ETSI TS 136 444 V12.2.0 (2015-04)

LTE;
Evolved Universal Terrestrial
Radio Access Network (E-UTRAN);
M3 Application Protocol (M3AP)
(3GPP TS 36.444 version 12.2.0 Release 12)

Reference
RTS/TSGR-0336444vc20

Keywords
LTE

ETSI

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Sous-Préfecture de Grasse (06) N° 7803/88

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Contents

Foreword

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  - 2 presented to TSG for approval;
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1 Scope

The present document specifies the E-UTRAN radio network layer signalling protocol for the M3 interface. The M3 Application Protocol (M3AP) supports the functions of M3 interface by signalling procedures defined in this document. M3AP is developed in accordance to the general principles stated in TS 36.401 [2] and TS 36.300 [3].

2 References

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

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

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

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

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

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

[5] ITU-T Recommendation X.680 (2002-07): "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[6] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description".

[7] 3GPP TS 23.203: "Policy and charging control architecture"

[8] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[9] 3GPP TS 36.445: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); M1 Data Transport".

[10] 3GPP TS 48.018: "General Packet Radio Service (GPRS); BSS GPRS Protocol (BSSGP)".

[11] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[12] 3GPP TS 29.281: "General Packet Radio Service (GPRS); Tunnelling Protocol User Plane (GTPv1-U)".

[13] 3GPP TS 23.003: "Technical Specification Group Core Network and Terminals; Numbering, addressing and identification".

[14] 3GPP TS 23.007: "Technical Specification Group Core Network and Terminals; Restoration procedures".

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: M3AP consists of Elementary Procedures (EPs). An Elementary Procedure is a unit of interaction between MCEs and the EPC. 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 M3AP EPs together or together with EPs from other interfaces is specified in stage 2 specifications (e.g. TS 23.246 [6] and TS 36.300 [3]).

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.

MCE MBMS M3AP ID: Unique identity, referencing the MBMS-service-associated logical M3-connection within an MCE.

MME MBMS M3AP ID: Unique identity, referencing the MBMS-service-associated logical M3-connection within an MME.

MBMS E-RAB: An MBMS E-RAB refers to the concatenation of an M1 bearer and the corresponding radio bearer, as defined in TS 36.300 [3].

MBMS-service-associated signalling: When M3AP messages associated to one MBMS service uses the MBMS-service-associated logical M3-connection for association of the message to the MBMS service in MCE and EPC.

MBMS-service-associated logical M3-connection: The MBMS-service-associated logical M3-connection uses the identities *MME MBMS M3AP ID* and *MCE MBMS M3AP ID*. For a received MBMS service associated M3AP message the MME identifies the associated MBMS service based on the *MME MBMS M3AP ID* IE and the MCE identifies the associated MBMS service based on the *MCE MBMS M3AP ID* IE.

3.2 Symbols

Not applicable.

3.3 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].

DL	Downlink
E-RAB	E-UTRAN Radio Access Bearer
eNB	E-UTRAN NodeB
EP	Elementary Procedure
EPC	Evolved Packet Core
E-UTRAN	Evolved UTRAN
GBR	Guaranteed Bit Rate
GTP	GPRS Tunneling Protocol
IE	Information Element
MBMS	Multimedia Broadcast Multicast Service
MBSFN	Multimedia Broadcast multicast service Single Frequency Network
MCE	Multi-cell/multicast Coordination Entity
MME	Mobility Management Entity
NAS	Non-Access Stratum
PLMN	Public Land Mobile Network
QoS	Quality of Service
TEID	Tunnel Endpoint Identifier
UE	User Equipment
UL	Uplink

4 General

4.1 Procedure specification principles

The principle for specifying the procedure logic is to specify the functional behaviour of the MCE exactly and completely. The EPC functional behaviour is left unspecified.

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.

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. MBMS 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 M3AP Services

M3AP provides the signalling service between MCE and EPC that is required to fulfil the M3AP functions described in clause 7. M3AP services are defined as

MBMS associated services: They are related to the whole M3 interface instance between the MCE and MME utilising an MBMS associated signalling connection.

Non MBMS associated services: They are related to the whole M3 interface instance between the MCE and MME utilising a Non MBMS associated signalling connection.

6 Services Expected from Signalling Transport

The signalling connection shall provide in sequence delivery of M3AP messages. M3AP shall be notified if the signalling connection breaks.

7 Functions of M3AP

The M3AP protocol provides the following functions:

- Session Management. This overall functionality is responsible for starting, stopping and updating MBMS sessions.
- Reset functionality to ensure a well defined initialisation on the M3 interface.
- Error Indication functionality to allow a proper error reporting/handling in cases where no failure messages are defined.
- M3 Setup functionality for initial M3 interface setup for providing configuration information.
- MCE Configuration Update function is to update application level configuration data needed for the MCE and MME to interoperate correctly on the M3 interface.

The mapping between the above functions and M3 EPs is shown in the table below.

Table 7-1: Mapping between M3AP functions and M3AP EPs

Function	Elementary Procedure(s)
Session Management	a) MBMS Session Start b) MBMS Session Stop c) MBMS Session Update
Error Indication Functionality	Error Indication
Reset Functionality	Reset
M3 Setup	M3 Setup
Configuration Update	MCE Configuration Update

8 M3AP Procedures

8.1 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 8-1: 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 Session Update	MBMS SESSION UPDATE REQUEST	MBMS SESSION UPDATE RESPONSE	MBMS SESSION UPDATE FAILURE
Reset	RESET	RESET ACKNOWLEDGE	
M3 Setup	M3 SETUP REQUEST	M3 SETUP RESPONSE	M3 SETUP FAILURE
MCE Configuration Update	MCE CONFIGURATION UPDATE	MCE CONFIGURATION UPDATE ACKNOWLEDGE	MCE CONFIGURATION UPDATE FAILURE

Table 8-2: 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 MCE to determine whether an MBMS E-RAB for an upcoming MBMS Session for a given MBMS Bearer Service can be accommodated by the E-UTRAN. The MCE is also requested to establish an MBMS service associated logical M3 connection. The MBMS Session Start procedure is triggered by the EPC (MME).

The procedure uses MBMS Service associated signaling.

8.2.2 Successful Operation

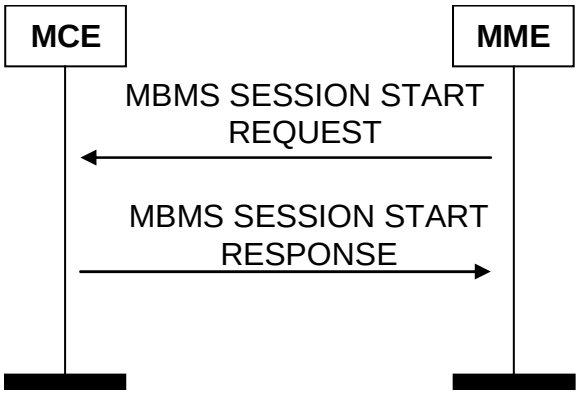

Figure 8.2.2-1: MBMS Session Start procedure. Successful operation.

The MME initiates the procedure by sending an MBMS SESSION START REQUEST message to the MCE.

The MCE shall use the information in the *MBMS E-RAB QoS parameters* IE to determine whether the requested configuration can be accommodated within E-UTRAN.

If the *Time of MBMS Data Transfer* IE is included in the MBMS SESSION START REQUEST message, the MCE shall, if supported, take it into account for the synchronization of the corresponding MCCH Update instead of the *Minimum Time to MBMS Data Transfer* IE. The MCE shall ensure the eNB applies the MCCH update from the last modification period before the time indicated by the *Time of MBMS Data Transfer* IE.

If the MCE receives the MBMS SESSION START REQUEST message including the *Re-establishment* IE for a service which is already ongoing, it shall, if supported, accept this message and replace the MBMS context for that service (see TS 23.007 [14]).

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

The MCE shall establish or modify the resources according to the values of the *Allocation and Retention Priority* IE (priority level and pre-emption indicators) and the resource situation as follows:

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

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

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

8.2.3 Unsuccessful Operation

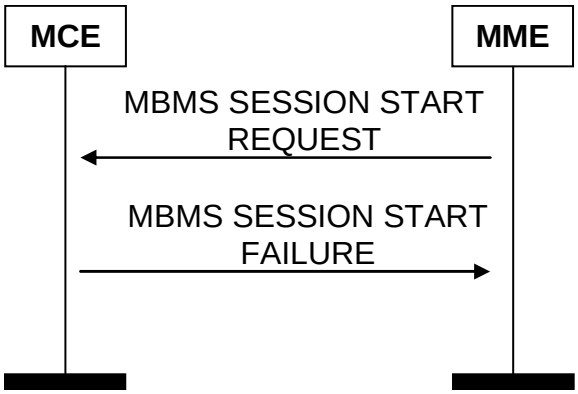

Figure 8.2.3-1: MBMS Session Start procedure. Unsuccessful operation.

If the MCE determines that the E-UTRAN is not able to accommodate the requested configuration for any MBSFN area of the requested service area (e.g. the necessary MBMS resources for the MBMS Session could not be established in any MBSFN area of the requested service area), the MME shall be informed by the MBMS SESSION START FAILURE message including a suitable cause value.

