- 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 COUNTING 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. For MBMS Broadcast mode, the applicability of the counting procedure for a service is indicated by the CN.

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

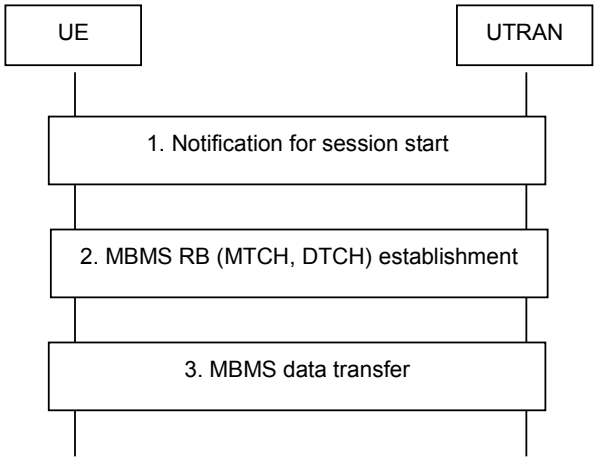


Figure 8.1.1: Session start

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. UTRAN counts the UEs interested in the MBMS service 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 interested 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.
  - Furthermore, UTRAN establishes the p-t-p RB by means of appropriate RRC procedures e.g. 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.

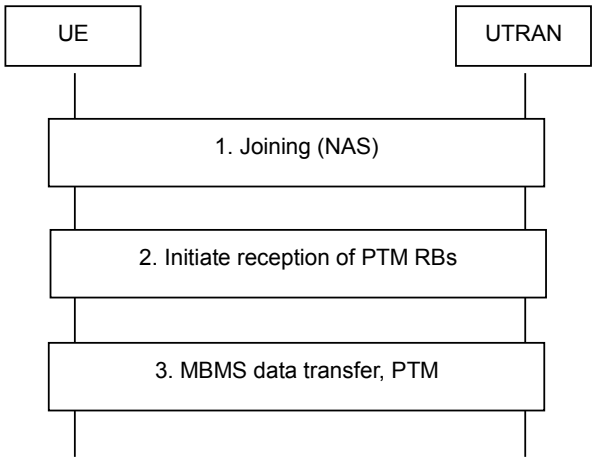


Figure 8.1.2: Joining with continuation of p-t-m

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, 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.

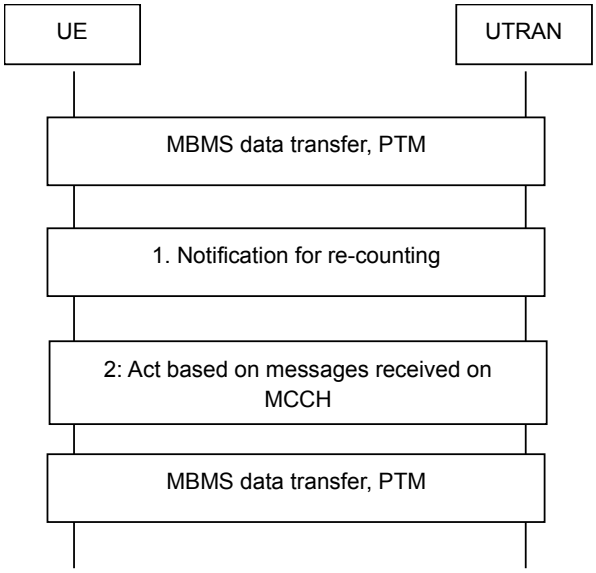


Figure 8.1.3: Recounting with continuation of p-t-m

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.
- UTRAN counts the UEs interested in the MBMS service 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.

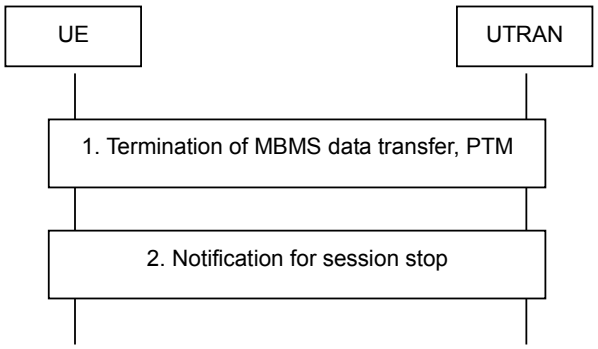


Figure 8.1.4: Session stop

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

- UTRAN updates the MBMS CHANGE INFORMATION, MBMS SERVICE INFORMATION and the MBMS RADIO BEARER INFORMATION including the service ID and the explicit 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.

