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Technical Specification

TS-3GA-36.413(Rel10)v10.6.0

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)

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一般社団法人
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THE TELECOMMUNICATION TECHNOLOGY COMMITTEE

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＜参考＞ [Remarks]

１．英文記述の適用レベル [Application level of English description]

適用レベル [Application level]：E2

本標準の本文、付属資料および付録の文章および図に英文記述を含んでいる。

[English description is included in the text and figures of main body, annexes and appendices.]

２．国際勧告等の関連 [Relationship with international recommendations and standards]

本標準は、3GPP で承認された Technical Specification 36.413 (Version 10.6.0) に準拠している。

[This standard is standardized based on the Technical Specification 36.413 (Version 10.6.0) approved by 3GPP.]

３．上記国際勧告等に対する追加項目等 [Departures from international recommendations]

原標準に対する変更項目 [Changes to original standard]

原標準が参照する標準のうち、TTC 標準に置き換える項目。[Standards referred to in the original standard, which are replaced by TTC standards.]

原標準が参照する標準のうち、それらに準拠した TTC 標準等が制定されている場合は自動的に最新版 TTC 標準等に置き換え参照するものとする。 [Standards referred to in the original standard should be replaced by derived TTC standards.]

４．工業所有権 [IPR]

本標準に関わる「工業所有権等の実施の権利に係る確認書」の提出状況は、ＴＴＣホームページによる。

[Status of “Confirmation of IPR Licensing Condition” submitted is provided in the TTC web site.]

５．作成専門委員会 [Working Group]

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Contents

Foreword

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

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

Version x.y.z

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- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e., technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the E-UTRAN radio network layer signalling protocol for the S1 interface. The S1 Application Protocol (S1AP) supports the functions of S1 interface by signalling procedures defined in this document. S1AP is developed in accordance to the general principles stated in TS 36.401 [2] and TS 36.410 [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 36.410: "S1 General Aspects and Principles".

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

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

[6] ITU-T Recommendation X.681 (07/2002): "Information technology – Abstract Syntax Notation One (ASN.1): Information object specification".

[7] Void

[8] 3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses".

[9] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC)".

[10] 3GPP TS 32.422: "Trace control and configuration management".

[11] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for E-UTRAN access".

[12] 3GPP TS 36.414: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 data transport".

[13] 3GPP TS 23.203: "Policy and charging control architecture"

[14] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA), Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; stage 2".

[15] 3GPP TS 33.401: "Security architecture".

[16] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRAN); Radio Resource Control (RRC) Protocol Specification".

[17] 3GPP TS 23.272: "Circuit Switched Fallback in Evolved Packet System; stage 2".

[18] 3GPP TS 48.018: "General Packet Radio Service (GPRS); BSS GPRS Protocol (BSSGP)".

[19] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling"

[20] 3GPP TS 36.304: “Evolved Universal Terrestrial Radio Access (E-UTRA), User Equipment (UE) procedures in idle mode”.

[21] 3GPP TS 23.003: “Technical Specification Group Core Network and Terminals; Numbering, addressing and identification”.

[22] 3GPP TS 36.423: “Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP)”.

[23] 3GPP TS 48.008: “Mobile Switching Centre-Base Station System (MSC-BSS) interface; Layer 3 specification”.

[24] 3GPP TS 24.301: “Non-Access Stratum (NAS) protocol for Evolved Packet System (EPS)”; stage 3.

[25] 3GPP2 A.S0008-C: “Interoperability Specification (IOS) for High Rate Packet Data (HRPD) Radio Access Network Interfaces with Session Control in the Access Network”.

[26] 3GPP TS 36.213: “Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures”.

[27] 3GPP2 C.S0024-A v3.0: “cdma2000 High Rate Packet Data Air Interface Specification”.

[28] 3GPP TS 22.220: “Service requirements for Home NodeBs and Home eNodeBs”.

[29] Void

[30] 3GPP TS 48.016: “General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN) interface; Network service”.

[31] 3GPP TS 37.320: “Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT);Overall description; Stage 2”.

[32] 3GPP TS 29.281: “General Packet Radio Service (GPRS); Tunnelling Protocol User Plane (GTPv1-U)”.

[33] 3GPP TS 24.008: “Mobile radio interface Layer 3 specification; Core network protocols; Stage 3”

[34] 3GPP TS 36.455: “Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol A (LPPa)”.

[35] 3GPP TS 29.060: “GPRS Tunnelling Protocol (GTP) accross the Gn and Gp interface”.

[36] 3GPP TS 29.274: “Tunnelling Protocol for Control plane (GTPv2-C); Stage 3”.

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].

ACL functionality: A functionality controlling the access to network nodes. In case of Access Control Lists (ACL) functionality is applied in a network node the network node may only accept connections from other peer network nodes once the source addresses of the sending network node is already known in the target node.

CSG Cell: an E-UTRAN cell broadcasting a CSG indicator set to true and a CSG identity. This cell operates in Closed Access Mode as defined in TS 22.220 [28].

Elementary Procedure: S1AP consists of Elementary Procedures (EPs). An Elementary Procedure is a unit of interaction between eNBs 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 standalone procedures, which can be active in parallel. The usage of several S1AP EPs together or together with EPs from other interfaces is specified in stage 2 specifications (e.g., TS 23.401 [11] and TS 36.300 [14]).

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

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

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

Successful:

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

Unsuccessful:

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

Successful and Unsuccessful:

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

Class 2 EPs are considered always successful.

eNB UE S1AP ID: as defined in TS 36.401 [2].

Hybrid Cell: an E-UTRAN cell broadcasting a CSG indicator set to false and a CSG identity. This cell operates in Hybrid Access Mode as defined in TS 22.220 [28].

MME UE S1AP ID: as defined in TS 36.401 [2].

E-RAB: as defined in TS 36.401 [2].

NOTE: The E-RAB is either a default E-RAB or a dedicated E-RAB.

E-RAB ID: the E-RAB ID uniquely identifies an E-RAB for one UE.

NOTE: The E-RAB ID remains unique for the UE even if the UE-associated logical S1-connection is released during periods of user inactivity.

Data Radio Bearer: the Data Radio bearer transports the packets of an E-RAB between a UE and an eNB. There is a one-to-one mapping between the E-RAB and the Data Radio Bearer.

UE-associated signalling: When S1-AP messages associated to one UE uses the UE-associated logical S1-connection for association of the message to the UE in eNB and EPC.

UE-associated logical S1-connection: The UE-associated logical S1-connection uses the identities *MME UE S1AP ID* and *eNB UE S1AP ID* according to definition in TS 23.401 [11]. For a received UE associated S1-AP message the MME identifies the associated UE based on the MME UE S1AP ID IE and the eNB identifies the associated UE based on the *eNB UE S1AP ID* IE. The UE-associated logical S1-connection may exist before the S1 UE context is setup in eNB.

3.2 Symbols

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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].

ACL	Access Control List
CCO	Cell Change Order
CDMA	Code Division Multiple Access
CID	Cell-ID (positioning method)
CS	Circuit Switched
CSG	Closed Subscriber Group
CN	Core Network
DL	Downlink
ECGI	E-UTRAN Cell Global Identifier
E-CID	Enhanced Cell-ID (positioning method)
eNB	E-UTRAN NodeB
EP	Elementary Procedure
EPC	Evolved Packet Core
E-RAB	E-UTRAN Radio Access Bearer
E-SMLC	Evolved Serving Mobile Location Centre
E-UTRAN	Evolved UTRAN
GBR	Guaranteed Bit Rate
GUMMEI	Globally Unique MME Identifier
GTP	GPRS Tunneling Protocol
HFN	Hyper Frame Number
HRPD	High Rate Packet Data
IE	Information Element
L-GW	Local GateWay
LIPA	Local IP Access
LPPa	LTE Positioning Protocol Annex
MDT	Minimization of Drive Tests
MME	Mobility Management Entity
NAS	Non Access Stratum
NNSF	NAS Node Selection Function
OTDOA	Observed Time Difference of Arrival
PS	Packet Switched
PWS	Public Warning System
PDCP	Packet Data Convergence Protocol
PLMN	Public Land Mobile Network
PS	Packet Switched
RRC	Radio Resource Control
RIM	RAN Information Management
SCTP	Stream Control Transmission Protocol
SN	Sequence Number
S-TMSI	S-Temporary Mobile Subscriber Identity
TAI	Tracking Area Identity
TEID	Tunnel Endpoint Identifier
UE	User Equipment

UE-AMBR	UE-Aggregate Maximum Bitrate
UL	Uplink

4 General

4.1 Procedure Specification Principles

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

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

- The procedure text discriminates between:

  1) Functionality which "shall" be executed

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

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

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

- Any required inclusion of an optional IE in a response message is explicitly indicated in the procedure text. If the procedure text does not explicitly indicate that an optional IE shall be included in a response message, the optional IE shall not be included. For requirements on including *Criticality Diagnostics* IE, see clause 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., E-RAB procedure.
Message	When referring to a message in the specification the MESSAGE NAME is written with all letters in upper case characters followed by the word "message", e.g., MESSAGE NAME message.
IE	When referring to an information element (IE) in the specification the *Information Element Name* is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g., *Information Element* IE.
Value of an IE	When referring to the value of an information element (IE) in the specification the "Value" is written as it is specified in subclause 9.2 enclosed by quotation marks, e.g., "Value".

5 S1AP Services

S1AP provides the signalling service between E-UTRAN and the evolved packet core (EPC) that is required to fulfil the S1AP functions described in clause 7. S1AP services are divided into two groups:

Non UE-associated services: They are related to the whole S1 interface instance between the eNB and MME utilising a non UE-associated signalling connection.

UE-associated services: They are related to one UE. S1AP functions that provide these services are associated with a UE-associated signalling connection that is maintained for the UE in question.

6 Services Expected from Signalling Transport

The signalling connection shall provide in sequence delivery of S1AP messages. S1AP shall be notified if the signalling connection breaks.

7 Functions of S1AP

The S1AP protocol has the following functions:

- E-RAB management function: This overall functionality is responsible for setting up, modifying and releasing E-RABs, which are triggered by the MME. The release of E-RABs may be triggered by the eNB as well.
- Initial Context Transfer function: This functionality is used to establish an S1UE context in the eNB, to setup the default IP connectivity, to setup one or more E-RAB(s) if requested by the MME, and to transfer NAS signalling related information to the eNB if needed.
- UE Capability Info Indication function: This functionality is used to provide the UE Capability Info when received from the UE to the MME.
- Mobility Functions for UEs in LTE_ACTIVE in order to enable
  - a change of eNBs within SAE/LTE (Inter MME/Serving SAE-GW Handovers) via the S1 interface (with EPC involvement).
  - a change of RAN nodes between different RATs (Inter-3GPP-RAT Handovers) via the S1 interface (with EPC involvement).
- Paging: This functionality provides the EPC with the capability to page the UE.
- S1 interface management functions comprise the:
  - Reset functionality to ensure a well defined initialisation on the S1 interface.
  - Error Indication functionality to allow a proper error reporting/handling in cases where no failure messages are defined.
  - Overload function to indicate the load situation in the control plane of the S1 interface.
  - Load balancing function to ensure equally loaded MMEs within an MME pool area
  - S1 Setup functionality for initial S1 interface setup for providing configuration information
  - eNB and MME Configuration Update functions are to update application level configuration data needed for the eNB and MME to interoperate correctly on the S1 interface.
- NAS Signalling transport function between the UE and the MME is used:
  - to transfer NAS signalling related information and to establish the S1 UE context in the eNB.
  - to transfer NAS signalling related information when the S1 UE context in the eNB is already established.
- S1 UE context Release function: This functionality is responsible to manage the release of UE specific context in the eNB and the MME.
- UE Context Modification function: This functionality allows to modify the established UE Context partly.
- Status Transfer: This functionality transfers PDCP SN Status information from source eNB to target eNB in support of in-sequence delivery and duplication avoidance for intra LTE handover.
- Trace function: This functionality is to control a trace session recording for a UE in ECM_CONNECTED or to control an MDT session transferring MDT measurements collected by the UE.
- Location Reporting: This functionality allows MME to be aware of the UE's current location.
- LPPa Signalling transport: This functionality transfers LPPa messages between eNB and E-SMLC over the S1 interface.
- S1 CDMA2000 Tunneling function: This functionality is to carry CDMA2000 signalling between UE and CDMA2000 RAT over the S1 Interface.

- Warning message transmission function:
  This functionality provides the means to start and overwrite the broadcasting of warning message.

- RAN Information Management (RIM) function: This functionality allows the request and transfer of RAN information (e.g., GERAN system information) between two RAN nodes via the core network.

- Configuration Transfer function: This functionality allows the request and transfer of RAN configuration information (e.g., SON information) between two RAN nodes via the core network.

8 S1AP Procedures

8.1 List of S1AP Elementary procedures

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

Table 1: Class 1 procedures

Elementary Procedure	Initiating Message	Successful Outcome	Unsuccessful Outcome
		Response message	Response message
Handover Preparation	HANDOVER REQUIRED	HANDOVER COMMAND	HANDOVER PREPARATION FAILURE
Handover Resource Allocation	HANDOVER REQUEST	HANDOVER REQUEST ACKNOWLEDGE	HANDOVER FAILURE
Path Switch Request	PATH SWITCH REQUEST	PATH SWITCH REQUEST ACKNOWLEDGE	PATH SWITCH REQUEST FAILURE
Handover Cancellation	HANDOVER CANCEL	HANDOVER CANCEL ACKNOWLEDGE	
E-RAB Setup	E-RAB SETUP REQUEST	E-RAB SETUP RESPONSE	
E-RAB Modify	E-RAB MODIFY REQUEST	E-RAB MODIFY RESPONSE	
E-RAB Release	E-RAB RELEASE COMMAND	E-RAB RELEASE RESPONSE	
Initial Context Setup	INITIAL CONTEXT SETUP REQUEST	INITIAL CONTEXT SETUP RESPONSE	INITIAL CONTEXT SETUP FAILURE
Reset	RESET	RESET ACKNOWLEDGE	
S1 Setup	S1 SETUP REQUEST	S1 SETUP RESPONSE	S1 SETUP FAILURE
UE Context Release	UE CONTEXT RELEASE COMMAND	UE CONTEXT RELEASE COMPLETE	
UE Context Modification	UE CONTEXT MODIFICATION REQUEST	UE CONTEXT MODIFICATION RESPONSE	UE CONTEXT MODIFICATION FAILURE
eNB Configuration Update	ENB CONFIGURATION UPDATE	ENB CONFIGURATION UPDATE ACKNOWLEDGE	ENB CONFIGURATION UPDATE FAILURE
MME Configuration Update	MME CONFIGURATION UPDATE	MME CONFIGURAION UPDATE ACKNOWLEDGE	MME CONFIGURATION UPDATE FAILURE
Write-Replace Warning	WRITE-REPLACE WARNING REQUEST	WRITE-REPLACE WARNING RESPONSE	
Kill	KILL REQUEST	KILL RESPONSE	

Table 2: Class 2 procedures

Elementary Procedure	Message
Handover Notification	HANDOVER NOTIFY
E-RAB Release Indication	E-RAB RELEASE INDICATION
Paging	PAGING
Initial UE Message	INITIAL UE MESSAGE
Downlink NAS Transport	DOWNLINK NAS TRANSPORT
Uplink NAS Transport	UPLINK NAS TRANSPORT
NAS non delivery indication	NAS NON DELIVERY INDICATION
Error Indication	ERROR INDICATION
UE Context Release Request	UE CONTEXT RELEASE REQUEST
DownlinkS1 CDMA2000 Tunneling	DOWNLINK S1 CDMA2000 TUNNELING
Uplink S1 CDMA2000 Tunneling	UPLINK S1 CDMA2000 TUNNELING
UE Capability Info Indication	UE CAPABILITY INFO INDICATION
eNB Status Transfer	eNB STATUS TRANSFER
MME Status Transfer	MME STATUS TRANSFER
Deactivate Trace	DEACTIVATE TRACE
Trace Start	TRACE START
Trace Failure Indication	TRACE FAILURE INDICATION
Location Reporting Control	LOCATION REPORTING CONTROL
Location Reporting Failure Indication	LOCATION REPORTING FAILURE INDICATION
Location Report	LOCATION REPORT
Overload Start	OVERLOAD START
Overload Stop	OVERLOAD STOP
eNB Direct Information Transfer	eNB DIRECT INFORMATION TRANSFER
MME Direct Information Transfer	MME DIRECT INFORMATION TRANSFER
eNB Configuration Transfer	eNB CONFIGURATION TRANSFER
MME Configuration Transfer	MME CONFIGURATION TRANSFER
Cell Traffic Trace	CELL TRAFFIC TRACE
Downlink UE Associated LPPa Transport	DOWNLINK UE ASSOCIATED LPPA TRANSPORT
Uplink UE Associated LPPa Transport	UPLINK UE ASSOCIATED LPPA TRANSPORT
Downlink Non UE Associated LPPa Transport	DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT
Uplink Non UE Associated LPPa Transport	UPLINK NON UE ASSOCIATED LPPA TRANSPORT

The following applies concerning interference between Elementary Procedures:

- The Reset procedure takes precedence over all other EPs.
- The UE Context Release procedure takes precedence over all other EPs that are using the UE-associated signalling.

8.2 E-RAB Management procedures

8.2.1 E-RAB Setup

8.2.1.1 General

The purpose of the E-RAB Setup procedure is to assign resources on Uu and S1 for one or several E-RABs and to setup corresponding Data Radio Bearers for a given UE. The procedure uses UE-associated signalling.

8.2.1.2 Successful Operation

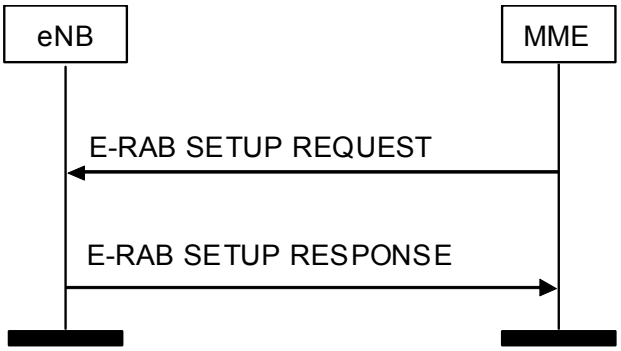

Figure 8.2.1.2-1: E-RAB Setup procedure. Successful operation.

The MME initiates the procedure by sending an E-RAB SETUP REQUEST message to the eNB.

- The E-RAB SETUP REQUEST message shall contain the information required by the eNB to build the E-RAB configuration consisting of at least one E-RAB and for each E-RAB to setup include an *E-RAB to be Setup Item* IE.

Upon reception of the E-RAB SETUP REQUEST message, and if resources are available for the requested configuration, the eNB shall execute the requested E-RAB configuration. For each E-RAB and based on the *E-RAB level QoS parameters* IE the eNB shall establish a Data Radio Bearer and allocate the required resources on Uu. The eNB shall pass the *NAS-PDU* IE and the value contained in the *E-RAB ID* IE received for the E-RAB for each established Data Radio Bearer to the UE. The eNB does not send the NAS PDUs associated to the failed Data radio bearers to the UE. The eNB shall allocate the required resources on S1 for the E-RABs requested to be established.

If the *Correlation ID* IE is included in the E-RAB SETUP REQUEST message towards the eNB with L-GW function for LIPA operation, then the eNB shall use this information for LIPA operation for the concerned E-RAB.

The E-RAB SETUP REQUEST message may contain

- the *UE Aggregate Maximum Bit Rate* IE.

If the *UE Aggregate Maximum Bit Rate* IE is included in the E-RAB SETUP REQUEST the eNB shall

- replace the previously provided UE Aggregate Maximum Bit Rate by the received UE Aggregate Maximum Bit Rate in the UE context;
- use the received UE Aggregate Maximum Bit Rate for non-GBR Bearers for the concerned UE.

If the *UE Aggregate Maximum Bit Rate* IE is not contained in the E-RAB SETUP REQUEST message, the eNB shall use the previously provided UE Aggregate Maximum Bit Rate which is stored in the UE context.

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

- The eNB shall consider the priority level of the requested E-RAB, 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 E-RAB setup has to be performed unconditionally and immediately. If the requested E-RAB is marked as “may trigger pre-emption” and the resource situation requires so, the eNB may trigger the pre-emption procedure which may then cause the forced release of a lower priority E-RAB which is marked as “pre-emptable”. Whilst the process and the extent of the pre-emption procedure are operator-dependent, the pre-emption indicators shall be treated as follows:

  1. The values of the last received *Pre-emption Vulnerability* IE and *Priority Level* IE shall prevail.
  2. If the *Pre-emption Capability* IE is set to “may trigger pre-emption”, then this allocation request may trigger the pre-emption procedure.
  3. If the *Pre-emption Capability* IE is set to “shall not trigger pre-emption”, then this allocation request shall not trigger the pre-emption procedure.

4. If the *Pre-emption Vulnerability* IE is set to "pre-emptable", then this E-RAB shall be included in the pre-emption process.

5. If the *Pre-emption Vulnerability* IE is set to "not pre-emptable", then this E-RAB shall not be included in the pre-emption process.

6. 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 rules:

1. E-UTRAN shall only pre-empt E-RABs with lower priority, in ascending order of priority.

2. The pre-emption may be done for E-RABs belonging to the same UE or to other UEs.

The eNB shall report to the MME, in the E-RAB SETUP RESPONSE message, the result for all the requested E-RABs.

- A list of E-RABs which are successfully established shall be included in the *E-RAB Setup List* IE.

- A list of E-RABs which failed to be established, if any, shall be included in the *E-RAB Failed to Setup List* IE.

In case of the establishment of an E-RAB the EPC must be prepared to receive user data before the E-RAB SETUP RESPONSE message has been received.

When the eNB reports unsuccessful establishment of an E-RAB, the cause value should be precise enough to enable the MME to know the reason for an unsuccessful establishment, e.g., "Radio resources not available", "Failure in the Radio Interface Procedure".

Interactions with Handover Preparation procedure:

If a handover becomes necessary during E-RAB Setup, the eNB may interrupt the ongoing E-RAB Setup procedure and initiate the Handover Preparation procedure as follows:

1. The eNB shall send the E-RAB SETUP RESPONSE message in which the eNB shall indicate, if necessary

   - all the E-RABs fail with an appropriate cause value, e.g., "S1 intra system Handover triggered", "S1 inter system Handover triggered" or "X2 Handover triggered".

2. The eNB shall trigger the handover procedure.

8.2.1.3 Unsuccessful Operation

The unsuccessful operation is specified in the successful operation section.

8.2.1.4 Abnormal Conditions

If the eNB receives a E-RAB SETUP REQUEST message containing a *E-RAB Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in TS 23.203 [13]), and which does not contain the *GBR QoS Information* IE, the eNB shall consider the establishment of the corresponding E-RAB as failed.

If the eNB receives an E-RAB SETUP REQUEST message containing several *E-RAB ID* IEs (in the *E-RAB To Be Setup List* IE) set to the same value, the eNB shall report the establishment of the corresponding E-RABs as failed in the E-RAB SETUP RESPONSE with the appropriate cause value, e.g., "Multiple E-RAB ID instances".

If the eNB receives an E-RAB SETUP REQUEST message containing a *E-RAB ID* IE (in the *E-RAB To Be Setup List* IE) set to the value that identifies an active E-RAB (established before the E-RAB SETUP REQUEST message was received), the eNB shall report the establishment of the new E-RAB as failed in the E-RAB SETUP RESPONSE with the appropriate cause value, e.g., "Multiple E-RAB ID instances".

8.2.2 E-RAB Modify

8.2.2.1 General

The purpose of the E-RAB Modify procedure is to enable modifications of already established E-RABs for a given UE. The procedure uses UE-associated signalling.

8.2.2.2 Successful Operation

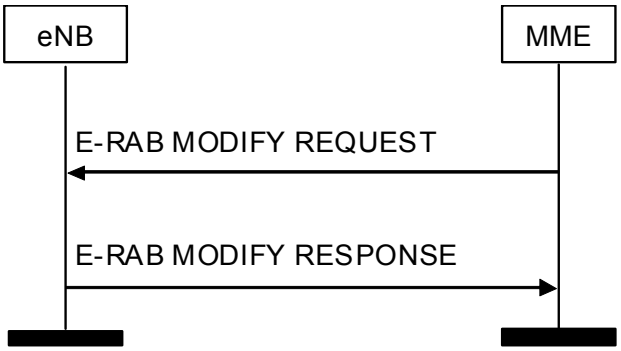

Figure 8.2.2.2-1: E-RAB Modify procedure. Successful operation.

The MME initiates the procedure by sending an E-RAB MODIFY REQUEST message to the eNB.

- The E-RAB MODIFY REQUEST message shall contain the information required by the eNB to modify one or several E-RABs of the existing E-RAB configuration.

Information shall be present in the E-RAB MODIFY REQUEST message only when any previously set value for the E-RAB configuration is requested to be modified.

Upon reception of the E-RAB MODIFY REQUEST message, and if resources are available for the requested target configuration, the eNB shall execute the modification of the requested E-RAB configuration. For each E-RAB that shall be modified and based on the new *E-RAB level QoS parameters* IE the eNB shall modify the Data Radio Bearer configuration and change allocation of resources on Uu according to the new resource request. The eNB shall pass the *NAS-PDU* IE received for the E-RAB to the UE when modifying the Data Radio Bearer configuration. The eNB does not send the NAS PDUs associated to the failed Data radio bearers to the UE. The eNB shall change allocation of resources on S1 according to the new resource request.

If the E-UTRAN failed to modify an E-RAB the E-UTRAN shall keep the E-RAB configuration as it was configured prior the E-RAB MODIFY REQUEST.

The E-RAB MODIFY REQUEST message may contain the

- the *UE Aggregate Maximum Bit Rate* IE.

If the *UE Aggregate Maximum Bit Rate* IE is included in the E-RAB MODIFY REQUEST, the eNB shall

- replace the previously provided UE Aggregate Maximum Bit Rate by the received UE Aggregate Maximum Bit Rate in the UE context;

- use the received UE Aggregate Maximum Bit Rate for non-GBR Bearers for the concerned UE.

If the *UE Aggregate Maximum Bit Rate* IE is not contained in the E-RAB MODIFY REQUEST message, the eNB shall use the previously provided UE Aggregate Maximum Bit Rate which is stored in the UE context.

The modification of resources according to the values of the *Allocation and Retention Priority* IE shall follow the principles described for the E-RAB Setup procedure.

The eNB shall report to the MME, in the E-RAB MODIFY RESPONSE message, the result for all the requested E-RABs to be modified.

- A list of E-RABs which are successfully modified shall be included in the *E-RAB Modify List* IE.

- A list of E-RABs which failed to be modified, if any, shall be included in the *E-RAB Failed to Modify List* IE.

When the eNB reports unsuccessful modification of an E-RAB, the cause value should be precise enough to enable the MME to know the reason for an unsuccessful modification, e.g., “Radio resources not available”, “Failure in the Radio Interface Procedure”.

In case of a modification of an E-RAB the EPC must be prepared to receive user data according to the modified E-RAB profile prior to the E-RAB MODIFY RESPONSE message.

Interactions with Handover Preparation procedure:

If a handover becomes necessary during E-RAB modify, the eNB may interrupt the ongoing E-RAB Modify procedure and initiate the Handover Preparation procedure as follows:

1. The eNB shall send the E-RAB MODIFY RESPONSE message in which the eNB shall indicate, if necessary
   - all the E-RABs fail with an appropriate cause value, e.g., "S1 intra system Handover triggered", "S1 inter system Handover triggered" or "X2 Handover triggered".
2. The eNB shall trigger the handover procedure.

8.2.2.3 Unsuccessful Operation

The unsuccessful operation is specified in the successful operation section.

8.2.2.4 Abnormal Conditions

If the eNB receives a E-RAB MODIFY REQUEST message containing a *E-RAB Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in TS 23.203 [13]) for a E-RAB previously configured as a non-GBR bearer (as defined in TS 23.203 [13]), and which does not contain the *GBR QoS Information* IE, the eNB shall consider the modification of the corresponding E-RAB as failed.

If the eNB receives an E-RAB MODIFY REQUEST message containing several *E-RAB ID* IEs (in the *E-RAB to be Modified List* IE) set to the same value, the eNB shall report the modification of the corresponding E-RABs as failed in the E-RAB MODIFY RESPONSE with the appropriate cause value, e.g., "Multiple E-RAB ID instances".

If the eNB receives an E-RAB MODIFY REQUEST message containing some *E-RAB ID* IEs that eNB does not recognize, the eNB shall report the corresponding invalid E-RABs as failed in the E-RAB MODIFY RESPONSE with the appropriate cause value, e.g., "Unknown E-RAB ID".

8.2.3 E-RAB Release

8.2.3.1 General

The purpose of the E-RAB Release procedure is to enable the release of already established E-RABs for a given UE. The procedure uses UE-associated signalling.

8.2.3.2 Successful Operation

8.2.3.2.1 E-RAB Release – MME initiated

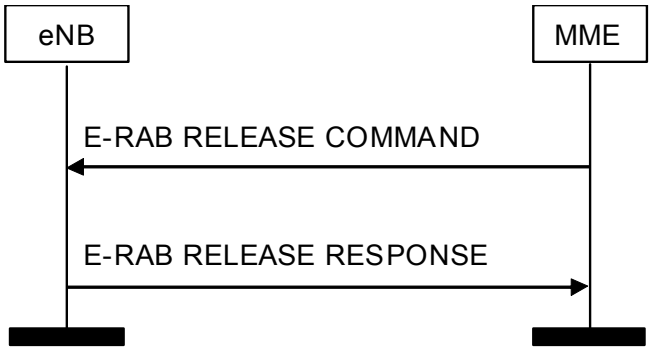

Figure 8.2.3.2.1-1: E-RAB Release procedure. Successful operation.

The MME initiates the procedure by sending an E-RAB RELEASE COMMAND message.

The E-RAB RELEASE COMMAND message shall contain the information required by the eNB to release at least one E-RAB in the *E-RAB To Be Released List* IE. If a *NAS-PDU* IE is contained in the message, the eNB shall pass it to the UE.

Upon reception of the E-RAB RELEASE COMMAND message the eNB shall execute the release of the requested E-RABs. For each E-RAB to be released the eNB shall release the corresponding Data Radio Bearer and release the

allocated resources on Uu. The eNB shall pass the value contained in the *E-RAB ID* IE received for the E-RAB to the radio interface protocol for each Data Radio Bearer to be released. The eNB shall release allocated resources on S1 for the E-RABs requested to be released.

The E-RAB RELEASE COMMAND message may contain

- the *UE Aggregate Maximum Bit Rate* IE.

If the *UE Aggregate Maximum Bit Rate* IE is included in the E-RAB RELEASE COMMAND the eNB shall

- replace the previously provided UE Aggregate Maximum Bit Rate by the received UE Aggregate Maximum Bit Rate in the UE context; the eNB shall use the received UE Aggregate Maximum Bit Rate for non-GBR Bearers for the concerned UE.

If the *UE Aggregate Maximum Bit Rate* IE is not contained in the E-RAB RELEASE COMMAND message, the eNB shall use the previously provided UE Aggregate Maximum Bit Rate which is stored in the UE context.

The eNB shall report to the MME, in the E-RAB RELEASE RESPONSE message, the result for all the E-RABs to be released.

- A list of E-RABs which are released successfully shall be included in the *E-RAB Release List* IE.

- A list of E-RABs which failed to be released, if any, shall be included in the *E-RAB Failed to Release List* IE.

The eNB shall be prepared to receive an E-RAB RELEASE COMMAND message on an established UE-associated logical S1-connection containing an *E-RAB Release List* IE at any time and shall always reply to it with an E-RAB RELEASE RESPONSE message.

After sending an E-RAB RELEASE RESPONSE message containing an E-RAB ID within the *E-RAB Release List* IE, the eNB shall be prepared to receive an E-RAB SETUP REQUEST message requesting establishment of an E-RAB with this E-RAB ID.

8.2.3.2.2 E-RAB Release Indication – eNB initiated

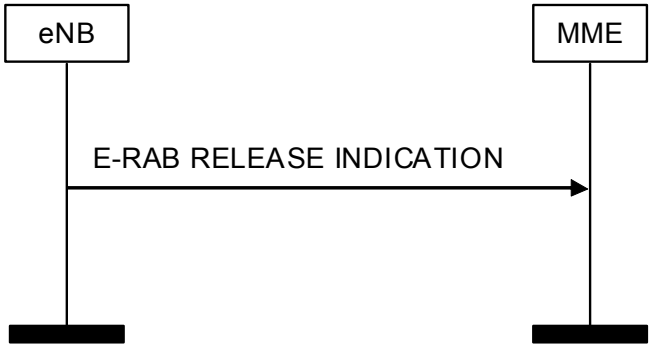

Figure 8.2.3.2.2-1: E-RAB Release INDICATION procedure. Successful operation.

The eNB initiates the procedure by sending an E-RAB RELEASE INDICATION message towards the MME.

The E-RAB RELEASE INDICATION message shall contain at least one E-RAB released at the eNB, in the *E-RAB Released List* IE.

Upon reception of the E-RAB RELEASE INDICATION message the MME shall normally initiate the appropriate release procedure on the core network side for the E-RABs identified in the E-RAB RELEASE INDICATION message.

Interaction with UE Context Release Request procedure:

If the eNB wants to remove all remaining E-RABs, e.g., for user inactivity, the UE Context Release Request procedure shall be used instead.

8.2.3.3 Abnormal Conditions

If the eNB receives an E-RAB RELEASE COMMAND message containing multiple *E-RAB ID* IEs (in the *E-RAB To Be Released List* IE) set to the same value, the eNB shall initiate the release of one corresponding E-RAB and ignore the duplication of the instances of the selected corresponding E-RABs.

If the MME receives an E-RAB RELEASE INDICATION message containing multiple *E-RAB ID* IEs (in the *E-RAB Released List* IE) set to the same value, the MME shall initiate the release of one corresponding E-RAB and ignore the duplication of the instances of the selected corresponding E-RABs.

If the eNB receives an E-RAB RELEASE COMMAND message containing some *E-RAB ID* IEs that eNB does not recognize, the eNB shall report the corresponding invalid E-RABs as failed in the E-RAB RELEASE RESPONSE message with the appropriate cause, e.g., “Unknown E-RAB ID”.

8.3 Context Management procedures

8.3.1 Initial Context Setup

8.3.1.1 General

The purpose of the Initial Context Setup procedure is to establish the necessary overall initial UE Context including E-RAB context, the Security Key, Handover Restriction List, UE Radio capability and UE Security Capabilities etc. The procedure uses UE-associated signalling.

8.3.1.2 Successful Operation

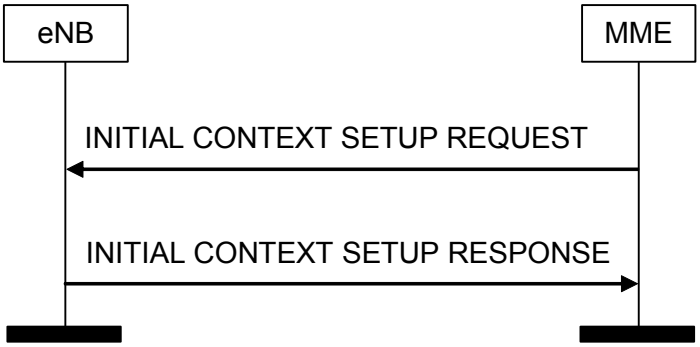

Figure 8.3.1.2-1: Initial Context Setup procedure. Successful operation.

In case of the establishment of an E-RAB the EPC must be prepared to receive user data before the INITIAL CONTEXT SETUP RESPONSE message has been received by the MME. If no UE-associated logical S1-connection exists, the UE-associated logical S1-connection shall be established at reception of the INITIAL CONTEXT SETUP REQUEST message.

The INITIAL CONTEXT SETUP REQUEST message shall contain within the *E-RAB to be Setup List* IE the information required by the eNB to build the new E-RAB configuration consisting of at least one additional E-RAB.

The *E-RAB to be Setup Item* IE may contain:

- the *NAS-PDU* IE,
- the *Correlation ID* IE in case of LIPA operation.

The INITIAL CONTEXT SETUP REQUEST message may contain

- the *Trace Activation* IE.
- the *Handover Restriction List* IE, which may contain roaming, area or access restrictions.
- the *UE Radio Capability* IE.
- the *Subscriber Profile ID for RAT/Frequency priority* IE.

- the *CS Fallback Indicator* IE.
- the *SRVCC Operation Possible* IE.
- the *CSG Membership Status* IE.
- the *Registered LAI* IE.
- the *GUMMEI ID* IE, which indicates the MME serving the UE, and shall only be present according to subclauses 4.6.2 and 4.7.6.6 of TS 36.300 [14].
- the *MME UE S1AP ID 2* IE, which indicates the MME UE S1AP ID assigned by the MME, and shall only be present according to subclause 4.6.2 of TS 36.300 [14].
- the *Management Based MDT Allowed* IE.

The INITIAL CONTEXT SETUP REQUEST message shall contain the *Subscriber Profile ID for RAT/Frequency priority* IE, if available in the MME.

If the *Correlation ID* IE is included in the INITIAL CONTEXT SETUP REQUEST message towards the eNB with L-GW function for LIPA operation, then the eNB shall use this information for LIPA operation for the concerned E-RAB.

Upon receipt of the INITIAL CONTEXT SETUP REQUEST message the eNB shall

- attempt to execute the requested E-RAB configuration.
- store the UE Aggregate Maximum Bit Rate in the UE context, and use the received UE Aggregate Maximum Bit Rate for non-GBR Bearers for the concerned UE.
- pass the value contained in the *E-RAB ID* IE and the *NAS-PDU* IE received for the E-RAB for each established Data radio bearer to the radio interface protocol. The eNB shall not send the NAS PDUs associated to the failed Data radio bearers to the UE.
- store the received Handover Restriction List in the UE context.
- store the received UE Radio Capability in the UE context.
- store the received Subscriber Profile ID for RAT/Frequency priority in the UE context and use it as defined in TS 36.300 [14].
- store the received SRVCC Operation Possible in the UE context and use it as defined in TS 23.216 [9].
- store the received UE Security Capabilities in the UE context.
- store the received Security Key in the UE context, take it into use and associate it with the initial value of NCC as defined in TS 33.401 [15].
- store the received CSG Membership Status, if supported, in the UE context.
- store the received Management Based MDT Allowed information, if supported, in the UE context.

For the Initial Context Setup an initial value for the Next Hop Chaining Count is stored in the UE context.

The allocation of resources according to the values of the *Allocation and Retention Priority* IE shall follow the principles described for the E-RAB Setup procedure.

The eNB shall use the information in the *Handover Restriction List* IE if present in the INITIAL CONTEXT SETUP REQUEST message to determine a target for subsequent mobility action for which the eNB provides information about the target of the mobility action towards the UE. If the *Handover Restriction List* IE is not contained in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall consider that no roaming area nor access restriction applies to the UE. The eNB shall also consider that no roaming area nor access restriction applies to the UE when:

- one of the setup E-RABs has some particular ARP values (TS 23.401 [11])
- the *CS Fallback Indicator* IE is set to “CS Fallback High Priority” in which case it shall process according to TS 23.272 [17].

If the *Trace Activation* IE is included in the INITIAL CONTEXT SETUP REQUEST message then eNB shall, if supported, initiate the requested trace function as described in TS 32.422 [10]. In particular, the eNB shall, if supported:

- if the *Trace Activation* IE does not include the *MDT Configuration* IE, initiate the requested trace session as described in TS 32.422 [10];
- if the *Trace Activation* IE includes the *MDT Activation* IE, within the *MDT Configuration* IE, set to "Immediate MDT and Trace", initiate the requested trace session and MDT session as described in TS 32.422 [10].
- if the *Trace Activation* IE includes the *MDT Activation* IE ,within the *MDT Configuration* IE, set to "Immediate MDT Only" or "Logged MDT only", initiate the requested MDT session as described in TS 32.422 [10] and the eNB shall ignore *Interfaces To Trace* IE, and *Trace Depth* IE.

If the *CS Fallback Indicator* IE is included in the INITIAL CONTEXT SETUP REQUEST message, it indicates that the UE Context to be set-up is subject to CS Fallback. The eNB shall reply with the INITIAL CONTEXT SETUP RESPONSE message and then act as defined in TS 23.272 [17].

If the *Registered LAI* IE is included in the INITIAL CONTEXT SETUP REQUEST message, it indicates that the eNB may take the *Registered LAI* IE into account when selecting the target cell or frequency and then act as defined in TS 23.272 [17].

If the *UE Security Capabilities* IE included in the INITIAL CONTEXT SETUP REQUEST message only contains the EIA0 algorithm as defined in TS 33.401 [15] and if this EIA0 algorithm is defined in the configured list of allowed integrity protection algorithms in the eNB (TS 33.401 [15]), the eNB shall take it into use and ignore the keys received in the *Security Key* IE.

If the *GUMMEI ID* IE is contained in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall, if supported, store this information in the UE context and use it for subsequent X2 handovers.

If the *MME UE S1AP ID 2* IE is contained in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall, if supported, store this information in the UE context and use it for subsequent X2 handovers.

If the *Management Based MDT Allowed* IE is contained in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall use it, if supported, to allow subsequent selection of the UE for management based MDT defined in TS 32.422 [10].

The eNB shall report to the MME, in the INITIAL CONTEXT SETUP RESPONSE message, the successful establishment of the security procedures with the UE, and, the result for all the requested E-RABs in the following way:

- A list of E-RABs which are successfully established shall be included in the *E-RAB Setup List* IE
- A list of E-RABs which failed to be established shall be included in the *E-RAB Failed to Setup List* IE.

When the eNB reports the unsuccessful establishment of an E-RAB, the cause value should be precise enough to enable the MME to know the reason for the unsuccessful establishment, e.g., "Radio resources not available", "Failure in the Radio Interface Procedure".

After sending the INITIAL CONTEXT SETUP RESPONSE message, the procedure is terminated in the eNB.

8.3.1.3 Unsuccessful Operation

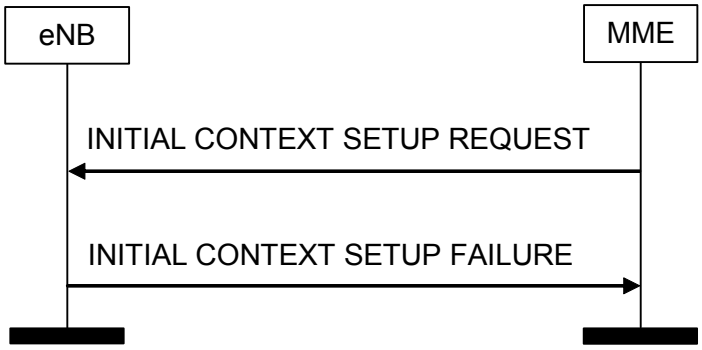

Figure 8.3.1.3-1: Initial Context Setup procedure. Unsuccessful operation.

If the eNB is not able to establish an S1 UE context, or cannot even establish one non GBR bearer it shall consider the procedure as failed and reply with the INITIAL CONTEXT SETUP FAILURE message.

8.3.1.4 Abnormal Conditions

If the eNB receives an INITIAL CONTEXT SETUP REQUEST message containing a *E-RAB Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in TS 23.203 [13]), and which does not contain the *GBR QoS Information* IE, the eNB shall consider the establishment of the corresponding E-RAB as failed.

If the eNB receives an INITIAL CONTEXT SETUP REQUEST message containing several *E-RAB ID* IEs (in the *E-RAB to Be Setup List* IE) set to the same value, the eNB shall consider the establishment of the corresponding E-RABs as failed.

If the supported algorithms for encryption defined in the *Encryption Algorithms* IE in the *UE Security Capabilities* IE, plus the mandated support of EEA0 in all UEs (TS 33.401 [15]), do not match any allowed algorithms defined in the configured list of allowed encryption algorithms in the eNB (TS 33.401 [15]), the eNB shall reject the procedure using the INITIAL CONTEXT SETUP FAILURE message.

If the supported algorithms for integrity defined in the *Integrity Protection Algorithms* IE in the *UE Security Capabilities* IE, plus the mandated support of the EIA0 algorithm in all UEs (TS 33.401 [15]), do not match any allowed algorithms defined in the configured list of allowed integrity protection algorithms in the eNB (TS 33.401 [15]), the eNB shall reject the procedure using the INITIAL CONTEXT SETUP FAILURE message.

If the *CSG Membership Status* IE is not included in the INITIAL CONTEXT SETUP REQUEST message and the cell accessed by the UE is a hybrid cell, the eNB shall reject the procedure using the INITIAL CONTEXT SETUP FAILURE message.

8.3.2 UE Context Release Request – eNB initiated

8.3.2.1 General

The purpose of the UE Context Release Request procedure is to enable the eNB to request the MME to release the UE-associated logical S1-connection due to E-UTRAN generated reasons, e.g., "$TX2_{RELOCOverall}$ Expiry". The procedure uses UE-associated signalling.

8.3.2.2 Successful Operation

Figure 8.3.2.2-1: UE Context Release Request procedure. Successful operation.

The eNB controlling a UE-associated logical S1-connection initiates the procedure by generating a UE CONTEXT RELEASE REQUEST message towards the affected MME node.

The UE CONTEXT RELEASE REQUEST message shall indicate the appropriate cause value, e.g., "User Inactivity", "Radio Connection With UE Lost", "CSG Subscription Expiry", "CS Fallback triggered", "Redirection towards 1xRTT", "Inter-RAT Redirection", "UE Not Available for PS Service", for the requested UE-associated logical S1-connection release.

Interactions with UE Context Release procedure:

The UE Context Release procedure should be initiated upon reception of a UE CONTEXT RELEASE REQUEST message.

8.3.3 UE Context Release (MME initiated)

8.3.3.1 General

The purpose of the UE Context Release procedure is to enable the MME to order the release of the UE-associated logical connection due to various reasons, e.g., completion of a transaction between the UE and the EPC, or completion of successful handover, or completion of handover cancellation, or release of the old UE-associated logical S1-connection when two UE-associated logical S1-connections toward the same UE is detected after the UE has initiated the establishment of a new UE-associated logical S1-connection, or the UE is no longer allowed to access the CSG cell (i.e., the UE becomes a non-member of the currently used CSG cell). The procedure uses UE-associated S1 connection.

8.3.3.2 Successful Operation

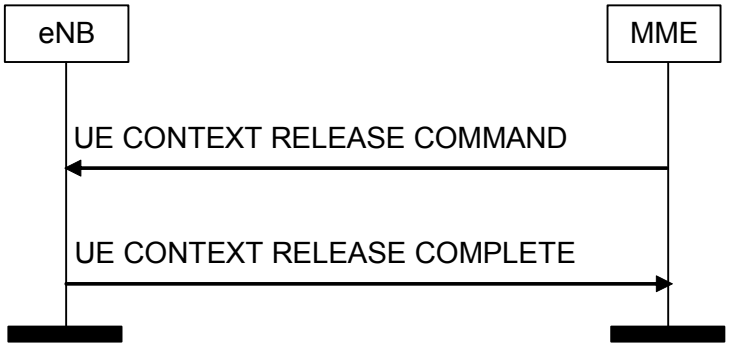

Figure 8.3.3.2-1: UE Context Release procedure. Successful operation.

The MME initiates the procedure by sending the UE CONTEXT RELEASE COMMAND message to the eNB.

The UE CONTEXT RELEASE COMMAND message shall contain the *UE S1AP ID pair* IE if available, otherwise the message shall contain the *MME UE S1AP ID* IE.

The MME provides the *cause* IE set to "Load Balancing TAU Required" in the UE CONTEXT RELEASE COMMAND message sent to the eNB for all load balancing and offload cases in the MME.

