2 3) The TrCH combining in TDD mode is excluded from the sentence 4) It is clarified that for MCCH and MSCH the TCTF field can be absent if MCCH or MSCH is the only logical channel mapped to the FACH. This case is explicitly signalled, and otherwise the TCTF field is used. It is also clarified that for MTCH the TCTF field is always used.
Consequences if not approved:	⌘	The specification is incorrect and does not reflect definitions in stage-3 specifications.

Clauses affected:	⌘	5.3.2, 5.4.2, 6.2.1.1, 6.2.1.2, and 6.2.1.3			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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5.3 Protocol structure

5.3.1 MBMS User Plane Protocol Stack Architecture

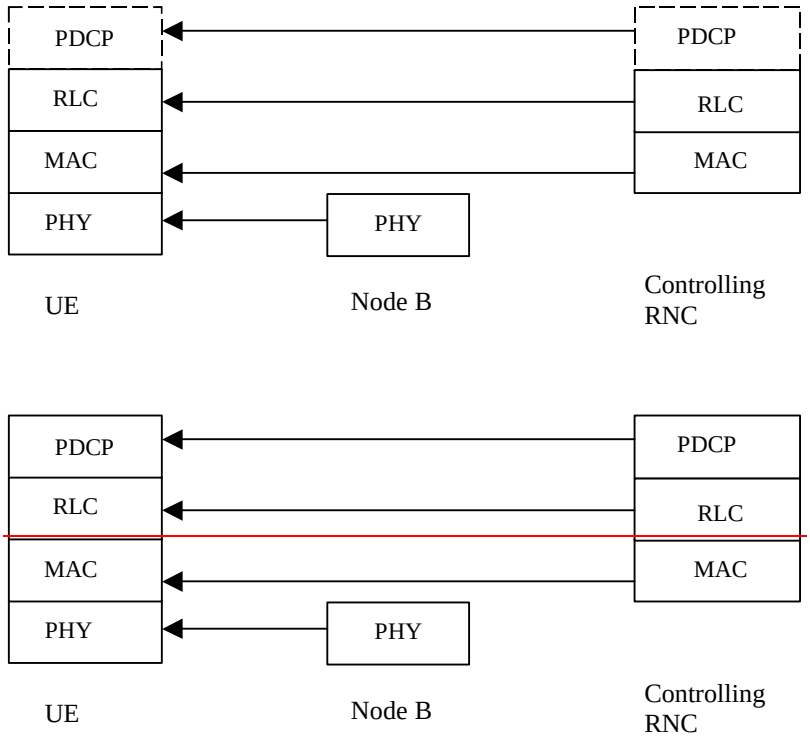

Figure 5.3.1: Protocol Stack for MTCH

Figure 5.3.1 illustrates the protocol termination for MTCH in MBMS, which is used in p-t-m transmission.

If configured by CRNC the PDCP sub-layer performs header compression/decompression for the MBMS traffic.

PDCP sub-layer may operate with RFC 3095 header compression protocol. In that case, header compression should be performed under RFC 3095 U-mode.

In the UTRAN side, there is one PDCP entity per cell supporting MBMS or MBMS Cell Group for each MBMS service in each RNS. The shared PDCP entity in the UTRAN duplicates all PDCP PDUs to every RLC entity for every cell belonging to one MBMS Cell Group.

In the UTRAN, there is one RLC entity for each MBMS service in each cell or cell group in case of utilization of selective combining or maximum ratio combining in TDD, and one MAC entity for each cell.

In the UE side, there is one PDCP and RLC entity for each MBMS service in each UE. In each UE there is one MAC entity per received cell when UE is performing the selective combining between these cells.

In case of p-t-p transmission, DTCH is used for MBMS transmission and the protocol termination for DTCH mapped on DCH and RACH/FACH are presented in [8].

5.3.2 MBMS Control Plane Protocol Stack Architecture

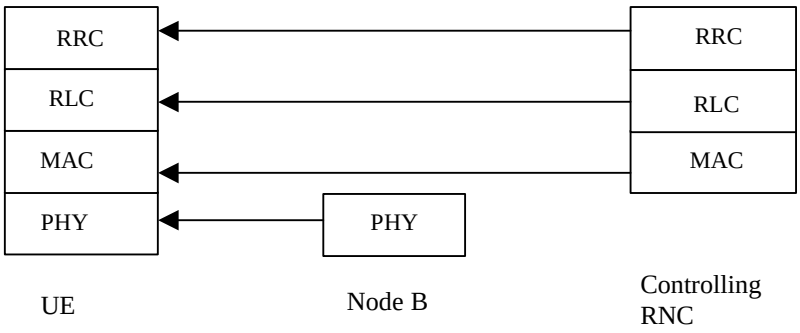

Figure 5.3.2: Protocol Stack for MCCH and MSCH

Figure 5.3.2 illustrates the protocol termination for MCCH and MSCH in MBMS, which are MBMS p-t-m control channels.

MBMS functionalities are included in MAC and RRC.

In case of p-t-p transmission, DCCH is used for MBMS and the protocol termination for DCCH mapped on DCH and FACH are presented in [8].

5.4 MAC architecture

5.4.1 UTRAN MAC Architecture to support MBMS

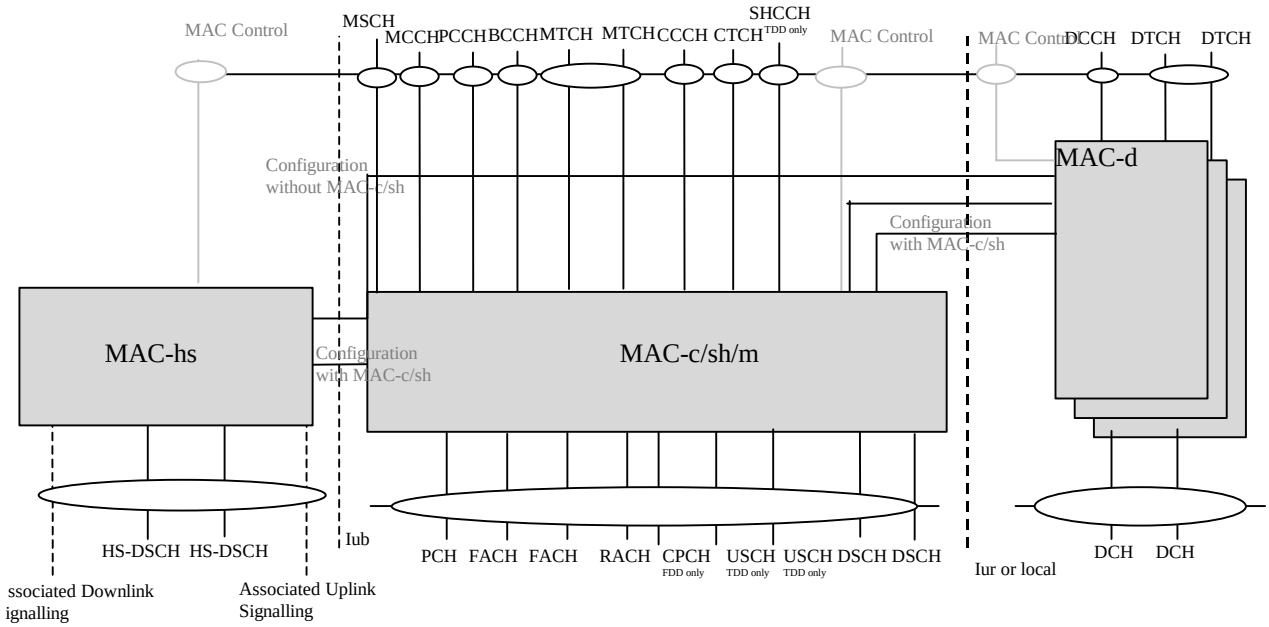

Figure 5.4.1: UTRAN MAC architecture

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 as presented in Figure 5.4.1. In addition, three logical channels are considered for p-t-m transmission of MBMS: MCCH, MSCH and MTCH. These logical channels are mapped on FACH. In case of p-t-p transmission DTCH and DCCH are used.

5.4.2 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 / Buffering / Priority Handling: This function manages common transport resources between MBMS and non-MBMS data flow(s) according to their priority and delay requirements set by higher layers.
- 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, MSCH and MCCH. In the case of MBMS soft combining (excluding TrCH combining in TDD), the combinable S-CCPCHs shall have the same TFC during the TTIs in which L1 combining is used.

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

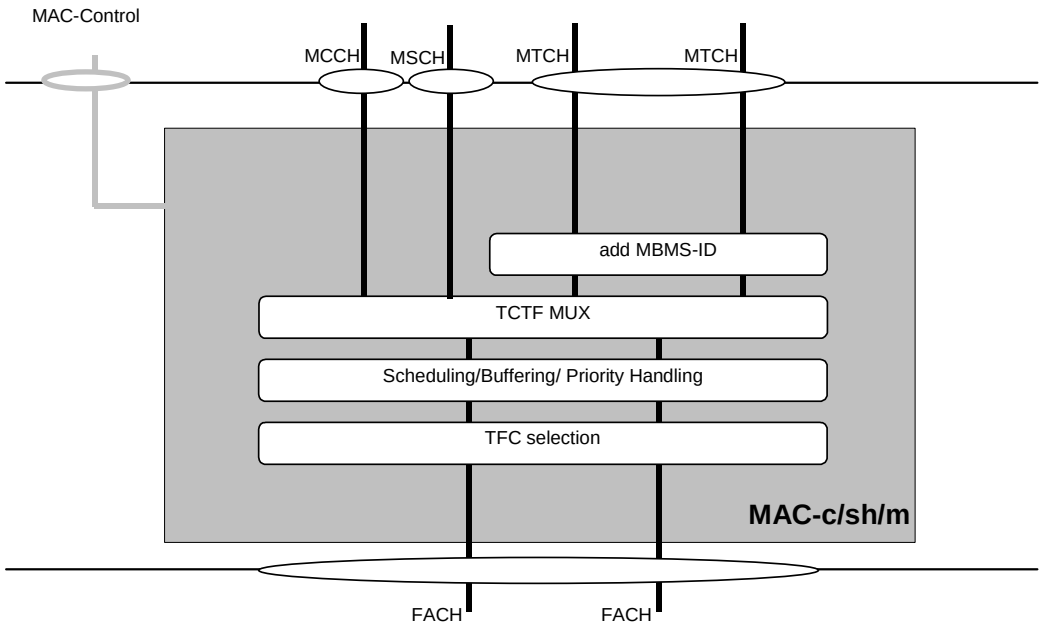

Figure 5.4.2: UTRAN side MAC-m architecture additions to MAC-c/sh

5.4.3 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-m entity in the UE or in case of selective combining one MAC-m entity for each selectively combined cell in the UE.

