ETSI TS 136 443 V15.0.0 (2018-09)

LTE;
Evolved Universal Terrestrial
Radio Access Network (E-UTRAN);
M2 Application Protocol (M2AP)
(3GPP TS 36.443 version 15.0.0 Release 15)

Reference
RTS/TSGR-0336443vf00

Keywords
LTE

ETSI

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Contents

Foreword

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1 Scope

The present document specifies the E-UTRAN radio network layer signalling protocol for the M2 interface. The M2 Application Protocol (M2AP) supports the functions of the M2 interface by signalling procedures defined in this document. M2AP is developed in accordance to the general principles stated in TS 36.401 [2] and TS 36.300 [3].

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TR 21.905: “Vocabulary for 3GPP Specifications”.

[2] 3GPP TS 36.401: “E-UTRAN Architecture Description”.

[3] 3GPP TS 36.300: “Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2”.

[4] 3GPP TS 36.413: “Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)”.

[5] ITU-T Recommendation X.691 (07/2002): “Information technology – ASN.1 encoding rules – Specification of Packed Encoding Rules (PER) “.

[6] ITU-T Recommendation X.680 (07/2002): “Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation”.

[7] Void

[8] 3GPP TS 23.246: “Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description”.

[9] 3GPP TS 29.061 “Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)”.

[10] Void

[11] 3GPP TS 36.331: “Evolved Universal Terrestrial Radio Access (E-UTRAN); Radio Resource Control (RRC) Protocol Specification”.

[12] 3GPP TS 36.211: “Evolved Universal Terrestrial Radio Access (E-UTRAN); Physical Channels and Modulation”.

[13] 3GPP TS 36.445: “Evolved Universal Terrestrial Radio Access Network (E-UTRAN); M1 Data Transport”.

[14] 3GPP TS 29.281: “General Packet Radio Service (GPRS); Tunnelling Protocol User Plane (GTPv1-U)”.

[15] 3GPP TS 23.203: “Policy and charging control architecture”.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

Elementary Procedure: M2AP consists of Elementary Procedures (Eps). An Elementary Procedure is a unit of interaction between eNBs and the MCE. These Elementary Procedures are defined separately and are intended to be used to build up complete sequences in a flexible manner. If the independence between some Eps is restricted, it is described under the relevant EP description. Unless otherwise stated by the restrictions, the Eps may be invoked independently of each other as standalone procedures, which can be active in parallel. The usage of several M2AP Eps together or together with Eps from other interfaces is specified in stage 2 specifications (e.g. TS 36.300 [3] and TS 23.246 [8]).

An EP consists of an initiating message and possibly a response message. Two kinds of Eps are used:

- **Class 1:** Elementary Procedures with response (success and/or failure).
- **Class 2:** Elementary Procedures without response.

For Class 1 Eps, the types of responses can be as follows:

Successful:

- A signalling message explicitly indicates that the elementary procedure successfully completed with the receipt of the response.

Unsuccessful:

- A signalling message explicitly indicates that the EP failed.
- On time supervision expiry (i.e. absence of expected response).

Successful and Unsuccessful:

- One signalling message reports both successful and unsuccessful outcome for the different included requests. The response message used is the one defined for successful outcome.

Class 2 Eps are considered always successful.

eNB MBMS M2AP ID: Unique identity, referencing the MBMS-service-associated logical M2-connection within an eNB.

MCE MBMS M2AP ID: Unique identity, referencing the MBMS-service-associated logical M2-connection within an MCE.

MBMS E-RAB: denotes both, the data bearer established between the eNB and the UE(s) to transport MBMS data and the MBMS M1 data bearer.

MBMS-service-associated signalling: When M2AP messages associated to one MBMS service uses the MBMS-service-associated logical M2-connection for association of the message to the respective MBMS service in eNB and EPC.

MBMS-service-associated logical M2-connection: The MBMS-service-associated logical M2-connection uses the identities *eNB MBMS M2AP ID* and *MCE MBMS M2AP ID*. For a received M2AP message the MCE identifies the associated MBMS E-RAB based on the *MCE MBMS M2AP ID* IE and the eNB identifies the associated MBMS-RAB based on the *eNB MBMS M2AP ID* IE.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

MCCH	Multicast Control Channel
PMCH	Physical Multicast Channel
SC-PTM	Single Cell Point to Multipoint

4 General

4.1 Procedure Specification Principles

The principle for specifying the procedure logic is to specify the functional behaviour of the terminating node exactly and completely. Any rule that specifies the behaviour of the originating node shall be possible to be verified with information that is visible within the system.

The following specification principles have been applied for the procedure text in clause 8:

- The procedure text discriminates between:

  1) Functionality which "shall" be executed

     The procedure text indicates that the receiving node "shall" perform a certain function Y under a certain condition. If the receiving node supports procedure X but cannot perform functionality Y requested in the REQUEST message of a Class 1 EP, the receiving node shall respond with the message used to report unsuccessful outcome for this procedure, containing an appropriate cause value.

  2) Functionality which "shall, if supported" be executed

     The procedure text indicates that the receiving node "shall, if supported," perform a certain function Y under a certain condition. If the receiving node supports procedure X, but does not support functionality Y, the receiving node shall proceed with the execution of the EP, possibly informing the requesting node about the not supported functionality.

- Any required inclusion of an optional IE in a response message is explicitly indicated in the procedure text. If the procedure text does not explicitly indicate that an optional IE shall be included in a response message, the optional IE shall not be included. For requirements on including *Criticality Diagnostics* IE, see section 10 in TS 36.413 [4].

4.2 Forwards and Backwards Compatibility

The forwards and backwards compatibility of the protocol is assured by mechanism where all current and future messages, and Ies or groups of related Ies, include ID and criticality fields that are coded in a standard format that will not be changed in the future. These parts can always be decoded regardless of the standard version.

4.3 Specification Notations

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

Procedure	When referring to an elementary procedure in the specification the Procedure Name is written with the first letters in each word in upper case characters followed by the word "procedure", e.g. E-RAB procedure.
Message	When referring to a message in the specification the MESSAGE NAME is written with all letters in upper case characters followed by the word "message", e.g. MESSAGE NAME message.
IE	When referring to an information element (IE) in the specification the *Information Element Name* is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g. *Information Element* IE.

Value of an IE When referring to the value of an information element (IE) in the specification the “Value” is written as it is specified in subclause 9.2 enclosed by quotation marks, e.g. “Value”.

5 M2AP Services

The present clause describes the services an eNB offers to its associated MCE.

5.1 M2AP procedure modules

The M2 interface M2AP procedures may be sub-divided as follows:

1. M2AP MBMS session control procedures;
2. M2AP global procedures;

The M2AP session control procedures are related to MBMS services.

The Global Procedures module contains procedures that are not related to a specific MBMS service.

5.2 Parallel transactions

Unless explicitly indicated in the procedure specification, at any instance in time one protocol peer shall have a maximum of one ongoing M2AP procedure related to a certain MBMS service.

6 Services Expected from Signalling Transport

The signalling connection shall provide in sequence delivery of M2AP messages. M2AP shall be notified if the signalling connection breaks.

7 Functions of M2AP

The M2AP protocol provides the following functions:

- MBMS Session Handling. This function supports start, stop and modify of an MBMS session, as well as configuration and modification of basic radio transmission parameters related to that service.
- MBMS Scheduling Information. This function provides MCCH related information, and optional session suspension decision to the eNB.
- Reporting of General Error Situations. This function allows reporting of general error situations, for which function specific error messages have not been defined.
- Resetting the M2. This function is used to reset the M2 interface.
- Setting up the M2. This function is used to exchange necessary data for the eNB for setup the M2 interface, provides basic configuration of radio parameters for transmission of MBMS data and implicitly perform an M2 Reset.
- eNB and MCE Configuration Update functions are to update configuration data exchanged during setup of M2.
- MBMS Service Counting. This function enables the MCE to perform counting and to receive the counting results for the MBMS service(s) per MBSFN area.
- MBMS Overload Notification. This function enables the eNB to notify the MCE about the MBMS overload status.

The mapping between the above functions and M2 Eps is shown in the table below.

Table 1: Mapping between M2AP functions and M2AP Eps

Function	Elementary Procedure(s)
MBMS Session Handling	a) MBMS Session Start b) MBMS Session Stop c) MBMS Session Update
MBMS Scheduling Information	MBMS Scheduling Information
Reporting of General Error Situations	Error Indication
Resetting the M2	Reset
Setting up the M2	M2 Setup
Configuration Update	a) eNB Configuration Update b) MCE Configuration Update
MBMS Service Counting	a) MBMS Service Counting b) MBMS Service Counting Results Report
MBMS Overload Notification	MBMS Overload Notification

8 M2AP Procedures

8.1 List of M2AP Elementary procedures

In the following tables, all Eps are divided into Class 1 and Class 2 Eps (see subclause 3.1 for explanation of the different classes):

Table 2: Class 1 procedures

Elementary Procedure	Initiating Message	Successful Outcome	Unsuccessful Outcome
		Response message	Response message
MBMS Session Start	MBMS SESSION START REQUEST	MBMS SESSION START RESPONSE	MBMS SESSION START FAILURE
MBMS Session Stop	MBMS SESSION STOP REQUEST	MBMS SESSION STOP RESPONSE	
MBMS Session Update	MBMS SESSION UPDATE REQUEST	MBMS SESSION UPDATE RESPONSE	MBMS SESSION UPDATE FAILURE
MBMS Scheduling Information	MBMS SCHEDULING INFORMATION	MBMS SCHEDULING INFORMATION RESPONSE	
Reset	RESET	RESET ACKNOWLEDGE	
M2 Setup	M2 SETUP REQUEST	M2 SETUP RESPONSE	M2 SETUP FAILURE
eNB Configuration Update	ENB CONFIGURATION UPDATE	ENB CONFIGURATION UPDATE ACKNOWLEDGE	ENB CONFIGURATION UPDATE FAILURE
MCE Configuration Update	MCE CONFIGURATION UPDATE	MCE CONFIGURATION UPDATE ACKNOWLEDGE	MCE CONFIGURATION UPDATE FAILURE
MBMS Service Counting	MBMS SERVICE COUNTING REQUEST	MBMS SERVICE COUNTING RESPONSE	MBMS SERVICE COUNTING FAILURE

Table 3: Class 2 procedures

Elementary Procedure	Message
Error Indication	ERROR INDICATION
MBMS Service Counting Results Report	MBMS SERVICE COUNTING RESULTS REPORT
MBMS Overload Notification	MBMS OVERLOAD NOTIFICATION

The following applies concerning interference between Elementary Procedures:

- The Reset procedure takes precedence over all other Eps.

8.2 MBMS Session Start

8.2.1 General

The purpose of the MBMS Session Start procedure is to request the eNB to notify Ues about an upcoming MBMS Session of a given MBMS Bearer Service and to establish an MBMS E-RAB and an MBMS-service-associated logical M2-connection. The MBMS Session Start procedure is triggered by the MCE.

The procedure uses MBMS-Service-associated signalling.

8.2.2 Successful Operation

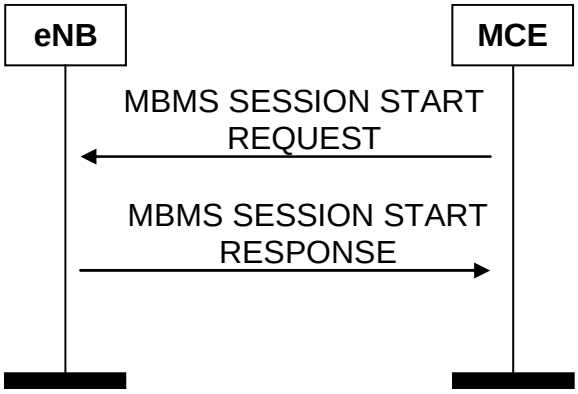

Figure 8.2.2-1. MBMS Session Start procedure. Successful operation.

The MCE initiates the procedure by sending an MBMS SESSION START REQUEST message. If the eNB accepts the MBMS session start request, the eNB responds with the MBMS SESSION START RESPONSE message. The eNB shall select and join the IP multicast (identified by the IP multicast address and the IP address of the multicast source as described by the *TNL Information* IE or, if present, the *Alternative TNL Information* IE) to enable the reception of MBMS data.

If the MBMS SESSION START REQUEST message contains the *MBMS Session Identity* IE, the eNB shall use it for broadcast of the MBMS Session Identity on the air interface.

If the MBMS SESSION START REQUEST message contains the *SC-PTM information* IE, the eNB shall use SC-PTM for the related MBMS service in the relevant cells. The eNB shall establish or modify the resources according to the values of the Allocation and Retention Priority IE (priority level and pre-emption indicators) and the resource situation as follows:

- The eNB shall consider the priority level of the requested session, when deciding on the resource allocation.
- The priority levels and the pre-emption indicators may (individually or in combination) be used to determine whether the session has to be started unconditionally and immediately. If the requested session is marked as "may trigger pre-emption" and the resource situation requires so, the eNB may trigger the pre-emption procedure which may then cause the forced release of a lower priority session which is marked as "pre-emptable". Whilst the process and the extent of the pre-emption procedure is operator-dependent, the pre-emption indicators shall be treated as follows:

    1. If the *Pre-emption Capability* IE is set to "may trigger pre-emption", then this allocation request is allowed to trigger a pre-emption procedure.
    2. If the *Pre-emption Capability* IE is set to "shall not trigger pre-emption", then this allocation request is not allowed to trigger a pre-emption procedure.
    3. If the *Pre-emption Vulnerability* IE is set to "pre-emptable", then this session shall be included in the pre-emption process.
    4. If the *Pre-emption Vulnerability* IE is set to "not pre-emptable", then this session shall not be included in the pre-emption process.
    5. If the *Priority Level* IE is set to "no priority" the given values for the *Pre-emption Capability* IE and *Pre-emption Vulnerability* IE shall not be considered. Instead the values "shall not trigger pre-emption" and "not pre-emptable" shall prevail.

- The E-UTRAN pre-emption process shall keep the following rule: E-UTRAN shall only pre-empt sessions with lower priority, in ascending order of priority.

The eNB shall report to the MCE, in the MBMS SESSION START RESPONSE message the result of the requested MBMS E-RAB.

8.2.3 Unsuccessful Operation

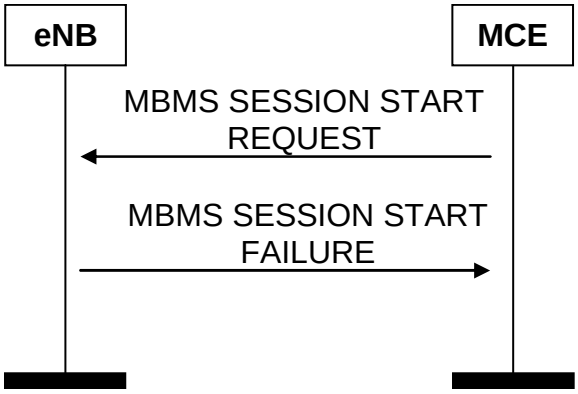

Figure 8.2.3-1. MBMS Session Start procedure. Unsuccessful operation.

If the eNB is not capable of correctly processing the request (e.g. the MBMS resources could not be established at all in any cell), the MCE shall be informed by the MBMS SESSION START FAILURE message.

8.2.4 Abnormal Conditions

In case the *SC-PTM information* IE is received, but does not contain any cell of the eNB, the MCE shall be informed by the MBMS SESSION START FAILURE message.

8.3 MBMS Session Stop

8.3.1 General

The purpose of the MBMS Session Stop procedure is to release the corresponding MBMS E-RAB and the MBMS-service-associated logical M2-connection. The MBMS Session Stop procedure is triggered by the MCE.

The procedure uses MBMS-Service-associated signalling.

8.3.2 Successful Operation

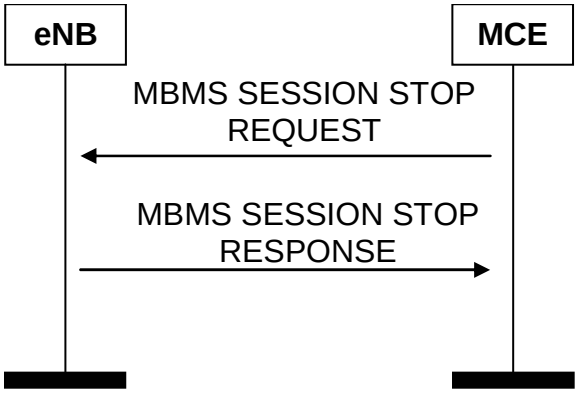

Figure 8.3.2-1. MBMS Session Stop procedure. Successful operation.

The MCE initiates the procedure by sending a MBMS SESSION STOP REQUEST message. Upon receipt of the MBMS SESSION STOP REQUEST message, the eNB shall respond with the MBMS SESSION STOP RESPONSE message. The eNB shall disable the reception from the IP backbone of the particular MBMS bearer service, release the affected resources and remove the MBMS bearer context.

8.3.3 Abnormal Conditions

Void.

8.4 MBMS Scheduling Information

8.4.1 General

The purpose of the MBMS Scheduling Information Procedure is to provide MCCH related information, and optional session suspension decision to the eNB.

The procedure uses non MBMS-Service-associated signalling.

8.4.2 Successful Operation

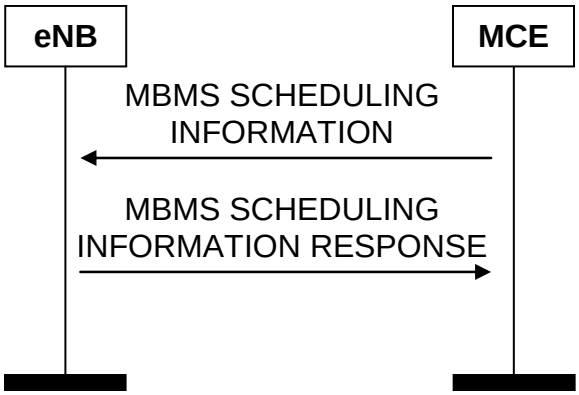

Figure 8.4.2-1. MBMS Scheduling Information procedure. Successful operation.

The MCE initiates the procedure by sending the MBMS SCHEDULING INFORMATION message to the eNB. The eNB shall store the *MBSFN Area Configuration Item* IE, apply the MCCH update from the modification period defined in the *MCCH Update Time* IE, and transmit the MCCH according to the MCCH configuration for the given MBSFN area indicated by the MCE. If an empty *PMCH Configuration List* IE is contained in this message for an MBSFN area, the eNB shall update the content of the corresponding MCCH so as not to include PMCH related information over the corresponding MCCH. If the *Modulation and Coding Scheme 2* IE is included, the eNB shall ignore the *Modulation and Coding Scheme* IE and use the *Modulation and Coding Scheme 2* IE instead. If the received *PMCH Configuration* IE contains the *MCH Scheduling Period Extended* IE, the eNB shall take its value into account instead of the value signalled in the *MCH Scheduling Period* IE. If the received *PMCH Configuration* IE contains the *MCH Scheduling Period Extended 2* IE, the eNB shall take its value into account instead of the value signalled in the *MCH Scheduling Period* IE. The eNB shall schedule the MBMS services in the MCCH according to the order defined in the *MBMS Session List per PMCH* IE. If the *MBMS Suspension Notification List* IE is included in this message for an MBSFN area, the eNB shall broadcast the suspension decision over the air interface from the radio frame defined by the *SFN* IE, until the end of the Modification Period just before the "MCCH Update Time".

If the MBMS SCHEDULING INFORMATION message contains the *Subframe Allocation Extended* IE included in the *MBSFN Subframe Configuration* IE, the eNB shall, if supported, store it and take it into account.

8.4.3 Abnormal Conditions

Void.

8.5 Reset

8.5.1 General

The purpose of the Reset procedure is to initialise or re-initialise the eNB or part of eNB M2AP MBMS-service-related contexts, in the event of a failure in the MCE or vice versa. This procedure does not affect the application level configuration data exchanged during, e.g., the M2 Setup procedure.

The procedure uses non MBMS-service-associated signalling.

8.5.2 Successful Operation

8.5.2.1 Reset Procedure Initiated from the MCE

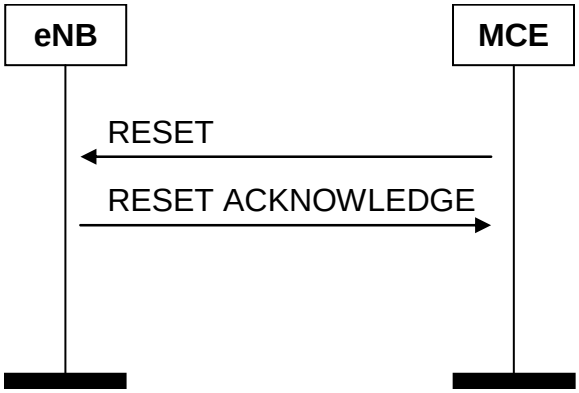

Figure 8.5.2.1-1. Reset procedure initiated from the MCE. Successful operation.