Upon reception of the UE CONTEXT RELEASE COMMAND message, the eNB shall release all related signalling and user data transport resources and reply with the UE CONTEXT RELEASE COMPLETE message. In case of eNB supporting L-GW function for LIPA operation, the eNB shall also release the node internal tunnel resources.

8.3.3.3 Abnormal Conditions

If the UE Context Release procedure is not initiated towards the eNB before the expiry of the timer $TS1_{RELOCOverall}$, the eNB shall request the MME to release the UE context.

If the UE returns to the eNB before the reception of the UE CONTEXT RELEASE COMMAND message or the expiry of the timer $TS1_{RELOCOverall}$, the eNB shall stop the $TS1_{RELOCOverall}$ and continue to serve the UE.

8.3.4 UE Context Modification

8.3.4.1 General

The purpose of the UE Context Modification procedure is to partly modify the established UE Context, e.g., with the Security Key or the Subscriber Profile ID for RAT/Frequency priority. The procedure uses UE-associated signalling.

8.3.4.2 Successful Operation

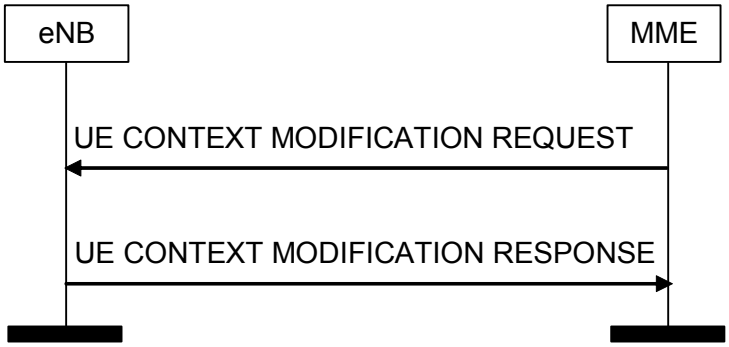

Figure 8.3.4.2-1: UE Context Modification procedure. Successful operation.

The UE CONTEXT MODIFICATION REQUEST message may contain.

- the *Security Key* IE.
- the *Subscriber Profile ID for RAT/Frequency priority* IE.
- the *UE Aggregate Maximum Bit Rate* IE.
- the *CS Fallback Indicator* IE.
- the *UE Security Capabilities* IE.
- the *CSG Membership Status* IE.
- the *Registered LAI* IE.

Upon receipt of the UE CONTEXT MODIFICATION REQUEST message the eNB shall

- store the received *Security Key* IE, take it into use and associate it with the initial value of NCC as defined in TS 33.401 [15]
- store the *UE Security Capabilities* IE and take them into use together with the received keys according to TS 33.401 [15].
- store the *Subscriber Profile ID for RAT*/*Frequency priority* IE and use it as defined in TS 36.300 [14].

If the *UE Aggregate Maximum Bit Rate* IE is included in the UE CONTEXT MODIFICATION REQUEST message the eNB shall:

- replace the previously provided UE Aggregate Maximum Bit Rate by the received UE Aggregate Maximum Bit Rate in the UE context;
- use the received UE Aggregate Maximum Bit Rate for non-GBR Bearers for the concerned UE.

If the *CSG Membership Status* IE is received in the UE CONTEXT MODIFICATION REQUEST message, the eNB shall take the following action:

- If the cell that serves the UE is a hybrid cell, the eNB shall store the value contained in the *CSG Membership Status* IE and replace any previously stored membership status value by this new one. It shall then use it as defined in TS 36.300 [14].
- If the cell that serves the UE is a CSG cell, and the *CSG Membership Status* IE is set to “not-member”, the eNB should initiate actions to ensure that the UE is no longer served by the CSG cell as defined in TS 36.300 [14].

If the *UE Aggregate Maximum Bit Rate* IE is not contained in the UE CONTEXT MODIFICATION REQUEST message, the eNB shall use the previously provided UE Aggregate Maximum Bit Rate which is stored in the UE context.

If the *CS Fallback Indicator* IE is included in the UE CONTEXT MODIFICATION REQUEST message, it indicates that the concerned UE Context is subject to CS Fallback. The eNB shall reply with the UE CONTEXT

MODIFICATION RESPONSE message and then act as defined in TS 23.272 [17]. If the *CS Fallback Indicator* IE is set to "CS Fallback High Priority", the eNB shall consider that no roaming area nor access restriction applies to the UE and process according to TS 23.272 [17].

If the *Registered LAI* IE is included in the UE CONTEXT MODIFICATION REQUEST message, it indicates that the eNB may take the *Registered LAI* IE into account when selecting the target cell or frequency and then act as defined in TS 23.272 [17].

The eNB shall report, in the UE CONTEXT MODIFICATION RESPONSE message to the MME the successful update of the UE context.

After sending the UE CONTEXT MODIFICATION RESPONSE message, the procedure is terminated in the eNB.

8.3.4.3 Unsuccessful Operation

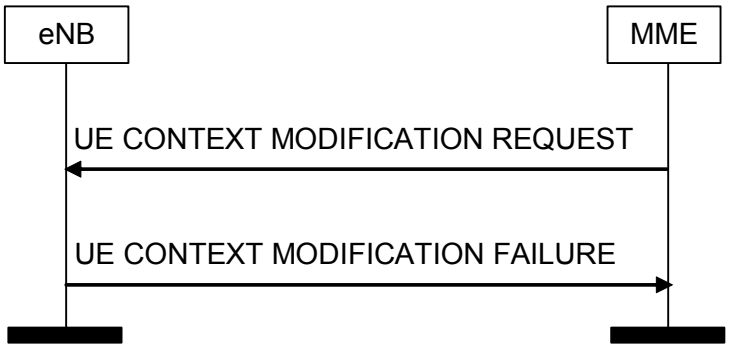

Figure 8.3.4.3-1: UE Context Modification procedure. Unsuccessful operation.

In case the UE context update cannot be performed successfully the eNB shall respond with the UE CONTEXT MODIFICATION FAILURE message to the MME with an appropriate cause value in the *Cause* IE.

8.3.4.4 Abnormal Conditions

If the eNB receives both the *CS Fallback Indicator* IE and one of the security IEs (either the *Security Key* IE or the *UE Security Capabilities* IE) in the UE Context Modification Request message, the eNB shall ignore both IEs and send back the UE CONTEXT MODIFICATION FAILURE message with an appropriate cause value.

8.4 Handover Signalling

8.4.1 Handover Preparation

8.4.1.1 General

The purpose of the Handover Preparation procedure is to request the preparation of resources at the target side via the EPC. There is only one Handover Preparation procedure ongoing at the same time for a certain UE.

8.4.1.2 Successful Operation

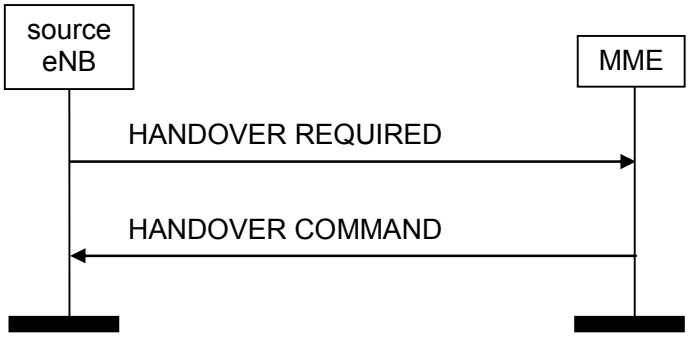

Figure 8.4.1.2-1: Handover preparation: successful operation

The source eNB initiates the handover preparation by sending the HANDOVER REQUIRED message to the serving MME. When the source eNB sends the HANDOVER REQUIRED message, it shall start the timer $TS1_{RELOCprep}$. The source eNB shall indicate the appropriate cause value for the handover in the *Cause* IE.

The source eNB shall include the *Source to Target Transparent Container* IE in the HANDOVER REQUIRED message.

In case of intra-system handover, the information in the *Source to Target Transparent Container* IE shall be encoded according to the definition of the *Source eNB to Target eNB Transparent Container* IE. In case of handover to UTRAN, the information in the *Source to Target Transparent Container* IE shall be encoded according to the *Source RNC to Target RNC Transparent Container* IE definition as specified in TS 25.413 [19] and the source eNB shall include the *UE History Information* IE in the *Source RNC to Target RNC Transparent Container* IE. If the handover is to GERAN A/Gb mode then the information in the *Source to Target Transparent Container* IE shall be encoded according to the definition of the *Source BSS to Target BSS Transparent Container* IE as described in TS 48.018 [18].

When the preparation, including the reservation of resources at the target side is ready, the MME responds with the HANDOVER COMMAND message to the source eNB.

If the *Target to Source Transparent Container* IE has been received by the MME from the handover target then the transparent container shall be included in the HANDOVER COMMAND message.

Upon reception of the HANDOVER COMMAND message the source eNB shall stop the timer $TS1_{RELOCprep}$ and start the timer $TS1_{RELOCOverall}$.

In case of intra-system handover, the information in the *Target to Source Transparent Container* IE shall be encoded according to the definition of the *Target eNB to Source eNB Transparent Container* IE. In case of inter-system handover to UTRAN, the information in the *Target to Source Transparent Container* IE shall be encoded according to the *Target RNC to Source RNC Transparent Container* IE definition as specified in TS 25.413 [19]. In case of inter-system handover to GERAN A/Gb mode, the information in the *Target to Source Transparent Container* IE shall be encoded according to the *Target BSS to Source BSS Transparent Container* IE definition as described in TS 48.018 [18].

If there are any E-RABs that could not be admitted in the target, they shall be indicated in the *E-RABs to Release List* IE.

If the *DL forwarding* IE is included within the *Source eNB to Target eNB Transparent Container* IE of the HANDOVER REQUIRED message and it is set to “DL forwarding proposed”, it indicates that the source eNB proposes forwarding of downlink data.

If the MME receives the *Direct Forwarding Path Availability* IE in the HANDOVER REQUIRED message indicating that a direct data path is available, it shall handle it as specified in TS 23.401 [11].

If the *CSG Id* IE and no *Cell Access Mode* IE are received in the HANDOVER REQUIRED message, the MME shall perform the access control according to the CSG Subscription Data of that UE and, if the access control is successful or if at least one of the E-RABs has some particular ARP values (see TS 23.401 [11]), it shall continue the handover and propagate the *CSG Id* IE to the target side. If the access control is unsuccessful but at least one of the E-RABs has some particular ARP values (see TS 23.401 [11]) the MME shall also provide the *CSG Membership Status* IE set to “non member” to the target side.

If the *CSG Id* IE and the *Cell Access Mode* IE set to “hybrid” are received in the HANDOVER REQUIRED message, the MME shall provide the membership status of the UE and the CSG Id to the target side.

The source eNB shall include the *SRVCC HO Indication* IE in the HANDOVER REQUIRED message if the SRVCC operation is needed as defined in TS 23.216 [9]. The source eNB shall indicate to the MME in the *SRVCC HO Indication* IE if the handover shall be prepared for PS and CS domain or only for CS domain. The *SRVCC HO Indication* IE is set according to the target cell capability and UE capability. In case the target system is GERAN without DTM support or the UE is without DTM support, the source eNB shall indicate “CS only” in the *SRVCC HO Indication* IE and “PS service not available” in *PS Service Not Available* IE. In case the target system is either GERAN with DTM but without DTM HO support and the UE is supporting DTM or the target system is UTRAN without PS HO support, the source eNB shall indicate “CS only” in the *SRVCC HO Indication* IE. Otherwise, the source eNB shall indicate “PS and CS” in the *SRVCC HO Indication* IE.

In case of inter-system handover from E-UTRAN, the source eNB shall indicate in the *Target ID* IE, in case the target system is UTRAN, the Target RNC-ID of the RNC (including the Routing Area Code only in case the UTRAN PS

domain is involved), in case the target system is GERAN the Cell Global Identity (including the Routing Area Code only in case the GERAN PS domain is involved) of the cell in the target system.

In case the SRVCC operation is performed and the *SRVCC HO Indication* IE indicates that handover shall be prepared only for CS domain, and if

- the target system is GERAN, then the source eNB
  - shall encode the information in the *Source to Target Transparent Container* IE within the HANDOVER REQUIRED message, according to the definition of the *Old BSS to New BSS information* IE as specified in TS 48.008 [23], and
  - shall not include the *Source to Target Transparent Container Secondary* IE in the HANDOVER REQUIRED message;
- the target system is UTRAN, then the source eNB
  - shall encode the information in the *Source to Target Transparent Container* IE within the HANDOVER REQUIRED message according to the definition of the *Source RNC to Target RNC Transparent Container* IE as specified in TS 25.413 [19],
  - shall include the *UE History Information* IE in the *Source RNC to Target RNC Transparent Container* IE, and
  - shall not include the *Source to Target Transparent Container Secondary* IE in the HANDOVER REQUIRED message.

In case the SRVCC operation is performed, the *SRVCC HO Indication* IE in the HANDOVER REQUIRED message indicates that handover shall be prepared for PS and CS domain, and if

- the target system is GERAN with DTM HO support, then the source eNB
  - shall encode the information in the *Source to Target Transparent Container* IE within the HANDOVER REQUIRED message according to the definition of the *Source BSS to Target BSS Transparent Container* IE as described in TS 48.018 [18],and
  - shall include the *Source to Target Transparent Container Secondary* IE in the HANDOVER REQUIRED message and encode information in the it according to the definition of the *Old BSS to New BSS information* IE as specified in TS 48.008 [23];
- the target system is UTRAN, then the source eNB
  - shall encode the information in the *Source to Target Transparent Container* IE within the HANDOVER REQUIRED message according to the definition of the *Source* RNC to *Target RNC Transparent Container* IE as specified in TS 25.413 [19],
  - shall include the *UE History Information* IE in the *Source RNC to Target RNC Transparent Container* IE,.and
  - shall not include the *Source to Target Transparent Container Secondary* IE in the HANDOVER REQUIRED message.

In case the SRVCC operation is performed, the *SRVCC HO Indication* IE in the HANDOVER REQUIRED message indicates that handover shall be prepared only for CS domain, and if

- the target system is GERAN, then the MME
  - shall encode the information in the *Target to Source Transparent Container* IE within the HANDOVER COMMAND message according to the definition of the *Layer 3 Information* IE as specified in TS 48.008 [23], and
  - shall not include the *Target to Source Transparent Container Secondary* IE in the HANDOVER COMMAND message;
- the target system is UTRAN, then the MME

- shall encode the information in the *Target to Source Transparent Container* IE within the HANDOVER COMMAND message according to the definition of the *Target RNC to Source RNC Transparent Container* IE as specified in TS 25.413 [19], and
- shall not include the *Target to Source Transparent Container Secondary* IE in the HANDOVER COMMAND message.

In case the SRVCC operation is performed, the *SRVCC HO Indication* IE in the HANDOVER REQUIRED message indicates that handover shall be prepared for PS and CS domain,

- the target system is GERAN with DTM HO support, and if
  - the Handover Preparation procedure has succeeded in the CS and PS domain, then the MME
    - shall encode the information in the *Target to Source Transparent Container* IE within the HANDOVER COMMAND message according to the definition of the *Layer 3 Information* IE as specified in TS 48.008 [23], and
    - shall include the *Target to Source Transparent Container Secondary* IE in the HANDOVER COMMAND message and encode information in the it according to the definition of the *Target BSS to Source BSS Transparent Container* IE as specified in TS 48.018 [18];
  - the Handover Preparation procedure has succeeded in the CS domain only, then the MME
    - shall encode the information in the *Target to Source Transparent Container* IE within the HANDOVER COMMAND message according to the definition of the *Layer 3 Information* IE as specified in TS 48.008 [23], and
    - shall not include the *Target to Source Transparent Container Secondary* IE in the HANDOVER COMMAND message;
- the target system is UTRAN, then the Handover Preparation procedure shall be considered successful if the Handover Preparation procedure has succeeded in the CS domain, and the MME
  - shall encode the information in the *Target to Source Transparent Container* IE within the HANDOVER COMMAND message according to the definition of the *Target RNC to Source RNC Transparent Container* IE as specified in TS 25.413 [19], and
  - shall not include the *Target to Source Transparent Container Secondary* IE in the HANDOVER COMMAND message.

If the HANDOVER COMMAND message contains the *DL GTP-TEID* IE and the *DL Transport Layer Address* IE for a given bearer in the *E-RABs Subject to Forwarding List* IE, then the source eNB shall consider that the forwarding of downlink data for this given bearer is possible.

If the HANDOVER COMMAND message contains the *UL GTP-TEID* IE and the *UL Transport Layer Address* IE for a given bearer in the *E-RABs Subject to Forwarding List* IE, then it means the target eNB has requested the forwarding of uplink data for this given bearer.

Interactions with E-RAB Management procedures:

If, after a HANDOVER REQUIRED message is sent and before the Handover Preparation procedure is terminated, the source eNB receives an MME initiated E-RAB Management procedure on the same UE associated signaling connection, the source eNB shall either:

1. cancel the Handover Preparation procedure by executing the Handover Cancel procedure with an appropriate cause value. After successful completion of the Handover Cancel procedure, the source eNB shall continue the MME initiated E-RAB Management procedure

or

2. terminate the MME initiated E-RAB Management procedure by sending the appropriate response message with an appropriate cause value, e.g., “S1 intra system Handover Triggered”, “S1 inter system Handover Triggered” to the MME and then the source eNB shall continue with the handover procedure.

8.4.1.3 Unsuccessful Operation

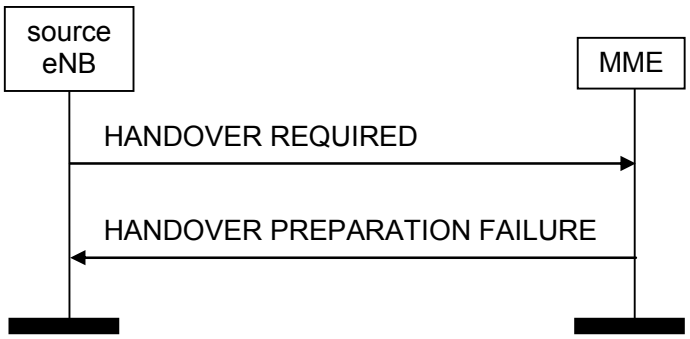

Figure 8.4.1.3-1: Handover preparation: unsuccessful operation

If the EPC or the target system is not able to accept any of the bearers or a failure occurs during the Handover Preparation, the MME sends the HANDOVER PREPARATION FAILURE message with an appropriate cause value to the source eNB.

If the *CSG Id* IE and no *Cell Access Mode* IE are received in the HANDOVER REQUIRED message and the access control is unsuccessful and none of the E-RABs has some particular ARP values (see TS 23.401 [11]) the MME shall send the HANDOVER PREPARATION FAILURE message with an appropriate cause value to the source eNB, except when one of the E-RABs has some particular ARP values (see TS 23.401 [11]). Upon reception, the source eNB may decide to prevent handover for that UE towards CSG (Closed Access Mode) cells with corresponding CSG Id.

Interaction with Handover Cancel procedure:

If there is no response from the EPC to the HANDOVER REQUIRED message before timer $TS1_{RELOCprep}$ expires in the source eNB, the source eNB should cancel the Handover Preparation procedure by initiating the Handover Cancel procedure with the appropriate value for the *Cause* IE. The source eNB shall ignore any HANDOVER COMMAND message or HANDOVER PREPARATION FAILURE message received after the initiation of the Handover Cancel procedure.

8.4.1.4 Abnormal Conditions

If the eNB receives at least one E-RAB ID included in the *E-RABs Subject to Forwarding List* IE without at least one valid associated tunnel address pair (in either UL or DL), then the eNB shall consider it as a logical error and act as described in subclause 10.4. A GTP tunnel address pair is considered valid if both the *GTP-TEID* IE and the *Transport Layer Address* IE are present.

8.4.2 Handover Resource Allocation

8.4.2.1 General

The purpose of the Handover Resource Allocation procedure is to reserve resources at the target eNB for the handover of a UE.

8.4.2.2 Successful Operation

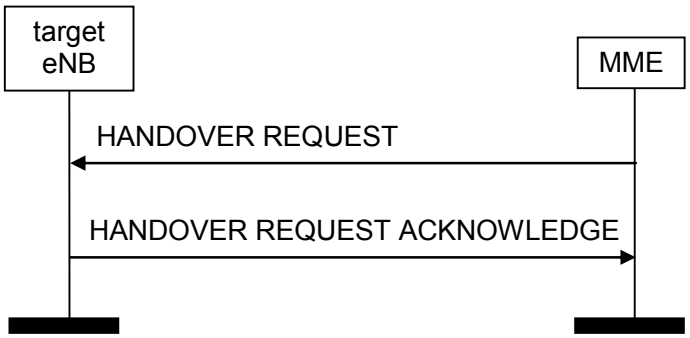

Figure 8.4.2.2-1: Handover resource allocation: successful operation

The MME initiates the procedure by sending the HANDOVER REQUEST message to the target eNB. The HANDOVER REQUEST message may contain the *Handover Restriction List* IE, which contains the serving PLMN and may contain equivalent PLMNs, and roaming area or access restrictions.

If the *Handover Restriction List* IE is contained in the HANDOVER REQUEST message, the target eNB shall store this information in the UE context. This information shall however not be considered whenever one of the handed over E-RABs has some particular ARP values (TS 23.401 [11]).

The target eNB shall use the information in *Handover Restriction List* IE if present in the HANDOVER REQUEST message to determine a target for subsequent mobility action for which the eNB provides information about the target of the mobility action towards the UE. If the *Handover Restriction List* IE is not contained in the HANDOVER REQUEST message, the target eNB shall consider that no access restriction applies to the UE.

Upon reception of the HANDOVER REQUEST message the eNB shall store the received *UE Security Capabilities* IE in the UE context and use it to prepare the configuration of the AS security relation with the UE.

If the *SRVCC Operation Possible* IE is included in the HANDOVER REQUEST message, the target eNB shall store the content of the received *SRVCC Operation Possible* IE in the UE context and, if supported, use it as defined in TS 23.216 [9].

Upon reception of the HANDOVER REQUEST message the eNB shall store the received *Security Context* IE in the UE context and the eNB shall use it to derive the security configuration as specified in TS 33.401 [15].

If the *Trace Activation* IE is included in the HANDOVER REQUEST message, the target eNB shall if supported, initiate the requested trace function as described in TS 32.422 [10]. In particular, the eNB shall, if supported:

- if the *Trace Activation* IE does not include the *MDT Configuration* IE, initiate the requested trace session as described in TS 32.422 [10];

- if the *Trace Activation* IE includes the *MDT Activation* IE, within the *MDT Configuration* IE, set to “Immediate MDT and Trace”, initiate the requested trace session and MDT session as described in TS 32.422 [10];

- if the *Trace Activation* IE includes the *MDT Activation* IE, within the *MDT Configuration* IE, set to “Immediate MDT Only” or “Logged MDT only”, initiate the requested MDT session as described in TS 32.422 [10] and the target eNB shall ignore *Interfaces To Trace* IE, and *Trace Depth* IE.

If the *CSG Id* IE is received in the HANDOVER REQUEST message, the eNB shall compare the received value with the CSG Id broadcast by the target cell.

If the *CSG Membership Status* IE is received in the HANDOVER REQUEST message and the *CSG Membership Status* is set to “member”, the eNB may provide the QoS to the UE as for member provided that the CSG Id received in the HANDOVER REQUEST messages corresponds to the CSG Id broadcast by the target cell.

If the *CSG Membership Status* IE and the *CSG Id* IE are received in the HANDOVER REQUEST message and the CSG Id does not correspond to the CSG Id broadcast by the target cell, the eNB may provide the QoS to the UE as for a non member and shall send back in the HANDOVER REQUEST ACKNOWLEDGE message the actual CSG Id broadcast by the target cell.

If the target eNB receives the *CSG Id* IE and the *CSG Membership Status* IE is set to “non member” in the HANDOVER REQUEST message and the target cell is a closed cell and at least one of the E-RABs has some particular ARP values (see TS 23.401 [11]), the eNB shall send back the HANDOVER REQUEST ACKNOWLEDGE message to the MME accepting those E-RABs and failing the other E-RABs.

If the *Subscriber Profile ID for RAT/Frequency priority* IE is contained in the *Source eNB to Target eNB Transparent Container* IE, the target eNB shall store the content of the received *Subscriber Profile ID for RAT/Frequency priority* IE in the UE context and use it as defined in TS 36.300 [14].

Upon reception of the *UE History Information* IE, which is included within the *Source eNB to Target eNB Transparent Container* IE in the HANDOVER REQUEST message, the target eNB shall collect the information defined as mandatory in the *UE History Information* IE, for as long as the UE stays in one of its cells, and store the collected information to be used for future handover preparations.

After all necessary resources for the admitted E-RABs have been allocated, the target eNB shall generate the HANDOVER REQUEST ACKNOWLEDGE message. The target eNB shall include in the *E-RABs Admitted List* IE

the E-RABs for which resources have been prepared at the target cell. The E-RABs that have not been admitted in the target cell, if any, shall be included in the *E-RABs Failed to Setup List* IE.

If the HANDOVER REQUEST message contains the *Data Forwarding Not Possible* IE associated with a given E-RAB within the *E-RABs To Be Setup List* IE set to "Data forwarding not possible", then the target eNB may decide not to include the *DL Transport Layer Address* IE and the *DL GTP-TEID* IE and for intra LTE handover the *UL Transport Layer Address* IE and the *UL GTP-TEID* IE within the *E-RABs Admitted List* IE of the HANDOVER REQUEST ACKNOWLEDGE message for that E-RAB.

For each bearer that target eNB has decided to admit and for which *DL forwarding* IE is set to "DL forwarding proposed", the target eNB may include the *DL GTP-TEID* IE and the *DL Transport Layer Address* IE within the *E-RABs Admitted List* IE of the HANDOVER REQUEST ACKNOWLEDGE message indicating that it accepts the proposed forwarding of downlink data for this bearer.

If the HANDOVER REQUEST ACKNOWLEDGE message contains the *UL GTP-TEID* IE and the *UL Transport Layer Address* IE for a given bearer in the *E-RABs Admitted List* IE, then it means the target eNB has requested the forwarding of uplink data for this given bearer.

If the *Request Type* IE is included in the HANDOVER REQUEST message, then the target eNB should perform the requested location reporting functionality for the UE as described in subclause 8.11.

If the *UE Security Capabilities* IE included in the HANDOVER REQUEST message only contains the EIA0 algorithm as defined in TS 33.401 [15] and if this EIA0 algorithm is defined in the configured list of allowed integrity protection algorithms in the eNB (TS 33.401 [15]), the eNB shall take it into use and ignore the keys received in the *Security Context* IE.

The *GUMMEI* IE shall only be contained in the HANDOVER REQUEST message according to subclauses 4.6.2 and 4.7.6.6 of TS 36.300 [14]. If the *GUMMEI* IE is present, the target eNB shall store this information in the UE context and use it for subsequent X2 handovers.

The *MME UE S1AP ID 2* IE shall only be contained in the HANDOVER REQUEST message according to subclause 4.6.2 of TS 36.300 [14].If the *MME UE S1AP ID 2* IE is present, the target eNB shall store this information in the UE context and use it for subsequent X2 handovers.

If the *Management Based MDT Allowed* IE is contained in the HANDOVER REQUEST message, the target eNB shall, if supported, store the received information in the UE context, and use this information to allow subsequent selections of the UE for management based MDT defined in TS 32.422 [10].

8.4.2.3 Unsuccessful Operation

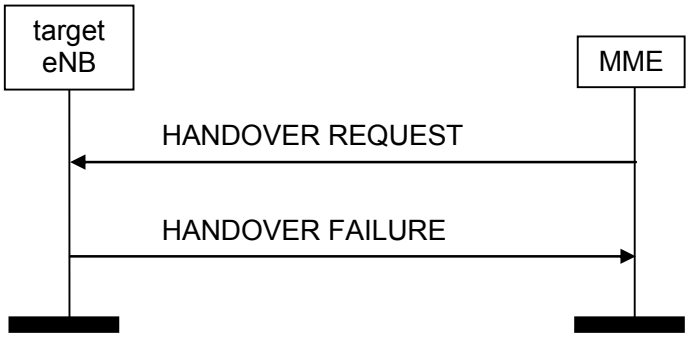

Figure 8.4.2.3-1: Handover resource allocation: unsuccessful operation

If the target eNB does not admit at least one non-GBR E-RAB, or a failure occurs during the Handover Preparation, it shall send the HANDOVER FAILURE message to the MME with an appropriate cause value.

If the target eNB does not receive the *CSG Membership Status* IE but does receive the *CSG Id* IE in the HANDOVER REQUEST message and the CSG Id does not correspond to the CSG Id of the target cell, the target eNB shall send the HANDOVER FAILURE message to the MME with an appropriate cause value.

If the target eNB receives a HANDOVER REQUEST message containing *RRC Container* IE that does not include required information as specified in TS 36.331 [16], the target eNB shall send the HANDOVER FAILURE message to the MME.

8.4.2.4 Abnormal Conditions

If the target eNB receives a HANDOVER REQUEST message containing a *E-RAB Level QoS Parameters* IE which contains a *QCI* IE indicating a GBR bearer (as defined in TS 23.203 [13]), and which does not contain the *GBR QoS Information* IE, the target eNB shall not admit the corresponding E-RAB.

If the target eNB receives a HANDOVER REQUEST message containing several *E-RAB ID* IEs (in the *E-RABs To Be Setup List* IE) set to the same value, the target eNB shall not admit the corresponding E-RABs.

If the *Subscriber Profile ID for RAT/Frequency priority* IE is not contained in the *Source eNB to Target eNB Transparent Container* IE whereas available in the source eNB, the target eNB shall trigger a local error handling.

NOTE: It is assumed that the information needed to verify this condition is visible within the system, see subclause 4.1.

If the supported algorithms for encryption defined in the *Encryption Algorithms* IE in the *UE Security Capabilities* IE, plus the mandated support of EEA0 in all UEs (TS 33.401 [15]), do not match any allowed algorithms defined in the configured list of allowed encryption algorithms in the eNB (TS 33.401 [15]), the target eNB shall reject the procedure using the HANDOVER FAILURE message.

If the supported algorithms for integrity defined in the *Integrity Protection Algorithms* IE in the *UE Security Capabilities* IE, plus the mandated support of the EIA0 algorithm in all UEs (TS 33.401 [15]), do not match any allowed algorithms defined in the configured list of allowed integrity protection algorithms in the eNB (TS 33.401 [15]), the target eNB shall reject the procedure using the HANDOVER FAILURE message.

If the target eNB receives a HANDOVER REQUEST message which does not contain the *Handover Restriction List* IE, and the serving PLMN cannot be determined otherwise by the eNB, the target eNB shall reject the procedure using the HANDOVER FAILURE message.

If the target eNB receives a HANDOVER REQUEST message containing the *Handover Restriction List* IE, and the serving PLMN indicated is not supported by the target cell, the target eNB shall reject the procedure using the HANDOVER FAILURE message.

8.4.3 Handover Notification

8.4.3.1 General

The purpose of the Handover Notification procedure is to indicate to the MME that the UE has arrived to the target cell and the S1 handover has been successfully completed.

8.4.3.2 Successful Operation

Figure 8.4.3.2-1: Handover notification

The target eNB shall send the HANDOVER NOTIFY message to the MME when the UE has been identified in the target cell and the S1 handover has been successfully completed.

8.4.3.3 Abnormal Conditions

Not applicable.

8.4.4 Path Switch Request

8.4.4.1 General

The purpose of the Path Switch Request procedure is to request the switch of a downlink GTP tunnel towards a new GTP tunnel endpoint.

8.4.4.2 Successful Operation

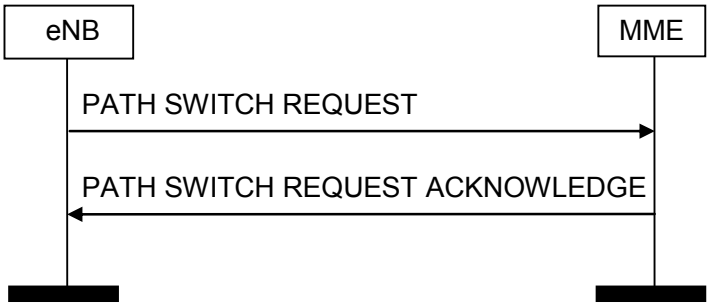

Figure 8.4.4.2-1: Path switch request: successful operation

The eNB initiates the procedure by sending the PATH SWITCH REQUEST message to the MME.

If the *E-RAB To Be Switched in Downlink List* IE in the PATH SWITCH REQUEST message does not include all E-RABs previously included in the UE Context, the MME shall consider the non included E-RABs as implicitly released by the eNB.

After all necessary updates including the UP path switch have been successfully completed in the EPC for at least one of the E-RABs included in the PATH SWITCH REQUEST *E-RAB To Be Switched in Downlink List* IE, the MME shall send the PATH SWITCH REQUEST ACKNOWLEDGE message to the eNB and the procedure ends. The UE-associated logical S1-connection shall be established at reception of the PATH SWITCH REQUEST ACKNOWLEDGE message.

In case the EPC failed to perform the UP path switch for at least one, but not all, of the E-RABs included in the PATH SWITCH REQUEST *E-RAB To Be Switched in Downlink List* IE, the MME shall include the E-RABs it failed to perform UP path switch in the PATH SWITCH REQUEST ACKNOWLEDGE *E-RAB To Be Released List* IE. In this case, the eNB shall release the corresponding data radio bearers, and the eNB shall regard the E-RABs indicated in the *E-RAB To Be Released List* IE as being fully released.

If the *CSG Id* IE and no *Cell Access Mode* IE are received in the PATH SWITCH REQUEST message, the MME shall use it in the core network as specified in TS 23.401 [11]. If the *CSG Id* IE and the *Cell Access Mode* IE set to “hybrid” are received in the PATH SWITCH REQUEST message, the MME shall decide the membership status of the UE and use it in the core network as specified in TS 23.401 [11]. If no *CSG Id* IE and no *Cell Access Mode* IE are received in the PATH SWITCH REQUEST message and the UE was previously either in a CSG cell or in a hybrid cell, the MME shall consider that the UE has moved into a cell that is neither a CSG cell nor a hybrid cell and use this as specified in TS 23.401 [11].

If the GUMMEI of the MME currently serving the UE is available at the eNB (see TS 36.300 [14]) the eNB shall include the *Source MME GUMMEI* IE within the PATH SWITCH REQUEST message.

Upon reception of the PATH SWITCH REQUEST ACKNOWLEDGE message the eNB shall store the received *Security Context* IE in the UE context and the eNB shall use it for the next X2 handover or Intra eNB handovers as specified in TS 33.401 [15].

The PATH SWITCH REQUEST ACKNOWLEDGE message may contain

- the *UE Aggregate Maximum Bit Rate* IE.
- the *MME UE S1AP ID 2* IE, which indicates the MME UE S1AP ID assigned by the MME.

If the *UE Aggregate Maximum Bit Rate* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message the eNB shall

- replace the previously provided UE Aggregate Maximum Bit Rate by the received UE Aggregate Maximum Bit Rate in the UE context; the eNB shall use the received UE Aggregate Maximum Bit Rate for non-GBR Bearers for the concerned UE.

If the *UE Aggregate Maximum Bit Rate* IE is not contained in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall use the previously provided UE Aggregate Maximum Bit Rate which is stored in the UE context.

In case the EPC decides to change the uplink termination point of the tunnels, it may include the *E-RAB To Be Switched in Uplink List* IE in the PATH SWITCH REQUEST ACKNOWLEDGE message to specify a new uplink transport layer address and uplink GTP-TEID for each respective E-RAB for which it wants to change the uplink tunnel termination point.

When the eNB receives the PATH SWITCH REQUEST ACKNOWLEDGE message and if this message includes the *E-RAB To Be Switched in Uplink List* IE, the eNB shall start delivering the uplink packets of the concerned E-RABs to the new uplink tunnel endpoints as indicated in the message.

If the *MME UE S1AP ID 2* IE is contained in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall store this information in the UE context and use it for subsequent X2 handovers.

8.4.4.3 Unsuccessful Operation

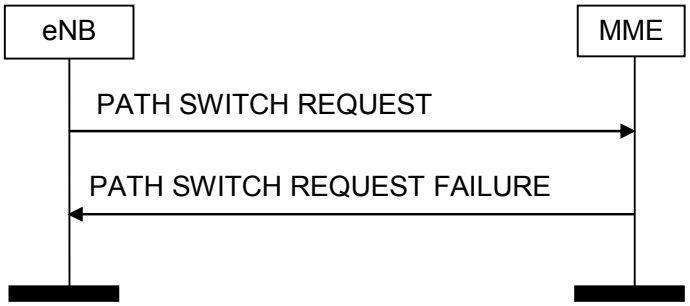

Figure 8.4.4.3-1: Path switch request: unsuccessful operation

If the EPC fails to switch the downlink GTP tunnel endpoint towards a new GTP tunnel endpoint for all E-RABs included in the *E-RAB To Be Switched in Downlink List* IE during the execution of the Path Switch Request procedure, the MME shall send the PATH SWITCH REQUEST FAILURE message to the eNB with an appropriate cause value. In this case, the eNB should decide its subsequent actions and the MME should behave as described in TS 23.401 [11].

8.4.4.4 Abnormal Conditions

If the MME receives a PATH SWITCH REQUEST message containing several *E-RAB ID* IEs (in the *E-RAB To Be Switched in Downlink List* IE) set to the same value, the MME shall send the PATH SWITCH REQUEST FAILURE message to the eNB.

8.4.5 Handover Cancellation

8.4.5.1 General

The purpose of the Handover Cancel procedure is to enable a source eNB to cancel an ongoing handover preparation or an already prepared handover.

The procedure uses UE-associated signalling.

8.4.5.2 Successful Operation

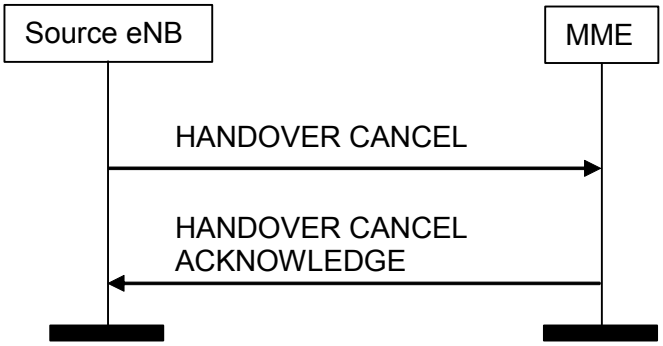

Figure 8.4.5.2-1: Handover Cancel procedure. Successful operation.

The source eNB initiates the procedure by sending a HANDOVER CANCEL message to the EPC.

The HANDOVER CANCEL message shall indicate the reason for cancelling the handover with the appropriate value of the *Cause* IE.

Upon reception of a HANDOVER CANCEL message, the EPC shall terminate the ongoing Handover Preparation procedure, release any resources associated with the handover preparation and send a HANDOVER CANCEL ACKNOWLEDGE message to the source eNB.

Transmission and reception of a HANDOVER CANCEL ACKNOWLEDGE message terminate the procedure in the EPC and in the source eNB. After this, the source eNB does not have a prepared handover for that UE-associated logical S1-connection.

8.4.5.3 Unsuccessful Operation

Not applicable.

8.4.5.4 Abnormal Conditions

If the source eNB becomes aware of the fact that an expected HANDOVER CANCEL ACKNOWLEDGE message is missing, the source eNB shall consider the Handover Cancellation as successfully terminated.

8.4.6 eNB Status Transfer

8.4.6.1 General

The purpose of the eNB Status Transfer procedure is to transfer the uplink PDCP-SN and HFN receiver status and the downlink PDCP-SN and HFN transmitter status from the source to the target eNB via the MME during an intra LTE S1 handover for each respective E-RAB for which PDCP-SN and HFN status preservation applies.

8.4.6.2 Successful Operation

Figure 8.4.6.2-1: eNB Status Transfer procedure

The source eNB initiates the procedure by stopping assigning PDCP-SNs to downlink SDUs and sending the eNB STATUS TRANSFER message to the MME at the point in time when it considers the transmitter/receiver status to be frozen.

- For each E-RAB for which PDCP-SN and HFN status preservation applies the source eNB shall include the *E-RAB ID* IE, the *UL COUNT value* IE and the *DL COUNT value* IE within the *E-RABs Subject to Status Transfer Item* IE in the *eNB Status Transfer Transparent Container* IE of the eNB STATUS TRANSFER message.

The source eNB may also include in the eNB STATUS TRANSFER message the missing and the received uplink SDUs in the *Receive Status Of UL PDCP SDUs* IE for each bearer for which the source eNB has accepted the request from the target eNB for uplink forwarding.

8.4.6.3 Unsuccessful Operation

Not applicable.

8.4.6.4 Abnormal Conditions

Not applicable.

8.4.7 MME Status Transfer

8.4.7.1 General

The purpose of the MME Status Transfer procedure is to transfer the uplink PDCP-SN and HFN receiver status and the downlink PDCP-SN and HFN transmitter status from the source to the target eNB via the MME during an S1 handover for each respective E-RAB for which PDCP-SN and HFN status preservation applies.

8.4.7.2 Successful Operation

Figure 8.4.7.2-1: MME Status Transfer procedure

The MME initiates the procedure by sending the MME STATUS TRANSFER message to the eNB.

For each bearer within the *E-RABs Subject to Status Transfer List* IE within the *eNB Status Transfer Transparent Container* IE for which the *UL COUNT value* IE is received in the MME STATUS TRANSFER message, the target eNB shall apply the contained information and shall not deliver any uplink packet which has a PDCP-SN lower than the value contained in the *PDCP-SN* IE of this IE.

For each bearer in *E-RABs Subject to Status Transfer List* IE within the *eNB Status Transfer Transparent Container* IE received in the MME STATUS TRANSFER message, the target eNB shall use *DL COUNT value* IE for the first downlink packet for which there is no PDCP-SN yet assigned.

If the *Receive Status Of UL PDCP SDUs* IE is included for at least one bearer in the *eNB Status Transfer Transparent Container* IE of the MME STATUS TRANSFER message, the target eNB may use it in a Status Report message sent to the UE over the radio interface.

8.4.7.3 Unsuccessful Operation

Not applicable.

8.4.7.4 Abnormal Conditions

If the target eNB receives this message for a UE for which no prepared handover exists at the target eNB, the target eNB shall ignore the message.

8.5 Paging

8.5.1 General

The purpose of the Paging procedure is to enable the MME to page a UE in the specific eNB.

8.5.2 Successful Operation

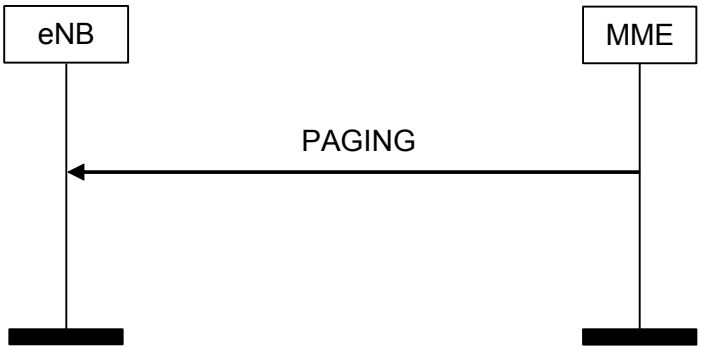

Figure 8.5.2-1: Paging procedure

The MME initiates the paging procedure by sending the PAGING message to the eNB.

At the reception of the PAGING message, the eNB shall perform paging of the UE in cells which belong to tracking areas as indicated in the *List of TAIs* IE.

The *CN Domain* IE shall be transferred transparently to the UE.

The *Paging DRX* IE may be included in the PAGING message, and if present the eNB shall use it according to TS 36.304 [20].

A list of CSG IDs may be included in the PAGING message.

If included, the E-UTRAN may use the list of CSG IDs to avoid paging the UE at CSG cells whose CSG ID does not appear in the list.

For each cell that belongs to any of the TAs indicated in the *List of TAIs* IE, the eNB shall generate one page on the radio interface.

The *Paging Priority* IE may be included in the PAGING message, and if present the eNB may use it according to TS 23.401 [11] and TS 23.272 [17].

8.5.3 Unsuccessful Operation

Not applicable.

8.5.4 Abnormal Conditions

Not applicable.

8.6 NAS transport

8.6.1 General

The purpose of the NAS Transport procedure is to carry UE – MME signalling over the S1 Interface. The NAS messages are not interpreted by the eNB, and their content is outside the scope of this specification. The procedure may use an existing UE-associated logical S1-connection. If no UE-associated logical S1-connection exists, the establishment of the UE-associated logical S1-connection is initiated (and may be established) as part of the procedure.

The NAS messages are transported in an IE of the INITIAL UE MESSAGE, DOWNLINK NAS TRANSPORT or UPLINK NAS TRANSPORT messages.

8.6.2 Successful Operations

8.6.2.1 Initial UE Message

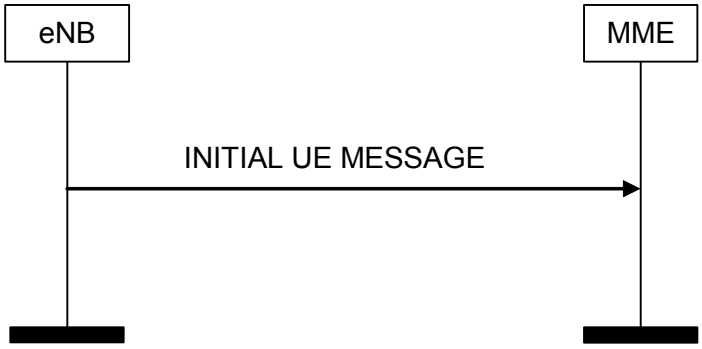

Figure 8.6.2.1-1: Initial UE Message procedure

When the eNB has received from the radio interface the first UL NAS message transmitted on an RRC connection to be forwarded to an MME, the eNB shall invoke the NAS Transport procedure and send the INITIAL UE MESSAGE message to the MME including the NAS message as a *NAS-PDU* IE. The eNB shall allocate a unique eNB UE S1AP ID to be used for the UE and the eNB shall include this identity in the INITIAL UE MESSAGE message. In case of network sharing, the selected PLMN is indicated by the *PLMN Identity* IE within the *TAI* IE included in the INITIAL UE MESSAGE message. When the eNB has received from the radio interface the *S-TMSI* IE, it shall include it in the INITIAL UE MESSAGE message. If the eNB does not support NNSF and the eNB has received from the radio interface the *GUMMEI* IE, the eNB may include it in the INITIAL UE MESSAGE message.

If the establishment of the UE-associated logical S1-connection towards the CN is performed due to an RRC connection establishment originating from a CSG cell, the *CSG Id* IE shall be included in the INITIAL UE MESSAGE message.

If the establishment of the UE-associated logical S1-connection towards the CN is performed due to an RRC connection establishment originating from a Hybrid cell, the *CSG Id* IE and the *Cell Access Mode* IE shall be included in the INITIAL UE MESSAGE message.

If the establishment of the UE-associated logical S1-connection towards the CN is performed due to an RRC connection establishment triggered by a Relay Node as defined in TS 36.300 [14], the *GW Transport Layer Address* IE and the *Relay Node Indicator* IE shall be included in the INITIAL UE MESSAGE message.

If the eNB has a L-GW function for LIPA operation, it shall include the *GW Transport Layer Address* IE in the INITIAL UE MESSAGE message.

NOTE: The first UL NAS message is always received in the RRC CONNECTION SETUP COMPLETE message.

