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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Foreword

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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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 M2 interface by signalling procedures defined in this document. M2AP is developed in accordance to the general principles stated in [2] and [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] 3GPP TS 36.412: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); M2 signaling transport ".

[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] 3GPP TS 23.203: "Policy and charging control architecture".

[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".

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 stand alone 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. [3] and [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.

Editors Note: This definition may need to be transferred to stage 2

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

Editors Note: This definition may need to be transferred to stage 2

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.

Editors Note: This definition may need to be transferred to stage 2

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

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 [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.

M2 signalling transport is described in [7].

7 Functions of M2AP

The M2AP protocol provides the following functions:

- MBMS Session Handling. This function supports start and stop 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 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.

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

Table 7-1: Mapping between M2AP functions and M2AP EPs

Function	Elementary Procedure(s)
MBMS Session Handling	a) MBMS Session Start b) MBMS Session Stop
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

8 M2AP Procedures

Editor's Note: Classification of M2AP procedures and procedural specification of 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 1: 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 Scheduling Information	MBMS SCHEDULING INFORMATION REQUEST	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	

Table 2: Class 2 procedures

Elementary Procedure	Message
Error Indication	ERROR INDICATION

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 a 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

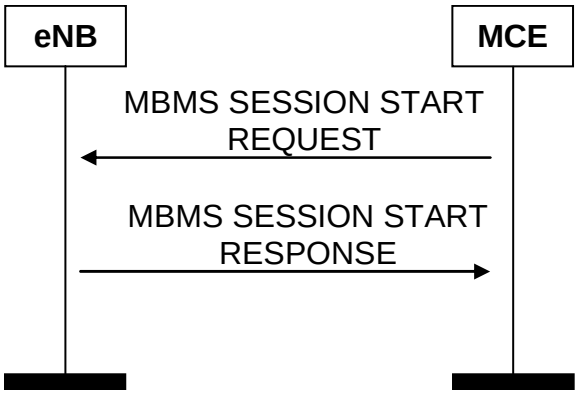

Figure 8.2.2-1. MBMS Session Start procedure. Successful operation.

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

8.2.3 Unsuccessful Operation

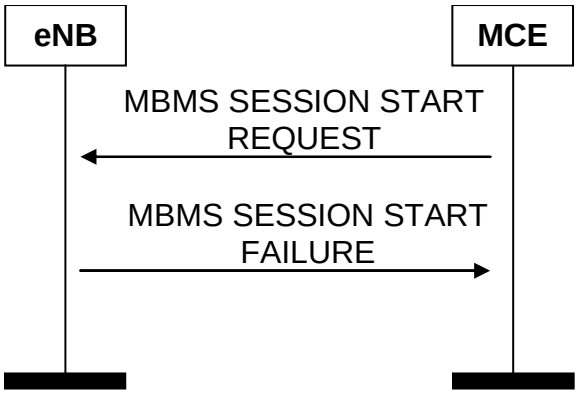

Figure 8.2.3-1. MBMS Session Start procedure. Unsuccessful operation.

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

Void.

8.3 MBMS Session Stop

8.3.1 General

The purpose of the MBMS Session Stop procedure is to request the eNB to notify UEs about the end of a given MBMS Session of a given MBMS Bearer Service and 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

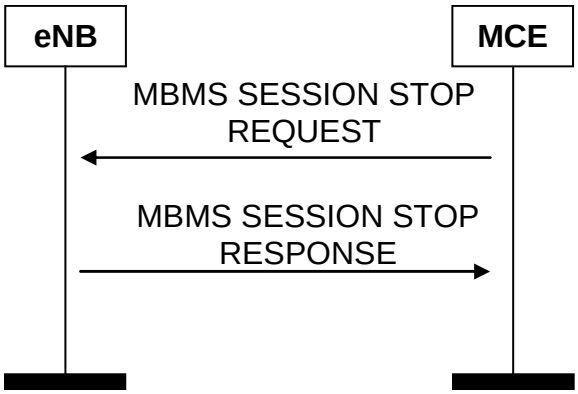

Figure 8.3.2-1. MBMS Session Stop procedure. Successful operation.

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

8.3.3 Abnormal Conditions

8.4 MBMS Scheduling Information

8.4.1 General

The purpose of the MBMS Scheduling Information Procedure is to provide MCCH related information to the eNB

The procedure uses non MBMS-Service-associated signalling.