8.2.4 Abnormal Conditions

Not applicable.

8.3 MBMS Session Stop

8.3.1 General

The purpose of the MBMS Session Stop procedure is to inform the MCE about the end of an ongoing MBMS Session for a given MBMS Bearer Service, and that the E-UTRAN releases the allocated MBMS E-RAB resources and that the associated MBMS service associated logical M3 connection is also released. The MBMS Session Stop procedure is triggered by the EPC (MME).

The procedure uses MBMS Service associated signaling.

8.3.2 Successful Operation

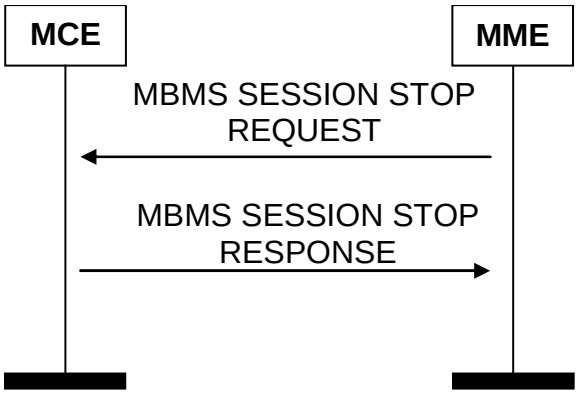

Figure 8.3.2-1: MBMS Session Stop procedure. Successful operation.

The MME initiates the procedure by sending an MBMS SESSION STOP REQUEST message to the MCE. Upon receipt of the MBMS SESSION STOP REQUEST message, the MCE shall send the MBMS SESSION STOP RESPONSE message after the MCE releases the affected resources and removes the MBMS bearer context.

If the *Time of MBMS Data Stop* IE is included in the MBMS SESSION STOP REQUEST message, the MCE shall, if supported, take it into account for the synchronization of the corresponding MCCH Update. The MCE shall ensure the eNB applies the MCCH update from the first modification period after the time indicated by the *Time of MBMS Data Stop* IE.

8.3.3 Unsuccessful Operation

Not applicable.

8.3.4 Abnormal Conditions

Not applicable.

8.4 Error Indication

8.4.1 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.

8.4.2 Successful Operation

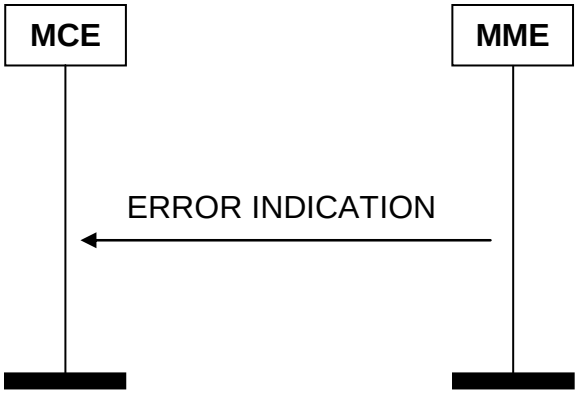

Figure 8.4.2-1. Error Indication procedure, MME originated. Successful operation.

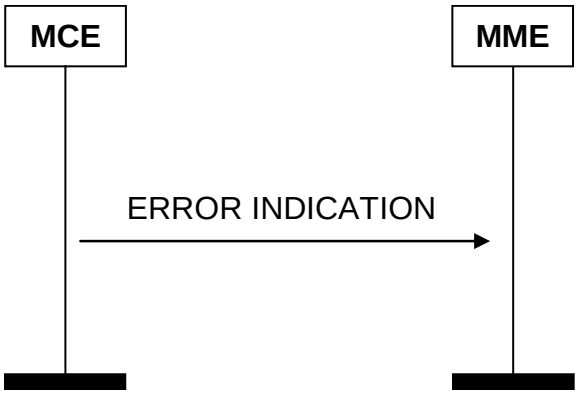

Figure 8.4.2.1-2. Error Indication procedure, MCE originated. Successful operation.

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 M3AP ID* IE and the *MME MBMS M3AP* IE shall be included in the ERROR INDICATION message. If one or both of *MCE MBMS M3AP ID* IE and the *MME MBMS M3AP* IE are not correct, the cause shall be set to appropriate value e.g. "Unknown or already allocated MCE MBMS M3AP ID", "Unknown or already allocated MME MBMS M3AP ID" or "Unknown or inconsistent pair of MBMS M3AP ID".

8.4.3 Abnormal Conditions

8.5 Reset

8.5.1 General

The purpose of the Reset procedure is to initialise or re-initialise the E-UTRAN, or part of E-UTRAN M3AP MBMS-related contexts, in the event of a failure in the EPC or vice versa. This procedure does not affect the application level configuration data exchanged during, e.g. the M3 Setup procedure.

The procedure uses non MBMS-service associated signalling.

8.5.2 Successful Operation

8.5.2.1 Reset Procedure Initiated from the MME

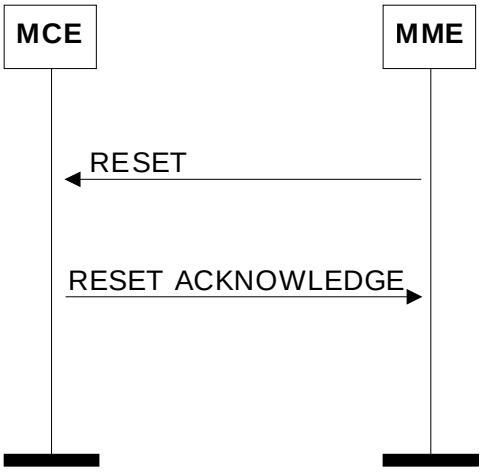

Figure 8.5.2.1-1: Reset procedure initiated from the MME. Successful operation.

In the event of a failure at the MME, 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 M3 related to MBMS-service association(s) indicated explicitly or implicitly in the RESET message and remove the MBMS-service contexts including MBMS M3AP IDs for the indicated MBMS service associations.

After the MCE has released all assigned M3 resources and the MBMS M3AP IDs for all indicated MBMS service associations which can be used for new MBMS-service-associated logical M3-connections over the M3 interface, the MCE shall respond with the RESET ACKNOWLEDGE message.

If the RESET message contains the *MBMS-Service-associated logical M3-connection list* IE, then:

- The MCE shall use the *MME MBMS M3AP ID* IE and/or the *MCE MBMS M3AP ID* IE to explicitly identify the MBMS service association(s) to be reset.

- The MCE shall in the RESET ACKNOWLEDGE message include, for each MBMS service association to be reset, the *MBMS-Service-associated logical M3-connection Item* IE in the *MBMS-Service-associated logical M3-connection list* IE. The *MBMS-Service -associated logical M3-connection Item* IEs shall be in the same order as received in the RESET message and shall include also unknown MBMS-Service-associated logical M3-connections. Empty *MBMS-Service-associated logical M3-connection Item* IEs, received in the RESET message, may be omitted in the RESET ACKNOWLEDGE message.

- If the *MME MBMS M3AP ID* IE is included in the *MBMS-Service-associated logical M3-connection Item* IE for an MBMS service association, the MCE shall include the *MME MBMS M3AP ID* IE in the corresponding *MBMS-Service-associated logical M3-connection Item* IE in the RESET ACKNOWLEDGE message.

- If the *MCE MBMS M3AP ID* IE is included in an *MBMS-Service-associated logical M3-connection Item* IE for an MBMS service association, the MCE shall include the *MCE MBMS M3AP ID* IE in the corresponding *MBMS-Service-associated logical M3-connection Item* IE in the RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except another Reset procedure) on the same M3 interface related to an MBMS service association, indicated explicitly or implicitly in the RESET message, shall be aborted.

8.5.2.2 Reset Procedure Initiated from the E-UTRAN

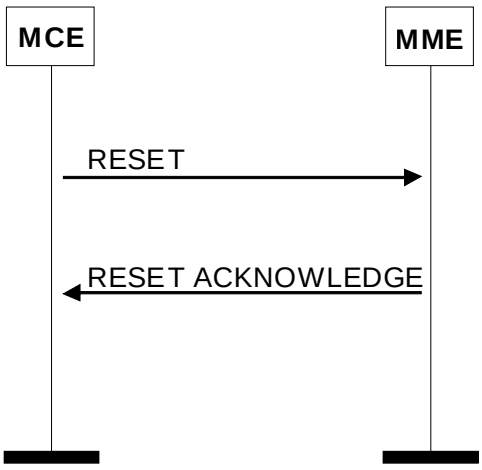

Figure 8.5.2.2-1: Reset procedure initiated from the E-UTRAN. Successful operation.

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 MME.

At reception of RESET message the MME shall release all allocated resources on M3 related to the MBMS service association(s) indicated explicitly or implicitly in the RESET message and remove the MBMS M3AP ID for the indicated MBMS service associations.

After the MME has released all assigned M3 resources and the MBMS M3AP IDs for all indicated MBMS service associations which can be used for new MBMS-service-associated logical M3-connections over the M3 interface, the MME shall respond with the RESET ACKNOWLEDGE message.

If the RESET message contains the *MBMS-Service-associated logical M3-connection list* IE, then:

- The MME shall use the *MME MBMS M3AP ID* IE and/or the *MCE MBMS M3AP ID* IE to explicitly identify the MBMS service association(s) to be reset.