In the event of a failure at the MCE, which has resulted in the loss of some or all transaction reference information, a RESET message shall be sent to the eNB.

At reception of RESET message the eNB shall release all allocated resources on M2 and M1/Uu related to MBMS-service association(s) indicated explicitly or implicitly in the RESET message and remove the indicated MBMS-service contexts including MBMS M2AP IDs.

After the eNB has released all assigned M2 and M1 resources and MBMS-service contexts for all indicated MBMS-service association(s), the eNB shall respond with the RESET ACKNOWLEDGE message. The eNB does not need to wait for the release of radio resources to be completed before returning the RESET ACKNOWLEDGE message.

If the RESET message contains the *MBMS-Service-associated logical M2-connection list* IE, then:

- The eNB shall use the *MCE MBMS M2AP ID* IE and/or the *eNB MBMS M2AP ID* IE to explicitly identify the MBMS service association(s) to be reset.

- The eNB shall in the RESET ACKNOWLEDGE message include, for each MBMS service association to be reset, the *MBMS-Service-associated logical M2-connection Item* IE in the *MBMS-Service-associated logical M2-connection list* IE. The *MBMS-Service-associated logical M2-connection Item* Ies shall be in the same order as received in the RESET message and shall include also unknown MBMS-Service-associated logical M2-connections. Empty *MBMS-Service-associated logical M2-connection Item* Ies, received in the RESET message, may be omitted in the RESET ACKNOWLEDGE message.

- If the *MCE MBMS M2AP ID* IE is included in the *MBMS-Service-associated logical M2-connection Item* IE for an MBMS service association, the eNB shall include the *MCE MBMS M2AP ID* IE in the corresponding *MBMS-Service-associated logical M2-connection Item* IE in the RESET ACKNOWLEDGE message.

- If the *eNB MBMS M2AP ID* IE is included in an *MBMS-Service-associated logical M2-connection Item* IE for an MBMS service association, the eNB shall include the *eNB MBMS M2AP ID* IE in the corresponding *MBMS-Service-associated logical M2-connection Item* IE in the RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except another Reset procedure) on the same M2 interface related to a MBMS service association, indicated explicitly or implicitly in the RESET message, shall be aborted.

8.5.2.2 Reset Procedure Initiated from the eNB

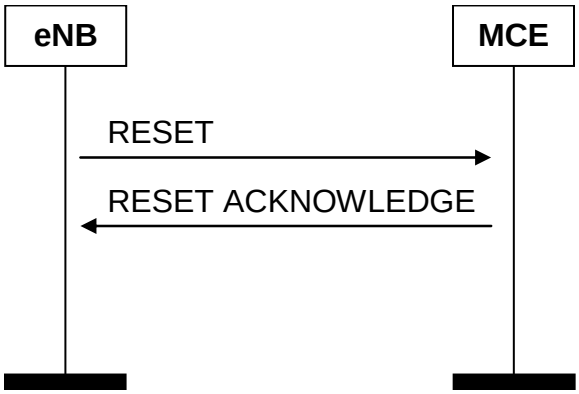

Figure 8.5.2.2-1. Reset procedure initiated from the eNB. Successful operation.

In the event of a failure at the eNB, which has resulted in the loss of some or all transaction reference information, a RESET message shall be sent to the MCE.

At reception of RESET message the MCE shall release all allocated resources on M2 related to MBMS-service association(s) indicated explicitly or implicitly in the RESET message and the indicated MBMS-service contexts on M2 for the eNB.

After the MCE has released all assigned M2 resources and MBMS-service contexts for all the eNB indicated MBMS-service association(s), the MCE shall respond with the RESET ACKNOWLEDGE message.

If the RESET message contains the *MBMS-Service-associated logical M2-connection list* IE, then:

- The MCE shall use the *MCE MBMS M2AP ID* IE and/or the *eNB MBMS M2AP ID* IE to explicitly identify the MBMS service association(s) to be reset.
- The MCE shall in the RESET ACKNOWLEDGE message include, for each MBMS service association to be reset, the *MBMS-Service-associated logical M2-connection Item* IE in the *MBMS-Service-associated logical M2-connection list* IE. The *MBMS-Service-associated logical M2-connection Item* Ies shall be in the same order as received in the RESET message and shall include also unknown MBMS-Service-associated logical M2-connections. Empty *MBMS-Service-associated logical M2-connection Item* Ies, received in the RESET message, may be omitted in the RESET ACKNOWLEDGE message.
- If the *MCE MBMS M2AP ID* IE is included in the *MBMS-Service-associated logical M2-connection Item* IE for an MBMS service association, the MCE shall include the *MCE MBMS M2AP ID* IE in the corresponding *MBMS-Service-associated logical M2-connection Item* IE in the RESET ACKNOWLEDGE message.
- If the *eNB MBMS M2AP ID* IE is included in an *MBMS-Service-associated logical M2-connection Item* IE for an MBMS service association, the MCE shall include the *eNB MBMS M2AP ID* IE in the corresponding *MBMS-Service-associated logical M2-connection Item* IE in the RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except another Reset procedure) on same M2 interface related to a MBMS service association, indicated explicitly or implicitly in the RESET message, shall be aborted.

8.5.3 Abnormal Conditions

8.5.3.1 Abnormal Condition at the MCE

If the RESET message includes the *MBMS-Service-associated logical M2-connection list* IE, but neither the *MCE MBMS M2AP ID* IE nor the *eNB MBMS M2AP ID* IE is present for a *MBMS-Service-associated logical M2-connection Item* IE, then the MCE shall ignore the *MBMS-Service-associated logical M2-connection Item* IE. The MCE may return the empty *MBMS-Service-associated logical M2-connection Item* IE in the *MBMS-Service-associated logical M2-connection list* IE in the RESET ACKNOWLEDGE message.

8.5.3.2 Abnormal Condition at the eNB

If the RESET message includes the *MBMS-Service-associated logical M2-connection list* IE, but neither the *MCE MBMS M2AP ID* IE nor the *eNB MBMS M2AP ID* IE is present for a *MBMS-Service-associated logical M2-connection Item* IE, then the eNB shall ignore the *MBMS-Service-associated logical M2-connection Item* IE. The eNB may return the empty *MBMS-Service-associated logical M2-connection Item* IE in the *MBMS-Service-associated logical M2-connection list* IE in the RESET ACKNOWLEDGE message.

8.5.3.3 Crossing of Reset Messages

If Reset procedure is ongoing in eNB and the eNB receives a RESET message from the peer entity on the same M2 interface related to one or several MBMS service associations previously requested to be reset, indicated explicitly or implicitly in the received RESET message, the eNB shall respond with RESET ACKNOWLEDGE message as described in 8.5.2.1.

If Reset procedure is ongoing in MCE and the MCE receives a RESET message from the peer entity on the same M2 interface related to one or several MBMS service associations previously requested to be reset, indicated explicitly or implicitly in the received RESET message, the MCE shall respond with RESET ACKNOWLEDGE message as described in 8.5.2.2.

8.6 M2 Setup

8.6.1 General

The purpose of the M2 Setup procedure is to exchange application level data needed for the eNB and MCE to interoperate correctly on the M2 interface and to configure MCCH related content on the BCCH for each of the cells controlled by the eNB which is foreseen to participate in MBMS service data transmission. This procedure shall be the first M2AP procedure triggered after the TNL association has become operational. The procedure uses non MBMS-service-associated signalling.

This procedure erases any existing application level configuration data in the eNB and the MCE and MCCH related BCCH data in all cells served by the eNB. This procedure also re-initialises the E-UTRAN M2AP MBMS service related contexts (if any) and erases all related signalling connections in the two nodes like a Reset procedure would do.

8.6.2 Successful Operation

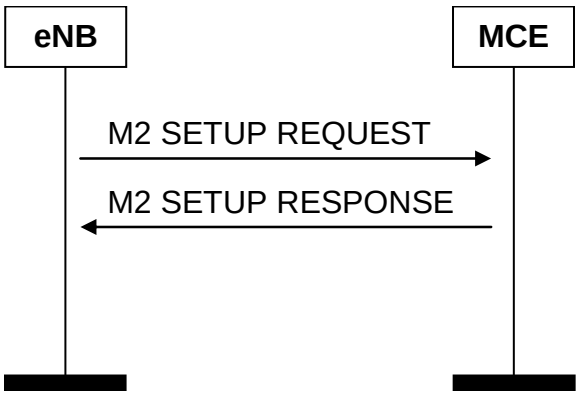

Figure 8.6.2-1. M2 Setup procedure. Successful operation.

The eNB initiates the procedure by sending a M2 SETUP REQUEST message including the appropriate data to the MCE. The eNB shall include in the M2 SETUP REQUEST message the cell(s) which is (are) foreseen to participate in MBMS service data transmission.

The MCE responds with M2 SETUP RESPONSE message including the appropriate data. The MCE shall provide the MCCH related BCCH configuration for all cells indicated in the M2 SETUP REQUEST message.

The exchanged data shall be stored in the respective node, MCCH related BCCH configuration broadcasted as provided by the MCE in the respective cell(s), and used for the duration of the TNL association or until any further configuration update procedure is performed.

When this procedure is finished the M2 interface is operational, all affected cells are ready for MBMS service data transmission and other M2 messages can be exchanged.

If the M2 SETUP REQUEST message contains the *eNB Name* IE the MCE may use this IE as a human readable name of the eNB.

If the M2 SETUP RESPONSE message contains the *MCE Name* IE the eNB may use this IE as a human readable name of the MCE.

The eNB shall broadcast the MCCH related BCCH configuration only in those cells indicated in the *Cell Information List* IE contained in the M2 SETUP RESPONSE message for which the *Cell Reservation Info* IE within the *MCCH related BCCH Configuration Item* IE is not set to "reserved Cell".

If the M2 SETUP RESPONSE message contains the *Modification Period Extended* IE within the *MCCH related BCCH Configuration Item* IE, the eNB shall take its value into account instead of the value signalled in the *Modification Period* IE.

If the M2 SETUP RESPONSE message contains the *Repetition Period Extended* IE within the *MCCH related BCCH Configuration Item* IE, the eNB shall take its value into account instead of the value signalled in the *Repetition Period* IE.

8.6.3 Unsuccessful Operation

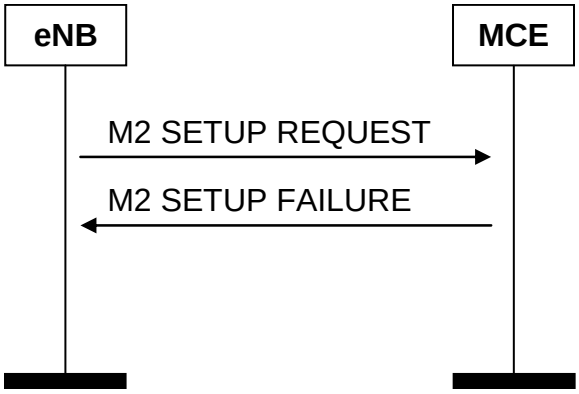

Figure 8.6.2-1. M2 Setup procedure. Unsuccessful operation.

If the MCE cannot accept the setup it should respond with a M2 SETUP FAILURE message and appropriate cause value.

If the M2 SETUP FAILURE message includes the *Time To Wait* IE the eNB shall wait at least for the indicated time before reinitiating the M2 setup towards the same MCE.

8.6.4 Abnormal Conditions

Void.

8.7 eNB Configuration Update

8.7.1 General

The purpose of the eNB Configuration Update procedure is to update application level configuration data needed for the eNB and MCE to interoperate correctly on the M2 interface. This procedure does not affect existing MBMS-service-related contexts, if any.

The procedure uses non MBMS-service-associated signalling.

8.7.2 Successful Operation

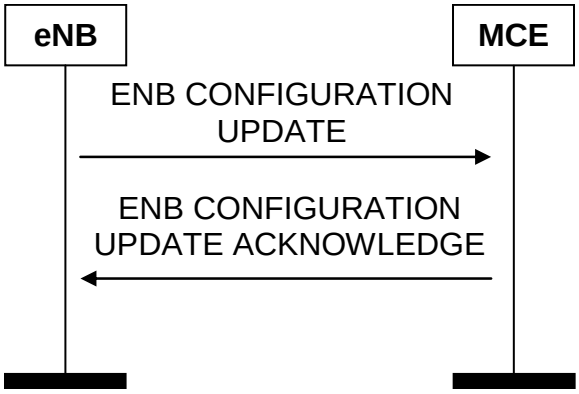

Figure 8.7.2-1. eNB Configuration Update procedure. Successful operation.

The eNB initiates the procedure by sending an ENB CONFIGURATION UPDATE message to the MCE including an appropriate set of updated configuration data that it has just taken into operational use. The eNB CONFIGURATION UPDATE message may contain:

- the *Global eNB ID* IE,
- the *eNB Name* IE,
- the *eNB MBMS Configuration data per cell* IE.

If the *Global eNB ID* IE is not included in the ENB CONFIGURATION UPDATE message, the MCE shall interpret that the existing eNB ID is not changed.

If the *eNB Name* IE is not included in the ENB CONFIGURATION UPDATE message, the MCE shall interpret that the existing eNB name, if any, is not changed.

The MCE responds with the ENB CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data. If the ENB CONFIGURATION UPDATE message does not contain the information for an existing cell, the MCE shall interpret that the corresponding configuration data for that cell is not changed and shall continue to operate the M2 with the existing related configuration data for that cell.

If the ENB CONFIGURATION UPDATE ACKNOWLEDGE message contains the *Cell Information List* IE within the *MCCH related BCCH Configuration Item* IE, the eNB shall broadcast that MCCH related BCCH configuration only in those cells indicated in the IE for which the *Cell Reservation Info* IE is not set to “reservedCell”. If the ENB CONFIGURATION UPDATE ACKNOWLEDGE message does not contain the *Cell Information List* IE within the *MCCH related BCCH Configuration Item* IE, the eNB shall not broadcast that MCCH related BCCH configuration in any cell. If the ENB CONFIGURATION UPDATE ACKNOWLEDGE message contains the *Modification Period Extended* IE within the *MCCH related BCCH Configuration Item* IE, the eNB shall take its value into account instead of the value signalled in the *Modification Period* IE. If the ENB CONFIGURATION UPDATE ACKNOWLEDGE message contains the *Repetition Period Extended* IE within the *MCCH related BCCH Configuration Item* IE, the eNB shall take its value into account instead of the value signalled in the *Repetition Period* IE. If the ENB CONFIGURATION UPDATE ACKNOWLEDGE message does not contain the *MCCH related BCCH Configuration Item* IE for an existing MBSFN area, the eNB shall interpret that the corresponding configuration data for that MBSFN area is not changed and shall continue to operate the M2 with the existing related configuration data for that MBSFN area.

The eNB may update the configured MBMS Services Areas and the MBSFN Synchronisation Area per cell:

- If the eNB includes the *E-UTRAN CGI* IE for a cell within the ENB CONFIGURATION UPDATE message, the MCE shall assume that the eNB does neither broadcast MCCH related configuration in the BCCH nor any MBMS service data in that cell any more.
- If the eNB includes the *eNB MBMS Configuration data Item* IE for a cell within the ENB CONFIGURATION UPDATE message, the MCE may decide to include in the ENB CONFIGURATION UPDATE ACKNOWLEDGE message the MCCH related BCCH configuration for the related MBSFN area(s).

If the eNB CONFIGURATION UPDATE message contains the *eNB Name* IE, the MCE may use this IE as a human readable name of the eNB.

The updated configuration data shall be stored in both eNB and MCE and used for the duration of the TNL association or until any further update is triggered by the eNB or the MCE.

The eNB may initiate a further eNB Configuration Update procedure only after a previous eNB Configuration Update procedure has been completed.

8.7.3 Unsuccessful Operation

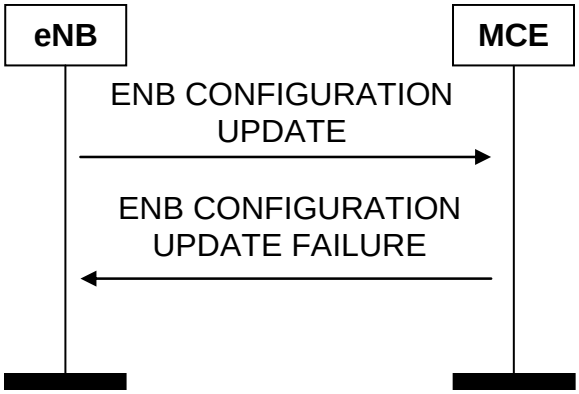

Figure 8.7.3-1. eNB Configuration Update procedure. Unsuccessful operation.

If the MCE cannot accept the update it shall respond with an ENB CONFIGURATION UPDATE FAILURE message and appropriate cause value.

If the ENB CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE the eNB shall wait at least for the indicated time before reinitiating the ENB Configuration Update procedure towards the MCE. Both nodes shall continue to operate the M2 interface with their respective configuration data.

8.7.4 Abnormal Conditions

If the eNB after initiating eNB Configuration Update procedure receives neither an ENB CONFIGURATION UPDATE ACKOWLEDGE nor an ENB CONFIGURATION UPDATE FAILURE message, the eNB may reinitiate a further eNB Configuration Update procedure towards the same MCE, provided that the content of the new ENB CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged ENB CONFIGURATION UPDATE message.

8.8 MCE Configuration Update

8.8.1 General

The purpose of the MCE Configuration Update procedure is to update application level configuration data needed for the eNB and MCE to interoperate correctly on the M2 interface and to re-configure MCCH related content on the BCCH for the MBSFN areas contributed by the eNB which is foreseen to participate in MBMS service data transmission. The procedure uses non MBMS-service-associated signalling. This procedure does not affect existing MBMS-service-related contexts, if any.

8.8.2 Successful Operation

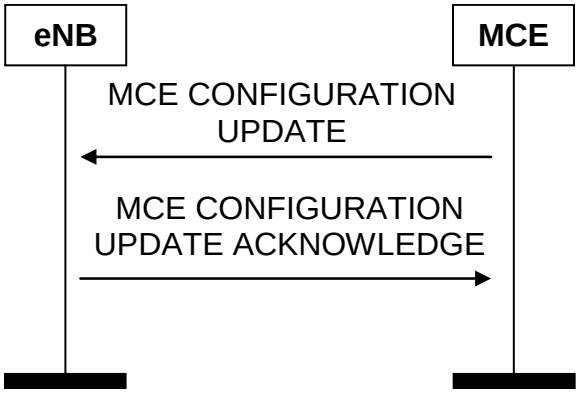

Figure 8.8.2-1. MCE Configuration Update procedure. Successful operation.

The MCE initiates the procedure by sending an MCE CONFIGURATION UPDATE message to the eNB including an appropriate set of updated configuration data. The MCE CONFIGURATION UPDATE message may contain:

- the *Global MCE ID* IE,
- the *MCE Name* IE,
- the *MCCH related BCCH Configuration data per MBSFN area* IE.

If the *Global MCE ID* IE is not included in the MCE CONFIGURATION UPDATE message, the eNB shall interpret that the existing MCE ID is not changed.

If the *MCE Name* IE is not included in the MCE CONFIGURATION UPDATE message, the eNB shall interpret that the existing MCE name, if any, is not changed.

The eNB responds with the MCE CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data.

If the MCE CONFIGURATION UPDATE message contains the *Cell Information List* IE within the *MCCH related BCCH Configuration Item* IE, the eNB shall broadcast that MCCH related BCCH configuration only in those cells indicated in the IE for which the Cell Reservation Info IE is not set to “reservedCell”. If the MCE CONFIGURATION UPDATE message does not contain the *Cell Information List* IE within the *MCCH related BCCH Configuration Item* IE, the eNB shall not broadcast that MCCH related BCCH configuration in any cell. If the MCE CONFIGURATION UPDATE message contains the *Modification Period Extended* IE within the *MCCH related BCCH Confiruation Item* IE, the eNB shall take its value into account instead of the value signalled in the *Modification Period* IE. If the MCE CONFIGURATION UPDATE message contains the *Repetition Period Extended* IE within the *MCCH related BCCH Confiruation Item* IE, the eNB shall take its value into account instead of the value signalled in the *Repetition Period* IE. If the MCE CONFIGURATION UPDATE message does not contain the *MCCH related BCCH Configuration Item* IE for an existing MBSFN area, the eNB shall interpret that the corresponding configuration data for that MBSFN area is not changed and shall continue to operate the M2 with the existing related configuration data for that MBSFN area.