8.4.2 Successful Operation

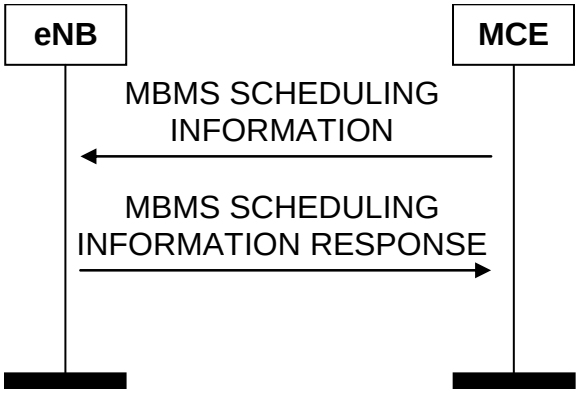

Figure 8.4.2-1. MBMS Scheduling Information procedure. Successful operation.

The MCE initiates the procedure by sending the MBMS SCHEDULING INFORMATION message to the eNB.

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 M2AP MBMS-service-related contexts, in the event of a failure in the MCE or vice versa. This procedure doesn't affect the application level configuration data exchanged during the M2 Setup procedure.

The procedure uses non MBMS-service associated signalling.

8.5.1.2 Successful Operation

8.5.1.2.1 Reset Procedure Initiated from the MCE

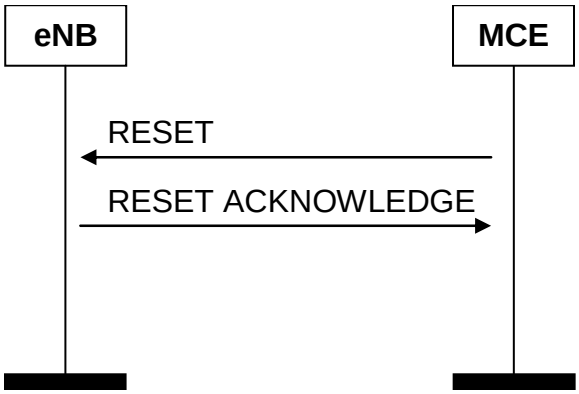

Figure 8.5.1.2.1-1. Reset procedure initiated from the MCE. Successful operation.

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) and remove all MBMS-service contexts including MBMS M2AP IDs.

After the eNB has released all assigned M2 resources, 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.

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except another Reset procedure) shall be aborted.

8.5.1.2.2 Reset Procedure Initiated from the eNB

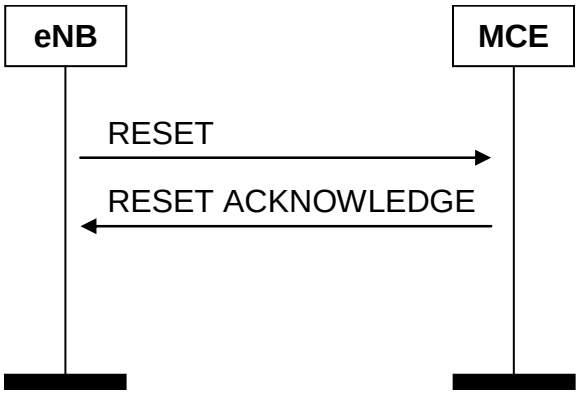

Figure 8.5.1.2.2-1. Reset procedure initiated from the eNB. Successful operation.

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 for the eNB.

After the MCE has released all assigned M2 resources, the MCE shall respond with the RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except another Reset procedure) shall be aborted.

8.5.1.3 Abnormal Conditions

Void.

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 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

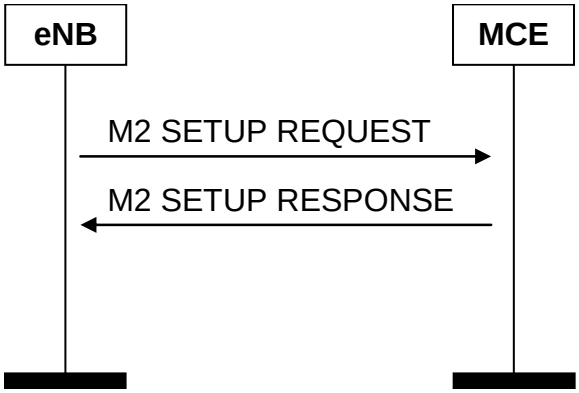

Figure 8.6.2-1. M2 Setup procedure. Successful operation.