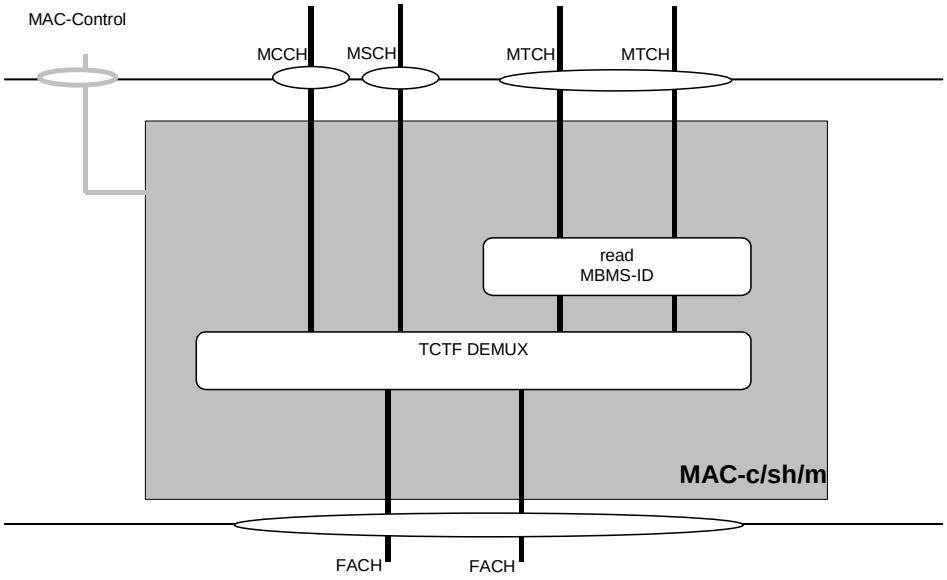

Figure 5.4.3: UE side MAC-m additions to MAC-c/sh

6 MBMS Channel Structure

There exists two transmission modes to provide the MBMS service:

- Point-to-point transmission (p-t-p)
- Point-to-multipoint transmission (p-t-m)

6.1 Point-to-Point Transmission

Point-to-point transmission is used to transfer MBMS specific control/user plane information as well as dedicated control/user plane information between the network and one UE in RRC Connected Mode. It is used only for the multicast mode of MBMS.

For a UE in CELL_FACH and Cell_DCH, DCCH or DTCH is used, allowing all existing mappings to transport channels.

A detailed description of channels used for point-to-point transmission is given in [8].

6.2 Point-to-multipoint Transmission

Point-to-multipoint transmission is used to transfer MBMS specific control/user plane information between the network and several UEs in RRC Connected or Idle Mode. It is used for broadcast or multicast mode of MBMS.

6.2.1 Logical Channels

6.2.1.1 MBMS point-to-multipoint Control Channel (MCCH)

This logical channel is used for a p-t-m downlink transmission of control plane information between network and UEs in RRC Connected or Idle Mode. The control plane information on MCCH is MBMS specific and is sent to UEs in a cell with an activated (joined) MBMS service. MCCH can be sent in S-CCPCH carrying the DCCH of the UEs in CELL_FACH state, or in standalone S-CCPCH, or in same S-CCPCH with MTCH.

The MCCH is always mapped to one specific FACH in the S-CCPCH as indicated on the BCCH. If MCCH is the only logical channel mapped in to the FACH, the absence of the TCTF field is explicitly signalled otherwise the TCTF field

is used in MAC header to identify MCCH logical channel type. In case of soft combining, the MCCH is mapped to a different S-CCPCH (CCTrCH in TDD) than MTCH.

Reception of paging has priority over reception of MCCH for Idle mode and URA/CELL_PCH UEs.

6.2.1.2 MBMS point-to-multipoint Traffic Channel (MTCH)

This logical channel is used for a p-t-m downlink transmission of user plane information between network and UEs in RRC Connected or Idle Mode. The user plane information on MTCH is MBMS Service specific and is sent to UEs in a cell with an activated MBMS service.

The MTCH is always mapped to one specific FACH in the S-CCPCH as indicated on the MCCH. The TCTF field is always used in MAC header to identify MTCH logical channel type.

6.2.1.3 MBMS point-to-multipoint Scheduling Channel (MSCH)

This logical channel is used for a p-t-m downlink transmission of MBMS service transmission schedule between network and UEs in RRC Connected or Idle Mode. The control plane information on MSCH is MBMS service and S-CCPCH specific and is sent to UEs in a cell receiving MTCH. One MSCH is sent in each S-CCPCH carrying the MTCH.

The MSCH is always mapped to one specific FACH in the S-CCPCH as indicated on the MCCH. Due to different error requirements the MSCH is mapped to a different FACH than MTCH. If MSCH is the only logical channel mapped in to the FACH, the absence of the TCTF field is explicitly signalled otherwise the TCTF field is used in MAC header to identify MSCH logical channel type.

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Scottsdale, USA, February 14th to 18th, 2005

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CHANGE REQUEST

⌘ **25.346** **CR** **012** ⌘ **rev** **-** ⌘ Current version: **6.3.0** ⌘

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

Title:	⌘	Clarification to UE capabilities to consider MCCH reception and selective/soft combining requirements
Source:	⌘	RAN WG2
Work item code:	⌘	MBMS-RAN
Date:	⌘	18th Feb 2005
Category:	⌘	**F**
Release:	⌘	Rel-6

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R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The UE capabilities for MBMS are currently unclear with regards to MCCH. It is also unclear as to whether the S-CCPCH requirements for MTCH reception include those for which selective/soft combining is performed.
Summary of change:	⌘	The UE capabilities are updated to clarify that: 1) MCCH reception does not require any increase in the minimum number of S-CCPCHs that the UE is required to receive. 2) The existing S-CCPCH reception capabilities of MTCH include the S-CCPCHs required for combining.
Consequences if not approved:	⌘	The minimum required capabilities of the MBMS UE would not be clear.

Clauses affected:	⌘	7.2

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

Other comments: ⌘

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7.2 UE Capability

The UE MBMS capability is not sent to UTRAN and is subject to UE implementation, including the relation between MBMS capability and actual RRC state which is also a UE implementation. A consequence is that a UE may be counted although its actual capability does not allow to receive MBMS transmissions e.g. because of its current RRC state. Further optimizations to avoid counting of useless UEs may be included in Stage 3.

The standard will describe a minimum UE capability requirement in order to allow operators to configure MBMS channels that can be common to all UEs supporting the given service.

There are some UE capability requirements that are common to all eventual service categories:

The minimum UE capability for MBMS capable UE, is one primary CCPCH plus all the configurations below. The UE is not required to support these configurations simultaneously.

1. One PICH and one MICH
2. One S-CCPCH and one MICH
3. One S-CCPCH (dedicated FACH and possibly the FACH, which may carry MCCH) and two S-CCPCH with 80ms TTI for MTCH reception
4. One S-CCPCH (dedicated FACH and possibly the FACH, which may carry MCCH) and three S-CCPCH with 40ms TTI for MTCH reception
5. One PICH and two S-CCPCH with 80ms TTI for MTCH reception
6. One PICH and three S-CCPCH with 40ms TTI for MTCH reception

The requirement one reflects the case when the UE is in Idle mode, or URA_PCH, CELL_PCH state and MBMS reception is not ongoing and requirement five and six are for the case that MBMS reception is ongoing in Idle mode, or URA_PCH, CELL_PCH state.

The requirement two reflects the case when the UE is in CELL_FACH state and MBMS is reception not ongoing and requirement three and four are for the case when MBMS reception is ongoing respectively.

The requirement for the number of simultaneous S-CCPCHs for MTCH reception includes those S-CCPCHs for which combining is performed.

When MBMS ptm reception is ongoing, the UE is required to periodically monitor the MCCH, which may be mapped onto a different S-CCPCH from MTCH, and a different S-CCPCH than the R'99 FACH when the UE is in CELL_FACH state. However this does not increase the requirement for the number of S-CCPCHs to be simultaneously received by the UE.

The ability of the UE to receive DPCH/HS-PDSCH simultaneously with S-CCPCH carrying MTCH/MCCH is subject to UE capability.

The minimum MBMS bit rate that all MBMS capable UEs shall support is to be defined in Stage 3.

For FDD, the UE shall support selective combining and soft combining. For TDD, the UE shall support selective and soft combining.

The standard may restrict further the UE implementation options by defining certain capability combinations.

If the UE is supporting MBMS ptm reception in CELL_DCH state, it shall have capability to acquire MCCH configuration from BCCH after handover procedure, and after that receive MCCH and MTCH.

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Scottsdale, USA, 14th-18th of February

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CHANGE REQUEST

⌘ **25.346** **CR** **013** ⌘ **rev** **-** ⌘ Current version: **6.4.0** ⌘

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

Title:	⌘	Extending the counting procedure for UEs in CELL_PCH/FACH state and introducing UE initialised p-t-p setup request
Source:	⌘	RAN WG2
Work item code:	⌘	MBMS-RAN
Date:	⌘	21/02/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

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Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	1) As the session repetition concept was created in SA2, the existing Iu linking based counting become inaccurate, as CRNC does not have knowledge have UEs in CELL_PCH and CELL_FACH already received session correctly. 2) Due to service priorisation and session repetition the UE is allowed to reject p-t-p RB setup in case that it has already received session or cannot receive p-t-p due to higher priority MBMS session provided on p-t-m. The SRNC cannot know in paging or RB setup phase, if the UE is going to accept or reject MBMS p-t-p setup, and thus in case of reject unnecessary signalling was introduced in the system.
Summary of change:	⌘	1) The counting is extended to include UE is CELL_PCH and CELL_FACH state so that if UE passes the probability check the UE responses counting on CCCH or DCCH. 2) The usage of Rel99 paging for p-t-p RB setup is removed as signalling is optimised in such a way that UEs capable of receiving MBMS service on p-t-p channel shall request p-t-p RB setup after receiving channel type indication on MCCH.
Consequences if not approved:	⌘	Counting remains inaccurate, and p-t-p RB setup signalling is un-optimised. Agreements in RAN WG2 has not been reflected in State-2

Clauses affected:	⌘					
Other specs	⌘	Y [ ]	N [X]	Other core specifications	⌘	

affected:		X	Test specifications
		X	O&M Specifications
Other comments:	⌘	5.2.5, 5.2.7, 7.2, 7.3, 8.1, 8.3.8, 8.3.9, 8.3.10 (new)	

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First Modified Section

5.2.5 MBMS Counting

MBMS Counting is used to determine the optimum transmission mechanism for a given service.