If the MCE CONFIGURATION UPDATE message contains the *MCE Name* IE, the eNB may use this IE as a human readable name of the MCE.

The updated configuration data shall be stored in both eNB and MCE and used for the duration of the TNL association or until any further update is triggered by the MCE or the eNB.

The MCE may initiate a further MCE Configuration Update procedure only after a previous MCE Configuration Update procedure has been completed.

If the MCE CONFIGURATION UPDATE message contains the *Subcarrier Spacing MBMS* IE within the *MCCH related BCCH Configuration Item* IE, the eNB shall, if supported, store this value and use it in MBMS operation.

8.8.3 Unsuccessful Operation

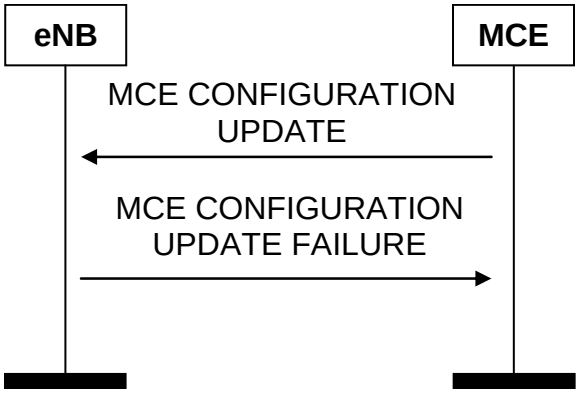

Figure 8.8.3-1. MCE Configuration Update procedure. Unsuccessful operation.

If the eNB cannot accept the update it shall respond with an MCE CONFIGURATION UPDATE FAILURE message and appropriate cause value.

If the MCE CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE the MCE shall wait at least for the indicated time before reinitiating the MCE Configuration Update procedure towards the eNB. Both nodes shall continue to operate the M2 interface with their respective configuration data.

8.8.4 Abnormal Conditions

If the MCE neither receives an MCE CONFIGURATION UPDATE ACKNOWLEDGE nor an MCE CONFIGURATION UPDATE FAILURE message, the MCE may reinitiate MCE Configuration Update procedure towards the same eNB provided that the content of the new MCE CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged MCE CONFIGURATION UPDATE message.

8.9 Error Indication

8.9.1 General

The Error Indication procedure is initiated by a node to report detected errors in one incoming message, provided they cannot be reported by an appropriate failure message.

If the error situation arises due to reception of a message utilising MBMS-service-associated signalling, then the Error Indication procedure uses MBMS-service-associated signalling. Otherwise the procedure uses non MBMS-service-associated signalling.

8.9.2 Successful Operation

Figure 8.9.2-1. Error Indication procedure, MCE originated. Successful operation.

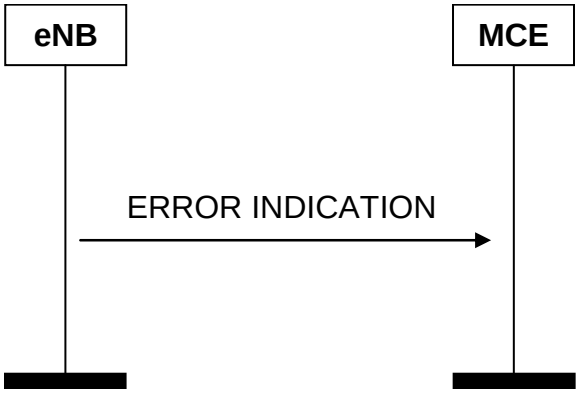

Figure 8.9.2.1-2. Error Indication procedure, eNB originated. Successful operation.

When the conditions defined in clause 10 are fulfilled, the Error Indication procedure is initiated by an ERROR INDICATION message sent from the receiving node.

The ERROR INDICATION message shall contain at least either the *Cause* IE or the *Criticality Diagnostics* IE.

In case the Error Indication procedure is triggered by utilising MBMS-service-associated signalling the *MCE MBMS M2AP ID* IE and the *eNB MBMS M2AP ID* IE shall be included in the ERROR INDICATION message. If one or both of *MCE MBMS M2AP ID* IE and the *eNB MBMS M2AP ID* IE are not correct, the cause shall be set to appropriate value e.g. “Unknown or already allocated MCE MBMS M2AP ID”, “Unknown or already allocated eNB MBMS M2AP ID” or “Unknown or inconsistent pair of MBMS M2AP ID”.

8.9.3 Abnormal Conditions

Void.

8.10 MBMS Session Update

8.10.1 General

The purpose of the MBMS Session Update procedure is to inform the eNB about changing characteristics of the MBMS session.

The procedure uses MBMS-Service-associated signalling.

8.10.2 Successful Operation

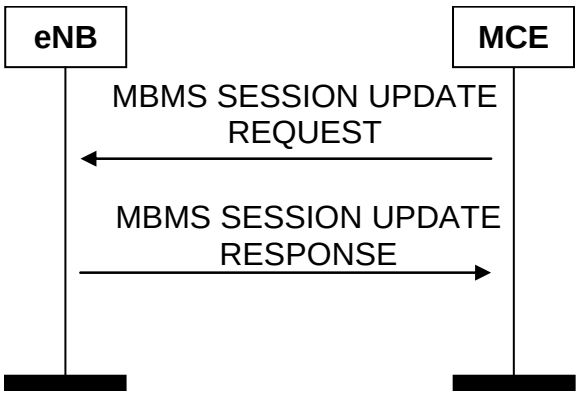

Figure 8.10.2-1. MBMS Session Update procedure. Successful operation.

The MCE initiates the procedure by sending a MBMS SESSION UPDATE REQUEST message.

If the *MBMS Service Area* IE is included in the MBMS SESSION UPDATE REQUEST message, the eNB shall check the involvement of its cells in the new service area, update correspondingly the MBMS context and resources, join or leave the IP multicast if needed and send the MBMS SESSION UPDATE RESPONSE message.

If the *TNL Information* IE is included in the MBMS SESSION UPDATE REQUEST message, the eNB shall ignore the contained information.

If the MBMS SESSION UPDATE REQUEST message contains the *MBMS Session Identity* IE for an MBMS service, the eNB shall ignore the contained information.

If the MBMS SESSION UPDATE REQUEST message contains the *SC-PTM information* IE, the eNB shall check the SC-PTM related involvement of its cells in the new list of Cell identities, update correspondingly the MBMS context and resources, join or leave the IP multicast if needed and send the MBMS SESSION UPDATE RESPONSE message. If the ARP parameter is updated, the corresponding update of resources shall follow the principles described for the MBMS Session Start procedure. The eNB shall provide the MBMS session only in those cells included in the new list of Cell identities.

8.10.3 Unsuccessful Operation

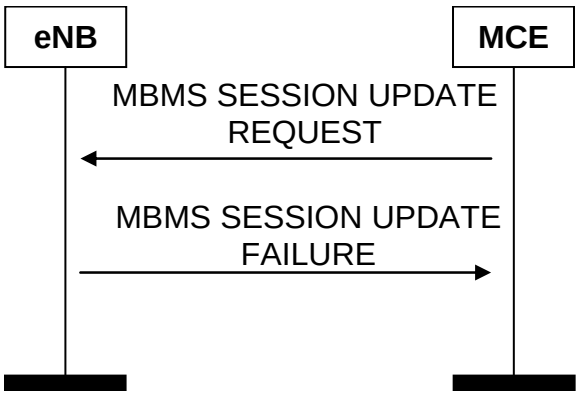

Figure 8.10.3-1. MBMS Session Update procedure. Unsuccessful operation.

If the eNB fails to update the MBMS session, it shall return a MBMS SESSION UPDATE FAILURE message.

8.10.4 Abnormal Conditions

Void.

8.11 MBMS Service Counting

8.11.1 General

The purpose of the MBMS Service Counting procedure is to request the eNB to report the number of connected mode Ues that either are receiving the MBMS service(s) or are interested in the reception of the MBMS service(s).

The procedure uses non MBMS-Service-associated signalling.

8.11.2 Successful Operation

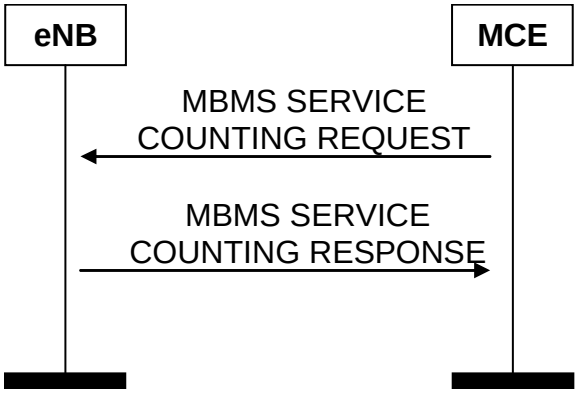

Figure 8.11.2-1. MBMS Service Counting procedure. Successful operation.

The MCE initiates the procedure by sending the MBMS SERVICE COUNTING REQUEST message to the eNB.

After receiving the MBMS SERVICE COUNTING REQUEST message successfully, the eNB shall respond the MCE with the MBMS SERVICE COUNTING RESPONSE message, apply the MCCH update from the modification period defined in the *MCCH Update Time* IE, and perform counting as specified in TS 36.300 [3].

8.11.3 Unsuccessful Operation

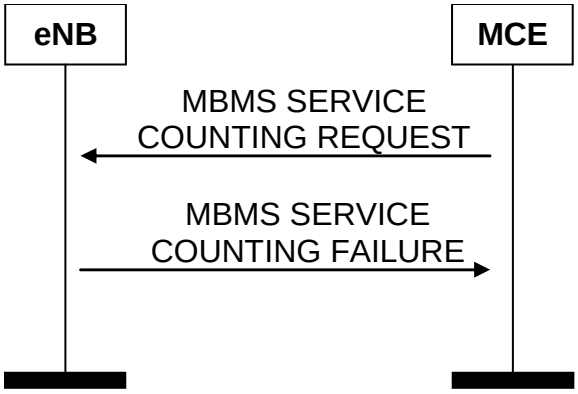

Figure 8.11.3-1. MBMS Service Counting procedure. Unsuccessful operation.

If the eNB is not capable of correctly processing the request, it shall return a MBMS SERVICE COUNTING FAILURE message.

8.11.4 Abnormal Conditions

If the eNB has received a MBMS SERVICE COUNTING REQUEST message for a MBSFN Area ID and MCCH Update Time pair, the eNB shall ignore subsequent MBMS SERVICE COUNTING REQUEST messages containing the same MBSFN Area ID and MCCH Update Time, and a different *MBMS Counting Request Session* IE.

8.12 MBMS Service Counting Results Report

8.12.1 General

The purpose of the MBMS Service Counting Results Report procedure is for the eNB to provide the counting results to the MCE.

The procedure uses non MBMS-Service-associated signalling.

8.12.2 Successful Operation

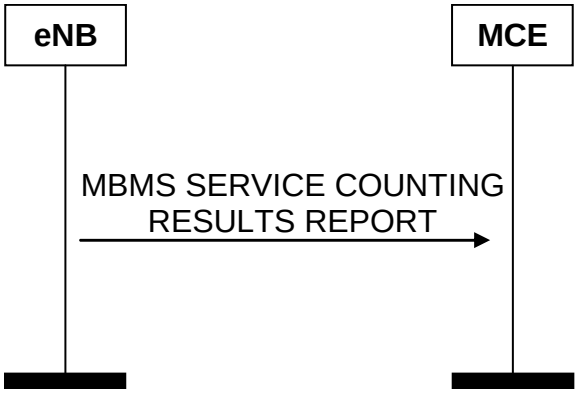

Figure 8.12.2-1. MBMS Service Counting Results Report procedure. Successful operation.

The eNB initiates the procedure by sending an MBMS SERVICE COUNTING RESULTS REPORT message.

The MBMS SERVICE COUNTING RESULTS REPORT message contains the counting results according to the counting configuration in the respective MBMS SERVICE COUNTING REQUEST message.

8.12.3 Abnormal Conditions

If, for a given MBSFN area, the MBMS SERVICE COUNTING RESULTS REPORT message contains one or more TMGIs corresponding to the configuration of one MBMS SERVICE COUNTING REQUEST message and some other TMGIs not part of this configuration, the MCE shall ignore the result corresponding to those other TMGIs.

8.13 MBMS Overload Notification

8.13.1 General

The purpose of the MBMS Overload Notification procedure is to enable the eNB to notify the MCE about MBMS overload status.

The procedure uses non MBMS-Service-associated signalling.

8.13.2 Successful Operation

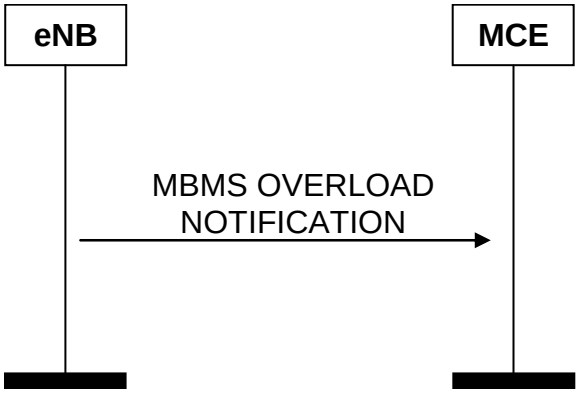

Figure 8.13.2-1. MBMS Overload Notification procedure. Successful operation.

The eNB initiates the procedure by sending an MBMS OVERLOAD NOTIFICATION message to the MCE.

If a *PMCH Overload Status* IE is set to “Overload”, the MCE shall consider that the corresponding PMCH is overloaded, i.e. the user plane data for ongoing sessions could not be transported over the air interface in the scheduling period. If a *PMCH Overload Status* IE is set to “Normal”, the MCE shall consider that the corresponding PMCH is not overloaded.

8.13.3 Abnormal Conditions

Void.

9 Elements for M2AP Communication

9.1 Message Functional Definition and Content

9.1.1 General

Sub clauses 9.1 and 9.2 describe the structure of the messages and information elements required for the M2AP protocol in tabular format. Sub clause 9.3 provides the corresponding ASN.1 definition.

The following attributes are used for the tabular description of the messages and information elements: Presence, Range Criticality and Assigned Criticality.

9.1.1 Message Contents

9.1.1.1 Presence

All information elements in the message descriptions below are marked mandatory, optional or conditional according to table 4.

Table 4. Meaning of abbreviations used in M2AP messages

Abbreviation	Meaning
M	Ies marked as Mandatory (M) shall always be included in the message.
O	Ies marked as Optional (O) may or may not be included in the message.
C	Ies marked as Conditional (C) shall be included in a message only if the condition is satisfied. Otherwise the IE shall not be included.

9.1.1.2 Criticality

Each Information Element or Group of Information Elements may have criticality information applied to it. Following cases are possible:

Table 5. Meaning of content within "Criticality" column

Abbreviation	Meaning
–	No criticality information is applied explicitly.
YES	Criticality information is applied. This is usable only for non-repeatable Ies.
GLOBAL	The IE and all its repetitions together have one common criticality information. This is usable only for repeatable Ies.
EACH	Each repetition of the IE has its own criticality information. It is not allowed to assign different criticality values to the repetitions. This is usable only for repeatable Ies.

9.1.1.3 Range

The Range column indicates the allowed number of copies of repetitive Ies/IE groups.

9.1.1.4 Assigned Criticality

This column provides the actual criticality information as defined in subclause 10.3.2 in TS 36.413 [4], if applicable.

9.1.2 MBMS SESSION START REQUEST

This message is sent by the MCE to establish an MBMS-service-associated logical M2-connection.

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCE MBMS M2AP ID	M		9.2.3.1		YES	reject
TMGI	M		9.2.3.3		YES	reject
MBMS Session Identity	O		9.2.3.4		YES	ignore
MBMS Service Area	M		9.2.3.6		YES	reject
TNL Information		*1*			YES	reject
>IP Multicast Address	M		IP Address 9.2.2.1		-	
>IP Source Address	M		IP Address 9.2.2.1		-	
>GTP DL TEID	M		GTP-TEID 9.2.2.2		-	
Alternative TNL Information	O				YES	ignore
>Alternative IP Multicast Address	M		IP Address 9.2.2.1		-	
>Alternative IP Source Address	M		IP Address 9.2.2.1		-	
>GTP DL TEID	M		GTP-TEID 9.2.2.2	Shall be set to same value as the *GTP DL TEID* IE of the *TNL Information* IE.	-	
SC-PTM information	O		9.2.1.22		YES	reject

9.1.3 MBMS SESSION START RESPONSE

This message is sent by the eNB to report the successful outcome of the request from the MBMS SESSION START REQUEST message.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCE MBMS M2AP ID	M		9.2.3.1		YES	ignore
eNB MBMS M2AP ID	M		9.2.3.2		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.4 MBMS SESSION START FAILURE

This message is sent by the eNB to report the unsuccessful outcome of the request from the MBMS SESSION START REQUEST message.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCE MBMS M2AP ID	M		9.2.3.1		YES	ignore
Cause	M		9.2.1.2		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.5 MBMS SESSION STOP REQUEST

This message is sent by the MCE to release the corresponding MBMS E-RAB and the MBMS-service-associated logical M2-connection.

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCE MBMS M2AP ID	M		9.2.3.1		YES	reject
eNB MBMS M2AP ID	M		9.2.3.2		YES	reject

9.1.6 MBMS SESSION STOP RESPONSE

This message is sent by the eNB to acknowledge the MBMS SESSION STOP message.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCE MBMS M2AP ID	M		9.2.3.1		YES	ignore
eNB MBMS M2AP ID	M		9.2.3.2		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.7 MBMS SCHEDULING INFORMATION

This message is sent by the MCE to provide MCCH related information to the eNB.

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCCH Update Time	M		9.2.1.19		YES	reject
MBSFN Area Configuration List		*1*			YES	reject
>MBSFN Area Configuration Item Ies		*1 to <maxnoofMBSFNareas>*				
>>PMCH Configuration List		*1*			YES	reject
>>>PMCH Configuration Item Ies		*0 to <maxnoofPMCHsperMBSFNarea>*			EACH	reject
>>>>PMCH Configuration	M		9.2.1.8		-	
>>>>MBMS Session List per PMCH	M		9.2.1.9		-	
>>Subframes Configuration List		*1*			YES	reject
>>>Subframes Configuration Item Ies		*1 to <maxnoofMBSFN-Allocations>*			EACH	reject
>>>>MBSFN Subframe Configuration	M		9.2.1.17		-	
>>Common Subframe Allocation Period	M		9.2.1.18		YES	reject
>>MBSFN Area ID	M		9.2.1.14		YES	reject
>>MBMS Suspension Notification List		*0..1*			YES	ignore
>>>MBMS Suspension Notification Item Ies		*1 to <maxnoofPMCHsperMBSFNarea>*			EACH	ignore
>>>>SFN	M		INTEGER (0..1023)	SFN of the first radio frame containing the information that the MBMS session(s) are to be suspended.	-	-
>>>>MBMS Sessions To Be Suspended List per PMCH		*1*			-	-
>>>>>MBMS Sessions To Be Suspended List per PMCH Item		*1 to <maxnoofSessionsPerPMCH>*			-	-
>>>>>>MBMS Service Identity	M		TMGI 9.2.3.3		-	-

Range bound	Explanation
maxnoofMBSFNareas	Maximum no. of MBSFN areas served by a single eNB. The value for maxnoofMBSFNareas is 256.
maxnoofPMCHsperMBSFNarea	Maximum no. of PMCHs possible per MBSFN .The value for maxnoofMCHsperMBSFNarea is 15.
maxnoofMBSFN-Allocations	Maximum no. of MBSFN frame allocations with different offset. The value for maxnoofMBSFN-Allocations is 8.
maxnoofSessionsPerPMCH	Maximum no. of Sessions per PMCH. The value for maxnoofSessionsPerPMCH is 29.

9.1.8 MBMS SCHEDULING INFORMATION RESPONSE

This message is sent by the eNB to acknowledge the MBMS SCHEDULING INFORMATION message.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.9 RESET

This message is either sent by the eNB or the MCE and is used to request the M2 interface or part of M2 interface to be reset.

Direction: eNB → MCE, MCE → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Cause	M		9.2.1.2		YES	ignore
CHOICE *Reset Type*	M				YES	reject
>M2 interface						
>>Reset All	M		ENUMERATED (Reset all, …)		–	–
>Part of M2 interface						
>>MBMS-Service-associated logical M2-connection list		*1*			–	–
>>>MBMS-Service – associated logical M2-connection Item		*1 to < maxNrOfIndividualM2ConnectionsToReset >*			EACH	reject
>>>>eNB MBMS M2AP ID	O		9.2.3.2		–	–
>>>>MCE MBMS M2AP ID	O		9.2.3.1		–	–

Range bound	Explanation
maxNrOfIndividualM2ConnectionsToReset	Maximum no. of MBMS-Service-associated logical M2-connections allowed to reset in one message. Value is 256.