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 the cell(s) which are foreseen to participate in MBMS service data transmission.

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

The exchanged data shall be stored in the respective node, MCCH related BCCH data broadcasted as provided by the MCE in the respective cell(s), and used for the duration of the TNL association.

When this procedure is finished the M2 interface is operational and 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.

8.6.3 Unsuccessful Operation

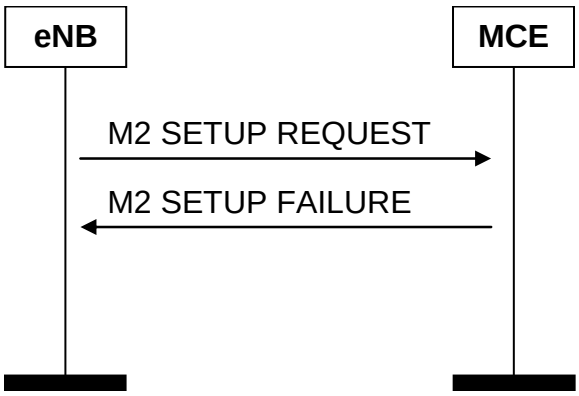

Figure 8.6.2-1. M2 Setup procedure. Unsuccessful operation.

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

If the M2 SETUP FAILURE messages include 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.

8.7.2 Successful Operation

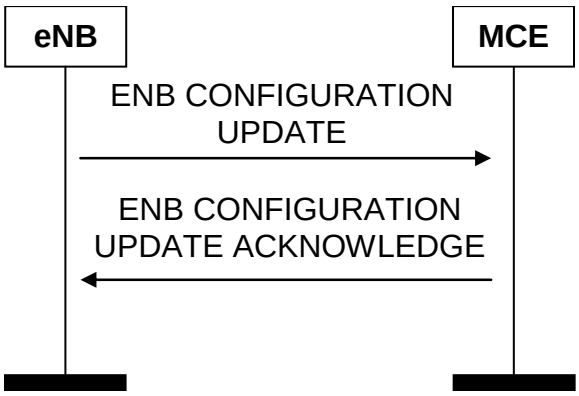

Figure 8.7.2-1. eNB Configuration Update procedure. Successful operation.

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.

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

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 data 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 MCCH related BCCH data for that cell.

The exchanged data shall be stored in the respective node, MCCH related BCCH data broadcasted as provided by the MCE in the respective cell(s), and used for the duration of the TNL association.

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

8.7.3 Unsuccessful Operation

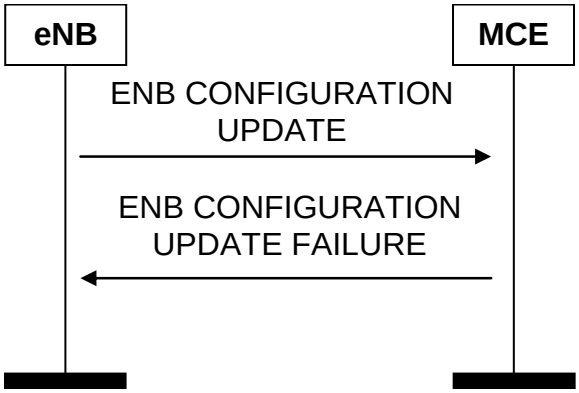

Figure 8.7.3-1. eNB Configuration Update procedure. Unsuccessful operation.

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

If the ENB CONFIGURATION UPDATE FAILURE messages 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

Void.

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 each of the cells controlled by the eNB which is foreseen to participate in MBMS service data transmission. The procedure uses non MBMS-service associated signalling.

8.8.2 Successful Operation

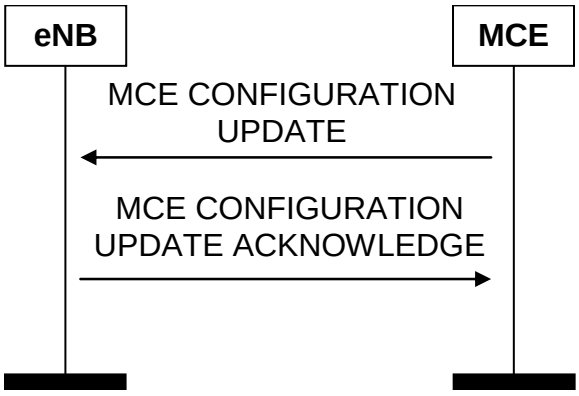

Figure 8.8.2-1. MCE Configuration Update procedure. Successful operation.