- The MME shall in the RESET ACKNOWLEDGE message include, for each MBMS service association to be reset, the *MBMS-Service-associated logical M3-connection Item* IE in the *MBMS-Service-associated logical M3-connection list* IE. The *MBMS-Service -associated logical M3-connection Item* IEs shall be in the same order as received in the RESET message and shall include also unknown MBMS-Service-associated logical M3-

connections. Empty *MBMS-Service-associated logical M3-connection Item* IEs, received in the RESET message, may be omitted in the RESET ACKNOWLEDGE message.

- If the *MME MBMS M3AP ID* IE is included in the *MBMS-Service-associated logical M3-connection Item* IE for an MBMS service association, the MME shall include the *MME MBMS M3AP ID* IE in the corresponding *MBMS-Service-associated logical M3-connection Item* IE in the RESET ACKNOWLEDGE message.

- If the *MCE MBMS M3AP ID* IE is included in an *MBMS-Service-associated logical M3-connection Item* IE for an MBMS service association, the MME shall include the MCE *MBMS M3AP ID* IE in the corresponding *MBMS-Service-associated logical M3-connection Item* IE in the RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except another Reset procedure) on the same M3 interface related to an MBMS service association, indicated explicitly or implicitly in the RESET message, shall be aborted.

8.5.3 Abnormal Conditions

8.5.3.1 Abnormal Condition at the EPC

If the RESET message includes the *MBMS-Service-associated logical M3-connection list* IE, but neither the *MME MBMS M3AP ID* IE nor the *MCE MBMS M3AP ID* IE is present for an *MBMS-Service-associated logical M3-connection Item* IE, then the MME shall ignore the *MBMS-Service-associated logical M3-connection Item* IE. The MME may return the empty *MBMS-Service-associated logical M3-connection Item* IE in the *MBMS-Service-associated logical M3-connection list* IE in the RESET ACKNOWLEDGE message.

8.5.3.2 Abnormal Condition at the E-UTRAN

If the RESET message includes the *MBMS-Service-associated logical M3-connection list* IE, but neither the *MME MBMS M3AP ID* IE nor the *MCE MBMS M3AP ID* IE is present for an *MBMS-Service-associated logical M3-connection Item* IE, then the MCE shall ignore the *MBMS-Service-associated logical M3-connection Item* IE. The MCE may return the empty *MBMS-Service-associated logical M3-connection Item* IE in the *MBMS-Service-associated logical M3-connection list* IE in the RESET ACKNOWLEDGE message.

8.5.3.3 Crossing of Reset Messages

If Reset procedure is ongoing in MCE and the MCE receives a RESET message from the peer entity on the same M3 interface related to one or several MBMS service associations previously requested to be reset, indicated explicitly or implicitly in the received RESET message, the MCE shall respond with RESET ACKNOWLEDGE message as described in 8.5.2.1.

If Reset procedure is ongoing in MME and the MME receives a RESET message from the peer entity on the same M3 interface related to one or several MBMS service associations previously requested to be reset, indicated explicitly or implicitly in the received RESET message, the MME shall respond with RESET ACKNOWLEDGE message as described in 8.5.2.2.

8.6 MBMS Session Update

8.6.1 General

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

The procedure uses MBMS-Service-associated signalling.

8.6.2 Successful Operation

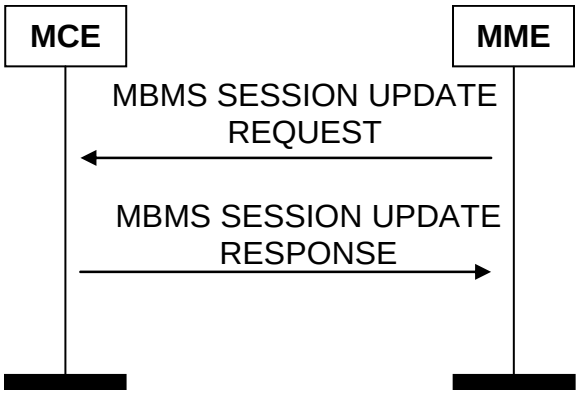

Figure 8.6.2-1. MBMS Session Update procedure. Successful operation.

The MME initiates the procedure by sending an MBMS SESSION UPDATE REQUEST message to the MCE.

The MCE shall use the information contained in the MBMS SESSION UPDATE REQUEST message to update its own parameters of this session such as the service area parameters or the allocation and retention priority (ARP) of the session. If the ARP parameter is updated, the corresponding update of resources shall follow the principles described for the MBMS Session Start procedure. The MCE shall then, if needed, transfer the updated parameters to the involved eNBs according to the service area.

If the *Time of MBMS Data Transfer* IE is included in the MBMS SESSION UPDATE REQUEST message, the MCE shall, if supported, take it into account for the synchronization of the corresponding MCCH Update instead of the *Minimum Time to MBMS Data Transfer* IE. The MCE shall ensure the eNB applies the MCCH update from the last modification period before the time indicated by the *Time of MBMS Data Transfer* IE. The MCE shall ignore the information contained in the received *Minimum Time to MBMS Data Transfer* IE.

After receiving the response from the involved eNBs the MCE shall report to the MME in the MBMS SESSION UPDATE RESPONSE message the result of the update.

8.6.3 Unsuccessful Operation

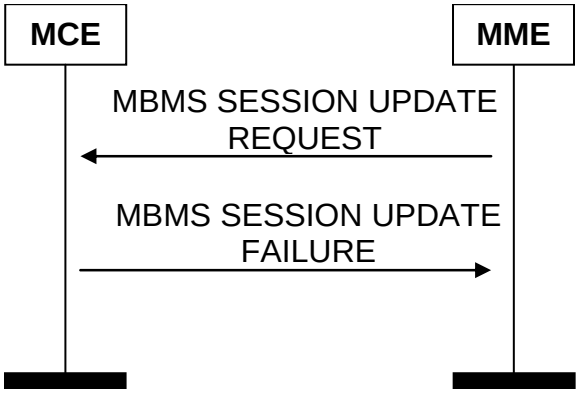

Figure 8.6.3-1: MBMS Session Update procedure. Unsuccessful operation.

If the MCE determines that the E-UTRAN is not able to accommodate the requested updating, the MCE shall send to the MME the MBMS SESSION UPDATE FAILURE message.

8.6.4 Abnormal Conditions

Not applicable.

8.7 M3 Setup

8.7.1 General

The purpose of the M3 Setup procedure is to exchange application level data needed for the MCE and MME to correctly interoperate on the M3 interface. The procedure uses non MBMS-service associated signalling.

This procedure erases any existing application level data in the MCE and the MME and replaces it by the one received. This procedure also re-initialises the E-UTRAN M3AP service-related contexts (if any) and erases all related MBMS-service-associated logical M3 connections in the two nodes like a Reset procedure would do.

8.7.2 Successful Operation

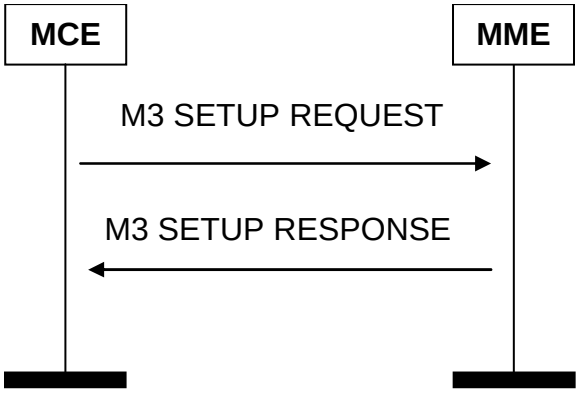

Figure 8.7.2-1: M3 Setup procedure- Successful operation.

The MCE initiates the procedure by sending a M3 SETUP REQUEST message including the appropriate data to the MME. The MME responds with a M3 SETUP RESPONSE.

The exchanged data shall be stored in respective node and used for the duration of the TNL association.

If the M3 SETUP REQUEST message contains the *MCE Name* IE the MME may use this IE as a human readable name of the MCE.

8.7.3 Unsuccessful Operation

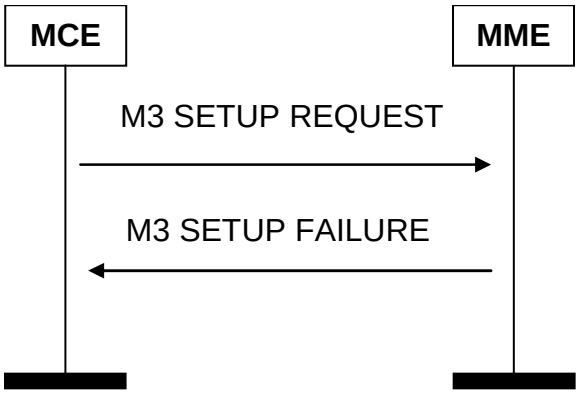

Figure 8.7.3-1: M3 Setup procedure. Unsuccessful operation.

If the MME cannot accept the setup, it should respond with a M3 SETUP FAILURE and appropriate cause value.

If the M3 SETUP FAILURE message includes the *Time To Wait* IE the MCE shall wait at least for the indicated time before reinitiating the M3 setup towards the same MME.