1. The need for counting is indicated in the notification, and achieved by requesting UEs, belonging to the same MBMS service group, to respond counting by sending MBMS COUNTING RESPONSE signalling flow to CRNC

    a. For UEs in idle mode the counting response refers to the RRC connection establishment procedure.

    b. For UEs in URA_PCH, or CELL_PCH state the counting response refers to cell update procedure

    c. UEs in CELL_FACH state the counting response refers to signalling on CCCH or DCCH.

2. The exact number of UEs that need to respond to counting ~~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 may control the load due to the RRC connection establishment requests, by setting an access "probability factor". For UEs in PMM connected mode the UTRAN may set different "probability factor" than UEs in idle mode.

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 may be switched on and off, on per-cell basis.

6. The RNC may use notification to indicate counting during an ongoing MBMS session (term used is re-counting).

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

The MBMS counting function includes a mechanism by which the UTRAN can prompt users interested in a given service to become RRC connected. This procedure is only applicable for UEs in idle mode and relies on the MBMS ACCESS INFORMATION transmitted on the MCCH. The probability factor indicates the probability with which UEs need to attempt an RRC connection procedure.

In order to trigger counting for a given service, the UTRAN may use the regular MBMS notification mechanism outlined in section 5.2.4 to force UEs interested in the service to read the MCCH information.

Once a UE detects that the counting procedure is on-going for the specific service it wants to receive, it will attempt to ~~set up an RRC connection~~ respond to the counting based on the probability factor included in the MCCH. ~~[The details of this mechanism will be defined in the Stage 3 specifications].~~

~~A UE in URA_PCH state which is notified on the MCCH shall initiate a cell update procedure with a specific cause based upon the information provided in the MBMS ACCESS INFORMATION.~~

Also, the UE will keep receiving the MBMS ACCESS INFORMATION at every access info period until the UE successfully ~~in idle mode becomes RRC connected or the UE in URA_PCH state finishes the cell update procedure successfully~~ responds to the counting or counting is no longer required. Whenever it receives new MBMS ACCESS INFORMATION the UE will update its probability factor with the new value.

The Figure 1 below illustrates this mechanism. The green colour for the MICH indicates when the NI is set for the service. The green colour for the MBMS ACCESS INFORMATION indicates that the counting procedure is on-going and that UEs need to establish an RRC connection based on the included probability factor (PF). For the critical MCCH info, different colours indicate potentially different content.

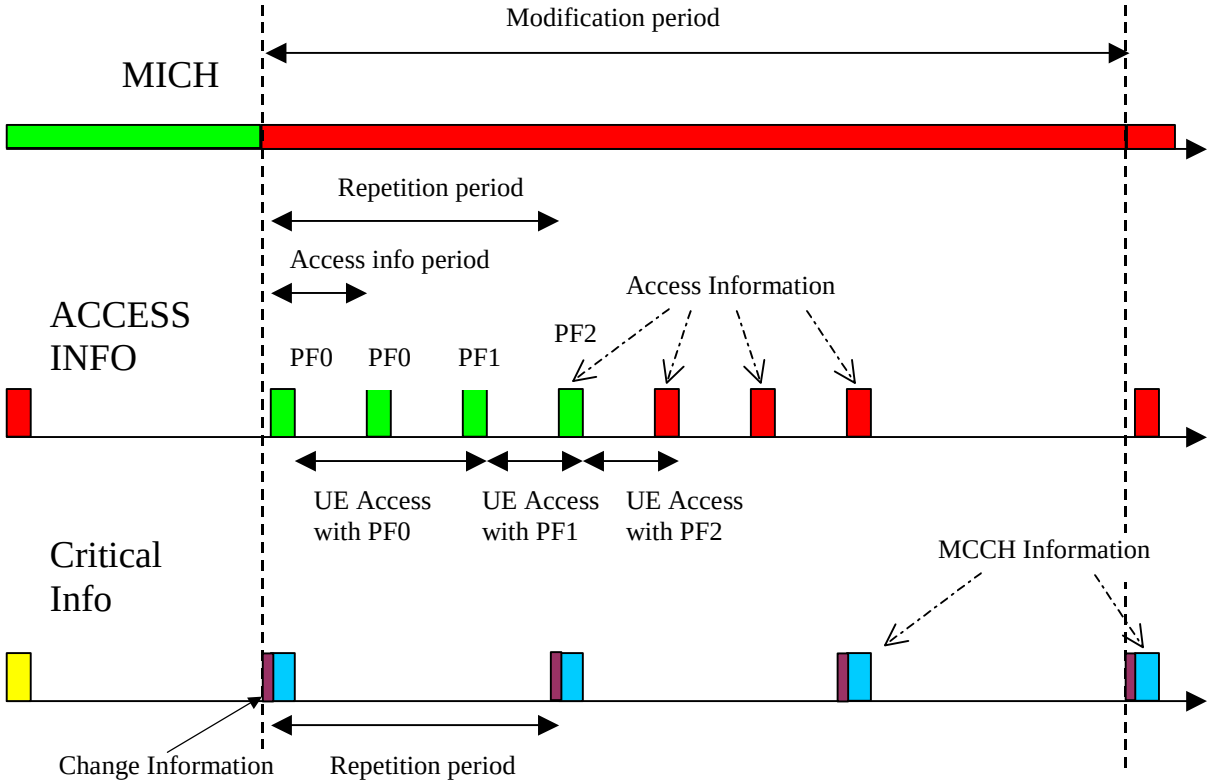


Figure 5.2.5: Illustration of Access Info period during MBMS counting

For every UE brought to RRC connected state for the purpose of counting, UTRAN will initiate the PMM Connection establishment procedure and will obtain from CN the set of MBMS services these users have joined.

Counting for on-going services (re-counting) will rely on the same scheduling of the MCCH information.

5.2.6 MBMS Radio Bearer Release in the UE

The UE releases the MBMS RB by using one of the following mechanisms:

- Explicit MBMS RB Release
- Implicit MBMS RB Release

The Explicit MBMS RB Release mechanism allows UTRAN to explicitly indicate to MBMS UEs that an MBMS Radio Bearer should be released. The Explicit MBMS RB Release indication is included in a new MBMS RADIO BEARER RELEASE information, the existing MBMS SERVICE INFORMATION, MBMS RADIO BEARER INFORMATION or the existing RADIO BEARER RELEASE message. If the Explicit MBMS RB Release indication is received, the UE releases the MBMS RB.

The Implicit MBMS RB Release mechanism allows is only used for p-t-m transmission and a UE to release the MBMS Radio Bearer without receiving the MBMS RB release message given from UTRAN as follows:

A UE uses a timer to implicit release of the MBMS RB. The timer value is given from UTRAN.

5.2.7 MBMS Session Repetition

In the case that the BM-SC repeats MBMS sessions (send multiple time identical content), the MBMS service Id and MBMS session Id is used to identify specific MBMS service and session. If UTRAN receives the MBMS session ID in session start, the UTRAN should:

- include MBMS session Id in critical and non critical information send on MCCH
  Note: The non-critical information may contain index referring to critical information, avoiding repetition of MBMS service and session Id in non-critical information.

If the UE has already received correctly the data of the MBMS session, which is being indicated on MCCH, the UE may:

- ignore FLC by not applying the Layer Convergence Information
- ignore counting procedure in Idle, ~~and~~ URA_PCH, CELL_PCH, and CELL_FACH state
- ignore p-t-m MBMS RB setup signalled on MCCH
- ignore p-t-p MBMS RB indication signalled on MCCH
- reject the p-t-p RB setup for MBMS service, signalled on DCCH

In the case that UTRAN receives reject from the UE to the p-t-p RB setup for MBMS service on DCCH, the UTRAN should not try to re-establish p-t-p RB setup for that MBMS service and session.

In the case that the UE has accepted the p-t-p RB for repeated MBMS session the UE shall receive the complete session.

*****NEXT Modified Section*****

7.2 UE Capability

The UE MBMS capability is not sent to UTRAN and is subject to UE implementation, including the relation between MBMS capability and actual RRC state which is also a UE implementation. A consequence is that a UE may be counted although its actual capability does not allow to receive MBMS transmissions e.g. because of its current RRC state. ~~Further optimizations to avoid counting of useless UEs may be included in Stage 3.~~

The standard will describe a minimum UE capability requirement in order to allow operators to configure MBMS channels that can be common to all UEs supporting the given service.

There are some UE capability requirements that are common to all eventual service categories:

The minimum UE capability for MBMS capable UE, is one primary CCPCH plus all the configurations below. The UE is not required to support these configurations simultaneously.

1. One PICH and one MICH
2. One S-CCPCH and one MICH
3. One S-CCPCH (dedicated FACH and possibly the FACH, which may carry MCCH) and two S-CCPCH with 80ms TTI for MTCH reception
4. One S-CCPCH (dedicated FACH and possibly the FACH, which may carry MCCH) and three S-CCPCH with 40ms TTI for MTCH reception
5. One PICH and two S-CCPCH with 80ms TTI for MTCH reception
6. One PICH and three S-CCPCH with 40ms TTI for MTCH reception

The requirement one reflects the case when the UE is in Idle mode, or URA_PCH, CELL_PCH state and MBMS reception is not ongoing and requirement five and six are for the case that MBMS reception is ongoing in Idle mode, or URA_PCH, CELL_PCH state.

The requirement two reflects the case when the UE is in CELL_FACH state and MBMS is reception not ongoing and requirement three and four are for the case when MBMS reception is ongoing respectively.

The ability of the UE to receive DPCH/HS-PDSCH simultaneously with S-CCPCH carrying MTCH/MCCH is subject to UE capability.

The minimum MBMS bit rate that all MBMS capable UEs shall support is to be defined in Stage 3.

For FDD, the UE shall support selective combining and soft combining. For TDD, the UE shall support selective and soft combining.

The standard may restrict further the UE implementation options by defining certain capability combinations.

If the UE is supporting MBMS ptm reception in CELL_DCH state, it shall have capability to acquire MCCH configuration from BCCH after handover procedure, and after that receive MCCH and MTCH.

7.3 MBMS Reception

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 is not described as periodic MCCH transmission is described in section 5.2.3.

The reception of multiple MBMS services simultaneously is subject to UE capability; selection principles between MBMS services are defined in section 5.2.8. The specific actions related to MBMS session repetition are specified in section 5.2.7.

7.3.1 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 there is an ongoing session for this service 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 due to counting response or due to the utilisation of p-t-p transfer mode for the MBMS service

    - 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 :

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

  - if the UE determines that a neighbouring cell is suitable for selective or soft combining and the UE has valid MBMS NEIGHBOURING CELL INFORMATION of that cell:

    - performs selective or soft combining of MTCH between the selected cell and the neighbouring cell.