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 cell* IE.

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

8.8.3 Unsuccessful Operation

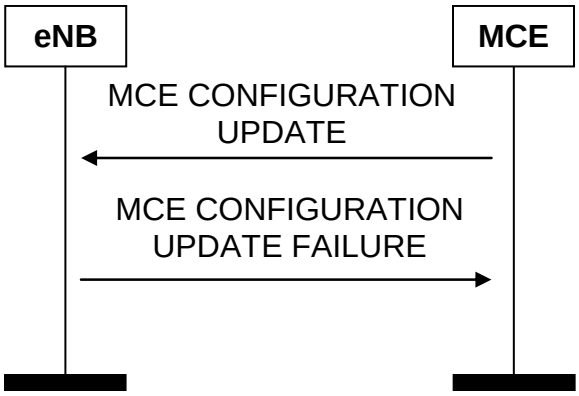

Figure 8.78.3-1. MCE Configuration Update procedure. Unsuccessful operation.

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

If the MCE CONFIGURATION UPDATE FAILURE messages 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

Void.

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

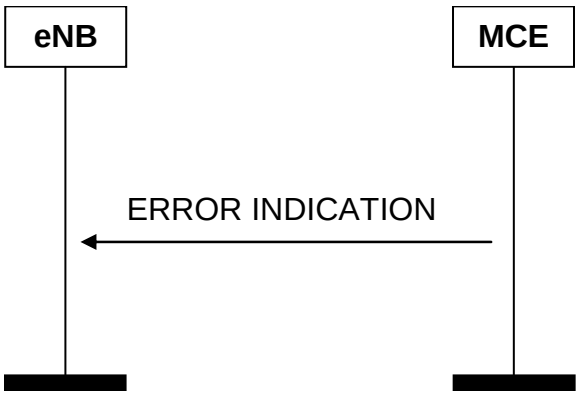

Figure 8.9.2-1. Error Indication procedure, MCE originated. Successful operation.

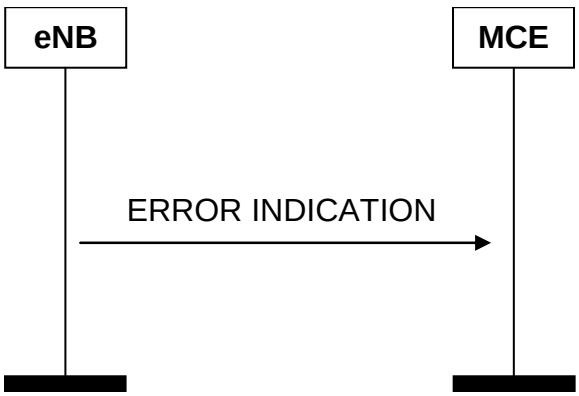

Figure 8.9.2.1-2. Error Indication procedure, eNB originated. Successful operation.

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* IE shall be included in the ERROR INDICATION message. If one or both of *MCE MBMS Service M2AP ID* IE and the *eNB MBMS Service M2AP* 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" or "Unknown or inconsistent pair of MBMS M2AP ID".

8.9.3 Abnormal Conditions

Void.

9 Elements for M2AP Communication

9.1 Message Functional Definition and Content

[Editors Note: The fact that Section 9 is provided on the current detail-level doesnt mean that it is agreed as such. Detailled comments appreciated.]

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 9.1.1.1-1. 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 9.1.1.2-1. 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 [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 and allocate resources for an MBMS E-RAB.