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 MCE and MME to interoperate correctly on the M3 interface.

The procedure uses non MBMS-service-associated signalling.

8.8.2 Successful Operation

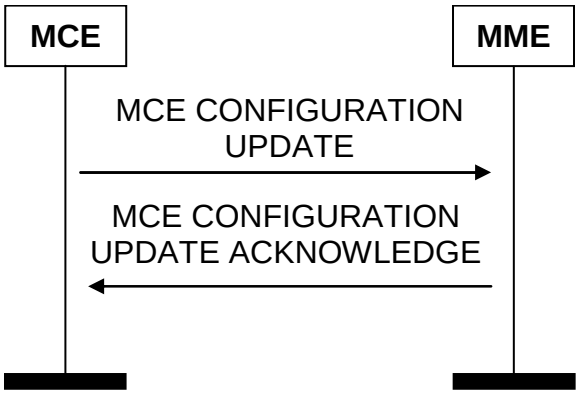

Figure 8.8.2-1: MCE Configuration Update procedure. Successful operation.

The MCE initiates the procedure by sending an MCE CONFIGURATION UPDATE message to the MME including an appropriate set of updated configuration data that it has just taken into operational use. The MME responds with MCE CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data. If information element(s) is/are not included in the MCE CONFIGURATION UPDATE message, the MME shall interpret that the corresponding configuration data is/are not changed and shall continue to operate the M3 with the existing related configuration data.

If the served MBMS Service Areas are to be updated, the complete set of supported MBMS Service Area Identities shall be included in the *MBMS Service Area List* IE.

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

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

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

8.8.3 Unsuccessful Operation

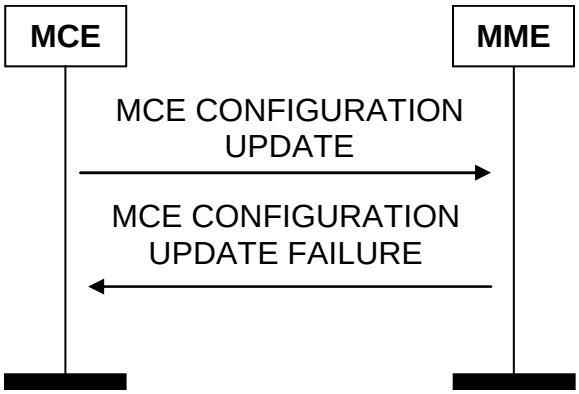

Figure 8.8.3-1: MCE Configuration Update procedure. Unsuccessful operation.

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

If the MCE CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE, the MCE shall wait at least for the indicated time before reinitiating the MCE Configuration Update procedure towards the MME. Both nodes shall continue to operate the M3 interface with their respective configuration data.

8.8.4 Abnormal Conditions

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

9 Elements for M3AP Communication

9.1 Message Functional Definition and Content

9.1.1 General

Subclauses 9.1 and 9.2 describe the structure of the messages and information elements required for the M3AP protocol in tabular format. Subclause 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.

9.1.2 Message Contents

9.1.2.1 Presence

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

Table 9-1: Meaning of abbreviations used in M3AP 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.

9.1.2.2 Criticality

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

Table 9-2: 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.

9.1.2.3 Range

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

9.1.2.4 Assigned Criticality

This column provides the actual criticality information as defined in subclause 10.3.2, if applicable.

9.1.3 MBMS SESSION START REQUEST

This message is sent by the MME to establish an MBMS E-RAB and an M3AP signalling connection.

Direction: MME → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME MBMS M3AP ID	M		9.2.3.2		YES	reject
TMGI	M		9.2.3.3		YES	reject
MBMS Session Identity	O		9.2.3.4		YES	ignore
MBMS 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
Minimum Time to MBMS Data Transfer	M		9.2.3.8		YES	reject
TNL Information	M				YES	reject
>IP Multicast Address	M		9.2.2.1		-	
>IP Source Address	M		9.2.2.1		-	
>GTP DL TEID	M		GTP TEID 9.2.2.2		-	
Time of MBMS Data Transfer	O		9.2.3.9		YES	ignore
Re-establishment	O		9.2.3.10		YES	ignore

9.1.4 MBMS SESSION START RESPONSE

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

Direction: MCE → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME MBMS M3AP ID	M		9.2.3.2		YES	ignore
MCE MBMS M3AP ID	M		9.2.3.1		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.5 MBMS SESSION START FAILURE

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

Direction: MCE → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME MBMS M3AP ID	M		9.2.3.2		YES	ignore
Cause	M		9.2.1.2		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.6 MBMS SESSION STOP REQUEST

This message is sent by the MME to release the corresponding MBMS E-RAB and the MBMS service associated logical M3 connection.

Direction: MME → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME MBMS M3AP ID	M		9.2.3.2		YES	reject
MCE MBMS M3AP ID	M		9.2.3.1		YES	reject
Time of MBMS Data Stop	O		9.2.3.9		YES	ignore

9.1.7 MBMS SESSION STOP RESPONSE

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

Direction: MCE → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME MBMS M3AP ID	M		9.2.3.2		YES	ignore
MCE MBMS M3AP ID	M		9.2.3.1		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.8 ERROR INDICATION

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

Direction: MCE → MME and MME → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME MBMS M3AP ID	O		9.2.3.2		YES	ignore
MCE MBMS M3AP ID	O		9.2.3.1		YES	ignore
Cause	O		9.2.1.2		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.9 RESET

This message is sent by both the MME and the MCE and is used to request that the M3 interface, or parts of the M3 interface, to be reset.

Direction: MME → MCE and MCE → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Cause	M		9.2.1.2		YES	ignore
CHOICE *Reset Type*	M				YES	reject
>M3 interface						
>>Reset All	M		ENUMERATED (Reset all, …)		–	–
>Part of M3 interface						
>>MBMS-Service-associated logical M3-connection list		*1*			–	–
>>>MBMS-Service - associated logical M3-connection Item		*1 to < maxnoofIndividualM3ConnectionsToReset >*			EACH	reject
>>>>MME MBMS M3AP ID	O		9.2.3.2		–	–
>>>>MCE MBMS M3AP ID	O		9.2.3.1		–	–

Range bound	Explanation
maxnoofIndividualM3ConnectionsToReset	Maximum no. of MBMS-Service-associated logical M3-connections allowed to reset in one message. Value is 256.

9.1.10 RESET ACKNOWLEDGE

This message is sent by both the MME and the MCE as a response to a RESET message.

Direction: MCE → MME and MME → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MBMS-Service-associated logical M3-connection list		*0..1*			YES	ignore
>MBMS-Service - associated logical M3-connection Item		*1 to < maxnoofIndividualM3ConnectionsToReset >*			EACH	ignore
>>MME MBMS M3AP ID	O		9.2.3.2		–	–
>>MCE MBMS M3AP ID	O		9.2.3.1		–	–
Criticality Diagnostics	O		9.2.1.7		YES	ignore

Range bound	Explanation
maxnoofIndividualM3ConnectionsToReset	Maximum no. of MBMS-Service-ssociated logical M3-connections allowed to reset in one message. Value is 256.

9.1.11 MBMS SESSION UPDATE REQUEST

This message is sent by the MME to inform the MCE of the changed characteristics of an ongoing MBMS service session.

Direction: MME → MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME MBMS M3AP ID	M		9.2.3.2		YES	reject
MCE MBMS M3AP 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	O		9.2.3.6		YES	ignore
Minimum Time to MBMS Data Transfer	M		9.2.3.8		YES	reject
TNL Information	O				YES	ignore
>IP Multicast Address	M		9.2.2.1		-	
>IP Source Address	M		IP Address 9.2.2.1		-	
>GTP DL TEID	M		GTP TEID 9.2.2.2		-	
Time of MBMS Data Transfer	O		9.2.3.9		YES	ignore

9.1.12 MBMS SESSION UPDATE RESPONSE

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

Direction: MCE → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME MBMS M3AP ID	M		9.2.3.2		YES	ignore
MCE MBMS M3AP ID	M		9.2.3.1		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.13 MBMS SESSION UPDATE FAILURE

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

Direction: MCE → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME MBMS M3AP ID	M		9.2.3.2		YES	ignore
MCE MBMS M3AP 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

9.1.14 M3 SETUP REQUEST

This message is sent by the MCE to transfer information for a TNL association.

Direction: MCE → MME.

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		9.2.1.10		YES	reject
MCE Name	O		PrintableString(SIZE(1…150,…))		YES	ignore
MBMS Service Area List		*1*			YES	reject
>**MBMS Service Area List Item**		*1 to <maxnoofMBMSServiceAreaIdentitiesPerMCE>*		Supported MBMS Service Area Identities in the MCE	GLOBAL	reject
>>MBMS Service Area 1	M		OCTET STRING(SIZE(2))	MBMS Service Area Identities as defined in TS 23.003 [13].		

Range bound	Explanation
maxnoofMBMSServiceAreaIdentitiesPerMCE	Maximum no. of Service Area Identities per MCE. The value for maxnoofMBMSServiceAreaIdentities is 65536.

9.1.15 M3 SETUP RESPONSE

This message is sent by the MME to tranfer information for a TNL association.