8.6.2.2 DOWNLINK NAS TRANSPORT

Figure 8.6.2.2-1: DOWNLINK NAS Transport Procedure

If the MME only needs to send a NAS message transparently via the eNB to the UE and a UE-associated logical S1-connection exists for the UE or if the MME has received the *eNB UE S1AP ID* IE in an INITIAL UE MESSAGE message, the MME shall send a DOWNLINK NAS TRANSPORT message to the eNB including the NAS message as a

NAS-PDU IE. If the UE-associated logical S1-connection is not established, the MME shall allocate a unique MME UE S1AP ID to be used for the UE and include that in the DOWNLINK NAS TRANSPORT message. By receiving the *MME UE S1AP ID* IE in the DOWNLINK NAS TRANSPORT, the eNB establishes the UE-associated logical S1-connection.

The *NAS-PDU* IE contains an MME – UE message that is transferred without interpretation in the eNB.

The DOWNLINK NAS TRANSPORT message may contain the *Handover Restriction List* IE, which may contain roaming area or access restrictions.

If the *Handover Restriction List* IE is contained in the DOWNLINK NAS TRANSPORT message, the eNB shall store this information in the UE context.

The eNB shall use the information in *Handover Restriction List* IE if present in the DOWNLINK NAS TRANSPORT message to determine a target for subsequent mobility action for which the eNB provides information about the target of the mobility action towards the UE. If the *Handover Restriction List* IE is not contained in the DOWNLINK NAS TRANSPORT message and there is no previously stored Handover restriction information, the eNB shall consider that no access restriction applies to the UE.

If the *Subscriber Profile ID for RAT/Frequency priority* IE is included in DOWNLINK NAS TRANSPORT message, the eNB shall, if supported, use it as defined in TS 36.300 [14].

8.6.2.3 UPLINK NAS TRANSPORT

Figure 8.6.2.3-1: UPLINK NAS TRANSPORT Procedure

When the eNB has received from the radio interface a NAS message to be forwarded to the MME to which a UE-associated logical S1-connection for the UE exists, the eNB shall send the UPLINK NAS TRANSPORT message to the MME including the NAS message as a *NAS-PDU* IE. The eNB shall include the TAI and ECGI of the current cell in every S1-AP UPLINK NAS TRANSPORT message.

The *NAS-PDU* IE contains a UE – MME message that is transferred without interpretation in the eNB.

If the eNB has a L-GW function for LIPA operation, it shall include the *GW Transport Layer Address* IE in the UPLINK NAS TRANSPORT message.

8.6.2.4 NAS NON DELIVERY INDICATION

Figure 8.6.2.4-1: NAS NON DELIVERY INDICATION Procedure

When the eNB decides not to start the delivery of a NAS message that has been received over a UE-associated logical S1-connection or the eNB is unable to ensure that the message has been received by the UE, it shall report the non-delivery of this NAS message by sending a NAS NON DELIVERY INDICATION message to the MME including the non-delivered NAS message within the *NAS-PDU* IE and an appropriate cause value within an appropriate *Cause* IE, e.g., "S1 intra system Handover Triggered", "S1 inter system Handover Triggered" or "X2 Handover Triggered".

8.6.3 Unsuccessful Operation

Not applicable.

8.6.4 Abnormal Conditions

If the S-TMSI is not received by the MME in the INITIAL UE MESSAGE message whereas expected, the MME shall consider the procedure as failed.

8.7 Management procedures

8.7.1 Reset

8.7.1.1 General

The purpose of the Reset procedure is to initialise or re-initialise the E-UTRAN, or part of E-UTRAN S1AP UE-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 S1 Setup procedure.

The procedure uses non-UE associated signalling.

8.7.1.2 Successful Operation

8.7.1.2.1 Reset Procedure Initiated from the MME

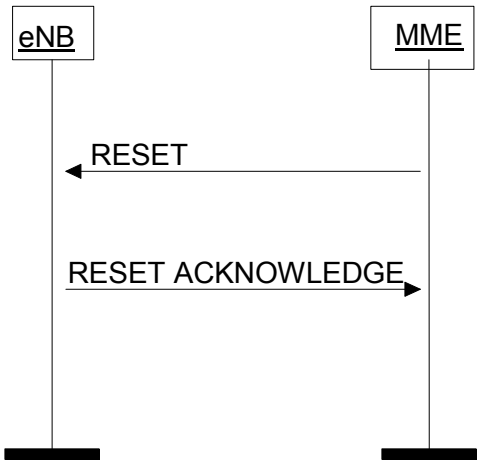

Figure 8.7.1.2.1-1: Reset procedure initiated from the MME. Successful operation.

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 eNB.

At reception of the RESET message the eNB shall release all allocated resources on S1 and Uu related to the UE association(s) indicated explicitly or implicitly in the RESET message and remove the indicated UE contexts including S1AP ID.

After the eNB has released all assigned S1 resources and the UE S1AP IDs for all indicated UE associations which can be used for new UE-associated logical S1-connections over the S1 interface, the eNB shall respond with the RESET ACKNOWLEDGE message. The eNB does not need to wait for the release of radio resources to be completed before returning the RESET ACKNOWLEDGE message.

If the RESET message contains the *UE-associated logical S1-connection list* IE, then:

- The eNB shall use the *MME UE S1AP ID* IE and/or the *eNB UE S1AP ID* IE to explicitly identify the UE association(s) to be reset.

- The eNB shall include in the RESET ACKNOWLEDGE message, for each UE association to be reset, the *UE-associated logical S1-connection Item* IE in the *UE-associated logical S1-connection list* IE. The *UE-associated logical S1-connection Item* IEs shall be in the same order as received in the RESET message and shall include also unknown UE-associated logical S1-connections. Empty *UE-associated logical S1-connection Item* IEs, received in the RESET message, may be omitted in the RESET ACKNOWLEDGE message.

- If the *MME UE S1AP ID* IE is included in the *UE-associated logical S1-connection Item* IE for a UE association, the eNB shall include the *MME UE S1AP ID* IE in the corresponding *UE-associated logical S1-connection Item* IE in the RESET ACKNOWLEDGE message.

- If the *eNB UE S1AP ID* IE is included in the *UE-associated logical S1-connection Item* IE for a UE association, the eNB shall include the *eNB UE S1AP ID* IE in the corresponding *UE-associated logical S1-connection Item* IE in the RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except for another Reset procedure) on the same S1 interface related to a UE association, indicated explicitly or implicitly in the RESET message, shall be aborted.

8.7.1.2.2 Reset Procedure Initiated from the E-UTRAN

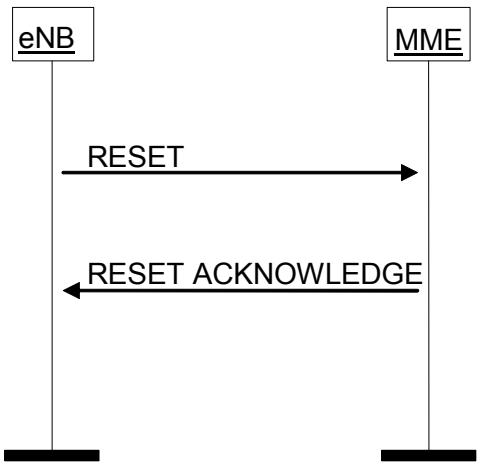

Figure 8.7.1.2.2-1: Reset procedure initiated from the E-UTRAN. Successful operation.

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

At reception of the RESET message the MME shall release all allocated resources on S1 related to the UE association(s) indicated explicitly or implicitly in the RESET message and remove the S1AP ID for the indicated UE associations.

After the MME has released all assigned S1 resources and the UE S1AP IDs for all indicated UE associations which can be used for new UE-associated logical S1-connections over the S1 interface, the MME shall respond with the RESET ACKNOWLEDGE message.

If the RESET message contains the *UE-associated logical S1-connection list* IE, then:

- The MME shall use the *MME UE S1AP ID* IE and/or the *eNB UE S1AP ID* IE to explicitly identify the UE association(s) to be reset.

- The MME shall in the RESET ACKNOWLEDGE message include, for each UE association to be reset, the *UE-associated logical S1-connection Item* IE in the *UE-associated logical S1-connection list* IE. The *UE-associated logical S1-connection Item* IEs shall be in the same order as received in the RESET message and shall include also unknown UE-associated logical S1-connections. Empty *UE-associated logical S1-connection Item* IEs, received in the RESET message, may be omitted in the RESET ACKNOWLEDGE message.

- If the *MME UE S1AP ID* IE is included in the *UE-associated logical S1-connection Item* IE for a UE association, the MME shall include the *MME UE S1AP ID* IE in the corresponding *UE-associated logical S1-connection Item* IE in the RESET ACKNOWLEDGE message.
- If the *eNB UE S1AP ID* IE is included in a *UE-associated logical S1-connection Item* IE for a UE association, the MME shall include the eNB *UE S1AP ID* IE in the corresponding *UE-associated logical S1-connection Item* IE in the RESET ACKNOWLEDGE message.

Interactions with other procedures:

If the RESET message is received, any other ongoing procedure (except for another Reset procedure) on the same S1 interface related to a UE association, indicated explicitly or implicitly in the RESET message, shall be aborted.

8.7.1.3 Abnormal Conditions

8.7.1.3.1 Abnormal Condition at the EPC

If the RESET message includes the *UE-associated logical S1-connection list* IE, but neither the *MME UE S1AP ID* IE nor the *eNB UE S1AP ID* IE is present for a *UE-associated logical S1-connection Item* IE, then the MME shall ignore the *UE-associated logical S1-connection Item* IE. The MME may return the empty *UE-associated logical S1-connection Item* IE in the *UE-associated logical S1-connection list* IE in the RESET ACKNOWLEDGE message.

8.7.1.3.2 Abnormal Condition at the E-UTRAN

If the RESET message includes the *UE-associated logical S1-connection list* IE, but neither the *MME UE S1AP ID* IE nor the *eNB UE S1AP ID* IE is present for a *UE-associated logical S1-connection Item* IE, then the eNB shall ignore the *UE-associated logical S1-connection Item* IE. The eNB may return the empty *UE-associated logical S1-connection Item* IE in the *UE-associated logical S1-connection list* IE in the RESET ACKNOWLEDGE message.

8.7.1.3.3 Crossing of Reset Messages

If a Reset procedure is ongoing in the eNB and the eNB receives a RESET message from the peer entity on the same S1 interface related to one or several UE associations previously requested to be reset, indicated explicitly or implicitly in the received RESET message, the eNB shall respond with the RESET ACKNOWLEDGE message as described in 8.7.1.2.1.

If a Reset procedure is ongoing in the MME and the MME receives a RESET message from the peer entity on the same S1 interface related to one or several UE associations previously requested to be reset, indicated explicitly or implicitly in the received RESET message, the MME shall respond with the RESET ACKNOWLEDGE message as described in 8.7.1.2.2.

8.7.2 Error Indication

8.7.2.1 General

The Error Indication procedure is initiated by a node in order 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 UE associated signalling, then the Error Indication procedure uses UE associated signalling. Otherwise the procedure uses non-UE associated signalling.

8.7.2.2 Successful Operation

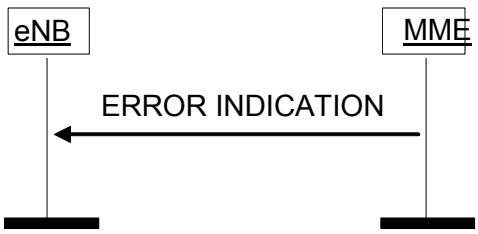

Figure 8.7.2.2-1: Error Indication procedure, MME originated. Successful operation.

Figure 8.7.2.2-2: Error Indication procedure, eNB originated. Successful operation.

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

The ERROR INDICATION message shall contain at least either the *Cause* IE or the *Criticality Diagnostics* IE. In case the Error Indication procedure is triggered by utilising UE associated signalling the *MME UE S1AP ID* IE and the *eNB UE S1AP ID* IE shall be included in the ERROR INDICATION message. If one or both of *MME UE S1AP ID* IE and the *eNB UE S1AP ID* IE are not correct, the cause shall be set to appropriate value, e.g., "Unknown or already allocated MME UE S1AP ID", "Unknown or already allocated eNB UE S1AP" or "Unknown or inconsistent pair of UE S1AP ID".

8.7.2.3 Abnormal Conditions

Not applicable.

8.7.3 S1 Setup

8.7.3.1 General

The purpose of the S1 Setup procedure is to exchange application level data needed for the eNB and the MME to correctly interoperate on the S1 interface. This procedure shall be the first S1AP procedure triggered after the TNL association has become operational. The procedure uses non-UE associated signalling.

This procedure erases any existing application level configuration data in the two nodes and replaces it by the one received. This procedure also re-initialises the E-UTRAN S1AP UE-related contexts (if any) and erases all related signalling connections in the two nodes like a Reset procedure would do, and clears MME overload state information at the eNB. If the eNB initiating the S1 Setup procedure supports a CSG cell, the procedure shall report the CSG ID(s) of the supported CSGs.

8.7.3.2 Successful Operation

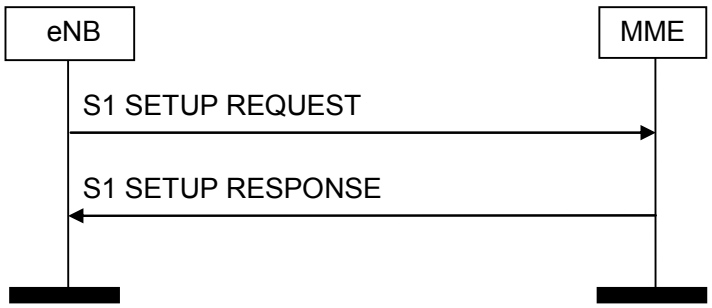

Figure 8.7.3.2-1: S1 Setup procedure: Successful Operation.

The eNB initiates the procedure by sending a S1 SETUP REQUEST message including the appropriate data to the MME. The MME responds with a S1 SETUP RESPONSE message including the appropriate data.

The exchanged data shall be stored in respective node and used for the duration of the TNL association. When this procedure is finished, the S1 interface is operational and other S1 messages can be exchanged.

If the eNB initiating the S1 SETUP procedure supports one (or more) CSG cell(s), the S1 SETUP REQUEST message shall contain the CSG ID(s) of the supported CSG(s).

If the S1 SETUP REQUEST message contains the *eNB Name* IE the MME may use this IE as a human readable name of the eNB.

If the S1 SETUP RESPONSE message contains the *MME Name* IE the eNB may use this IE as a human readable name of the MME.

If the *MME Relay Support Indicator* IE is included in the S1 SETUP RESPONSE message, the eNB shall consider this information when selecting an appropriate MME for the Relay Node.

8.7.3.3 Unsuccessful Operation

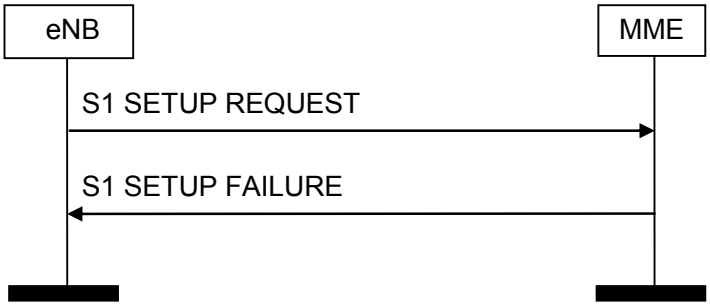

Figure 8.7.3.3-1: S1 Setup procedure: Unsuccessful Operation.

If the MME cannot accept the setup, it should respond with a S1 SETUP FAILURE and appropriate cause value.

If the S1 SETUP FAILURE message includes the *Time To Wait* IE, the eNB shall wait at least for the indicated time before reinitiating the S1 setup towards the same MME.

8.7.3.4 Abnormal Conditions

If the eNB initiates the procedure by sending a S1 SETUP REQUEST message including the *PLMN Identity* IEs and none of the PLMNs provided by the eNB is identified by the MME, then the MME shall reject the eNB S1 Setup Request procedure with the appropriate cause value, e.g, "Unknown PLMN".

8.7.4 eNB Configuration Update

8.7.4.1 General

The purpose of the eNB Configuration Update procedure is to update application level configuration data needed for the eNB and the MME to interoperate correctly on the S1 interface. This procedure does not affect existing UE-related contexts, if any.

8.7.4.2 Successful Operation

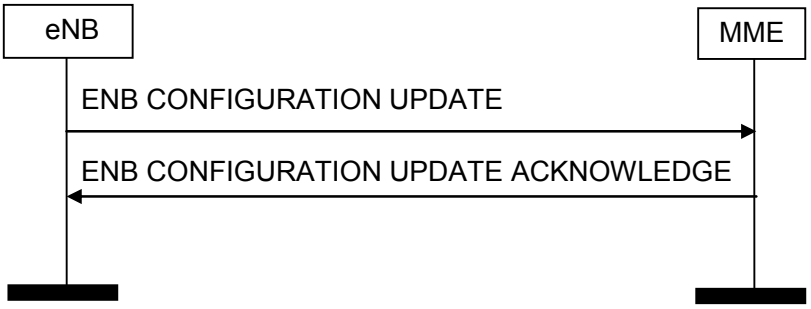

Figure 8.7.4.2-1: ENB Configuration Update procedure: Successful Operation.

The eNB initiates the procedure by sending an ENB 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 ENB CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data. If information element(s) is/are not included in the ENB CONFIGURATION UPDATE message, the MME shall interpret that the corresponding configuration data is/are not changed and shall continue to operate the S1 with the existing related configuration data.

If the supported TA(s) is/are to be updated, the whole list of supported TAs, including those that are not to be updated, shall be included in the *Supported TAs* IE. The MME shall overwrite the whole list of TAs.

If the supported CSG ID(s) is/are to be updated, the whole list of supported CSG IDs, including those that are not to be updated, shall be included in the *CSG Id List* IE. The MME shall overwrite the whole list of CSG Ids.

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

If the *Default Paging DRX* IE is included, the MME shall overwrite any previously stored default paging DRX value for the eNB.

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

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

8.7.4.3 Unsuccessful Operation

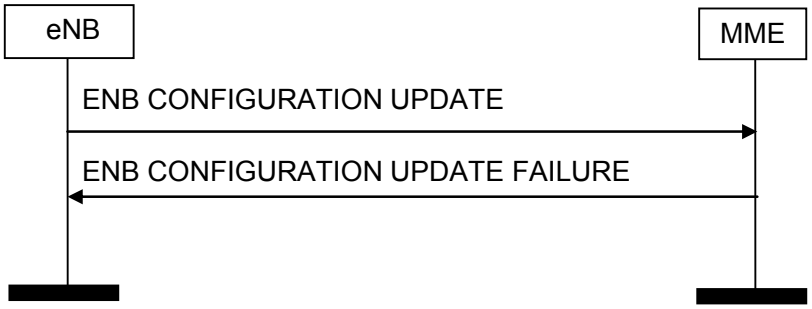

Figure 8.7.4.3-1: ENB Configuration Update procedure: Unsuccessful Operation.

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

If the ENB CONFIGURATION UPDATE FAILURE messages includes the *Time To Wait* IE, the eNB shall wait at least for the indicated time before reinitiating the ENB Configuration Update procedure towards the same MME. Both nodes shall continue to operate the S1 with their respective configuration data.

8.7.4.4 Abnormal Conditions

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

8.7.5 MME Configuration Update

8.7.5.1 General

The purpose of the MME Configuration Update procedure is to update application level configuration data needed for the eNB and MME to interoperate correctly on the S1 interface. This procedure does not affect existing UE-related contexts, if any.

8.7.5.2 Successful Operation

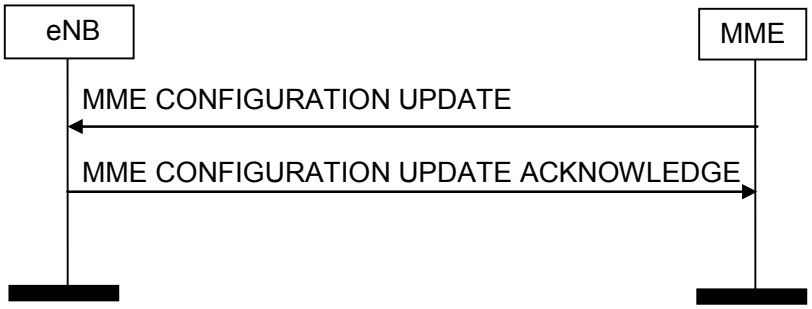

Figure 8.7.5.2-1: MME Configuration Update procedure: Successful Operation.

The MME initiates the procedure by sending an MME CONFIGURATION UPDATE message including the appropriate updated configuration data to the eNB. The eNB responds with an MME CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data. If information element(s) is/are not included in the MME CONFIGURATION UPDATE message, the eNB shall interpret that the corresponding configuration data is not changed and shall continue to operate the S1 with the existing related configuration data.

If the served PLMNs is/are to be updated, the eNB shall overwrite the whole list of PLMNs.

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

The updated configuration data shall be stored in the respective node and used for the duration of the TNL association or until any further update is performed from the MME.

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

8.7.5.3 Unsuccessful Operation

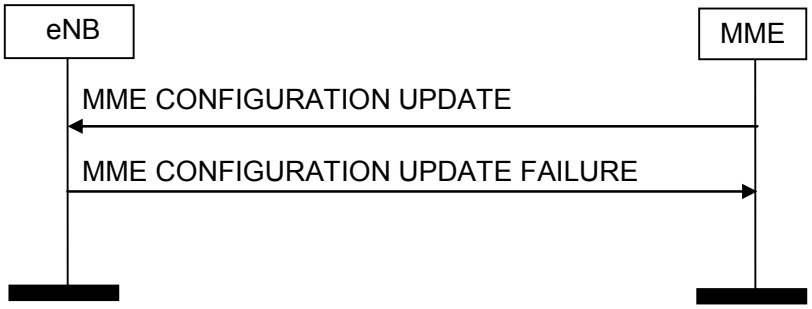

Figure 8.7.5.3-1: MME Configuration Update: Unsuccessful Operation.

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

If the MME CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE the MME shall wait at least for the indicated time before reinitiating the MME Configuration Update procedure towards the same eNB. Both nodes shall continue to operate the S1 with the existing configuration data.

8.7.5.4 Abnormal Conditions

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

8.7.6 Overload Start

8.7.6.1 General

The purpose of the Overload Start procedure is to inform an eNB to reduce the signalling load towards the concerned MME.

The procedure uses non-UE associated signalling.

8.7.6.2 Successful Operation

Figure 8.7.6.2-1: Overload Start procedure

The eNB receiving the OVERLOAD START message shall assume the MME from which it receives the message as being in an overloaded state.

If the *Overload Action* IE in the *Overload Response* IE within the OVERLOAD START message is set to

- "reject RRC connection establishments for non-emergency mobile originated data transfer" (i.e., reject traffic corresponding to RRC cause "mo-data" and "delayTolerantAccess" in TS 36.331 [16]), or
- "reject RRC connection establishments for signalling" (i.e., reject traffic corresponding to RRC cause "mo-data", "mo-signalling" and "delayTolerantAccess" in TS 36.331 [16]), or
- "only permit RRC connection establishments for emergency sessions and mobile terminated services" (i.e., only permit traffic corresponding to RRC cause "emergency" and "mt-Access" in TS 36.331 [16]), or
- "only permit RRC connection establishments for high priority sessions and mobile terminated services" (i.e., only permit traffic corresponding to RRC cause "highPriorityAccess" and "mt-Access" in TS 36.331 [16]), or
- "reject only RRC connection establishment for delay tolerant access" (i.e., only reject traffic corresponding to RRC cause "delayTolerantAccess" in TS 36.331 [16]).

The eNB shall:

- if the *Traffic Load Reduction Indication* IE is included in the OVERLOAD START message and if supported, reduce the signalling traffic indicated as to be rejected by the indicated percentage,
- otherwise ensure that only the signalling traffic not indicated as to be rejected is sent to the MME.

NOTE: When the Overload Action IE is set to "only permit RRC connection establishments for emergency sessions and mobile terminated services", emergency calls with RRC cause "highPriorityAccess" from high priority users are rejected (see TS 24.301 [24]).

If the *GUMMEI List* IE is present, the eNB shall, if supported, use this information to identify to which traffic the above defined rejections shall be applied.

If an overload action is ongoing and the eNB receives a further OVERLOAD START message, the eNB shall replace the ongoing overload action with the newly requested one.

8.7.6.3 Unsuccessful Operation

Not applicable.

8.7.7 Overload Stop

8.7.7.1 General

The purpose of the Overload Stop procedure is to signal to an eNB the MME is connected to that the overload situation at the MME has ended and normal operation shall resume.

The procedure uses non-UE associated signalling.

8.7.7.2 Successful Operation

Figure 8.7.7.2.-1: Overload Stop procedure

The eNB receiving the OVERLOAD STOP message shall assume that the overload situation at the MME from which it receives the message has ended and shall resume normal operation towards this MME.

If the *GUMMEI List* IE is present, the eNB shall, if supported, use this information to identify which traffic to cease rejecting. If no particular overload action is ongoing for a particular GUMMEI value, the eNB shall ignore this value.

8.7.7.3 Unsuccessful Operation

Not applicable.

8.8 S1 CDMA2000 Tunneling Procedures

8.8.1 General

The purpose of S1 CDMA2000 Tunneling procedures is to carry CDMA2000 signalling between UE and CDMA2000 RAT over the S1 Interface. This includes signalling for pre-registration of UE with CDMA2000 HRPD network, signalling for handover preparation for handover from E-UTRAN to CDMA2000 HRPD/1xRTT and pre-registration and paging of UE with CDMA2000 1xRTT CS system. The CDMA2000 messages are not interpreted by the eNB, and their content is outside the scope of this specification, however, additional information may be sent along with the tunnelled CDMA2000 message to assist the eNB and the MME in the tunneling procedure. These procedures use an established UE-associated logical S1-connection.

The CDMA2000 messages are transported in an IE of the DOWNLINK S1 CDMA2000 TUNNELING or UPLINK S1 CDMA2000 TUNNELING messages.

8.8.2 Successful Operations

8.8.2.1 Downlink S1 CDMA2000 Tunneling

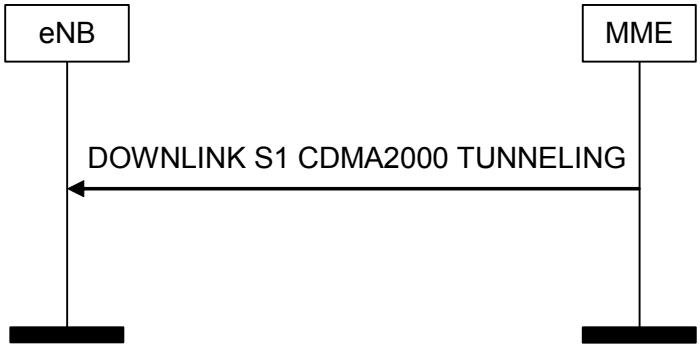

Figure 8.8.2.1-1: Downlink S1 CDMA2000 Tunneling Procedure

If a CDMA2000 message needs to be sent from the MME to a given UE and a UE-associated logical S1-connection exists for that given UE, the MME should send a DOWNLINK S1 CDMA2000 TUNNELING message to the eNB including the CDMA2000 message in the *CDMA2000-PDU* IE. The eNB forwards the received *CDMA2000-PDU* IE to the UE along with an indication of the RAT Type associated with the *CDMA2000-PDU* IE based on the *CDMA2000 RAT Type* IE.

If the MME receives handover status information along with the tunnelled downlink CDMA2000 message, the MME should include the handover status information in the *CDMA2000 HO Status* IE in the DOWNLINK S1 CDMA2000 TUNNELING message.

If the DOWNLINK S1 CDMA2000 TUNNELING message contains the *E-RABs Subject to Forwarding List* IE, it indicates that DL forwarding is available for the indicated E-RABs towards the tunnel endpoint identified by the *DL GTP-TEID* IE for those E-RABs.

8.8.2.2 Uplink S1 CDMA2000 Tunneling

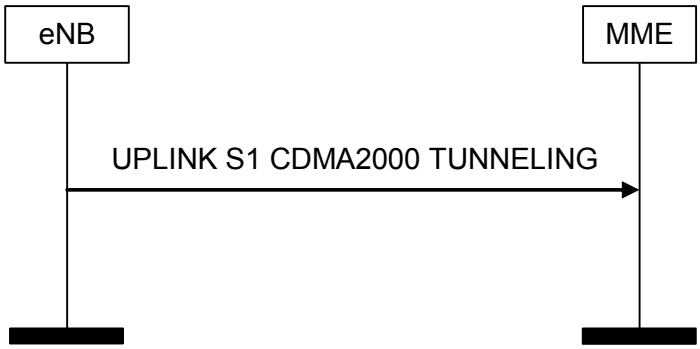

Figure 8.8.2.2-1: Uplink S1 CDMA2000 Tunneling Procedure

When the eNB has received from the radio interface a CDMA2000 message to be forwarded to the MME in which a UE-associated logical S1-connection for a given UE exists, the eNB shall send the UPLINK S1 CDMA2000 TUNNELING message to the MME including the CDMA2000 message in the *CDMA2000-PDU* IE.

If the MME receives the *CDMA2000 HO Required Indication* IE set to “true” in UPLINK S1 CDMA2000 TUNNELING message, the MME shall send the necessary handover preparation information to the CDMA2000 target RAT.

If the MME receives any of the *CDMA2000 1xRTT SRVCC Info* IE, or the *CDMA2000 1xRTT RAND* IE in the UPLINK S1 CDMA2000 TUNNELING message, the MME shall forward the received information to the CDMA2000 1xRTT RAT.

If the MME receives the *E-UTRAN Round Trip Delay Estimation Info* IE in the UPLINK S1 CDMA2000 TUNNELING message, the MME shall forward the received information to the target HRPD access. The MME shall

forward the received *CDMA2000 Sector ID* IE and *CDMA2000-PDU* IE to the proper destination node in the CDMA2000 RAT.

Interactions with E-RAB Management procedures:

If, after an UPLINK S1 CDMA2000 TUNNELING message with *CDMA2000 HO Required Indication* IE set to "true" is sent before the DOWNLINK S1 CDMA2000 TUNNELING message with *CDMA2000 HO Status* IE is received, the source eNB receives an MME initiated E-RAB Management procedure on the same UE associated signaling connection, the source eNB shall terminate the MME initiated E-RAB Management procedure by sending the appropriate response message with an appropriate cause value, e.g., "S1 inter system Handover Triggered", to the MME.

8.8.3 Unsuccessful Operation

Not applicable

8.8.4 Abnormal Conditions

If the eNB receives at least one E-RAB ID included in the *E-RABs Subject to Forwarding Items* IE without any associated DL GTP-TEID and DL Transport Layer Address pair in the DOWNLINK S1 CDMA2000 TUNNELING message, the eNB shall consider it as a logical error and act as described in subclause 10.4.

The eNB shall ignore the *UL GTP-TEID* IE and/or *UL Transport Layer Address* IE in the *E-RABs Subject to Forwarding Items* IE, when the IEs are included in the DOWNLINK S1 CDMA2000 TUNNELING message.

8.9 UE Capability Info Indication

8.9.1 General

The purpose of the UE Capability Info Indication procedure is to enable the eNB to provide to the MME UE capability-related information.

8.9.2 Successful Operation

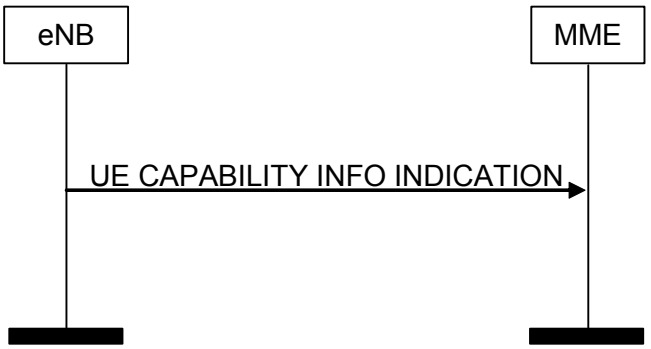

Figure 8.9.2-1: UE Capability Info Indication procedure. Successful operation.

The eNB controlling a UE-associated logical S1-connection initiates the procedure by sending a UE CAPABILITY INFO INDICATION message to the MME including the UE capability information. The UE capability information received by the MME shall replace any previously stored UE capability information in the MME for the UE.

8.10 Trace Procedures

8.10.1 Trace Start

8.10.1.1 General

The purpose of the Trace Start procedure is to allow the MME to request the eNB to initiate a trace function for a UE. The procedure uses UE-associated signalling. If no UE-associated logical S1-connection exists, the UE-associated logical S1-connection shall be established as part of the procedure.

8.10.1.2 Successful Operation

Figure 8.10.1.2-1: Trace Start procedure.

The MME initiates the procedure by sending a TRACE START message. On receipt of a TRACE START message, the eNB shall initiate the requested trace function as described in TS 32.422 [10].

If the *Trace Activation* IE is included in the TRACE START message which includes the *MDT Activation* IE set to "Immediate MDT and Trace", the eNB shall if supported, initiate the requested trace session and MDT session as described in TS 32.422 [10].

If the *Trace Activation* IE is included in the TRACE START message which includes the *MDT Activation* IE set to "Immediate MDT Only" or "Logged MDT only", the target eNB shall, if supported, initiate the requested MDT session as described in TS 32.422 [10] and the target eNB shall ignore *Interfaces To Trace* IE, and *Trace Depth* IE.

Interactions with other procedures:

If the eNB is not able to initiate the trace session due to ongoing handover of the UE to another eNB, the eNB shall initiate a Trace Failure Indication procedure with the appropriate cause value.

8.10.2 Trace Failure Indication

8.10.2.1 General

The purpose of the Trace Failure Indication procedure is to allow the eNB to inform the MME that a Trace Start procedure or a Deactivate Trace procedure has failed due to an interaction with a handover procedure. The procedure uses UE-associated signalling.

8.10.2.2 Successful Operation

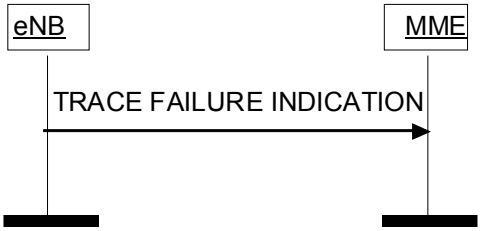

Figure 8.10.2.2-1: Trace Failure Indication procedure.

The eNB initiates the procedure by sending a TRACE FAILURE INDICATION message. Upon reception of the TRACE FAILURE INDICATION message, the MME shall take appropriate actions based on the failure reason indicated by the *Cause* IE.

8.10.3 Deactivate Trace

8.10.3.1 General

The purpose of the Deactivate Trace procedure is to allow the MME to request the eNB to stop the trace session, for the indicated trace reference.

8.10.3.2 Successful Operation

Figure 8.10.3.2-1: Deactivate Trace procedure. Successful operation.

The MME invokes the Deactivate Trace procedure by sending a DEACTIVATE TRACE message to the eNB as described in TS 32.422 [10].

Upon reception of this message, the eNB shall stop the trace session for the indicated trace reference in the *E-UTRAN Trace ID* IE.

Interactions with other procedures:

If the eNB is not able to stop the trace session due to ongoing handover of the UE to another eNB, the eNB shall initiate a Trace Failure Indication procedure with the appropriate cause value.

8.10.4 Cell Traffic Trace

8.10.4.1 General

The purpose of the Cell Traffic Trace procedure is to send the allocated Trace Recording Session Reference and the Trace Reference to MME. The procedure uses UE-associated signalling.

8.10.4.2 Successful Operation

Figure 8.10.4.2-1: Cell Traffic Trace procedure. Successful operation.

The procedure is initiated with a CELL TRAFFIC TRACE message sent from the eNB to the MME.

If the *Privacy Indicator* IE is included in the message, the MME shall take the information into account for anonymization of MDT data (TS 32.422 [10]).

8.11 Location Reporting Procedures

8.11.1 Location Reporting Control

8.11.1.1 General

The purpose of Location Reporting Control procedure is to allow the MME to request the eNB to report where the UE is currently located. The procedure uses UE-associated signalling.

8.11.1.2 Successful Operation

Figure 8.11.1.2-1: Location Reporting Control procedure. Successful operation.

The MME initiates the procedure by sending a LOCATION REPORTING CONTROL message. On receipt of a LOCATION REPORTING CONTROL message the eNB shall perform the requested location reporting control action for the UE.

The *Request Type* IE indicates to the eNB whether:

- to report directly;
- to report upon change of serving cell, or
- to stop reporting at change of serving cell.

If reporting upon change of serving cell is requested, the eNB shall report whenever the UE changes its serving cell to another cell belonging to the eNB.

The *Request Type* IE also indicates what type of location information the eNB shall report. The location information is E-UTRAN CGI and TAI.

8.11.1.3 Abnormal Conditions

Not applicable.

8.11.2 Location Report Failure Indication

8.11.2.1 General

The Location Report Failure Indication procedure is initiated by an eNB in order to inform the MME that a Location Reporting Control procedure has failed due to an interaction with a handover procedure. The procedure uses UE-associated signalling.

8.11.2.2 Successful Operation

Figure 8.11.2.2-1: Location Report Failure Indication procedure.

Upon reception of the LOCATION REPORT FAILURE INDICATION message the MME shall take appropriate actions based on the failure reason indicated by the *Cause* IE.

8.11.3 Location Report

8.11.3.1 General

The purpose of Location Report procedure is to provide the UE's current location to the MME. The procedure uses UE-associated signalling.

8.11.3.2 Successful Operation

Figure 8.11.3.2-1: Location Report procedure. Successful operation.

The eNB initiates the procedure by generating a LOCATION REPORT message. The LOCATION REPORT message may be used as a response to a LOCATION REPORTING CONTROL message.

In case reporting at change of serving cell has been requested, the eNB shall send a LOCATION REPORT message whenever the information given to the EPC in any S1AP message is not anymore valid.

8.11.3.3 Abnormal Conditions

Not applicable.

8.12 Warning Message Transmission Procedures

8.12.1 Write-Replace Warning

8.12.1.1 General

The purpose of Write-Replace Warning procedure is to start or overwrite the broadcasting of warning messages.

The procedure uses non UE-associated signalling.

8.12.1.2 Successful Operation

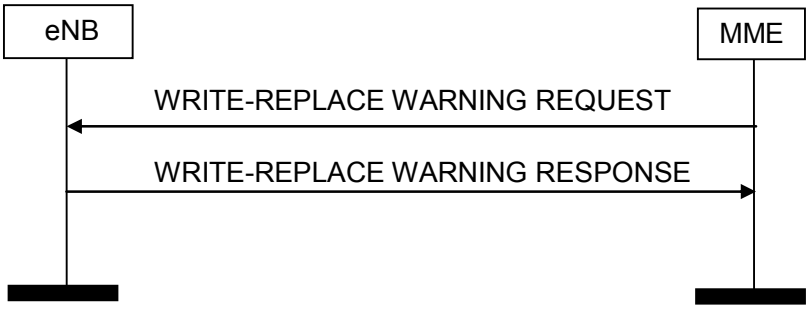

Figure 8.12.1.2-1: Write-Replace Warning procedure. Successful operation.

The MME initiates the procedure by sending a WRITE-REPLACE WARNING REQUEST message to the eNB.

Upon receipt of the WRITE-REPLACE WARNING REQUEST, eNB shall prioritise its resources to process the warning message.

If, in a certain area, broadcast of a warning message is already ongoing and the eNB receives a WRITE-REPLACE WARNING REQUEST message with *Message Identifier* IE and/or *Serial Number* IE which are different from those in

the warning message being broadcast, and if the *Concurrent Warning Message Indicator* IE is not present, the eNB shall replace the warning message being broadcast with the newly received one for that area.

If the eNB receives a WRITE-REPLACE WARNING REQUEST message with a warning message identified by the *Message Identifier* IE and *Serial Number* IE and if there are no prior warning messages being broadcast in any of warning areas indicated in the *Warning Area List* IE, the eNB shall broadcast the received warning message for those area(s).

If, in a certain area, broadcast of one or more warning messages are already ongoing and the eNB receives a WRITE-REPLACE WARNING REQUEST message with a *Message Identifier* IE and/or *Serial Number* IE which are different from those in any of the warning messages being broadcast, and if the *Concurrent Warning Message Indictor* IE is present, the eNB shall schedule the received warning message for broadcast, for that area.

If the *Concurrent Warning Message Indicator* IE is present and if a value "0" is received in the *Number of Broadcast Requested* IE, the eNB shall broadcast the received warning message indefinitely until requested otherwise to stop broadcasting, except if the *Repetition Period* IE is set to "0".

If the eNB receives a WRITE-REPLACE WARNING REQUEST message with *Message Identifier* IE and *Serial Number* IE which correspond to one of the warning messages already being broadcast in the eNB, the eNB shall not start a new broadcast or replace an existing one but it shall still reply by sending a WRITE-REPLACE WARNING RESPONSE message which includes the *Broadcast Completed Area List* IE set according to the ongoing broadcast.

If *Warning Area List* IE is not included in the WRITE-REPLACE WARNING REQUEST message, the eNB shall broadcast the indicated message in all of the cells within the eNB.

If *Warning Type* IE is included in WRITE-REPLACE WARNING REQUEST message, the eNB shall broadcast the Primary Notification irrespective of the setting of the *Repetition Period* IE and the *Number of Broadcasts Requested* IE, and process the Primary Notification according to TS 36.331 [16].

If the *Warning Security Information* IE is included in the WRITE-REPLACE WARNING REQUEST message, the eNB shall send this IE together with the *Warning Type* IE in the Primary Notification.

If the *Data Coding Scheme* IE and the *Warning Message Contents* IE are both included in the WRITE-REPLACE WARNING REQUEST message, the eNB shall schedule a broadcast of the warning message according to the value of the *Repetition Period* IE and *Number of Broadcasts Requested* IE and process the warning message according to TS 36.331 [16].

The eNB acknowledges the WRITE-REPLACE WARNING REQUEST message by sending a WRITE-REPLACE WARNING RESPONSE message to the MME.

If the *Broadcast Completed Area List* IE is not included in the WRITE-REPLACE WARNING RESPONSE message, the MME shall consider that the broadcast is unsuccessful in all the cells within the eNB.

If the *Extended Repetition Period* IE is included in the WRITE-REPLACE WARNING REQUEST message, the eNB shall ignore the value in the *Repetition Period* IE.

8.12.1.3 Abnormal Conditions

If the *Concurrent Warning Message Indicator* IE is not present and if a value "0" is received in the *Number of Broadcast Requested* IE, the eNB shall not broadcast the received secondary notification.

If *Concurrent Warning Message Indicator* IE is included and if a value "0" is received in the *Repetition Period* IE, the eNB shall not broadcast the received warning message except if the *Number of Broadcast Requested* IE is set to "1".

If *Concurrent Warning Message Indicator* IE is not included and if a value "0" is received in the *Repetition Period* IE, the eNB shall not broadcast the received secondary notification except if the *Number of Broadcast Requested* IE is set to "1".

8.12.2 Kill

8.12.2.1 General

The purpose of Kill procedure is to cancel an already ongoing broadcast of a warning message.

The procedure uses non UE-associated signalling.

8.12.2.2 Successful Operation

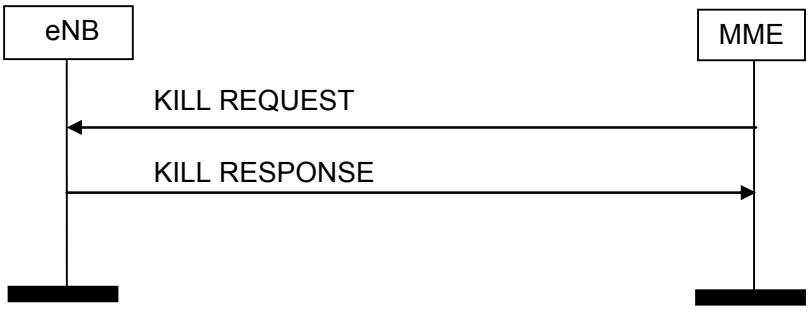

Figure 8.12.2.2-1: Kill procedure. Successful operation.

The MME initiates the procedure by sending a KILL REQUEST message to the eNB.

If, in a certain area, broadcast of one or more warning messages is already ongoing and the eNB receives a KILL REQUEST message with the same *Message Identifier* and *Serial Number* IE from those in any of the warning messages being broadcast, the eNB shall stop broadcasting and discard the warning message, for that area.

If the *Warning Area List* IE is not included in the KILL REQUEST message, the eNB shall stop broadcasting and discard the warning message identified by the *Message Identifier* IE and the *Serial Number* IE in all of the cells in the eNB.

The eNB shall acknowledge the KILL REQUEST message by sending the KILL RESPONSE message, with the *Message Identifier* IE and the *Serial Number* IE copied from the KILL REQUEST message and include the *Broadcast Cancelled Area List* IE.

If an area included in the *Warning Area List* IE does not appear in the *Broadcast Cancelled Area List* IE, the MME shall consider that the eNB had no ongoing broadcast to stop for the same *Message Identifier* and *Serial Number* in that area.

If the *Broadcast Cancelled Area List* IE is not included in the KILL RESPONSE message, the MME shall consider that the eNB had no ongoing broadcast to stop for the same *Message Identifier* and *Serial Number*.

8.13 eNB Direct Information Transfer

8.13.1 General

The purpose of the eNB Direct Information Transfer procedure is to transfer RAN information from the eNB to the MME in unacknowledged mode. The MME does not interpret the transferred RAN information.

This procedure uses non-UE associated signalling.

8.13.2 Successful Operation

8.13.2.1 eNB Direct Information Transfer

Figure 8.13.1.2-1: ENB Direct Information Transfer procedure. Successful operation.

The procedure is initiated with an ENB DIRECT INFORMATION TRANSFER message sent from the eNB to the MME.

The *RIM Transfer* IE within the *Inter-system Information Transfer Type* IE shall contain the *RIM Routing Address* IE that identifies the final RAN destination node where the RIM information needs to be transferred to by the core network. In case of transfer to UTRAN the source eNB shall include the *RAC* IE in the *Target RNC-ID* IE within the *RIM Routing Address* IE.

8.13.3 Abnormal Conditions

Not applicable.

8.14 MME Direct Information Transfer

8.14.1 General

The purpose of the MME Direct Information Transfer procedure is to transfer RAN information from the MME to the eNB in unacknowledged mode.

This procedure uses non-UE associated signalling.

8.14.2 Successful Operation

8.14.2.1 MME Direct Information Transfer

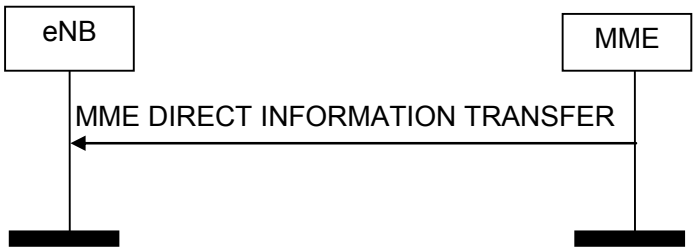

Figure 8.14.1.2-1: MME Direct Information Transfer procedure. Successful operation.

The procedure is initiated with a DIRECT INFORMATION TRANSFER message sent from the MME to the eNB.

The *Inter-system Information Transfer Type* IE indicates the nature of the transferred information. When the transferred information is of RIM nature, the *RIM Information* IE within the *RIM Transfer* IE shall contain a BSSGP RIM PDU. The *RIM Routing Address* IE shall not be present since the eNB is the final destination node.

8.14.3 Abnormal Conditions

Not applicable.

8.15 eNB Configuration Transfer

8.15.1 General

The purpose of the eNB Configuration Transfer procedure is to transfer RAN configuration information from the eNB to the MME in unacknowledged mode. The MME does not interpret the transferred RAN configuration information.