7.3.2 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 there is an ongoing session for this service in the URA where the UE is situated, i.e. MTCH and MCCH are available

  - act on RRC messages received on MCCH,

    - if on the MCCH it is indicated that the MBMS service in the cell requires a ~~cell update~~counting response or is due to the utilisation of p-t-p transfer mode for the MBMS service:

- initiate a cell update procedure, for sending MBMS COUTING RESPONSE, or MBMS P-T-P MODIFICATION REQUEST signalling flow. The cause to be used in the cell update procedure is defined in Stage 3.

- 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,

- if the UE determines that a neighbouring cell is suitable for selective or soft combining and the UE has valid MBMS NEIGHBOURING CELL INFORMATION of that cell

- performs selective or soft combining of MTCH between the selected cell and the neighbouring cell.

7.3.3 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 there is an ongoing session for this service in the cell where the UE is situated, i.e. MTCH and MCCH are available

- act on RRC messages received on MCCH

- if on the MCCH it is indicated that the MBMS service in the cell requires counting response or is due to the utilisation of p-t-p transfer mode for the MBMS service:

- initiate a cell update procedure for sending MBMS COUTING RESPONSE, or MBMS P-T-P MODIFICATION REQUEST signalling flow. The cause to be used in the cell update procedure is defined in Stage 3.

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

- if the UE determines that a neighbouring cell is suitable for selective or soft combining and the UE has valid MBMS NEIGHBOURING CELL INFORMATION of that cell

- performs selective or soft combining of MTCH between the selected cell and the neighbouring cell.

7.3.4 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 there is an ongoing session for this service in the cell where the UE is situated, i.e. MTCH and MCCH are available

- act on RRC messages received on MCCH

- if on the MCCH it is indicated that the MBMS service in the cell requires a counting response or is due to the utilisation of p-t-p transfer mode for MBMS service:

- initiate a counting response for sending MBMS COUTING RESPONSE, or MBMS P-T-P MODIFICATION REQUEST signalling flow.

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

- if the UE determines that a neighbouring cell is suitable for selective or soft combining and the UE has valid MBMS NEIGHBOURING CELL INFORMATION of that cell

- performs selective or soft combining of MTCH between the selected cell and the neighbouring cell.

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

7.3.5 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 there is an ongoing session for this service 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.

  - if the UE determines that a neighbouring cell is suitable for selective or soft combining and the UE has valid MBMS NEIGHBOURING CELL INFORMATION of that cell and UE has capability

    - performs selective or soft combining of MTCH between the selected cell and the neighbouring cell.

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

8 UTRAN Signalling Flows for MBMS

8.1 MBMS High Level Signalling Scenarios

8.1.1 Session start

Upon receiving a session start indication from CN, UTRAN initiates the session start sequence to allocate radio resources to UEs for receiving the MBMS content. As part of this sequence, UTRAN may apply the counting procedure (counting the number of idle mode, URA_PCH, CELL_PCH and CELL_FACH state UEs) to decide whether to use the p-t-m or p-t-p transfer mode.

The Figure 8.1.1 shows an example of a possible session start sequence.

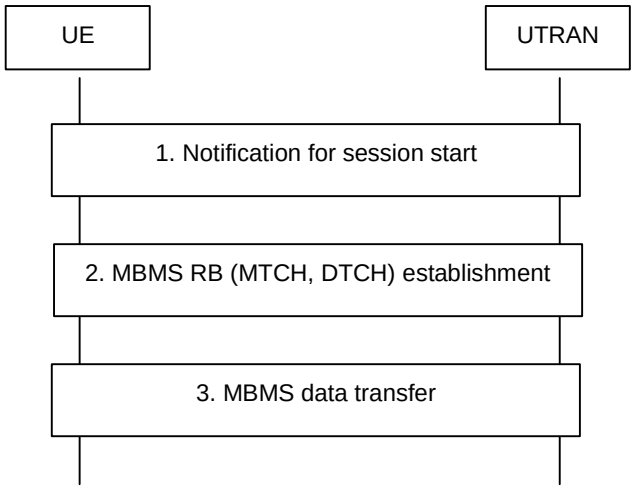


Figure 8.1.1: Session start

In general, the session start sequence involves the following steps:

- In case UTRAN applies counting to determine the most optimal transfer mode the following steps are performed:
  - UTRAN sets the correct MBMS Notification Indicator (NI) and sends the MBMS CHANGE INFORMATION and the MBMS ACCESS INFORMATION including service ID, the session ID if received from the CN, and access probability on MCCH.

- Upon DRX wakeup, UEs in idle mode as well as UEs in CELL_PCH, URA_PCH and CELL _FACH not receiving an MBMS service provided in p-t-m transfer mode evaluate the MBMS NI and if set, read the MBMS CHANGE INFORMATION from MCCH at beginning of the modification period. UEs in idle mode as well as UEs in CELL_PCH, URA_PCH and CELL _FACH receiving an MBMS service provided in p-t-m transfer mode read the MBMS CHANGE INFORMATION directly. If service Id of activated MBMS service and session ID that the UE has not received is indicated in MBMS CHANGE INFORMATION UEs continue reading the rest of MCCH information. Upon receiving the MBMS ACCESS INFORMATION including access probability, UEs in idle mode or URA_PCH, CELL_PCH, and CELL_FACH state for which the probability check passes, initiate counting response. ~~RRC connection establishment to move to PMM CONNECTED or perform cell update procedure respectively. UEs in CELL_PCH or CELL_FACH state ignore the MBMS ACCESS INFORMATION.~~ UTRAN counts the UEs interested in the MBMS service ~~using~~ combining the UE linking from CN and received counting responses from UEs.

- In the case that no UE is counted as present in the cell then UTRAN may decide not to provide any RB for the service in the cell.

- In case a pre- defined threshold is reached, UTRAN applies the p-t-m RB establishment procedure specified below. Otherwise, UTRAN may repeat the MBMS ACCESS INFORMATION a number of times, using different probability values. If the threshold is not reached, UTRAN applies the p-t-p RB establishment procedure

- In case UTRAN selects the p-t-m RB establishment procedure:

  - UTRAN configures MTCH and updates MCCH (MBMS SERVICE INFORMATION and MBMS RADIO BEARER INFORMATION) by including the service ID, the session ID if received from the CN, and p-t-m RB information for the concerned MBMS service

  - In case p-t-m RB establishment is not preceded by counting, UTRAN sets the correct MBMS Notification Indicator (NI) and sends MBMS CHANGE INFORMATION.

  - UTRAN sends the MBMS dedicated notification message including the service ID and cause= session start on DCCH to inform UEs in CELL_DCH that are not receiving an MBMS service provided using p-t-m transfer mode

  - In case p-t-m RB establishment is preceded by counting, UEs read MCCH at the pre- defined time(s) to acquire the MBMS SERVICE INFORMATION and MBMS RADIO BEARER INFORMATION

  - In case p-t-m RB establishment is not preceded by counting, Upon DRX wakeup, UEs not receiving MTCH evaluate the MBMS NI and if set, read MCCH at beginning of modification period to acquire MBMS CHANGE INFORMATION. UEs in idle mode as well as UEs in CELL_PCH, URA_PCH and CELL _FACH receiving an MBMS service provided in p-t-m transfer mode read the MBMS CHANGE INFORMATION directly. If service Id of activated MBMS service and session ID that the UE has not received is indicated in MBMS CHANGE INFORMATION UEs continue reading the rest of MCCH information to acquire the MBMS SERVICE INFORMATION and MBMS RADIO BEARER INFORMATION

  - UEs that are incapable of receiving the MTCH for the session that is started in parallel to the existing activity notify the user. This enables the user to choose between the ongoing activity and the new MBMS service

  - Upon receiving MBMS dedicated notification with cause= session start, UEs in CELL_DCH that are incapable of receiving the MCCH and the corresponding MTCH in parallel to the existing activity notify the user. This enables the user to choose between the ongoing activity and the new MBMS service. If the user decides to receive the new MBMS service, the UE shall read MCCH to acquire the MBMS SERVICE INFORMATION and MBMS RADIO BEARER INFORMATION.

  - Upon receiving the MBMS SERVICE INFORMATION and the MBMS RB INFORMATION including the p-t-m RB information for the concerned MBMS service, the UE starts receiving the p-t-m radio bearers

- In case UTRAN selects the p-t-p RB establishment procedure:

- UTRAN indicates on MCCH in MBMS CHANGE INFORMATION that MBMS service is provided via p-t-p
- After receiving MBMS CHANGE INFORMATION UEs interest to receive MBMS service, after possible service priorisation, request MBMS p-t-p RB establishment by sending MBMS P-T-P MODIFICATION REQUEST signalling flow. ~~applies conventional paging to trigger UEs in CELL_PCH to perform cell update.~~
- Furthermore, UTRAN establishes the p-t-p RB by means of appropriate RRC procedures eg. the RB setup procedure
- UEs establish the p-t-p radio bearers by means of the RRC procedure selected by UTRAN eg. the RB setup procedure
- UTRAN updates MCCH (MBMS SERVICE INFO) to inform UEs joining or entering the cell at a later point in time.

8.1.2 Joining (during a session)

In case the user wants to join an MBMS service (before or during a session), the UE initiates NAS procedures (e.g. MBMS service activation).

If no session is ongoing upon completion of the joining procedure, the joining procedure is transparent to the AS.

In case a session using p-t-m transfer mode is ongoing upon completion of the joining procedure, the UE may initiate reception of the p-t-m radio bearers. In case the ongoing session applies p-t-p transfer mode, UTRAN may establish the p-t-p radio bearers. UTRAN would do this upon receiving a UE linking indication from CN, which normally follows the joining. As a result of the UE linking, UTRAN may decide to change the transfer mode from p-t-p to p-t-m. This change of transfer mode is out of the scope of this sequence (to be covered by a separate sequence).

The Figure 8.1.2 shows an example of a possible joining sequence.