Direction: MME → 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

9.1.16 M3 SETUP FAILURE

This message is sent by the MME to indicate M3 Setup failure.

Direction: MME → 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		9.2.1.9		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.1.17 MCE CONFIGURATION UPDATE

This message is sent by the MCE transfer updated information for a TNL association.

Direction: MCE → MME.

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		9.2.1.10		YES	reject
MCE Name	O		PrintableString (SIZE(1…150, …))		YES	ignore
MBMS Service Area List		*0..1*			YES	reject
>MBMS Service Area List Item		*1 to <maxnoofMBMSServiceAreaIdentitiesPerMCE>*		Supported MBMS Service Area Identities in the MCE	GLOBAL	reject
>>MBMS Service Area 1	M		OCTET STRING(SIZE(2))	MBMS Service Area Identities as defined in TS 23.003 [13].		

Range bound	Explanation
maxnoofMBMSServiceAreaIdentitiesPerMCE	Maximum no. of Service Area Identities per MCE. The value for maxnoofMBMSServiceAreaIdentities is 65536.

9.1.18 MCE CONFIGURATION UPDATE ACKNOWLEDGE

This message is sent by the MME to acknowledge the MCE updated information for a TNL association.

Direction: MME → MCE.

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

9.1.19 MCE CONFIGURATION UPDATE FAILURE

This message is sent by the MME to indicate MCE configuration failure.

Direction: MME → 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		9.2.1.9		YES	ignore
Criticality Diagnostics	O		9.2.1.7		YES	ignore

9.2 Information Element Definitions

9.2.0 General

Subclause 9.2 presents the M3AP IE definitions in tabular format. The corresponding ASN.1 definition is presented in subclause 9.3. In case there is contradiction between the tabular format in subclause 9.2 and the ASN.1 definition, the ASN.1 shall take precedence, except for the definition of conditions for the presence of conditional elements, where the tabular format shall take precedence.

When specifying information elements which are to be represented by bitstrings, if not otherwise specifically stated in the semantics description of the concerned IE or elsewhere, the following principle applies with regards to the ordering of bits:

- The first bit (leftmost bit) contains the most significant bit (MSB);
- The last bit (rightmost bit) contains the least significant bit (LSB);
- When importing bitstrings from other specifications, the first bit of the bitstring contains the first bit of the concerned information;

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		(MBMS Session Start, MBMS Session Stop, MBMS Session Update, Error Indication, Reset, M3 Setup, MCE Configuration Update, …)	
>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 M3AP 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 M3AP ID, Unknown or already allocated MME MBMS M3AP ID, Unknown or inconsistent pair of MBMS M3AP 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, Not enough User Plane Processing Resources, 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 M3AP ID	The action failed because the MCE MBMS M3AP ID is either unknown, or (for a first message received at the MCE) is known and already allocated to an existing MBMS service related context.
Unknown or already allocated MME MBMS M3AP ID	The action failed because the MME MBMS M3AP 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 M3AP IDs	The action failed because both MBMS M3AP 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.
Not enough User Plane Processing Resources	No requested user plane resources are available.
Hardware Failure	Action related to hardware failure.
O&M Intervention	The action is due to O&M intervention.
Unspecified Failure	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	Criticality	Assigned Criticality
MBMS E-RAB QoS Parameters						
>QCI	M		INTEGER (0..255)	QoS Class Identifier defined in TS 23.246 [6]. Coding is specified in TS 23.203 [7].		
>GBR QoS Information	O		9.2.1.5	This IE applies to GBR bearers only and shall be ignored otherwise.		
>Allocation and Retention Priority	M		9.2.1.8		YES	ignore

9.2.1.4 Void

9.2.1.5 GBR QoS Information

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

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

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 Allocation and Retention Priority

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

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

9.2.1.9 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, …)	

9.2.1.10 Global MCE ID

This IE is used to globally identify an MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.7	
MCE ID	M		OCTET STRING (SIZE(2))	
MCE ID Extension	O		OCTET STRING (SIZE(1))	Extension of the Global MCE ID.

9.2.2 Transport Network Layer Related IEs

9.2.2.1 IP Address

This information element is an IP address to be used for the user plane transport.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Transport Layer Address	M		OCTET STRING (SIZE(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. TS 36.445 [9].

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 (SIZE(4))	For details and range, see TS 29.281 [12]

9.2.3 NAS Related IEs

9.2.3.1 MCE MBMS M3AP ID

The MCE MBMS M3AP ID uniquely identifies the MBMS Service association over the M3 interface within the MCE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MCE MBMS M3AP ID	M		INTEGER (0 .. 65535)	

9.2.3.2 MME MBMS M3AP ID

The MME MBMS M3AP ID uniquely identifies the MBMS Service association over the M3 interface within the MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MME MBMS M3AP ID	M		INTEGER (0 .. 65535)	

9.2.3.3 TMGI

The TMGI uniquely identifies the MBMS Bearer Service.

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

9.2.3.4 MBMS Session Identity

The MBMS Session Identity identifies the session of 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 TS 29.061 [8].

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 TS 29.061 [8].

9.2.3.6 MBMS Service Area

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MBMS Service Area	M		OCTET STRING	Value part coded per MBMS Service Area AVP as defined in TS 29.061 [8].

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).

9.2.3.8 Minimum Time to MBMS Data Transfer

This IE denotes the minimum time occurring between the transmission of the MBMS SESSION START REQUEST message to the MCE and the actual start of the data transfer. The coding of this element is described in TS 48.018 [10].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Minimum Time to MBMS Data Transfer	M		OCTET STRING (SIZE (1))	Coded as the value part of *Time to MBMS Data Transfer* IE defined in TS 48.018 [10].

9.2.3.9 Absolute Time of MBMS Data

This IE denotes the absolute time of the actual start or stop of the MBMS data transfer.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Absolute Time of MBMS Data	M		BIT STRING (SIZE(64))	Time in seconds relative to 00:00:00 on 1 January 1900 (calculated as continuous time without leap seconds and traceable to a common time reference) where binary encoding of the integer part is in the first 32 bits and binary encoding of the fraction part in the last 32 bits. The fraction part is expressed with a granularity of 1 /2**32 second.

9.2.3.10 Re-establishment

This IE allows identification of the serving MME during some restoration scenarios. Restoration functions are specified in TS 23.007 [14].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Re-establishment	M		ENUMERATED(true, …)	

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

9.3.1 General

M3AP ASN.1 definition conforms with ITU-T Rec. X.691 [4] and ITU-T Rec. X.680 [5].

Sub clause 9.3 presents the Abstract Syntax of the M3AP 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 M3AP messages. M3AP 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 M3AP 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 M3AP 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
--
-- **************************************************************
```

```
M3AP-PDU-Descriptions {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m3ap (5) version1 (1) m3ap-PDU-Descriptions (0) }
DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode
FROM M3AP-CommonDataTypes

    MBMSSessionStartRequest,
    MBMSSessionStartResponse,
    MBMSSessionStartFailure,
    MBMSSessionStopRequest,
    MBMSSessionStopResponse,
    MBMSSessionUpdateRequest,
    MBMSSessionUpdateResponse,
    MBMSSessionUpdateFailure,
    MCEConfigurationUpdate,
    MCEConfigurationUpdateAcknowledge,
    MCEConfigurationUpdateFailure,
    M3SetupRequest,
    M3SetupResponse,
    M3SetupFailure,
    ErrorIndication,
    Reset,
    ResetAcknowledge,
    PrivateMessage

FROM M3AP-PDU-Contents

    id-mBMSsessionStart,
    id-mBMSsessionStop,
    id-mBMSsessionUpdate,
    id-mCEConfigurationUpdate,
    id-m3Setup,
    id-errorIndication,
    id-Reset,
    id-privateMessage
FROM M3AP-Constants;


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

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

M3AP-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
--
-- ********************************************************

M3AP-PDU ::= CHOICE {
    initiatingMessage   InitiatingMessage,
    successfulOutcome   SuccessfulOutcome,
    unsuccessfulOutcome UnsuccessfulOutcome,
    ...
}

InitiatingMessage ::= SEQUENCE {
    procedureCode   M3AP-ELEMENTARY-PROCEDURE.&procedureCode        ({M3AP-ELEMENTARY-PROCEDURES}),
    criticality     M3AP-ELEMENTARY-PROCEDURE.&criticality          ({M3AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value           M3AP-ELEMENTARY-PROCEDURE.&InitiatingMessage    ({M3AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

SuccessfulOutcome ::= SEQUENCE {
    procedureCode   M3AP-ELEMENTARY-PROCEDURE.&procedureCode        ({M3AP-ELEMENTARY-PROCEDURES}),
    criticality     M3AP-ELEMENTARY-PROCEDURE.&criticality          ({M3AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value           M3AP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome    ({M3AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode   M3AP-ELEMENTARY-PROCEDURE.&procedureCode        ({M3AP-ELEMENTARY-PROCEDURES}),
    criticality     M3AP-ELEMENTARY-PROCEDURE.&criticality          ({M3AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value           M3AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome  ({M3AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}


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

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

M3AP-ELEMENTARY-PROCEDURES M3AP-ELEMENTARY-PROCEDURE ::= {
    M3AP-ELEMENTARY-PROCEDURES-CLASS-1          |
    M3AP-ELEMENTARY-PROCEDURES-CLASS-2          ,
    ...
}

M3AP-ELEMENTARY-PROCEDURES-CLASS-1 M3AP-ELEMENTARY-PROCEDURE ::= {
    mBMSsessionStart                                            |
    mBMSsessionStop                                             |
    mBMSsessionUpdate                                           |
    reset                                                       |
    m3Setup                                                     |
    mCEConfigurationUpdate                                      ,
    ...
}

M3AP-ELEMENTARY-PROCEDURES-CLASS-2 M3AP-ELEMENTARY-PROCEDURE ::= {
    errorIndication                         |
    privateMessage                          ,
    ...