This procedure uses non-UE associated signalling.

8.15.2 Successful Operation

8.15.2.1 eNB Configuration Transfer

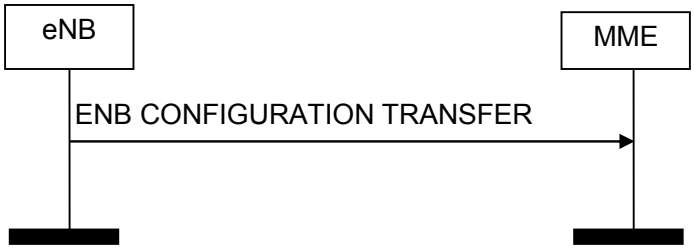

Figure 8.15.2.1-1: eNB Configuration Transfer procedure. Successful operation.

The procedure is initiated with an ENB CONFIGURATION TRANSFER message sent from the eNB to the MME.

If the MME receives the *SON Configuration Transfer* IE, it shall transparently transfer the *SON Configuration Transfer* IE towards the eNB indicated in the *Target eNB-ID* IE which is included in the *SON Configuration Transfer IE*.

8.15.3 Abnormal Conditions

Not applicable.

8.16 MME Configuration Transfer

8.16.1 General

The purpose of the MME Configuration Transfer procedure is to transfer RAN configuration information from the MME to the eNB in unacknowledged mode.

This procedure uses non-UE associated signalling.

8.16.2 Successful Operation

8.16.2.1 MME Configuration Transfer

Figure 8.16.2.1-1: MME Configuration Transfer procedure. Successful operation.

The procedure is initiated with an MME CONFIGURATION TRANSFER message sent from the MME to the eNB.

If the eNB receives the *SON Information* IE containing the *SON Information Request* IE, it may transfer back the requested information towards the eNB indicated in *the Source eNB-ID* IE of the *SON Configuration Transfer* IE by initiating the eNB Configuration Transfer procedure.

If the eNB receives the *SON Information* IE containing the *X2 TNL Configuration Info* IE and the *eNB X2 Extended Transport Layer Addresses* IE, it may use it as part of its ACL functionality configuration actions, if such ACL functionality is deployed.

If the eNB receives the *SON Information* IE containing the *SON Information Reply* IE including the *X2 TNL Configuration Info* IE as an answer to a former request, it may use it to initiate the X2 TNL establishment.

In case the *IP-Sec Transport Layer Address* IE is present and the *GTP Transport Layer Addresses* IE within the *eNB X2 Extended Transport Layer Addresses* IE is not empty, GTP traffic is conveyed within an IP-Sec tunnel terminated at the IP-Sec tunnel end point given in by the *IP-Sec Transport Layer Address* IE.

In case the *IP-Sec Transport Layer Address* IE is not present, GTP traffic is terminated at the end points given by the list of addresses in *eNB GTP Transport Layer Addresses* IE within the *eNB X2 Extended Transport Layer Addresses* IE.

In case the *eNB GTP Transport Layer Addresses* IE is empty and the *IP-Sec Transport Layer Address* IE is present, SCTP traffic is conveyed within an IP-Sec tunnel terminated at the IP-Sec tunnel end point given in the *IP-Sec Transport Layer Address* IE, within the *eNB X2 Extended Transport Layer Addresses* IE.

If the eNB is configured to use one IPsec tunnel for all S1 and X2 traffic (IPsec star topology) then the traffic to the peer eNB shall be routed through this IPsec tunnel and the *IP-Sec Transport Layer Address* IE shall be ignored.

If the eNB receives the *SON Information* IE containing the *SON Information Reply* IE including the *Time Synchronization Info* IE as an answer to a former request, it may use it for over-the-air synchronization by means of network listening.

8.16.3 Abnormal Conditions

Not applicable.

8.17 LPPa transport

8.17.1 General

The purpose of the LPPa Transport procedure is to carry LPPa signalling (defined in TS 36.455 [34]) between eNB and E-SMLC over the S1 Interface as defined in TS 36.455 [34]. The procedure may use UE-associated signalling or non-UE associated signalling. The UE-associated signalling is used to support E-CID positioning of a specific UE. The non-UE associated signalling is used to obtain assistance data from an eNB to support OTDOA positioning for any UE.

8.17.2 Successful Operations

8.17.2.1 DOWNLINK UE ASSOCIATED LPPA TRANSPORT

Figure 8.17.2.1-1: DOWNLINK UE ASSOCIATED LPPA Transport Procedure

The MME initiates the procedure by sending the DOWNLINK UE ASSOCIATED LPPA TRANSPORT message to eNB.

8.17.2.2 UPLINK UE ASSOCIATED LPPA TRANSPORT

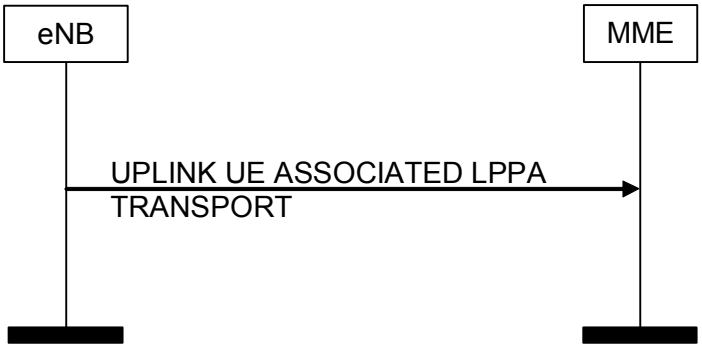

Figure 8.17.2.2-1: UPLINK UE ASSOCIATED LPPA TRANSPORT Procedure

The eNB initiates the procedure by sending the UPLINK UE ASSOCIATED LPPA TRANSPORT message to MME.

8.17.2.3 DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT

Figure 8.17.2.3-1: DOWNLINK NON UE ASSOCIATED LPPA Transport Procedure

The MME initiates the procedure by sending the DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT message to eNB.

8.17.2.4 UPLINK NON UE ASSOCIATED LPPA TRANSPORT

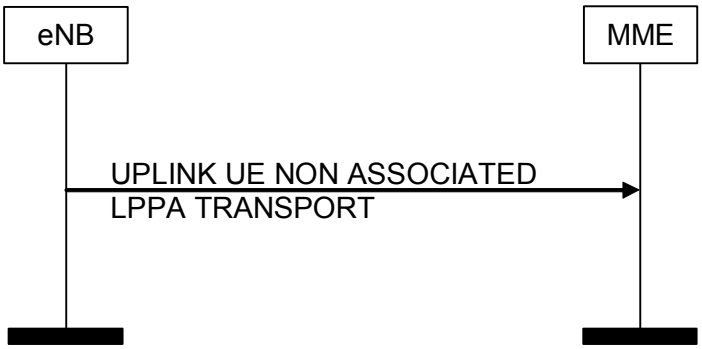

Figure 8.17.2.4-1: UPLINK NON UE ASSOCIATED LPPA TRANSPORT Procedure

The eNB initiates the procedure by sending the UPLINK NON UE ASSOCIATED LPPA TRANSPORT message to MME.

8.17.3 Unsuccessful Operation

Not applicable

8.17.4 Abnormal Conditions

If an MME receives an UPLINK UE ASSOCIATED LPPA TRANSPORT message with an unknown Routing ID for the UE, the MME shall ignore the message.

If an MME receives an UPLINK NON UE ASSOCIATED LPPA TRANSPORT message indicating an unknown or unreachable Routing ID, the MME shall ignore the message.

9 Elements for S1AP Communication

9.1 Message Functional Definition and Content

9.1.1 General

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 4: Meaning of abbreviations used in S1AP 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 5: Meaning of content within "Criticality" column

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

9.1.2.3 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 E-RAB Management Messages

9.1.3.1 E-RAB SETUP REQUEST

This message is sent by the MME and is used to request the eNB to assign resources on Uu and S1 for one or several E-RABs.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
UE Aggregate Maximum Bit Rate	O		9.2.1.20		YES	reject
E-RAB to be Setup List		*1*			YES	reject
>E-RAB To Be Setup Item IEs		*1 to <maxnoof E-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>E-RAB Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters	-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	EPC TEID	-	
>>NAS-PDU	M		9.2.3.5		-	
>>Correlation ID	O		9.2.2.80		YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.1.3.2 E-RAB SETUP RESPONSE

This message is sent by the eNB and is used to report the outcome of the request from the E-RAB SETUP REQUEST message.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
E-RAB Setup List		*0..1*			YES	ignore
>E-RAB Setup Item Ies		*1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M				-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	eNB TEID	-	
E-RAB Failed to Setup List	O		E-RAB List 9.2.1.36	a value for *E-RAB ID* shall only be present once in *E-RAB Setup List* IE + in *E-RAB Failed to Setup List* IE	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.1.3.3 E-RAB MODIFY REQUEST

This message is sent by the MME and is used to request the eNB to modify the Data Radio Bearers and the allocated resources on Uu and S1 for one or several E-RABs.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
UE Aggregate Maximum Bit Rate	O		9.2.1.20		YES	reject
E-RAB to be Modified List		*1*			YES	reject
>E-RAB To Be Modified Item IEs		*1 to <maxnoof E-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>E-RAB Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters	-	
>>NAS-PDU	M		9.2.3.5		-	

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.1.3.4 E-RAB MODIFY RESPONSE

This message is sent by the eNB and is used to report the outcome of the request from the E-RAB MODIFY REQUEST message.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
E-RAB Modify List		*0..1*			YES	ignore
>E-RAB Modify Item IEs		*1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RABID	M		9.2.1.2		-	
E-RAB Failed to Modify List	O		E-RAB List 9.2.1.36	a value for *E-RAB ID* shall only be present once in *E-RAB Modify List* IE + *E-RAB Failed to Modify List* IE	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.1.3.5 E-RAB RELEASE COMMAND

This message is sent by the MME and is used to request the eNB to release allocated resources on Uu and S1 for one or several E-RABs.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
UE Aggregate Maximum Bit Rate	O		9.2.1.20		YES	reject
E-RAB To Be Released List	M		E-RAB List 9.2.1.36	a value for E-RAB ID shall only be present once in E-RAB To Be Released List IE	YES	ignore
NAS-PDU	O		9.2.3.5		YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.1.3.6 E-RAB RELEASE RESPONSE

This message is sent by the eNB and is used to report the outcome of the request from the E-RAB RELEASE COMMAND message.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
E-RAB Release List		*0..1*			YES	ignore
>E-RAB Release Item IEs		*1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
E-RAB Failed to Release List	O		E-RAB List 9.2.1.36	a value for *E-RAB ID* shall only be present once in *E-RAB Release List* IE + *E-RAB Failed to Release List* IE	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.1.3.7 E-RAB RELEASE INDICATION

This message is sent by the eNB and is used to indicate the MME to release one or several E-RABs for one UE.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-RAB Released List	M		E-RAB List 9.2.1.36	a value for *E-RAB ID* shall only be present once in *E-RAB Released List* IE	YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.1.4 Context Management Messages

9.1.4.1 INITIAL CONTEXT SETUP REQUEST

This message is sent by the MME to request the setup of a UE context.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
UE Aggregate Maximum Bit Rate	M		9.2.1.20		YES	reject
E-RAB to Be Setup List		*1*			YES	reject
>E-RAB to Be Setup Item IEs		*1 to <maxnoofE-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>E-RAB Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters	-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2		-	
>>NAS-PDU	O		9.2.3.5		-	
>>Correlation ID	O		9.2.2.80		YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
UE Security Capabilities	M		9.2.1.40		YES	reject
Security Key	M		9.2.1.41	The KeNB is provided after the key-generation in the MME, see TS 33.401 [15]	YES	reject
Trace Activation	O		9.2.1.4		YES	ignore
Handover Restriction List	O		9.2.1.22		YES	ignore
UE Radio Capability	O		9.2.1.27		YES	ignore
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.39		YES	ignore
CS Fallback Indicator	O		9.2.3.21		YES	reject
SRVCC Operation Possible	O		9.2.1.58		YES	ignore
CSG Membership Status	O		9.2.1.73		YES	ignore
Registered LAI	O		9.2.3.1		YES	ignore
GUMMEI ID	O		9.2.3.9	This IE indicates the MME serving the UE	YES	ignore
MME UE S1AP ID 2	O		9.2.3.3	This IE indicates the MME UE S1AP ID assigned by the MME	YES	ignore
Management Based MDT Allowed	O		9.2.1.83		YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.1.4.2 Void

9.1.4.3 INITIAL CONTEXT SETUP RESPONSE

This message is sent by the eNB to confirm the setup of a UE context.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
E-RAB Setup List		*1*			YES	ignore
>E-RAB Setup Item Ies		*1 to <maxnoofE-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2		-	
E-RAB Failed to Setup List	O		E-RAB List 9.2.1.36	a value for *E-RAB ID* shall only be present once in *E-RAB Setup List* IE + *E-RAB Failed to Setup List* IE	YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.1.4.4 INITIAL CONTEXT SETUP FAILURE

This message is sent by the eNB to indicate that the setup of the UE context was unsuccessful.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Cause	M		9.2.1.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.4.5 UE CONTEXT RELEASE REQUEST

This message is sent by the eNB to request the release of the UE-associated S1-logical connection over the S1 interface.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Cause	M		9.2.1.3		YES	ignore
GW Context Release Indication	O		9.2.1.84		YES	reject

9.1.4.6 UE CONTEXT RELEASE COMMAND

This message is sent by the MME to request the release of the UE-associated S1-logical connection over the S1 interface.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
CHOICE *UE S1AP IDs*	M				YES	reject
>UE S1AP ID pair	M		9.2.3.18			
>MME UE S1AP ID	M		9.2.3.3			
Cause	M		9.2.1.3		YES	ignore

9.1.4.7 UE CONTEXT RELEASE COMPLETE

This message is sent by the eNB to confirm the release of the UE-associated S1-logical connection over the S1 interface.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.4.8 UE CONTEXT MODIFICATION REQUEST

This message is sent by the MME to provide UE Context information changes to the eNB.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1APID	M		9.2.3.3		YES	reject
eNB UE S1APID	M		9.2.3.4		YES	reject
Security Key	O		9.2.1.41	A fresh KeNB is provided after performing a key-change on the fly procedure in the MME, see TS 33.401 [15]	YES	reject
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.39		YES	ignore
UE Aggregate Maximum Bit Rate	O		9.2.1.20		YES	ignore
CS Fallback Indicator	O		9.2.3.21		YES	reject
UE Security Capabilities	O		9.2.1.40		YES	reject
CSG Membership Status	O		9.2.1.73		YES	ignore
Registered LAI	O		9.2.3.1		YES	ignore

9.1.4.9 UE CONTEXT MODIFICATION RESPONSE

This message is sent by the eNB to confirm the performed UE context updates.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.4.10 UE CONTEXT MODIFICATION FAILURE

This message is sent by the eNB in case the performed UE context update is not successful.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Cause	M		9.2.1.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5 Handover Signalling Messages

9.1.5.1 HANDOVER REQUIRED

This message is sent by the source eNB to the MME to request the preparation of resources at the target.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Handover Type	M		9.2.1.13		YES	reject
Cause	M		9.2.1.3		YES	ignore
Target ID	M		9.2.1.6		YES	reject
Direct Forwarding Path Availability	O		9.2.3.15		YES	ignore
SRVCC HO Indication	O		9.2.1.59		YES	reject
Source to Target Transparent Container	M		9.2.1.56		YES	reject
Source to Target Transparent Container Secondary	O		Source to Target Transparent Container 9.2.1.56		YES	reject
MS Classmark 2	C-ifSRVCCtoGERAN		9.2.1.64		YES	reject
MS Classmark 3	C-ifSRVCCtoGERAN		9.2.1.65		YES	ignore
CSG Id	O		9.2.1.62		YES	reject
Cell Access Mode	O		9.2.1.74		YES	reject
PS Service Not Available	O		9.2.1.77		YES	ignore

Condition	Explanation
ifSRVCCtoGERAN	This IE shall be present if the *Handover Type* IE is set to the "Value" LTEtoGERAN and the *SRVCC HO Indication* IE is present.

9.1.5.2 HANDOVER COMMAND

This message is sent by the MME to inform the source eNB that resources for the handover have been prepared at the target side.

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Handover Type	M		9.2.1.13		YES	reject
NAS Security Parameters from E-UTRAN	C-iftoUTRANGERAN		9.2.3.30	The eNB shall use this IE as specified in TS 33.401 [15].	YES	reject
E-RABs Subject to Forwarding List		*0..1*			YES	ignore
>E-RABs Subject to Forwarding Item IEs		*1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>DL Transport Layer Address	O		9.2.2.1		-	
>>DL GTP-TEID	O		9.2.2.2	To deliver forwarded DL PDCP SDUs	-	
>>UL Transport Layer Address	O		9.2.2.1		-	
>>UL GTP-TEID	O		9.2.2.2	To deliver forwarded UL PDCP SDUs	-	
E-RABs to Release List	O		E-RAB List 9.2.1.36		YES	ignore
Target to Source Transparent Container	M		9.2.1.57		YES	reject
Target to Source Transparent Container Secondary	O		Target to Source Transparent Container 9.2.1.57		YES	reject
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Condition	Explanation
iftoUTRANGERAN	This IE shall be present if the Handover Type IE is set to the value “LTEtoUTRAN “ or “LTEtoGERAN”

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.

9.1.5.3 HANDOVER PREPARATION FAILURE

This message is sent by the MME to inform the source eNB that the Handover Preparation has failed.

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Cause	M		9.2.1.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5.4 HANDOVER REQUEST

This message is sent by the MME to the target eNB to request the preparation of resources.

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	reject
Handover Type	M		9.2.1.13		YES	reject
Cause	M		9.2.1.3		YES	ignore
UE Aggregate Maximum Bit Rate	M		9.2.1.20		YES	reject
E-RABs To Be Setup List		*1*			YES	reject
>E-RABs To Be Setup Item IEs		*1 to <maxnoof E-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	To deliver UL PDUs	-	
>>E-RAB Level QoS Parameters	M		9.2.1.15	Includes necessary QoS parameters	-	
>>Data Forwarding Not Possible	O		9.2.1.76		YES	ignore
Source to Target Transparent Container	M		9.2.1.56		YES	reject
UE Security Capabilities	M		9.2.1.40		YES	reject
Handover Restriction List	O		9.2.1.22		YES	ignore
Trace Activation	O		9.2.1.4		YES	ignore
Request Type	O		9.2.1.34		YES	ignore
SRVCC Operation Possible	O		9.2.1.58		YES	ignore
Security Context	M		9.2.1.26		YES	reject
NAS Security Parameters to E-UTRAN	C-iffromUTRANGERAN		9.2.3.31	The eNB shall use this IE as specified in TS 33.401 [15].	YES	reject
CSG Id	O		9.2.1.62		YES	reject
CSG Membership Status	O		9.2.1.73		YES	ignore
GUMMEI	O		9.2.3.9	This IE indicates the MME serving the UE	YES	ignore
MME UE S1AP ID 2	O		9.2.3.3	This IE indicates the MME UE S1AP ID assigned by the MME	YES	ignore
Management Based MDT Allowed	O		9.2.1.83		YES	ignore

Condition	Explanation
C-iffromUTRANGERAN	This IE shall be present if the Handover Type IE is set to the value "UTRANtoLTE" or "GERANtoLTE"

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.

9.1.5.5 HANDOVER REQUEST ACKNOWLEDGE

This message is sent by the target eNB to inform the MME about the prepared resources at the target.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4	allocated at the target eNB	YES	ignore
E-RABs Admitted List		*1*			YES	ignore
>E-RABs Admitted Item IEs		*1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	To deliver DL PDUs	-	
>>DL Transport Layer Address	O		9.2.2.1		-	
>>DL GTP-TEID	O		9.2.2.2	To deliver forwarded DL PDCP SDUs.	-	
>>UL Transport Layer Address	O		9.2.2.1		-	
>>UL GTP-TEID	O		9.2.2.2	To deliver forwarded UL PDCP SDUs.	-	
E-RABs Failed to Setup List	O		E-RAB List 9.2.1.36	a value for *E-RAB ID* shall only be present once in *E-RABs Admitted List* IE + *E-RABs Failed to Setup List* IE	YES	ignore
Target to Source Transparent Container	M		9.2.1.57		YES	reject
CSG Id	O		9.2.1.62		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.

9.1.5.6 HANDOVER FAILURE

This message is sent by the target eNB to inform the MME that the preparation of resources has failed.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	ignore
Cause	M		9.2.1.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5.7 HANDOVER NOTIFY

This message is sent by the target eNB to inform the MME that the UE has been identified in the target cell and the S1 handover has been completed.

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16		YES	ignore

9.1.5.8 PATH SWITCH REQUEST

This message is sent by the eNB to request the MME to switch DL GTP tunnel termination point(s) from one end-point to another.

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-RAB To Be Switched in Downlink List		*1*			YES	reject
>E-RABs Switched in Downlink Item IEs		*1 to <maxnoof E-RABs>*			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Transport layer address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	To deliver DL PDUs	-	
Source MME UE S1AP ID	M		9.2.3.3		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16		YES	ignore
UE Security Capabilities	M		9.2.1.40		YES	ignore
CSG Id	O		9.2.1.62		YES	ignore
Cell Access Mode	O		9.2.1.74		YES	ignore
Source MME GUMMEI	O		9.2.3.9		YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.

9.1.5.9 PATH SWITCH REQUEST ACKNOWLEDGE

This message is sent by the MME to inform the eNB that the path switch has been successfully completed in the EPC.

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
UE Aggregate Maximum Bit Rate	O		9.2.1.20		YES	ignore
E-RAB To Be Switched in Uplink List		*0..1*			YES	ignore
>E-RABs Switched in Uplink Item IEs		*1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	M		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2		-	
E-RAB To Be Released List	O		E-RAB List 9.2.1.36	a value for *E-RAB ID* shall only be present once in *E-RAB To Be Switched in Uplink List* IE + *E-RAB to Be Released List* IE	YES	ignore
Security Context	M		9.2.1.26	One pair of {NCC, NH} is provided	YES	reject
Criticality Diagnostics	O		9.2.1.21		YES	ignore
MME UE S1AP ID 2	O		9.2.3.3	This IE indicates the MME UE S1AP ID assigned by the MME	YES	ignore

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.

9.1.5.10 PATH SWITCH REQUEST FAILURE

This message is sent by the MME to inform the eNB that a failure has occurred in the EPC during the Path switch request procedure.

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Cause	M		9.2.1.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5.11 HANDOVER CANCEL

This message is sent by the source eNB to the MME to request the cancellation of an ongoing handover.

Direction: eNB → 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 UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Cause	M		9.2.1.3		YES	ignore

9.1.5.12 HANDOVER CANCEL ACKNOWLEDGE

This message is sent by the MME to the source eNB to confirm that the ongoing handover was cancelled.

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	M		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.5.13 eNB STATUS TRANSFER

This message is sent by the source eNB to transfer the PDCP SN receiver and transmitter status.

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
eNB Status Transfer Transparent Container	M		9.2.1.31		YES	reject

9.1.5.14 MME STATUS TRANSFER

This message is sent by the MME to transfer the PDCP-SN receiver and transmitter status.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
eNB Status Transfer Transparent Container	M		9.2.1.31		YES	reject

9.1.6 PAGING

This message is sent by the MME and is used to page a UE in one or several tracking areas.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
UE Identity Index value	M		9.2.3.10		YES	ignore
UE Paging Identity	M		9.2.3.13		YES	ignore
Paging DRX	O		9.2.1.16		YES	ignore
CN Domain	M		9.2.3.22		YES	ignore
List of TAIs		*1*			YES	ignore
>TAI List Item		*1 to <maxnoofTAIs>*			EACH	ignore
>>TAI	M		9.2.3.16		-	
CSG Id List		*0..1*			GLOBAL	ignore
>CSG Id		*1 to <maxnoofCSGId>*	9.2.1.62		-	
Paging Priority	O		9.2.1.78		YES	ignore

Range bound	Explanation
maxnoofTAIs	Maximum no. of TAIs. Value is 256.
maxnoofCSGIds	Maximum no. of CSG Ids within the CSG Id List. Value is 256.

9.1.7 NAS Transport Messages

9.1.7.1 INITIAL UE MESSAGE

This message is sent by the eNB to transfer the initial layer 3 message to the MME over the S1 interface.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	reject
NAS-PDU	M		9.2.3.5		YES	reject
TAI	M		9.2.3.16	Indicating the Tracking Area from which the UE has sent the NAS message.	YES	reject
E-UTRAN CGI	M		9.2.1.38	Indicating the E-UTRAN CGI from which the UE has sent the NAS message.	YES	ignore
RRC Establishment cause	M		9.2.1.3a		YES	Ignore
S-TMSI	O		9.2.3.6		YES	reject
CSG Id	O		9.2.1.62		YES	reject
GUMMEI	O		9.2.3.9		YES	reject
Cell Access Mode	O		9.2.1.74		YES	reject
GW Transport Layer Address	O		Transport Layer Address 9.2.2.1	Indicating GW Transport Layer Address if the GW is collocated with eNB	YES	ignore
Relay Node Indicator	O		9.2.1.79	Indicating a relay node	YES	reject

9.1.7.2 DOWNLINK NAS TRANSPORT

This message is sent by the MME and is used for carrying NAS information over the S1 interface.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
NAS-PDU	M		9.2.3.5		YES	reject
Handover Restriction List	O		9.2.1.22		YES	ignore
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.39		YES	ignore

9.1.7.3 UPLINK NAS TRANSPORT

This message is sent by the eNB and is used for carrying NAS information over the S1 interface.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
NAS-PDU	M		9.2.3.5		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16		YES	ignore
GW Transport Layer Address	O		Transport Layer Address 9.2.2.1	Indicating GW Transport Layer Address if the GW is collocated with eNB	YES	ignore

9.1.7.4 NAS NON DELIVERY INDICATION

This message is sent by the eNB and is used for reporting the non delivery of a NAS PDU previously received within a DOWNLINK NAS TRANSPORT message over the S1 interface.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
NAS-PDU	M		9.2.3.5		YES	ignore
Cause	M		9.2.1.3		YES	ignore

9.1.8 Management messages

9.1.8.1 RESET

This message is sent by both the MME and the eNB and is used to request that the S1 interface, or parts of the S1 interface, to be reset.

Direction : MME → eNB and eNB → 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		9.2.1.3		YES	ignore
CHOICE *Reset Type*	M				YES	reject
>S1 interface						
>>Reset All	M		ENUMERATED (Reset all,…)		-	
>Part of S1 interface						
>>UE-associated logical S1-connection list		*1*			-	
>>>UE-associated logical S1-connection Item		*1 to <maxnoofIndividualS1ConnectionsToReset>*			EACH	reject
>>>>MME UE S1AP ID	O		9.2.3.3		-	
>>>>eNB UE S1AP ID	O		9.2.3.4		-	

Range bound	Explanation
maxnoofIndividualS1ConnectionsToReset	Maximum no. of UE-associated logical S1-connections allowed to reset in one message. Value is 256.

9.1.8.2 RESET ACKNOWLEDGE

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

Direction : eNB → MME and MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
UE-associated logical S1-connection list		*0..1*			YES	ignore
>UE-associated logical S1-connection Item		*1 to <maxnoofIndividualS1ConnectionsToReset>*			EACH	ignore
>>MME UE S1AP ID	O		9.2.3.3		-	
>>eNB UE S1AP ID	O		9.2.3.4		-	
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofIndividualS1ConnectionsToReset	Maximum no. of UE-associated logical S1-connections allowed to reset in one message. Value is 256.

9.1.8.3 ERROR INDICATION

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

Direction : MME → eNB and eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	O		9.2.3.3		YES	ignore
eNB UE S1AP ID	O		9.2.3.4		YES	ignore
Cause	O		9.2.1.3		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.8.4 S1 SETUP REQUEST

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

Direction: eNB → 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 eNB ID	M		9.2.1.37		YES	reject
eNB Name	O		PrintableString(1..150,…)		YES	ignore
Supported TAs		*1..<maxnoofTACs>*		Supported TAs in the eNB	GLOBAL	reject
>TAC	M		9.2.3.7	Broadcasted TAC	-	
>Broadcast PLMNs		*1..<maxnoofBPLMNs>*		Broadcasted PLMNs	-	
>>PLMN Identity	M		9.2.3.8			
Default paging DRX	M		9.2.1.16		YES	ignore
CSG Id List		*0..1*			GLOBAL	reject
>CSG Id	M	*1 to <maxnoofCSGIds>*	9.2.1.62			

Range bound	Explanation
maxnoofTACs	Maximum no. of TACs. Value is 256.

Range bound	Explanation
maxnoofBPLMNs	Maximum no. of Broadcasted PLMNs. Value is 6.

Range bound	Explanation
maxnoofCSGIds	Maximum no. of CSG Ids within the CSG Id List. Value is 256.

9.1.8.5 S1 SETUP RESPONSE

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME Name	O		PrintableString (1..150,…)		YES	ignore
Served GUMMEIs		*1..<maxnoofRATs>*		The LTE related pool configuration is included on the first place in the list.	GLOBAL	reject
>Served PLMNs		1..*<maxnoofPLMNsPer MME>*			-	
>>PLMN Identity	M		9.2.3.8		-	
>Served GroupIDs		*1..<maxnoofGroupIDs>*			-	
>>MME Group ID	M		OCTET STRING (2)		-	
>Served MMECs		*1..<maxnoofMMECs>*			-	
>>MME Code	M		9.2.3.12		-	
Relative MME Capacity	M		9.2.3.17		YES	ignore
MME Relay Support Indicator	O		9.2.1.82		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

Range bound	Explanation
maxnoofPLMNsPer MME	Maximum no. of PLMNs per MME. Value is 32.
maxnoofRATs	Maximum no. of RATs. Value is 8.
maxnoofGroupIDs	Maximum no. of GroupIDs per node per RAT. Value is 65535.
maxnoofMMECs	Maximum no. of MMECs per node per RAT. Value is 256.

9.1.8.6 S1 SETUP FAILURE

This message is sent by the MME to indicate S1 Setup failure.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Cause	M		9.2.1.3		YES	ignore
Time to wait	O		9.2.1.61		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.8.7 ENB CONFIGURATION UPDATE

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

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
eNB Name	O		PrintableString(1..150,…)		YES	ignore
Supported TAs		*0..<maxnoofTACs>*		Supported TAs in the eNB	GLOBAL	reject
>TAC	M		9.2.3.7	Broadcasted TAC	-	
>Broadcast PLMNs		*1..<maxnoofBPLMNs>*		BroadcastedPLMNs	-	
>>PLMN Identity	M		9.2.3.8		-	
CSG Id List		*0..1*			GLOBAL	reject
>CSG Id		*1 to <maxnoofCSGId>*	9.2.1.62		-	
Default paging DRX	O		9.2.1.16		YES	ignore

Range bound	Explanation
maxnoofTACs	Maximum no. of TACs. Value is 256.
maxnoofBPLMNs	Maximum no. of Broadcasted PLMNs. Value is 6.
maxnoofCSGIds	Maximum no. of CSG Ids within the CSG Id List. Value is 256.

9.1.8.8 ENB CONFIGURATION UPDATE ACKNOWLEDGE

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

Direction: MME → eNB

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		9.2.1.21		YES	ignore

9.1.8.9 ENB CONFIGURATION UPDATE FAILURE

This message is sent by the MME to indicate S1 eNB Configuration Update failure.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Cause	M		9.2.1.3		YES	ignore
Time to wait	O		9.2.1.61		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.8.10 MME CONFIGURATION UPDATE

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

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
MME Name	O		PrintableString(1..150,…)		YES	ignore
Served GUMMEIs		*0..<maxnoofRATs>*		The LTE related pool configuration is included on the first place in the list.	GLOBAL	reject
>Served PLMNs		*1..<maxnoofPLMNsPer MME>*			-	
>>PLMN Identity	M		9.2.3.8		-	
>Served GroupIDs		*1..<maxnoofGroupIDs>*			-	
>>MME GroupID	M		OCTET STRING (2)		-	
>Served MMECs		*1..<maxnoofMMECs>*			-	
>>MME Code	M		9.2.3.12		-	
Relative MME Capacity	O		9.2.3.17		YES	reject

Range bound	Explanation
maxnoofPLMNsPer MME	Maximum no. of PLMNs per MME. Value is 32.
maxnoofRATs	Maximum no. of RATs. Value is 8.
maxnoofGroupIDs	Maximum no. of GroupIDs per node per RAT. Value is 65535.
maxnoofMMECs	Maximum no. of MMECs per node per RAT. Value is 256.

9.1.8.11 MME CONFIGURATION UPDATE ACKNOWLEDGE

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

Direction: eNB → MME

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		9.2.1.21		YES	ignore

9.1.8.12 MME CONFIGURATION UPDATE FAILURE

This message is sent by the eNB to indicate S1 MME Configuration Update failure.

Direction: eNB → 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		9.2.1.3		YES	ignore
Time to wait	O		9.2.1.61		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.8.13 OVERLOAD START

This message is sent by the MME and is used to indicate to the eNB that the MME is overloaded.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Overload Response	M		9.2.3.19		YES	reject
GUMMEI List		*0..1*			YES	ignore
>GUMMEI List Item		*1..<maxnoofMMECs>*			EACH	ignore
>>GUMMEI	M		9.2.3.9		-	
Traffic Load Reduction Indication	O		9.2.3.36		YES	ignore

Range bound	Explanation
maxnoofMMECs	Maximum no. of MMECs per node per RAT. Value is 256.

9.1.8.14 OVERLOAD STOP

This message is sent by the MME and is used to indicate that the MME is no longer overloaded.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
GUMMEI List		*0..1*			YES	ignore
>GUMMEI List Item		*1..<maxnoofMMECs>*			EACH	ignore
>>GUMMEI	M		9.2.3.9		-	

Range bound	Explanation
maxnoofMMECs	Maximum no. of MMECs per node per RAT. Value is 256.

9.1.9 S1 CDMA2000 Tunneling Messages

9.1.9.1 DOWNLINK S1 CDMA2000 TUNNELING

This message is sent by the MME and is used for carrying CDMA2000 information over the S1 interface.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-RABs Subject to Forwarding List		*0..1*			YES	ignore
>E-RABs Subject to Forwarding Item IEs		*1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>DL Transport Layer Address	O		9.2.2.1		-	
>>DL GTP-TEID	O		9.2.2.2	This IE indicates the tunnel endpoint for forwarding of DL data.	-	
>>UL Transport Layer Address	O		9.2.2.1		-	
>>UL GTP-TEID	O		9.2.2.2		-	
CDMA2000 HO Status	O		9.2.1.28		YES	ignore
CDMA2000 RAT Type	M		9.2.1.24		YES	reject
CDMA2000-PDU	M		9.2.1.23		YES	reject

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.

9.1.9.2 UPLINK S1 CDMA2000 TUNNELING

This message is sent by the eNB and is used for carrying CDMA2000 information over the S1 interface.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
CDMA2000 RAT Type	M		9.2.1.24		YES	reject
CDMA2000 Sector ID	M		9.2.1.25		YES	reject
CDMA2000 HO Required Indication	O		9.2.1.29		YES	ignore
CDMA2000 1xRTT SRVCC Info	O		9.2.1.35		YES	reject
CDMA2000 1xRTT RAND	O		9.2.1.33		YES	reject
CDMA2000-PDU	M		9.2.1.23		YES	reject
EUTRAN Round Trip Delay Estimation Info	O		9.2.1.69		YES	ignore

9.1.10 UE CAPABILITY INFO INDICATION

This message is sent by the eNB to provide UE Radio Capability information to the MME.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
UE Radio Capability	M		9.2.1.27		YES	ignore

9.1.11 Trace Messages

9.1.11.1 TRACE START

This message is sent by the MME to initiate trace recording for a UE.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Trace Activation	M		9.2.1.4		YES	ignore

9.1.11.2 TRACE FAILURE INDICATION

This message is sent by the eNB to indicate that a Trace Start procedure or a Deactivate Trace procedure has failed for a UE.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-UTRAN Trace ID	M		OCTET STRING (8)	As per E-UTRAN Trace ID IE in Trace Activation IE (9.2.1.4)	YES	ignore
Cause	M		9.2.1.3		YES	ignore

9.1.11.3 DEACTIVATE TRACE

This message is sent by the MME to deactivate trace.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-UTRAN Trace ID	M		OCTET STRING (8)	As per E-UTRAN Trace ID IE in Trace Activation IE (9.2.1.4)	YES	ignore

9.1.12 Location Reporting Messages

9.1.12.1 LOCATION REPORTING CONTROL

This message is sent by the MME and is used to request the eNB to report where the UE is currently located.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Request Type	M		9.2.1.34		YES	ignore

9.1.12.2 LOCATION REPORT FAILURE INDICATION

This message is sent by the eNB and is used to indicate the failure of location report.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Cause	M		9.2.1.3		YES	ignore

9.1.12.3 LOCATION REPORT

This message is sent by the eNB and is used to provide the UE's location to the MME.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
E-UTRAN CGI	M		9.2.1.38		YES	ignore
TAI	M		9.2.3.16		YES	ignore
Request Type	M		9.2.1.34	The Request Type IE is sent as it has been provided.	YES	ignore

9.1.13 Warning Message Transmission Messages

9.1.13.1 WRITE-REPLACE WARNING REQUEST

This message is sent by the MME to request the start or overwrite of the broadcast of a warning message.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Message Identifier	M		9.2.1.44		YES	reject
Serial Number	M		9.2.1.45		YES	reject
Warning Area List	O		9.2.1.46		YES	ignore
Repetition Period	M		9.2.1.48		YES	reject
Extended Repetition Period	O		9.2.1.75		YES	reject
Number of Broadcasts Requested	M		9.2.1.49		YES	reject
Warning Type	O		9.2.1.50		YES	ignore
Warning Security Information	O		9.2.1.51		YES	ignore
Data Coding Scheme	O		9.2.1.52		YES	ignore
Warning Message Contents	O		9.2.1.53		YES	ignore
Concurrent Warning Message Indicator	O		9.2.1.72		YES	reject

9.1.13.2 WRITE-REPLACE WARNING RESPONSE

This message is sent by the eNB to acknowledge the MME on the start or overwrite request of a warning message.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Message Identifier	M		9.2.1.44		YES	reject
Serial Number	M		9.2.1.45		YES	reject
Broadcast Completed Area List	O		9.2.1.54		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.13.3 KILL REQUEST

This message is forwarded by the MME to eNB to cancel an already ongoing broadcast of a warning message

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Message Identifier	M		9.2.1.44		YES	reject
Serial Number	M		9.2.1.45		YES	reject
Warning Area List	O		9.2.1.46		YES	ignore

9.1.13.4 KILL RESPONSE

This message is sent by the eNB to indicate the list of warning areas where cancellation of the broadcast of the identified message was successful and unsuccessful.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	reject
Message Identifier	M		9.2.1.44		YES	reject
Serial Number	M		9.2.1.45		YES	reject
Broadcast Cancelled Area List	O		9.2.1.70		YES	ignore
Criticality Diagnostics	O		9.2.1.21		YES	ignore

9.1.14 eNB DIRECT INFORMATION TRANSFER

This message is sent by the eNB in order to transfer specific information.

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Inter-system Information Transfer Type	M		9.2.1.55		YES	ignore

9.1.15 MME DIRECT INFORMATION TRANSFER

This message is sent by the MME in order to transfer specific information.

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Inter-system Information Transfer Type	M		9.2.1.55		YES	ignore

9.1.16 eNB CONFIGURATION TRANSFER

This message is sent by the eNB in order to transfer RAN configuration information.

Direction: eNB → MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
SON Configuration Transfer	O		9.2.3.26		YES	ignore

9.1.17 MME CONFIGURATION TRANSFER

This message is sent by the MME in order to transfer RAN configuration information.

Direction: MME → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
SON Configuration Transfer	O		9.2.3.26		YES	ignore

9.1.18 CELL TRAFFIC TRACE

This message is sent by eNB to transfer specific information.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1 AP ID	M		9.2.3.3		YES	reject
eNB UE S1 AP ID	M		9.2.3.4		YES	reject
E-UTRAN Trace ID	M		OCTET STRING (8)	The E-UTRAN Trace ID IE is composed of the following: Trace Reference defined in TS 32.422 [10] (leftmost 6 octets, with PLMN information coded as in 9.2.3.8), and Trace Recording Session Reference defined in TS 32.422 [10] (last 2 octets).	YES	ignore
E-UTRAN CGI	M		9.2.1.38		YES	ignore
Trace Collection Entity IP Address	M		Transport Layer Address 9.2.2.1	Defined in TS 32.422 [10]	YES	ignore
Privacy Indicator	O		ENUMERATED (Immediate MDT, Logged MDT, ...)		YES	ignore

9.1.19 LPPa Transport Messages

9.1.19.1 DOWNLINK UE ASSOCIATED LPPA TRANSPORT

This message is sent by the MME and is used for carrying LPPa message over the S1 interface.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Routing ID	M		9.2.3.33		YES	reject
LPPa-PDU	M		9.2.3.32		YES	reject

9.1.19.2 UPLINK UE ASSOCIATED LPPA TRANSPORT

This message is sent by the eNB and is used for carrying LPPa message over the S1 interface.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
MME UE S1AP ID	M		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
Routing ID	M		9.2.3.33		YES	reject
LPPa-PDU	M		9.2.3.32		YES	reject

9.1.19.3 DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT

This message is sent by the MME and is used for carrying LPPa message over the S1 interface.

Direction: MME → eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Routing ID	M		9.2.3.33		YES	reject
LPPa-PDU	M		9.2.3.32		YES	reject

9.1.19.4 UPLINK NON UE ASSOCIATED LPPA TRANSPORT

This message is sent by the eNB and is used for carrying LPPa message over the S1 interface.

Direction: eNB → MME

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
Routing ID	M		9.2.3.33		YES	reject
LPPa-PDU	M		9.2.3.32		YES	reject

9.2 Information Element Definitions

9.2.0 General

Subclause 9.2 presents the S1AP 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		(Handover Preparation, Handover Resource Allocation, Handover Notification, Path Switch Request, Handover Cancellation, E-RAB Setup, E-RAB Modify, E-RAB Release, E-RAB Release Indication, Initial Context Setup, Paging, Downlink NAS transport, Initial UE Message, Uplink NAS transport, Reset, Error Indication, NAS Non Delivery Indication, S1 Setup, UE Context Release Request , UE Context Release, Downlink S1 CDMA2000 Tunneling, Uplink S1 CDMA2000 Tunneling; UE Context Modification, UE Capability Info Indication, eNB Status Transfer, MME Status Transfer, Deactivate Trace, Trace Start, Trace Failure Indication, eNB Configuration Update, MME Configuration Update, Location Reporting Control, Location Reporting Failure Indication, Location Report, Overload Start, Overload Stop, Private Message, Write-Replace Warning, eNB Direct Information Transfer, MME Direct Information Transfer, Cell Traffic Trace, eNB Configuration Transfer, MME Configuration Transfer, Downlink UE Associated LPPa transport, Uplink UE Associated LPPa transport, Downlink Non UE Associated LPPa transport, Uplink Non UE Associated LPPa transport, Kill, …)	
>Type of Message	M		CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, …)	

9.2.1.2 E-RAB ID

This element uniquely identifies a radio access bearer for a particular UE, which makes the E-RAB ID unique over one S1 connection. The E-RAB ID shall remain the same for the duration of the E-RAB even if the UE-associated logical S1-connection is released or moved using S1 handover.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
E-RAB ID	M		INTEGER (0..15, …)	

9.2.1.3 Cause

The purpose of the *Cause* IE is to indicate the reason for a particular event for the S1AP 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 (Unspecified, $TX2_{RELOCOverall}$ Expiry, Successful Handover, Release due to E-UTRAN Generated Reason, Handover Cancelled, Partial Handover, Handover Failure In Target EPC/eNB Or Target System, Handover Target not allowed, $TS1_{RELOCoverall}$ Expiry, $TS1_{RELOCprep}$ Expiry, Cell not available, Unknown Target ID, No Radio Resources Available in Target Cell, Unknown or already allocated MME UE S1AP ID, Unknown or already allocated eNB UE S1AP ID, Unknown or inconsistent pair of UE S1AP ID, Handover desirable for radio reasons, Time critical handover, Resource optimisation handover, Reduce load in serving cell, User inactivity, Radio Connection With UE Lost, Load Balancing TAU Required, CS Fallback Triggered, UE Not Available For PS Service, Radio resources not available, Failure in the Radio Interface Procedure, Invalid QoS combination, Inter-RAT redirection, Interaction with other procedure, Unknown E-RAB ID, Multiple E-RAB ID instances, Encryption and/or integrity protection algorithms not supported, S1 intra system Handover triggered, S1 inter system Handover triggered, X2 Handover triggered …, Redirection towards 1xRTT, Not supported QCI value, invalid CSG Id)	
>Transport Layer				
>>Transport Layer Cause	M		ENUMERATED (Transport Resource Unavailable, Unspecified, …)	
>NAS				
>>NAS Cause	M		ENUMERATED (Normal Release, Authentication failure, Detach, Unspecified, …, CSG Subscription Expiry)	
>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, Unknown PLMN, …)	

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
Unspecified	Sent for radio network layer cause when none of the specified cause values applies
TX2RELOCOverall Expiry	The timer guarding the handover that takes place over X2 has abnormally expired.
Successful Handover	Successful handover.
Release due to E-UTRAN generated reason	Release is initiated due to E-UTRAN generated reason.
Handover Cancelled	The reason for the action is cancellation of Handover
Partial Handover	Provides a reason for the handover cancellation. The HANDOVER COMMAND message from MME contained *E-RABs to Release List* IE and the source eNB estimated service continuity for the UE would be better by not proceeding with handover towards this particular target eNB.
Handover Failure In Target EPC/eNB Or Target System	The handover failed due to a failure in target EPC/eNB or target system.
Handover Target not allowed	Handover to the indicated target cell is not allowed for the UE in question.
$TS1_{RELOCoverall}$ Expiry	The reason for the action is expiry of timer $TS1_{RELOCoverall}$.
$TS1_{RELOCprep}$ Expiry	Handover Preparation procedure is cancelled when timer $TS1_{RELOCprep}$ expires.
Cell not available	The concerned cell is not available.
Unknown Target ID	Handover rejected because the target ID is not known to the EPC.
No radio resources available in target cell	Load on target cell is too high.
Unknown or already allocated MME UE S1AP ID	The action failed because the MME UE S1AP ID is either unknown, or (for a first message received at the eNB) is known and already allocated to an existing context.
Unknown or already allocated eNB UE S1AP ID	The action failed because the eNB UE S1AP ID is either unknown, or (for a first message received at the MME) is known and already allocated to an existing context.
Unknown or inconsistent pair of UE S1AP ID	The action failed because both UE S1AP IDs are unknown, or are known but do not define a single UE context.
Handover Desirable for Radio Reasons	The reason for requesting handover is radio related.
Time Critical Handover	handover is requested for time critical reason i.e., this cause value is reserved to represent all critical cases where the connection is likely to be dropped if handover is not performed.
Resource Optimisation Handover	The reason for requesting handover is to improve the load distribution with the neighbour cells.
Reduce Load in Serving Cell	Load on serving cell needs to be reduced.