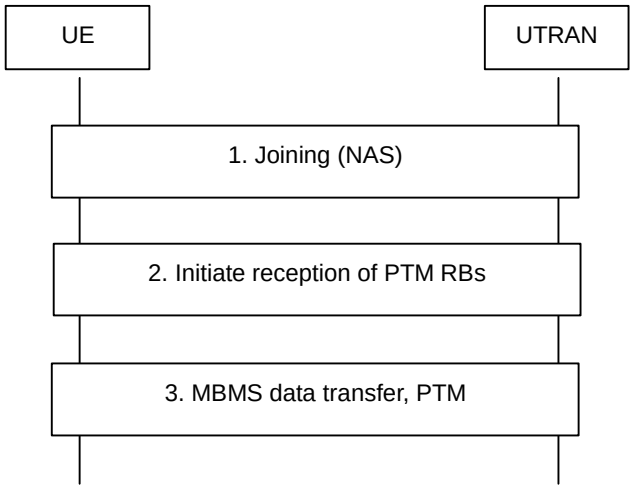


Figure 8.1.2: Joining with continuation of p-t-m

In general, the joining sequence involves the following steps:

- UEs in idle mode first perform RRC connection establishment, while UEs in CELL_PCH and URA_PCH first perform cell update
- UEs initiate the joining procedure (NAS)
- In case UTRAN continues to use the p-t-m transfer mode:
  - UTRAN sends the MBMS dedicated notification message on DCCH including the service ID and cause= session ongoing to inform UEs in CELL_DCH

- Upon receiving MBMS dedicated notification with cause= session ongoing, UEs in CELL_DCH that are incapable of receiving the MCCH and the corresponding MTCH in parallel to the existing activity notify the upper layer. This enables the user to choose between the ongoing activity and the new MBMS service. If the user chooses to receive the new MBMS service or if the UE in Cell_DCH is capable of receiving MCCH and MTCH in parallel to the existing activity, the UE shall read MCCH to acquire the MBMS SERVICE INFORMATION and MBMS RADIO BEARER INFORMATION from MCCH.
- Upon acquiring the MBMS SERVICE INFORMATION and the MBMS RADIO BEARER INFORMATION including the p-t-m RB information for the concerned MBMS service, the UE starts receiving the p-t-m radio bearers

- In case UTRAN continues using the p-t-p transfer mode:
  - UTRAN establishes the p-t-p RB by means of appropriate RRC procedures eg. the RB setup procedure
  - UEs establish the p-t-p radio bearers by means of the RRC procedure selected by UTRAN eg. the RB setup procedure.

8.1.3 Recounting

During a p-t-m MBMS session, UTRAN may perform re- counting to verify if p-t-m is still the optimal transfer mode. The purpose of the re- counting procedure is to count the number of idle mode, ~~and~~ URA_PCH, CELL_PCH, and CELL_FACH state UEs that have joined a specific service. As a result of this procedure, UTRAN may decide to change the transfer mode from p-t-m to p-t-p. This change of transfer mode is outside the scope of this sequence (to be covered by a separate sequence).

The Figure 8.1.3 shows an example of a possible recounting sequence.

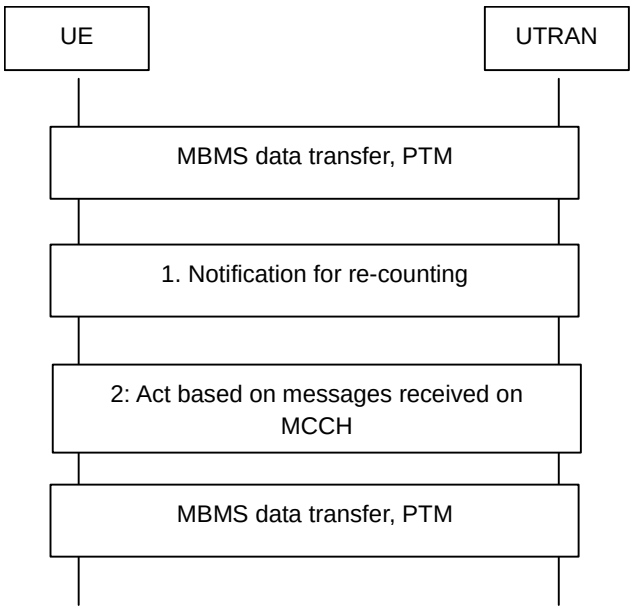


Figure 8.1.3: Recounting with continuation of p-t-m

In case UTRAN applies re- counting to determine the most optimal transfer mode, the following steps are performed:

- UTRAN sends the MBMS CHANGE INFORMATION and the MBMS ACCESS INFORMATION including service ID, and access probability on MCCH
- UEs in idle mode as well as UEs in CELL_PCH, URA_PCH and CELL _FACH receiving an MBMS service provided in p-t-m transfer mode read the MBMS CHANGE INFORMATION at the beginning of each modification period. If service Id of activated MBMS service is indicated in MBMS CHANGE INFORMATION UEs continue reading the rest of MCCH information.

- Upon receiving the MBMS ACCESS INFORMATION including access probability, UEs in idle mode or URA_PCH, CELL_PCH and CELL_FACH state for which the probability check passes, initiate counting response ~~RRC connection establishment or cell update procedure respectively. UEs in CELL_PCH or CELL_FACH state ignore the MBMS ACCESS INFORMATION.~~

- UTRAN counts the UEs interested in the MBMS service ~~using~~ combining the UE linking from CN and received counting responses from UEs

- In the case that no UE is counted as present in the cell then UTRAN may decide not to provide any RB for the service in the cell.

- In case a pre- defined threshold is reached, UTRAN continues using the p-t-m transfer mode. Otherwise, UTRAN may repeat the MBMS ACCESS INFORMATION a number of times, using different probability values. If the threshold is not reached, UTRAN switches transfer mode from p-t-m to p-t-p

- In case UTRAN continues using the p-t-m transfer mode, it may return UEs that responded to counting back to idle mode by releasing the RRC connection.

8.1.4 Session stop

UTRAN may apply the session stop procedure to inform UEs that the end of MTCH transmission concerns the end of a session rather than just an idle period. The purpose of the procedure is to reduce the UE power consumption.

The Figure 8.1.4 shows an example of a possible session stop sequence.

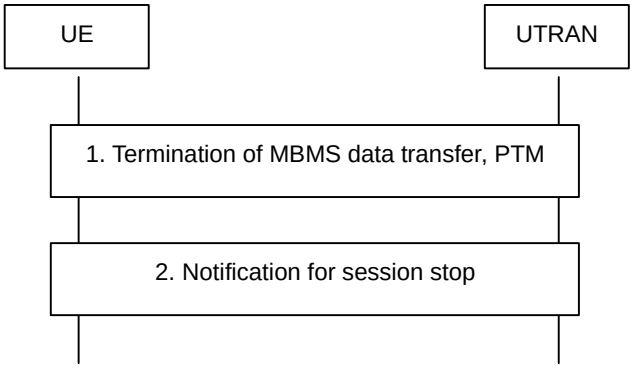


Figure 8.1.4: Session stop

In case UTRAN provides the service p-t-m, the session stop sequence involves the following steps:

- UTRAN sends the MBMS CHANGE INFORMATION and the MBMS RADIO BEARER INFORMATION including service ID and radio bearer release indicator. UTRAN updates MCCH (MBMS SERVICE INFORMATION) to inform UEs joining or entering the cell in a later point of time.
- UEs in idle mode as well as UEs in CELL_PCH, URA_PCH and CELL _FACH receiving an MBMS service provided in p-t-m transfer mode read the MBMS CHANGE INFORMATION at the beginning of the each modification period. If service Id of activated MBMS service is indicated in MBMS CHANGE INFORMATION UEs continue reading the rest of MCCH information.
- Upon receiving this information the UE stops receiving the MTCH

In case UTRAN provides the service p-t-p, the session stop sequence involves the following steps:

- UTRAN releases the p-t-p radio bearers and updates MCCH (MBMS SERVICE INFO) to inform UEs joining or entering the cell at a later point in time.

*****NEXT Modified Section*****

8.3 MBMS Uu Signalling Flows

8.3.1 Broadcast of MBMS System Information

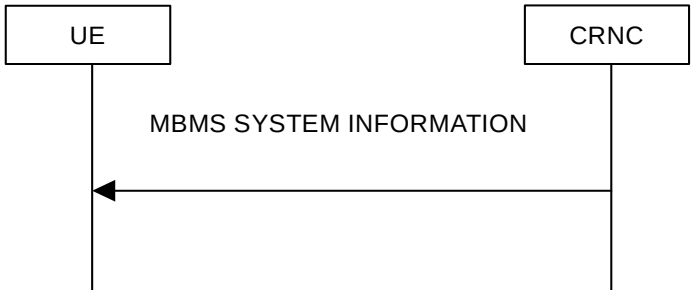


Figure 8.3.1: Broadcast of MBMS system information.

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

The purpose of the signalling flow is for UTRAN to broadcast MBMS system information to UEs using the BCCH. The MBMS SYSTEM INFORMATION shall be repeatedly transmitted after its first transmission. Upon receiving the first MBMS SYSTEM INFORMATION, the UE shall establish the radio bearer carrying an MCCH.

The MBMS SYSTEM INFORMATION includes:

- MCCH schedule information (access info, repetition and modification periods)

- Configuration of a radio bearer carrying an MCCH

More information may be included in the MBMS SYSTEM INFORMATION.

8.3.2 MBMS Service Information

Figure 8.3.2: MBMS service information signalling flow

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

The purpose of the signalling flow is for RNC to inform UEs of all of MBMS services available in one cell. The MBMS SERVICE INFORMATION shall be transmitted periodically on MCCH to support mobility in the MBMS service.

The MBMS SERVICE INFORMATION contains MBMS service ids, optionally the MBMS Session ID, and p-t-m indication. The MBMS service ids indicate the MBMS services which are being served in the cell or the MBMS services which can be served if the UE requests it. P-t-m indication indicates that the MBMS service is on p-t-m in the cell, thus it informs the UE of the need of reception of the MBMS RADIO BEARER INFORMATION. More information may be included in the MBMS SERVICE INFORMATION.

8.3.3 MBMS Radio Bearer Information

Figure 8.3.3: 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 shall be transmitted periodically on MCCH to support mobility in the MBMS service.

MBMS RADIO BEARER INFORMATION includes MBMS Service Id, MBMS UTRAN Cell Group Identifier, logical channel, transport channel and physical channel information per MBMS service. An MBMS UTRAN Cell Group Identifier is used to indicate to UEs which MBMS Cell Group the cell pertains to. More information may be included in MBMS RADIO BEARER INFORMATION.

8.3.4 MBMS Access Information

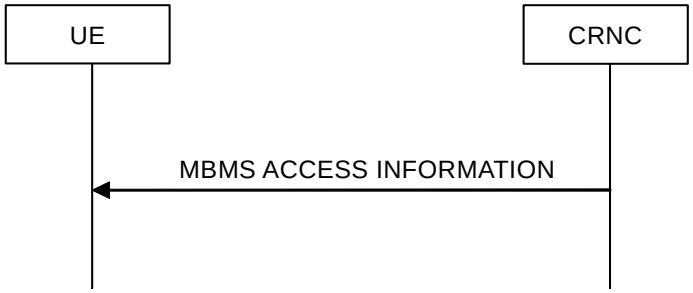


Figure 8.3.4: MBMS Access Information signalling flow

This signalling flow is applicable for handling MBMS UEs in IDLE mode.