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 E-RAB QoS parameters	M		9.2.1.3		YES	reject
MBMS Session Duration	M		9.2.3.5		YES	reject
MBMS Service Area	M		9.2.3.6		YES	reject
TNL Information	M				YES	reject
>IP Multicast Address	M		9.2.2.1		-	
>GTP DL TEID	M		GTP-TEID 9.2.2.2		-	

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	M				YES	reject
>MBSFN Area Configuration Item IEs		1 to <maxnoofMBSFNareas>			EACH	reject
>>PMCH Configuration List	M				YES	reject
>>>PMCH Configuration Item IEs		1 to <maxnoofPMCHsperMBSFNarea>			EACH	reject
>>>>PMCH Configuration	M		9.2.1.8		-	
>>>>MBMS Session List per PMCH	M		9.2.1.9		-	
>>Subframes Configuration List	M				YES	reject
>>>Subframes Configuration Item IEs		1 to <maxnoofMBSFNallocations>			EACH	reject
>>>>MBSFN Subframe Configuration	M		9.2.1.17		-	
>>PMCH Subframe Allocation Period	M		9.2.1.18		YES	reject

Range bound	Explanation
maxnoofMBSFNareas	Maximum no. of MBSFN areas served by a single eNB. The value for maxnoofMBSFNareas is 256. [FFS]
maxnoofPMCHsperMBSFNarea	Maximum no. of PMCHs possible per MBSFN .The value for maxnoofMCHsperMBSFNarea is 16.
maxnoofMBSFNallocations	Maximum no. of MBSFN frame allocations with different offset. The value for maxnoofMBSFNallocations is 8.

9.1.8 MBMS SCHEDULING INFORMATION RESPONSE

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

Direction: eNB → MCE.

Signalling bearer mode: Connection oriented.

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 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

9.1.10 RESET ACKNOWLEDGE

This message is sent as a response to a 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
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.11 M2 SETUP REQUEST

This message is sent by the eNB to initiate the an 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	M				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	M				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. [FFS]

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	O				YES	reject
> eNB MBMS Configuration data Item IEs		1 to <maxnoofCells>			EACH	reject
>>CHOICE **eNB ID**						
>>>eNB MBMS Configuration data Item	M		9.2.1.12			
>>>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	O				YES	ignore
> MCCH related BCCH Configuration data Item IEs		1 to <maxnoofMBSFNareas>			EACH	ignore
>> MCCH related BCCH Configuration Item	M		9.2.1.13		-	
Criticality Diagnostics	O		9.2.1.7		YES	ignore

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 cell	O				YES	reject
> MCCH related BCCH Configuration data Item IEs		1 to <maxnoofCells>			EACH	reject
>> MCCH related BCCH Configuration Item	M		9.2.1.13		-	

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

9.2 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				Assumed max no of messages is 256.
>Procedure Code	M		(Session Start, Session Stop, MBMS Scheduling Information, Reset, M2 Setup, eNB Configuration Update, MCE Configuration Update, Error Indication)	
>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, Invalid QoS combination, Interaction with other procedure, Not supported QCI value, Unspecified, …)	
>Transport Layer				
>>Transport Layer Cause	M		ENUMERATED (Transport Resource Unavailable, Unspecified, ...)	
> NAS				
>> NAS Cause	M		ENUMERATED (Unspecified, …)	
>Protocol				
>>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
Invalid QoS combination	The action was failed because of invalid QoS combination.
Interaction with other procedure	The action is due to an ongoing interaction with another procedure
Not supported QCI Value	The E-RAB setup failed because the requested QCI is not supported.
Unspecified	Sent for radio network layer cause when none of the specified cause values applies

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 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 [8]. Coding is specified in [10].
>Allocation and Retention Priority	M		9.2.1.4	
>GBR QoS Information	O		9.2.1.5	This IE applies to GBR bearers only and shall be ignored otherwise.

9.2.1.4 Allocation and Retention Priority

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

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 "priority of allocation and retention" (see [8]). **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)	**Desc**.: This IE indicates the pre-emption capability of the request on other MBMS E-RABs **Usage**: The MBMS E-RAB shall not pre-empt other MBMS E-RABs or, the MBMS E-RAB may pre-empt other MBMS E-RABs. The Pre-emption Capability indicator applies to the allocation of resources for an MBMS E-RAB and as such it provides the trigger to the pre-emption procedures/processes of the MBMS eNB.
>Pre-emption Vulnerability	M		ENUMERATED(not pre-emptable, pre-emptable)	**Desc**.: This IE indicates the vulnerability of the MBMS E-RAB to preemption of other MBMS E-RABs. **Usage**: The MBMS E-RAB shall not be pre-empted by other MBMS E-RABs or the MBMS E-RAB may be pre-empted by other RABs. Pre-emption Vulnerability indicator applies for the entire duration of the MBMS E-RAB, unless modified and as such indicates whether the MBMS E-RAB is a target of the pre-emption procedures/processes of the eNB

9.2.1.5 GBR QoS Information

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBMS E-RAB Maximum Bit Rate Downlink	M		Bit Rate 9.2.1.6	**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 9.2.1.6	**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.