}


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

mBMSsessionStart M3AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MBMSSessionStartRequest
    SUCCESSFUL OUTCOME      MBMSSessionStartResponse
    UNSUCCESSFUL OUTCOME    MBMSSessionStartFailure
    PROCEDURE CODE          id-mBMSsessionStart
    CRITICALITY             reject
}

mBMSsessionStop M3AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MBMSSessionStopRequest
    SUCCESSFUL OUTCOME      MBMSSessionStopResponse
    PROCEDURE CODE          id-mBMSsessionStop
    CRITICALITY             reject
}

mBMSsessionUpdate M3AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MBMSSessionUpdateRequest
    SUCCESSFUL OUTCOME      MBMSSessionUpdateResponse
    UNSUCCESSFUL OUTCOME    MBMSSessionUpdateFailure
    PROCEDURE CODE          id-mBMSsessionUpdate
    CRITICALITY             reject
}
```

```
errorIndication M3AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ErrorIndication
    PROCEDURE CODE          id-errorIndication
    CRITICALITY             ignore
}

reset M3AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Reset
    SUCCESSFUL OUTCOME  ResetAcknowledge
    PROCEDURE CODE      id-Reset
    CRITICALITY         reject
}

privateMessage          M3AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PrivateMessage
    PROCEDURE CODE          id-privateMessage
    CRITICALITY             ignore
}

mCEConfigurationUpdate M3AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MCEConfigurationUpdate
    SUCCESSFUL OUTCOME      MCEConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    MCEConfigurationUpdateFailure
    PROCEDURE CODE          id-mCEConfigurationUpdate
    CRITICALITY             reject
}


m3Setup M3AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      M3SetupRequest
    SUCCESSFUL OUTCOME      M3SetupResponse
    UNSUCCESSFUL OUTCOME    M3SetupFailure
    PROCEDURE CODE          id-m3Setup
    CRITICALITY             reject
}

END
```

9.3.4 PDU Definitions

```
-- **************************************************************
--
-- PDU definitions for M3AP.
--
-- **************************************************************

M3AP-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m3ap (5) version1 (1) m3ap-PDU-Contents (1) }
DEFINITIONS AUTOMATIC TAGS ::=
```

```
BEGIN

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

IMPORTS

    Absolute-Time-ofMBMS-Data,
    Cause,
    CriticalityDiagnostics,
    Global-MCE-ID,
    MBMS-E-RAB-QoS-Parameters,
    MBMS-Service-associatedLogicalM3-ConnectionItem,
    MBMS-Service-Area,
    MBMSServiceArea1,
    MBMS-Session-Duration,
    MBMS-Session-ID,
    MCE-MBMS-M3AP-ID,
    MCEname,
    MinimumTimeToMBMSDataTransfer,
    MME-MBMS-M3AP-ID,
    TimeToWait,
    TMGI,
    TNL-Information,
    Reestablishment

FROM M3AP-IEs

    PrivateIE-Container{},
    ProtocolExtensionContainer{},
    ProtocolIE-Container{},
    ProtocolIE-ContainerList{},
    ProtocolIE-ContainerPair{},
    ProtocolIE-ContainerPairList{},
    ProtocolIE-Single-Container{},
    M3AP-PRIVATE-IES,
    M3AP-PROTOCOL-EXTENSION,
    M3AP-PROTOCOL-IES,
    M3AP-PROTOCOL-IES-PAIR
FROM M3AP-Containers

    id-AllocationAndRetentionPriority,
    id-MCE-MBMS-M3AP-ID,
    id-MME-MBMS-M3AP-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-MBMS-Service-Area-List,
    id-MBMS-Service-Area-List-Item,
    id-TimeToWait,
    id-ResetType,
    id-MBMS-Service-associatedLogicalM3-ConnectionItem,
    id-MBMS-Service-associatedLogicalM3-ConnectionListResAck,
    id-MBMSServiceAreaList,
    id-MinimumTimeToMBMSDataTransfer,
    id-Time-ofMBMS-DataStop,
    id-Time-ofMBMS-DataTransfer,
    id-Global-MCE-ID,
    id-MCEname,
    id-Reestablishment,
    maxnoofMBMSServiceAreaIdentitiesPerMCE,
    maxnooferrors,
    maxNrOfIndividualM3ConnectionsToReset

FROM M3AP-Constants;

-- ************************************************************
--
-- MBMS SESSION START REQUEST
--
-- ************************************************************

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

MBMSSessionStartRequest-IEs M3AP-PROTOCOL-IES ::= {
    { ID id-MME-MBMS-M3AP-ID                    CRITICALITY reject  TYPE MME-MBMS-M3AP-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-MinimumTimeToMBMSDataTransfer       CRITICALITY reject  TYPE MinimumTimeToMBMSDataTransfer   PRESENCE mandatory}|
    { ID id-TNL-Information                     CRITICALITY reject  TYPE TNL-Information                 PRESENCE mandatory}|
    { ID id-Time-ofMBMS-DataTransfer            CRITICALITY ignore  TYPE Absolute-Time-ofMBMS-Data       PRESENCE optional}|
    { ID id-Reestablishment                     CRITICALITY ignore  TYPE Reestablishment                 PRESENCE optional},
    ...
}