The purpose of the signalling flow is for the RNC to inform UE(s) interested in a particular service of the potential need to establish an RRC connection. The MBMS ACCESS INFORMATION is transmitted during counting and re-counting on MCCH. The MBMS ACCESS INFORMATION includes MBMS service id for each service for which counting is required and the associated access "probability factor". More information may be included in MBMS ACCESS INFORMATION.

8.3.5 MBMS Neighbouring Cell Information

Figure 8.3.5: MBMS Neighbouring Cell Information signalling flow

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

The purpose of the MBMS NEIGHBOURING CELL INFORMATION signalling flow is for the UTRAN to inform to UEs of the MTCH configuration of the neighbouring cells which are available for selective combining. In case of partial soft combining, the MBMS NEIGBOURING CELL INFORMATION contains the L1-combining schedule, which indicates when the soft combining is applicable between the specific S-CCPCH of the cell and the specific S-CCPCH of the neighbouring cell. With MBMS NEIGHBOURING CELL INFORMATION the UE is able to receive MTCH transmission from neighbouring cell without reception of the MCCH of that cell. The MBMS NEIGHBOURING CELL INFORMATION shall be repeatedly transmitted on MCCH when selective or soft combining is utilized in the MBMS p-t-m transmission in the given cell group.

8.3.6 MBMS Joined Indication

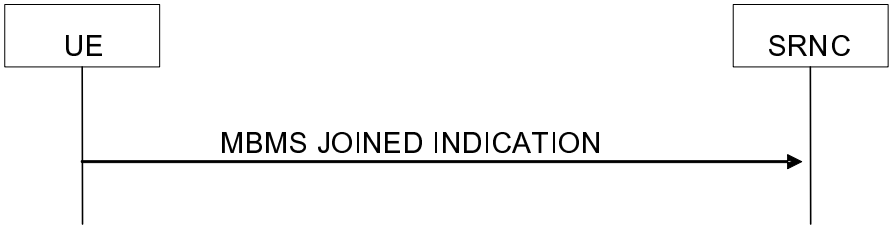


Figure 8.3.6: MBMS joined indication signalling flow

This signalling flow is applicable for handling MBMS to UEs in RRC-Connected, PMM-IDLE state. The MBMS JOINED INDICATION is sent over the DCCH.

The signalling flow is initiated by the UE after entering RRC-Connected, PMM-IDLE state. The purpose of the signalling flow is to enable the UE to inform the SRNC that the user has joined at least one MBMS service. The SRNC requests the MBMS services the UE has joined from the SGSN as defined in subclause 8.2.10.

In SRNC relocation this information is transmitted from source RNC to target RNC.

NOTE: If SRNC has valid linking information the complete service list of activated services is also transmitted from source RNC to target RNC in SRNC relocation.

8.3.7 MTCH Scheduling Information

Figure 8.3.7: MTCH scheduling information.

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

The purpose of the signalling flow is to enable UEs to perform discontinuous reception of MTCH. The UE may discontinuously receive MTCH based on scheduling information indicated by the MTCH SCHEDULING INFORMATION. This signalling is transmitted on MSCH mapped on SCCPCH carrying MTCH. The MTCH SCHEDULING INFORMATION is signalled on each MSCH repetition period. The MSCH repetition period and the offset from the MCCH modification period are indicated on MCCH. In case of soft combining, the MSCH repetition period is same for all soft combinable S-CCPCH. The scheduling information allows to cover different periods for different MBMS services.

The MTCH SCHEDULING INFORMATION includes for each service:

- MBMS service Id (the actual coding is defined in stage-3).

- Beginning and duration of MBMS data transmission (one contiguous block or more is defined in Stage-3).

- Duration can be infinite (no DTX). This option could be signalled in the MCCH (Stage-3 definition).

-Indication of no MBMS data transmission for either this period or several consecutive periods (a period is expressed in MSCH repetition period).

8.3.8 MBMS Change Information

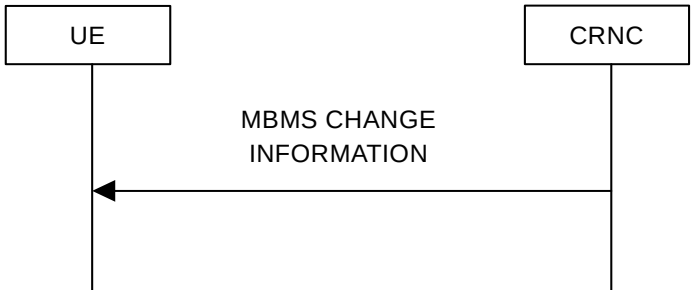


Figure 8.3.8: MBMS change information.

This signalling flow is applicable for handling MBMS to UEs in PMM IDLE and CONNECTED mode. UTRAN should transmit this signalling flow in beginning of each modification period on MCCH and repeat it at least in every repetition period of that modification period. UE shall read this information flow when detecting that MICH bits set for a service that UE has activated, or periodically at the begin of each modification period when receiving MTCH.

The purpose of the signalling flow is to indicate MBMS services whose MCCH information is changed in that modification period. The content of MBMS CHANGE INFORMATIO shall be minimized, so that the MCCH reading time for the UEs, activated MBMS service whose MCCH information is not modified on that modification period, is minimized.

The MBMS CHANGE INFORMATION includes:

- The MBMS service Ids for which MCCH information is modified on that modification period.
- Indication that specific MBMS service is provided on p-t-p RB

8.3.9 MBMS P-T-P Modification Request

Figure 8.3.9: MBMS P-T-P Modification Request.

This signalling flow is applicable for handling UEs that are interested to receive~~ing~~ MBMS p-t-p RB in ~~CELL_DCH state~~PMM IDLE and CONNECTED mode. The UE may transmit this signalling flow to request the setup p-t-p MBMS RB after receiving the indication on MCCH that p-t-p transfer mode is utilised or to request the release of the p-t-p MBMS RB due to higher priority MBMS service, or indicate the frequency used for transmitting the higher priority service as specified in subclause 5.2.8. This signalling flow is transmitted on DCCH or on CCCH (in the case of a request to setup p-t-p MBMS RB).

UEs in idle mode are required to perform RRC connection establishment for sending this information flow.

For UEs in CELL_DCH state the utilisation of this signalling flow for requesting the setup of the p-t-p MBMS RB is FFS.

When UTRAN receives this message from the UE, the UTRAN may setup or release the p-t-p MBMS RB by normal RB release procedure or may perform inter-frequency HHO.

8.3.10 MBMS Counting Response

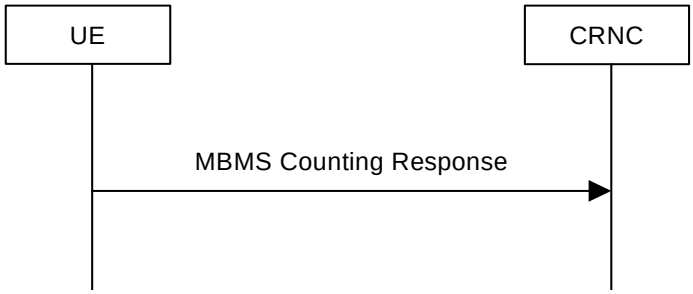


Figure 8.3.10: MBMS Counting Response.

This signalling flow is applicable for UEs passing the probability check in counting procedure in idle mode or URA_PCH, CELL_PCH or CELL_FACH state. For the UE in idle mode this signalling flow refers to the complete RRC connection establishment procedure. For UEs in URA_PCH and CELL_PCH state this signalling flow refers to cell update procedure and for UEs in CELL_FACH state it refers to message sent on CCCH or on DCCH.

The mapping of this signalling flow to the existing CCCH or DCCH message(s) or introduction of new messages is defined in stage-3.

The MBMS Counting Response contains:

- MBMS service and session ID, FFS. (Possible short identity used in MBMS ACCESS INFORMATION for message coding optimisation)

9 Security for MBMS

Ciphering for MBMS multicast data is done between the BM-SC and the UE as defined in [7]. Therefore, for MBMS p-t-m data transmissions no radio interface ciphering is applied.

In case of p-t-p MBMS data transmissions, if the security is activated for the UE the ciphering is also applied for p-t-p MBMS data RB as for any other RB of the UE.

10 Mobility Procedures for MBMS

One of the requirements in [5] 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.

10.1 Use of Periodical Transmission of MBMS Critical Information

In this mechanism, the cell periodically transmits an MBMS critical information, informing all MBMS services currently configured for p-t-m transmission or p-t-p transmission. If MBMS service is configured for p-t-m transmission, the periodical transmission of MBMS critical information may also contain the Radio Bearer information corresponding to each MBMS service and Neighbouring cell information.

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

10.2 UE Actions for Mobility

The UE mobility between intra frequency cells is not affected by the MBMS reception. The mobility between different frequency layers is affected by the Frequency Layer Convergence process as defined in 11.2, if used by the network.

In CELL_FACH and in CELL_DCH state the RRC operation has priority over MBMS reception, thus UE performs the inter frequency and inter RAT measurements as configured by the SRNC. UTRAN should utilize different periodicities between MCCH transmissions and CELL_FACH state measurement occasion, such that CELL_FACH state measurements and MCCH transmissions are not constantly overlapping for some UE.

In Idle mode and in CELL_PCH, URA_PCH states the measurements are performed as configured by the network based on the Release 5. The MBMS specific measurement occasions to S-CCPCH for UEs in idle mode and in CELL_PCH, URA_PCH states are not introduced and measurements have priority over MBMS reception. The usage of channel protection (channel coding) to recover some of the lost transport blocks is possible.

UEs may have DRx occasions for specific MBMS service when UE can stop decoding S-CCPCH and perform measurements. DRx occasion are based on scheduling information.

R'99 standards have some means to reduce need for number of measurements, which can be utilized for MBMS.

When the UE reselects the cell due to the mobility or returns to on service from out of service, the UE shall acquire the MCCH information if the interested MBMS service is available in the selected cell for the reception of the service. The service is available when the session has been already started and the service is being served on p-t-p/p-t-m in the cell, or the service can be served in the cell if the UE requests it.

If the MBMS service is available in the cell, the UE will perform an action for the service reception in the cell. For example, if the service is on p-t-p, the idle mode UE will initiate RRC connection establishment procedure. Otherwise, the UE does not need to perform such an action in the cell. The UE, which moves to the new cell, will operate according to the RRC state/mode as follows.