User Inactivity	The action is requested due to user inactivity on all E-RABs, e.g., S1 is requested to be released in order to optimise the radio resources.
Radio Connection With UE Lost	The action is requested due to loosing the radio connection to the UE.
Load Balancing TAU Required	The action is requested for all load balancing and offload cases in the MME.
CS Fallback triggered	The action is due to a CS fallback that has been triggered. When it is included in UE CONTEXT RELEASE REQUEST message, it indicates the PS service suspension is not required in the EPC.
UE Not Available for PS Service	The action is requested due to a CS fallback to GERAN that has been triggered. When it is included in the UE CONTEXT RELEASE REQUEST message, it indicates that the PS service suspension is required in the EPC due to the target GERAN cell or the UE has no DTM capability.
Radio resources not available	No requested radio resources are available
Invalid QoS combination	The action was failed because of invalid QoS combination.
Inter-RAT Redirection	The release is requested due to inter-RAT redirection. When it is included in UE CONTEXT RELEASE REQUEST message, it indicates the PS service suspension is not required in the EPC .
Failure in the Radio Interface Procedure	Radio interface procedure has failed
Interaction with other procedure	The action is due to an ongoing interaction with another procedure
Unknown E-RAB ID	The action failed because the E-RAB ID is unknown in the eNB
Multiple E-RAB ID Instances	The action failed because multiple instance of the same E-RAB had been provided to the eNB
Encryption and/or integrity protection algorithms not supported	The eNB is unable to support any of the encryption and/or integrity protection algorithms supported by the UE.
S1 Intra system Handover triggered	The action is due to a S1 intra system handover that has been triggered.
S1 Inter system Handover triggered	The action is due to a S1 inter system handover that has been triggered.
X2 Handover triggered	The action is due to an X2 handover that has been triggered.
Redirection towards 1xRTT	The release of the UE-associated logical S1 connection is requested due to redirection towards a 1xRTT system e.g., CS fallback to 1xRTT, or SRVCC to 1xRTT, when the PS service suspension is required in the EPC. During this procedure, the radio interface message might but need not include redirection information.
Not supported QCI Value	The E-RAB setup failed because the requested QCI is not supported.
Invalid CSG Id	The CSG ID provided to the target eNB was found invalid.

Transport Layer cause	Meaning
Transport Resource Unavailable	The required transport resources are not available
Unspecified	Sent when none of the above cause values applies but still the cause is Transport Network Layer related

NAS cause	Meaning
Normal Release	The release is normal
Authentication Failure	The action is due to authentication failure.
Detach	The action is due to detach.
Unspecified	Sent when none of the above cause values applies but still the cause is NAS related
CSG Subscription Expiry	The action is due to the UE becoming a non-member of the currently used CSG.

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 when none of the above cause values applies but still the cause is Protocol related

Miscellaneous cause	Meaning
Control Processing Overload	Control processing overload
Not Enough User Plane Processing Resources Available	No enough resources are available related to user plane processing.
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.
Unknown PLMN	The MME does not identify any PLMN provided by the eNB

9.2.1.3a RRC Establishment Cause

The purpose of the *RRC Establishment Cause* IE is to indicate to the MME the reason for RRC Connection Establishment. The encoding is the same as that of the Establishment Cause IE defined in TS 36.331 [16].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RRC Establishment Cause	M		ENUMERATED(emergency, highPriorityAccess, mt-Access, mo-Signalling, mo-Data, …,delay TolerantAccess)	

9.2.1.4 Trace activation

Defines parameters related to a trace activation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
E-UTRAN Trace ID	M		OCTET STRING (8)	The E-UTRAN Trace ID IE is composed of the following: Trace Reference defined in TS 32.422 [10] (leftmost 6 octets, with PLMN information coded as in 9.2.3.8), and Trace Recording Session Reference defined in TS 32.422 [10] (last 2 octets)		
Interfaces To Trace	M		BIT STRING (8)	Each position in the bitmap represents a eNB interface: first bit =S1-MME, second bit =X2, third bit =Uu: other bits reserved for future use. Value '1' indicates 'should be traced'. Value '0' indicates 'should not be traced'.		
Trace depth	M		ENUMERATED(minimum, medium, maximum, MinimumWithoutVendorSpecificExtension, MediumWithoutVendorSpecificExtension, MaximumWithoutVendorSpecificExtension, …)	Defined in TS 32.422 [10]		
Trace Collection Entity IP Address	M		Transport Layer Address 9.2.2.1	Defined in TS 32.422 [10]		
MDT Configuration	O		9.2.1.81		YES	ignore

9.2.1.5 Source ID

Void.

9.2.1.6 Target ID

The *Target ID* IE identifies the target for the handover. The target ID may be, e.g., the target Global eNB-ID (for intra SAE/LTE), the RNC-ID (for SAE/LTE-UMTS handover) or the Cell Global ID of the handover target (in case of SAE/LTE to GERAN A/Gb mode handover).

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
CHOICE *Target ID*					-	-
>Target eNB-ID					-	-
>>Global eNB ID	M		9.2.1.37		-	-
>>Selected TAI	M		TAI 9.2.3.16		-	-
>Target RNC-ID					-	-
>>LAI	M		9.2.3.1		-	-
>>RAC	O		9.2.3.2		-	-
>>RNC-ID	M		INTEGER (0..4095)	If the *Extended RNC-ID* IE is included in the *Target ID* IE, the *RNC-ID* IE shall be ignored.	-	-

>>Extended RNC-ID	O		9.2.1.14	The *Extended RNC-ID* IE shall be used if the RNC identity has a value larger than 4095.	-	-
>*CGI*					-	-
>>PLMN identity	M		9.2.3.8		-	-
>>LAC	M		OCTET STRING (2)	0000 and FFFE not allowed.	-	-
>>CI	M		OCTET STRING (2)		-	-
>>RAC	O		9.2.3.2		-	-

9.2.1.7 Source eNB to Target eNB Transparent Container

The *Source eNB to target eNB Transparent Container* IE is an information element that is produced by the source eNB and is transmitted to the target eNB. For inter-system handovers to E-UTRAN, the IE is transmitted from the external handover source to the target eNB.

This IE is transparent to the EPC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
RRC Container	M		OCTET STRING	Includes the RRC Handover Preparation Information message as defined in subclause 10.2.2 of TS 36.331 [16].	-	
E-RABs Information List		*0..1*			-	
>E-RABs Information Item		*1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>DL Forwarding	O		9.2.3.14		-	
Target Cell ID	M		E-UTRAN CGI 9.2.1.38		-	
Subscriber Profile ID for RAT/Frequency priority	O		9.2.1.39		-	
UE History Information	M		9.2.1.42		-	

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.

9.2.1.8 Target eNB to Source eNB Transparent Container

The *Target eNB to Source eNB Transparent Container* IE is an information element that is produced by the target eNB and is transmitted to the source eNB. For inter-system handovers to E-UTRAN, the IE is transmitted from the target eNB to the external relocation source.

This IE is transparent to EPC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
RRC Container	M		OCTET STRING	Includes the RRC E-UTRA Handover Command message as defined in subclause 10.2.2 of TS 36.331 [16].	-	

9.2.1.9 Source RNC to Target RNC Transparent Container

This IE is used to transparently pass radio related information between the handover source and the handover target through the EPC. This container is used for inter 3GPP RAT handovers from SAE/LTE to UTRAN.

This IE defined in TS 25.413 [19].

9.2.1.10 Target RNC to Source RNC Transparent Container

This container is used to transparently pass radio related information between the handover target and the handover source through the EPC. This container is used inter 3GPP RAT handovers from SAE/LTE to UTRAN.

This IE defined in TS 25.413 [19].

9.2.1.11 Source BSS to Target BSS Transparent Container

This container is used to transparently pass radio related information between the handover source and the handover target through the EPC. This container is used for inter 3GPP RAT handovers from SAE/LTE to GERAN A/Gb mode.

This IE is defined in TS 48.018 [18].

9.2.1.12 Target BSS to Source BSS Transparent Container

This container is used to transparently pass radio related information between the handover source and the handover target through the EPC. This container is used for inter 3GPP RAT handovers from SAE/LTE to GERAN A/Gb mode.

This IE is defined in TS 48.018 [18].

9.2.1.13 Handover Type

This IE indicates which kind of handover was triggered in the source side.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Handover Type	M		ENUMERATED (IntraLTE, LTEtoUTRAN, LTEtoGERAN, UTRANtoLTE, GERANtoLTE)	

9.2.1.14 Extended RNC-ID

The Extended RNC-ID is used to identify an RNC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Extended RNC-ID	M		INTEGER (4096..65535)	The *Extended RNC-ID* IE shall be used if the RNC identity has a value larger than 4095.

9.2.1.15 E-RAB Level QoS Parameters

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
E-RAB Level QoS Parameters				
>QCI	M		INTEGER (0..255)	QoS Class Identifier defined in TS 23.401 [11]. Coding specified in TS 23.203 [13].
>Allocation and Retention Priority	M		9.2.1.60	
>GBR QoS Information	O		9.2.1.18	This IE applies to GBR bearers only and shall be ignored otherwise.

9.2.1.16 Paging DRX

This IE indicates the Paging DRX as defined in TS 36.304 [20].

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Paging DRX	M		ENUMERATED(32, 64, 128, 256, …)		-	

9.2.1.17 Paging Cause

Void.

9.2.1.18 GBR QoS Information

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
E-RAB Maximum Bit Rate Downlink	M		Bit Rate 9.2.1.19	**Desc**.: This IE indicates the maximum downlink E-RAB Bit Rate as specified in TS 23.401 [11] for this bearer.
E-RAB Maximum Bit Rate Uplink	M		Bit Rate 9.2.1.19	**Desc**.: This IE indicates the maximum uplink E-RAB Bit Rate as specified in TS 23.401 [11] for this bearer.
E-RAB Guaranteed Bit Rate Downlink	M		Bit Rate 9.2.1.19	**Desc**.: This IE indicates the downlink guaranteed E-RAB Bit Rate as specified in TS 23.401 [11] (provided that there is data to deliver) for this bearer.
E-RAB Guaranteed Bit Rate Uplink	M		Bit Rate 9.2.1.19	**Desc**.: This IE indicates the uplink guaranteed E-RAB Bit Rate as specified in TS 23.401 [11] (provided that there is data to deliver) for this bearer.

9.2.1.19 Bit Rate

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

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

9.2.1.20 UE Aggregate Maximum Bit Rate

The UE Aggregate Maximum Bitrate is applicable for all Non-GBR bearers per UE which is defined for the Downlink and the Uplink direction and provided by the MME to the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Aggregate Maximum Bit Rate				**Desc**.: Applicable for non-GBR E-RABs
>UE Aggregate Maximum Bit Rate Downlink	M		Bit Rate 9.2.1.19	**Desc**.: This IE indicates the UE Aggregate Maximum Bit Rate as specified in TS 23.401 [11] in the downlink direction
>UE Aggregate Maximum Bit Rate Uplink	M		Bit Rate 9.2.1.19	**Desc**.: This IE indicates the UE Aggregate Maximum Bit Rate as specified in TS 23.401 [11] in the uplink direction. Receiving both the *UE Aggregate Maximum Bit Rate Downlink* IE and the *UE Aggregate Maximum Bit Rate Uplink* IE equal to value zero shall be considered as a logical error by the eNB.

9.2.1.21 Criticality Diagnostics

The *Criticality Diagnostics* IE is sent by the eNB or the MME 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 clause 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.

9.2.1.22 Handover Restriction List

This IE defines area roaming or access restrictions for subsequent mobility action for which the eNB provides information about the target of the mobility action towards the UE, e.g., handover and CCO. If the eNB receives the Handover Restriction List, it shall overwrite previously received restriction information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Serving PLMN	M		9.2.3.8	
Equivalent PLMNs		*0..<maxnoofEPLMNs>*		Allowed PLMNs in addition to Serving PLMN. This list corresponds to the list of "equivalent PLMNs" as defined in TS 24.301 [24].
>PLMN Identity	M		9.2.3.8	
Forbidden TAs		*0..<maxnoofEPLMNsPlusOne>*		intra LTE roaming restrictions
>PLMN Identity	M		9.2.3.8	The PLMN of forbidden TACs
>Forbidden TACs		*1..<maxnoofForbTACs>*		
>>TAC	M		9.2.3.7	The TAC of the forbidden TAI
Forbidden LAs		*0..<maxnoofEPLMNsPlusOne>*		inter-3GPP RAT roaming restrictions
>PLMN Identity	M		9.2.3.8	
>Forbidden LACs		*1..<maxnoofForbLACs>*		
>>LAC	M		OCTET STRING(2)	
Forbidden inter RATs	O		ENUMERATED(ALL, GERAN, UTRAN, CDMA2000, …, GERAN and UTRAN, CDMA2000 and UTRAN)	inter-3GPP and 3GPP2 RAT access restrictions

Range bound	Explanation
maxnoofEPLMNs	Maximum no. of equivalent PLMN Ids. Value is 15.
maxnoofEPLMNsPlusOne	Maximum no. of equivalent PLMN Ids plus one. Value is 16.
maxnoofForbTACs	Maximum no. of forbidden Tracking Area Codes. Value is 4096.
maxnoofForbLACs	Maximum no. of forbidden Location Area Codes. Value is 4096.

9.2.1.23 CDMA2000-PDU

This information element contains a CDMA2000 message between the UE and CDMA2000 RAT that is transferred without interpretation in the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CDMA2000-PDU	M		OCTET STRING	

9.2.1.24 CDMA2000 RAT Type

In the uplink, this information element, along with the *CDMA2000 Sector ID* IE is used for routing the tunnelled CDMA2000 message to the proper destination node in the CDMA2000 RAT and is set by the eNB to the CDMA2000 RAT type received from the UE.

NOTE: In the downlink, this information element is used by the eNB to provide an indication of the RAT Type associated with the tunnelled CDMA2000 message to the UE to help it route the tunnelled downlink CDMA2000 message to the appropriate CDMA upper layer.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CDMA2000 RAT Type	M		ENUMERATED (HRPD, 1xRTT, …)	This IE is used to identify which CDMA2000 RAT the tunnelled CDMA2000 signalling is associated with. The source of this information in the uplink is the UE and in the downlink it is the CDMA2000 system.

9.2.1.25 CDMA2000 Sector ID

This information element, along with the *RAT Type* IE is used for routing the tunnelled CDMA2000 message to the proper destination node in the CDMA2000 RAT.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CDMA2000 Sector ID	M		OCTET STRING	This IE is set to CDMA2000 Reference Cell ID corresponding to the HRPD/1xRTT sector under the HRPD AN/1xBS towards which the signalling is performed. The CDMA2000 Reference Cell ID is statically configured in the eNB. If the RAT type is HRPD, this IE contains the HRPD Sector ID as specified in 3GPP2 C.S0024-A [27]. If the RAT type is 1x RTT, this IE is encoded as the Reference Cell ID IE in 3GPP2 A.S0008-C [25].

9.2.1.26 Security Context

The purpose of the *Security Context* IE is to provide security related parameters to the eNB which are used to derive security keys for user plane traffic and RRC signalling messages and for security parameter generation for subsequent X2 or intra eNB Handovers, or for the security parameters for the current S1 Handover. For intra LTE S1 Handover one pair of {NCC, NH} is provided for 1-hop security, see TS 33.401 [15].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Next Hop Chaining Count	M		INTEGER (0..7)	Next Hop Chaining Counter (NCC) defined in TS 33.401 [15]. For inter-RAT Handover into LTE the *Next Hop Chaining Count* IE takes the value defined for NCC at initial setup, i.e., *Next Hop Chaining Count* IE = “0”.
Next-Hop NH	M		9.2.1.41 Security Key	The NH together with the NCC is used to derive the security configuration as defined in TS 33.401 [15]. For inter RAT Handover the *Next-Hop NH* IE is the KeNB to be used in the new configuration.

9.2.1.27 UE Radio Capability

This IE contains UE Radio Capability information.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UE Radio Capability	M		OCTET STRING	Includes the UERadioAccessCapabilityInformation message as defined in 10.2.2 of TS 36.331 [16].

9.2.1.28 CDMA2000 HO Status

This IE is used to indicate to the eNB which initiated an inter-RAT HO towards CDMA2000 about the outcome of the handover preparation to CDMA2000.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CDMA2000 HO Status	M		ENUMERATED (HO Success, HO Failure, …)	This IE indicates the status of the handover resource allocation in the CDMA2000 RAT.

9.2.1.29 CDMA2000 HO Required Indication

This information element is set by the eNB to provide an indication about whether the UE has initiated the handover preparation with the CDMA2000 RAT.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CDMA2000 HO Required Indication	M		ENUMERATED (true, …)	This IE indicates to MME that handover preparation to CDMA2000 has been started. It helps MME to decide when to send certain handover preparation information for HRPD (TS 23.402 [8]) and 1xRTT (TS 23.216 [9]) to the CDMA2000 RAT.

9.2.1.30 1xRTT MEID

Void.

9.2.1.31 eNB Status Transfer Transparent Container

The *eNB Status Transfer Transparent Container* IE is an information element that is produced by the source eNB and is transmitted to the target eNB. This IE is used for the intra SAE/LTE S1 handover case.

This IE is transparent to the EPC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
E-RABs Subject to Status Transfer List		*1*			-	-
>E-RABs Subject to Status Transfer Item		*1 to <maxnoof E-RABs>*			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	-
>>UL COUNT value	M		COUNT Value 9.2.1.32	PDCP-SN and HFN of first missing UL PDCP SDU	-	-
>>DL COUNT value	M		COUNT Value 9.2.1.32	PDCP-SN and HFN that the target eNB should assign for the next DL SDU not having an SN yet	-	-
>>Receive Status Of UL PDCP SDUs	O		BIT STRING (4096)	PDCP Sequence Number = (First Missing SDU Number + bit position) modulo 4096 0: PDCP SDU has not been received. 1: PDCP SDU has been received correctly.		

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RABs for one UE. Value is 256.

9.2.1.32 COUNT value

This IE contains a PDCP sequence number and a hyper frame number.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
PDCP-SN	M		INTEGER (0..4095)		-	-
HFN	M		INTEGER (0..1048575)		-	-

9.2.1.33 CDMA2000 1xRTT RAND

This information element is a random number generated by the eNB and tunnelled to the 1xCS IWS (TS 23.402 [8]) and is transparent to MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CDMA2000 1xRTT RAND	M		OCTET STRING	This IE is a Random Challenge that is used for authentication of UE during 1xCS registration, eCSFB to 1xRTT or handover from E-UTRAN to CDMA2000 1xRTT RAT. This IE is coded as the RAND (32bits) of the Authentication Challenge Parameter (RAND) in 3GPP2 A.S0008-C [25].

9.2.1.34 Request Type

The purpose of the *Request Type* IE is to indicate the type of location request to be handled by the eNB.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Request Type				
>Event	M		ENUMERATED(Direct, Change of service cell, Stop Change of service cell)	
>Report Area	M		ENUMERATED (ECGI, …)	

9.2.1.35 CDMA2000 1xRTT SRVCC Info

This IE defines SRVCC related information elements that are assembled by the MME to be tunnelled transparently to the 1xCS IWS (TS 23.402 [8]) system.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CDMA2000 1xRTT SRVCC Info				
>CDMA2000 1xRTT MEID	M		OCTET STRING	This information element is the Mobile Equipment Identifier or Hardware ID that is tunnelled from the UE and is transparent to the eNB. This IE is used to derive a MEID-based PLCM that is used for channelization in CDMA2000 1xRTT network.
>CDMA2000 1xRTT Mobile Subscription Information	M		OCTET STRING	This IE provides the list of UE supported 1x RTT Band classes and Band Subclasses. It is provided by the UE to the eNB as part of the UE capability. It is transparent to the eNB.
>CDMA2000 1xRTT Pilot List	M		OCTET STRING	This IE provides the measured pilot information. Encoded as the *Pilot List* IE from the A21-1x air interface signalling message in 3GPP2 A.S0008-C [25].

9.2.1.36 E-RAB List

This IE contains a list of E-RAB IDs with a cause value. It is used for example to indicate failed bearers or bearers to be released.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
E-RAB List Item		*1 to <maxnoof E-RABs>*			EACH	ignore
>E-RAB ID	M		9.2.1.2		-	-
>Cause	M		9.2.1.3		-	-

Range bound	Explanation
maxnoofE-RABs	Maximum no. of E-RAB allowed towards one UE, the maximum value is 256.

9.2.1.37 Global eNB ID

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
CHOICE *eNB ID*	M			
>Macro eNB ID				
>>Macro eNB ID	M		BIT STRING (20)	Equal to the 20 leftmost bits of the *Cell Identity* IE contained in the *E-UTRAN CGI* IE (see subclause 9.2.1.38) of each cell served by the eNB.
>Home eNB ID				
>>Home eNB ID	M		BIT STRING (28)	Equal to the *Cell Identity* IE contained in the *E-UTRAN CGI* IE (see subclause 9.2.1.38) of the cell served by the eNB.

9.2.1.38 E-UTRAN CGI

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		9.2.3.8	
Cell Identity	M		BIT STRING (28)	The leftmost bits of the Cell Identity correspond to the eNB ID (defined in subclause 9.2.1.37).

9.2.1.39 Subscriber Profile ID for RAT/Frequency priority

The *Subscriber Profile ID* IE for RAT/Frequency Selection Priority is used to define camp priorities in Idle mode and to control inter-RAT/inter-frequency handover in Active mode TS 36.300 [14].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Subscriber Profile ID for RAT/Frequency Priority	M		INTEGER (1..256)	

9.2.1.40 UE Security Capabilities

The *UE Security Capabilities* IE defines the supported algorithms for encryption and integrity protection in the UE.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UE Security Capabilities				
>Encryption Algorithms	M		BIT STRING (16, …)	Each position in the bitmap represents an encryption algorithm: "all bits equal to 0" – UE supports no other algorithm than EEA0 "first bit" – 128-EEA1, "second bit" – 128-EEA2, other bits reserved for future use. Value '1' indicates support and value '0' indicates no support of the algorithm. Algorithms are defined in TS 33.401 [15].
>Integrity Protection Algorithms	M		BIT STRING (16, …)	Each position in the bitmap represents an integrity protection algorithm: "all bits equal to 0" – UE supports no other algorithm than EIA0 (TS 33.401 [15]) "first bit" – 128-EIA1, "second bit" – 128-EIA2, other bits reserved for future use. Value '1' indicates support and value '0' indicates no support of the algorithm. Algorithms are defined in TS 33.401 [15].

9.2.1.41 Security Key

The *Security Key* IE is used to apply security in the eNB for different scenarios as defined in TS 33.401 [15].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Security Key	M		BIT STRING (SIZE(256))	Key material for KeNB or Next Hop Key as defined in TS 33.401 [15]

9.2.1.42 UE History Information

The *UE History Information* IE contains information about cells that a UE has been served by in active state prior to the target cell.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Last Visited Cell List		*1 to <MaxNrOfCells>*		Most recent information is added to the top of this list	-	-
>Last Visited Cell Information	M		9.2.1.43		-	-

Range bound	Explanation
MaxNrOfCells	Maximum length of the list. Value is 16.

9.2.1.43 Last Visited Cell Information

The Last Visited Cell Information may contain E-UTRAN or UTRAN cell specific information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
CHOICE *Last Visited Cell Information*	M				-	-
>*E-UTRAN Cell*						
>>Last Visited E-UTRAN Cell Information	M		9.2.1.43a		-	-
>*UTRAN Cell*						
>>Last Visited UTRAN Cell Information	M		OCTET STRING	Defined in TS 25.413 [19]	-	-
>*GERAN Cell*						
>>Last Visited GERAN Cell Information	M		9.2.1.43b		-	-

9.2.1.43a Last Visited E-UTRAN Cell Information

The Last Visited E-UTRAN Cell Information contains information about a cell that is to be used for RRM purposes.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Global Cell ID	M		E-UTRAN CGI 9.2.1.38		-	
Cell Type	M		9.2.1.66		-	
Time UE stayed in Cell	M		INTEGER (0..4095)	The duration of the time the UE stayed in the cell in seconds. If the UE stays in a cell more than 4095s, this IE is set to 4095.	-	

9.2.1.43b Last Visited GERAN Cell Information

The Last Visited Cell Information for GERAN is currently undefined.

NOTE: If in later Releases this is defined, the choice type may be extended with the actual GERAN specific information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
CHOICE Last Visited GERAN Cell Information	M				-	
>*Undefined*	M		NULL		-	

9.2.1.44 Message Identifier

The purpose of the *Message Identifier* IE is to identify the warning message. Message Identifier IE is set by the EPC and transferred to the UE by the eNB

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Message Identifier	M		BIT STRING (16)	This IE is set by the EPC, transferred to the UE by the eNB. The eNB shall treat it as an identifier of the message.

9.2.1.45 Serial Number

The *Serial Number* IE identifies a particular message from the source and type indicated by the Message Identifier and is altered every time the message with a given Message Identifier is changed.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Serial Number	M		BIT STRING(16)	

9.2.1.46 Warning Area List

The *Warning Area List* IE indicates the areas where the warning message needs to be broadcast.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Warning Area*				
>*Cell ID List*		*1 to <maxnoofCellID>*		
>>E-CGI	M		9.2.1.38	
>*TAI List*		*1 to <maxnoofTAIforWarning>*		
>>TAI	M		9.2.3.16	
>*Emergency Area ID List*		*1 to <maxnoofEmergencyAreaID>*		
>>Emergency Area ID	M		9.2.1.47	

Range bound	Explanation
maxnoofCellID	Maximum no. of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAIforWarning	Maximum no. of TAI subject for warning message broadcast. Value is 65535.
maxnoofEmergencyAreaID	Maximum no. of Emergency Area ID subject for warning message broadcast. Value is 65535.

9.2.1.47 Emergency Area ID

The *Emergency Area ID* IE is used to indicate the area which has the emergency impact.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Emergency Area ID	M		OCTET STRING(3)	Emergency Area ID may consist of several cells. Emergency Area ID is defined by the operator.

9.2.1.48 Repetition Period

The *Repetition Period* IE indicates the periodicity of the warning message to be broadcast.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Repetition Period	M		INTEGER (0..4095)	The unit of value 1 to 4095 is [second].

9.2.1.49 Number of Broadcasts Requested

The *Number of Broadcast Requested* IE indicates the number of times a message is to be broadcast.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Number of Broadcasts Requested	M		INTEGER (0..65535)	

9.2.1.50 Warning Type

The *Warning Type* IE indicates types of the disaster. This IE also indicates that a Primary Notification is included. This IE can be used by the UE to differentiate the type of alert according to the type of disaster.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Warning Type	M		OCTET STRING(2)	

9.2.1.51 Warning Security Information

The *Warning Security Information* IE provides the security information needed for securing the Primary Notification.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Warning Security Information	M		OCTET STRING(50)	

9.2.1.52 Data Coding Scheme

The *Data Coding Scheme* IE identifies the alphabet or coding employed for the message characters and message handling at the UE (it is passed transparently from the EPC to the UE).

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Data Coding Scheme	M		BIT STRING(8)	

9.2.1.53 Warning Message Contents

The *Warning Message Content* IE contains user information, e.g., the message with warning contents, and will be broadcast over the radio interface.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Warning Message Contents	M		OCTET STRING (SIZE(1..9600))	The length of this IE varies between 1 to 9600 bytes.

9.2.1.54 Broadcast Completed Area List

The *Broadcast Completed Area List* IE indicates the areas where broadcast was performed successfully.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Broadcast Completed Area*				
>Broadcast Completed Area				
>>Cell ID Broadcast		*1 to <maxnoofCellID>*		
>>>E-CGI	M		9.2.1.38	
>TAI Broadcast				
>>TAI Broadcast		*1 to <maxnoofTAIforWarning>*		
>>>TAI	M		9.2.3.16	
>>>Completed Cell in TAI List		*1 to <maxnoofCellinTAI>*		
>>>>E-CGI	M			
>Emergency Area ID				
>>Emergency Area ID Broadcast		*1 to <maxnoofEmergencyAreaID>*		
>>>Emergency Area ID	M		9.2.1.47	
>>>Completed Cell in Emergency Area ID List		*1 to <maxnoofCellinEAI>*		
>>>>E-CGI	M			

Range bound	Explanation
maxnoofCellID	Maximum no. of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAIforWarning	Maximum no. of TAI subject for warning message broadcast. Value is 65535.
maxnoofEmergencyAreaID	Maximum no. of Emergency Area ID subject for warning message broadcast. Value is 65535.
maxnoofCellinTAI	Maximum no. of Cell ID within a TAI. Value is 65535.
maxnoofCellinEAI	Maximum no. of Cell ID within an Emergency Area. Value is 65535.

9.2.1.55 Inter-system Information Transfer Type

The *Inter-system Information Type* IE indicates the type of information that the eNB requests to transfer.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Inter-system Information Transfer Type*				
>RIM				
>>RIM Transfer			9.2.3.23	

9.2.1.56 Source To Target Transparent Container

The *Source to Target Transparent Container* IE is an information element that is used to transparently pass radio related information from the handover source to the handover target through the EPC; it is produced by the source RAN node and is transmitted to the target RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Source to Target Transparent Container	M		OCTET STRING	This IE includes a transparent container from the source RAN node to the target RAN node. The octets of the OCTET STRING are encoded according to the specifications of the target system. Note: in the current version of the specification, this IE may either carry the *Source eNB to Target eNB Transparent Container* IE or the *Source RNC to Target RNC Transparent Container* IE as defined in TS 25.413 [19] or the *Source BSS to Target BSS Transparent Container* IE as defined in TS 48.018 [18] or the *Old BSS to New BSS information* IE as defined in TS 48.008 [23].

9.2.1.57 Target To Source Transparent Container

The *Target to Source Transparent Container* IE is an information element that is used to transparently pass radio related information from the handover target to the handover source through the EPC; it is produced by the target RAN node and is transmitted to the source RAN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Target to Source Transparent Container	M		OCTET STRING	This IE includes a transparent container from the target RAN node to the source RAN node. The octets of the OCTET STRING are coded according to the specifications of the target system. Note: in the current version of the specification, this IE may either carry the *Target eNB to Source eNB Transparent Container* IE or the *Target RNC to Source RNC Transparent Container* IE as defined in TS 25.413 [19] or the *Target BSS to Source BSS Transparent Container* IE as defined in TS 48.018 [18] or the *Layer 3 Information* IE as defined in TS 48.008 [23].

9.2.1.58 SRVCC Operation Possible

This element indicates that both UE and MME are SRVCC-capable. E-UTRAN behaviour on receipt of this IE is specified in TS 23.216 [9].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SRVCC operation possible	M		ENUMERATED (Possible, …)	

9.2.1.59 SRVCC HO Indication

This information element is set by the source eNB to provide an indication that E-RAB may be subjected to handover via SRVCC means.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SRVCC HO Indication	M		ENUMERATED (PS and CS, CS only, …)	

9.2.1.60 Allocation and Retention Priority

This IE specifies the relative importance compared to other E-RABs for allocation and retention of the E-UTRAN Radio Access Bearer.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Allocation/Retention Priority				
>Priority Level	M		INTEGER (0..15)	**Desc.:** This IE should be understood as "priority of allocation and retention" (see TS 23.401 [11]). **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)	**Descr.:** This IE indicates the pre-emption capability of the request on other E-RABs **Usage:** The E-RAB shall not pre-empt other E-RABs or, the E-RAB may pre-empt other E-RABs The Pre-emption Capability indicator applies to the allocation of resources for an E-RAB and as such it provides the trigger to the pre-emption procedures/processes of the eNB.
>Pre-emption Vulnerability	M		ENUMERATED(not pre-emptable, pre-emptable)	**Desc.:** This IE indicates the vulnerability of the E-RAB to preemption of other E-RABs. **Usage**: The E-RAB shall not be pre-empted by other E-RABs or the E-RAB may be pre-empted by other RABs. Pre-emption Vulnerability indicator applies for the entire duration of the E-RAB, unless modified and as such indicates whether the E-RAB is a target of the pre-emption procedures/processes of the eNB.

9.2.1.61 Time to wait

This IE defines the minimum allowed waiting times.

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

9.2.1.62 CSG Id

This information element indicates the identifier of the Closed Subscriber Group, as defined in TS 23.003 [21].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CSG Id	M		BIT STRING (SIZE (27))	

9.2.1.63 CSG Id List

Void.

9.2.1.64 MS Classmark 2

The coding of this element is described in TS 48.008 [23].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
MS Classmark 2	M		OCTET STRING	Coded same way as the *Mobile Station Classmark 2* IE defined in TS 48.008 [23].

9.2.1.65 MS Classmark 3

The coding of this element is described in TS 48.008 [23].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
MS Classmark 3	M		OCTET STRING	Coded same way as the *Mobile Station Classmark 3* IE defined in TS 48.008 [23].

9.2.1.66 Cell Type

The cell type provides the cell coverage area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Cell Size	M		ENUMERATED (verysmall, small, medium, large, …)		-	-

9.2.1.67 Old BSS to New BSS Information

This container is used to transparently pass radio related information between the handover source and the handover target through the EPC. This container is used for inter 3GPP RAT handovers from SAE/LTE to GERAN A/Gb mode.

This IE is defined in TS 48.008 [23].

9.2.1.68 Layer 3 Information

This container is used to transparently pass radio related information between the handover target and the handover source through the EPC. This container is used for inter 3GPP RAT handovers from SAE/LTE to GERAN A/Gb mode.

This IE is defined in TS 48.008 [23].

9.2.1.69 E-UTRAN Round Trip Delay Estimation Info

This IE contains the information to assist target HRPD access with the acquisition of the UE.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
E-UTRAN Round Trip Delay Estimation Info	M		INTEGER (0..2047)	Includes the Round Trip Delay between the eNB and the UE. The unit is $16T_s$(see subclause 4.2.3 in TS 36.213 [26]).

9.2.1.70 Broadcast Cancelled Area List

The *Broadcast Cancelled Area List* IE indicates the areas where broadcast was stopped successfully.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Broadcast Cancelled Area*				
>CID Cancelled				
>>Cell ID Cancelled		*1 to <maxnoofCellID>*		
>>>E-CGI	M		9.2.1.38	
>>>Number of Broadcasts	M		9.2.1.71	
>TAI Cancelled				
>>TAI Cancelled		*1 to <maxnoofTAIforWarning >*		
>>>TAI	M		9.2.3.16	
>>>**Cancelled Cell in TAI List**		*1 to <maxnoofCellinTAI>*		
>>>>E-CGI	M			
>>>>Number of Broadcasts	M		9.2.1.71	
>Emergency Area Cancelled				
>>Emergency Area ID Cancelled		*1 to <maxnoofEmergencyAreaID>*		
>>>Emergency Area ID	M		9.2.1.47	
>>>**Cancelled Cell in Emergency Area ID List**		*1 to <maxnoofCellinEAI>*		
>>>>E-CGI	M			
>>>>Number of Broadcasts	M		9.2.1.71	

Range bound	Explanation
maxnoofCellID	Maximum no. of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAIforWarning	Maximum no. of TAI subject for warning message broadcast. Value is 65535.
maxnoofEmergencyAreaID	Maximum no. of Emergency Area ID subject for warning message broadcast. Value is 65535.
maxnoofCellinTAI	Maximum no. of Cell ID within a TAI. Value is 65535.
maxnoofCellinEAI	Maximum no. of Cell ID within an Emergency Area. Value is 65535.

9.2.1.71 Number of Broadcasts

The *Number of Broadcasts* IE indicates the number of times that a particular message has been broadcast in a given warning area.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Number of Broadcasts	M		INTEGER(0..65535)	This IE is set to '0' if valid results are not known or not available. It is set to 65535 if the counter results have overflown.

9.2.1.72 Concurrent Warning Message Indicator

The *Concurrent Warning Message Indicator* IE indicates to eNB that the received warning message is a new message to be scheduled for concurrent broadcast with any other ongoing broadcast of warning messages.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Concurrent Warning Message Indicator	M		ENUMERATED(true)	This IE is used to identify a PWS type warning system which allows the broadcast of multiple concurrent warning messages over the radio.

9.2.1.73 CSG Membership Status

This element indicates the membership status of the UE to a particular CSG.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CSG Membership Status	M		ENUMERATED (member, not-member)	

9.2.1.74 Cell Access Mode

This element indicates the access mode of the cell accessed by the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cell Access Mode	M		ENUMERATED (hybrid, …)	

9.2.1.75 Extended Repetition Period

The *Extended Repetition Period* IE indicates the periodicity of the warning message to be broadcast.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Extended Repetition Period	M		INTEGER (4096..2^{17}-1)	The *Extended Repetition Period* IE is used if the Repetition Period has a value larger than 4095. Unit [second].

9.2.1.76 Data Forwarding Not Possible

This information element indicates that the MME decided that the corresponding E-RAB bearer will not be subject to data forwarding.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Data Forwarding Not Possible	M		ENUMERATED (Data forwarding not possible, …)	

9.2.1.77 PS Service Not Available

This IE indicates that the UE is not available for the PS service in the target cell in case of SRVCC to GERAN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PS Service Not Available	M		ENUMERATED (PS service not Available, …)	

9.2.1.78 Paging Priority

This element indicates the paging priority for paging a UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Paging Priority	M		ENUMERATED (PrioLevel1, PrioLevel2, PrioLevel3, PrioLevel4, PrioLevel5, PrioLevel6, PrioLevel7, PrioLevel8, …)	Lower value codepoint indicates higher priority.

9.2.1.79 Relay Node Indicator

This element indicates a relay node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Relay Node Indicator	M		ENUMERATED (true, …)	

9.2.1.80 Correlation ID

This information element is the GTP Tunnel Endpoint Identifier or GRE key to be used for the user plane transport between eNB and the L-GW described in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Correlation ID	M		OCTET STRING (4)	

9.2.1.81 MDT Configuration

The IE defines the MDT configuration parameters.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MDT Activation	M		ENUMERATED(Immediate MDT only, Logged MDT only, Immediate MDT and Trace, …)	
CHOICE *Area Scope of MDT*	M			
>*Cell based*				
>>**Cell ID List for MDT**		*1 to <maxnoofCellIDforMDT>*		
>>>E-CGI	M		9.2.1.38	
>*TA based*				
>>**TA List for MDT**		*1 to <maxnoofTAforMDT>*		
>>>TAC	M		9.2.3.7	
>*PLMN Wide*			NULL	
CHOICE *MDT Mode*	M			
>*Immediate MDT*				
>>Measurements to Activate	M		BITSTRING (SIZE(8))	Each position in the bitmap indicates a MDT measurement, as defined in TS 37.320 [31]. First Bit = M1, Second Bit= M2. Other bits are reserved for future use and are ignored if received. Value “1” indicates “activate” and value “0” indicates “do not activate”.
>>Reporting Trigger MDT	M		ENUMERATED (periodic, A2event-triggered,, …)	
>>Threshold Event A2	C-ifM1A2trigger			Included in case of event-triggered reporting for measurement M1
>>>CHOICE *Threshold*	M			
>>>>*RSRP*				
>>>>>Threshold RSRP	M		INTEGER (0..97)	This IE is defined in TS 36.331 [16].
>>>>*RSRQ*				
>>>>>Threshold RSRQ	M		INTEGER (0..34)	This IE is defined in TS 36.331 [16].
>>Periodic reporting MDT	C-ifperiodic MDT			Included in case of periodic reporting.
>>>Report interval	M		ENUMERATED (ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, , min1, min6, min12, min30, min60)	This IE is defined in TS 36.331 [16].
>>>Report amount	M		ENUMERATED (1, 2, 4, 8, 16, 32, 64, infinity)	Number of reports.
>*Logged MDT*				
>>Logging interval	M		ENUMERATED (1.28, 2,56, 5.12,10.24,20.48, 30.72, 40.96 and 61.44)	This IE is defined in TS 36.331 [16]. Unit: [second]
>>Logging duration	M		ENUMERATED (10, 20, 40, 60, 90 and 120)	This IE is defined in TS 36.331 [16]. Unit: [minute]

Range bound	Explanation
maxnoofCellIDforMDT	Maximum no. of Cell ID subject for MDT scope. Value is 32.
maxnoofTAforMDT	Maximum no. of TA subject for MDT scope. Value is 8.

Condition	Explanation
ifM1A2trigger	This IE shall be present if the *Measurements to Activate* IE has the first bit set to "1" and the *Reporting Trigger* IE is set to "A2event-triggered".
ifperiodicMDT	This IE shall be present if the *Reporting Trigger* IE is set to "periodic".

9.2.1.82 MME Relay Support Indicator

This element is set by the MME to advertise its support of Relay functionalities.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MME Relay Support Indicator	M		ENUMERATED (true, ...)	

9.2.1.83 Management Based MDT Allowed

This information element is used by the eNB to allow selection of the UE for management based MDT as described in TS 32.422 [10].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Management Based MDT Allowed	M		ENUMERATED (Allowed, ...)	

9.2.1.84 GW Context Release Indication

This information element is set by the eNB to provide an indication that MME may release of any resources related to the signalled S1AP context (see TS 36.300 [14]).

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GW Context Release Indication	M		ENUMERATED (true, …)	This IE indicates to MME that the eNB has successfully performed an X2 HO for the UE to a target eNB.

9.2.2 Transport Network Layer Related IEs

9.2.2.1 Transport Layer Address

This information element is an IP address.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Transport Layer Address	M		BIT STRING (1..160, …)	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 36.414 [12].

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 serving gateway.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GTP-TEID	M		OCTET STRING (4)	For details and range, see TS 29.281 [32]

9.2.3 NAS Related IEs

9.2.3.1 LAI

This information element is used to uniquely identify a Location Area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
LAI				
>PLMN identity	M		9.2.3.8	
>LAC	M		OCTET STRING (2)	0000 and FFFE not allowed.

9.2.3.2 RAC

This information element is used to identify a Routing Area within a Location Area. It is used for PS services.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAC	M		OCTET STRING (1)	

9.2.3.3 MME UE S1AP ID

The MME UE S1AP ID uniquely identifies the UE association over the S1 interface within the MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MME UE S1AP ID	M		INTEGER (0 .. 2^{32} -1)	

9.2.3.4 eNB UE S1AP ID

The eNB UE S1AP ID uniquely identifies the UE association over the S1 interface within the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eNB UE S1AP ID	M		INTEGER (0 .. 2^{24} -1)	

9.2.3.5 NAS-PDU

This information element contains an EPC – UE or UE – EPC message that is transferred without interpretation in the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NAS-PDU	M		OCTET STRING	

9.2.3.6 S-TMSI

The Temporary Mobile Subscriber Identity is used for security reasons, to hide the identity of a subscriber.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
MMEC	M		9.2.3.12			
M-TMSI	M		OCTET STRING (SIZE (4))	M-TMSI is unique within MME that allocated it.		

9.2.3.7 TAC

This information element is used to uniquely identify a Tracking Area Code.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
TAC	M		OCTET STRING (SIZE (2))	

9.2.3.8 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 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).

9.2.3.9 GUMMEI

This information element indicates the globally unique MME identity.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GUMMEI				
>PLMN identity	M		9.2.3.8	
>MME Group ID	M		OCTET STRING (2)	
>MME code	M		9.2.3.12	

9.2.3.10 UE Identity Index value

The *UE Identity Index value* IE is used by the eNB to calculate the Paging Frame TS 36.304 [20].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Identity Index Value	M		BIT STRING (10)	Coded as specified in TS 36.304 [20].

9.2.3.11 IMSI

This information element contains an International Mobile Subscriber Identity, which is commonly used to identify the UE in the CN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
IMSI	M		OCTET STRING (SIZE (3..8))	- digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bit 4 to 1 of octet n encoding digit 2n-1 - bit 8 to 5 of octet n encoding digit 2n -Number of decimal digits shall be from 6 to 15 starting with the digits from the PLMN identity. When the IMSI is made of an odd number of digits, the filler digit shall be added at the end to make an even number of digits of length 2N. The filler digit shall then be consequently encoded as bit 8 to 5 of octet N.

9.2.3.12 MMEC

This information element represents the MME Code to uniquely identify an MME within an MME pool area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MMEC	M		OCTET STRING (SIZE (1))	

9.2.3.13 UE Paging Identity

This IE represents the Identity with which the UE is paged.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *UE Paging Identity*				
>*IMSI*				
>>IMSI	M		9.2.3.11	
>*S-TMSI*				
>>S-TMSI	M		9.2.3.6	

9.2.3.14 DL Forwarding

This information element indicates that the E-RAB is proposed for forwarding of downlink packets.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL Forwarding				
>DL Forwarding	M		ENUMERATED (DL forwarding proposed, …)	

9.2.3.15 Direct Forwarding Path Availability

The availability of a direct forwarding path shall be determined by the source eNB. The EPC behaviour on receipt of this IE is specified in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Direct Forwarding Path Availability	M		ENUMERATED (Direct Path Available, …)	

9.2.3.16 TAI

This information element is used to uniquely identify a Tracking Area.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
TAI				
>PLMN identity	M		9.2.3.8	
>TAC	M		9.2.3.7	

9.2.3.17 Relative MME Capacity

This IE indicates the relative processing capacity of an MME with respect to the other MMEs in the pool in order to load-balance MMEs within a pool defined in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Relative MME Capacity	M		INTEGER (0..255)	

9.2.3.18 UE S1AP ID pair

This IE contains a pair of UE S1AP identities.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
MME UE S1AP ID	M		9.2.3.3		-	-
eNB UE S1AP ID	M		9.2.3.4		-	-

9.2.3.19 Overload Response

The *Overload Response* IE indicates the required behaviour of the eNB in an overload situation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Overload Response*				
>Overload Action				
>>Overload Action	M		9.2.3.20	

9.2.3.20 Overload Action

The *Overload Action* IE indicates which signalling traffic is subject to rejection by the eNB in an MME overload situation as defined in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Overload Action	M		ENUMERATED (Reject RRC connection establishments for non-emergency MO DT, Reject RRC connection establishments for Signalling, Permit Emergency Sessions and mobile terminated services only, …, Permit High Priority Sessions and mobile terminated services only, Reject delay tolerant access)	

9.2.3.21 CS Fallback Indicator

The IE indicates that a fallback to the CS domain is needed.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CS Fallback Indicator	M		ENUMERATED(CS Fallback required, … , CS Fallback High Priority)	

9.2.3.22 CN Domain

This IE indicates whether Paging is originated from the CS or PS domain.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CN Domain	M		ENUMERATED(PS, CS)	

9.2.3.23 RIM Transfer

This IE contains the RIM Information (e.g. NACC information) and additionally in uplink transfers the RIM routing address of the destination of this RIM information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIM Transfer				
>RIM Information	M		9.2.3.24	
>RIM Routing Address	O		9.2.3.25	

9.2.3.24 RIM Information

This IE contains the RIM Information (e.g., NACC information) i.e., the BSSGP RIM PDU from the RIM application part contained in the eNB, or the BSSGP RIM PDU to be forwarded to the RIM application part in the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIM Information				
>RIM Information	M		OCTET STRING	Contains the BSSGP RIM PDU as defined in ref TS 48.018 [18].