9.2.1.6 Bit Rate

This IE indicates the number of bits delivered by E-UTRAN in UL or to 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

9.2.1.7 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 [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 <maxnoof errors>		
>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
Allocated Subframes End	M		INTEGER (0..1535)	Encoded as the *sf-AllocEnd* IE in[11]
Modulation and Coding Scheme	M		INTEGER (0..28)	Encoded as the *dataMCS* IE in[11]
MSAP Occasion	M		ENUMERATED (rf8, rf16, rf32, rf64, rf128, rf256, rf512, rf1024)	Encoded as the *msap-OccasionPeriod* IE in [11]

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	
>MBMS Session Identity	M		9.2.3.4	
>LCID	M		INTEGER (0..29)	Logical Channel Identity

Range bound	Explanation
maxnoofSessionsPerPMCH	Maximum no. of Sessions per PMCH. The value for maxnoofSessionsPerPMCH is 30.

9.2.1.10 Global eNB ID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
CHOICE **eNB ID**	M			
>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
>Home eNB ID			BIT STRING (28)	Equal to the *Cell Identity* IE contained in the *E-UTRAN CGI* IE (see section 9.2.1.11) of the cell served by the eNB

9.2.1.11 E-UTRAN CGI

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
Cell Identity	M		BIT STRING (28)	The 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 IEs

This information element provides MCCH related BCCH 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	M			
>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
MBSFN Area Id	M		9.2.1.14	
PDCCH Data Length	M		ENUMERATED (dl0, dl1, dl2)	This IE is encoded along the number of OFDM symbols for PDCCH as of table 6.7-1. in [12].
Repetition Period	M		ENUMERATED (rf32, rf64, rf128, rf256)	The same encoding as the *repetitionPeriod* in *mcch-Config* as specified in [11]
Offset	M		INTEGER (0..10)	The same encoding as the *repetitionPeriod* in *mcch-Config* as specified in [11]
Modification Period	M		ENUMERATED (ms5120, ms10240)	The same encoding as the *modificationPeriod* in *mcch-Config* as specified in [11]
Subframe Allocation Info	M		BIT STRING (SIZE(6))	The same encoding as the *subframeAllocationInfo* specified in [11]
Modulation and Coding Scheme	M		ENUMERATED (n2, n7, n13, n19)	The same encoding as the *signallingMCS* specified in [11]
MBSFN Subframe Configuration	M		9.2.1.17	

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)	[FFS: this needs to be aligned with RAN1/2]

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 defines the global MCE Identification.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Global MCE Id	M		OCTET STRING	[FFS]

9.2.1.17 MBSFN Subframe Configuration

This IE indicates the MBSFN Subframe Configuration, as defined in [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 [11]
Radio Frame Allocation Offset	M		INTEGER (0..7)	Semantics along the IE definition in [11]
CHOICE **Subframe Allocation**	M			
>One Frame				
>>One Frame Item	M		BIT STING (SIZE(6))	Semantics along the IE definition in [11]
>Four Frames				
>> Four Frame Item	M		BIT STING (SIZE(24))	Semantics along the IE definition in [11]

9.2.1.18 PMCH Subframe Allocation Period

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PMCH Subframe Allocation Period	M		ENUMERATED (rf4, rf8, rf6, rf32, rf64, rf128, rf256)	The same encoding as the *pmch-SubframeAllocPeriod* as specified in [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 [3].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MCCH Update Delay	M		INTEGER (0..255)	This IE indicates a time in multiples of the modification period. 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 [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 [3]

9.2.2 Transport Network Layer Related IEs

9.2.2.1 IP Multicast Address

This information element is an IP address.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Transport Layer 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 Transport Layer Address, see ref. [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)	

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 (0..3))	

9.2.3.4 MBMS Session Identity

The MBMS Session Identity identifies the session of a MBMS Bearer Service in E-UTRAN and is used by the UE to recognise repetitions of a 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 [9].