Whenever the UE moves between p-t-m cells, UE shall receive the MBMS RADIO BEARER INFORMATION, which includes an MBMS UCG-Id. If the MBMS UCG-Id received in a new cell is the same as the MBMS UCG-Id received in an old cell, then the UE receives MTCH without re-establishment of its PDCP as the new cell is processed by the same PDCP entity as the old cell. If the MBMS UCG-Ids differs between old on new cell, the UE re-establishes its PDCP entity according to the RADIO BEARER INFORMATION. In case that RLC entity is shared in CRNC between old and new cell, the UE receives MTCH without re-establishment of its RLC, If old and new cell does not share RLC entity in CRNC the UE shall re-establish its RLC. UE shall re-establish MAC and physical layer protocol entities upon cell change.

10.2.1 RRC idle mode

Idle mode UE shall:

- if BCCH contains information regarding the MCCH in the new cell:
  - listen to the MCCH and receive the MBMS SERVICE INFORMATION;
  - if the MBMS SERVICE INFORMATION contains the interested MBMS service–id:
    - if MBMS SERVICE INFORMATION indicates that the service is on p-t-m:
      - receive the MBMS RADIO BEARER INFORMATION and listen to the MTCH;
    - else:
      - initiate RRC connection establishment procedure and request the setup of MBMS p-t-p RB;
  - if the UE receive the MBMS RADIO BEARER INFORMATION before the MBMS SERVICE INFORMATION and;
    - if MBMS RADIO BEARER INFORMATION contains the interested MBMS service id:
      - listen to the MTCH without the need of receiving the MBMS SERVICE INFORMATION.

10.2.2 URA_PCH State

URA_PCH state UE shall:

- perform URA update procedure if needed;

- if BCCH contains information regarding the MCCH in the new cell:
  - listen to the MCCH and receive the MBMS SERVICE INFORMATION;
  - if MBMS SERVICE INFORMATION contains the interested MBMS service id:
    - if MBMS SERVICE INFORMATION indicates that the service is on p-t-m:
      - receive the MBMS RADIO BEARER INFORMATION and listen to the MTCH;
    - else:
      - initiate cell update procedure and request to setup the MBMS p-t-p RB
  - if the UE receive the MBMS RADIO BEARER INFORMATION before MBMS SERVICE INFORMATION message and;
    - if MBMS RADIO BEARER INFORMATION contains the interested MBMS service id:
      - listen to the MTCH without the need of receiving the MBMS SERVICE INFORMATION.

10.2.3 CELL_PCH

CELL_PCH state UE shall:

- perform cell update procedure;
- if BCCH contains information regarding the MCCH in the new cell:
  - listen to the MCCH and receive the MBMS SERVICE INFORMATION;
  - if MBMS SERVICE INFORMATION contains the interested MBMS service id and:
    - if MBMS SERVICE INFORMATION indicates that the service is on p-t-m:
      - receive the MBMS RADIO BEARER INFORMATION message and listen to the MTCH.
    - else:
      - initiate the cell update procedure and request to setup the MBMS p-t-p RB
  - if the UE receive the MBMS RADIO BEARER INFORMATION before the MBMS SERVICE INFORMATION and;
    - if MBMS RADIO BEARER INFORMATION contains the interested MBMS service id:
      - listen to the MTCH without the need of receiving the MBMS SERVICE INFORMATION.

10.2.4 CELL_FACH

CELL_FACH state UE shall:

- perform cell update procedure
- if BCCH contains information regarding the MCCH in the new cell:
  - listen to the MCCH and receive the MBMS SERVICE INFORMATION;
  - if MBMS SERVICE INFORMATION contains the interested MBMS service id and;
    - if MBMS SERVICE INFORMATION indicates that the service is on p-t-m:
      - receive the MBMS RADIO BEARER INFORMATION and listen to the MTCH;
    - else:
      - initiate request to setup the MBMS p-t-p RB

- if the UE receive the MBMS RADIO BEARER INFORMATION before the MBMS SERVICE INFORMATION and;
  - if MBMS RADIO BEARER INFORMATION contains the interested MBMS service id:
    - listen to the MTCH without the need of receiving the MBMS SERVICE INFORMATION.

10.2.5 CELL_DCH State

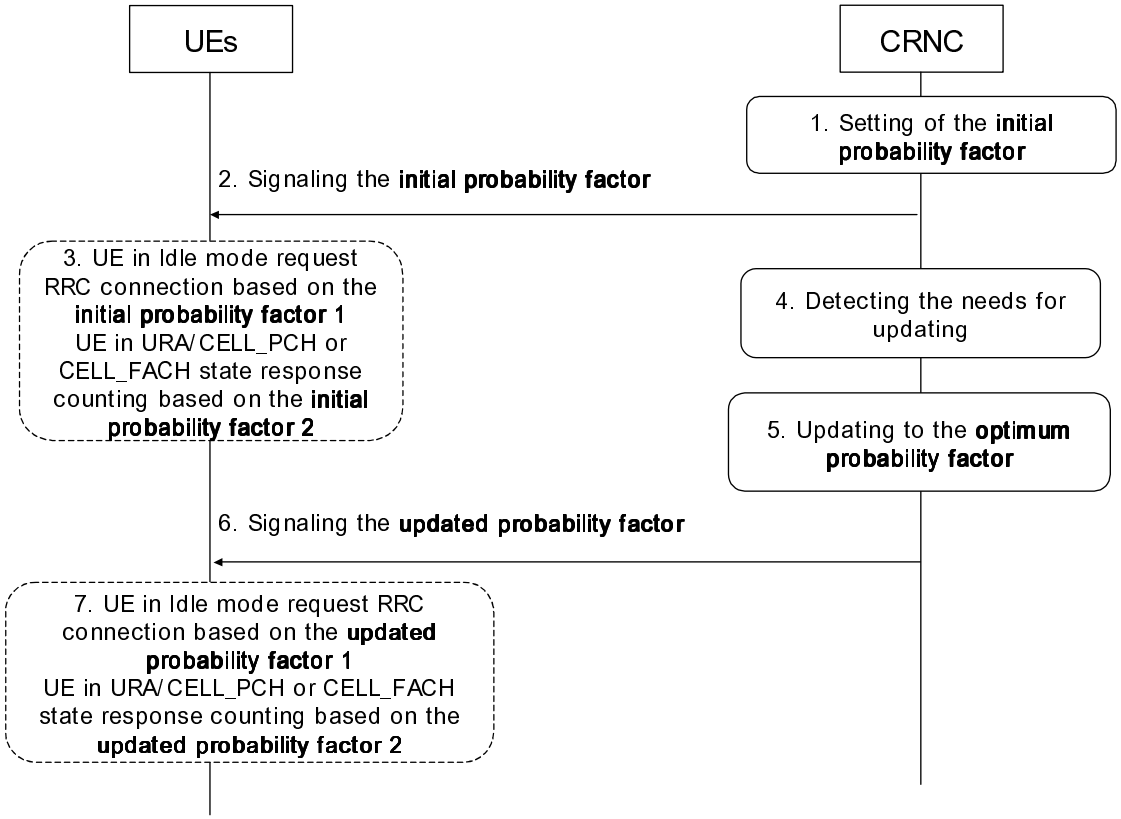
CELL_DCH state UE shall:

- act on the RRC message received on DCCH in handover.
- if the UE has the capability to support MBMS in CELL_DCH:
  - if BCCH contains information regarding the MCCH in the new cell:
    - listen to the MCCH and receive the MBMS SERVICE INFORMATION;
    - if MBMS SERVICE INFORMATION contains the interested MBMS service id and;
      - if MBMS SERVICE INFORMATION indicates that the service is on p-t-m:
        - receive the MBMS RADIO BEARER INFORMATION and listen to the MTCH.
    - if the UE receive the MBMS RADIO BEARER INFORMATION before the MBMS SERVICE INFORMATION and;
      - if MBMS RADIO BEARER INFORMATION contains the interested MBMS service id:
        - listen to the MTCH without the need of receiving the MBMS SERVICE INFORMATION.

11 Resource Management for MBMS

11.1 MBMS Access Control Procedure

MCCH messages initiating counting or recounting cause multiple responses from UEs within a cell. This may result in RACH congestion if number of UEs is high in a cell. To avoid this, CRNC may perform MBMS access control procedure during counting or recounting procedure. MBMS access control procedure is described in Figure 11.1.


UEs
CRNC
1. Setting of the initial probability factor
2. Signaling the initial probability factor
3. UE in Idle mode request RRC connection based on the initial probability factor 1
UE in URA/CELL_PCH or CELL_FACH state response counting based on the initial probability factor 2
4. Detecting the needs for updating
5. Updating to the optimum probability factor
6. Signaling the updated probability factor
7. UE in Idle mode request RRC connection based on the updated probability factor 1
UE in URA/CELL_PCH or CELL_FACH state response counting based on the updated probability factor 2