8.2 MBMS RNC Signalling Flows

8.2.1 MBMS Session Start procedure

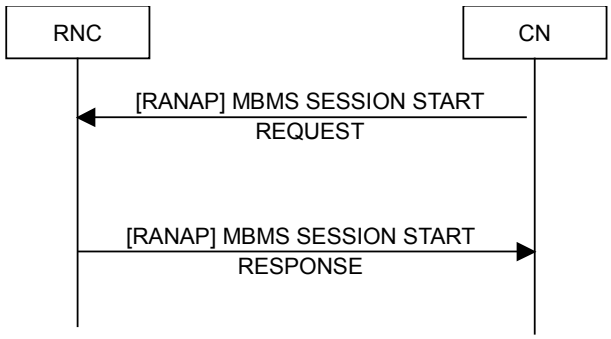


Figure 8.2.1: MBMS Session Start procedure. Successful operation.

The MBMS Session Start procedure is initiated by the CN when an MBMS Session is started. The MBMS SESSION START REQUEST is sent to each RNC that is connected to the CN (in case of Iu-flex the RNC may receive more than one MBMS SESSION START REQUEST message).

The MBMS SESSION START REQUEST contains the MBMS Service Id, and optionally the MBMS Session ID, MBMS Bearer Service Type and the MBMS Session Attributes (MBMS Service Area Information, QoS parameters…) It may also include a list of RAs which lists each RA that contains at least one PMM-IDLE UE that has activated the service.

MBMS Session Start procedure also provides the MBMS Iu Data Bearer Establishment functionality. In case of Iu-flex the RNC shall not establish more than one MBMS Iu bearer for a certain service towards a pool area and shall inform the respective CN nodes accordingly.

8.2.2 MBMS Session Update procedure

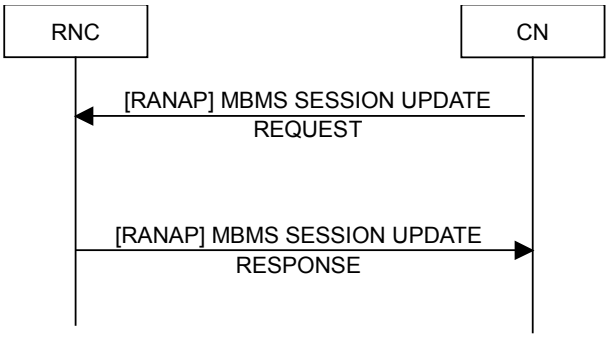


Figure 8.2.2: MBMS Session Update procedure. Successful operation.

The MBMS Session Update procedure is initiated by the CN when an MBMS Session is ongoing and SGSN notices that there is a need to update the list of RAs. The MBMS SESSION UPDATE REQUEST contains the MBMS Service Id, and e.g. List of RAs with PMM Idle UEs..

8.2.3 MBMS Session Stop procedure

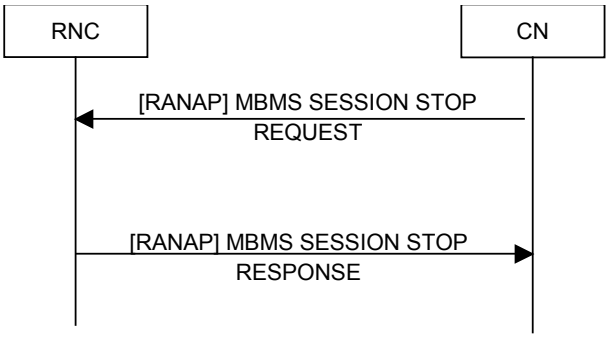


Figure 8.2.3: MBMS Session Stop procedure.

This signalling flow depicts the MBMS Session Stop procedure.

This procedure is initiated by the CN to the RNCs with an ongoing MBMS session, when no more data will be sent for that MBMS service for some period of time.