9.2.3.25 RIM Routing Address

This IE identifies the destination node where the RIM Information needs to be routed by the CN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
CHOICE *RIM Routing Address*						
>*GERAN-Cell-ID*					-	
>>LAI	M		9.2.3.1		-	
>>RAC	M		9.2.3.2		-	
>>CI	M		OCTET STRING (2)		-	
>*Target RNC-ID*					-	
>>LAI	M		9.2.3.1		-	
>>RAC	O		9.2.3.2		-	
>>RNC-ID	M		INTEGER (0..4095)	If the *Extended RNC-ID* IE is included in the *Target ID* IE, the *RNC-ID* IE shall be ignored.	-	
>>Extended RNC-ID	O		9.2.1.14	The *Extended RNC-ID* IE shall be used if the RNC identity has a value larger than 4095.	-	

9.2.3.26 SON Configuration Transfer

This IE contains the SON Information and additionally includes the eNB identifier of the destination of this SON information and the eNB identifier of the source of this information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SON Configuration Transfer				
>Target eNB-ID	M			
>>Global eNB ID	M		9.2.1.37	
>>Selected TAI	M		TAI 9.2.3.16	
>Source eNB-ID	M			
>>Global eNB ID	M		9.2.1.37	
>>Selected TAI	M		TAI 9.2.3.16	
>SON Information	M		9.2.3.27	
>X2 TNL Configuration Info	O		9.2.3.29	Source eNB X2 TNL Configuration Info

9.2.3.27 SON Information

This IE identifies the nature of the SON information transferred, i.e., a request or a reply.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
CHOICE *SON Information*						
>*SON Information Request*						
>>SON Information Request				ENUMERATED(X2 TNL Configuration Info, …, Time synchronization Info)	-	
>*SON Information Reply*						
>>SON Information Reply				9.2.3.28	-	

9.2.3.28 SON Information Reply

This IE contains the SON Information to be replied to the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SON Information Reply				
>X2 TNL Configuration Info	O		9.2.3.29	
>Time synchronization Info	O		9.2.3.34	

9.2.3.29 X2 TNL Configuration Info

The X2 TNL Configuration Info IE is used for signalling X2 TNL Configuration information for automatic X2 SCTP association establishment.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eNB X2 Transport Layer Addresses		*1 to <maxnoofeNBX2 TLAs>*		
>Transport Layer Address	M		9.2.2.1	Transport Layer Addresses for X2 SCTP end-point.
eNB X2 Extended Transport Layer Addresses		*0 to <maxnoofeNBX2 ExtTLAs>*		
>IP-Sec Transport Layer Address	O		9.2.2.1	Transport Layer Addresses for IP-Sec end-point
>**eNB GTP Transport Layer Addresses**		*0 to <maxnoofeNBX2 GTPTLAs>*		
>>GTP Transport Layer Address	M		9.2.2.1	GTP Transport Layer Addresses for GTP end-points (used for data forwarding over X2).

Range bound	Explanation
maxnoofeNBX2TLAs	Maximum no. of eNB X2 Transport Layer Addresses for an SCTP end-point. Value is 2.
maxnoofeNBX2ExtTLAs	Maximum no. of eNB X2 Extended Transport Layer Addresses in the message. Value is 16.
maxnoofeNBX2GTPTLAs	Maximum no. of eNB X2 GTP Transport Layer Addresses for an GTP end-point in the message. Value is 16.

9.2.3.30 NAS Security Parameters from E-UTRAN

The purpose of the *NAS Security Parameters from E-UTRAN* IE is to provide security related parameters for I-RAT handovers from E-UTRAN via the eNB to the UE.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
NAS Security Parameters from E-UTRAN	M		OCTET STRING	Coded as the value part of *NAS security parameters from E-UTRA* IE defined in TS 24.301 [24].

9.2.3.31 NAS Security Parameters to E-UTRAN

The purpose of the *NAS Security Parameters to E-UTRAN* IE is to provide security related parameters for I-RAT handovers to E-UTRAN via the RNC or BSS to the UE.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
NAS Security Parameters to E-UTRAN	M		OCTET STRING	Coded as the value part of *NAS security parameters to E-UTRA* IE defined in TS 24.301 [24].

9.2.3.32 LPPa-PDU

This information element contains an eNB – E-SMLC or E-SMLC – eNB message that is transferred without interpretation in the MME.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
LPPa-PDU	M		OCTET STRING	

9.2.3.33 Routing ID

This information element is used to identify an E-SMLC within the EPC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Routing ID	M		INTEGER (0..255)	

9.2.3.34 Time Synchronization Info

The *Time Synchronization Info* IE is used for signalling stratum level and synchronization status for over-the-air synchronization using network listening.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Synchronization Info				
>Stratum Level	M		INTEGER (0..3, …)	
>Synchronization status	M		ENUMERATED(Synchronous, Asynchronous, …)	

9.2.3.35 Void

9.2.3.36 Traffic Load Reduction Indication

The *Traffic Load Reduction Indication* IE indicates the percentage of the type of traffic relative to the instantaneous incoming rate at the eNB, as indicated in the *Overload Action* IE, to be rejected.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Traffic Load Reduction Indication	M		INTEGER (1..99)	

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

9.3.0 General

S1AP ASN.1 definition conforms to ITU-T Rec. X.691 [4], ITU-T Rec. X.680 [5] and ITU-T Rec. X.681 [6].

The ASN.1 definition specifies the structure and content of S1AP messages. S1AP 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 S1AP message according to the PDU definitions module and with the following additional rules:

- 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 where 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.

NOTE: In the above “IE” means an IE in the object set with an explicit ID. If one IE needs to appear more than once in one object set, then the different occurrences will have different IE IDs.

If a S1AP 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 subclause 10.3.6.

Subclause 9.3 presents the Abstract Syntax of S1AP protocol with ASN.1. In case there is contradiction between the ASN.1 definition in this subclause and the tabular format in subclause 9.1 and 9.2, 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.

9.3.1 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 interoperability;
- 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.

9.3.2 Elementary Procedure Definitions

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

S1AP-PDU-Descriptions  {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-PDU-Descriptions (0)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    ProcedureCode
FROM S1AP-CommonDataTypes

    CellTrafficTrace,
    DeactivateTrace,
    DownlinkUEAssociatedLPPaTransport,
    DownlinkNASTransport,
    DownlinkNonUEAssociatedLPPaTransport,
    DownlinkS1cdma2000tunneling,
    ENBDirectInformationTransfer,
    ENBStatusTransfer,
    ENBConfigurationUpdate,
    ENBConfigurationUpdateAcknowledge,
    ENBConfigurationUpdateFailure,
    ErrorIndication,
    HandoverCancel,
    HandoverCancelAcknowledge,
    HandoverCommand,
    HandoverFailure,
    HandoverNotify,
    HandoverPreparationFailure,
    HandoverRequest,
    HandoverRequestAcknowledge,
    HandoverRequired,
    InitialContextSetupFailure,
    InitialContextSetupRequest,
    InitialContextSetupResponse,
    InitialUEMessage,
```

```
    KillRequest,
    KillResponse,
    LocationReportingControl,
    LocationReportingFailureIndication,
    LocationReport,
    MMEConfigurationUpdate,
    MMEConfigurationUpdateAcknowledge,
    MMEConfigurationUpdateFailure,
    MMEDirectInformationTransfer,
    MMEStatusTransfer,
    NASNonDeliveryIndication,
    OverloadStart,
    OverloadStop,
    Paging,
    PathSwitchRequest,
    PathSwitchRequestAcknowledge,
    PathSwitchRequestFailure,
    PrivateMessage,
    Reset,
    ResetAcknowledge,
    S1SetupFailure,
    S1SetupRequest,
    S1SetupResponse,
    E-RABModifyRequest,
    E-RABModifyResponse,
    E-RABReleaseCommand,
    E-RABReleaseResponse,
    E-RABReleaseIndication,
    E-RABSetupRequest,
    E-RABSetupResponse,
    TraceFailureIndication,
    TraceStart,
    UECapabilityInfoIndication,
    UEContextModificationFailure,
    UEContextModificationRequest,
    UEContextModificationResponse,
    UEContextReleaseCommand,
    UEContextReleaseComplete,
    UEContextReleaseRequest,
    UplinkUEAssociatedLPPaTransport,
    UplinkNASTransport,
    UplinkNonUEAssociatedLPPaTransport,
    UplinkS1cdma2000tunneling,
    WriteReplaceWarningRequest,
    WriteReplaceWarningResponse,
    ENBConfigurationTransfer,
    MMEConfigurationTransfer


FROM S1AP-PDU-Contents

    id-CellTrafficTrace,
    id-DeactivateTrace,
```

```
    id-downlinkUEAssociatedLPPaTransport,
    id-downlinkNASTransport,
    id-downlinkNonUEAssociatedLPPaTransport,
    id-DownlinkS1cdma2000tunneling,
    id-eNBStatusTransfer,
    id-ErrorIndication,
    id-HandoverCancel,
    id-HandoverNotification,
    id-HandoverPreparation,
    id-HandoverResourceAllocation,
    id-InitialContextSetup,
    id-initialUEMessage,
    id-ENBConfigurationUpdate,
    id-Kill,
    id-LocationReportingControl,
    id-LocationReportingFailureIndication,
    id-LocationReport,
    id-eNBDirectInformationTransfer,
    id-MMEConfigurationUpdate,
    id-MMEDirectInformationTransfer,
    id-MMEStatusTransfer,
    id-NASNonDeliveryIndication,
    id-OverloadStart,
    id-OverloadStop,
    id-Paging,
    id-PathSwitchRequest,
    id-PrivateMessage,
    id-Reset,
    id-S1Setup,
    id-E-RABModify,
    id-E-RABRelease,
    id-E-RABReleaseIndication,
    id-E-RABSetup,
    id-TraceFailureIndication,
    id-TraceStart,
    id-UECapabilityInfoIndication,
    id-UEContextModification,
    id-UEContextRelease,
    id-UEContextReleaseRequest,
    id-uplinkUEAssociatedLPPaTransport,
    id-uplinkNASTransport,
    id-uplinkNonUEAssociatedLPPaTransport,
    id-UplinkS1cdma2000tunneling,
    id-WriteReplaceWarning,
    id-eNBConfigurationTransfer,
    id-MMEConfigurationTransfer
FROM S1AP-Constants;


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

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

S1AP-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
--
-- ************************************************************

S1AP-PDU ::= CHOICE {
    initiatingMessage   InitiatingMessage,
    successfulOutcome   SuccessfulOutcome,
    unsuccessfulOutcome UnsuccessfulOutcome,
    ...
}

InitiatingMessage ::= SEQUENCE {
    procedureCode   S1AP-ELEMENTARY-PROCEDURE.&procedureCode    ({S1AP-ELEMENTARY-PROCEDURES}),
    criticality S1AP-ELEMENTARY-PROCEDURE.&criticality          ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value       S1AP-ELEMENTARY-PROCEDURE.&InitiatingMessage    ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

SuccessfulOutcome ::= SEQUENCE {
    procedureCode   S1AP-ELEMENTARY-PROCEDURE.&procedureCode    ({S1AP-ELEMENTARY-PROCEDURES}),
    criticality S1AP-ELEMENTARY-PROCEDURE.&criticality          ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value       S1AP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome    ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode   S1AP-ELEMENTARY-PROCEDURE.&procedureCode    ({S1AP-ELEMENTARY-PROCEDURES}),
    criticality S1AP-ELEMENTARY-PROCEDURE.&criticality          ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
    value       S1AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome  ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}

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

```
S1AP-ELEMENTARY-PROCEDURES S1AP-ELEMENTARY-PROCEDURE ::= {
    S1AP-ELEMENTARY-PROCEDURES-CLASS-1      |
    S1AP-ELEMENTARY-PROCEDURES-CLASS-2,
    ...
}


S1AP-ELEMENTARY-PROCEDURES-CLASS-1 S1AP-ELEMENTARY-PROCEDURE ::= {
    handoverPreparation                         |
    handoverResourceAllocation                  |
    pathSwitchRequest                           |
    e-RABSetup                                  |
    e-RABModify                                 |
    e-RABRelease                                |
    initialContextSetup                         |
    handoverCancel                              |
    kill                                        |
    reset                                       |
    s1Setup                                     |
    uEContextModification                       |
    uEContextRelease                            |
    eNBConfigurationUpdate                      |
    mMEConfigurationUpdate                      |
    writeReplaceWarning                        ,
    ...
}

S1AP-ELEMENTARY-PROCEDURES-CLASS-2 S1AP-ELEMENTARY-PROCEDURE ::= {
    handoverNotification                        |
    e-RABReleaseIndication                      |
    paging                                      |
    downlinkNASTransport                        |
    initialUEMessage                            |
    uplinkNASTransport                          |
    errorIndication                             |
    nASNonDeliveryIndication                    |
    uEContextReleaseRequest                     |
    downlinkS1cdma2000tunneling                 |
    uplinkS1cdma2000tunneling                   |
    uECapabilityInfoIndication                  |
    eNBStatusTransfer                           |
    mMEStatusTransfer                           |
    deactivateTrace                             |
    traceStart                                  |
    traceFailureIndication                      |
    cellTrafficTrace                            |
    locationReportingControl                    |
    locationReportingFailureIndication          |
    locationReport                              |
    overloadStart                               |
    overloadStop                                |
```

```
    eNBDirectInformationTransfer               |
    mMEDirectInformationTransfer               |
    eNBConfigurationTransfer                   |
    mMEConfigurationTransfer                   |
    privateMessage                            ,
    ...,
    downlinkUEAssociatedLPPaTransport          |
    uplinkUEAssociatedLPPaTransport            |
    downlinkNonUEAssociatedLPPaTransport       |
    uplinkNonUEAssociatedLPPaTransport
}

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

handoverPreparation S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  HandoverRequired
    SUCCESSFUL OUTCOME  HandoverCommand
    UNSUCCESSFUL OUTCOME    HandoverPreparationFailure
    PROCEDURE CODE          id-HandoverPreparation
    CRITICALITY     reject
}

handoverResourceAllocation S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  HandoverRequest
    SUCCESSFUL OUTCOME  HandoverRequestAcknowledge
    UNSUCCESSFUL OUTCOME    HandoverFailure
    PROCEDURE CODE          id-HandoverResourceAllocation
    CRITICALITY     reject
}

handoverNotification S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  HandoverNotify
    PROCEDURE CODE          id-HandoverNotification
    CRITICALITY     ignore
}

pathSwitchRequest S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  PathSwitchRequest
    SUCCESSFUL OUTCOME  PathSwitchRequestAcknowledge
    UNSUCCESSFUL OUTCOME    PathSwitchRequestFailure
    PROCEDURE CODE          id-PathSwitchRequest
    CRITICALITY     reject
}

e-RABSetup S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  E-RABSetupRequest
    SUCCESSFUL OUTCOME  E-RABSetupResponse
    PROCEDURE CODE      id-E-RABSetup
    CRITICALITY     reject
```

```
}

e-RABModify S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  E-RABModifyRequest
    SUCCESSFUL OUTCOME  E-RABModifyResponse
    PROCEDURE CODE      id-E-RABModify
    CRITICALITY     reject
}

e-RABRelease S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  E-RABReleaseCommand
    SUCCESSFUL OUTCOME  E-RABReleaseResponse
    PROCEDURE CODE      id-E-RABRelease
    CRITICALITY     reject
}

e-RABReleaseIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  E-RABReleaseIndication
    PROCEDURE CODE      id-E-RABReleaseIndication
    CRITICALITY     ignore
}

initialContextSetup S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  InitialContextSetupRequest
    SUCCESSFUL OUTCOME  InitialContextSetupResponse
    UNSUCCESSFUL OUTCOME InitialContextSetupFailure
    PROCEDURE CODE      id-InitialContextSetup
    CRITICALITY     reject
}

uEContextReleaseRequest S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextReleaseRequest
    PROCEDURE CODE          id-UEContextReleaseRequest
    CRITICALITY             ignore
}

paging S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Paging
    PROCEDURE CODE      id-Paging
    CRITICALITY         ignore
}

downlinkNASTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkNASTransport
    PROCEDURE CODE          id-downlinkNASTransport
    CRITICALITY             ignore
}

initialUEMessage S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      InitialUEMessage
    PROCEDURE CODE          id-initialUEMessage
    CRITICALITY             ignore
}
```

```
uplinkNASTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkNASTransport
    PROCEDURE CODE          id-uplinkNASTransport
    CRITICALITY             ignore
}
nASNonDeliveryIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      NASNonDeliveryIndication
    PROCEDURE CODE          id-NASNonDeliveryIndication
    CRITICALITY             ignore
}

handoverCancel S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  HandoverCancel
    SUCCESSFUL OUTCOME  HandoverCancelAcknowledge
    PROCEDURE CODE          id-HandoverCancel
    CRITICALITY     reject
}

reset S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  Reset
    SUCCESSFUL OUTCOME  ResetAcknowledge
    PROCEDURE CODE      id-Reset
    CRITICALITY         reject
}

errorIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  ErrorIndication
    PROCEDURE CODE      id-ErrorIndication
    CRITICALITY     ignore
}

s1Setup S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      S1SetupRequest
    SUCCESSFUL OUTCOME      S1SetupResponse
    UNSUCCESSFUL OUTCOME    S1SetupFailure
    PROCEDURE CODE          id-S1Setup
    CRITICALITY             reject
}

eNBConfigurationUpdate S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBConfigurationUpdate
    SUCCESSFUL OUTCOME      ENBConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    ENBConfigurationUpdateFailure
    PROCEDURE CODE          id-ENBConfigurationUpdate
    CRITICALITY             reject
}

mMEConfigurationUpdate S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMEConfigurationUpdate
    SUCCESSFUL OUTCOME      MMEConfigurationUpdateAcknowledge
    UNSUCCESSFUL OUTCOME    MMEConfigurationUpdateFailure
    PROCEDURE CODE          id-MMEConfigurationUpdate
```

```
    CRITICALITY             reject
}

downlinkS1cdma2000tunneling S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkS1cdma2000tunneling
    PROCEDURE CODE          id-DownlinkS1cdma2000tunneling
    CRITICALITY             ignore
}

uplinkS1cdma2000tunneling S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkS1cdma2000tunneling
    PROCEDURE CODE          id-UplinkS1cdma2000tunneling
    CRITICALITY             ignore
}

uEContextModification S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextModificationRequest
    SUCCESSFUL OUTCOME      UEContextModificationResponse
    UNSUCCESSFUL OUTCOME    UEContextModificationFailure

    PROCEDURE CODE      id-UEContextModification
    CRITICALITY     reject
}

uECapabilityInfoIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UECapabilityInfoIndication
    PROCEDURE CODE          id-UECapabilityInfoIndication
    CRITICALITY             ignore
}

uEContextRelease S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UEContextReleaseCommand
    SUCCESSFUL OUTCOME      UEContextReleaseComplete
    PROCEDURE CODE          id-UEContextRelease
    CRITICALITY             reject
}

eNBStatusTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBStatusTransfer
    PROCEDURE CODE          id-eNBStatusTransfer
    CRITICALITY             ignore
}

mMEStatusTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMEStatusTransfer
    PROCEDURE CODE          id-MMEStatusTransfer
    CRITICALITY             ignore
}

deactivateTrace S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DeactivateTrace
    PROCEDURE CODE          id-DeactivateTrace
    CRITICALITY             ignore
```

```
}

traceStart S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  TraceStart
    PROCEDURE CODE      id-TraceStart
    CRITICALITY         ignore
}

traceFailureIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  TraceFailureIndication
    PROCEDURE CODE      id-TraceFailureIndication
    CRITICALITY         ignore
}
cellTrafficTrace S1AP-ELEMENTARY-PROCEDURE ::={
    INITIATING MESSAGE CellTrafficTrace
    PROCEDURE CODE     id-CellTrafficTrace
    CRITICALITY       ignore
}

locationReportingControl S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LocationReportingControl
    PROCEDURE CODE          id-LocationReportingControl
    CRITICALITY             ignore
}

locationReportingFailureIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LocationReportingFailureIndication
    PROCEDURE CODE          id-LocationReportingFailureIndication
    CRITICALITY             ignore
}

locationReport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      LocationReport
    PROCEDURE CODE          id-LocationReport
    CRITICALITY             ignore
}

overloadStart S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  OverloadStart
    PROCEDURE CODE      id-OverloadStart
    CRITICALITY     ignore
}

overloadStop S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  OverloadStop
    PROCEDURE CODE      id-OverloadStop
    CRITICALITY     reject
}

writeReplaceWarning S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  WriteReplaceWarningRequest
    SUCCESSFUL OUTCOME  WriteReplaceWarningResponse
    PROCEDURE CODE      id-WriteReplaceWarning
```

```
    CRITICALITY         reject
}

eNBDirectInformationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  ENBDirectInformationTransfer
    PROCEDURE CODE      id-eNBDirectInformationTransfer
    CRITICALITY         ignore
}

mMEDirectInformationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  MMEDirectInformationTransfer
    PROCEDURE CODE      id-MMEDirectInformationTransfer
    CRITICALITY         ignore
}

eNBConfigurationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      ENBConfigurationTransfer
    PROCEDURE CODE          id-eNBConfigurationTransfer
    CRITICALITY             ignore
}

mMEConfigurationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      MMEConfigurationTransfer
    PROCEDURE CODE          id-MMEConfigurationTransfer
    CRITICALITY             ignore
}


privateMessage S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  PrivateMessage
    PROCEDURE CODE      id-PrivateMessage
    CRITICALITY         ignore
}

kill S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE  KillRequest
    SUCCESSFUL OUTCOME  KillResponse
    PROCEDURE CODE      id-Kill
    CRITICALITY         reject
}

downlinkUEAssociatedLPPaTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      DownlinkUEAssociatedLPPaTransport
    PROCEDURE CODE          id-downlinkUEAssociatedLPPaTransport
    CRITICALITY             ignore
}

uplinkUEAssociatedLPPaTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkUEAssociatedLPPaTransport
    PROCEDURE CODE          id-uplinkUEAssociatedLPPaTransport
    CRITICALITY             ignore
}
downlinkNonUEAssociatedLPPaTransport S1AP-ELEMENTARY-PROCEDURE ::= {
```

```
    INITIATING MESSAGE      DownlinkNonUEAssociatedLPPaTransport
    PROCEDURE CODE          id-downlinkNonUEAssociatedLPPaTransport
    CRITICALITY             ignore
}

uplinkNonUEAssociatedLPPaTransport S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      UplinkNonUEAssociatedLPPaTransport
    PROCEDURE CODE          id-uplinkNonUEAssociatedLPPaTransport
    CRITICALITY             ignore
}

END
```

9.3.3 PDU Definitions

```
-- **************************************************************
--
-- PDU definitions for S1AP.
--
-- **************************************************************

S1AP-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS

    UEAggregateMaximumBitrate,
    Cause,
    CellAccessMode,
    Cdma2000HORequiredIndication,
    Cdma2000HOStatus,
    Cdma2000OneXSRVCCInfo,
    Cdma2000OneXRAND,
    Cdma2000PDU,
    Cdma2000RATType,
    Cdma2000SectorID,
    EUTRANRoundTripDelayEstimationInfo,
    CNDomain,
    ConcurrentWarningMessageIndicator,
    CriticalityDiagnostics,
    CSFallbackIndicator,
    CSG-Id,
    CSG-IdList,
    CSGMembershipStatus,
    Data-Forwarding-Not-Possible,
    Direct-Forwarding-Path-Availability,
    Global-ENB-ID,
    EUTRAN-CGI,
    ENBname,
    ENB-StatusTransfer-TransparentContainer,
    ENB-UE-S1AP-ID,
    ExtendedRepetitionPeriod,
    GTP-TEID,
```

```
    GUMMEI,
    HandoverRestrictionList,
    HandoverType,
    LAI,
    LPPa-PDU,
    ManagementBasedMDTAllowed,
    MMEname,
    MMERelaySupportIndicator,
    MME-UE-S1AP-ID,
    MSClassmark2,
    MSClassmark3,
    NAS-PDU,
    NASSecurityParametersfromE-UTRAN,
    NASSecurityParameterstoE-UTRAN,
    OverloadResponse,
    PagingDRX,
    PagingPriority,
    PLMNidentity,
    RIMTransfer,
    RelativeMMECapacity,
    RequestType,
    E-RAB-ID,
    E-RABLevelQoSParameters,
    E-RABList,
    RelayNode-Indicator,
    Routing-ID,
    SecurityKey,
    SecurityContext,
    ServedGUMMEIs,
    SONConfigurationTransfer,
    Source-ToTarget-TransparentContainer,
    SourceBSS-ToTargetBSS-TransparentContainer,
    SourceeNB-ToTargeteNB-TransparentContainer,
    SourceRNC-ToTargetRNC-TransparentContainer,
    SubscriberProfileIDforRFP,
    SRVCCOperationPossible,
    SRVCCHOIndication,
    SupportedTAs,
    TAI,
    Target-ToSource-TransparentContainer,
    TargetBSS-ToSourceBSS-TransparentContainer,
    TargeteNB-ToSourceeNB-TransparentContainer,
    TargetID,
    TargetRNC-ToSourceRNC-TransparentContainer,
    TimeToWait,
    TraceActivation,
    TrafficLoadReductionIndication,
    E-UTRAN-Trace-ID,
    TransportLayerAddress,
    UEIdentityIndexValue,
    UEPagingID,
    UERadioCapability,
    UE-S1AP-IDs,
```

```
    UE-associatedLogicalS1-ConnectionItem,
    UESecurityCapabilities,
    S-TMSI,
    MessageIdentifier,
    SerialNumber,
    WarningAreaList,
    RepetitionPeriod,
    NumberofBroadcastRequest,
    WarningType,
    WarningSecurityInfo,
    DataCodingScheme,
    WarningMessageContents,
    BroadcastCompletedAreaList,
    RRC-Establishment-Cause,
    BroadcastCancelledAreaList,
    PS-ServiceNotAvailable,
    GUMMEIList,
    Correlation-ID,
    GWContextReleaseIndication,
    PrivacyIndicator


FROM S1AP-IEs

    PrivateIE-Container{},
    ProtocolExtensionContainer{},
    ProtocolIE-Container{},
    ProtocolIE-ContainerList{},
    ProtocolIE-ContainerPair{},
    ProtocolIE-ContainerPairList{},
    ProtocolIE-SingleContainer{},
    S1AP-PRIVATE-IES,
    S1AP-PROTOCOL-EXTENSION,
    S1AP-PROTOCOL-IES,
    S1AP-PROTOCOL-IES-PAIR
FROM S1AP-Containers


    id-uEaggregateMaximumBitrate,
    id-Cause,
    id-CellAccessMode,
    id-cdma2000HORequiredIndication,
    id-cdma2000HOStatus,
    id-cdma2000OneXSRVCCInfo,
    id-cdma2000OneXRAND,
    id-cdma2000PDU,
    id-cdma2000RATType,
    id-cdma2000SectorID,
    id-EUTRANRoundTripDelayEstimationInfo,
    id-CNDomain,
    id-ConcurrentWarningMessageIndicator,
    id-CriticalityDiagnostics,
```

```
    id-CSFallbackIndicator,
    id-CSG-Id,
    id-CSG-IdList,
    id-CSGMembershipStatus,
    id-Data-Forwarding-Not-Possible,
    id-DefaultPagingDRX,
    id-Direct-Forwarding-Path-Availability,
    id-Global-ENB-ID,
    id-EUTRAN-CGI,
    id-eNBname,
    id-eNB-StatusTransfer-TransparentContainer,
    id-eNB-UE-S1AP-ID,
    id-GERANtoLTEHOInformationRes,
    id-GUMMEI-ID,
    id-HandoverRestrictionList,
    id-HandoverType,
    id-InitialContextSetup,
    id-Inter-SystemInformationTransferTypeEDT,
    id-Inter-SystemInformationTransferTypeMDT,
    id-LPPa-PDU,
    id-NAS-DownlinkCount,
    id-ManagementBasedMDTAllowed,
    id-MMEname,
    id-MME-UE-S1AP-ID,
    id-MSClassmark2,
    id-MSClassmark3,
    id-NAS-PDU,
    id-NASSecurityParametersfromE-UTRAN,
    id-NASSecurityParameterstoE-UTRAN,
    id-OverloadResponse,
    id-pagingDRX,
    id-PagingPriority,
    id-RelativeMMECapacity,
    id-RequestType,
    id-Routing-ID,
    id-E-RABAdmittedItem,
    id-E-RABAdmittedList,
    id-E-RABDataForwardingItem,
    id-E-RABFailedToModifyList,
    id-E-RABFailedToReleaseList,
    id-E-RABFailedtoSetupItemHOReqAck,
    id-E-RABFailedToSetupListBearerSURes,
    id-E-RABFailedToSetupListCtxtSURes,
    id-E-RABFailedToSetupListHOReqAck,
    id-E-RABFailedToBeReleasedList,
    id-E-RABModify,
    id-E-RABModifyItemBearerModRes,
    id-E-RABModifyListBearerModRes,
    id-E-RABRelease,
    id-E-RABReleaseItemBearerRelComp,
    id-E-RABReleaseItemHOCmd,
    id-E-RABReleaseListBearerRelComp,
    id-E-RABReleaseIndication,
```

```
    id-E-RABSetup,
    id-E-RABSetupItemBearerSURes,
    id-E-RABSetupItemCtxtSURes,
    id-E-RABSetupListBearerSURes,
    id-E-RABSetupListCtxtSURes,
    id-E-RABSubjecttoDataForwardingList,
    id-E-RABToBeModifiedItemBearerModReq,
    id-E-RABToBeModifiedListBearerModReq,
    id-E-RABToBeReleasedList,
    id-E-RABReleasedList,
    id-E-RABToBeSetupItemBearerSUReq,
    id-E-RABToBeSetupItemCtxtSUReq,
    id-E-RABToBeSetupItemHOReq,
    id-E-RABToBeSetupListBearerSUReq,
    id-E-RABToBeSetupListCtxtSUReq,
    id-E-RABToBeSetupListHOReq,
    id-E-RABToBeSwitchedDLItem,
    id-E-RABToBeSwitchedDLList,
    id-E-RABToBeSwitchedULList,
    id-E-RABToBeSwitchedULItem,
    id-E-RABtoReleaseListHOCmd,
    id-SecurityKey,
    id-SecurityContext,
    id-ServedGUMMEIs,
    id-SONConfigurationTransferECT,
    id-SONConfigurationTransferMCT,
    id-Source-ToTarget-TransparentContainer,
    id-Source-ToTarget-TransparentContainer-Secondary,
    id-SourceMME-UE-S1AP-ID,
    id-SRVCCOperationPossible,
    id-SRVCCHOIndication,
    id-SubscriberProfileIDforRFP,
    id-SupportedTAs,
    id-S-TMSI,
    id-TAI,
    id-TAIItem,
    id-TAIList,
    id-Target-ToSource-TransparentContainer,
    id-Target-ToSource-TransparentContainer-Secondary,
    id-TargetID,
    id-TimeToWait,
    id-TraceActivation,
    id-TrafficLoadReductionIndication,
    id-E-UTRAN-Trace-ID,
    id-UEIdentityIndexValue,
    id-UEPagingID,
    id-UERadioCapability,
    id-UTRANtoLTEHOInformationRes,
    id-UE-associatedLogicalS1-ConnectionListResAck,
    id-UE-associatedLogicalS1-ConnectionItem,
    id-UESecurityCapabilities,
    id-UE-S1AP-IDs,
    id-ResetType,
```

```
    id-MessageIdentifier,
    id-SerialNumber,
    id-WarningAreaList,
    id-RepetitionPeriod,
    id-NumberofBroadcastRequest,
    id-WarningType,
    id-WarningSecurityInfo,
    id-DataCodingScheme,
    id-WarningMessageContents,
    id-BroadcastCompletedAreaList,
    id-BroadcastCancelledAreaList,
    id-RRC-Establishment-Cause,
    id-TraceCollectionEntityIPAddress,
    maxnoofTAIs,
    maxNrOfErrors,
    maxNrOfE-RABs,
    maxNrOfIndividualS1ConnectionsToReset,
    maxnoofEmergencyAreaID,
    maxnoofCellID,
    maxnoofTAIforWarning,
    maxnoofCellinTAI,
    maxnoofCellinEAI,
    id-ExtendedRepetitionPeriod,
    id-PS-ServiceNotAvailable,
    id-RegisteredLAI,
    id-GUMMEIList,
    id-SourceMME-GUMMEI,
    id-MME-UE-S1AP-ID-2,
    id-GW-TransportLayerAddress,
    id-RelayNode-Indicator,
    id-Correlation-ID,
    id-MMERelaySupportIndicator,
    id-GWContextReleaseIndication,
    id-PrivacyIndicator


FROM S1AP-Constants;

-- ************************************************************
--
-- Common Container Lists
--
-- ************************************************************

E-RAB-IE-ContainerList          { S1AP-PROTOCOL-IES     : IEsSetParam } ::= ProtocolIE-ContainerList    { 1, maxNrOfE-RABs,   {IEsSetParam} }
E-RAB-IE-ContainerPairList      { S1AP-PROTOCOL-IES-PAIR : IEsSetParam }    ::= ProtocolIE-ContainerPairList { 1, maxNrOfE-RABs,   {IEsSetParam} }
ProtocolError-IE-ContainerList  { S1AP-PROTOCOL-IES     : IEsSetParam } ::= ProtocolIE-ContainerList    { 1, maxNrOfE-RABs,   {IEsSetParam} }

-- ************************************************************
--
-- HANDOVER PREPARATION ELEMENTARY PROCEDURE
--
-- ************************************************************
```

```
-- **************************************************************
--
-- Handover Required
--
-- **************************************************************

HandoverRequired ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { HandoverRequiredIEs} },
    ...
}

HandoverRequiredIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY reject  TYPE MME-UE-S1AP-ID
    PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY reject  TYPE ENB-UE-S1AP-ID
    PRESENCE mandatory }|
    { ID id-HandoverType                            CRITICALITY reject  TYPE HandoverType
    PRESENCE mandatory }|
    { ID id-Cause                                   CRITICALITY ignore  TYPE Cause
    PRESENCE mandatory }|
    { ID id-TargetID                                CRITICALITY reject  TYPE TargetID
    PRESENCE mandatory }|
    { ID id-Direct-Forwarding-Path-Availability     CRITICALITY ignore  TYPE Direct-Forwarding-Path-Availability        PRESENCE optional }|
    { ID id-SRVCCHOIndication                       CRITICALITY reject  TYPE SRVCCHOIndication
    PRESENCE optional }|
    { ID id-Source-ToTarget-TransparentContainer    CRITICALITY reject  TYPE Source-ToTarget-TransparentContainer       PRESENCE mandatory }|
    { ID id-Source-ToTarget-TransparentContainer-Secondary  CRITICALITY reject  TYPE Source-ToTarget-TransparentContainer      PRESENCE optional }|
    { ID id-MSClassmark2                            CRITICALITY reject  TYPE MSClassmark2
    PRESENCE conditional }|
    { ID id-MSClassmark3                            CRITICALITY ignore  TYPE MSClassmark3
    PRESENCE conditional }|
    { ID id-CSG-Id                                  CRITICALITY reject  TYPE CSG-Id
    PRESENCE optional }|
    { ID id-CellAccessMode                          CRITICALITY reject  TYPE CellAccessMode
    PRESENCE optional }|
    { ID id-PS-ServiceNotAvailable                  CRITICALITY ignore  TYPE PS-ServiceNotAvailable
    PRESENCE optional },
    ...
}


-- **************************************************************
--
-- Handover Command
--
-- **************************************************************

HandoverCommand ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container { { HandoverCommandIEs} },
    ...
}
```

```
HandoverCommandIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY reject  TYPE MME-UE-S1AP-ID
        PRESENCE mandatory  } |
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY reject  TYPE ENB-UE-S1AP-ID
        PRESENCE mandatory  } |
    { ID id-HandoverType                            CRITICALITY reject  TYPE HandoverType
        PRESENCE mandatory  } |
    { ID id-NASSecurityParametersfromE-UTRAN        CRITICALITY reject  TYPE NASSecurityParametersfromE-UTRAN
    PRESENCE conditional
    -- This IE shall be present if HandoverType IE is set to value "LTEtoUTRAN" or "LTEtoGERAN" --                    }|
    { ID id-E-RABSubjecttoDataForwardingList        CRITICALITY ignore  TYPE E-RABSubjecttoDataForwardingList
    PRESENCE optional   } |
    { ID id-E-RABtoReleaseListHOCmd                 CRITICALITY ignore  TYPE E-RABList
        PRESENCE optional   } |
    { ID id-Target-ToSource-TransparentContainer    CRITICALITY reject  TYPE Target-ToSource-TransparentContainer                    PRESENCE
mandatory }|
    { ID id-Target-ToSource-TransparentContainer-Secondary  CRITICALITY reject  TYPE Target-ToSource-TransparentContainer
    PRESENCE optional }|
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics
        PRESENCE optional   },
    ...
}

E-RABSubjecttoDataForwardingList ::= E-RAB-IE-ContainerList { {E-RABDataForwardingItemIEs} }

E-RABDataForwardingItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABDataForwardingItem         CRITICALITY ignore  TYPE E-RABDataForwardingItem            PRESENCE mandatory    },
    ...
}

E-RABDataForwardingItem ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    dL-transportLayerAddress        TransportLayerAddress                                                   OPTIONAL,
    dL-gTP-TEID                     GTP-TEID                                                                OPTIONAL,
    uL-TransportLayerAddress        TransportLayerAddress                                                   OPTIONAL,
    uL-GTP-TEID                     GTP-TEID                                                                OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { E-RABDataForwardingItem-ExtIEs} } OPTIONAL,
    ...
}

E-RABDataForwardingItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}



-- **************************************************************
--
-- Handover Preparation Failure
--
-- **************************************************************

HandoverPreparationFailure ::= SEQUENCE {
```

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

HandoverPreparationFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID              PRESENCE mandatory     } |
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory     } |
    { ID id-Cause                           CRITICALITY ignore  TYPE Cause                       PRESENCE mandatory     }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional      },
    ...
}

-- **************************************************************
--
-- HANDOVER RESOURCE ALLOCATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Handover Request
--
-- **************************************************************

HandoverRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {HandoverRequestIEs} },
    ...
}

HandoverRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY reject  TYPE MME-UE-S1AP-ID                          PRESENCE mandatory}|
    { ID id-HandoverType                            CRITICALITY reject  TYPE HandoverType                            PRESENCE mandatory}|
    { ID id-Cause                                   CRITICALITY ignore  TYPE Cause                                   PRESENCE mandatory}|
    { ID id-uEaggregateMaximumBitrate               CRITICALITY reject  TYPE UEAggregateMaximumBitrate               PRESENCE mandatory}|
    { ID id-E-RABToBeSetupListHOReq                 CRITICALITY reject  TYPE E-RABToBeSetupListHOReq                 PRESENCE mandatory}|
    { ID id-Source-ToTarget-TransparentContainer    CRITICALITY reject  TYPE Source-ToTarget-TransparentContainer    PRESENCE mandatory}|
    { ID id-UESecurityCapabilities                  CRITICALITY reject  TYPE UESecurityCapabilities                  PRESENCE mandatory}|
    { ID id-HandoverRestrictionList                 CRITICALITY ignore  TYPE HandoverRestrictionList                 PRESENCE optional}|
    { ID id-TraceActivation                         CRITICALITY ignore  TYPE TraceActivation                         PRESENCE optional}|
    { ID id-RequestType                             CRITICALITY ignore  TYPE RequestType                             PRESENCE optional}|
    { ID id-SRVCCOperationPossible                  CRITICALITY ignore  TYPE SRVCCOperationPossible                  PRESENCE optional}|
    { ID id-SecurityContext                         CRITICALITY reject  TYPE SecurityContext                         PRESENCE mandatory}|
    { ID id-NASSecurityParameterstoE-UTRAN          CRITICALITY reject  TYPE NASSecurityParameterstoE-UTRAN          PRESENCE conditional
    -- This IE shall be present if the Handover Type IE is set to the value "UTRANtoLTE" or "GERANtoLTE" --}|
    { ID id-CSG-Id                                  CRITICALITY reject  TYPE CSG-Id                                  PRESENCE optional}|
    { ID id-CSGMembershipStatus                     CRITICALITY ignore  TYPE CSGMembershipStatus                     PRESENCE optional}|
    { ID id-GUMMEI-ID                               CRITICALITY ignore  TYPE GUMMEI                                  PRESENCE optional}|
    { ID id-MME-UE-S1AP-ID-2                        CRITICALITY ignore  TYPE MME-UE-S1AP-ID                          PRESENCE optional}|
    { ID id-ManagementBasedMDTAllowed               CRITICALITY ignore  TYPE ManagementBasedMDTAllowed               PRESENCE optional},
    ...
}

E-RABToBeSetupListHOReq                ::= E-RAB-IE-ContainerList { {E-RABToBeSetupItemHOReqIEs} }
```

```
E-RABToBeSetupItemHOReqIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABToBeSetupItemHOReq         CRITICALITY reject  TYPE E-RABToBeSetupItemHOReq             PRESENCE mandatory     },
    ...
}

E-RABToBeSetupItemHOReq ::= SEQUENCE {
    e-RAB-ID                            E-RAB-ID,
    transportLayerAddress               TransportLayerAddress,
    gTP-TEID                            GTP-TEID,
    e-RABlevelQosParameters             E-RABLevelQoSParameters,
    iE-Extensions                       ProtocolExtensionContainer { {E-RABToBeSetupItemHOReq-ExtIEs} }                OPTIONAL,
    ...
}

E-RABToBeSetupItemHOReq-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    {ID id-Data-Forwarding-Not-Possible   CRITICALITY ignore   EXTENSION  Data-Forwarding-Not-Possible   PRESENCE optional},
    ...
}

-- ************************************************************
--
-- Handover Request Acknowledge
--
-- ************************************************************

HandoverRequestAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {HandoverRequestAcknowledgeIEs} },
    ...
}

HandoverRequestAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                          CRITICALITY ignore  TYPE MME-UE-S1AP-ID
    PRESENCE mandatory  } |
    { ID id-eNB-UE-S1AP-ID                          CRITICALITY ignore  TYPE ENB-UE-S1AP-ID
    PRESENCE mandatory  } |
    { ID id-E-RABAdmittedList                       CRITICALITY ignore  TYPE E-RABAdmittedList
    PRESENCE mandatory  } |
    { ID id-E-RABFailedToSetupListHOReqAck          CRITICALITY ignore  TYPE E-RABFailedtoSetupListHOReqAck                    PRESENCE optional
    } |
    { ID id-Target-ToSource-TransparentContainer    CRITICALITY reject  TYPE Target-ToSource-TransparentContainer       PRESENCE mandatory }|
    { ID id-CSG-Id                                  CRITICALITY ignore  TYPE CSG-Id
    PRESENCE optional } |
    { ID id-CriticalityDiagnostics                  CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   },
    ...
}

E-RABAdmittedList                   ::= E-RAB-IE-ContainerList { {E-RABAdmittedItemIEs} }

E-RABAdmittedItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABAdmittedItem           CRITICALITY ignore  TYPE E-RABAdmittedItem          PRESENCE mandatory   },
    ...
```

```
}

E-RABAdmittedItem ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    transportLayerAddress           TransportLayerAddress,
    gTP-TEID                        GTP-TEID,
    dL-transportLayerAddress        TransportLayerAddress   OPTIONAL,
    dL-gTP-TEID                     GTP-TEID                OPTIONAL,
    uL-TransportLayerAddress        TransportLayerAddress   OPTIONAL,
    uL-GTP-TEID                     GTP-TEID                OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABAdmittedItem-ExtIEs} }   OPTIONAL,
    ...
}

E-RABAdmittedItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABFailedtoSetupListHOReqAck                  ::= E-RAB-IE-ContainerList { {E-RABFailedtoSetupItemHOReqAckIEs} }

E-RABFailedtoSetupItemHOReqAckIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABFailedtoSetupItemHOReqAck          CRITICALITY ignore  TYPE E-RABFailedToSetupItemHOReqAck                  PRESENCE mandatory
    },
    ...
}

E-RABFailedToSetupItemHOReqAck ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    cause               Cause,
    iE-Extensions                   ProtocolExtensionContainer { { E-RABFailedToSetupItemHOReqAckExtIEs} }                   OPTIONAL,
    ...
}

E-RABFailedToSetupItemHOReqAckExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- Handover Failure
--
-- **************************************************************

HandoverFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container     { { HandoverFailureIEs} },
    ...
}

HandoverFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID             PRESENCE mandatory   } |
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory   }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional    },
```

```
    ...
}

-- **************************************************************
--
-- HANDOVER NOTIFICATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Handover Notify
--
-- **************************************************************

HandoverNotify ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { HandoverNotifyIEs} },
    ...
}

HandoverNotifyIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID         PRESENCE mandatory   } |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID         PRESENCE mandatory   } |
    { ID id-EUTRAN-CGI              CRITICALITY ignore  TYPE EUTRAN-CGI             PRESENCE mandatory}|
    { ID id-TAI                     CRITICALITY ignore  TYPE TAI                    PRESENCE mandatory},
    ...
}

-- **************************************************************
--
-- PATH SWITCH REQUEST ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Path Switch Request
--
-- **************************************************************

PathSwitchRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { PathSwitchRequestIEs} },
    ...
}

PathSwitchRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory}|
    { ID id-E-RABToBeSwitchedDLList         CRITICALITY reject  TYPE E-RABToBeSwitchedDLList     PRESENCE mandatory}|
    { ID id-SourceMME-UE-S1AP-ID            CRITICALITY reject  TYPE MME-UE-S1AP-ID              PRESENCE mandatory}|
    { ID id-EUTRAN-CGI                      CRITICALITY ignore  TYPE EUTRAN-CGI                  PRESENCE mandatory}|
    { ID id-TAI                             CRITICALITY ignore  TYPE TAI                         PRESENCE mandatory}|
    { ID id-UESecurityCapabilities          CRITICALITY ignore  TYPE UESecurityCapabilities      PRESENCE mandatory}|
    { ID id-CSG-Id                          CRITICALITY ignore  TYPE CSG-Id                      PRESENCE optional}|
```

```
    { ID id-CellAccessMode                  CRITICALITY ignore  TYPE CellAccessMode             PRESENCE optional}|
    { ID id-SourceMME-GUMMEI                CRITICALITY ignore  TYPE GUMMEI                     PRESENCE optional},
    ...
}

E-RABToBeSwitchedDLList                 ::= E-RAB-IE-ContainerList { {E-RABToBeSwitchedDLItemIEs} }

E-RABToBeSwitchedDLItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABToBeSwitchedDLItem         CRITICALITY reject  TYPE E-RABToBeSwitchedDLItem             PRESENCE mandatory     },
    ...
}

E-RABToBeSwitchedDLItem ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    transportLayerAddress               TransportLayerAddress,
    gTP-TEID                    GTP-TEID,
    iE-Extensions                   ProtocolExtensionContainer { { E-RABToBeSwitchedDLItem-ExtIEs} }                    OPTIONAL,
    ...
}

E-RABToBeSwitchedDLItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- **************************************************************
--
-- Path Switch Request Acknowledge
--
-- **************************************************************

PathSwitchRequestAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { PathSwitchRequestAcknowledgeIEs} },
    ...
}

PathSwitchRequestAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID              PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory}|
    { ID id-uEaggregateMaximumBitrate       CRITICALITY ignore  TYPE UEAggregateMaximumBitrate   PRESENCE optional}|
    { ID id-E-RABToBeSwitchedULList         CRITICALITY ignore  TYPE E-RABToBeSwitchedULList     PRESENCE optional}|
    { ID id-E-RABToBeReleasedList           CRITICALITY ignore  TYPE E-RABList                   PRESENCE optional}|
    { ID id-SecurityContext                 CRITICALITY reject  TYPE SecurityContext             PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional}|
    { ID id-MME-UE-S1AP-ID-2                CRITICALITY ignore  TYPE MME-UE-S1AP-ID              PRESENCE optional},
    ...
}

E-RABToBeSwitchedULList ::= E-RAB-IE-ContainerList { {E-RABToBeSwitchedULItemIEs} }

E-RABToBeSwitchedULItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABToBeSwitchedULItem     CRITICALITY ignore  TYPE E-RABToBeSwitchedULItem    PRESENCE mandatory   },
    ...
}
```

```
E-RABToBeSwitchedULItem ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    transportLayerAddress           TransportLayerAddress,
    gTP-TEID                        GTP-TEID,
    iE-Extensions                   ProtocolExtensionContainer { { E-RABToBeSwitchedULItem-ExtIEs} }        OPTIONAL,
    ...
}

E-RABToBeSwitchedULItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- Path Switch Request Failure
--
-- **************************************************************

PathSwitchRequestFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { PathSwitchRequestFailureIEs} },
    ...
}

PathSwitchRequestFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID              PRESENCE mandatory    } |
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory    } |
    { ID id-Cause                           CRITICALITY ignore  TYPE Cause                       PRESENCE mandatory    }|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional     },
    ...
}