9.1.10 RESET ACKNOWLEDGE

This message is sent as a response to the RESET message.

Direction : MCE → eNB, eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MBMS-Service-associated logical M2-connection list		*0..1*			YES	ignore
>MBMS-Service – associated logical M2-connection Item		*1 to < maxNrOfIndividualM2ConnectionsToReset >*			EACH	ignore
>>eNB MBMS M2AP ID	O		9.2.3.2		–	–
>>MCE MBMS M2AP ID	O		9.2.3.1		–	–
Criticality Diagnostics	O		9.2.1.7		YES	ignore

Range bound	Explanation
maxNrOfIndividualM2ConnectionsToReset	Maximum no. of MBMS-Service-associated logical M2-connections allowed to reset in one message. Value is 256.

9.1.11 M2 SETUP REQUEST

This message is sent by the eNB to initiate the M2 interface instance.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Global eNB ID	M		9.2.1.10		YES	reject
eNB Name	O		Printable String (1..150,…)		YES	ignore
eNB MBMS Configuration data per cell		*1*			YES	reject
>eNB MBMS Configuration data Item Ies		*1 to <maxnoofCells>*			EACH	reject
>>eNB MBMS Configuration data Item	M		9.2.1.12		-	

Range bound	Explanation
maxnoofCells	Maximum no. of cells that may be served by an eNB. The value for maxnoofCells is 256.

9.1.12 M2 SETUP RESPONSE

This message is sent by the MCE to complete the initiation of an M2 interface instance, providing MCCH related BCCH information.

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Global MCE ID	M		9.2.1.16		YES	reject
MCE Name	O		Printable String (1..150,…)		YES	ignore
MCCH related BCCH Configuration data per MBSFN area		*1*			YES	reject
>MCCH related BCCH Configuration data Item Ies		*1 to <maxnoofMBSFNareas>*			EACH	reject
>> MCCH related BCCH Configuration Item	M		9.2.1.13		-	
Criticality Diagnostics	O		9.2.1.7		YES	ignore

Range bound	Explanation
maxnoofMBSFNareas	Maximum no. of MBSFN areas served by a single eNB. The value for maxnoofMBSFNareas is 256.

9.1.13 M2 SETUP FAILURE

This message is sent by the MCE to indicate non acceptance of the M2 Setup Request.

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Cause	M		9.2.1.2		YES	ignore
Time To Wait	O		9.2.1.15		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.14 ENB CONFIGURATION UPDATE

This message is sent by the eNB to indicate that application level configuration data has changed in the eNB.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Global eNB ID	O		9.2.1.10		YES	reject
eNB Name	O		Printable String (1..150,…)		YES	ignore
eNB MBMS Configuration data per cell		*0..1*			YES	reject
>eNB MBMS Configuration data per cell Item Ies		*1 to <maxnoofCells>*			EACH	reject
>>CHOICE *MBMS Configuration Update*	M					
>>>Configuration Data						
>>>>eNB MBMS Configuration data Item			9.2.1.12			
>>>E-CGI						
>>>>E-UTRAN CGI			9.2.1.11			

Range bound	Explanation
maxnoofCells	Maximum no. of cells that may be served by an eNB. The value for maxnoofCells is 256.

9.1.15 ENB CONFIGURATION UPDATE ACKNOWLEDGE

This message acknowledges the ENB CONFIGURATION UPDATE message.

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCCH related BCCH Configuration data per MBSFN area		*0..1*			YES	reject
>MCCH related BCCH Configuration data Item Ies		*1 to <maxnoofMBSFNareas>*			EACH	reject
>>MCCH related BCCH Configuration Item	M		9.2.1.13		-	
Criticality Diagnostics	O		9.2.1.7		YES	ignore

Range bound	Explanation
maxnoofMBSFNareas	Maximum no. of MBSFN areas served by a single eNB. The value for maxnoofMBSFNareas is 256.

9.1.16 ENB CONFIGURATION UPDATE FAILURE

This message is sent by the MCE to indicate non acceptance of the eNB Configuration Update.

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Cause	M		9.2.1.2		YES	ignore
Time To Wait	O		9.2.1.15		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.17 MCE CONFIGURATION UPDATE

This message is sent by the MCE to indicate that application level configuration data has changed in the MCE.

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Global MCE ID	O		9.2.1.16		YES	reject
MCE Name	O		Printable String (1..150,…)		YES	ignore
MCCH related BCCH Configuration data per MBSFN area		*0..1*			YES	reject
>MCCH related BCCH Configuration data Item Ies		*1 to <maxnoofMBSFNareas>*			EACH	reject
>>MCCH related BCCH Configuration Item	M		9.2.1.13		-	

Range bound	Explanation
maxnoofMBSFNareas	Maximum no. of MBSFN areas served by a single eNB. The value for maxnoofMBSFNareas is 256.

9.1.18 MCE CONFIGURATION UPDATE ACKNOWLEDGE

This message acknowledges the MCE CONFIGURATION UPDATE message.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.19 MCE CONFIGURATION UPDATE FAILURE

This message is sent by the eNB to indicate non acceptance of the MCE Configuration Update.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Cause	M		9.2.1.2		YES	ignore
Time To Wait	O		9.2.1.15		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.20 ERROR INDICATION

This message is sent by both the MCE and the eNB and is used to indicate that some error has been detected in the node.

Direction: MCE → eNB and eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MCE MBMS M2AP ID	O		9.2.3.1		YES	ignore
eNB MBMS M2AP ID	O		9.2.3.2		YES	ignore
Cause	O		9.2.1.2		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.21 MBMS SESSION UPDATE REQUEST

This message is sent by the MCE to the eNB in order to inform of the change of session characteristics e.g. service area of one MBMS service session.

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCE MBMS M2AP ID	M		9.2.3.1		YES	reject
eNB MBMS M2AP ID	M		9.2.3.2		YES	reject
TMGI	M		9.2.3.3		YES	reject
MBMS Session Identity	O		9.2.3.4		YES	ignore
MBMS Service Area	O		9.2.3.6		YES	ignore
TNL Information	O				YES	reject
>IP Multicast Address	M		9.2.2.1		-	
>IP Source Address	M		IP Address 9.2.2.1		-	
>GTP DL TEID	M		GTP-TEID 9.2.2.2		-	
SC-PTM information	O		9.2.1.22		YES	reject

9.1.22 MBMS SESSION UPDATE RESPONSE

This message is sent by the eNB to report the successful outcome of the request from the MBMS SESSION UPDATE REQUEST message.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCE MBMS M2AP ID	M		9.2.3.1		YES	ignore
eNB MBMS M2AP ID	M		9.2.3.2		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.23 MBMS SESSION UPDATE FAILURE

This message is sent by the eNB to report the unsuccessful outcome of the request from the MBMS SESSION UPDATE REQUEST message.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCE MBMS M2AP ID	M		9.2.3.1		YES	ignore
eNB MBMS M2AP ID	M		9.2.3.2		YES	ignore
Cause	M		9.2.1.2		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.24 MBMS SERVICE COUNTING REQUEST

This message is sent by the MCE to request the eNB to report the number of connected mode Ues that are receiving or interested in the MBMS service(s).

Direction: MCE → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MCCH Update Time	M		9.2.1.19		YES	reject
MBSFN Area ID	M		9.2.1.14		YES	reject
MBMS Counting Request Session	M				YES	reject
>MBMS Counting Request Session Item		*1 to <maxnoofcountingservice>*			EACH	reject
>>TMGI	M		9.2.3.3		-	-

Range bound	Explanation
maxnoofcountingservice	Maximum no. of the services that are counted by RAN. The value for maxnoofcountingservice is 16.

9.1.25 MBMS SERVICE COUNTING RESPONSE

This message is sent by the eNB to acknowledge the MBMS SERVICE COUNTING REQUEST message.

Direction: eNB→MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.26 MBMS SERVICE COUNTING FAILURE

This message is sent by the eNB to report the unsuccessful outcome of the request from the MBMS SERVICE COUNTING REQUEST message.

Direction: eNB → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Cause	M		9.2.1.2		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.27 MBMS SERVICE COUNTING RESULTS REPORT

This message is sent by the eNB to report the number of connected mode Ues that are receiving or interested in the MBMS service(s) as indicated in the MBMS SERVICE COUNTING REQUEST message.

Direction: eNB→MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MBSFN Area ID	M		9.2.1.14		YES	reject
MBMS Counting Result List	M				YES	reject
>MBMS Counting Result Item		*1 to <maxnoofcountingservice>*			EACH	reject
>>TMGI	M		9.2.3.3		-	
>>Counting Result	M		9.2.1.21		-	

Range bound	Explanation
Maxnoofcountingservice	Maximum no. of the services that are counted by RAN. The value for maxnoofcountingservice is 16.

9.1.28 MBMS OVERLOAD NOTIFICATION

This message is sent by the eNB to notify the MCE about MBMS overload status.

Direction: eNB→MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MBSFN Area ID	M		9.2.1.14		YES	reject
Overload Status Per PMCH List		*1*			YES	reject
>Overload Status Per PMCH Item Ies		*1..<maxnoofPMCHsperMBSFNarea>*			-	-
>>PMCH Overload Status	M		ENUMERATED (Normal, Overload, …)		YES	reject
>>**Active MBMS Session List**		*0..1*			YES	reject
>>>**Active MBMS Session Item Ies**		*1 to <maxnoofSessionsPerPMCH>*			-	-
>>>>MBMS Service Identity	M		TMGI 9.2.3.3		YES	reject

Range bound	Explanation
maxnoofPMCHsperMBSFNarea	Maximum no. of PMCHs possible per MBSFN .The value is 15.
maxnoofSessionsPerPMCH	Maximum no. of Sessions per PMCH. The value for maxnoofSessionsPerPMCH is 29.

9.2 Information Element Definitions

9.2.1 Radio Network Layer Related Ies

9.2.1.1 Message Type

The *Message Type* IE uniquely identifies the message being sent. It is mandatory for all messages.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Message Type				
>Procedure Code	M		INTEGER (0..255)	
>Type of Message	M		CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, …)	

9.2.1.2 Cause

The purpose of the *Cause* IE is to indicate the reason for a particular event for the M2AP protocol.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Cause Group*	M			
>Radio Network Layer				
>>Radio Network Layer Cause	M		ENUMERATED (Unknown or already allocated MCE MBMS M2AP ID, Unknown or already allocated eNB MBMS M2AP ID, Unknown or inconsistent pair of MBMS M2AP IDs, Radio resources not available, Interaction with other procedure, Unspecified, …, Invalid QoS combination, Not supported QCI value)	
>Transport Layer				
>>Transport Layer Cause	M		ENUMERATED (Transport Resource Unavailable, Unspecified, …)	
>NAS				
>>NAS Cause	M		ENUMERATED (Unspecified, …)	
*>Protoco*l				
>>Protocol Cause	M		ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Abstract Syntax Error (Falsely Constructed Message), Unspecified, …)	
>Misc				
>>Miscellaneous Cause	M		ENUMERATED (Control Processing Overload, Hardware Failure, O&M Intervention, Unspecified, …)	

The meaning of the different cause values is described in the following table. In general, “not supported” cause values indicate that the related capability is missing. On the other hand, “not available” cause values indicate that the related capability is present, but insufficient resources were available to perform the requested action.

Radio Network Layer cause	Meaning
Unknown or already allocated MCE MBMS M2AP ID	The action failed because the MCE MBMS M2AP ID is either unknown, or (for a first message received at the eNB) is known and already allocated to an existing MBMS service related context.
Unknown or already allocated eNB MBMS M2AP ID	The action failed because the eNB MBMS M2AP ID is either unknown, or (for a first message received at the MCE) is known and already allocated to an existing context.
Unknown or inconsistent pair of MBMS M2AP IDs	The action failed because both MBMS M2AP IDs are unknown, or are known but do not define a single MBMS context.
Radio resources not available	No requested radio resources are available
Interaction with other procedure	The action is due to an ongoing interaction with another procedure
Unspecified	Sent for radio network layer cause when none of the specified cause values applies
Invalid QoS combination	The action was failed because of invalid QoS combination.
Not supported QCI Value	The E-RAB setup failed because the requested QCI is not supported.

Transport Layer cause	Meaning
Transport Resource Unavailable	The required transport resources are not available.
Unspecified	Sent for transport network layer cause when none of the specified cause values applies.

NAS cause	Meaning
Unspecified	Sent for NAS cause when none of the specified cause values applies.

Protocol cause	Meaning
Transfer Syntax Error	The received message included a transfer syntax error.
Abstract Syntax Error (Reject)	The received message included an abstract syntax error and the concerning criticality indicated “reject”.
Abstract Syntax Error (Ignore And Notify)	The received message included an abstract syntax error and the concerning criticality indicated “ignore and notify”.
Message Not Compatible With Receiver State	The received message was not compatible with the receiver state.
Semantic Error	The received message included a semantic error.
Abstract Syntax Error (Falsely Constructed Message)	The received message contained Ies or IE groups in wrong order or with too many occurrences.
Unspecified	Sent for protocol cause when none of the specified cause values applies.

Miscellaneous cause	Meaning
Control Processing Overload	Control processing overload.
Hardware Failure	Action related to hardware failure
O&M Intervention	The action is due to O&M intervention.
Unspecified	Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer, NAS or Protocol.

9.2.1.3 Void

9.2.1.4 Void

9.2.1.5 Void

9.2.1.6 Void

9.2.1.7 Criticality Diagnostics

The *Criticality Diagnostics* IE is sent by the eNB or the MCE when parts of a received message have not been comprehended or were missing, or if the message contained logical errors. When applicable, it contains information about which Ies were not comprehended or were missing.

For further details on how to use the *Criticality Diagnostics* IE, (see section 10 in TS 36.413 [4]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Procedure Code	O		INTEGER (0..255)	Procedure Code is to be used if Criticality Diagnostics is part of Error Indication procedure, and not within the response message of the same procedure that caused the error.
Triggering Message	O		ENUMERATED (initiating message, successful outcome, unsuccessful outcome)	The Triggering Message is used only if the Criticality Diagnostics is part of Error Indication procedure.
Procedure Criticality	O		ENUMERATED (reject, ignore, notify)	This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure).
Information Element Criticality Diagnostics		*0 to <maxnooferrors>*		
>IE Criticality	M		ENUMERATED(reject, ignore, notify)	The IE Criticality is used for reporting the criticality of the triggering IE. The value 'ignore' shall not be used.
>IE ID	M		INTEGER (0..65535)	The IE ID of the not understood or missing IE.
>Type of Error	M		ENUMERATED(not understood, missing, …)	

Range bound	Explanation
maxnooferrors	Maximum no. of IE errors allowed to be reported with a single message. The value for maxnooferrors is 256.

9.2.1.8 PMCH Configuration

This information element provided PMCH configuration related content for MCCH.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality

Allocated Subframes End	M		INTEGER (0..1535)	Encoded as the *sf-AllocEnd* IE in TS 36.331 [11].	–	–
Modulation and Coding Scheme	M		INTEGER (0..28)	Encoded as the *dataMCS* IE in TS 36.331 [11].	–	–
MCH Scheduling Period	M		ENUMERATED (rf8, rf16, rf32, rf64, rf128, rf256, rf512, rf1024)	Encoded as the *mch-SchedulingPeriod* IE in TS 36.331 [11].	–	–
Modulation and Coding Scheme 2	O		INTEGER (0..27)	Encoded as the t2 in the *dataMCS* IE in TS 36.331 [11]. If this IE is present, the value signalled in the *Modulation and Coding Scheme* IE is ignored.	YES	reject
MCH Scheduling Period Extended	O		ENUMERATED (rf4, …)	Encoded as the *mch-SchedulingPeriod-r12* IE in TS 36.331 [11]. If this IE is present, the value signalled in the *MCH Scheduling Period* IE is ignored.	YES	reject
MCH Scheduling Period Extended 2	O		ENUMERATED (rf1, rf2, …)	Encoded as the *mch-SchedulingPeriod-v14x0* IE in TS 36.331 [11]. If this IE is present, the value signalled in the *MCH Scheduling Period* IE is ignored.	YES	reject

9.2.1.9 MBMS Session List per PMCH

This information element provided PMCH configuration related content for MCCH.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBMS Session List per PMCH Item Ies		*1 to <maxnoofSessionsPerPMCH>*		
>MBMS Service Identity	M		TMGI 9.2.3.3	
>LCID	M		INTEGER (0..28)	Logical Channel Identity.

Range bound	Explanation
maxnoofSessionsPerPMCH	Maximum no. of Sessions per PMCH. The value for maxnoofSessionsPerPMCH is 29.

9.2.1.10 Global eNB ID

This information element is used to globally identify an eNB (see TS 36.401 [2]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.7	
CHOICE *eNB ID*	M			
>eNB ID				
>>Macro eNB ID			BIT STRING (20)	Equal to the 20 leftmost bits of the Cell Identity IE contained in the E-UTRAN CGI IE (see section 9.2.1.11) of each cell served by the eNB.
>Short Macro eNB ID				
>>Short Macro eNB ID	M		BIT STRING (SIZE(18))	Equal to the 18 leftmost bits of the Cell Identity IE contained in the E-UTRAN CGI IE (see section 9.2.1.11) of each cell served by the eNB.
>Long Macro eNB ID				
>>Long Macro eNB ID	M		BIT STRING (SIZE(21))	Equal to the 21 leftmost bits of the Cell Identity IE contained in the E-UTRAN CGI IE (see section 9.2.1.11) of each cell served by the eNB.

9.2.1.11 E-UTRAN CGI

This information element is used to globally identify a cell (see TS 36.401 [2]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.7	
Cell Identity	M		BIT STRING (28)	The 20 leftmost bits of the Cell Identity correspond to the eNB ID (*Global eNB ID* IE defined in section 9.2.1.10).

9.2.1.12 eNB MBMS Configuration data Item

This information element provides MBMS related configuration information from the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
E-UTRAN CGI	M		9.2.1.11	
MBSFN Synchronisation Area Id	M		9.2.1.20	
MBMS Service Area List		*1*		
>MBMS Service Area Item		*1 to <maxnoofMBMSServiceAreasPerCell>*		
>>MBMS Service Area	M		9.2.3.6	

Range bound	Explanation
maxnoofMBMSServiceAreasPerCell	Maximum no. of Service Areas per cell. The value for maxnoofMBMSServiceAreasPerCell is 256.

9.2.1.13 MCCH related BCCH Configuration Item

This information element provides MCCH related BCCH configuration information to the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
MBSFN Area Id	M		9.2.1.14		–	–
PDCCH Length	M		ENUMERATED (s1, s2,…)	This IE is encoded along the number of OFDM symbols for PDCCH as of table 6.7-1. In TS 36.211 [12].	–	–
Repetition Period	M		ENUMERATED (rf32, rf64, rf128, rf256)	The same encoding as the *mcch-RepetitionPeriod* IE in the *mcch-Config* IE as specified in TS 36.331 [11].	–	–
Repetition Period Extended	O		ENUMERATED (rf1, rf2, rf4, rf8, rf16, …)	The same encoding as the *mcch-RepetitionPeriod-v14x0* IE in the *mcch-Config* IE as specified in TS 36.331 [11]. If this IE is present, the value signalled in the *Repetition Period* IE is ignored.	YES	reject
Offset	M		INTEGER (0..10)	The same encoding as the *mcch-Offset* in *mcch-Config* IE as specified in TS 36.331 [11].	–	–
Modification Period	M		ENUMERATED (rf512, rf1024)	The same encoding as the *mcch-Modification Period* IE in the *mcch-Config* IE as specified in TS 36.331 [11].	–	–

Modification Period Extended	O		ENUMERATED (rf1, rf2, rf4, rf8, rf16, rf32, rf64, rf128, rf256, …)	The same encoding as the *mcch-ModificationPeriod-v14x0* IE in the *mcch-Config* IE as specified in TS 36.331 [11]. If this IE is present, the value signalled in the *ModificationPeriod* IE is ignored.	YES	reject
Subframe Allocation Info	M		BIT STRING (SIZE(6))	The same encoding as the *sf-AllocInfo* IE specified in TS 36.331 [11].	–	–
Modulation and Coding Scheme	M		ENUMERATED (n2, n7, n13, n19)	The same encoding as the *signallingMCS* IE specified in TS 36.331 [11].	–	–
Cell Information List		*0..1*				
>Cell Information		*1 to <maxnoofCells>*				
>>E-UTRAN CGI	M		9.2.1.11		–	–
>>Cell Reservation Info	M		ENUMERATED (reservedCell, nonReservedCell, …)		–	–
Subcarrier Spacing MBMS	O		ENUMERATED (khz-7dot5, khz-1dot25, …)	Semantics along the definition of the *subcarrierSpacingMBMS-r14* IE as specified in TS 36.331 [11].	YES	reject

Range bound	Explanation
maxnoofCells	Maximum no. of cells that may be served by an eNB. The value for maxnoofCells is 256.