The MBMS Session Stop procedure also provides the MBMS Iu Data Bearer Release functionality.

8.2.4 RNC Registration procedure

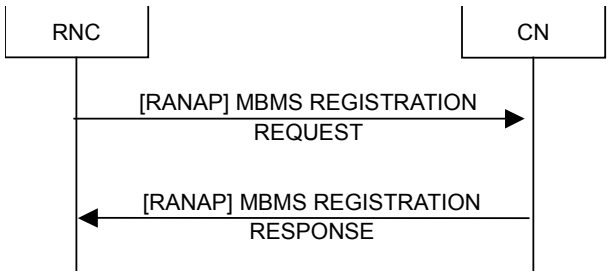


Figure 8.2.4: MBMS Registration procedure.

This signalling flow depicts the MBMS Registration procedure.

This procedure is initiated by the RNC in the case that the RNC is not SRNC for any UE that has joined the MBMS Service, but this RNC is DRNC for PMM-CONNECTED UEs that have joined the MBMS Service and there is no MBMS Service Context for the MBMS Service in this RNC.

This procedure shall be initiated by the DRNC, as soon as a UE link is received over the Iur and there exists no MBMS Service Context for the MBMS service for which the UE link is received.

8.2.5 RNC De-Registration procedure

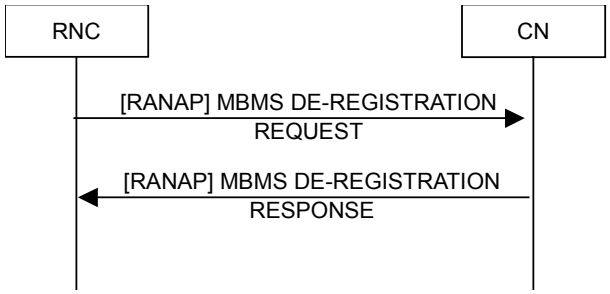


Figure 8.2.5: RNC MBMS De-Registration procedure.

This signalling flow depicts the RNC De-Registration procedure. This procedure is initiated by the RNC towards the CN node it was registered to in case the RNC is not acting as a Serving RNC for any UE that has activated the MBMS Service and has ceased to act as a Drift RNC for UEs which has activated an MBMS service.

8.2.6 CN De-Registration procedure

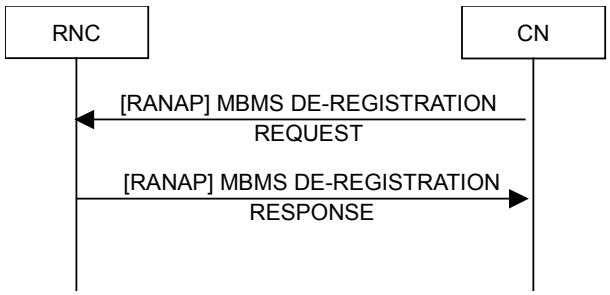


Figure 8.2.6: CN MBMS De-Registration procedure.

This signalling flow depicts the CN De-Registration procedure.

This procedure is initiated by the CN in order to inform the RNC that a certain MBMS Service is no longer available.