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

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

```
}

MBMSSessionStartResponse-IEs M3AP-PROTOCOL-IES ::= {
    { ID id-MME-MBMS-M3AP-ID                  CRITICALITY ignore  TYPE MME-MBMS-M3AP-ID             PRESENCE mandatory } |
    { ID id-MCE-MBMS-M3AP-ID                  CRITICALITY ignore  TYPE MCE-MBMS-M3AP-ID             PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics            CRITICALITY ignore  TYPE CriticalityDiagnostics       PRESENCE optional  },
    ...
}


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

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

MBMSSessionStartFailure-IEs M3AP-PROTOCOL-IES ::= {
    { ID id-MME-MBMS-M3AP-ID                  CRITICALITY ignore  TYPE MME-MBMS-M3AP-ID             PRESENCE mandatory } |
    { ID id-Cause                             CRITICALITY ignore  TYPE Cause                       PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics            CRITICALITY ignore  TYPE CriticalityDiagnostics       PRESENCE optional  },
    ...
}


-- **************************************************************
--
-- MBMS SESSION STOP REQUEST
--
-- **************************************************************

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

MBMSSessionStopRequest-IEs M3AP-PROTOCOL-IES ::= {
    { ID id-MME-MBMS-M3AP-ID                CRITICALITY reject  TYPE MME-MBMS-M3AP-ID              PRESENCE mandatory}|
    { ID id-MCE-MBMS-M3AP-ID                CRITICALITY reject  TYPE MCE-MBMS-M3AP-ID              PRESENCE mandatory}|
    { ID id-Time-ofMBMS-DataStop            CRITICALITY ignore  TYPE Absolute-Time-ofMBMS-Data      PRESENCE optional},
    ...
}

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

MBMSSessionStopResponse ::= SEQUENCE {
```

```
    protocolIEs                     ProtocolIE-Container       {{ MBMSSessionStopResponse-IEs}},
    ...
}

MBMSSessionStopResponse-IEs M3AP-PROTOCOL-IES ::= {
    { ID id-MME-MBMS-M3AP-ID                  CRITICALITY ignore  TYPE MME-MBMS-M3AP-ID             PRESENCE mandatory } |
    { ID id-MCE-MBMS-M3AP-ID                  CRITICALITY ignore  TYPE MCE-MBMS-M3AP-ID             PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics            CRITICALITY ignore  TYPE CriticalityDiagnostics       PRESENCE optional  } ,
    ...
}

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

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

MBMSSessionUpdateRequest-IEs M3AP-PROTOCOL-IES ::= {
    { ID id-MME-MBMS-M3AP-ID                  CRITICALITY reject  TYPE MME-MBMS-M3AP-ID             PRESENCE mandatory}|
    { ID id-MCE-MBMS-M3AP-ID                  CRITICALITY reject  TYPE MCE-MBMS-M3AP-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 ignore  TYPE MBMS-Service-Area            PRESENCE optional}|
    { ID id-MinimumTimeToMBMSDataTransfer     CRITICALITY reject  TYPE MinimumTimeToMBMSDataTransfer PRESENCE mandatory}|
    { ID id-TNL-Information                   CRITICALITY ignore  TYPE TNL-Information              PRESENCE optional}|
    { ID id-Time-ofMBMS-DataTransfer          CRITICALITY ignore  TYPE Absolute-Time-ofMBMS-Data     PRESENCE optional},
    ...
}

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

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

MBMSSessionUpdateResponse-IEs M3AP-PROTOCOL-IES ::= {
    { ID id-MME-MBMS-M3AP-ID                  CRITICALITY ignore  TYPE MME-MBMS-M3AP-ID             PRESENCE mandatory } |
    { ID id-MCE-MBMS-M3AP-ID                  CRITICALITY ignore  TYPE MCE-MBMS-M3AP-ID             PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics            CRITICALITY ignore  TYPE CriticalityDiagnostics       PRESENCE optional  },
    ...
}
```

```
-- **************************************************************
--
-- MBMS SESSION UPDATE FAILURE
--
-- **************************************************************

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

MBMSSessionUpdateFailure-IEs M3AP-PROTOCOL-IES ::= {
    { ID id-MME-MBMS-M3AP-ID                  CRITICALITY ignore  TYPE MME-MBMS-M3AP-ID              PRESENCE mandatory } |
    { ID id-MCE-MBMS-M3AP-ID                  CRITICALITY ignore  TYPE MCE-MBMS-M3AP-ID              PRESENCE mandatory } |
    { ID id-Cause                             CRITICALITY ignore  TYPE Cause                         PRESENCE mandatory } |
    { ID id-CriticalityDiagnostics            CRITICALITY ignore  TYPE CriticalityDiagnostics        PRESENCE optional  },
    ...
}

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

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

ErrorIndication-IEs M3AP-PROTOCOL-IES ::= {
    { ID id-MME-MBMS-M3AP-ID                CRITICALITY ignore  TYPE MME-MBMS-M3AP-ID            PRESENCE optional } |
    { ID id-MCE-MBMS-M3AP-ID                CRITICALITY ignore  TYPE MCE-MBMS-M3AP-ID            PRESENCE optional } |
    { ID id-Cause                           CRITICALITY ignore  TYPE Cause                       PRESENCE optional  } |
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional  } ,
    ...
}


-- **************************************************************
--
-- Reset
--
-- **************************************************************

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

ResetIEs M3AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory  }|
    { ID id-ResetType               CRITICALITY reject  TYPE ResetType          PRESENCE mandatory  },
    ...
```

```
}

ResetType ::= CHOICE {
    m3-Interface        ResetAll,
    partOfM3-Interface      MBMS-Service-associatedLogicalM3-ConnectionListRes,
    ...
}



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

MBMS-Service-associatedLogicalM3-ConnectionListRes ::= SEQUENCE (SIZE(1.. maxNrOfIndividualM3ConnectionsToReset)) OF ProtocolIE-Single-Container {
{ MBMS-Service-associatedLogicalM3-ConnectionItemRes } }

MBMS-Service-associatedLogicalM3-ConnectionItemRes  M3AP-PROTOCOL-IES ::= {
    { ID id-MBMS-Service-associatedLogicalM3-ConnectionItem  CRITICALITY reject     TYPE MBMS-Service-associatedLogicalM3-ConnectionItem   PRESENCE
mandatory },
    ...
}


-- **************************************************************
--
-- Reset Acknowledge
--
-- **************************************************************

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

ResetAcknowledgeIEs M3AP-PROTOCOL-IES ::= {
    { ID id-MBMS-Service-associatedLogicalM3-ConnectionListResAck       CRITICALITY ignore  TYPE MBMS-Service-associatedLogicalM3-
ConnectionListResAck            PRESENCE optional   }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional  },
    ...
}

MBMS-Service-associatedLogicalM3-ConnectionListResAck ::= SEQUENCE (SIZE(1.. maxNrOfIndividualM3ConnectionsToReset)) OF ProtocolIE-Single-Container
{ { MBMS-Service-associatedLogicalM3-ConnectionItemResAck } }

MBMS-Service-associatedLogicalM3-ConnectionItemResAck   M3AP-PROTOCOL-IES ::= {
    { ID id-MBMS-Service-associatedLogicalM3-ConnectionItem CRITICALITY ignore  TYPE MBMS-Service-associatedLogicalM3-ConnectionItem PRESENCE
mandatory },
    ...
}

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

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

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

PrivateMessage-IEs M3AP-PRIVATE-IES ::= {
    ...
}


-- **************************************************************
--
-- M3 SETUP ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- M3 Setup Request
--
-- **************************************************************

M3SetupRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {M3SetupRequestIEs} },
    ...
}

M3SetupRequestIEs M3AP-PROTOCOL-IES ::= {
    { ID id-Global-MCE-ID           CRITICALITY reject  TYPE Global-MCE-ID                  PRESENCE mandatory}|
    { ID id-MCEname                 CRITICALITY ignore  TYPE MCEname                        PRESENCE optional}|
    { ID id-MBMSServiceAreaList     CRITICALITY reject  TYPE MBMSServiceAreaListItem        PRESENCE mandatory},
    ...
}


MBMSServiceAreaListItem ::= SEQUENCE (SIZE(1..maxnoofMBMSServiceAreaIdentitiesPerMCE)) OF MBMSServiceArea1


-- **************************************************************
--
-- M3 Setup Response
--
-- **************************************************************

M3SetupResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {M3SetupResponseIEs} },
    ...
}
```

```
M3SetupResponseIEs M3AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional},
    ...
}

-- **************************************************************
--
-- M3 Setup Failure
--
-- **************************************************************

M3SetupFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       { {M3SetupFailureIEs} },
    ...
}

M3SetupFailureIEs M3AP-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 ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- MCE Configuration Update
--
-- **************************************************************

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

MCEConfigurationUpdateIEs M3AP-PROTOCOL-IES ::= {
    { ID id-Global-MCE-ID           CRITICALITY reject  TYPE Global-MCE-ID                PRESENCE optional}|
    { ID id-MCEname                 CRITICALITY ignore  TYPE MCEname                      PRESENCE optional}|
    { ID id-MBMSServiceAreaList     CRITICALITY reject  TYPE MBMSServiceAreaListItem      PRESENCE optional},
    ...
}

-- **************************************************************
--
-- MCE Configuration Update Acknowledge
--
-- **************************************************************

MCEConfigurationUpdateAcknowledge ::= SEQUENCE {
```

```
    protocolIEs         ProtocolIE-Container       { {MCEConfigurationUpdateAcknowledgeIEs} },
    ...
}


MCEConfigurationUpdateAcknowledgeIEs M3AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional  },
    ...
}

-- **************************************************************
--
-- MCE Configuration Update Failure
--
-- **************************************************************

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

MCEConfigurationUpdateFailureIEs M3AP-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},
    ...
}

END
```

9.3.5 Information Element definitions

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

M3AP-IEs {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m3ap (5) version1 (1) m3ap-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    id-AllocationAndRetentionPriority,
    maxnooferrors

FROM M3AP-Constants
```

```
    Criticality,
    ProcedureCode,
    ProtocolIE-ID,
    TriggeringMessage
FROM M3AP-CommonDataTypes

    ProtocolExtensionContainer{},
    ProtocolIE-Single-Container{},
    M3AP-PROTOCOL-EXTENSION,
    M3AP-PROTOCOL-IES
FROM M3AP-Containers;

-- A

Absolute-Time-ofMBMS-Data           ::= BIT STRING (SIZE (64))

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

AllocationAndRetentionPriority-ExtIEs M3AP-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,
    not-enough-user-plane-processing-resources,
    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-MME-MBMS-M3AP-ID,
    unknown-or-already-allocated-MCE-MBMS-M3AP-ID,
    unknown-or-inconsistent-pair-of-MBMS-M3AP-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 M3AP-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 M3AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- D
-- E

ExtendedMCE-ID ::= OCTET STRING (SIZE(1))

-- F
-- G

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

GlobalMCE-ID-ExtIEs M3AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

GBR-QosInformation-ExtIEs M3AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

-- H
-- I

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

-- J
-- K
-- L
-- M

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

```
MBMS-E-RAB-QoS-Parameters-ExtIEs M3AP-PROTOCOL-EXTENSION ::= {
-- Extension for Release 10 ARP support --
    {ID id-AllocationAndRetentionPriority   CRITICALITY ignore  EXTENSION AllocationAndRetentionPriority   PRESENCE mandatory},
    ...
}

MBMS-Service-associatedLogicalM3-ConnectionItem ::= SEQUENCE {
    mME-MBMS-M3AP-ID                MME-MBMS-M3AP-ID OPTIONAL,
    mCE-MBMS-M3AP-ID                MCE-MBMS-M3AP-ID OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { MBMS-Service-associatedLogicalM3-ConnectionItemExtIEs} } OPTIONAL,
    ...
}


MBMS-Service-associatedLogicalM3-ConnectionItemExtIEs M3AP-PROTOCOL-EXTENSION ::= {
    ...
}

MBMSServiceArea1 ::= OCTET STRING (SIZE (2))

MBMS-Service-Area           ::= OCTET STRING


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

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


MCE-MBMS-M3AP-ID            ::= INTEGER (0..65535)

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

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

MinimumTimeToMBMSDataTransfer   ::= OCTET STRING (SIZE (1))

MME-MBMS-M3AP-ID        ::= INTEGER (0..65535)

-- N
-- O
-- P

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)
```

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

-- Q

QCI ::= INTEGER (0..255)