9.2.1.14 MBSFN Area Id

This IE defines the MBSFN Area Id.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBSFN Area Id	M		INTEGER (0..255)	The same encoding as the *mbsfn-AreaId* IE specified in TS 36.331 [11].

9.2.1.15 Time to Wait

This IE defines the minimum allowed waiting time.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Time to Wait	M		ENUMERATED(1s, 2s, 5s, 10s, 20s, 60s,…)	

9.2.1.16 Global MCE ID

This IE is used to globally identify an MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
MCE ID	M		OCTET STRING (SIZE(2))	

9.2.1.17 MBSFN Subframe Configuration

This IE indicates the MBSFN Subframe Configuration, as defined in TS 36.331 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Radio Frame Allocation Period	M		ENUMERATED (n1, n2, n4, n8, n16, n32)	Semantics along the IE definition in TS 36.331 [11].
Radio Frame Allocation Offset	M		INTEGER (0..7)	Semantics along the IE definition in TS 36.331 [11].
CHOICE *Subframe Allocation*	M			
>One Frame				
>>One Frame Item	M		BIT STRING (SIZE(6))	Semantics along the IE definition in TS 36.331 [11].
>Four Frames				
>>Four Frame Item	M		BIT STRING (SIZE(24))	Semantics along the IE definition in TS 36.331 [11].
CHOICE *Subframe Allocation Extended*	O			
>One Frame Extension				
>>One Frame Extension Item	M		BIT STRING (SIZE(2))	Semantics along the definition of the *MBSFN-SubframeConfig-v1430* IE as specified in TS 36.331 [11].
>Four Frames Extension				
>>Four Frame Extension Item	M		BIT STRING (SIZE(8))	Semantics along the definition of the *MBSFN-SubframeConfig-v1430* IE as specified in TS 36.331 [11].

9.2.1.18 Common Subframe Allocation Period

This IE defines the period during which allocated subframes are divided between PMCHs configured for the MBSFN area, see TS 36.331 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Common Subframe Allocation Period	M		ENUMERATED (rf4, rf8, rf16, rf32, rf64, rf128, rf256)	The same encoding as the *commonSF-AllocPeriod* IE as specified in TS 36.331 [11].

9.2.1.19 MCCH Update Time

This IE indicates the time at which the eNB shall apply the update of the MCCH as specified in TS 36.300 [3].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MCCH Update Time	M		INTEGER (0..255)	This IE indicates the modification period, as an absolute value, from when the MCCH update should be applied. Note: The duration of the modification period is configured in eNB and MCE.

9.2.1.20 MBSFN Synchronisation Area Id

This IE defines the MBSFN Synchronisation Area Identity as specified in TS 36.300 [3].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBSFN Synchronisation Area Id	M		INTEGER (0..65535)	The MBSFN Synchronisation Area is defined in TS 36.300 [3].

9.2.1.21 Counting Result

This IE defines the number of connected mode Ues that are receiving or interested in a MBMS service.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Counting Result	M		INTEGER(0..1023)	This IE indicates the number of connected mode Ues that are receiving or interested in a MBMS service. The value 1023 is used if the UE number is equal to or more than 1023.

9.2.1.22 SC-PTM information

This IE defines the SC-PTM information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBMS Cell List Item		*1 .. < maxnoofCellsforMBMS >*		
>Cell ID	M		E-UTRAN CGI 9.2.1.11	Global ID of the cell.
MBMS E-RAB QoS parameters	M		9.2.1.23	

Range bound	Explanation
maxnoofCellsforMBMS	Maximum no. of cells for the MBMS service. The value for maxnoofCellsforMBMS is 4096.

9.2.1.23 MBMS E-RAB QoS parameters

This IE defines the QoS to be applied to an MBMS E-RAB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBMS E-RAB QoS Parameters				
>QCI	M		INTEGER (0..255)	QoS Class Identifier defined in TS 23.246 [8]. Coding is specified in TS 23.203 [15].
>GBR QoS Information	O		9.2.1.24	This IE applies to GBR bearers only and shall be ignored otherwise.
>Allocation and Retention Priority	M		9.2.1.26	

9.2.1.24 GBR QoS Information

This IE indicates the maximum and guaranteed bit rates of a GBR bearer for downlink.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBMS E-RAB Maximum Bit Rate Downlink	M		Bit Rate 9.2.1.25	**Desc**.: This IE indicates the maximum downlink MBMS E-RAB Bit Rate (i.e. from the EPC to E-UTRAN) for this bearer.
MBMS E-RAB Guaranteed Bit Rate Downlink	M		Bit Rate 9.2.1.25	**Desc**.: This IE indicates the downlink guaranteed MBMS E-RAB Bit Rate (provided that there is data to deliver) from the EPC to the E-UTRAN for this bearer.

9.2.1.25 Bit Rate

This IE indicates the number of bits delivered by E-UTRAN in DL within a period of time, divided by the duration of the period. It is used, for example, to indicate the maximum or guaranteed bit rate for a GBR bearer, or an aggregated maximum bit rate.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Bit Rate			INTEGER (0..10,000,000,000)	The unit is: bit/s

9.2.1.26 Allocation and Retention Priority

This IE specifies the relative importance of an MBMS E-RAB compared to other MBMS E-RABs for allocation and retention of the MBMS E-RAB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Allocation/Retention Priority				
>Priority Level	M		INTEGER (0..15)	**Desc.:** This IE should be understood as the "priority of allocation and retention" (see TS 23.246 [6]). **Usage:** Value 15 means "no priority". Values between 1 and 14 are ordered in decreasing order of priority, i.e. 1 is the highest and 14 the lowest. Value 0 shall be treated as a logical error if received.
>Pre-emption Capability	M		ENUMERATED(shall not trigger pre-emption, may trigger pre-emption)	This IE indicates the pre-emption capability of the request on other MBMS E-RABs.
>Pre-emption Vulnerability	M		ENUMERATED(not pre-emptable, pre-emptable)	This IE indicates the vulnerability of the MBMS E-RAB to 53ehaviour53n of other MBMS E-RABs.

9.2.2 Transport Network Layer Related Ies

9.2.2.1 IP Address

This information element is an IP address.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
IP Address	M		OCTET STRING (4..16)	The Radio Network Layer is not supposed to interpret the address information. It should pass it to the transport layer for interpretation. For details on the IP Address, see ref. TS 36.445 [13].

9.2.2.2 GTP-TEID

This information element is the GTP Tunnel Endpoint Identifier to be used for the user plane transport between eNB and the MBMS-GW.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GTP TEID	M		OCTET STRING (4)	For details and range, see TS 29.281 [14].

9.2.3 NAS Related Ies

9.2.3.1 MCE MBMS M2AP ID

The MCE MBMS M2AP ID uniquely identifies the MBMS Service association over the M2 interface within the MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MCE MBMS M2AP ID	M		INTEGER (0 .. 2^{24} -1)	

9.2.3.2 eNB MBMS M2AP ID

The eNB MBMS M2AP ID uniquely identifies the MBMS Service association over the M2 interface within the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eNB MBMS M2AP ID	M		INTEGER (0 .. 65535)	

9.2.3.3 TMGI

The TMGI uniquely identifies the MBMS Bearer Service.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
TMGI				
>PLMN identity	M		9.2.3.7	
>Service ID	M		OCTET STRING (SIZE (3))	

9.2.3.4 MBMS Session Identity

The MBMS Session Identity identifies the session of an MBMS Bearer Service in E-UTRAN and is used by the UE to recognise repetitions of the session.

This IE is transparent to RAN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBMS Session Identity	M		OCTET STRING (SIZE (1))	Coded same way as the MBMS Session Identity IE as defined in TS 29.061 [9].

9.2.3.5 Void

9.2.3.6 MBMS Service Area

The MBMS Service Area IE consists of a list of one or several MBMS Service Area Identities where each MBMS Service Area Identity is frequency agnostic and can be mapped onto one or more cells.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBMS Service Area	M		OCTET STRING	Value part coded per MBMS Service Area AVP as defined in TS 29.061 [9].

9.2.3.7 PLMN Identity

This information element indicates the PLMN Identity.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN identity	M		OCTET STRING (SIZE (3))	- digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bits 4 to 1 of octet n encoding digit 2n-1 - bits 8 to 5 of octet n encoding digit 2n -The Selected PLMN identity consists of 3 digits from MCC followed by either -a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or -3 digits from MNC (in case of a 3 digit MNC).

9.3 Message and Information Element Abstract Syntax (with ASN.1)

9.3.1 General

M2AP ASN.1 definition conforms with ITU-T Rec. X.691 [5] and ITU-T Rec. X.680 [6].

Sub clause 9.3 presents the Abstract Syntax of the M2AP protocol with ASN.1. In case there is contradiction between the ASN.1 definition in this sub clause and the tabular format in sub clause 9.1 and 9.2, the ASN.1 shall take precedence, except for the definition of conditions for the presence of conditional elements, in which the tabular format shall take precedence.

The ASN.1 definition specifies the structure and content of M2AP messages. M2AP messages can contain any Ies specified in the object set definitions for that message without the order or number of occurrence being restricted by ASN.1. However, for this version of the standard, a sending entity shall construct an M2AP message according to the PDU definitions module and with the following additional rules (Note that in the following IE means an IE in the object set with an explicit id. If one IE needed to appear more than once in one object set, then the different occurrences have different IE ids):

- Ies shall be ordered (in an IE container) in the order they appear in object set definitions.

- Object set definitions specify how many times Ies may appear. An IE shall appear exactly once if the presence field in an object has value “mandatory”. An IE may appear at most once if the presence field in an object has value “optional” or “conditional”. If in a tabular format there is multiplicity specified for an IE (i.e. an IE list) then in the corresponding ASN.1 definition the list definition is separated into two parts. The first part defines an IE container list in which the list elements reside. The second part defines list elements. The IE container list appears as an IE of its own. For this version of the standard an IE container list may contain only one kind of list elements.

If an M2AP message that is not constructed as defined above is received, this shall be considered as Abstract Syntax Error, and the message shall be handled as defined for Abstract Syntax Error in clause 10.

9.3.2 Usage of Private Message Mechanism for Non-standard Use

The private message mechanism for non-standard use may be used:

- for special operator (and/or vendor) specific features considered not to be part of the basic functionality, i.e. the functionality required for a complete and high-quality specification in order to guarantee multivendor inter-operability.

- by vendors for research purposes, e.g. to implement and evaluate new algorithms/features before such features are proposed for standardisation.

The private message mechanism shall not be used for basic functionality. Such functionality shall be standardised.

9.3.3 Elementary Procedure Definitions

```
-- **************************************************************
--
-- Elementary Procedure definitions
--
-- **************************************************************

M2AP-PDU-Descriptions {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
```

```
eps-Access (21) modules (3) m2ap (4) version1 (1) m2ap-PDU-Descriptions (0) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- ************************************************************
--
-- IE parameter types from other modules.
--
-- ************************************************************

IMPORTS
    Criticality,
    ProcedureCode
FROM M2AP-CommonDataTypes


    SessionStartRequest,
    SessionStartResponse,
    SessionStartFailure,
    SessionStopRequest,
    SessionStopResponse,
    SessionUpdateRequest,
    SessionUpdateResponse,
    SessionUpdateFailure,
    MbmsSchedulingInformation,
    MbmsSchedulingInformationResponse,
    ErrorIndication,
    Reset,
    ResetAcknowledge,
    M2SetupRequest,
    M2SetupResponse,
    M2SetupFailure,
    ENBConfigurationUpdate,
    ENBConfigurationUpdateAcknowledge,
    ENBConfigurationUpdateFailure,
    MCEConfigurationUpdate,
    MCEConfigurationUpdateAcknowledge,
    MCEConfigurationUpdateFailure,
    MbmsServiceCountingRequest,
    MbmsServiceCountingResponse,
    MbmsServiceCountingFailure,
    MbmsServiceCountingResultsReport,
    PrivateMessage,
    MbmsOverloadNotification
FROM M2AP-PDU-Contents

    id-sessionStart,
    id-sessionStop,
    id-sessionUpdate,
    id-mbmsServiceCounting,
    id-mbmsServiceCountingResultsReport,
    id-mbmsSchedulingInformation,
```

```
    id-errorIndication,
    id-reset,
    id-m2Setup,
    id-eNBConfigurationUpdate,
    id-mCEConfigurationUpdate,
    id-privateMessage,
    id-mbmsOverloadNotification
FROM M2AP-Constants;


-- ****************************************************************
--
-- Interface Elementary Procedure Class
--
-- ****************************************************************

M2AP-ELEMENTARY-PROCEDURE ::= CLASS {
    &InitiatingMessage              ,
    &SuccessfulOutcome              OPTIONAL,
    &UnsuccessfulOutcome                OPTIONAL,
    &procedureCode          ProcedureCode   UNIQUE,
    &criticality            Criticality     DEFAULT ignore
}
WITH SYNTAX {
    INITIATING MESSAGE      &InitiatingMessage
    [SUCCESSFUL OUTCOME     &SuccessfulOutcome]
    [UNSUCCESSFUL OUTCOME       &UnsuccessfulOutcome]
    PROCEDURE CODE          &procedureCode
    [CRITICALITY            &criticality]
}

-- ****************************************************************
--
-- Interface PDU Definition
--
-- ****************************************************************

M2AP-PDU ::= CHOICE {
    initiatingMessage   InitiatingMessage,
    successfulOutcome   SuccessfulOutcome,
    unsuccessfulOutcome UnsuccessfulOutcome,
    ...
}

InitiatingMessage ::= SEQUENCE {
    procedureCode   M2AP-ELEMENTARY-PROCEDURE.&procedureCode        ({M2AP-ELEMENTARY-PROCEDURES}),
    criticality     M2AP-ELEMENTARY-PROCEDURE.&criticality          ({M2AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value           M2AP-ELEMENTARY-PROCEDURE.&InitiatingMessage    ({M2AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

SuccessfulOutcome ::= SEQUENCE {
    procedureCode   M2AP-ELEMENTARY-PROCEDURE.&procedureCode        ({M2AP-ELEMENTARY-PROCEDURES}),
    criticality     M2AP-ELEMENTARY-PROCEDURE.&criticality          ({M2AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value           M2AP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome    ({M2AP-ELEMENTARY-PROCEDURES}{@procedureCode})
```

```
}

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode   M2AP-ELEMENTARY-PROCEDURE.&procedureCode        ({M2AP-ELEMENTARY-PROCEDURES}),
    criticality     M2AP-ELEMENTARY-PROCEDURE.&criticality          ({M2AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value           M2AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome  ({M2AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}


-- **************************************************************
--
-- Interface Elementary Procedure List
--
-- **************************************************************

M2AP-ELEMENTARY-PROCEDURES M2AP-ELEMENTARY-PROCEDURE ::= {
    M2AP-ELEMENTARY-PROCEDURES-CLASS-1          |
    M2AP-ELEMENTARY-PROCEDURES-CLASS-2          ,
    ...
}

M2AP-ELEMENTARY-PROCEDURES-CLASS-1 M2AP-ELEMENTARY-PROCEDURE ::= {
    sessionStart                                            |
    sessionStop                                             |
    sessionUpdate                                           |
    mbmsSchedulingInformation                               |
    reset                                                   |
    m2Setup                                                 |
    eNBConfigurationUpdate                                  |
    mCEConfigurationUpdate                                  |
    mbmsServiceCounting                                     ,
    ...
}

M2AP-ELEMENTARY-PROCEDURES-CLASS-2 M2AP-ELEMENTARY-PROCEDURE ::= {
    errorIndication                         |
    privateMessage                          |
    mbmsServiceCountingResultsReport        |
    mbmsOverloadNotification                ,
    ...

}


-- **************************************************************
--
-- Interface Elementary Procedures
--
-- **************************************************************

sessionStart M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SessionStartRequest
    SUCCESSFUL OUTCOME      SessionStartResponse
    UNSUCCESSFUL OUTCOME    SessionStartFailure
```

```
    PROCEDURE CODE          id-sessionStart
    CRITICALITY             reject
}

sessionStop M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SessionStopRequest
    SUCCESSFUL OUTCOME      SessionStopResponse
    PROCEDURE CODE          id-sessionStop
    CRITICALITY             reject
}

sessionUpdate M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      SessionUpdateRequest
    SUCCESSFUL OUTCOME      SessionUpdateResponse
    UNSUCCESSFUL OUTCOME    SessionUpdateFailure
    PROCEDURE CODE          id-sessionUpdate
    CRITICALITY             reject
}

mbmsSchedulingInformation M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MbmsSchedulingInformation
    SUCCESSFUL OUTCOME      MbmsSchedulingInformationResponse
    PROCEDURE CODE          id-mbmsSchedulingInformation
    CRITICALITY             reject
}

errorIndication M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ErrorIndication
    PROCEDURE CODE          id-errorIndication
    CRITICALITY             ignore
}

reset   M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      Reset
    SUCCESSFUL OUTCOME      ResetAcknowledge
    PROCEDURE CODE          id-reset
    CRITICALITY             reject
}

m2Setup M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      M2SetupRequest
    SUCCESSFUL OUTCOME      M2SetupResponse
    UNSUCCESSFUL OUTCOME    M2SetupFailure
    PROCEDURE CODE          id-m2Setup
    CRITICALITY             reject
}

eNBConfigurationUpdate      M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBConfigurationUpdate
    SUCCESSFUL OUTCOME      ENBConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    ENBConfigurationUpdateFailure
    PROCEDURE CODE          id-eNBConfigurationUpdate
    CRITICALITY             reject
}
```

```
mCEConfigurationUpdate      M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MCEConfigurationUpdate
    SUCCESSFUL OUTCOME      MCEConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    MCEConfigurationUpdateFailure
    PROCEDURE CODE          id-mCEConfigurationUpdate
    CRITICALITY             reject
}

mbmsServiceCounting         M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MbmsServiceCountingRequest
    SUCCESSFUL OUTCOME      MbmsServiceCountingResponse
    UNSUCCESSFUL OUTCOME    MbmsServiceCountingFailure
    PROCEDURE CODE          id-mbmsServiceCounting
    CRITICALITY             reject
}

mbmsServiceCountingResultsReport    M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MbmsServiceCountingResultsReport
    PROCEDURE CODE          id-mbmsServiceCountingResultsReport
    CRITICALITY             reject
}

privateMessage          M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PrivateMessage
    PROCEDURE CODE          id-privateMessage
    CRITICALITY             ignore
}

mbmsOverloadNotification    M2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MbmsOverloadNotification
    PROCEDURE CODE          id-mbmsOverloadNotification
    CRITICALITY             reject
}

END
```