-- **************************************************************
--
-- HANDOVER CANCEL ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Handover Cancel
--
-- **************************************************************

HandoverCancel ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { HandoverCancelIEs} },
    ...
}

HandoverCancelIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY reject  TYPE MME-UE-S1AP-ID              PRESENCE mandatory    } |
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory    } |
```

```
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause                  PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- Handover Cancel Request Acknowledge
--
-- **************************************************************

HandoverCancelAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { HandoverCancelAcknowledgeIEs} },
    ...
}

HandoverCancelAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY ignore  TYPE MME-UE-S1AP-ID              PRESENCE mandatory    } |
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY ignore  TYPE ENB-UE-S1AP-ID              PRESENCE mandatory    }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional       },
    ...
}

-- **************************************************************
--
-- E-RAB SETUP ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- E-RAB Setup Request
--
-- **************************************************************

E-RABSetupRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {E-RABSetupRequestIEs} },
    ...
}

E-RABSetupRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                  CRITICALITY reject  TYPE MME-UE-S1AP-ID                            PRESENCE mandatory    }|
    { ID id-eNB-UE-S1AP-ID                  CRITICALITY reject  TYPE ENB-UE-S1AP-ID                            PRESENCE mandatory    }|
    { ID id-uEaggregateMaximumBitrate       CRITICALITY reject  TYPE UEAggregateMaximumBitrate                 PRESENCE optional     }|
    { ID id-E-RABToBeSetupListBearerSUReq   CRITICALITY reject  TYPE E-RABToBeSetupListBearerSUReq             PRESENCE mandatory    },
    ...
}

E-RABToBeSetupListBearerSUReq ::= SEQUENCE (SIZE(1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { {E-RABToBeSetupItemBearerSUReqIEs} }

E-RABToBeSetupItemBearerSUReqIEs    S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABToBeSetupItemBearerSUReq    CRITICALITY reject TYPE E-RABToBeSetupItemBearerSUReq       PRESENCE mandatory },
    ...
}
```

```
E-RABToBeSetupItemBearerSUReq ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    e-RABlevelQoSParameters         E-RABLevelQoSParameters,
    transportLayerAddress           TransportLayerAddress,
    gTP-TEID                        GTP-TEID,
    nAS-PDU                         NAS-PDU,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABToBeSetupItemBearerSUReqExtIEs} } OPTIONAL,
    ...
}


E-RABToBeSetupItemBearerSUReqExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    { ID id-Correlation-ID      CRITICALITY ignore  EXTENSION Correlation-ID        PRESENCE optional},
    ...
}


-- **************************************************************
--
-- E-RAB Setup Response
--
-- **************************************************************

E-RABSetupResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {E-RABSetupResponseIEs} },
    ...
}

E-RABSetupResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-E-RABSetupListBearerSURes               CRITICALITY ignore  TYPE E-RABSetupListBearerSURes                  PRESENCE optional      }|
    { ID id-E-RABFailedToSetupListBearerSURes       CRITICALITY ignore  TYPE E-RABList                  PRESENCE optional      }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional       },
    ...
}


E-RABSetupListBearerSURes ::= SEQUENCE (SIZE(1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { {E-RABSetupItemBearerSUResIEs} }

E-RABSetupItemBearerSUResIEs    S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABSetupItemBearerSURes    CRITICALITY ignore TYPE E-RABSetupItemBearerSURes  PRESENCE mandatory },
    ...
}

E-RABSetupItemBearerSURes ::= SEQUENCE {
    e-RAB-ID                    E-RAB-ID,
    transportLayerAddress       TransportLayerAddress,
    gTP-TEID                    GTP-TEID,
    iE-Extensions               ProtocolExtensionContainer { {E-RABSetupItemBearerSUResExtIEs} } OPTIONAL,
    ...
}
```

```
E-RABSetupItemBearerSUResExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}



-- **************************************************************
--
-- E-RAB MODIFY ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- E-RAB Modify Request
--
-- **************************************************************

E-RABModifyRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {E-RABModifyRequestIEs} },
    ...
}

E-RABModifyRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                      CRITICALITY reject  TYPE MME-UE-S1AP-ID                                     PRESENCE mandatory
    }|
    { ID id-eNB-UE-S1AP-ID                      CRITICALITY reject  TYPE ENB-UE-S1AP-ID                                     PRESENCE mandatory
    }|
    { ID id-uEaggregateMaximumBitrate           CRITICALITY reject  TYPE UEAggregateMaximumBitrate                          PRESENCE optional
    }|
    { ID id-E-RABToBeModifiedListBearerModReq   CRITICALITY reject  TYPE E-RABToBeModifiedListBearerModReq              PRESENCE mandatory    },
    ...
}

E-RABToBeModifiedListBearerModReq ::= SEQUENCE (SIZE(1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { {E-RABToBeModifiedItemBearerModReqIEs} }

E-RABToBeModifiedItemBearerModReqIEs    S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABToBeModifiedItemBearerModReq    CRITICALITY reject TYPE E-RABToBeModifiedItemBearerModReq      PRESENCE mandatory },
    ...
}

E-RABToBeModifiedItemBearerModReq ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    e-RABLevelQoSParameters         E-RABLevelQoSParameters,
    nAS-PDU                         NAS-PDU,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABToBeModifyItemBearerModReqExtIEs} } OPTIONAL,
    ...
}


E-RABToBeModifyItemBearerModReqExtIEs S1AP-PROTOCOL-EXTENSION ::= {
```

```
    ...
}



-- **************************************************************
--
-- E-RAB Modify Response
--
-- **************************************************************

E-RABModifyResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {E-RABModifyResponseIEs} },
    ...
}

E-RABModifyResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-E-RABModifyListBearerModRes             CRITICALITY ignore  TYPE E-RABModifyListBearerModRes         PRESENCE optional      }|
    { ID id-E-RABFailedToModifyList     CRITICALITY ignore  TYPE E-RABList              PRESENCE optional       }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional       },
    ...
}


E-RABModifyListBearerModRes ::= SEQUENCE (SIZE(1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { {E-RABModifyItemBearerModResIEs} }

E-RABModifyItemBearerModResIEs  S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABModifyItemBearerModRes  CRITICALITY ignore TYPE E-RABModifyItemBearerModRes    PRESENCE mandatory },
    ...
}

E-RABModifyItemBearerModRes ::= SEQUENCE {
    e-RAB-ID                    E-RAB-ID,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABModifyItemBearerModResExtIEs} } OPTIONAL,
    ...
}


E-RABModifyItemBearerModResExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
-- **************************************************************
--
-- E-RAB RELEASE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- E-RAB Release Command
--
-- **************************************************************

E-RABReleaseCommand ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {E-RABReleaseCommandIEs} },
    ...
}

E-RABReleaseCommandIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-uEaggregateMaximumBitrate       CRITICALITY reject  TYPE UEAggregateMaximumBitrate    PRESENCE optional       }|
    { ID id-E-RABToBeReleasedList       CRITICALITY ignore  TYPE E-RABList                  PRESENCE mandatory   }|
    { ID id-NAS-PDU                         CRITICALITY ignore  TYPE NAS-PDU                    PRESENCE optional       },
    ...
}


-- **************************************************************
--
-- E-RAB Release Response
--
-- **************************************************************

E-RABReleaseResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { E-RABReleaseResponseIEs } },
    ...
}

E-RABReleaseResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-E-RABReleaseListBearerRelComp               CRITICALITY ignore  TYPE E-RABReleaseListBearerRelComp          PRESENCE optional       }|
    { ID id-E-RABFailedToReleaseList        CRITICALITY ignore  TYPE E-RABList              PRESENCE optional    }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional       },
    ...
}


E-RABReleaseListBearerRelComp ::= SEQUENCE (SIZE(1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { {E-RABReleaseItemBearerRelCompIEs} }

E-RABReleaseItemBearerRelCompIEs    S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABReleaseItemBearerRelComp    CRITICALITY ignore TYPE E-RABReleaseItemBearerRelComp       PRESENCE mandatory },
    ...
```

```
}

E-RABReleaseItemBearerRelComp ::= SEQUENCE {
    e-RAB-ID                    E-RAB-ID,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABReleaseItemBearerRelCompExtIEs} } OPTIONAL,
    ...
}


E-RABReleaseItemBearerRelCompExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}



-- **************************************************************
--
-- E-RAB RELEASE INDICATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- E-RAB Release Indication
--
-- **************************************************************

E-RABReleaseIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {E-RABReleaseIndicationIEs} },
    ...
}

E-RABReleaseIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory      }|
    { ID id-E-RABReleasedList           CRITICALITY ignore  TYPE E-RABList                  PRESENCE mandatory   },
    ...
}
-- **************************************************************
--
-- INITIAL CONTEXT SETUP ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Initial Context Setup Request
--
-- **************************************************************

InitialContextSetupRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {InitialContextSetupRequestIEs} },
    ...
```

```
}

InitialContextSetupRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-uEaggregateMaximumBitrate   CRITICALITY reject  TYPE UEAggregateMaximumBitrate      PRESENCE mandatory}|
    { ID id-E-RABToBeSetupListCtxtSUReq CRITICALITY reject  TYPE E-RABToBeSetupListCtxtSUReq    PRESENCE mandatory}|
    { ID id-UESecurityCapabilities      CRITICALITY reject  TYPE UESecurityCapabilities         PRESENCE mandatory}|
    { ID id-SecurityKey                 CRITICALITY reject  TYPE SecurityKey                   PRESENCE mandatory}|
    { ID id-TraceActivation             CRITICALITY ignore  TYPE TraceActivation               PRESENCE optional}|
    { ID id-HandoverRestrictionList     CRITICALITY ignore  TYPE HandoverRestrictionList       PRESENCE optional}|
    { ID id-UERadioCapability           CRITICALITY ignore  TYPE UERadioCapability             PRESENCE optional}|
    { ID id-SubscriberProfileIDforRFP   CRITICALITY ignore  TYPE SubscriberProfileIDforRFP     PRESENCE optional}|
    { ID id-CSFallbackIndicator         CRITICALITY reject  TYPE CSFallbackIndicator           PRESENCE optional}|
    { ID id-SRVCCOperationPossible      CRITICALITY ignore  TYPE SRVCCOperationPossible        PRESENCE optional}|
    { ID id-CSGMembershipStatus         CRITICALITY ignore  TYPE CSGMembershipStatus           PRESENCE optional}|
    { ID id-RegisteredLAI               CRITICALITY ignore  TYPE LAI                           PRESENCE optional}|
    { ID id-GUMMEI-ID                   CRITICALITY ignore  TYPE GUMMEI                        PRESENCE optional}|
    { ID id-MME-UE-S1AP-ID-2            CRITICALITY ignore  TYPE MME-UE-S1AP-ID                PRESENCE optional}|
    { ID id-ManagementBasedMDTAllowed   CRITICALITY ignore  TYPE ManagementBasedMDTAllowed     PRESENCE optional},
    ...
}



E-RABToBeSetupListCtxtSUReq ::= SEQUENCE (SIZE(1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { {E-RABToBeSetupItemCtxtSUReqIEs} }

E-RABToBeSetupItemCtxtSUReqIEs  S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABToBeSetupItemCtxtSUReq  CRITICALITY reject TYPE E-RABToBeSetupItemCtxtSUReq    PRESENCE mandatory },
    ...
}

E-RABToBeSetupItemCtxtSUReq ::= SEQUENCE {
    e-RAB-ID                    E-RAB-ID,
    e-RABlevelQoSParameters                E-RABLevelQoSParameters,
    transportLayerAddress           TransportLayerAddress,
    gTP-TEID            GTP-TEID,
    nAS-PDU             NAS-PDU     OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABToBeSetupItemCtxtSUReqExtIEs} } OPTIONAL,
    ...
}


E-RABToBeSetupItemCtxtSUReqExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    { ID id-Correlation-ID      CRITICALITY ignore  EXTENSION Correlation-ID        PRESENCE optional},
    ...
}


-- **************************************************************
--
-- Initial Context Setup Response
```

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

InitialContextSetupResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {InitialContextSetupResponseIEs} },
    ...
}

InitialContextSetupResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID                      CRITICALITY ignore  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID                      CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory }|
    { ID id-E-RABSetupListCtxtSURes             CRITICALITY ignore  TYPE E-RABSetupListCtxtSURes         PRESENCE mandatory }|
    { ID id-E-RABFailedToSetupListCtxtSURes     CRITICALITY ignore  TYPE E-RABList                       PRESENCE optional }|
    { ID id-CriticalityDiagnostics              CRITICALITY ignore  TYPE CriticalityDiagnostics          PRESENCE optional },
    ...
}


E-RABSetupListCtxtSURes ::= SEQUENCE (SIZE(1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { {E-RABSetupItemCtxtSUResIEs} }

E-RABSetupItemCtxtSUResIEs  S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABSetupItemCtxtSURes  CRITICALITY ignore TYPE E-RABSetupItemCtxtSURes    PRESENCE mandatory },
    ...
}

E-RABSetupItemCtxtSURes ::= SEQUENCE {
    e-RAB-ID                    E-RAB-ID,
    transportLayerAddress           TransportLayerAddress,
    gTP-TEID            GTP-TEID,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABSetupItemCtxtSUResExtIEs} } OPTIONAL,
    ...
}


E-RABSetupItemCtxtSUResExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- **************************************************************
--
-- Initial Context Setup Failure
--
-- **************************************************************

InitialContextSetupFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {InitialContextSetupFailureIEs} },
    ...
}

InitialContextSetupFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory }|
```

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

-- **************************************************************
--
-- PAGING ELEMENTARY PROCEDURE
--
-- **************************************************************


-- **************************************************************
--
-- Paging
--
-- **************************************************************

Paging ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      {{PagingIEs}},
    ...
}

PagingIEs S1AP-PROTOCOL-IES ::= {
    { ID id-UEIdentityIndexValue        CRITICALITY ignore  TYPE UEIdentityIndexValue   PRESENCE mandatory}|
    { ID id-UEPagingID                  CRITICALITY ignore  TYPE UEPagingID             PRESENCE mandatory}|
    { ID id-pagingDRX                   CRITICALITY ignore  TYPE PagingDRX              PRESENCE optional}|
    { ID id-CNDomain                    CRITICALITY ignore  TYPE CNDomain               PRESENCE mandatory}|
    { ID id-TAIList                     CRITICALITY ignore  TYPE TAIList                PRESENCE mandatory}|
    { ID id-CSG-IdList                  CRITICALITY ignore  TYPE CSG-IdList             PRESENCE optional}|
    { ID id-PagingPriority              CRITICALITY ignore  TYPE PagingPriority         PRESENCE optional},
    ...
}

TAIList::= SEQUENCE (SIZE(1.. maxnoofTAIs)) OF ProtocolIE-SingleContainer {{TAIItemIEs}}

TAIItemIEs  S1AP-PROTOCOL-IES ::= {
    { ID id-TAIItem  CRITICALITY ignore     TYPE TAIItem    PRESENCE mandatory },
    ...
}

TAIItem ::= SEQUENCE {
    tAI                         TAI,
    iE-Extensions                   ProtocolExtensionContainer { {TAIItemExtIEs} } OPTIONAL,
    ...
}


TAIItemExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

```
--
-- UE CONTEXT RELEASE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- UE CONTEXT RELEASE REQUEST
--
-- **************************************************************

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

UEContextReleaseRequest-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                         PRESENCE mandatory}|
    { ID id-GWContextReleaseIndication  CRITICALITY reject  TYPE GWContextReleaseIndication    PRESENCE optional},
    ...
}

-- **************************************************************
--
-- UE Context Release Command
--
-- **************************************************************

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

UEContextReleaseCommand-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-UE-S1AP-IDs             CRITICALITY reject  TYPE UE-S1AP-IDs                   PRESENCE mandatory} |

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

-- **************************************************************
--
-- UE Context Release Complete
--
-- **************************************************************

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

```
UEContextReleaseComplete-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}


-- **************************************************************
--
-- UE CONTEXT MODIFICATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- UE Context Modification Request
--
-- **************************************************************

UEContextModificationRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { UEContextModificationRequestIEs} },
    ...
}

UEContextModificationRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory}|
    { ID id-SecurityKey                 CRITICALITY reject  TYPE SecurityKey                   PRESENCE optional}|
    { ID id-SubscriberProfileIDforRFP   CRITICALITY ignore  TYPE SubscriberProfileIDforRFP     PRESENCE optional}|
    { ID id-uEaggregateMaximumBitrate   CRITICALITY ignore  TYPE UEAggregateMaximumBitrate     PRESENCE optional}|
    { ID id-CSFallbackIndicator         CRITICALITY reject  TYPE CSFallbackIndicator           PRESENCE optional}|
    { ID id-UESecurityCapabilities      CRITICALITY reject  TYPE UESecurityCapabilities        PRESENCE optional}|
    { ID id-CSGMembershipStatus         CRITICALITY ignore  TYPE CSGMembershipStatus           PRESENCE optional}|
    { ID id-RegisteredLAI               CRITICALITY ignore  TYPE LAI                           PRESENCE optional},
    ...
}
-- **************************************************************
--
-- UE Context Modification Response
--
-- **************************************************************

UEContextModificationResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { UEContextModificationResponseIEs} },
    ...
}

UEContextModificationResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID             PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
```

```
}-- ************************************************************
--
-- UE Context Modification Failure
--
-- ************************************************************

UEContextModificationFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { UEContextModificationFailureIEs} },
    ...
}

UEContextModificationFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID             PRESENCE mandatory }|
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory }|
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}

-- ************************************************************
--
-- NAS TRANSPORT ELEMENTARY PROCEDURES
--
-- ************************************************************

-- ************************************************************
--
-- DOWNLINK NAS TRANSPORT
--
-- ************************************************************

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

DownlinkNASTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                 PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                 PRESENCE mandatory} |
    { ID id-NAS-PDU                     CRITICALITY reject  TYPE NAS-PDU                        PRESENCE mandatory} |
    { ID id-HandoverRestrictionList     CRITICALITY ignore  TYPE HandoverRestrictionList        PRESENCE optional} |
    { ID id-SubscriberProfileIDforRFP   CRITICALITY ignore  TYPE SubscriberProfileIDforRFP      PRESENCE optional},
    ...
}


-- ************************************************************
--
-- INITIAL UE MESSAGE
--
-- ************************************************************

InitialUEMessage ::= SEQUENCE {
```

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

InitialUEMessage-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory} |
    { ID id-NAS-PDU                     CRITICALITY reject  TYPE NAS-PDU                      PRESENCE mandatory} |
    { ID id-TAI                         CRITICALITY reject  TYPE TAI                          PRESENCE mandatory} |
    { ID id-EUTRAN-CGI                  CRITICALITY ignore  TYPE EUTRAN-CGI                   PRESENCE mandatory} |
    { ID id-RRC-Establishment-Cause     CRITICALITY ignore  TYPE RRC-Establishment-Cause      PRESENCE mandatory} |
    { ID id-S-TMSI                      CRITICALITY reject  TYPE S-TMSI                       PRESENCE optional} |
    { ID id-CSG-Id                      CRITICALITY reject  TYPE CSG-Id                       PRESENCE optional} |
    { ID id-GUMMEI-ID                   CRITICALITY reject  TYPE GUMMEI                       PRESENCE optional} |
    { ID id-CellAccessMode              CRITICALITY reject  TYPE CellAccessMode               PRESENCE optional} |
    { ID id-GW-TransportLayerAddress    CRITICALITY ignore  TYPE TransportLayerAddress        PRESENCE optional} |
    { ID id-RelayNode-Indicator         CRITICALITY reject  TYPE RelayNode-Indicator          PRESENCE optional},
    ...
}


-- **************************************************************
--
-- UPLINK NAS TRANSPORT
--
-- **************************************************************

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

UplinkNASTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID           PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID           PRESENCE mandatory} |
    { ID id-NAS-PDU                     CRITICALITY reject  TYPE NAS-PDU                  PRESENCE mandatory} |
    { ID id-EUTRAN-CGI                  CRITICALITY ignore  TYPE EUTRAN-CGI               PRESENCE mandatory} |
    { ID id-TAI                         CRITICALITY ignore  TYPE TAI                      PRESENCE mandatory} |
    { ID id-GW-TransportLayerAddress    CRITICALITY ignore  TYPE TransportLayerAddress    PRESENCE optional},
    ...
}
-- **************************************************************
--
-- NAS NON DELIVERY INDICATION
--
-- **************************************************************

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

NASNonDeliveryIndication-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID            PRESENCE mandatory} |
```

```
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID            PRESENCE mandatory} |
    { ID id-NAS-PDU                 CRITICALITY ignore  TYPE NAS-PDU               PRESENCE mandatory} |
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause             PRESENCE mandatory} ,
    ...
}

-- **************************************************************
--
-- RESET ELEMENTARY PROCEDURE
--
-- **************************************************************

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

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

ResetIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory   }|
    { ID id-ResetType               CRITICALITY reject  TYPE ResetType          PRESENCE mandatory       },
    ...
}

ResetType ::= CHOICE {
    s1-Interface        ResetAll,
    partOfS1-Interface      UE-associatedLogicalS1-ConnectionListRes,
    ...
}



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

UE-associatedLogicalS1-ConnectionListRes ::= SEQUENCE (SIZE(1.. maxNrOfIndividualS1ConnectionsToReset)) OF ProtocolIE-SingleContainer { { UE-
associatedLogicalS1-ConnectionItemRes } }

UE-associatedLogicalS1-ConnectionItemRes    S1AP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalS1-ConnectionItem    CRITICALITY reject TYPE UE-associatedLogicalS1-ConnectionItem      PRESENCE mandatory },
    ...
}


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

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

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

ResetAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalS1-ConnectionListResAck     CRITICALITY ignore  TYPE UE-associatedLogicalS1-ConnectionListResAck
    PRESENCE optional   }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional       },
    ...
}

UE-associatedLogicalS1-ConnectionListResAck ::= SEQUENCE (SIZE(1.. maxNrOfIndividualS1ConnectionsToReset)) OF ProtocolIE-SingleContainer { { UE-
associatedLogicalS1-ConnectionItemResAck } }

UE-associatedLogicalS1-ConnectionItemResAck S1AP-PROTOCOL-IES ::= {
    { ID id-UE-associatedLogicalS1-ConnectionItem    CRITICALITY ignore TYPE UE-associatedLogicalS1-ConnectionItem      PRESENCE mandatory },
    ...
}

-- **************************************************************
--
-- ERROR INDICATION ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Error Indication
--
-- **************************************************************

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

ErrorIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY ignore  TYPE MME-UE-S1AP-ID             PRESENCE optional    } |
    { ID id-eNB-UE-S1AP-ID              CRITICALITY ignore  TYPE ENB-UE-S1AP-ID             PRESENCE optional    } |
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE optional    } |
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional    } ,
    ...
}

-- **************************************************************
--
-- S1 SETUP ELEMENTARY PROCEDURE
--
```

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

-- **************************************************************
--
-- S1 Setup Request
--
-- **************************************************************

S1SetupRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {S1SetupRequestIEs} },
    ...
}

S1SetupRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Global-ENB-ID       CRITICALITY reject  TYPE Global-ENB-ID      PRESENCE mandatory}|
    { ID id-eNBname             CRITICALITY ignore  TYPE ENBname            PRESENCE optional}|
    { ID id-SupportedTAs        CRITICALITY reject  TYPE SupportedTAs       PRESENCE mandatory}|
    { ID id-DefaultPagingDRX    CRITICALITY ignore  TYPE PagingDRX          PRESENCE mandatory}|
    { ID id-CSG-IdList          CRITICALITY reject  TYPE CSG-IdList         PRESENCE optional},
    ...
}

-- **************************************************************
--
-- S1 Setup Response
--
-- **************************************************************

S1SetupResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {S1SetupResponseIEs} },
    ...
}


S1SetupResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MMEname                     CRITICALITY ignore  TYPE MMEname                        PRESENCE optional}|
    { ID id-ServedGUMMEIs               CRITICALITY reject  TYPE ServedGUMMEIs                  PRESENCE mandatory}|
    { ID id-RelativeMMECapacity         CRITICALITY ignore  TYPE RelativeMMECapacity            PRESENCE mandatory}|
    { ID id-MMERelaySupportIndicator    CRITICALITY ignore  TYPE MMERelaySupportIndicator       PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional},
    ...
}

-- **************************************************************
--
-- S1 Setup Failure
--
-- **************************************************************

S1SetupFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {S1SetupFailureIEs} },
    ...
}
```

```
S1SetupFailureIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory   }|
    { ID id-TimeToWait                  CRITICALITY ignore  TYPE TimeToWait                 PRESENCE optional    }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional       },
    ...
}

-- **************************************************************
--
-- ENB CONFIGURATION UPDATE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- eNB Configuration Update
--
-- **************************************************************

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

ENBConfigurationUpdateIEs S1AP-PROTOCOL-IES ::= {
    { ID id-eNBname             CRITICALITY ignore  TYPE ENBname            PRESENCE optional   }|
    { ID id-SupportedTAs        CRITICALITY reject  TYPE SupportedTAs       PRESENCE optional   }|
    { ID id-CSG-IdList                  CRITICALITY reject  TYPE CSG-IdList             PRESENCE optional}|
    { ID id-DefaultPagingDRX    CRITICALITY ignore  TYPE PagingDRX      PRESENCE optional   },
    ...
}

-- **************************************************************
--
-- eNB Configuration Update Acknowledge
--
-- **************************************************************

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


ENBConfigurationUpdateAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional       },
    ...
}

-- **************************************************************
--
-- eNB Configuration Update Failure
```

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

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

ENBConfigurationUpdateFailureIEs S1AP-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 },
...
}


-- **************************************************************
--
-- MME Configuration UPDATE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- MME Configuration Update
--
-- **************************************************************

MMEConfigurationUpdate ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {MMEConfigurationUpdateIEs} },
    ...
}

MMEConfigurationUpdateIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MMEname             CRITICALITY ignore  TYPE MMEname            PRESENCE optional   }|
    { ID id-ServedGUMMEIs           CRITICALITY reject  TYPE ServedGUMMEIs              PRESENCE optional       }|
    { ID id-RelativeMMECapacity CRITICALITY reject  TYPE RelativeMMECapacity    PRESENCE optional},
    ...
}

-- **************************************************************
--
-- MME Configuration Update Acknowledge
--
-- **************************************************************

MMEConfigurationUpdateAcknowledge ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {MMEConfigurationUpdateAcknowledgeIEs} },
    ...
}


MMEConfigurationUpdateAcknowledgeIEs S1AP-PROTOCOL-IES ::= {
```

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

-- **************************************************************
--
-- MME Configuration Update Failure
--
-- **************************************************************

MMEConfigurationUpdateFailure ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {MMEConfigurationUpdateFailureIEs} },
    ...
}

MMEConfigurationUpdateFailureIEs S1AP-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       },
    ...
}

-- **************************************************************
--
-- DOWNLINK S1 CDMA2000 TUNNELING ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Downlink S1 CDMA2000 Tunneling
--
-- **************************************************************

DownlinkS1cdma2000tunneling ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {DownlinkS1cdma2000tunnelingIEs} },
    ...
}

DownlinkS1cdma2000tunnelingIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory   } |
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory   } |
    { ID id-E-RABSubjecttoDataForwardingList        CRITICALITY ignore  TYPE E-RABSubjecttoDataForwardingList
    PRESENCE optional   } |
    { ID id-cdma2000HOStatus                CRITICALITY ignore  TYPE Cdma2000HOStatus           PRESENCE optional       } |
    { ID id-cdma2000RATType             CRITICALITY reject  TYPE Cdma2000RATType            PRESENCE mandatory   } |
    { ID id-cdma2000PDU                 CRITICALITY reject  TYPE Cdma2000PDU                PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- UPLINK S1 CDMA2000 TUNNELING ELEMENTARY PROCEDURE
```

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

-- ************************************************************
--
-- Uplink S1 CDMA2000 Tunneling
--
-- ************************************************************

UplinkS1cdma2000tunneling ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {UplinkS1cdma2000tunnelingIEs} },
    ...
}

UplinkS1cdma2000tunnelingIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory   } |
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory   } |
    { ID id-cdma2000RATType             CRITICALITY reject  TYPE Cdma2000RATType            PRESENCE mandatory   } |
    { ID id-cdma2000SectorID            CRITICALITY reject  TYPE Cdma2000SectorID           PRESENCE mandatory   } |
    { ID id-cdma2000HORequiredIndication    CRITICALITY ignore  TYPE Cdma2000HORequiredIndication                    PRESENCE optional     } |
    { ID id-cdma2000OneXSRVCCInfo       CRITICALITY reject  TYPE Cdma2000OneXSRVCCInfo          PRESENCE optional       } |
    { ID id-cdma2000OneXRAND            CRITICALITY reject  TYPE Cdma2000OneXRAND           PRESENCE optional    } |
    { ID id-cdma2000PDU                 CRITICALITY reject  TYPE Cdma2000PDU                PRESENCE mandatory   }|
    { ID id-EUTRANRoundTripDelayEstimationInfo  CRITICALITY ignore  TYPE EUTRANRoundTripDelayEstimationInfo             PRESENCE optional},
    -- Extension for Release 9 to assist target HRPD access with the acquisition of the UE --
    ...
}


-- ************************************************************
--
-- UE CAPABILITY INFO INDICATION ELEMENTARY PROCEDURE
--
-- ************************************************************

-- ************************************************************
--
-- UE Capability Info Indication
--
-- ************************************************************

UECapabilityInfoIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { UECapabilityInfoIndicationIEs} },
    ...
}

UECapabilityInfoIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID                PRESENCE mandatory      } |
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID                PRESENCE mandatory      } |
    { ID id-UERadioCapability           CRITICALITY ignore  TYPE UERadioCapability             PRESENCE mandatory      } ,
    ...
}
```

```
-- **************************************************************
--
-- eNB STATUS TRANSFER ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- eNB Status Transfer
--
-- **************************************************************

ENBStatusTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {ENBStatusTransferIEs} },
    ...
}

ENBStatusTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-StatusTransfer-TransparentContainer CRITICALITY reject  TYPE ENB-StatusTransfer-TransparentContainer           PRESENCE mandatory} ,
    ...
}


-- **************************************************************
--
-- MME STATUS TRANSFER ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- MME Status Transfer
--
-- **************************************************************

MMEStatusTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {MMEStatusTransferIEs} },
    ...
}

MMEStatusTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-StatusTransfer-TransparentContainer CRITICALITY reject  TYPE ENB-StatusTransfer-TransparentContainer           PRESENCE mandatory} ,
    ...
}


-- **************************************************************
--
-- TRACE ELEMENTARY PROCEDURES
```

```
--
-- **************************************************************
-- **************************************************************
--
-- Trace Start
--
-- **************************************************************

TraceStart ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {TraceStartIEs} },
    ...
}

TraceStartIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-TraceActivation             CRITICALITY ignore  TYPE TraceActivation            PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- Trace Failure Indication
--
-- **************************************************************

TraceFailureIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {TraceFailureIndicationIEs} },
    ...
}

TraceFailureIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID              CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID              CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-E-UTRAN-Trace-ID            CRITICALITY ignore  TYPE E-UTRAN-Trace-ID           PRESENCE mandatory} |
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory} ,
    ...
}

-- **************************************************************
--
-- DEACTIVATE TRACE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- DEACTIVATE TRACE
--
-- **************************************************************

DeactivateTrace ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { DeactivateTraceIEs} },
```

```
    ...
}

DeactivateTraceIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID      CRITICALITY reject  TYPE MME-UE-S1AP-ID     PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID      CRITICALITY reject  TYPE ENB-UE-S1AP-ID     PRESENCE mandatory} |
    { ID id-E-UTRAN-Trace-ID        CRITICALITY ignore  TYPE E-UTRAN-Trace-ID       PRESENCE mandatory   },
    ...
}

-- **************************************************************
--
-- CELL TRAFFIC TRACE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- CELL TRAFFIC TRACE
--
-- **************************************************************

CellTrafficTrace ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container    { { CellTrafficTraceIEs } },
    ...
}

CellTrafficTraceIEs S1AP-PROTOCOL-IES ::= {
    {ID id-MME-UE-S1AP-ID                   CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory}|
    {ID id-eNB-UE-S1AP-ID                   CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory}|
    {ID id-E-UTRAN-Trace-ID                 CRITICALITY ignore  TYPE E-UTRAN-Trace-ID           PRESENCE mandatory}|
    {ID id-EUTRAN-CGI                       CRITICALITY ignore  TYPE EUTRAN-CGI                 PRESENCE mandatory}|
    {ID id-TraceCollectionEntityIPAddress   CRITICALITY ignore  TYPE TransportLayerAddress      PRESENCE mandatory}|
    {ID id-PrivacyIndicator                 CRITICALITY ignore  TYPE PrivacyIndicator           PRESENCE optional},
    ...
}

-- **************************************************************
--
-- LOCATION ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- Location Reporting Control
--
-- **************************************************************

LocationReportingControl ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { LocationReportingControlIEs} },
    ...
}
```

```
LocationReportingControlIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-RequestType             CRITICALITY ignore  TYPE RequestType                PRESENCE mandatory      } ,
    ...
}

-- **************************************************************
--
-- Location Report Failure Indication
--
-- **************************************************************

LocationReportingFailureIndication ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { LocationReportingFailureIndicationIEs} },
    ...
}

LocationReportingFailureIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-Cause                   CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory},
    ...
}

-- **************************************************************
--
-- Location Report
--
-- **************************************************************

LocationReport ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { { LocationReportIEs} },
    ...
}

LocationReportIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-EUTRAN-CGI              CRITICALITY ignore  TYPE EUTRAN-CGI                 PRESENCE mandatory} |
    { ID id-TAI                     CRITICALITY ignore  TYPE TAI                        PRESENCE mandatory} |
    { ID id-RequestType             CRITICALITY ignore  TYPE RequestType                PRESENCE mandatory} ,
    ...
}

-- **************************************************************
--
-- OVERLOAD ELEMENTARY PROCEDURES
--
-- **************************************************************

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

```
--
-- Overload Start
--
-- **************************************************************

OverloadStart ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {OverloadStartIEs} },
    ...
}

OverloadStartIEs S1AP-PROTOCOL-IES ::= {
    { ID id-OverloadResponse                    CRITICALITY reject  TYPE OverloadResponse                PRESENCE mandatory}|
    { ID id-GUMMEIList                          CRITICALITY ignore  TYPE GUMMEIList                      PRESENCE optional}|
    { ID id-TrafficLoadReductionIndication      CRITICALITY ignore  TYPE TrafficLoadReductionIndication  PRESENCE optional},
    ...
}
-- **************************************************************
--
-- Overload Stop
--
-- **************************************************************

OverloadStop ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {OverloadStopIEs} },
    ...
}

OverloadStopIEs S1AP-PROTOCOL-IES ::= {
{ ID id-GUMMEIList                          CRITICALITY ignore  TYPE GUMMEIList             PRESENCE optional },
    ...
}
-- **************************************************************
--
-- WRITE-REPLACE WARNING ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Write-Replace Warning Request
--
-- **************************************************************


WriteReplaceWarningRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {WriteReplaceWarningRequestIEs} },
    ...
}

WriteReplaceWarningRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier           CRITICALITY reject  TYPE MessageIdentifier      PRESENCE mandatory              }|
    { ID id-SerialNumber                CRITICALITY reject  TYPE SerialNumber           PRESENCE mandatory              }|
    { ID id-WarningAreaList             CRITICALITY ignore  TYPE WarningAreaList        PRESENCE optional               }|
```

```
    { ID id-RepetitionPeriod            CRITICALITY reject  TYPE RepetitionPeriod       PRESENCE mandatory             }|
    { ID id-ExtendedRepetitionPeriod    CRITICALITY reject  TYPE ExtendedRepetitionPeriod   PRESENCE optional    }|
    { ID id-NumberofBroadcastRequest    CRITICALITY reject  TYPE NumberofBroadcastRequest   PRESENCE mandatory  }|
    { ID id-WarningType                 CRITICALITY ignore  TYPE WarningType            PRESENCE optional              }|
    { ID id-WarningSecurityInfo         CRITICALITY ignore  TYPE WarningSecurityInfo    PRESENCE optional              }|
    { ID id-DataCodingScheme            CRITICALITY ignore  TYPE DataCodingScheme       PRESENCE optional              }|
    { ID id-WarningMessageContents      CRITICALITY ignore  TYPE WarningMessageContents     PRESENCE optional          }|
    { ID id-ConcurrentWarningMessageIndicator   CRITICALITY reject  TYPE ConcurrentWarningMessageIndicator             PRESENCE optional
    },
    ...
}
-- **************************************************************
--
-- Write-Replace Warning Response
--
-- **************************************************************

WriteReplaceWarningResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {WriteReplaceWarningResponseIEs} },
    ...
}

WriteReplaceWarningResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier           CRITICALITY reject  TYPE MessageIdentifier              PRESENCE mandatory }|
    { ID id-SerialNumber                CRITICALITY reject  TYPE SerialNumber                   PRESENCE mandatory }|
    { ID id-BroadcastCompletedAreaList  CRITICALITY ignore  TYPE BroadcastCompletedAreaList     PRESENCE optional     }|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics         PRESENCE optional },
    ...
}

-- **************************************************************
--
-- eNB DIRECT INFORMATION TRANSFER ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- eNB Direct Information Transfer
--
-- **************************************************************

ENBDirectInformationTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container     {{ ENBDirectInformationTransferIEs}},
    ...
}

ENBDirectInformationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Inter-SystemInformationTransferTypeEDT      CRITICALITY reject  TYPE Inter-SystemInformationTransferType                  PRESENCE
mandatory}  ,
    ...
}
```

```
Inter-SystemInformationTransferType ::= CHOICE {
    rIMTransfer     RIMTransfer,
    ...
}

-- ************************************************************
--
-- MME DIRECT INFORMATION TRANSFER ELEMENTARY PROCEDURE
--
-- ************************************************************

-- ************************************************************
--
-- MME Direct Information Transfer
--
-- ************************************************************

MMEDirectInformationTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      {{ MMEDirectInformationTransferIEs}},
    ...
}

MMEDirectInformationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Inter-SystemInformationTransferTypeMDT      CRITICALITY reject  TYPE Inter-SystemInformationTransferType                    PRESENCE
mandatory}  ,
    ...
}
-- ************************************************************
--
-- eNB CONFIGURATION TRANSFER ELEMENTARY PROCEDURE
--
-- ************************************************************

-- ************************************************************
--
-- eNB Configuration Transfer
--
-- ************************************************************

ENBConfigurationTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      {{ ENBConfigurationTransferIEs}},
    ...
}

ENBConfigurationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SONConfigurationTransferECT     CRITICALITY ignore  TYPE SONConfigurationTransfer                    PRESENCE optional}  ,
    ...
}

-- ************************************************************
--
-- MME CONFIGURATION TRANSFER ELEMENTARY PROCEDURE
--
```

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

-- **************************************************************
--
-- MME Configuration Transfer
--
-- **************************************************************

MMEConfigurationTransfer ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      {{ MMEConfigurationTransferIEs}},
    ...
}

MMEConfigurationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-SONConfigurationTransferMCT     CRITICALITY ignore  TYPE SONConfigurationTransfer                   PRESENCE optional}  ,
    ...
}

-- **************************************************************
--
-- PRIVATE MESSAGE ELEMENTARY PROCEDURE
--
-- **************************************************************

-- **************************************************************
--
-- Private Message
--
-- **************************************************************

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

PrivateMessageIEs S1AP-PRIVATE-IES ::= {
    ...
}

-- **************************************************************
--
-- Kill Request
--
-- **************************************************************


KillRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container      { {KillRequestIEs} },
    ...
}

KillRequestIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier           CRITICALITY reject  TYPE MessageIdentifier      PRESENCE mandatory }|
```

```
    { ID id-SerialNumber               CRITICALITY reject  TYPE SerialNumber          PRESENCE mandatory }|
    { ID id-WarningAreaList            CRITICALITY ignore  TYPE WarningAreaList       PRESENCE optional },
    ...
}

-- **************************************************************
--
-- Kill Response
--
-- **************************************************************

KillResponse ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container        { {KillResponseIEs} },
    ...
}

KillResponseIEs S1AP-PROTOCOL-IES ::= {
    { ID id-MessageIdentifier          CRITICALITY reject  TYPE MessageIdentifier             PRESENCE mandatory }|
    { ID id-SerialNumber               CRITICALITY reject  TYPE SerialNumber                  PRESENCE mandatory }|
    { ID id-BroadcastCancelledAreaList CRITICALITY ignore  TYPE BroadcastCancelledAreaList    PRESENCE optional }|
    { ID id-CriticalityDiagnostics     CRITICALITY ignore  TYPE CriticalityDiagnostics        PRESENCE optional },
    ...
}

-- **************************************************************
--
-- LPPA TRANSPORT ELEMENTARY PROCEDURES
--
-- **************************************************************

-- **************************************************************
--
-- DOWNLINK UE ASSOCIATED LPPA TRANSPORT
--
-- **************************************************************

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

DownlinkUEAssociatedLPPaTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID            PRESENCE mandatory } |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID            PRESENCE mandatory } |
    { ID id-Routing-ID              CRITICALITY reject  TYPE Routing-ID                PRESENCE mandatory } |
    { ID id-LPPa-PDU            CRITICALITY reject  TYPE LPPa-PDU              PRESENCE mandatory } ,
    ...
}

-- **************************************************************
--
-- UPLINK UE ASSOCIATED LPPA TRANSPORT
--
```

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

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

UplinkUEAssociatedLPPaTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-MME-UE-S1AP-ID          CRITICALITY reject  TYPE MME-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-eNB-UE-S1AP-ID          CRITICALITY reject  TYPE ENB-UE-S1AP-ID             PRESENCE mandatory} |
    { ID id-Routing-ID              CRITICALITY reject  TYPE Routing-ID                 PRESENCE mandatory} |
    { ID id-LPPa-PDU            CRITICALITY reject  TYPE LPPa-PDU               PRESENCE mandatory} ,
    ...
}


-- **************************************************************
--
-- DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT
--
-- **************************************************************

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

DownlinkNonUEAssociatedLPPaTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-Routing-ID              CRITICALITY reject   TYPE Routing-ID                PRESENCE mandatory} |
    { ID id-LPPa-PDU            CRITICALITY reject  TYPE LPPa-PDU               PRESENCE mandatory} ,
    ...
}

-- **************************************************************
--
-- UPLINK NON UE ASSOCIATED LPPA TRANSPORT
--
-- **************************************************************

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

UplinkNonUEAssociatedLPPaTransport-IEs S1AP-PROTOCOL-IES ::= {
    { ID id-Routing-ID              CRITICALITY reject   TYPE Routing-ID                PRESENCE mandatory} |
    { ID id-LPPa-PDU            CRITICALITY reject  TYPE LPPa-PDU               PRESENCE mandatory} ,
    ...
}