9.2.3.5 MBMS Session Duration

This IE defines the duration of the MBMS Session.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBMS Session Duration	M		OCTET STRING (SIZE (3))	Coded as the value part of MBMS-Session-Duration AVP as defined in [9].

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 [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 [5] and [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 a 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 a 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,
    MbmsSchedulingInformation,
    MbmsSchedulingInformationResponse,
    ErrorIndication,
    ResetRequest,
    ResetAcknowledge,
    M2SetupRequest,
    M2SetupResponse,
    M2SetupFailure,
    ENBConfigurationUpdate,
    ENBConfigurationUpdateAcknowledge,
    ENBConfigurationUpdateFailure,
    MCEConfigurationUpdate,
    MCEConfigurationUpdateAcknowledge,
    MCEConfigurationUpdateFailure,
    PrivateMessage
FROM M2AP-PDU-Contents

    id-sessionStart,
    id-sessionStop,
    id-mbmsSchedulingInformation,
    id-errorIndication,
    id-reset,
    id-m2Setup,
    id-eNBConfigurationUpdate,
    id-mCEConfigurationUpdate,
    id-privateMessage
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                                             |
    mbmsSchedulingInformation                               |
    reset                                                   |
    m2Setup                                                 |
    eNBConfigurationUpdate                                  |
    mCEConfigurationUpdate                                  ,
    ...
}

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

}


-- ********************************************************
--
-- 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
}

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      ResetRequest
    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
}

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

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,
    MBMS-E-RAB-QoS-Parameters,
    MBMS-Service-Area,
    MBMS-Session-Duration,
    MBMS-Session-ID,
    MBMSsessionListPerPMCH-Item,
    MBSFN-Subframe-Configuration,
    MCCH-Update-Time,
    MCCHrelatedBCCH-ConfigPerMBSFNArea-Item,
    MCE-MBMS-M2AP-ID,
    MCEname,
    PMCH-Configuration,
    PMCH-Subframe-Allocation-Period,
    TimeToWait,
    TMGI,
    TNL-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-E-RAB-QoS-Parameters,
    id-MBMS-Session-Duration,
    id-MBMS-Service-Area,
    id-TNL-Information,
    id-CriticalityDiagnostics,
    id-Cause,
    id-MBMSFN-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-PMCH-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,
    maxnoofMBSFN-Allocations,
    maxnoofMBSFNareas,
    maxnoofPMCHsperMBSFNarea,
    maxnoofCells,
    maxnoofMBMSServiceAreasPerCell,
    maxnoofSessionsPerPMCH,
    maxnooferrors

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-E-RAB-QoS-Parameters           CRITICALITY reject  TYPE MBMS-E-RAB-QoS-Parameters    PRESENCE mandatory } |
    { ID id-MBMS-Session-Duration               CRITICALITY reject  TYPE MBMS-Session-Duration        PRESENCE mandatory } |
    { ID id-MBMS-Service-Area                   CRITICALITY reject  TYPE MBMS-Service-Area            PRESENCE mandatory } |
    { ID id-TNL-Information                     CRITICALITY reject  TYPE TNL-Information              PRESENCE mandatory } ,
    ...
}

-- **************************************************************
--
-- 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  } ,
    ...
}


-- **************************************************************
--
-- 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-MBMSFN-Area-Configuration-List      CRITICALITY reject  TYPE MBMSFN-Area-Configuration-List PRESENCE mandatory } ,
    ...
}

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

MBMSFN-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-PMCH-Subframe-Allocation-Period     CRITICALITY reject  TYPE PMCH-Subframe-Allocation-Period   PRESENCE mandatory },
    ...
}

PMCH-Configuration-List ::= SEQUENCE (SIZE(1.. 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 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 REQUEST
--
-- **************************************************************

ResetRequest ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container       {{ResetRequest-IEs}},
    ...
}
```

```
ResetRequest-IEs M2AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory   },
    ...
}

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

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

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


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

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

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

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

    maxnoofMBSFNareas,
    maxnoofPMCHsperMBSFNarea,
    maxnoofCells,
    maxnoofMBMSServiceAreasPerCell,
    maxnoofSessionsPerPMCH,
    maxnooferrors

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,
    invalid-QoS-combination,
    interaction-with-other-procedure,
    not-supported-QCI-value,
    unspecified,
    ...