-- R

Reestablishment ::= ENUMERATED {true, ...}

-- S
-- T

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

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

TMGI-ExtIEs M3AP-PROTOCOL-EXTENSION ::= {
    ...
}


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

TNL-Information-ExtIEs M3AP-PROTOCOL-EXTENSION ::= {
    ...
}

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


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

END
```

9.3.6 Common definitions

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

M3AP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m3ap (5) version1 (1) m3ap-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
--
-- **************************************************************

M3AP-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m3ap (5) version1 (1) m3ap-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    ProcedureCode,
    ProtocolIE-ID
FROM M3AP-CommonDataTypes;

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

id-mBMSsessionStart                                     ProcedureCode ::= 0
id-mBMSsessionStop                                      ProcedureCode ::= 1
id-errorIndication                                      ProcedureCode ::= 2
id-privateMessage                                       ProcedureCode ::= 3
id-Reset                                                ProcedureCode ::= 4
id-mBMSsessionUpdate                                    ProcedureCode ::= 5
id-mCEConfigurationUpdate                               ProcedureCode ::= 6
id-m3Setup                                              ProcedureCode ::= 7



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

maxnoofMBMSServiceAreaIdentitiesPerMCE      INTEGER ::= 65536
maxnooferrors                               INTEGER ::= 256
maxNrOfIndividualM3ConnectionsToReset       INTEGER ::= 256

-- **************************************************************
--
-- IEs
```

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

id-MME-MBMS-M3AP-ID                                                 ProtocolIE-ID ::= 0
id-MCE-MBMS-M3AP-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-MBMS-Service-Area-List                                           ProtocolIE-ID ::= 10
id-MBMS-Service-Area-List-Item                                      ProtocolIE-ID ::= 11
id-TimeToWait                                                       ProtocolIE-ID ::= 12
id-ResetType                                                        ProtocolIE-ID ::= 13
id-MBMS-Service-associatedLogicalM3-ConnectionItem                  ProtocolIE-ID ::= 14
id-MBMS-Service-associatedLogicalM3-ConnectionListResAck            ProtocolIE-ID ::= 15
id-MinimumTimeToMBMSDataTransfer                                    ProtocolIE-ID ::= 16
id-AllocationAndRetentionPriority                                   ProtocolIE-ID ::= 17
id-Global-MCE-ID                                                    ProtocolIE-ID ::= 18
id-MCEname                                                          ProtocolIE-ID ::= 19
id-MBMSServiceAreaList                                              ProtocolIE-ID ::= 20
id-Time-ofMBMS-DataTransfer                                         ProtocolIE-ID ::= 21
id-Time-ofMBMS-DataStop                                             ProtocolIE-ID ::= 22
id-Reestablishment                                                  ProtocolIE-ID ::= 23
END
```

9.3.8 Container definitions

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

M3AP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) m3ap (5) version1 (1) m3ap-Containers (5)  }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
```

```
    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs,
    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolIE-ID
FROM M3AP-CommonDataTypes;

-- **************************************************************
--
-- Class Definition for Protocol IEs
--
-- **************************************************************

M3AP-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
--
-- **************************************************************

M3AP-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
```

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

M3AP-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
--
-- **************************************************************

M3AP-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 {M3AP-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Single-Container {M3AP-PROTOCOL-IES : IEsSetParam} ::=
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field {M3AP-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
    id              M3AP-PROTOCOL-IES.&id                   ({IEsSetParam}),
    criticality     M3AP-PROTOCOL-IES.&criticality          ({IEsSetParam}{@id}),
    value           M3AP-PROTOCOL-IES.&Value                ({IEsSetParam}{@id})
}
```

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

ProtocolIE-ContainerPair {M3AP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-FieldPair {{IEsSetParam}}

ProtocolIE-FieldPair {M3AP-PROTOCOL-IES-PAIR : IEsSetParam} ::= SEQUENCE {
    id                  M3AP-PROTOCOL-IES-PAIR.&id                  ({IEsSetParam}),
    firstCriticality    M3AP-PROTOCOL-IES-PAIR.&firstCriticality    ({IEsSetParam}{@id}),
    firstValue          M3AP-PROTOCOL-IES-PAIR.&FirstValue          ({IEsSetParam}{@id}),
    secondCriticality   M3AP-PROTOCOL-IES-PAIR.&secondCriticality   ({IEsSetParam}{@id}),
    secondValue         M3AP-PROTOCOL-IES-PAIR.&SecondValue         ({IEsSetParam}{@id})
}

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

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, M3AP-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-Container {{IEsSetParam}}

ProtocolIE-ContainerPairList {INTEGER : lowerBound, INTEGER : upperBound, M3AP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-ContainerPair {{IEsSetParam}}

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

ProtocolExtensionContainer {M3AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
    SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
    ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField {M3AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
    id                  M3AP-PROTOCOL-EXTENSION.&id             ({ExtensionSetParam}),
    criticality         M3AP-PROTOCOL-EXTENSION.&criticality    ({ExtensionSetParam}{@id}),
    extensionValue      M3AP-PROTOCOL-EXTENSION.&Extension      ({ExtensionSetParam}{@id})
}

-- **************************************************************
--
-- Container for Private IEs
--
-- **************************************************************
```

```
PrivateIE-Container {M3AP-PRIVATE-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (1..maxPrivateIEs)) OF
    PrivateIE-Field {{IEsSetParam}}

PrivateIE-Field {M3AP-PRIVATE-IES : IEsSetParam} ::= SEQUENCE {
    id              M3AP-PRIVATE-IES.&id            ({IEsSetParam}),
    criticality     M3AP-PRIVATE-IES.&criticality   ({IEsSetParam}{@id}),
    value           M3AP-PRIVATE-IES.&Value         ({IEsSetParam}{@id})
}

END
```

9.4 Message Transfer Syntax

M3AP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax as specified in ref. ITU-T Rec. X.691 [4].

9.5 Timers

10 Handling of Unknown, Unforeseen and Erroneous Protocol Data

Section 10 of TS 36.413 [11] 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 with content	0.0.1
2009-11				For RAN3#66	0.1.0
2009-11				Capture agreements in RAN3#66	1.0.0
2009-12				Presented for approval at RAN#46	2.0.0
46	RP-091254			Approved at RAN#46	9.0.0
47	RP-100226	0001		Corrections to TS36.444	9.1.0
47	RP-100227	0003	1	Miscellaneous corrections to TS 36.444	9.1.0
47	RP-100227	0004	2	Misc corrections	9.1.0
47	RP-100227	0005	2	Introduction of MBMS Session Update in M3AP	9.1.0
47	RP-100227	0007	1	Editorial Correction on TS 36.444	9.1.0
47	RP-100227	0008	1	No support for E-RAB Pre-emption	9.1.0
49	RP-100906	0012	1	MBMS Session Update procedure	9.2.0
49	RP-100906	0013		Alignment of tabulars to agreed notation for TS36.413 and TS36.423	9.2.0
50	RP-101270	0015	1	Correction of ASN1 in M3AP	9.3.0
2010-12				Created Rel-10 version based on v. 9.3.0	10.0.0
SP-49	SP-100629			Clarification on the use of References (TS 21.801 CR#0030)	10.1.0
51	RP-110223	0018	1	Correction on MBMS Reset procedure	10.1.0
51	RP-110240	0019	2	Introduction of ARP	10.1.0
51	RP-110226	0020	1	Clarification on TEID value range	10.1.0
52	RP-110685	0021	2	Correction of references	10.2.0
54	RP-111650	0022		Correction on MBMS Session Stop	10.3.0
2011-12				Created Rel-11 version based on v. 10.3.0	11.0.0
54	RP-111655	0025	4	Correction of MCCH Update synchronization Mechanism	11.0.0
54	RP-111655	0026	5	Addition of M3 Setup	11.0.0
55	RP-120236	0027	2	Correction on Reset	11.1.0
55	RP-120236	0028	2	Corrections on M3 Setup and MCE Configuration Update Procedures	11.1.0
55	RP-120236	0030	3	Correct of reset	11.1.0
56	RP-120751	0032		Correction on usage of Time of MBMS Data Stop IE	11.2.0
56	RP-120751	0033	1	Correction on M3 Configuration Procedure	11.2.0
56	RP-120752	0037		Correction of Absolute Time	11.2.0
56	RP-120751	0038	1	Correction of MCE Configuration Update procedure in M3 interface	11.2.0
56	RP-120752	0040	1	Correction of ASN.1 Concerning the Presence of extendedMCE-ID	11.2.0
57	RP-121140	0042	1	Coding Rules	11.3.0
58	RP-121724	0044	1	Correction of MBMS Session Start Partial Success	11.4.0
59	RP-130212	0048	1	Correction for Session Update procedure	11.5.0
60	RP-130643	0049		Correction on the Sending Node of MBMS Session Update Failure	11.6.0
60	RP-130643	0053	2	Correction of the update of Minimum time to MBMS Data Transfer	11.6.0
63	RP-140297	0057	6	Restoration of eMBMS Bearer Services and logical M3 Connections in MCE	12.0.0
64	RP-140905	0060	1	MBMS Bearer priority Update	12.1.0
64	RP-140905	0061		Corrections on MBMS Restoration	12.1.0
67	RP-150356	0070	1	Rapporteur Review on 36444	12.2.0

History

Document history		
V12.1.0	September 2014	Publication
V12.2.0	April 2015	Publication