9.3.4 PDU Definitions

```
-- **************************************************************
--
-- PDU definitions for M2AP.
--
-- **************************************************************

M2AP-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m2ap (4) version1 (1) m2ap-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN
```

```
-- **************************************************************
--
-- IE parameter types from other modules.
--
-- **************************************************************

IMPORTS

    Cause,
    CriticalityDiagnostics,
    ENB-MBMS-Configuration-data-Item,
    ENB-MBMS-Configuration-data-ConfigUpdate-Item,
    ENB-MBMS-M2AP-ID,
    ENBname,
    GlobalENB-ID,
    GlobalMCE-ID,
    MBSFN-Area-ID,
    MBMS-Service-Area,
    MBMS-Session-ID,
    MBMSsessionListPerPMCH-Item,
    MBMS-Service-associatedLogicalM2-ConnectionItem,
    MBSFN-Subframe-Configuration,
    MCCH-Update-Time,
    MCCHrelatedBCCH-ConfigPerMBSFNArea-Item,
    MCE-MBMS-M2AP-ID,
    MCEname,
    PMCH-Configuration,
    Common-Subframe-Allocation-Period,
    TimeToWait,
    TMGI,
    TNL-Information,
    SFN,
    MBMSsessionsToBeSuspendedListPerPMCH-Item,
    SC-PTM-Information

FROM M2AP-Ies

    PrivateIE-Container{},
    ProtocolExtensionContainer{},
    ProtocolIE-Container{},
    ProtocolIE-ContainerList{},
    ProtocolIE-ContainerPair{},
    ProtocolIE-ContainerPairList{},
    ProtocolIE-Single-Container{},
    M2AP-PRIVATE-IES,
    M2AP-PROTOCOL-EXTENSION,
    M2AP-PROTOCOL-IES,
    M2AP-PROTOCOL-IES-PAIR
FROM M2AP-Containers

    id-MCE-MBMS-M2AP-ID,
    id-ENB-MBMS-M2AP-ID,
    id-TMGI,
    id-MBMS-Session-ID,
```

```
    id-MBMS-Service-Area,
    id-TNL-Information,
    id-Alternative-TNL-Information,
    id-CriticalityDiagnostics,
    id-Cause,
    id-MBSFN-Area-Configuration-List,
    id-MBSFN-Subframe-Configuration-Item,
    id-MBSFN-Subframe-Configuration-List,
    id-MCCH-Update-Time,
    id-PMCH-Configuration-List,
    id-PMCH-Configuration-Item,
    id-Common-Subframe-Allocation-Period,
    id-GlobalENB-ID,
    id-ENBname,
    id-ENB-MBMS-Configuration-data-List,
    id-ENB-MBMS-Configuration-data-Item,
    id-GlobalMCE-ID,
    id-MCEname,
    id-MCCHrelatedBCCH-ConfigPerMBSFNArea,
    id-MCCHrelatedBCCH-ConfigPerMBSFNArea-Item,
    id-TimeToWait,
    id-ENB-MBMS-Configuration-data-List-ConfigUpdate,
    id-ENB-MBMS-Configuration-data-ConfigUpdate-Item,
    id-MBSFN-Area-ID,
    id-ResetType,
    id-MBMS-Service-associatedLogicalM2-ConnectionItem,
    id-MBMS-Service-associatedLogicalM2-ConnectionListResAck,
    id-MBMS-Counting-Request-Session,
    id-MBMS-Counting-Request-Session-Item,
    id-MBMS-Counting-Result-List,
    id-MBMS-Counting-Result-Item,
    id-MBMS-Suspension-Notification-List,
    id-MBMS-Suspension-Notification-Item,
    id-PMCH-Overload-Status,
    id-Overload-Status-Per-PMCH-List,
    id-Active-MBMS-Session-List,
    id-SC-PTM-Information,
    maxnoofMBSFN-Allocations,
    maxnoofMBSFNareas,
    maxnoofPMCHsperMBSFNarea,
    maxnoofCells,
    maxnoofMBMSServiceAreasPerCell,
    maxnoofSessionsPerPMCH,
    maxnooferrors,
    maxNrOfIndividualM2ConnectionsToReset,
    maxnoofCountingService

FROM M2AP-Constants;

-- ************************************************************
--
-- SESSION START REQUEST
--
-- ************************************************************
```

```
SessionStartRequest ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{SessionStartRequest-Ies}},
    ...
}

SessionStartRequest-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCE-MBMS-M2AP-ID                  CRITICALITY reject  TYPE MCE-MBMS-M2AP-ID                  PRESENCE mandatory}|
    { ID id-TMGI                              CRITICALITY reject  TYPE TMGI                              PRESENCE mandatory}|
    { ID id-MBMS-Session-ID                   CRITICALITY ignore  TYPE MBMS-Session-ID                   PRESENCE optional}|
    { ID id-MBMS-Service-Area                 CRITICALITY reject  TYPE MBMS-Service-Area                 PRESENCE mandatory}|
    { ID id-TNL-Information                   CRITICALITY reject  TYPE TNL-Information                   PRESENCE mandatory}|
    { ID id-Alternative-TNL-Information       CRITICALITY ignore  TYPE TNL-Information                   PRESENCE optional}|
    { ID id-SC-PTM-Information                CRITICALITY reject  TYPE SC-PTM-Information                PRESENCE optional},
    ...
}

-- **************************************************************
--
-- SESSION START RESPONSE
--
-- **************************************************************

SessionStartResponse ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ SessionStartResponse-Ies}},
    ...
}

SessionStartResponse-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCE-MBMS-M2AP-ID                  CRITICALITY ignore  TYPE MCE-MBMS-M2AP-ID                  PRESENCE mandatory } |
    { ID id-ENB-MBMS-M2AP-ID                  CRITICALITY ignore  TYPE ENB-MBMS-M2AP-ID                  PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics            CRITICALITY ignore  TYPE CriticalityDiagnostics            PRESENCE optional  },
    ...
}


-- **************************************************************
--
-- SESSION START FAILURE
--
-- **************************************************************

SessionStartFailure ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ SessionStartFailure-Ies}},
    ...
}

SessionStartFailure-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCE-MBMS-M2AP-ID                  CRITICALITY ignore  TYPE MCE-MBMS-M2AP-ID                  PRESENCE mandatory } |
    { ID id-Cause                             CRITICALITY ignore  TYPE Cause                             PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics            CRITICALITY ignore  TYPE CriticalityDiagnostics            PRESENCE optional  },
    ...
}
```

```
-- **************************************************************
--
-- SESSION STOP REQUEST
--
-- **************************************************************

SessionStopRequest ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{SessionStopRequest-Ies}},
    ...
}

SessionStopRequest-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCE-MBMS-M2AP-ID                  CRITICALITY reject  TYPE MCE-MBMS-M2AP-ID                    PRESENCE mandatory } |
    { ID id-ENB-MBMS-M2AP-ID                  CRITICALITY reject  TYPE ENB-MBMS-M2AP-ID                    PRESENCE mandatory } ,
    ...
}

-- **************************************************************
--
-- SESSION STOP RESPONSE
--
-- **************************************************************

SessionStopResponse ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ SessionStopResponse-Ies}},
    ...
}

SessionStopResponse-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCE-MBMS-M2AP-ID                  CRITICALITY ignore  TYPE MCE-MBMS-M2AP-ID                    PRESENCE mandatory } |
    { ID id-ENB-MBMS-M2AP-ID                  CRITICALITY ignore  TYPE ENB-MBMS-M2AP-ID                    PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics            CRITICALITY ignore  TYPE CriticalityDiagnostics              PRESENCE optional  } ,
    ...
}

-- **************************************************************
--
-- SESSION UPDATE REQUEST
--
-- **************************************************************

SessionUpdateRequest ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{SessionUpdateRequest-Ies}},
    ...
}

SessionUpdateRequest-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCE-MBMS-M2AP-ID           CRITICALITY reject  TYPE MCE-MBMS-M2AP-ID              PRESENCE mandatory}|
    { ID id-ENB-MBMS-M2AP-ID           CRITICALITY reject  TYPE ENB-MBMS-M2AP-ID              PRESENCE mandatory}|
    { ID id-TMGI                       CRITICALITY reject  TYPE TMGI                          PRESENCE mandatory}|
    { ID id-MBMS-Session-ID            CRITICALITY ignore  TYPE MBMS-Session-ID               PRESENCE optional}|
    { ID id-MBMS-Service-Area          CRITICALITY ignore  TYPE MBMS-Service-Area             PRESENCE optional}|
    { ID id-TNL-Information            CRITICALITY reject  TYPE TNL-Information               PRESENCE optional}|
```

```
    { ID id-SC-PTM-Information          CRITICALITY reject  TYPE SC-PTM-Information             PRESENCE optional},
    ...
}

-- **************************************************************
--
-- SESSION UPDATE RESPONSE
--
-- **************************************************************

SessionUpdateResponse ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ SessionUpdateResponse-Ies}},
    ...
}

SessionUpdateResponse-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCE-MBMS-M2AP-ID                   CRITICALITY ignore  TYPE MCE-MBMS-M2AP-ID                    PRESENCE mandatory } |
    { ID id-ENB-MBMS-M2AP-ID                   CRITICALITY ignore  TYPE ENB-MBMS-M2AP-ID                    PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics             CRITICALITY ignore  TYPE CriticalityDiagnostics              PRESENCE optional  },
    ...
}
-- **************************************************************
--
-- SESSION UPDATE FAILURE
--
-- **************************************************************

SessionUpdateFailure ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ SessionUpdateFailure-Ies}},
    ...
}

SessionUpdateFailure-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCE-MBMS-M2AP-ID                   CRITICALITY ignore  TYPE MCE-MBMS-M2AP-ID                    PRESENCE mandatory } |
    { ID id-ENB-MBMS-M2AP-ID                   CRITICALITY ignore  TYPE ENB-MBMS-M2AP-ID                    PRESENCE mandatory } |
    { ID id-Cause                              CRITICALITY ignore  TYPE Cause                               PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics             CRITICALITY ignore  TYPE CriticalityDiagnostics              PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- MBMS SCHEDULING INFORMATION
--
-- **************************************************************

MbmsSchedulingInformation ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ MbmsSchedulingInformation-Ies}},
    ...
}

MbmsSchedulingInformation-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCCH-Update-Time                   CRITICALITY reject  TYPE MCCH-Update-Time                        PRESENCE mandatory }|
    { ID id-MBSFN-Area-Configuration-List      CRITICALITY reject  TYPE MBSFN-Area-Configuration-List           PRESENCE mandatory },
```

```
    ...
}

MBSFN-Area-Configuration-List ::= SEQUENCE (SIZE(1.. maxnoofMBSFNareas)) OF ProtocolIE-Container { { MBSFN-Area-Configuration-Item } }

MBSFN-Area-Configuration-Item M2AP-PROTOCOL-IES ::= {
    { ID id-PMCH-Configuration-List             CRITICALITY reject  TYPE PMCH-Configuration-List                      PRESENCE mandatory }|
    { ID id-MBSFN-Subframe-Configuration-List   CRITICALITY reject  TYPE MBSFN-Subframe-ConfigurationList             PRESENCE mandatory }|
    { ID id-Common-Subframe-Allocation-Period   CRITICALITY reject  TYPE Common-Subframe-Allocation-Period           PRESENCE mandatory }|
    { ID id-MBSFN-Area-ID                       CRITICALITY reject  TYPE MBSFN-Area-ID                               PRESENCE mandatory }|
    { ID id-MBMS-Suspension-Notification-List   CRITICALITY ignore  TYPE MBMS-Suspension-Notification-List           PRESENCE optional },
    ...
}

PMCH-Configuration-List ::= SEQUENCE (SIZE(0.. maxnoofPMCHsperMBSFNarea)) OF ProtocolIE-Single-Container { { PMCH-Configuration-ItemIEs } }

PMCH-Configuration-ItemIEs M2AP-PROTOCOL-IES ::= {
    { ID id-PMCH-Configuration-Item  CRITICALITY reject TYPE PMCH-Configuration-Item    PRESENCE mandatory },
    ...
}

PMCH-Configuration-Item ::= SEQUENCE {
    pmch-Configuration              PMCH-Configuration,
    mbms-Session-List               MBMSsessionListPerPMCH-Item,
    iE-Extensions                   ProtocolExtensionContainer { { PMCH-Configuration-ItemExtIEs} } OPTIONAL,
    ...
}

PMCH-Configuration-ItemExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

MBSFN-Subframe-ConfigurationList ::= SEQUENCE (SIZE(1.. maxnoofMBSFN-Allocations)) OF ProtocolIE-Single-Container { { MBSFN-Subframe-
ConfigurationItem } }

MBSFN-Subframe-ConfigurationItem M2AP-PROTOCOL-IES ::= {
    { ID id-MBSFN-Subframe-Configuration-Item       CRITICALITY reject  TYPE MBSFN-Subframe-Configuration              PRESENCE mandatory },
    ...
}

MBMS-Suspension-Notification-List ::= SEQUENCE (SIZE(1.. maxnoofPMCHsperMBSFNarea)) OF ProtocolIE-Single-Container { { MBMS-Suspension-
Notification-ItemIEs } }

MBMS-Suspension-Notification-ItemIEs M2AP-PROTOCOL-IES ::= {
    { ID id-MBMS-Suspension-Notification-Item   CRITICALITY ignore  TYPE MBMS-Suspension-Notification-Item      PRESENCE optional},
    ...
}

MBMS-Suspension-Notification-Item ::= SEQUENCE {
    sfn                                     SFN,
    mbms-Sessions-To-Be-Suspended-List      MBMSsessionsToBeSuspendedListPerPMCH-Item,
    iE-Extensions                           ProtocolExtensionContainer { { MBMS-Suspension-Notification-ItemExtIEs} } OPTIONAL,
    ...
}
```

```
MBMS-Suspension-Notification-ItemExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- MBMS SCHEDULING INFORMATION RESPONSE
--
-- **************************************************************

MbmsSchedulingInformationResponse ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ MbmsSchedulingInformationResponse-Ies}},
    ...
}

MbmsSchedulingInformationResponse-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics              CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional },
    ...
}


-- **************************************************************
--
-- M2 SETUP REQUEST
--
-- **************************************************************

M2SetupRequest ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{M2SetupRequest-Ies}},
    ...
}

M2SetupRequest-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-GlobalENB-ID                            CRITICALITY reject  TYPE GlobalENB-ID                               PRESENCE mandatory}|
    { ID id-ENBname                                 CRITICALITY ignore  TYPE ENBname                                    PRESENCE optional}|
    { ID id-ENB-MBMS-Configuration-data-List        CRITICALITY reject  TYPE ENB-MBMS-Configuration-data-List           PRESENCE mandatory},
    ...
}

ENB-MBMS-Configuration-data-List ::= SEQUENCE (SIZE(1.. maxnoofCells)) OF ProtocolIE-Single-Container { { ENB-MBMS-Configuration-data-ItemIEs } }

ENB-MBMS-Configuration-data-ItemIEs M2AP-PROTOCOL-IES ::= {
    { ID id-ENB-MBMS-Configuration-data-Item    CRITICALITY reject  TYPE ENB-MBMS-Configuration-data-Item              PRESENCE mandatory },
    ...
}


-- **************************************************************
--
-- M2 SETUP RESPONSE
--
-- **************************************************************
```

```
M2SetupResponse ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ M2SetupResponse-Ies}},
    ...
}

M2SetupResponse-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-GlobalMCE-ID                          CRITICALITY reject  TYPE GlobalMCE-ID                                  PRESENCE mandatory
}|
    { ID id-MCEname                               CRITICALITY ignore  TYPE MCEname                                      PRESENCE optional }|
    { ID id-MCCHrelatedBCCH-ConfigPerMBSFNArea     CRITICALITY reject  TYPE MCCHrelatedBCCH-ConfigPerMBSFNArea           PRESENCE mandatory
}|
    { ID id-CriticalityDiagnostics                CRITICALITY ignore  TYPE CriticalityDiagnostics                    PRESENCE optional },
    ...
}

MCCHrelatedBCCH-ConfigPerMBSFNArea ::= SEQUENCE (SIZE(1.. maxnoofMBSFNareas)) OF ProtocolIE-Single-Container { { MCCHrelatedBCCH-
ConfigPerMBSFNArea-ItemIEs } }

MCCHrelatedBCCH-ConfigPerMBSFNArea-ItemIEs  M2AP-PROTOCOL-IES ::= {
    { ID id-MCCHrelatedBCCH-ConfigPerMBSFNArea-Item     CRITICALITY reject  TYPE MCCHrelatedBCCH-ConfigPerMBSFNArea-Item       PRESENCE mandatory
},
    ...
}

-- **************************************************************
--
-- M2 SETUP FAILURE
--
-- **************************************************************

M2SetupFailure ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ M2SetupFailure-Ies}},
    ...
}

M2SetupFailure-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                     PRESENCE mandatory}|
    { ID id-TimeToWait                  CRITICALITY ignore  TYPE TimeToWait                PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics    PRESENCE optional},

    ...
}

-- **************************************************************
--
-- ENB CONFIGURATION UPDATE
--
-- **************************************************************

ENBConfigurationUpdate ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ENBConfigurationUpdate-Ies}},
    ...
}
```

```
ENBConfigurationUpdate-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-GlobalENB-ID                                    CRITICALITY reject  TYPE GlobalENB-ID                                  PRESENCE optional }|
    { ID id-ENBname                                         CRITICALITY ignore  TYPE ENBname                                       PRESENCE optional }|
    { ID id-ENB-MBMS-Configuration-data-List-ConfigUpdate   CRITICALITY reject  TYPE ENB-MBMS-Configuration-data-List-ConfigUpdate     PRESENCE
optional },
    ...
}
ENB-MBMS-Configuration-data-List-ConfigUpdate ::= SEQUENCE (SIZE(1.. maxnoofCells)) OF ProtocolIE-Single-Container { { ENB-MBMS-Configuration-data-
ConfigUpdate-ItemIEs } }

ENB-MBMS-Configuration-data-ConfigUpdate-ItemIEs    M2AP-PROTOCOL-IES ::= {
    { ID id-ENB-MBMS-Configuration-data-ConfigUpdate-Item   CRITICALITY reject  TYPE ENB-MBMS-Configuration-data-ConfigUpdate-Item     PRESENCE
mandatory },
    ...
}

-- **************************************************************
--
-- ENB CONFIGURATION UPDATE ACKNOWLEDGE
--
-- **************************************************************

ENBConfigurationUpdateAcknowledge ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ ENBConfigurationUpdateAcknowledge-Ies}},
    ...
}

ENBConfigurationUpdateAcknowledge-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCCHrelatedBCCH-ConfigPerMBSFNArea              CRITICALITY reject  TYPE MCCHrelatedBCCH-ConfigPerMBSFNArea        PRESENCE optional }|
    { ID id-CriticalityDiagnostics                          CRITICALITY ignore  TYPE CriticalityDiagnostics                    PRESENCE optional },
    ...
}


-- **************************************************************
--
-- ENB CONFIGURATION UPDATE FAILURE
--
-- **************************************************************

ENBConfigurationUpdateFailure ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ ENBConfigurationUpdateFailure-Ies}},
    ...
}

ENBConfigurationUpdateFailure-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory}|
    { ID id-TimeToWait                  CRITICALITY ignore  TYPE TimeToWait                 PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional},

    ...
}
```

```
-- **************************************************************
--
-- MCE CONFIGURATION UPDATE
--
-- **************************************************************

MCEConfigurationUpdate ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{MCEConfigurationUpdate-Ies}},
    ...
}

MCEConfigurationUpdate-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-GlobalMCE-ID                          CRITICALITY reject  TYPE GlobalMCE-ID                              PRESENCE optional }|
    { ID id-MCEname                               CRITICALITY ignore  TYPE MCEname                                   PRESENCE optional }|
    { ID id-MCCHrelatedBCCH-ConfigPerMBSFNArea     CRITICALITY reject  TYPE MCCHrelatedBCCH-ConfigPerMBSFNArea        PRESENCE optional },
    ...
}

-- **************************************************************
--
-- MCE CONFIGURATION UPDATE ACKNOWLEDGE
--
-- **************************************************************

MCEConfigurationUpdateAcknowledge ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ MCEConfigurationUpdateAcknowledge-Ies}},
    ...
}

MCEConfigurationUpdateAcknowledge-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics             CRITICALITY ignore  TYPE CriticalityDiagnostics   PRESENCE optional},
    ...
}


-- **************************************************************
--
-- MCE CONFIGURATION UPDATE FAILURE
--
-- **************************************************************

MCEConfigurationUpdateFailure ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ MCEConfigurationUpdateFailure-Ies}},
    ...
}

MCEConfigurationUpdateFailure-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory}|
    { ID id-TimeToWait                  CRITICALITY ignore  TYPE TimeToWait                 PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional},

    ...
}
```

```
-- **************************************************************
--
-- ERROR INDICATION
--
-- **************************************************************

ErrorIndication ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ErrorIndication-Ies}},
    ...
}

ErrorIndication-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCE-MBMS-M2AP-ID               CRITICALITY ignore  TYPE MCE-MBMS-M2AP-ID            PRESENCE optional}|
    { ID id-ENB-MBMS-M2AP-ID               CRITICALITY ignore  TYPE ENB-MBMS-M2AP-ID            PRESENCE optional}|
    { ID id-Cause                          CRITICALITY ignore  TYPE Cause                       PRESENCE optional}|
    { ID id-CriticalityDiagnostics         CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional},
    ...
}

-- **************************************************************
--
-- RESET
--
-- **************************************************************

Reset ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{Reset-Ies}},
    ...
}

Reset-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause             PRESENCE mandatory}|
    { ID id-ResetType               CRITICALITY reject  TYPE ResetType         PRESENCE mandatory},
    ...
}

ResetType ::= CHOICE {
    m2-Interface            ResetAll,
    partOfM2-Interface      MBMS-Service-associatedLogicalM2-ConnectionListRes,
    ...
}

ResetAll ::= ENUMERATED {
    reset-all,
    ...
}

MBMS-Service-associatedLogicalM2-ConnectionListRes ::= SEQUENCE (SIZE(1.. maxNrOfIndividualM2ConnectionsToReset)) OF ProtocolIE-Single-Container {
{ MBMS-Service-associatedLogicalM2-ConnectionItemRes } }

MBMS-Service-associatedLogicalM2-ConnectionItemRes  M2AP-PROTOCOL-IES ::= {
    { ID id-MBMS-Service-associatedLogicalM2-ConnectionItem CRITICALITY reject  TYPE MBMS-Service-associatedLogicalM2-ConnectionItem   PRESENCE
mandatory},
```

```
    ...
}

-- **************************************************************
--
-- RESET ACKNOWLEDGE
--
-- **************************************************************

ResetAcknowledge ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ResetAcknowledge-Ies}},
    ...
}

ResetAcknowledge-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MBMS-Service-associatedLogicalM2-ConnectionListResAck   CRITICALITY ignore  TYPE MBMS-Service-associatedLogicalM2-ConnectionListResAck
        PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional},
    ...
}

MBMS-Service-associatedLogicalM2-ConnectionListResAck ::= SEQUENCE (SIZE(1.. maxNrOfIndividualM2ConnectionsToReset)) OF ProtocolIE-Single-Container
{ { MBMS-Service-associatedLogicalM2-ConnectionItemResAck } }

MBMS-Service-associatedLogicalM2-ConnectionItemResAck   M2AP-PROTOCOL-IES ::= {
    { ID id-MBMS-Service-associatedLogicalM2-ConnectionItem CRITICALITY ignore  TYPE MBMS-Service-associatedLogicalM2-ConnectionItem   PRESENCE
mandatory},
    ...
}


-- **************************************************************
--
-- PRIVATE MESSAGE
--
-- **************************************************************

PrivateMessage ::= SEQUENCE {
    privateIEs      PrivateIE-Container  {{PrivateMessage-Ies}},
    ...
}

PrivateMessage-Ies M2AP-PRIVATE-IES ::= {
    ...
}


-- **************************************************************
--
-- MBMS SERVICE COUNTING REQUEST
--
-- **************************************************************

MbmsServiceCountingRequest ::= SEQUENCE {
```

```
    protocolIEs         ProtocolIE-Container    {{MbmsServiceCountingRequest-Ies}},
    ...
}

MbmsServiceCountingRequest-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MCCH-Update-Time                    CRITICALITY reject  TYPE MCCH-Update-Time                   PRESENCE mandatory }|
    { ID id-MBSFN-Area-ID                       CRITICALITY reject  TYPE MBSFN-Area-ID                     PRESENCE mandatory }|
    { ID id-MBMS-Counting-Request-Session       CRITICALITY reject  TYPE MBMS-Counting-Request-Session      PRESENCE mandatory },
    ...
}

MBMS-Counting-Request-Session ::= SEQUENCE (SIZE(1.. maxnoofCountingService)) OF ProtocolIE-Container { { MBMS-Counting-Request-Session-Item } }

MBMS-Counting-Request-Session-Item M2AP-PROTOCOL-IES ::= {
    { ID id-MBMS-Counting-Request-Session-Item  CRITICALITY reject  TYPE MBMS-Counting-Request-SessionIE        PRESENCE mandatory },
    ...
}

MBMS-Counting-Request-SessionIE ::= SEQUENCE{
    tmgi                    TMGI,
    iE-Extensions           ProtocolExtensionContainer { { MBMS-Counting-Request-SessionIE-ExtIEs} } OPTIONAL,
    ...
}

MBMS-Counting-Request-SessionIE-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- MBMS SERVICE COUNTING RESPONSE
--
-- **************************************************************

MbmsServiceCountingResponse ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        {{MbmsServiceCountingResponse-Ies}},
    ...
}

MbmsServiceCountingResponse-Ies M2AP-PROTOCOL-IES ::= {

    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional },
    ...
}


-- **************************************************************
--
-- MBMS SERVICE COUNTING FAILURE
--
-- **************************************************************

MbmsServiceCountingFailure ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container        {{ MbmsServiceCountingFailure-Ies}},
```

```
    ...
}

MbmsServiceCountingFailure-Ies M2AP-PROTOCOL-IES ::= {

    { ID id-Cause                               CRITICALITY ignore  TYPE Cause                          PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics              CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional},
    ...
}


-- **************************************************************
--
-- MBMS SERVICE COUNTING RESULTS REPORT
--
-- **************************************************************

MbmsServiceCountingResultsReport ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        {{ MbmsServiceCountingResultsReport-Ies}},
    ...
}

MbmsServiceCountingResultsReport-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MBSFN-Area-ID                   CRITICALITY reject  TYPE MBSFN-Area-ID                       PRESENCE mandatory}|
    { ID id-MBMS-Counting-Result-List       CRITICALITY reject  TYPE MBMS-Counting-Result-List          PRESENCE mandatory},
    ...
}

MBMS-Counting-Result-List ::= SEQUENCE (SIZE(1.. maxnoofCountingService)) OF ProtocolIE-Container { { MBMS-Counting-Result-Item } }

MBMS-Counting-Result-Item M2AP-PROTOCOL-IES ::= {
    { ID id-MBMS-Counting-Result-Item       CRITICALITY reject  TYPE MBMS-Counting-Result       PRESENCE mandatory },
    ...
}

MBMS-Counting-Result ::= SEQUENCE{
    tmgi                TMGI,
    countingResult      CountingResult,
    iE-Extensions       ProtocolExtensionContainer { { MBMS-Counting-Result-ExtIEs} } OPTIONAL,
    ...
}

MBMS-Counting-Result-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CountingResult ::= INTEGER (0..1023)

-- **************************************************************
--
-- MBMS OVERLOAD NOTIFICATION
--
-- **************************************************************
```

```
MbmsOverloadNotification ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        {{ MbmsOverloadNotification-Ies}},
    ...
}

MbmsOverloadNotification-Ies M2AP-PROTOCOL-IES ::= {
    { ID id-MBSFN-Area-ID                       CRITICALITY reject  TYPE MBSFN-Area-ID                          PRESENCE mandatory}|
    { ID id-Overload-Status-Per-PMCH-List       CRITICALITY reject  TYPE Overload-Status-Per-PMCH-List          PRESENCE mandatory},
    ...
}

Overload-Status-Per-PMCH-List ::= SEQUENCE (SIZE(1..maxnoofPMCHsperMBSFNarea)) OF ProtocolIE-Container { { Overload-Status-Per-PMCH-Item } }

Overload-Status-Per-PMCH-Item M2AP-PROTOCOL-IES ::= {
    { ID id-PMCH-Overload-Status            CRITICALITY reject  TYPE PMCH-Overload-Status        PRESENCE mandatory }|
    { ID id-Active-MBMS-Session-List        CRITICALITY reject  TYPE Active-MBMS-Session-List    PRESENCE optional },
    ...
}

PMCH-Overload-Status ::= ENUMERATED {normal, overload, ...}

Active-MBMS-Session-List ::= SEQUENCE (SIZE(1..maxnoofSessionsPerPMCH)) OF ProtocolIE-Container { { Active-MBMS-Session-Item } }

Active-MBMS-Session-Item M2AP-PROTOCOL-IES ::= {
    { ID id-TMGI        CRITICALITY reject  TYPE TMGI       PRESENCE mandatory },
    ...
}

END
```