}

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

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)),
    home-eNB-ID     BIT STRING (SIZE (28)),
    ...
}

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 ::= OCTET STRING

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

-- H
-- I

IPMulticastAddress          ::= OCTET STRING (SIZE(4..16, ...))

-- J
-- K
-- L

LCID    ::= INTEGER (0..29)

-- M
```

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

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

MBMS-Service-Area           ::= OCTET STRING

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

MBMS-Session-Duration ::= OCTET STRING (SIZE (3))

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

MBMSsessionListPerPMCH-Item ::= SEQUENCE (SIZE(1..maxnoofSessionsPerPMCH)) OF SEQUENCE {
    tmgi                            TMGI,
    sessionID                       MBMS-Session-ID,
    lcid                        LCID,
    iE-Extensions                   ProtocolExtensionContainer { { MBMSsessionListPerPMCH-Item-ExtIEs} } OPTIONAL,
    ...
}

MBMSsessionListPerPMCH-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) )
    }
}

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

MCCHrelatedBCCH-ConfigPerMBSFNArea-Item ::= SEQUENCE {
    mbsfnArea                       MBSFN-Area-ID,
    pdcchDataLength                 ENUMERATED {s1, s2, ...},
    repetitionPeriod                ENUMERATED {rf32, rf64, rf128, rf256},
    offset                          INTEGER (0..10),
    modificationPeriod              ENUMERATED {ms5120, ms10240},
    subframeAllocationInfo          BIT STRING (SIZE(6)),
```

```
    modulationandCodingScheme       ENUMERATED {n2, n7, n13, n19},
    mbsfnSubframConfiguration       MBSFN-Subframe-Configuration,
    iE-Extensions                   ProtocolExtensionContainer { { MCCHrelatedBCCH-ConfigPerMBSFNArea-Item-ExtIEs} } OPTIONAL,
    ...
}

MCCHrelatedBCCH-ConfigPerMBSFNArea-Item-ExtIEs M2AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

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


MSAP-Occasion               ::= ENUMERATED {rf8, rf16, rf32, rf64, rf128, rf256, rf512, rf1024}
-- N
-- O
-- P

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

PMCH-Configuration          ::= SEQUENCE {
    msapConfiguration               AllocatedSubframesEnd,
    dataMCS                         INTEGER (0..28),
    msapOccasion                    MSAP-Occasion,
    iE-Extensions                   ProtocolExtensionContainer { {PMCH-Configuration-ExtIEs} } OPTIONAL,
    ...
}

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

PMCH-Subframe-Allocation-Period ::= ENUMERATED {rf4, rf8, rf6, 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
-- S
```

```
-- T

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

TMGI ::= SEQUENCE {
    pLMNidentity            PLMN-Identity,
    serviceID               OCTET STRING (SIZE (0..3)),
    iE-Extensions           ProtocolExtensionContainer { {TMGI-ExtIEs} } OPTIONAL,
    ...
}

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


TNL-Information ::= SEQUENCE {
    iPMCAddress                     IPMulticastAddress,
    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


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

maxnoofMBSFNareas                       INTEGER ::= 256 -- FFS
maxnoofMBSFN-Allocations                INTEGER ::= 8
maxnoofPMCHsperMBSFNarea                INTEGER ::= 16
maxnoofCells                            INTEGER ::= 256
maxnoofMBMSServiceAreasPerCell          INTEGER ::= 256 -- FFS
maxnoofSessionsPerPMCH                  INTEGER ::= 30
maxnooferrors                           INTEGER ::= 256


-- ************************************************************
--
-- 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-E-RAB-QoS-Parameters                                        ProtocolIE-ID ::= 4
id-MBMS-Session-Duration                                            ProtocolIE-ID ::= 5
id-MBMS-Service-Area                                                ProtocolIE-ID ::= 6
```

```
id-TNL-Information                                          ProtocolIE-ID ::= 7
id-CriticalityDiagnostics                                   ProtocolIE-ID ::= 8
id-Cause                                                    ProtocolIE-ID ::= 9
id-MBMSFN-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-PMCH-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

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. [5].

9.5 Timers

10 Handling of Unknown, Unforeseen and Erroneous Protocol Data

Section 10 of [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

History

Document history		
V9.0.0	February 2010	Publication