8.2.7 MBMS Channel Type Switching over Uu

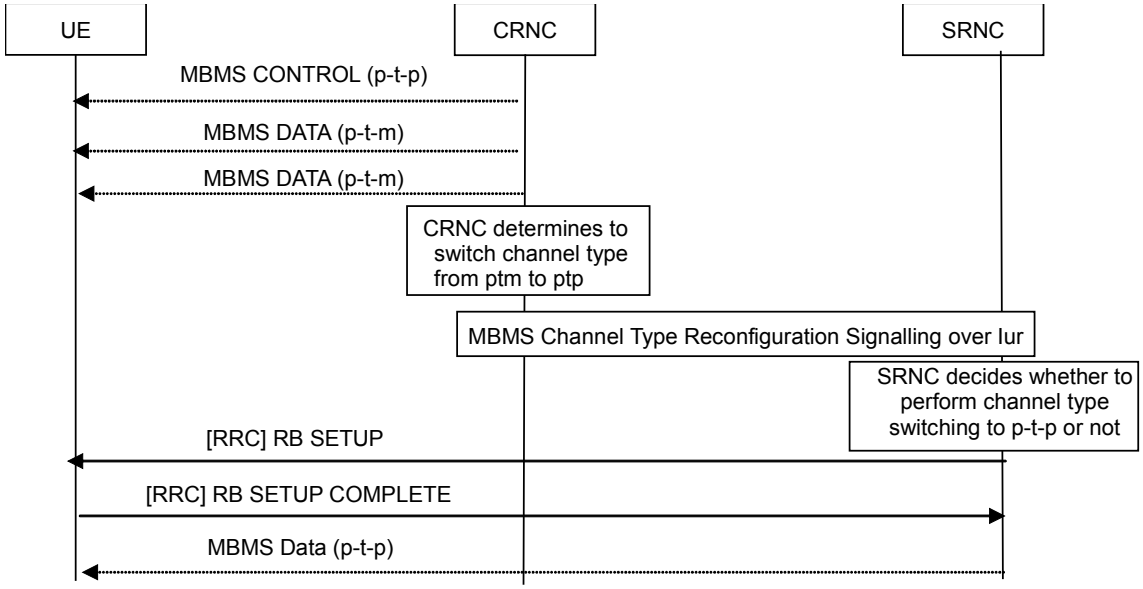


Figure 8.2.7: Channel type switching signalling flow from p-t-m to p-t-p.

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 contains the MBMS Service Id. It is FFS whether the SRNC always follows the CRNC's request or not.

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

8.2.8 MBMS UE Linking

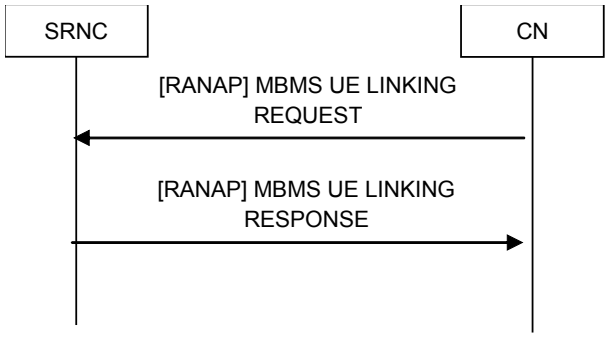


Figure 8.2.8: MBMS UE linking signalling flow

This signalling flow is only applicable for handling UEs in PMM-CONNECTED mode with activated MBMS Services.

The signalling flow is used to link a specific UE to one or several MBMS service contexts in the SRNC. The MBMS UE LINKING REQUEST message contains the whole list of MBMS Service Ids and MBMS PTP RAB IDs (e.g. mapped from NSAPIs) activated by the UE. If there has not been an MBMS service context related to an MBMS Service Id then SRNC creates an MBMS service context as a result of this procedure.

8.2.9 MBMS UE De-Linking

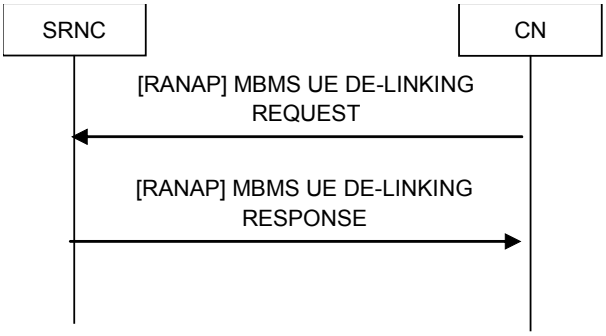


Figure 8.2.9: MBMS UE De-linking signalling flow

This signalling flow is only applicable for handling UEs in PMM-CONNECTED mode with activated MBMS Services.