9.3.5 Information Element definitions

```
-- **************************************************************
--
-- Information Element Definitions
--
-- **************************************************************

M2AP-Ies {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m2ap (4) version1 (1) m2ap-Ies (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    id-MCH-Scheduling-PeriodExtended,
    id-MCH-Scheduling-PeriodExtended2,
    id-Modification-PeriodExtended,
    id-Modulation-Coding-Scheme2,
    id-Repetition-PeriodExtended,
    id-Subcarrier-SpacingMBMS,
```

```
    id-SubframeAllocationExtended,
    maxnoofMBSFNareas,
    maxnoofPMCHsperMBSFNarea,
    maxnoofCells,
    maxnoofMBMSServiceAreasPerCell,
    maxnoofSessionsPerPMCH,
    maxnooferrors,
    maxnoofCellsforMBMS

FROM M2AP-Constants

    Criticality,
    ProcedureCode,
    ProtocolIE-ID,
    TriggeringMessage
FROM M2AP-CommonDataTypes

    ProtocolExtensionContainer{},
    ProtocolIE-Single-Container{},
    M2AP-PROTOCOL-EXTENSION,
    M2AP-PROTOCOL-IES
FROM M2AP-Containers;

-- A

AllocatedSubframesEnd ::= INTEGER (0..1535)

AllocationAndRetentionPriority ::= SEQUENCE {
    priorityLevel               PriorityLevel,
    pre-emptionCapability       Pre-emptionCapability,
    pre-emptionVulnerability    Pre-emptionVulnerability,
    iE-Extensions               ProtocolExtensionContainer { {AllocationAndRetentionPriority-ExtIEs} } OPTIONAL
}

AllocationAndRetentionPriority-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- B

BitRate ::= INTEGER (0..10000000000)

-- C

Cause ::= CHOICE {
    radioNetwork        CauseRadioNetwork,
    transport           CauseTransport,
    nAS                 CauseNAS,
    protocol            CauseProtocol,
    misc                CauseMisc,
    ...
}

CauseMisc ::= ENUMERATED {
```

```
    control-processing-overload,
    hardware-failure,
    om-intervention,
    unspecified,
    ...
}

CauseNAS ::= ENUMERATED {
    unspecified,
    ...
}

CauseProtocol ::= ENUMERATED {
    transfer-syntax-error,
    abstract-syntax-error-reject,
    abstract-syntax-error-ignore-and-notify,
    message-not-compatible-with-receiver-state,
    semantic-error,
    abstract-syntax-error-falsely-constructed-message,
    unspecified,
    ...
}

CauseRadioNetwork ::= ENUMERATED {
    unknown-or-already-allocated-MCE-MBMS-M2AP-ID,
    unknown-or-already-allocated-eNB-MBMS-M2AP-ID,
    unknown-or-inconsistent-pair-of-MBMS-M2AP-IDs,
    radio-resources-not-available,
    interaction-with-other-procedure,
    unspecified,
    ...,
    invalid-QoS-combination,
    not-supported-QCI-value

}

CauseTransport ::= ENUMERATED {
    transport-resource-unavailable,
    unspecified,
    ...
}

Cell-Information ::= SEQUENCE {
    eCGI                            ECGI,
    cellReservationInfo         ENUMERATED {reservedCell, nonReservedCell, ...},
    iE-Extensions                   ProtocolExtensionContainer { { Cell-Information-ExtIEs} } OPTIONAL,
    ...
}

Cell-Information-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

Cell-Information-List ::= SEQUENCE (SIZE(1..maxnoofCells)) OF Cell-Information
```

```
CriticalityDiagnostics ::= SEQUENCE {
    procedureCode                   ProcedureCode                   OPTIONAL,
    triggeringMessage               TriggeringMessage               OPTIONAL,
    procedureCriticality            Criticality                     OPTIONAL,
    iEsCriticalityDiagnostics       CriticalityDiagnostics-IE-List  OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {CriticalityDiagnostics-ExtIEs} }       OPTIONAL,
    ...
}


CriticalityDiagnostics-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1..maxnooferrors)) OF
    SEQUENCE {
        iECriticality           Criticality,
        iE-ID                   ProtocolIE-ID,
        typeOfError             TypeOfError,
        iE-Extensions           ProtocolExtensionContainer { {CriticalityDiagnostics-IE-List-ExtIEs} } OPTIONAL,
        ...
}

CriticalityDiagnostics-IE-List-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- D
-- E

ECGI ::= SEQUENCE {
    pLMN-Identity               PLMN-Identity,
    eUTRANcellIdentifier        EUTRANCellIdentifier,
    iE-Extensions               ProtocolExtensionContainer { {ECGI-ExtIEs} } OPTIONAL,
    ...
}

ECGI-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}


ENB-ID ::= CHOICE {
    macro-eNB-ID    BIT STRING (SIZE (20)),
    ... ,
    short-Macro-eNB-ID      BIT STRING (SIZE(18)),
    long-Macro-eNB-ID       BIT STRING (SIZE(21))
}

ENB-MBMS-Configuration-data-Item ::= SEQUENCE {
    eCGI                            ECGI,
    mbsfnSynchronisationArea        MBSFN-SynchronisationArea-ID,
```

```
    mbmsServiceAreaList             MBMS-Service-Area-ID-List,
    iE-Extensions                   ProtocolExtensionContainer { { ENB-MBMS-Configuration-data-Item-ExtIEs} } OPTIONAL,
    ...
}

ENB-MBMS-Configuration-data-Item-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

ENB-MBMS-Configuration-data-ConfigUpdate-Item ::= CHOICE {
    mBMSConfigData                  ENB-MBMS-Configuration-data-Item,
    eCGI                            ECGI,
    ...
}

ENB-MBMS-M2AP-ID ::= INTEGER (0..65535)

ENBname ::= PrintableString (SIZE (1..150,...))

EUTRANCellIdentifier ::= BIT STRING (SIZE (28))


-- F
-- G

GBR-QosInformation ::= SEQUENCE {
    mBMS-E-RAB-MaximumBitrateDL         BitRate,
    mBMS-E-RAB-GuaranteedBitrateDL      BitRate,
    iE-Extensions                       ProtocolExtensionContainer { { GBR-QosInformation-ExtIEs} } OPTIONAL,
    ...
}

GBR-QosInformation-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

GlobalENB-ID ::= SEQUENCE {
    pLMN-Identity           PLMN-Identity,
    eNB-ID                  ENB-ID,
    iE-Extensions           ProtocolExtensionContainer { {GlobalENB-ID-ExtIEs} } OPTIONAL,
    ...
}

GlobalENB-ID-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

GlobalMCE-ID ::= SEQUENCE {
    pLMN-Identity           PLMN-Identity,
    mCE-ID                  MCE-ID,
    iE-Extensions           ProtocolExtensionContainer { {GlobalMCE-ID-ExtIEs} } OPTIONAL,
    ...
}
```

```
GlobalMCE-ID-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

GTP-TEID ::= OCTET STRING (SIZE (4))

-- H
-- I

IPAddress ::= OCTET STRING (SIZE(4..16))

-- J
-- K
-- L

LCID ::= INTEGER (0..28)

-- M

MBMS-Cell-List ::= SEQUENCE (SIZE(1.. maxnoofCellsforMBMS)) OF ECGI

MBMS-E-RAB-QoS-Parameters ::= SEQUENCE {
    qCI                             QCI,
    gbrQosInformation               GBR-QosInformation      OPTIONAL,
    allocationAndRetentionPriority  AllocationAndRetentionPriority,
    iE-Extensions                   ProtocolExtensionContainer { { MBMS-E-RAB-QoS-Parameters-ExtIEs} }   OPTIONAL,
    ...
}

MBMS-E-RAB-QoS-Parameters-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

MBMS-Service-associatedLogicalM2-ConnectionItem ::= SEQUENCE {
    eNB-MBMS-M2AP-ID                ENB-MBMS-M2AP-ID OPTIONAL,
    mCE-MBMS-M2AP-ID                MCE-MBMS-M2AP-ID OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { MBMS-Service-associatedLogicalM2-ConnectionItemExtIEs} } OPTIONAL,
    ...
}


MBMS-Service-associatedLogicalM2-ConnectionItemExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

MBMS-Service-Area ::= OCTET STRING

MBMS-Service-Area-ID-List ::= SEQUENCE (SIZE(1..maxnoofMBMSServiceAreasPerCell)) OF MBMS-Service-Area

MBMS-Session-ID ::= OCTET STRING (SIZE (1))

MBMSsessionListPerPMCH-Item ::= SEQUENCE (SIZE(1..maxnoofSessionsPerPMCH)) OF SEQUENCE {
    tmgi                            TMGI,
    lcid                            LCID,
```

```
    iE-Extensions                   ProtocolExtensionContainer { { MBMSsessionListPerPMCH-Item-ExtIEs} } OPTIONAL,
    ...
}

MBMSsessionListPerPMCH-Item-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

MBMSsessionsToBeSuspendedListPerPMCH-Item ::= SEQUENCE (SIZE(1..maxnoofSessionsPerPMCH)) OF SEQUENCE {
    tmgi                            TMGI,
    iE-Extensions                   ProtocolExtensionContainer { { MBMSsessionsToBeSuspendedListPerPMCH-Item-ExtIEs} } OPTIONAL,
    ...
}

MBMSsessionsToBeSuspendedListPerPMCH-Item-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

MBSFN-Area-ID ::= INTEGER (0..255)

MBSFN-SynchronisationArea-ID ::= INTEGER (0..65535)

MBSFN-Subframe-Configuration ::= SEQUENCE {
    radioframeAllocationPeriod      ENUMERATED {n1, n2, n4, n8, n16, n32},
    radioframeAllocationOffset      INTEGER (0..7),
    subframeAllocation              CHOICE {
        oneFrame                        BIT STRING (SIZE (6)  ),
        fourFrames                      BIT STRING (SIZE (24) ) },
    iE-Extensions                   ProtocolExtensionContainer { { MBSFN-Subframe-Configuration-ExtIEs} } OPTIONAL,
    ...
}

MBSFN-Subframe-Configuration-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    {ID id-SubframeAllocationExtended       CRITICALITY reject  EXTENSION SubframeAllocationExtended     PRESENCE optional},
    ...
}

MCCH-Update-Time ::= INTEGER (0..255)

MCCHrelatedBCCH-ConfigPerMBSFNArea-Item ::= SEQUENCE {
    mbsfnArea                       MBSFN-Area-ID,
    pdcchLength                     ENUMERATED {s1, s2, ...},
    repetitionPeriod                ENUMERATED {rf32, rf64, rf128, rf256},
    offset                          INTEGER (0..10),
    modificationPeriod              ENUMERATED {rf512, rf1024},
    subframeAllocationInfo          BIT STRING (SIZE(6)),
    modulationAndCodingScheme       ENUMERATED {n2, n7, n13, n19},
    cellInformationList             Cell-Information-List   OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { MCCHrelatedBCCH-ConfigPerMBSFNArea-Item-ExtIEs} } OPTIONAL,
    ...
}

MCCHrelatedBCCH-ConfigPerMBSFNArea-Item-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
-- Extension for Rel-14 to support MCCH repetition period values --
```

```
    {ID id-Repetition-PeriodExtended           CRITICALITY reject  EXTENSION Repetition-PeriodExtended  PRESENCE optional}|
-- Extension for Rel-14 to support MCCH modification period values --
    {ID id-Modification-PeriodExtended         CRITICALITY reject  EXTENSION Modification-PeriodExtended       PRESENCE optional}|
    {ID id-Subcarrier-SpacingMBMS              CRITICALITY reject  EXTENSION Subcarrier-SpacingMBMS            PRESENCE optional},
    ...
}

MCE-ID ::= OCTET STRING (SIZE(2))

MCE-MBMS-M2AP-ID ::= INTEGER (0.. 16777215)

MCEname ::= PrintableString (SIZE (1..150,...))


MCH-Scheduling-Period ::= ENUMERATED {rf8, rf16, rf32, rf64, rf128, rf256, rf512, rf1024}

MCH-Scheduling-PeriodExtended ::= ENUMERATED {rf4, ...}

MCH-Scheduling-PeriodExtended2 ::= ENUMERATED {rf1, rf2, ...}


Modulation-Coding-Scheme2 ::= INTEGER (0..27)

Modification-PeriodExtended ::= ENUMERATED {rf1, rf2, rf4, rf8, rf16, rf32, rf64, rf128, rf256, ...}

-- N
-- O
-- P

PLMN-Identity ::= OCTET STRING (SIZE(3))

PMCH-Configuration ::= SEQUENCE {
    allocatedSubframesEnd          AllocatedSubframesEnd,
    dataMCS                        INTEGER (0..28),
    mchSchedulingPeriod            MCH-Scheduling-Period,
    iE-Extensions                  ProtocolExtensionContainer { {PMCH-Configuration-ExtIEs} } OPTIONAL,
    ...
}

PMCH-Configuration-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
-- Extension for Rel-12 to support 256QAM for MTCH –
    {ID id-Modulation-Coding-Scheme2           CRITICALITY reject  EXTENSION Modulation-Coding-Scheme2         PRESENCE optional}|
-- Extension for Rel-12 to support shorter MCH scheduling period –
    {ID id-MCH-Scheduling-PeriodExtended       CRITICALITY reject  EXTENSION MCH-Scheduling-PeriodExtended     PRESENCE optional}|
-- Extension for Rel-14 to support shorter MCH scheduling period values –
    {ID id-MCH-Scheduling-PeriodExtended2      CRITICALITY reject  EXTENSION MCH-Scheduling-PeriodExtended2    PRESENCE optional},
    ...
}

Common-Subframe-Allocation-Period ::= ENUMERATED {rf4, rf8, rf16, rf32, rf64, rf128, rf256}

Pre-emptionCapability ::= ENUMERATED {
    shall-not-trigger-pre-emption,
    may-trigger-pre-emption
```

```
}

Pre-emptionVulnerability ::= ENUMERATED {
    not-pre-emptable,
    pre-emptable
}

PriorityLevel ::= INTEGER { spare (0), highest (1), lowest (14), no-priority (15) } (0..15)

-- Q

QCI ::= INTEGER (0..255)

-- R

Repetition-PeriodExtended ::= ENUMERATED {rf1, rf2, rf4, rf8, rf16, ...}

-- S

SC-PTM-Information ::= SEQUENCE {
    mbmsCellList                    MBMS-Cell-List,
    mbms-E-RAB-QoS-Parameters       MBMS-E-RAB-QoS-Parameters,
    iE-Extensions                   ProtocolExtensionContainer { {SC-PTM-Information-ExtIEs} } OPTIONAL,
    ...
}

SC-PTM-Information-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

SFN ::= INTEGER (0..1023)

Subcarrier-SpacingMBMS ::= ENUMERATED {khz-7dot5, khz-1dot25, ...}

SubframeAllocationExtended  ::= CHOICE {
        oneFrameExtension               BIT STRING (SIZE(2)),
        fourFrameExtension              BIT STRING (SIZE(8)),
        choice-extension                ProtocolIE-Single-Container { { SubframeAllocationExtended-ExtIEs} },

        ...
}


SubframeAllocationExtended-ExtIEs M2AP-PROTOCOL-IES ::= {   ...
}

-- T

TimeToWait ::= ENUMERATED {v1s, v2s, v5s, v10s, v20s, v60s, ...}

TMGI ::= SEQUENCE {
    pLMNidentity            PLMN-Identity,
    serviceID               OCTET STRING (SIZE (3)),
    iE-Extensions           ProtocolExtensionContainer { {TMGI-ExtIEs} } OPTIONAL,
```

```
    ...
}

TMGI-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}


TNL-Information ::= SEQUENCE {
    iPMCAddress                     IPAddress,
    iPSourceAddress                 IPAddress,
    gTP-TEID                        GTP-TEID,
    iE-Extensions                   ProtocolExtensionContainer { {TNL-Information-ExtIEs} } OPTIONAL,
    ...
}

TNL-Information-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

TypeOfError ::= ENUMERATED {
    not-understood,
    missing,
    ...
}


-- U
-- V
-- W
-- X
-- Y
-- Z

END
```