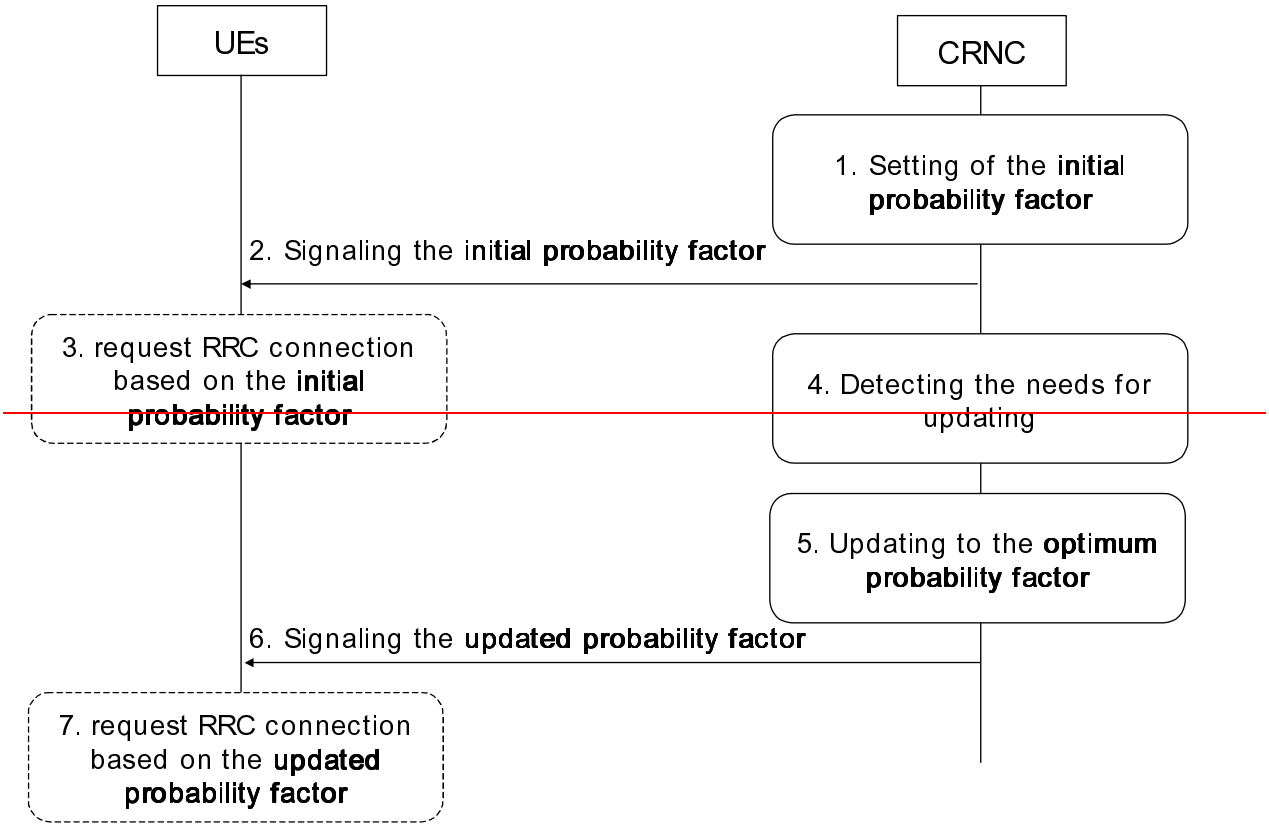

UEs
CRNC
1. Setting of the initial probability factor
2. Signaling the initial probability factor
3. request RRC connection based on the initial probability factor
4. Detecting the needs for updating
5. Updating to the optimum probability factor
6. Signaling the updated probability factor
7. request RRC connection based on the updated probability factor

Figure 11.1: MBMS Access Control Procedure

1. CRNC calculates an initial probability factor for a MBMS service when a MCCH message causing counting or recounting is about to be sent. CRNC can use different probability factor for UEs in Idle mode and for different UEs in URA_PCH, CELL_PCH and CELL_FACH
2. CRNC includes the probability factor into the MCCH message and sends it to UEs. This can be done in MBMS Group Notification.
3. UEs in idle mode or in URA_PCH, CELL_PCH and CELL_FACH state passing the probability check performs counting response ~~perform RRC connection request procedure using the probability factor received in step 2.~~ UEs keep listening to MCCH to get updated probability factor until they have successfully responded to couting or counting is no longer required. ~~succeed to establish RRC connection.~~
4. CRNC detects the probability factor needs to be updated. Detecting mechanism is not to be standardized.
5. CRNC recalculates the probability factor. The way of calculating new probability factor is not to be standardized.
6. CRNC includes the updated probability factor into the MCCH message and sends it to UEs.
7. UEs in idle mode or in URA_PCH, CELL_PCH or CELL_FACH state that pass the probability check, by using updated probability factor, perform counting response ~~perform RRC connection request procedure using the new probability factor. UEs keep listening to MCCH to get updated probability factor until they succeed to establish RRC connection.~~

CRNC and UEs ~~who~~ that are still trying to perform the ~~RRC connection request procedure~~ counting response repeat step 3 ~ step 7 until e.g. counting or recounting procedure ends.

3GPP TSG-RAN WG2 Meeting #46
Phoenix, USA, 14th – 18th February 2005

Tdoc ⌘R2-050709

CR-Form-v7.1

CHANGE REQUEST

⌘ **25.346** **CR** **015** ⌘ **rev** **-** ⌘ Current version: **6.3.0** ⌘

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

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

Title:	⌘	Introduction of new procedures in MBMS stage 2 spec.
Source:	⌘	RAN WG2
Work item code:	⌘	MBMS-RAN
Date:	⌘	17/2/2004
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

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

Reason for change:	⌘	In RAN3#45, the RANAP has already included the MBMS RAB Establishment Indication procedure, it need to be reflected in MBMS stage 2 spec 25.346. In RAN3#46, it was agreed to introduce new MBMS RAB Release Request procedure (See R3-050117), it also need to be reflected in MBMS stage 2 spec 25.346.
Summary of change:	⌘	The MBMS RAB Establishment Indication procedure and MBMS RAB Release Request procedure is introduced in new chapters. The cases where the RNC may choose not to execute the MBMS Iu data bearer setup, for a particular MBMS service are also added.
Consequences if not approved:	⌘	The decision I RAN3#45 and RA3#46 are not captured in 25.346.

Clauses affected:	⌘	5.1.2, 8.2.xx, 8.2.yy

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

Other comments: ⌘

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

/* start changed section */

5.1.2 MBMS Session start and MBMS Session Stop

At MBMS Session Start and MBMS Session Stop the RNC receives a respective request from the CN. The MBMS Session Start Request shall contain the MBMS Service Id, MBMS Bearer Service Type and MBMS Session Attributes (MBMS Service Area Information, QoS parameters, …). The MBMS Session Start Request triggers the RNC to notify UEs, which have activated the MBMS Service of the MBMS Session Start. The MBMS Session Stop Request may trigger the RNC to notify UEs, which have activated the MBMS Service of the MBMS Session Stop.

The MBMS Session Start and Session Stop procedures provide the setup and release of the MBMS RAB in the following way:

The MBMS Session Start Request shall contain all information necessary to setup an MBMS RAB. When the RNC receives an MBMS Session Start Request, it typically executes MBMS Iu data bearer set up and shall inform the sending CN node, of the outcome in the MBMS Session Start response message.

Upon reception of MBMS Session Start Request, if the MBMS Service Context is not yet present in the RNC, the RNC shall store the MBMS Service Id. Further the RNC shall memorise the MBMS Bearer Service Type and MBMS Session Attributes (MBMS Service Area Information, QoS parameters, …) as part of the MBMS Service Context.

The RNC may choose not to execute the MBMS Iu data bearer setup, for a particular MBMS service, when:

1 The RNC does not control any cell contained within the MBMS Service Area, or

2 The RNC controls at least one cell contained within the MBMS Service Area and a list of PMM-Idle Mode UEs is included in MBMS Session Start but no RA's contained within the list are under the control of the RNC

The RNC may not execute the MBMS Iu data bearer setup for a given Iu interface in case of Iu-flex. In those cases the CN node shall be informed accordingly.

In case of Iu-flex, the RNC might receive more than one MBMS Session Start Request for an MBMS Service and shall not set up more than one MBMS Iu bearer for a certain MBMS Service towards a pool area.

When the RNC receives an MBMS Session Stop Request it shall release the associated MBMS RAB resources.

The MBMS Session Start and Session Stop procedures serve to establish and release the MBMS Iu signalling connection.

Not affected part are not shown

8.2.xx MBMS RAB Establishment Indication

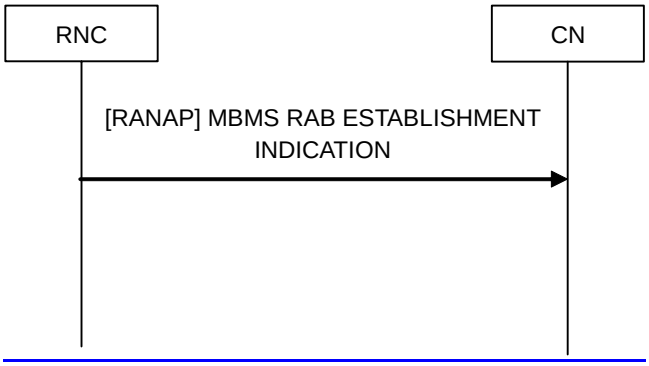


Figure 8.2.xx: MBMS RAB Establishment Indication procedure

This signalling flow is used by the RNC to indicate to the CN the establishment of the MBMS RAB corresponding to the MBMS Iu signalling connection.

When the RNC decides not to establish an MBMS Iu bearer, for a particular MBMS service, during MBMS Session Start procedure, for example the RNC does not control any contained in MBMS Service Area Information and the RNC does not belong to any of the RA in a list of RAs which lists each RA that contains at least one PMM-IDLE UE but later when a UE linking (via Iu or Iur) is performed or as a result (p-t-p decision) of channel type reconfiguration in another RNC, the RNC establishes the Iu bearer and uses this procedure to inform the CN that an Iu bearer has been established.

If Iu-Flex is active, the selection of the CN node is implementation dependant.

The MBMS RAB ESTABLISHMENT INDICATION message contains the *Transport Layer Address* IE and the *Iu Transport Association* IE.

/* next changed section */

8.2.yy MBMS RAB Release

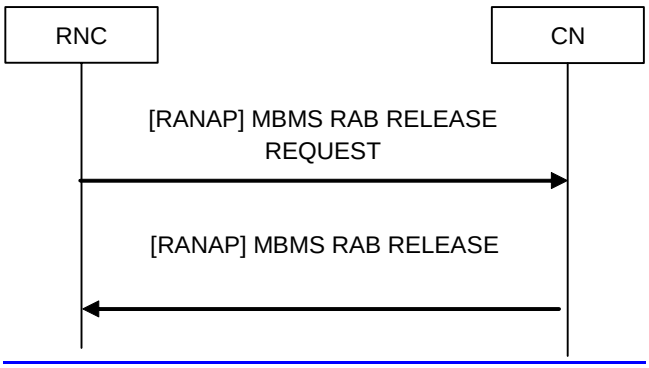


Figure 8.2.yy: MBMS RAB Release Request procedure.

This signalling flow is used by the RNC to indicate to the CN to request the release of an MBMS RAB.

At receiption of the MBMS RAB RELEASE REQUEST message the CN should initiate the release of all MBMS resources related to the Iu connection without releasing the Iu signalling connection.

The RNC shall at reception of MBMS RAB RELEASE initiate the release of the related MBMS RAB resources.

The MBMS RAB release may be initiated e.g. for the following reasons (unexhausted):

- There are lack of rafio resource in UTRAN and RNC decided to pre-emp a MBMS RAB for a on-going MBMS session based on Allocation/Retention Priority
- When there are no UEs interested in MBMS consuming radio resources in cells under the RNC or the RNC is controlling UEs in cells under another RNC;
- In case of channel type switching from ptp to ptm in cells under control of another RNC in its role of DRNC;
- There are no cells under the RNC which are part of the RA List Of Idle Ues if received.

/* end changed section */