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

8.2.10 MBMS Service Id Request

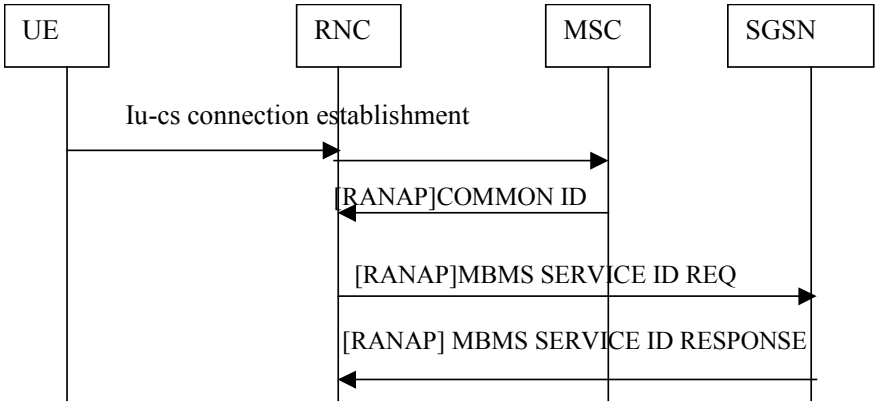


Figure 8.2.10: MBMS Service Id list over Iu signalling flow

This signalling flow is applicable for handling MBMS to UEs in RRC-Connected, PMM-IDLE state. The list of MBMS services the user has joined is sent over Iu.

The purpose of this signalling flow is to perform UE linking for a RRC connected, PMM idle user. The UE provides an indication that the user has joined at least one MBMS service and the PS Domain specific IDNNS (the message that would carry this information is FFS) whenever an Iu-cs connection is established and the UE is PMM idle (that is there is no Iu-ps connection), The RNC requests the MBMS services the UE has joined from the SGSN (or the SGSN the UE is attached to in case of Iu-flex) using a connectionless procedure. The MBMS SERVICE ID REQ contains the IMSI of the UE. The SGSN response contains the full list of MBMS services the user has joined.

The MBMS service list is then stored in the RNC. The list is deleted when the UE moves to RRC idle and the RRC context is removed in the RNC.

8.2.11 MBMS Attach/Detach over Iur

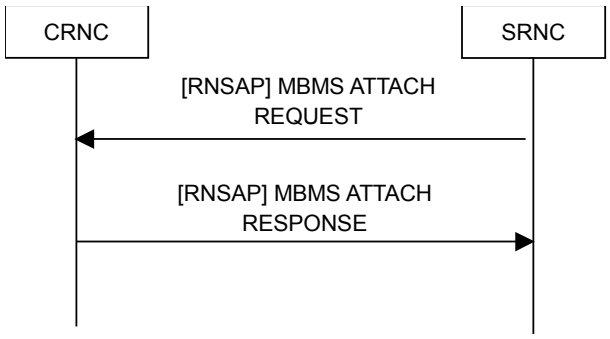


Figure 8.2.11-1: MBMS attach request signalling flow: Successful Operation.

This signalling flow is only applicable for handling UEs in RRC connected mode with activated MBMS Services.

The purpose of this signalling flow is

- to either allow the CRNC to add one or several new UEs to the total number of UEs in a given cell using one or several MBMS services. The MBMS ATTACH REQUEST then contains the Cell Id of the new cell (may contain the URA Id of the new URA for UEs in URA_PCH state), the whole list of affected MBMS Service Ids and a UTRAN specific UE Identification if necessary.
- or to allow the SRNC to inform the DRNC in which URA notifications for MBMS Services have to be sent. The MBMS ATTACH REQUEST then contains a list of URAs and the corresponding MBMS Services.

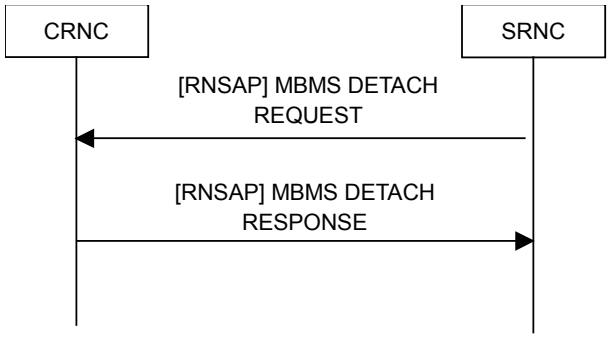


Figure 8.2.11-2: MBMS detach request signalling flow: Successful Operation.

This signalling flow is only applicable for handling UEs in RRC connected mode with activated MBMS Services.