9.3.6 Common definitions

```
-- **************************************************************
--
-- Common definitions
--
-- **************************************************************

M2AP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m2ap (4) version1 (1) m2ap-CommonDataTypes (3)  }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- **************************************************************
```

```
--
-- Extension constants
--
-- **************************************************************

maxPrivateIEs                                   INTEGER ::= 65535
maxProtocolExtensions                           INTEGER ::= 65535
maxProtocolIEs                                  INTEGER ::= 65535

-- **************************************************************
--
-- Common Data Types
--
-- **************************************************************

Criticality     ::= ENUMERATED { reject, ignore, notify }

Presence        ::= ENUMERATED { optional, conditional, mandatory }

PrivateIE-ID    ::= CHOICE {
    local               INTEGER (0.. maxPrivateIEs),
    global              OBJECT IDENTIFIER
}

ProcedureCode       ::= INTEGER (0..255)


ProtocolIE-ID       ::= INTEGER (0..maxProtocolIEs)


TriggeringMessage   ::= ENUMERATED { initiating-message, successful-outcome, unsuccessful-outcome}

END
```

9.3.7 Constant definitions

```
-- **************************************************************
--
-- Constant definitions
--
-- **************************************************************

M2AP-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m2ap (4) version1 (1) m2ap-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    ProcedureCode,
    ProtocolIE-ID
```

```
FROM M2AP-CommonDataTypes;

-- **************************************************************
--
-- Elementary Procedures
--
-- **************************************************************

id-sessionStart                                         ProcedureCode ::= 0
id-sessionStop                                          ProcedureCode ::= 1
id-mbmsSchedulingInformation                            ProcedureCode ::= 2
id-errorIndication                                      ProcedureCode ::= 3
id-reset                                                ProcedureCode ::= 4
id-m2Setup                                              ProcedureCode ::= 5
id-eNBConfigurationUpdate                               ProcedureCode ::= 6
id-mCEConfigurationUpdate                               ProcedureCode ::= 7
id-privateMessage                                       ProcedureCode ::= 8
id-sessionUpdate                                        ProcedureCode ::= 9
id-mbmsServiceCounting                                  ProcedureCode ::= 10
id-mbmsServiceCountingResultsReport                     ProcedureCode ::= 11
id-mbmsOverloadNotification                             ProcedureCode ::= 12

-- **************************************************************
--
-- Lists
--
-- **************************************************************

maxnoofMBSFNareas                       INTEGER ::= 256
maxnoofMBSFN-Allocations                INTEGER ::= 8
maxnoofPMCHsperMBSFNarea                INTEGER ::= 15
maxnoofCells                            INTEGER ::= 256
maxnoofMBMSServiceAreasPerCell          INTEGER ::= 256
maxnoofSessionsPerPMCH                  INTEGER ::= 29
maxnooferrors                           INTEGER ::= 256
maxNrOfIndividualM2ConnectionsToReset   INTEGER ::= 256
maxnoofCountingService                  INTEGER ::= 16
maxnoofCellsforMBMS                     INTEGER ::= 4096


-- **************************************************************
--
-- Ies
--
-- **************************************************************

id-MCE-MBMS-M2AP-ID                                             ProtocolIE-ID ::= 0
id-ENB-MBMS-M2AP-ID                                             ProtocolIE-ID ::= 1
id-TMGI                                                         ProtocolIE-ID ::= 2
id-MBMS-Session-ID                                              ProtocolIE-ID ::= 3
id-MBMS-Service-Area                                            ProtocolIE-ID ::= 6
id-TNL-Information                                              ProtocolIE-ID ::= 7
id-CriticalityDiagnostics                                       ProtocolIE-ID ::= 8
id-Cause                                                        ProtocolIE-ID ::= 9
```

```
id-MBSFN-Area-Configuration-List                                ProtocolIE-ID ::= 10
id-PMCH-Configuration-List                                      ProtocolIE-ID ::= 11
id-PMCH-Configuration-Item                                      ProtocolIE-ID ::= 12
id-GlobalENB-ID                                                 ProtocolIE-ID ::= 13
id-ENBname                                                      ProtocolIE-ID ::= 14
id-ENB-MBMS-Configuration-data-List                             ProtocolIE-ID ::= 15
id-ENB-MBMS-Configuration-data-Item                             ProtocolIE-ID ::= 16
id-GlobalMCE-ID                                                 ProtocolIE-ID ::= 17
id-MCEname                                                      ProtocolIE-ID ::= 18
id-MCCHrelatedBCCH-ConfigPerMBSFNArea                           ProtocolIE-ID ::= 19
id-MCCHrelatedBCCH-ConfigPerMBSFNArea-Item                      ProtocolIE-ID ::= 20
id-TimeToWait                                                   ProtocolIE-ID ::= 21
id-MBSFN-Subframe-Configuration-List                            ProtocolIE-ID ::= 22
id-MBSFN-Subframe-Configuration-Item                            ProtocolIE-ID ::= 23
id-Common-Subframe-Allocation-Period                            ProtocolIE-ID ::= 24
id-MCCH-Update-Time                                             ProtocolIE-ID ::= 25
id-ENB-MBMS-Configuration-data-List-ConfigUpdate                ProtocolIE-ID ::= 26
id-ENB-MBMS-Configuration-data-ConfigUpdate-Item                ProtocolIE-ID ::= 27
id-MBMS-Service-associatedLogicalM2-ConnectionItem              ProtocolIE-ID ::= 28
id-MBSFN-Area-ID                                                ProtocolIE-ID ::= 29
id-ResetType                                                    ProtocolIE-ID ::= 30
id-MBMS-Service-associatedLogicalM2-ConnectionListResAck        ProtocolIE-ID ::= 31
id-MBMS-Counting-Request-Session                                ProtocolIE-ID ::= 32
id-MBMS-Counting-Request-Session-Item                           ProtocolIE-ID ::= 33
id-MBMS-Counting-Result-List                                    ProtocolIE-ID ::= 34
id-MBMS-Counting-Result-Item                                    ProtocolIE-ID ::= 35
id-Modulation-Coding-Scheme2                                    ProtocolIE-ID ::= 36
id-MCH-Scheduling-PeriodExtended                                ProtocolIE-ID ::= 37
id-Alternative-TNL-Information                                  ProtocolIE-ID ::= 38
id-Overload-Status-Per-PMCH-List                                ProtocolIE-ID ::= 39
id-PMCH-Overload-Status                                         ProtocolIE-ID ::= 41
id-Active-MBMS-Session-List                                     ProtocolIE-ID ::= 42
id-MBMS-Suspension-Notification-List                            ProtocolIE-ID ::= 43
id-MBMS-Suspension-Notification-Item                            ProtocolIE-ID ::= 44
id-SC-PTM-Information                                           ProtocolIE-ID ::= 45
id-Modification-PeriodExtended                                  ProtocolIE-ID ::= 46
id-Repetition-PeriodExtended                                    ProtocolIE-ID ::= 47
id-MCH-Scheduling-PeriodExtended2                               ProtocolIE-ID ::= 48
id-Subcarrier-SpacingMBMS                                       ProtocolIE-ID ::= 49
id-SubframeAllocationExtended                                   ProtocolIE-ID ::= 50

END
```

9.3.8 Container definitions

```
-- **************************************************************
--
-- Container definitions
--
-- **************************************************************

M2AP-Containers {
```

```
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m2ap (4) version1 (1) m2ap-Containers (5)  }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- ************************************************************
--
-- IE parameter types from other modules.
--
-- ************************************************************

IMPORTS
    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs,
    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolIE-ID
FROM M2AP-CommonDataTypes;

-- ************************************************************
--
-- Class Definition for Protocol Ies
--
-- ************************************************************

M2AP-PROTOCOL-IES ::= CLASS {
    &id             ProtocolIE-ID           UNIQUE,
    &criticality    Criticality,
    &Value,
    &presence       Presence
}
WITH SYNTAX {
    ID              &id
    CRITICALITY     &criticality
    TYPE            &Value
    PRESENCE        &presence
}

-- ************************************************************
--
-- Class Definition for Protocol Ies
--
-- ************************************************************

M2AP-PROTOCOL-IES-PAIR ::= CLASS {
    &id                     ProtocolIE-ID       UNIQUE,
    &firstCriticality       Criticality,
    &FirstValue,
    &secondCriticality      Criticality,
    &SecondValue,
```

```
    &presence               Presence
}
WITH SYNTAX {
    ID                      &id
    FIRST CRITICALITY       &firstCriticality
    FIRST TYPE              &FirstValue
    SECOND CRITICALITY      &secondCriticality
    SECOND TYPE             &SecondValue
    PRESENCE                &presence
}

-- **************************************************************
--
-- Class Definition for Protocol Extensions
--
-- **************************************************************

M2AP-PROTOCOL-EXTENSION ::= CLASS {
    &id                 ProtocolIE-ID       UNIQUE,
    &criticality        Criticality,
    &Extension,
    &presence           Presence
}
WITH SYNTAX {
    ID                  &id
    CRITICALITY         &criticality
    EXTENSION           &Extension
    PRESENCE            &presence
}

-- **************************************************************
--
-- Class Definition for Private Ies
--
-- **************************************************************

M2AP-PRIVATE-IES ::= CLASS {
    &id                 PrivateIE-ID,
    &criticality        Criticality,
    &Value,
    &presence           Presence
}
WITH SYNTAX {
    ID                  &id
    CRITICALITY         &criticality
    TYPE                &Value
    PRESENCE            &presence
}

-- **************************************************************
--
-- Container for Protocol Ies
--
-- **************************************************************
```

```
ProtocolIE-Container {M2AP-PROTOCOL-IES : IesSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IesSetParam}}

ProtocolIE-Single-Container {M2AP-PROTOCOL-IES : IesSetParam} ::=
    ProtocolIE-Field {{IesSetParam}}

ProtocolIE-Field {M2AP-PROTOCOL-IES : IesSetParam} ::= SEQUENCE {
    id              M2AP-PROTOCOL-IES.&id                   ({IesSetParam}),
    criticality     M2AP-PROTOCOL-IES.&criticality          ({IesSetParam}{@id}),
    value           M2AP-PROTOCOL-IES.&Value                ({IesSetParam}{@id})
}

-- ************************************************************
--
-- Container for Protocol IE Pairs
--
-- ************************************************************

ProtocolIE-ContainerPair {M2AP-PROTOCOL-IES-PAIR : IesSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-FieldPair {{IesSetParam}}

ProtocolIE-FieldPair {M2AP-PROTOCOL-IES-PAIR : IesSetParam} ::= SEQUENCE {
    id                  M2AP-PROTOCOL-IES-PAIR.&id                  ({IesSetParam}),
    firstCriticality    M2AP-PROTOCOL-IES-PAIR.&firstCriticality    ({IesSetParam}{@id}),
    firstValue          M2AP-PROTOCOL-IES-PAIR.&FirstValue          ({IesSetParam}{@id}),
    secondCriticality   M2AP-PROTOCOL-IES-PAIR.&secondCriticality   ({IesSetParam}{@id}),
    secondValue         M2AP-PROTOCOL-IES-PAIR.&SecondValue         ({IesSetParam}{@id})
}

-- ************************************************************
--
-- Container Lists for Protocol IE Containers
--
-- ************************************************************

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, M2AP-PROTOCOL-IES : IesSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-Container {{IesSetParam}}

ProtocolIE-ContainerPairList {INTEGER : lowerBound, INTEGER : upperBound, M2AP-PROTOCOL-IES-PAIR : IesSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-ContainerPair {{IesSetParam}}

-- ************************************************************
--
-- Container for Protocol Extensions
--
-- ************************************************************

ProtocolExtensionContainer {M2AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
    SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
```

```
    ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField {M2AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
    id                  M2AP-PROTOCOL-EXTENSION.&id             ({ExtensionSetParam}),
    criticality         M2AP-PROTOCOL-EXTENSION.&criticality    ({ExtensionSetParam}{@id}),
    extensionValue      M2AP-PROTOCOL-EXTENSION.&Extension      ({ExtensionSetParam}{@id})
}

-- ************************************************************
--
-- Container for Private Ies
--
-- ************************************************************

PrivateIE-Container {M2AP-PRIVATE-IES : IesSetParam} ::=
    SEQUENCE (SIZE (1..maxPrivateIEs)) OF
    PrivateIE-Field {{IesSetParam}}

PrivateIE-Field {M2AP-PRIVATE-IES : IesSetParam} ::= SEQUENCE {
    id              M2AP-PRIVATE-IES.&id            ({IesSetParam}),
    criticality     M2AP-PRIVATE-IES.&criticality   ({IesSetParam}{@id}),
    value           M2AP-PRIVATE-IES.&Value         ({IesSetParam}{@id})
}

END
```

9.4 Message Transfer Syntax

M2AP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax as specified in ref. ITU-T Rec. X.691 [5].

9.5 Timers

10 Handling of Unknown, Unforeseen and Erroneous Protocol Data

Section 10 of TS 36.413 [4] is applicable for the purposes of the present document.

Annex A (informative): Change history

TSG #	TSG Doc.	CR	Rev	Subject/Comment	New
2008-02				First draft	0.0.0
2009-10				Second draft	0.0.1
2009-10				Draft with first content	0.0.2
2009-10				Including comments from RAN3#65bis	0.0.3
2009-10				Preparing RAN3#66	0.0.4
2009-10				Submission to RAN3#66, based on received comments	0.0.5
2009-11				Update following discussions at RAN3#66	0.0.6
2009-11				further revisions along RAN2 agreements, step to v100	1.0.0
2009-11				incorporating comments along email discussions before RAN#46	1.1.0
2009-12				stepping the version to 2.0.0 for approval at RAN#46	2.0.0
46	RP-091200			Approved at RAN#46	9.0.0
47	RP-100226	0001	1	Some minor description corrections for M2AP	9.1.0
47	RP-100226	0002	1	Removal of QoS information in MBMS Session Start message	9.1.0
47	RP-100226	0003		Clarification of MCCH Update Time	9.1.0
47	RP-100226	0004		Correct the descripton of Error Indication and misspelt of BIT STRING	9.1.0
47	RP-100227	0005	1	Some corrections to TS36.443	9.1.0
47	RP-100226	0006	1	MBSFN subframe configuration	9.1.0
47	RP-100227	0008	2	MBSFN Area Configuration	9.1.0
47	RP-100227	0009	1	Miscellaneous corrections to TS36.443	9.1.0
47	RP-100227	0010	2	Optional MBMS Session ID	9.1.0
47	RP-100227	0013	3	Remove the MBMS Session Duration IE from the MBMS Session Start Request message	9.1.0
47	RP-100227	0015	3	Misc corrections	9.1.0
47	RP-100227	0016	2	Introduction of MBMS Session Update in M2AP	9.1.0
47	RP-100227	0019	3	Rapporteur's update for M2AP protocol	9.1.0
49	RP-100906	0027		Alignment of tabulars to agreed notation for TS36.413 and TS36.423	9.2.0
2010-12				Created Rel-10 version based on v. 9.2.0	10.0.0
SP-49	SP-100629			Clarification on the use of References (TS 21.801 CR#0030)	10.1.0
51	RP-110240	0033	2	Introduction of MBMS counting procedure	10.1.0
51	RP-110221	0037		Addition of Criticality Diagnostics IE in the M2 Setup Response message	10.1.0
51	RP-110223	0040	1	Correction on MBMS Reset procedure	10.1.0
51	RP-110222	0042	1	Correction of M2 Setup	10.1.0
51	RP-110226	0043	1	Clarification on TEID value range	10.1.0
52	RP-110692	0044	1	Completion of MBMS new functions	10.2.0
52	RP-110692	0045	1	Mismatch in Counting Report	10.2.0
52	RP-110686	0047	1	Removal of unused references and text clean-up for Rel-10	10.2.0
53	RP-111197	0050	2	Clarification on the M2 Reset Procedure	10.3.0
53	RP-111196	0053	1	Correction to the eNB Configuration Update procedure, and the MCE Configuration Update procedure	10.3.0
53	RP-111195	0054	1	Abnormal condition UE Counting Request	10.3.0
54	RP-111648	0060		Correction of Counting Request	10.4.0
54	RP-111651	0061	1	Correction to the eNB Configuration Update procedure, and the MCE Configuration Update procedure	10.4.0
55	RP-120234	0062		Correct of reset	10.5.0
2012-06				Created Rel-11 version based on v. 10.5.0	
56	RP-120752	0063	2	Correction on MBMS Session Start and Stop procedures in M2 interface	11.0.0
58	RP-121737	0064		Rapporteur editorial corrections	11.1.0
59	RP-130212	0065	1	Correction for Session Update procedure	11.2.0
60	RP-130643	0067		Correction of Update of Session Identity and TNL Address	11.3.0
2014-09				Created Rel-12 version based on v. 11.3.0	12.0.0
66	RP-142088	0074	3	Introduction of 256QAM for PMCH	12.1.0
66	RP-142093	0075	3	CR for shortening MCH scheduling period	12.1.0
67	RP-150356	0092	1	Add missing 95ehaviour for MBMS Service Counting procedure	12.2.0
67	RP-150347	0099		Correction of M2AP Scheduling Information	12.2.0
67	RP-150355	0101	1	Support for eMBMS congestion management, via MBMS Scheduling Information procedure	12.2.0
2015-06				Created Rel-13 version based on v. 12.2.0	13.0.0
68	RP-150946	0093	5	eMBMS Alternative IP Multicast distribution address	13.0.0
69	RP-151456	0113		Correction on ASN.1 inconsistency of mbmsServiceCountingResultsReport	13.1.0
70	RP-152101	0109	5	Introduction of SC-PTM	13.2.0
71	RP-160449	0118		Rapporteur Review on 36.443	13.3.0

Change history							
Date	**Meeting**	**Tdoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2017-03	RP-75	RP-170538	0124		B	Introduction of new period values for MBMS	14.0.0
2017-03	RP-75	RP-170542	0125		B	Introduction of New types of eNB ID	14.0.0
2017-04						Editorial Correction: “rejcet” to “reject” in ASN code	14.0.1
2018-09	RP-81	RP-181926	0126	1	F	Introduction of release 14 eMBMS enhancements	14.1.0
2018-09	-	-	-	-	-	Update to Rel-15 version (MCC)	15.0.0

History

Document history		
V15.0.0	September 2018	Publication