The purpose of this signalling flow is

- to either allow the CRNC to decrease the total number of UEs receiving one or several MBMS service in a given cell. The MBMS DETACH REQUEST contains the Cell Id of the old cell (may contain the URA Id of the old URA for UEs in URA_PCH state), the whole list of affected MBMS Service Ids and a UTRAN specific UE Identification if necessary.
- or to allow the SRNC to inform the DRNC in which URA there is not anymore a need to send notifications for MBMS Services due to the presence of UEs in URA_PCH. The MBMS DETACH REQUEST then contains a list of URAs and the corresponding MBMS Services

8.2.12 MBMS Channel Type Reconfiguration over Iur

These signalling flows need further study.

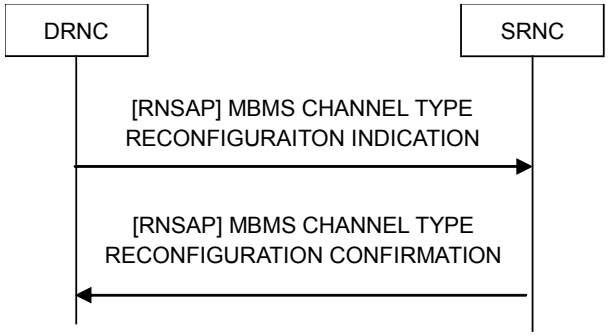


Figure 8.2.12: Channel Type Reconfiguration signalling flow: Successful Operation.

This signalling flow is only applicable for handling MBMS UEs in RRC connected mode.

The purpose of this signalling flow is that the CRNC informs the selected channel type to the SRNCs used in a cell under the CRNC. The MBMS CHANNEL TYPE RECONFIGURATION INDICATION contains a list of U-RNTI, Channel type and MBMS Service Id corresponding to the UEs connected to the SRNC.

8.2.13 Information Exchange over Iur

These signalling flows is used by the DRNC to acquire the MBMS related information for MBMS service identified by TMGI.

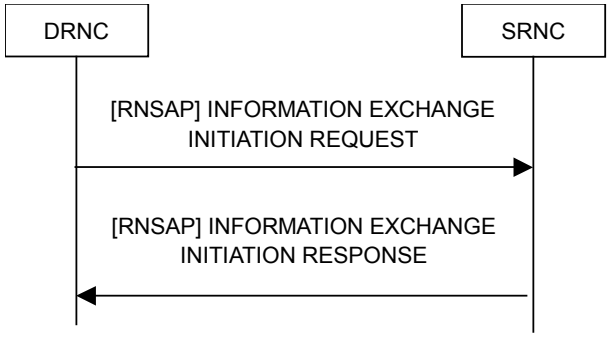


Figure 8.2.13: Information Exchange Initiation signalling flow: Successful Operation.

The purpose of this signalling flow is that the DRNC request the APN and IP multicast address for an MBMS service. The INFORMATION EXCHANGE INITIATION REQUEST includes the TMGI for which the APN and IP multicast address are requested. In the INFORMATION EXCHANGE INITIATION RESPONSE message, the corresponding APN and IP multicast address are included.

8.2.14 MBMS RAB Establishment Indication

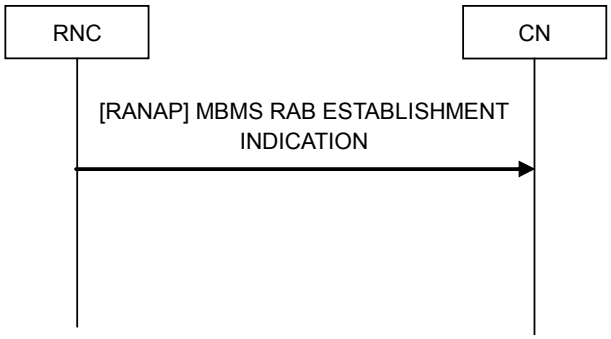


Figure 8.2.14: MBMS RAB Establishment Indication procedure

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.

8.2.15 MBMS RAB Release

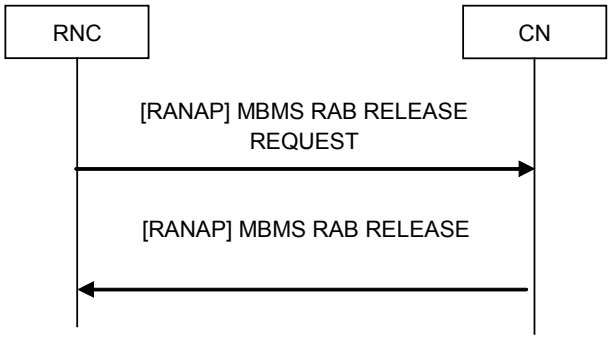


Figure 8.2.15: MBMS RAB Release Request procedure.

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

At reception 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-empt an 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.

8.3 MBMS Uu Signalling Flows

8.3.1 Broadcast of MBMS System Information

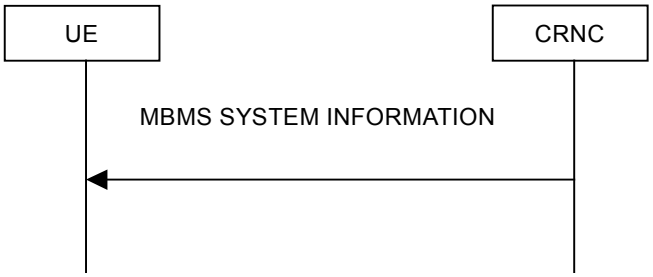


Figure 8.3.1: Broadcast of MBMS system information.

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

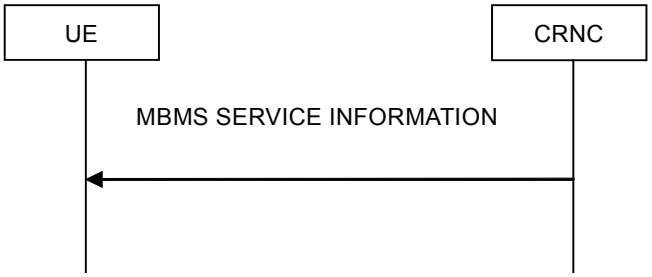


Figure 8.3.2: MBMS service information signalling flow

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 provide an indication of the status of the MBMS service in the cell and to support mobility.

The MBMS SERVICE INFORMATION contains MBMS service ids, optionally the MBMS Session ID, and an indication of the service status in the cell i.e. whether it is provided by p-t-m or p-t-p bearers or whether explicit release is indicated. 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.

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, radio bearer, transport channel and physical channel information per MBMS service.

8.3.4 MBMS Access Information

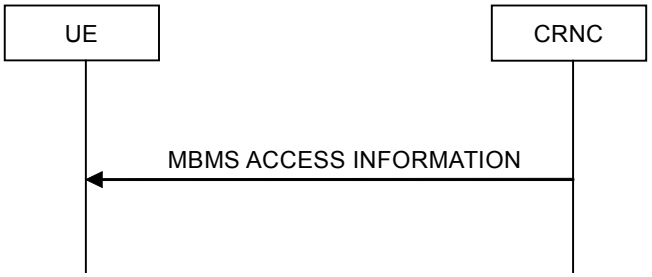


Figure 8.3.4: MBMS Access Information signalling flow

This signalling flow is applicable for handling MBMS UEs in IDLE mode or URA_PCH, CELL_PCH, CELL_FACH state.

The purpose of the signalling flow is for the RNC to inform UE(s) interested in a particular service of the potential need to make an MBMS Counting Response i.e. establish an RRC connection or make a cell update. The MBMS ACCESS INFORMATION is transmitted during counting and re-counting on MCCH. The MBMS ACCESS INFORMATION includes, for each service for which counting is required, the MBMS service identifier, probability factors for idle and connected modes and an indication of the connected mode states to which the signalling flow applies.

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

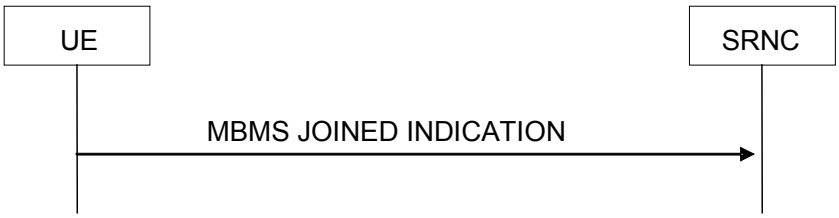


Figure 8.3.6: MBMS joined indication signalling flow

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

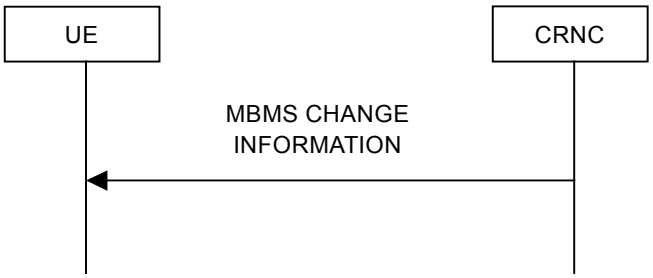


Figure 8.3.8: MBMS change information.

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.

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 MBMS p-t-p RB in PMM IDLE and CONNECTED mode. In idle mode, URA_PCH and CELL_PCH states the UE may transmit this signalling flow to request the setup of a p-t-p MBMS RB after receiving the indication on MCCH that p-t-p transfer mode is utilised or, in CELL_DCH state, to request the release of the p-t-p MBMS RB due to higher priority MBMS service, or to 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 dependent upon UE state.

UEs in idle mode are required to perform RRC connection establishment for sending this information flow. UEs that are in URA_PCH or CELL_PCH state are required to make a cell update and UEs that are in CELL_DCH state transmit an MBMS MODIFICATION REQUEST message.

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 , in the case of a preferred frequency being indicated, it may perform inter-frequency HHO.

The MBMS P-T-P Modification Request message includes the identity of the MBMS service when the service appears in the list of MBMS Selected Services.

8.3.10 MBMS Counting Response

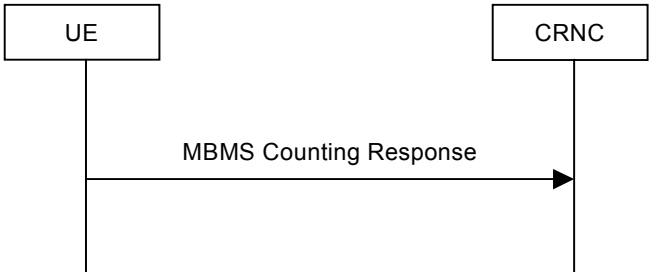
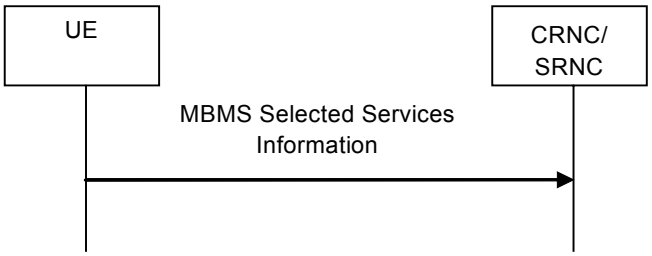


Figure 8.3.10: MBMS Counting Response.

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, CELL_PCH and CELL_FACH state this signalling flow refers to cell update procedure.

The MBMS Counting Response message includes the identity of the MBMS service when the service appears in the list of MBMS Selected Services.

8.3.11 MBMS Selected Services Information



This signalling flow is applicable for UEs entering CELL_DCH state. The purpose of the signalling flow is to enable the UE to inform the SRNC that the user requires the reception of MBMS Selected Services. When the SRNC is not the CRNC of the UE, this signalling flow may interact with the URA linking/de-linking described in subclause 5.1.10.

This signalling flow is also applicable for UEs in CELL_DCH states, when the list of MBMS Selected Services has been modified.

This signalling flow is also applicable for UEs in CELL_PCH, URA_PCH and CELL_FACH states when the list of MBMS Selected Services has been modified by the upper layers and the MBMS Service appears in the MCCH of the cell and the RNC has indicated in the MBMS GENERAL INFORMATION message that it should be notified of a change to this list. If an MBMS Service is contained in the list of MBMS Selected Services but is currently not available in the cell, when the service appears on the MCCH the UE does not perform this signalling flow.

The purpose of the signalling flow is to enable the UE to inform the CRNC that the list of MBMS Selected Services in the UE has been modified.

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.