END
```

9.3.4 Information Element Definitions

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

S1AP-IEs {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    id-E-RABInformationListItem,
    id-E-RABItem,
    id-Bearers-SubjectToStatusTransfer-Item,
    id-Time-Synchronization-Info,
    id-x2TNLConfigurationInfo,
    id-eNBX2ExtendedTransportLayerAddresses,
    id-MDTConfiguration,
    maxNrOfCSGs,
    maxNrOfE-RABs,
    maxNrOfErrors,
    maxnoofBPLMNs,
    maxnoofPLMNsPerMME,
    maxnoofTACs,
    maxnoofEPLMNs,
    maxnoofEPLMNsPlusOne,
    maxnoofForbLACs,
    maxnoofForbTACs,
    maxnoofCells,
    maxnoofCellID,
    maxnoofEmergencyAreaID,
    maxnoofTAIforWarning,
    maxnoofCellinTAI,
    maxnoofCellinEAI,
    maxnoofeNBX2TLAs,
    maxnoofeNBX2ExtTLAs,
    maxnoofeNBX2GTPTLAs,
    maxnoofRATs,
    maxnoofGroupIDs,
    maxnoofMMECs,
    maxnoofTAforMDT,
    maxnoofCellIDforMDT
```

```
FROM S1AP-Constants

    Criticality,
    ProcedureCode,
    ProtocolIE-ID,
    TriggeringMessage
FROM S1AP-CommonDataTypes

    ProtocolExtensionContainer{},
    S1AP-PROTOCOL-EXTENSION,
    ProtocolIE-SingleContainer{},
    S1AP-PROTOCOL-IES

FROM S1AP-Containers;

-- A

AreaScopeOfMDT ::= CHOICE {
    cellBased                   CellBasedMDT,
    tABased                     TABasedMDT,
    pLMNWide                    NULL,
    ...
}

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

AllocationAndRetentionPriority-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- B

Bearers-SubjectToStatusTransferList ::= SEQUENCE (SIZE(1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { { Bearers-SubjectToStatusTransfer-
ItemIEs } }

Bearers-SubjectToStatusTransfer-ItemIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Bearers-SubjectToStatusTransfer-Item    CRITICALITY ignore  TYPE Bearers-SubjectToStatusTransfer-Item       PRESENCE mandatory    },
    ...
}

Bearers-SubjectToStatusTransfer-Item ::= SEQUENCE {
    e-RAB-ID                            E-RAB-ID,
    uL-COUNTvalue                       COUNTvalue,
    dL-COUNTvalue                       COUNTvalue,
    receiveStatusofULPDCPSDUs           ReceiveStatusofULPDCPSDUs           OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { {Bearers-SubjectToStatusTransfer-ItemExtIEs} } OPTIONAL,
```

```
    ...
}

Bearers-SubjectToStatusTransfer-ItemExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

BitRate ::= INTEGER (0..10000000000)

BPLMNs ::= SEQUENCE (SIZE(1.. maxnoofBPLMNs)) OF PLMNidentity

BroadcastCancelledAreaList ::= CHOICE {
    cellID-Cancelled                CellID-Cancelled,
    tAI-Cancelled                   TAI-Cancelled,
    emergencyAreaID-Cancelled       EmergencyAreaID-Cancelled,
    ...
}

BroadcastCompletedAreaList ::= CHOICE {
    cellID-Broadcast                CellID-Broadcast,
    tAI-Broadcast                   TAI-Broadcast,
    emergencyAreaID-Broadcast       EmergencyAreaID-Broadcast,
    ...
}


-- C

CancelledCellinEAI ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF CancelledCellinEAI-Item

CancelledCellinEAI-Item ::= SEQUENCE {
    eCGI                    EUTRAN-CGI,
    numberOfBroadcasts      NumberOfBroadcasts,
    iE-Extensions           ProtocolExtensionContainer { {CancelledCellinEAI-Item-ExtIEs} } OPTIONAL,
    ...
}

CancelledCellinEAI-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CancelledCellinTAI ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF CancelledCellinTAI-Item

CancelledCellinTAI-Item ::= SEQUENCE{
    eCGI                EUTRAN-CGI,
    numberOfBroadcasts  NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CancelledCellinTAI-Item-ExtIEs} } OPTIONAL,
    ...
}

CancelledCellinTAI-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
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,
    unknown-PLMN,
...
}

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 {
    unspecified,
    tx2relocoverall-expiry,
    successful-handover,
    release-due-to-eutran-generated-reason,
    handover-cancelled,
    partial-handover,
    ho-failure-in-target-EPC-eNB-or-target-system,
    ho-target-not-allowed,
    tS1relocoverall-expiry,
    tS1relocprep-expiry,
    cell-not-available,
    unknown-targetID,
    no-radio-resources-available-in-target-cell,
    unknown-mme-ue-s1ap-id,
    unknown-enb-ue-s1ap-id,
    unknown-pair-ue-s1ap-id,
    handover-desirable-for-radio-reason,
    time-critical-handover,
    resource-optimisation-handover,
    reduce-load-in-serving-cell,
    user-inactivity,
```

```
    radio-connection-with-ue-lost,
    load-balancing-tau-required,
    cs-fallback-triggered,
    ue-not-available-for-ps-service,
    radio-resources-not-available,
    failure-in-radio-interface-procedure,
    invalid-qos-combination,
    interrat-redirection,
    interaction-with-other-procedure,
    unknown-E-RAB-ID,
    multiple-E-RAB-ID-instances,
    encryption-and-or-integrity-protection-algorithms-not-supported,
    s1-intra-system-handover-triggered,
    s1-inter-system-handover-triggered,
    x2-handover-triggered,
    ...,
    redirection-towards-1xRTT,
    not-supported-QCI-value,
    invalid-CSG-Id

}

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

CauseNas ::= ENUMERATED {
    normal-release,
    authentication-failure,
    detach,
    unspecified,
    ...,
    csg-subscription-expiry
}

CellAccessMode ::= ENUMERATED {
    hybrid,
    ...
}

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

CellID-Broadcast ::= SEQUENCE (SIZE(1..maxnoofCellID)) OF CellID-Broadcast-Item

CellID-Broadcast-Item ::= SEQUENCE {
    eCGI                EUTRAN-CGI,
    iE-Extensions       ProtocolExtensionContainer { {CellID-Broadcast-Item-ExtIEs} } OPTIONAL,
    ...
}

CellID-Broadcast-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
```

```
    ...
}

CellID-Cancelled::= SEQUENCE (SIZE(1..maxnoofCellID)) OF CellID-Cancelled-Item

CellID-Cancelled-Item ::= SEQUENCE {
    eCGI                EUTRAN-CGI,
    numberOfBroadcasts  NumberOfBroadcasts,
    iE-Extensions       ProtocolExtensionContainer { {CellID-Cancelled-Item-ExtIEs} } OPTIONAL,
    ...
}

CellID-Cancelled-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CellBasedMDT::= SEQUENCE {
    cellIdListforMDT    CellIdListforMDT,
    iE-Extensions       ProtocolExtensionContainer { {CellBasedMDT-ExtIEs} } OPTIONAL,
    ...
}

CellBasedMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CellIdListforMDT ::= SEQUENCE (SIZE(1..maxnoofCellIDforMDT)) OF EUTRAN-CGI

Cdma2000PDU ::= OCTET STRING

Cdma2000RATType ::= ENUMERATED {
    hRPD,
    onexRTT,
    ...
}

Cdma2000SectorID ::= OCTET STRING

Cdma2000HOStatus ::= ENUMERATED {
    hOSuccess,
    hOFailure,
    ...
}

Cdma2000HORequiredIndication ::= ENUMERATED {
    true,
    ...
}

Cdma2000OneXSRVCCInfo ::= SEQUENCE {
    cdma2000OneXMEID            Cdma2000OneXMEID,
    cdma2000OneXMSI             Cdma2000OneXMSI,
    cdma2000OneXPilot           Cdma2000OneXPilot,
```

```
    iE-Extensions               ProtocolExtensionContainer { {Cdma2000OneXSRVCCInfo-ExtIEs} } OPTIONAL,
    ...
}

Cdma2000OneXSRVCCInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Cdma2000OneXMEID ::= OCTET STRING

Cdma2000OneXMSI ::= OCTET STRING

Cdma2000OneXPilot ::= OCTET STRING

Cdma2000OneXRAND ::= OCTET STRING


Cell-Size ::= ENUMERATED {verysmall, small, medium, large, ...}

CellType ::= SEQUENCE {
    cell-Size               Cell-Size,
    iE-Extensions           ProtocolExtensionContainer { { CellType-ExtIEs}}    OPTIONAL,
    ...
}

CellType-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CGI ::= SEQUENCE {
    pLMNidentity                PLMNidentity,
    lAC             LAC,
    cI              CI,
    rAC             RAC                     OPTIONAL,
    iE-Extensions   ProtocolExtensionContainer { {CGI-ExtIEs} } OPTIONAL,
    ...
    }

CGI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

CNDomain ::= ENUMERATED {
    ps,
    cs
}

ConcurrentWarningMessageIndicator ::= ENUMERATED {
    true
}
```

```
Correlation-ID      ::= OCTET STRING (SIZE (4))

CSFallbackIndicator ::= ENUMERATED {
    cs-fallback-required,
    ...,
    cs-fallback-high-priority
}

CSG-Id      ::= BIT STRING (SIZE (27))


CSG-IdList ::= SEQUENCE (SIZE (1..maxNrOfCSGs)) OF CSG-IdList-Item

CSG-IdList-Item ::= SEQUENCE {
    cSG-Id          CSG-Id,
    iE-Extensions   ProtocolExtensionContainer { {CSG-IdList-Item-ExtIEs} } OPTIONAL,
    ...
}

CSG-IdList-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CSGMembershipStatus ::= ENUMERATED {
    member,
    not-member
}


COUNTvalue ::= SEQUENCE {
    pDCP-SN         PDCP-SN,
    hFN             HFN,
    iE-Extensions   ProtocolExtensionContainer { {COUNTvalue-ExtIEs} } OPTIONAL,
    ...
}
COUNTvalue-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

CriticalityDiagnostics-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1..maxNrOfErrors)) OF CriticalityDiagnostics-IE-Item
```

```
CriticalityDiagnostics-IE-Item ::=  SEQUENCE {
    iECriticality           Criticality,
    iE-ID                   ProtocolIE-ID,
    typeOfError         TypeOfError,
    iE-Extensions           ProtocolExtensionContainer {{CriticalityDiagnostics-IE-Item-ExtIEs}} OPTIONAL,
    ...
}

CriticalityDiagnostics-IE-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


-- D

DataCodingScheme ::= BIT STRING (SIZE (8))

DL-Forwarding ::= ENUMERATED {
    dL-Forwarding-proposed,
    ...
}

Direct-Forwarding-Path-Availability ::= ENUMERATED {
    directPathAvailable,
    ...
}

Data-Forwarding-Not-Possible ::= ENUMERATED {
    data-Forwarding-not-Possible,
    ...
}

-- E

ECGIList ::= SEQUENCE (SIZE(1..maxnoofCellID)) OF EUTRAN-CGI

EmergencyAreaIDList ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaID

EmergencyAreaID ::= OCTET STRING (SIZE (3))

EmergencyAreaID-Broadcast ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaID-Broadcast-Item

EmergencyAreaID-Broadcast-Item ::= SEQUENCE {
    emergencyAreaID         EmergencyAreaID,
    completedCellinEAI      CompletedCellinEAI,
    iE-Extensions           ProtocolExtensionContainer { {EmergencyAreaID-Broadcast-Item-ExtIEs} } OPTIONAL,
    ...
}

EmergencyAreaID-Broadcast-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
EmergencyAreaID-Cancelled ::= SEQUENCE (SIZE(1..maxnoofEmergencyAreaID)) OF EmergencyAreaID-Cancelled-Item

EmergencyAreaID-Cancelled-Item ::= SEQUENCE {
    emergencyAreaID         EmergencyAreaID,
    cancelledCellinEAI      CancelledCellinEAI,
    iE-Extensions           ProtocolExtensionContainer { {EmergencyAreaID-Cancelled-Item-ExtIEs} } OPTIONAL,
    ...
}

EmergencyAreaID-Cancelled-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

CompletedCellinEAI ::= SEQUENCE (SIZE(1..maxnoofCellinEAI)) OF CompletedCellinEAI-Item

CompletedCellinEAI-Item ::= SEQUENCE {
    eCGI                    EUTRAN-CGI,
    iE-Extensions           ProtocolExtensionContainer { {CompletedCellinEAI-Item-ExtIEs} } OPTIONAL,
    ...
}

CompletedCellinEAI-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ENB-ID ::= CHOICE {
    macroENB-ID         BIT STRING (SIZE(20)),
    homeENB-ID          BIT STRING (SIZE(28)),
    ...
}

GERAN-Cell-ID ::= SEQUENCE {
    lAI             LAI,
    rAC             RAC,
    cI              CI,
    iE-Extensions           ProtocolExtensionContainer { { GERAN-Cell-ID-ExtIEs} } OPTIONAL,
    ...
}

GERAN-Cell-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Global-ENB-ID ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    eNB-ID                  ENB-ID,
    iE-Extensions           ProtocolExtensionContainer { {GlobalENB-ID-ExtIEs} } OPTIONAL,
    ...
}

GlobalENB-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
```

```
}

GUMMEIList::= SEQUENCE (SIZE (1.. maxnoofMMECs)) OF GUMMEI

ENB-StatusTransfer-TransparentContainer     ::= SEQUENCE {
    bearers-SubjectToStatusTransferList     Bearers-SubjectToStatusTransferList,
    iE-Extensions           ProtocolExtensionContainer { {ENB-StatusTransfer-TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}

ENB-StatusTransfer-TransparentContainer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ENB-UE-S1AP-ID              ::= INTEGER (0..16777215)

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

ENBX2TLAs ::= SEQUENCE (SIZE(1.. maxnoofeNBX2TLAs)) OF TransportLayerAddress

EncryptionAlgorithms ::= BIT STRING (SIZE (16,...))

EPLMNs ::= SEQUENCE (SIZE(1..maxnoofEPLMNs)) OF PLMNidentity
EventType   ::= ENUMERATED {
    direct,
    change-of-serve-cell,
    stop-change-of-serve-cell,
    ...
}

E-RAB-ID        ::= INTEGER (0..15, ...)

E-RABInformationList    ::= SEQUENCE (SIZE (1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { { E-RABInformationListIEs } }

E-RABInformationListIEs S1AP-PROTOCOL-IES ::= {
    { ID id-E-RABInformationListItem            CRITICALITY ignore  TYPE E-RABInformationListItem               PRESENCE mandatory     },
    ...
}

E-RABInformationListItem ::= SEQUENCE {
    e-RAB-ID                        E-RAB-ID,
    dL-Forwarding                   DL-Forwarding       OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {E-RABInformationListItem-ExtIEs} }                    OPTIONAL,
    ...
}

E-RABInformationListItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

E-RABList ::= SEQUENCE (SIZE(1.. maxNrOfE-RABs)) OF ProtocolIE-SingleContainer { {E-RABItemIEs} }

E-RABItemIEs    S1AP-PROTOCOL-IES ::= {
```

```
    { ID id-E-RABItem    CRITICALITY ignore TYPE E-RABItem  PRESENCE mandatory },
    ...
}

E-RABItem ::= SEQUENCE {
    e-RAB-ID                    E-RAB-ID,
    cause                       Cause,
    iE-Extensions               ProtocolExtensionContainer { {E-RABItem-ExtIEs} } OPTIONAL,
    ...
}

E-RABItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


E-RABLevelQoSParameters ::= SEQUENCE {
    qCI         QCI,
    allocationRetentionPriority         AllocationAndRetentionPriority,
    gbrQosInformation                   GBR-QosInformation          OPTIONAL,
    iE-Extensions                       ProtocolExtensionContainer { {E-RABQoSParameters-ExtIEs} } OPTIONAL,
    ...
}

E-RABQoSParameters-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


EUTRAN-CGI ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    cell-ID                 CellIdentity,
    iE-Extensions           ProtocolExtensionContainer { {EUTRAN-CGI-ExtIEs} } OPTIONAL,
    ...
}

EUTRAN-CGI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

EUTRANRoundTripDelayEstimationInfo ::= INTEGER (0..2047)

ExtendedRNC-ID                  ::= INTEGER (4096..65535)

ExtendedRepetitionPeriod ::= INTEGER (4096..131071)

-- F

ForbiddenInterRATs ::= ENUMERATED {
    all,
    geran,
    utran,
    cdma2000,
```

```
    ...,
    geranandutran,
    cdma2000andutran

}

ForbiddenTAs ::= SEQUENCE (SIZE(1.. maxnoofEPLMNsPlusOne)) OF ForbiddenTAs-Item

ForbiddenTAs-Item ::= SEQUENCE {
    pLMN-Identity       PLMNidentity,
    forbiddenTACs       ForbiddenTACs,
    iE-Extensions       ProtocolExtensionContainer { {ForbiddenTAs-Item-ExtIEs} } OPTIONAL,
    ...
}

ForbiddenTAs-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ForbiddenTACs ::= SEQUENCE (SIZE(1..maxnoofForbTACs)) OF TAC

ForbiddenLAs ::= SEQUENCE (SIZE(1..maxnoofEPLMNsPlusOne)) OF ForbiddenLAs-Item

ForbiddenLAs-Item ::= SEQUENCE {
    pLMN-Identity       PLMNidentity,
    forbiddenLACs       ForbiddenLACs,
    iE-Extensions       ProtocolExtensionContainer { {ForbiddenLAs-Item-ExtIEs} } OPTIONAL,
    ...
}

ForbiddenLAs-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ForbiddenLACs ::= SEQUENCE (SIZE(1..maxnoofForbLACs)) OF LAC

-- G

GBR-QosInformation ::= SEQUENCE {
    e-RAB-MaximumBitrateDL          BitRate,
    e-RAB-MaximumBitrateUL          BitRate,
    e-RAB-GuaranteedBitrateDL       BitRate,
    e-RAB-GuaranteedBitrateUL       BitRate,
    iE-Extensions                   ProtocolExtensionContainer { { GBR-QosInformation-ExtIEs} } OPTIONAL,
    ...
}

GBR-QosInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


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

```
GUMMEI          ::= SEQUENCE {
    pLMN-Identity       PLMNidentity,
    mME-Group-ID        MME-Group-ID,
    mME-Code            MME-Code,
    iE-Extensions       ProtocolExtensionContainer { {GUMMEI-ExtIEs} } OPTIONAL,
    ...
}

GUMMEI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

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

-- H

HandoverRestrictionList ::= SEQUENCE {
    servingPLMN                 PLMNidentity,
    equivalentPLMNs             EPLMNs                  OPTIONAL,
    forbiddenTAs                ForbiddenTAs            OPTIONAL,
    forbiddenLAs                ForbiddenLAs            OPTIONAL,
    forbiddenInterRATs          ForbiddenInterRATs      OPTIONAL,
    iE-Extensions               ProtocolExtensionContainer { {HandoverRestrictionList-ExtIEs} } OPTIONAL,
    ...
}

HandoverRestrictionList-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

HandoverType ::= ENUMERATED {
    intralte,
    ltetoutran,
    ltetogeran,
    utrantolte,
    gerantolte,
    ...
}

HFN ::= INTEGER (0..1048575)

-- I

ImmediateMDT ::= SEQUENCE {
    measurementsToActivate      MeasurementsToActivate,
    reportingTriggerMDT         ReportingTriggerMDT,
    thresholdeventA2            ThresholdEventA2                OPTIONAL,
-- Included in case of event-triggered reporting for measurement M1
    periodicReportingMDT        PeriodicReportingMDT            OPTIONAL,
```

```
-- Included in case of periodic reporting
    iE-Extensions               ProtocolExtensionContainer { { ImmediateMDT-ExtIEs} } OPTIONAL,
    ...
}

ImmediateMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

IMSI    ::= OCTET STRING (SIZE (3..8))

IntegrityProtectionAlgorithms ::= BIT STRING (SIZE (16,...))

InterfacesToTrace ::= BIT STRING (SIZE (8))



-- J
-- K
-- L


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

LAI ::= SEQUENCE {
    pLMNidentity                PLMNidentity,
    lAC             LAC,
    iE-Extensions           ProtocolExtensionContainer { {LAI-ExtIEs} } OPTIONAL,
    ...
}

LAI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

LastVisitedCell-Item ::= CHOICE {
    e-UTRAN-Cell                    LastVisitedEUTRANCellInformation,
    uTRAN-Cell                      LastVisitedUTRANCellInformation,
    gERAN-Cell                      LastVisitedGERANCellInformation,
    ...
}
LastVisitedEUTRANCellInformation ::= SEQUENCE {
    global-Cell-ID                  EUTRAN-CGI,
    cellType                        CellType,
    time-UE-StayedInCell            Time-UE-StayedInCell,
    iE-Extensions                   ProtocolExtensionContainer { { LastVisitedEUTRANCellInformation-ExtIEs} } OPTIONAL,
    ...
}
LastVisitedEUTRANCellInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}
LastVisitedUTRANCellInformation ::= OCTET STRING
```

```
LastVisitedGERANCellInformation ::= CHOICE {
    undefined                       NULL,
    ...
}

L3-Information              ::= OCTET STRING
-- This is a dummy IE used only as a reference to the actual definition in relevant specification.

LPPa-PDU ::=  OCTET STRING

LoggedMDT ::= SEQUENCE {
    loggingInterval             LoggingInterval,
    loggingDuration             LoggingDuration,
    iE-Extensions               ProtocolExtensionContainer { {LoggedMDT-ExtIEs} } OPTIONAL,
    ...
}

LoggedMDT-ExtIEs    S1AP-PROTOCOL-EXTENSION ::= {
...
}

LoggingInterval ::= ENUMERATED {ms128, ms256, ms512, ms1024, ms2048, ms3072, ms4096, ms6144}

LoggingDuration ::= ENUMERATED {m10, m20, m40, m60, m90, m120}

-- M

MDT-Activation  ::= ENUMERATED {
    immediate-MDT-only,
    immediate-MDT-and-Trace,
    logged-MDT-only,
    ...
}

MDT-Configuration ::= SEQUENCE {
    mdt-Activation              MDT-Activation,
    areaScopeOfMDT              AreaScopeOfMDT,
    mDTMode                     MDTMode,
    iE-Extensions               ProtocolExtensionContainer { { MDT-Configuration-ExtIEs} } OPTIONAL,
    ...
}
MDT-Configuration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ManagementBasedMDTAllowed ::= ENUMERATED {allowed, ...}

PrivacyIndicator ::= ENUMERATED {
    immediate-MDT,
    logged-MDT,
    ...
}
```

```
MDTMode ::= CHOICE {
    immediateMDT                ImmediateMDT,
    loggedMDT                   LoggedMDT,
    ...
}

MeasurementsToActivate ::= BIT STRING (SIZE (8))

MeasurementThresholdA2 ::= CHOICE {
    threshold-RSRP              Threshold-RSRP,
    threshold-RSRQ              Threshold-RSRQ,
    ...
}

MessageIdentifier   ::= BIT STRING (SIZE (16))

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

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

MME-Group-ID    ::= OCTET STRING (SIZE (2))

MME-Code        ::= OCTET STRING (SIZE (1))

MME-UE-S1AP-ID  ::= INTEGER (0..4294967295)
M-TMSI          ::= OCTET STRING (SIZE (4))

MSClassmark2    ::= OCTET STRING
MSClassmark3    ::= OCTET STRING

-- N

NAS-PDU ::=  OCTET STRING

NASSecurityParametersfromE-UTRAN ::= OCTET STRING

NASSecurityParameterstoE-UTRAN ::= OCTET STRING

NumberofBroadcastRequest ::= INTEGER (0..65535)

NumberOfBroadcasts ::= INTEGER (0..65535)

-- O
OldBSS-ToNewBSS-Information     ::= OCTET STRING
-- This is a dummy IE used only as a reference to the actual definition in relevant specification.

OverloadAction ::= ENUMERATED {
    reject-non-emergency-mo-dt,
    reject-rrc-cr-signalling,
    permit-emergency-sessions-and-mobile-terminated-services-only,
    ...,
    permit-high-priority-sessions-and-mobile-terminated-services-only,
```

```
    reject-delay-tolerant-access
}

OverloadResponse ::= CHOICE {
    overloadAction                  OverloadAction,
    ...
}


-- P

PagingDRX ::= ENUMERATED {
    v32,
    v64,
    v128,
    v256,
    ...
   }

PagingPriority ::= ENUMERATED {
    priolevel1,
    priolevel2,
    priolevel3,
    priolevel4,
    priolevel5,
    priolevel6,
    priolevel7,
    priolevel8,
    ...
}

PDCP-SN ::= INTEGER (0..4095)

PeriodicReportingMDT ::= SEQUENCE {
    reportInterval              ReportIntervalMDT,
    reportAmount                ReportAmountMDT,
    iE-Extensions               ProtocolExtensionContainer { { PeriodicReportingMDT-ExtIEs} } OPTIONAL,
    ...
}

PeriodicReportingMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

PLMNidentity                ::= TBCD-STRING

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)

PS-ServiceNotAvailable ::= ENUMERATED {
    ps-service-not-available,
    ...
}

-- Q

QCI                     ::= INTEGER (0..255)

-- R

ReceiveStatusofULPDCPSDUs ::= BIT STRING (SIZE(4096))

RelativeMMECapacity             ::= INTEGER (0..255)

RelayNode-Indicator ::= ENUMERATED {
    true,
    ...
}

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

ReportAmountMDT ::= ENUMERATED{r1, r2, r4, r8, r16, r32, r64, rinfinity}

ReportIntervalMDT ::= ENUMERATED {ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, min1, min6, min12, min30, min60}

ReportingTriggerMDT ::= ENUMERATED{
    periodic,
    a2eventtriggered,
    ...
}

RequestType ::= SEQUENCE {
    eventType               EventType,
    reportArea              ReportArea,
    iE-Extensions           ProtocolExtensionContainer { { RequestType-ExtIEs} }    OPTIONAL,
    ...
}


RequestType-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

RIMTransfer ::= SEQUENCE {
    rIMInformation          RIMInformation,
    rIMRoutingAddress       RIMRoutingAddress       OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { { RIMTransfer-ExtIEs} }            OPTIONAL,
```

```
    ...
}

RIMTransfer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

RIMInformation ::= OCTET STRING

RIMRoutingAddress ::= CHOICE {
    gERAN-Cell-ID           GERAN-Cell-ID,
    ...,
    targetRNC-ID            TargetRNC-ID
}

ReportArea ::= ENUMERATED {
    ecgi,
    ...
}

RepetitionPeriod ::= INTEGER (0..4095)


RNC-ID                  ::= INTEGER (0..4095)

RRC-Container   ::= OCTET STRING

RRC-Establishment-Cause ::= ENUMERATED {
    emergency,
    highPriorityAccess,
    mt-Access,
    mo-Signalling,
    mo-Data,
    ...,
    delay-TolerantAccess
}

Routing-ID      ::= INTEGER (0..255)

-- S


SecurityKey ::= BIT STRING (SIZE(256))



SecurityContext ::= SEQUENCE {
    nextHopChainingCount        INTEGER (0..7),
    nextHopParameter            SecurityKey,
    iE-Extensions               ProtocolExtensionContainer { { SecurityContext-ExtIEs} } OPTIONAL,
    ...
}
```

```
SecurityContext-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

SerialNumber ::= BIT STRING (SIZE (16))

SONInformation ::= CHOICE{
    sONInformationRequest       SONInformationRequest,
    sONInformationReply         SONInformationReply,
    ...
}

SONInformationRequest ::= ENUMERATED {
    x2TNL-Configuration-Info,
    ...,
    time-Synchronization-Info}

SONInformationReply ::= SEQUENCE {
    x2TNLConfigurationInfo          X2TNLConfigurationInfo          OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer {{SONInformationReply-ExtIEs}} OPTIONAL,
    ...
}

SONInformationReply-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for Release 9 to transfer Time synchronization information --
    {ID id-Time-Synchronization-Info    CRITICALITY ignore      EXTENSION TimeSynchronizationInfo        PRESENCE optional},
    ...
}


SONConfigurationTransfer ::= SEQUENCE {
    targeteNB-ID                    TargeteNB-ID,
    sourceeNB-ID                    SourceeNB-ID,
    sONInformation                  SONInformation,
    iE-Extensions           ProtocolExtensionContainer { { SONConfigurationTransfer-ExtIEs} }            OPTIONAL,
...
}

SONConfigurationTransfer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for Release 10 to transfer the IP addresses of the eNB initiating the ANR action --
    {ID id-x2TNLConfigurationInfo   CRITICALITY ignore  EXTENSION X2TNLConfigurationInfo    PRESENCE conditional
    -- This IE shall be present if the SON Information IE contains the SON Information Request IE and the SON Information Request IE is set to
"X2TNL Configuration Info" -- },
    ...
}



Source-ToTarget-TransparentContainer ::= OCTET STRING
-- This IE includes a transparent container from the source RAN node to the target RAN node.
-- The octets of the OCTET STRING are encoded according to the specifications of the target system.
```

```
SourceBSS-ToTargetBSS-TransparentContainer      ::= OCTET STRING
-- This is a dummy IE used only as a reference to the actual definition in relevant specification.

SourceeNB-ID ::= SEQUENCE {
    global-ENB-ID   Global-ENB-ID,
    selected-TAI    TAI,
    iE-Extensions   ProtocolExtensionContainer { {SourceeNB-ID-ExtIEs} } OPTIONAL
}

SourceeNB-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

SRVCCOperationPossible ::= ENUMERATED {
    possible,
    ...
}

SRVCCHOIndication ::= ENUMERATED {
    pSandCS,
    cSonly,
    ...
}

SourceeNB-ToTargeteNB-TransparentContainer      ::= SEQUENCE {
    rRC-Container                   RRC-Container,
    e-RABInformationList            E-RABInformationList        OPTIONAL,
    targetCell-ID                   EUTRAN-CGI,
    subscriberProfileIDforRFP       SubscriberProfileIDforRFP       OPTIONAL,
    uE-HistoryInformation           UE-HistoryInformation,
    iE-Extensions           ProtocolExtensionContainer { {SourceeNB-ToTargeteNB-TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}

SourceeNB-ToTargeteNB-TransparentContainer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


SourceRNC-ToTargetRNC-TransparentContainer      ::= OCTET STRING
-- This is a dummy IE used only as a reference to the actual definition in relevant specification.


ServedGUMMEIs ::= SEQUENCE (SIZE (1.. maxnoofRATs)) OF ServedGUMMEIsItem

ServedGUMMEIsItem ::= SEQUENCE {
    servedPLMNs             ServedPLMNs,
    servedGroupIDs          ServedGroupIDs,
    servedMMECs             ServedMMECs,
    iE-Extensions           ProtocolExtensionContainer { {ServedGUMMEIsItem-ExtIEs} }   OPTIONAL,
    ...
}
```

```
ServedGUMMEIsItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ServedGroupIDs ::= SEQUENCE (SIZE(1.. maxnoofGroupIDs)) OF MME-Group-ID
ServedMMECs ::= SEQUENCE (SIZE(1.. maxnoofMMECs)) OF MME-Code

ServedPLMNs ::= SEQUENCE (SIZE(1.. maxnoofPLMNsPerMME)) OF PLMNidentity

SubscriberProfileIDforRFP ::= INTEGER (1..256)

SupportedTAs ::= SEQUENCE (SIZE(1.. maxnoofTACs)) OF SupportedTAs-Item

SupportedTAs-Item ::=   SEQUENCE  {
    tAC                 TAC,
    broadcastPLMNs      BPLMNs,
    iE-Extensions       ProtocolExtensionContainer { {SupportedTAs-Item-ExtIEs} } OPTIONAL,
    ...
}

SupportedTAs-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

StratumLevel ::= INTEGER (0..3, ...)

SynchronizationStatus ::= ENUMERATED { synchronous, asynchronous, ... }

TimeSynchronizationInfo ::= SEQUENCE {
    stratumLevel                    StratumLevel,
    synchronizationStatus           SynchronizationStatus,
    iE-Extensions                   ProtocolExtensionContainer { { TimeSynchronizationInfo-ExtIEs} } OPTIONAL,
    ...
}

TimeSynchronizationInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

S-TMSI ::= SEQUENCE {
    mMEC    MME-Code,
    m-TMSI  M-TMSI,
    iE-Extensions       ProtocolExtensionContainer { {S-TMSI-ExtIEs} } OPTIONAL,
    ...
}

S-TMSI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- T

TAC ::= OCTET STRING (SIZE (2))
```

```
TAIListforWarning ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAI

TAI ::= SEQUENCE {
    pLMNidentity            PLMNidentity,
    tAC                     TAC,
    iE-Extensions           ProtocolExtensionContainer { {TAI-ExtIEs} } OPTIONAL,
    ...
}

TAI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAI-Broadcast ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAI-Broadcast-Item

TAI-Broadcast-Item ::= SEQUENCE {
    tAI                 TAI,
    completedCellinTAI  CompletedCellinTAI,
    iE-Extensions       ProtocolExtensionContainer { {TAI-Broadcast-Item-ExtIEs} } OPTIONAL,
    ...
}

TAI-Broadcast-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAI-Cancelled ::= SEQUENCE (SIZE(1..maxnoofTAIforWarning)) OF TAI-Cancelled-Item

TAI-Cancelled-Item ::= SEQUENCE {
    tAI                 TAI,
    cancelledCellinTAI  CancelledCellinTAI,
    iE-Extensions       ProtocolExtensionContainer { {TAI-Cancelled-Item-ExtIEs} } OPTIONAL,
    ...
}

TAI-Cancelled-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TABasedMDT ::= SEQUENCE {
    tAListforMDT            TAListforMDT,
    iE-Extensions           ProtocolExtensionContainer { {TABasedMDT-ExtIEs} } OPTIONAL,
    ...
}

TABasedMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TAListforMDT ::= SEQUENCE (SIZE(1..maxnoofTAforMDT)) OF TAC

CompletedCellinTAI ::= SEQUENCE (SIZE(1..maxnoofCellinTAI)) OF CompletedCellinTAI-Item
```

```
CompletedCellinTAI-Item ::= SEQUENCE{
    eCGI                EUTRAN-CGI,
    iE-Extensions       ProtocolExtensionContainer { {CompletedCellinTAI-Item-ExtIEs} } OPTIONAL,
    ...
}

CompletedCellinTAI-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TBCD-STRING ::= OCTET STRING (SIZE (3))

TargetID ::= CHOICE {
    targeteNB-ID            TargeteNB-ID,
    targetRNC-ID            TargetRNC-ID,
    cGI                     CGI,
    ...
}

TargeteNB-ID ::= SEQUENCE {
    global-ENB-ID   Global-ENB-ID,
    selected-TAI    TAI,
    iE-Extensions   ProtocolExtensionContainer { {TargeteNB-ID-ExtIEs} } OPTIONAL,
    ...
}

TargeteNB-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

TargetRNC-ID ::= SEQUENCE {
    lAI                 LAI,
    rAC                 RAC     OPTIONAL,
    rNC-ID              RNC-ID,
    extendedRNC-ID      ExtendedRNC-ID      OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { {TargetRNC-ID-ExtIEs} } OPTIONAL,
    ...
    }


TargetRNC-ID-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


TargeteNB-ToSourceeNB-TransparentContainer      ::= SEQUENCE {
    rRC-Container           RRC-Container,
    iE-Extensions           ProtocolExtensionContainer { {TargeteNB-ToSourceeNB-TransparentContainer-ExtIEs} } OPTIONAL,
    ...
}

TargeteNB-ToSourceeNB-TransparentContainer-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
```

```
    ...
}

Target-ToSource-TransparentContainer ::= OCTET STRING
-- This IE includes a transparent container from the target RAN node to the source RAN node.
-- The octets of the OCTET STRING are coded according to the specifications of the target system.

TargetRNC-ToSourceRNC-TransparentContainer      ::= OCTET STRING
-- This is a dummy IE used only as a reference to the actual definition in relevant specification.

TargetBSS-ToSourceBSS-TransparentContainer      ::= OCTET STRING
-- This is a dummy IE used only as a reference to the actual definition in relevant specification.

ThresholdEventA2 ::= SEQUENCE {
    measurementThreshold        MeasurementThresholdA2,
    iE-Extensions               ProtocolExtensionContainer { { ThresholdEventA2-ExtIEs} } OPTIONAL,
    ...
}

ThresholdEventA2-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

Threshold-RSRP ::= INTEGER(0..97)

Threshold-RSRQ ::= INTEGER(0..34)

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

Time-UE-StayedInCell ::= INTEGER (0..4095)

TransportLayerAddress       ::= BIT STRING (SIZE(1..160, ...))

TraceActivation ::= SEQUENCE {
    e-UTRAN-Trace-ID                    E-UTRAN-Trace-ID,
    interfacesToTrace               InterfacesToTrace,
    traceDepth                      TraceDepth,
    traceCollectionEntityIPAddress  TransportLayerAddress,
    iE-Extensions                   ProtocolExtensionContainer { { TraceActivation-ExtIEs} }     OPTIONAL,
    ...
}

TraceActivation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for Rel-10 to support MDT --
    { ID id-MDTConfiguration    CRITICALITY ignore  EXTENSION MDT-Configuration     PRESENCE    optional },
    ...
}

TraceDepth ::= ENUMERATED {
    minimum,
    medium,
    maximum,
    minimumWithoutVendorSpecificExtension,
```

```
    mediumWithoutVendorSpecificExtension,
    maximumWithoutVendorSpecificExtension,
    ...
}

E-UTRAN-Trace-ID ::=  OCTET STRING (SIZE (8))

TrafficLoadReductionIndication ::= INTEGER (1..99)

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

-- U

UEAggregateMaximumBitrate ::= SEQUENCE {
    uEaggregateMaximumBitRateDL             BitRate,
    uEaggregateMaximumBitRateUL             BitRate,
    iE-Extensions                           ProtocolExtensionContainer { {UEAggregate-MaximumBitrates-ExtIEs} } OPTIONAL,
    ...
}

UEAggregate-MaximumBitrates-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}



UE-S1AP-IDs ::= CHOICE{
    uE-S1AP-ID-pair     UE-S1AP-ID-pair,
    mME-UE-S1AP-ID      MME-UE-S1AP-ID,
    ...
}

UE-S1AP-ID-pair ::= SEQUENCE{
    mME-UE-S1AP-ID      MME-UE-S1AP-ID,
    eNB-UE-S1AP-ID      ENB-UE-S1AP-ID,
    iE-Extensions       ProtocolExtensionContainer { {UE-S1AP-ID-pair-ExtIEs} } OPTIONAL,
    ...
}
UE-S1AP-ID-pair-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}


UE-associatedLogicalS1-ConnectionItem ::= SEQUENCE {
    mME-UE-S1AP-ID                  MME-UE-S1AP-ID OPTIONAL,
    eNB-UE-S1AP-ID                  ENB-UE-S1AP-ID OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { UE-associatedLogicalS1-ConnectionItemExtIEs} } OPTIONAL,
    ...
}
```

```
UE-associatedLogicalS1-ConnectionItemExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

UEIdentityIndexValue    ::= BIT STRING (SIZE (10))

UE-HistoryInformation ::= SEQUENCE (SIZE(1..maxnoofCells)) OF LastVisitedCell-Item

UEPagingID ::= CHOICE {
    s-TMSI      S-TMSI,
    iMSI        IMSI,
    ...
    }

UERadioCapability ::= OCTET STRING

UESecurityCapabilities ::= SEQUENCE {
    encryptionAlgorithms            EncryptionAlgorithms,
    integrityProtectionAlgorithms   IntegrityProtectionAlgorithms,
    iE-Extensions                   ProtocolExtensionContainer { { UESecurityCapabilities-ExtIEs} }             OPTIONAL,
...
}

UESecurityCapabilities-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- V
-- W

WarningAreaList ::= CHOICE {
    cellIDList                      ECGIList,
    trackingAreaListforWarning      TAIListforWarning,
    emergencyAreaIDList             EmergencyAreaIDList,
    ...
}


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

WarningSecurityInfo ::= OCTET STRING (SIZE (50))


WarningMessageContents ::= OCTET STRING (SIZE(1..9600))


-- X


X2TNLConfigurationInfo ::= SEQUENCE {
    eNBX2TransportLayerAddresses    ENBX2TLAs,
```

```
    iE-Extensions                   ProtocolExtensionContainer { { X2TNLConfigurationInfo-ExtIEs} } OPTIONAL,
    ...
}

X2TNLConfigurationInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for Release 10 to transfer the IPsec and U-plane addresses during ANR action --
    {ID id-eNBX2ExtendedTransportLayerAddresses CRITICALITY ignore  EXTENSION ENBX2ExtTLAs  PRESENCE optional},
    ...
}

ENBX2ExtTLAs ::= SEQUENCE (SIZE(1.. maxnoofeNBX2ExtTLAs)) OF ENBX2ExtTLA

ENBX2ExtTLA ::= SEQUENCE {
    iPsecTLA                    TransportLayerAddress       OPTIONAL,
    gTPTLAa                     ENBX2GTPTLAs                OPTIONAL,
    iE-Extensions               ProtocolExtensionContainer { { ENBX2ExtTLA-ExtIEs} } OPTIONAL,
    ...
}

ENBX2ExtTLA-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
    ...
}

ENBX2GTPTLAs ::= SEQUENCE (SIZE(1.. maxnoofeNBX2GTPTLAs)) OF TransportLayerAddress

-- Y
-- Z

END
```

9.3.5 Common Definitions

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

S1AP-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-CommonDataTypes (3) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

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

PrivateIE-ID    ::= CHOICE {
    local               INTEGER (0..65535),
    global              OBJECT IDENTIFIER
}

ProcedureCode       ::= INTEGER (0..255)

ProtocolExtensionID ::= INTEGER (0..65535)

ProtocolIE-ID       ::= INTEGER (0..65535)

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

END
```

9.3.6 Constant Definitions

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

S1AP-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN
```

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

IMPORTS
    ProcedureCode,
    ProtocolIE-ID

FROM S1AP-CommonDataTypes;


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

id-HandoverPreparation              ProcedureCode ::= 0
id-HandoverResourceAllocation       ProcedureCode ::= 1
id-HandoverNotification         ProcedureCode ::= 2
id-PathSwitchRequest                ProcedureCode ::= 3
id-HandoverCancel                   ProcedureCode ::= 4
id-E-RABSetup                       ProcedureCode ::= 5
id-E-RABModify                      ProcedureCode ::= 6
id-E-RABRelease                     ProcedureCode ::= 7
id-E-RABReleaseIndication           ProcedureCode ::= 8
id-InitialContextSetup              ProcedureCode ::= 9
id-Paging                           ProcedureCode ::= 10
id-downlinkNASTransport             ProcedureCode ::= 11
id-initialUEMessage                 ProcedureCode ::= 12
id-uplinkNASTransport               ProcedureCode ::= 13
id-Reset                            ProcedureCode::= 14
id-ErrorIndication                  ProcedureCode ::= 15
id-NASNonDeliveryIndication         ProcedureCode ::= 16
id-S1Setup                          ProcedureCode ::= 17
id-UEContextReleaseRequest          ProcedureCode ::= 18
id-DownlinkS1cdma2000tunneling      ProcedureCode ::= 19
id-UplinkS1cdma2000tunneling        ProcedureCode ::= 20
id-UEContextModification            ProcedureCode ::= 21
id-UECapabilityInfoIndication       ProcedureCode ::= 22
id-UEContextRelease                 ProcedureCode ::= 23
id-eNBStatusTransfer                ProcedureCode ::= 24
id-MMEStatusTransfer                ProcedureCode ::= 25
id-DeactivateTrace                  ProcedureCode ::= 26
id-TraceStart                       ProcedureCode ::= 27
id-TraceFailureIndication           ProcedureCode ::= 28
id-ENBConfigurationUpdate           ProcedureCode ::= 29
id-MMEConfigurationUpdate           ProcedureCode ::= 30
id-LocationReportingControl         ProcedureCode ::= 31
id-LocationReportingFailureIndication   ProcedureCode ::= 32
```

```
id-LocationReport                   ProcedureCode ::= 33
id-OverloadStart                    ProcedureCode ::= 34
id-OverloadStop                     ProcedureCode ::= 35
id-WriteReplaceWarning              ProcedureCode ::= 36
id-eNBDirectInformationTransfer     ProcedureCode ::= 37
id-MMEDirectInformationTransfer     ProcedureCode ::= 38
id-PrivateMessage                   ProcedureCode ::= 39
id-eNBConfigurationTransfer         ProcedureCode ::= 40
id-MMEConfigurationTransfer         ProcedureCode ::= 41
id-CellTrafficTrace                 ProcedureCode ::= 42
id-Kill                             ProcedureCode ::= 43
id-downlinkUEAssociatedLPPaTransport    ProcedureCode ::= 44
id-uplinkUEAssociatedLPPaTransport      ProcedureCode ::= 45
id-downlinkNonUEAssociatedLPPaTransport ProcedureCode ::= 46
id-uplinkNonUEAssociatedLPPaTransport   ProcedureCode ::= 47

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

maxPrivateIEs                       INTEGER ::= 65535
maxProtocolExtensions               INTEGER ::= 65535
maxProtocolIEs                      INTEGER ::= 65535
-- ************************************************************
--
-- Lists
--
-- ************************************************************

maxNrOfCSGs                             INTEGER ::= 256
maxNrOfE-RABs                           INTEGER ::= 256
maxnoofTAIs                             INTEGER ::= 256
maxnoofTACs                             INTEGER ::= 256
maxNrOfErrors                           INTEGER ::= 256
maxnoofBPLMNs                           INTEGER ::= 6
maxnoofPLMNsPerMME                      INTEGER ::= 32
maxnoofEPLMNs                           INTEGER ::= 15
maxnoofEPLMNsPlusOne                    INTEGER ::= 16
maxnoofForbLACs                         INTEGER ::= 4096
maxnoofForbTACs                         INTEGER ::= 4096
maxNrOfIndividualS1ConnectionsToReset   INTEGER ::= 256
maxnoofCells                            INTEGER ::= 16
maxnoofTAIforWarning                    INTEGER ::= 65535
maxnoofCellID                           INTEGER ::= 65535
maxnoofEmergencyAreaID                  INTEGER ::= 65535
maxnoofCellinTAI                        INTEGER ::= 65535
maxnoofCellinEAI                        INTEGER ::= 65535
maxnoofeNBX2TLAs                        INTEGER ::= 2
maxnoofeNBX2ExtTLAs                     INTEGER ::= 16
maxnoofeNBX2GTPTLAs                     INTEGER ::= 16
maxnoofRATs                             INTEGER ::= 8
```

```
maxnoofGroupIDs                         INTEGER ::= 65535
maxnoofMMECs                            INTEGER ::= 256
maxnoofCellIDforMDT                     INTEGER ::= 32
maxnoofTAforMDT                         INTEGER ::= 8


-- ************************************************************
--
-- IEs
--
-- ************************************************************

id-MME-UE-S1AP-ID                           ProtocolIE-ID ::= 0
id-HandoverType                             ProtocolIE-ID ::= 1
id-Cause                                    ProtocolIE-ID ::= 2
id-SourceID                                 ProtocolIE-ID ::= 3
id-TargetID                                 ProtocolIE-ID ::= 4
id-eNB-UE-S1AP-ID                           ProtocolIE-ID ::= 8
id-E-RABSubjecttoDataForwardingList         ProtocolIE-ID ::= 12
id-E-RABtoReleaseListHOCmd                  ProtocolIE-ID ::= 13
id-E-RABDataForwardingItem                  ProtocolIE-ID ::= 14
id-E-RABReleaseItemBearerRelComp            ProtocolIE-ID ::= 15
id-E-RABToBeSetupListBearerSUReq            ProtocolIE-ID ::= 16
id-E-RABToBeSetupItemBearerSUReq            ProtocolIE-ID ::= 17
id-E-RABAdmittedList                        ProtocolIE-ID ::= 18
id-E-RABFailedToSetupListHOReqAck           ProtocolIE-ID ::= 19
id-E-RABAdmittedItem                        ProtocolIE-ID ::= 20
id-E-RABFailedtoSetupItemHOReqAck           ProtocolIE-ID ::= 21
id-E-RABToBeSwitchedDLList                  ProtocolIE-ID ::= 22
id-E-RABToBeSwitchedDLItem                  ProtocolIE-ID ::= 23
id-E-RABToBeSetupListCtxtSUReq              ProtocolIE-ID ::= 24
id-TraceActivation                          ProtocolIE-ID ::= 25
id-NAS-PDU                                  ProtocolIE-ID ::= 26
id-E-RABToBeSetupItemHOReq                  ProtocolIE-ID ::= 27
id-E-RABSetupListBearerSURes                ProtocolIE-ID ::= 28
id-E-RABFailedToSetupListBearerSURes        ProtocolIE-ID ::= 29
id-E-RABToBeModifiedListBearerModReq        ProtocolIE-ID ::= 30
id-E-RABModifyListBearerModRes              ProtocolIE-ID ::= 31
id-E-RABFailedToModifyList                  ProtocolIE-ID ::= 32
id-E-RABToBeReleasedList                    ProtocolIE-ID ::= 33
id-E-RABFailedToReleaseList                 ProtocolIE-ID ::= 34
id-E-RABItem                                ProtocolIE-ID ::= 35
id-E-RABToBeModifiedItemBearerModReq        ProtocolIE-ID ::= 36
id-E-RABModifyItemBearerModRes              ProtocolIE-ID ::= 37
id-E-RABReleaseItem                         ProtocolIE-ID ::= 38
id-E-RABSetupItemBearerSURes                ProtocolIE-ID ::= 39
id-SecurityContext                          ProtocolIE-ID ::= 40
id-HandoverRestrictionList                  ProtocolIE-ID ::= 41
id-UEPagingID                               ProtocolIE-ID ::= 43
id-pagingDRX                                ProtocolIE-ID ::= 44
id-TAIList                                  ProtocolIE-ID ::= 46
id-TAIItem                                  ProtocolIE-ID ::= 47
id-E-RABFailedToSetupListCtxtSURes          ProtocolIE-ID ::= 48
```

```
id-E-RABReleaseItemHOCmd                    ProtocolIE-ID ::= 49
id-E-RABSetupItemCtxtSURes                  ProtocolIE-ID ::= 50
id-E-RABSetupListCtxtSURes                  ProtocolIE-ID ::= 51
id-E-RABToBeSetupItemCtxtSUReq              ProtocolIE-ID ::= 52
id-E-RABToBeSetupListHOReq                  ProtocolIE-ID ::= 53
id-GERANtoLTEHOInformationRes                   ProtocolIE-ID ::= 55
id-UTRANtoLTEHOInformationRes                   ProtocolIE-ID ::= 57
id-CriticalityDiagnostics                       ProtocolIE-ID ::= 58
id-Global-ENB-ID                                ProtocolIE-ID ::= 59
id-eNBname                                      ProtocolIE-ID ::= 60
id-MMEname                                      ProtocolIE-ID ::= 61
id-ServedPLMNs                                  ProtocolIE-ID ::= 63
id-SupportedTAs                                 ProtocolIE-ID ::= 64
id-TimeToWait                                   ProtocolIE-ID ::= 65
id-uEaggregateMaximumBitrate                    ProtocolIE-ID ::= 66
id-TAI                                          ProtocolIE-ID ::= 67
id-E-RABReleaseListBearerRelComp                ProtocolIE-ID ::= 69
id-cdma2000PDU                                  ProtocolIE-ID ::= 70
id-cdma2000RATType                              ProtocolIE-ID ::= 71
id-cdma2000SectorID                             ProtocolIE-ID ::= 72
id-SecurityKey                                  ProtocolIE-ID ::= 73
id-UERadioCapability                            ProtocolIE-ID ::= 74
id-GUMMEI-ID                                    ProtocolIE-ID ::= 75
id-E-RABInformationListItem                     ProtocolIE-ID ::= 78
id-Direct-Forwarding-Path-Availability          ProtocolIE-ID ::= 79
id-UEIdentityIndexValue                         ProtocolIE-ID ::= 80
id-cdma2000HOStatus                             ProtocolIE-ID ::= 83
id-cdma2000HORequiredIndication                 ProtocolIE-ID ::= 84
id-E-UTRAN-Trace-ID                             ProtocolIE-ID ::= 86
id-RelativeMMECapacity                          ProtocolIE-ID ::= 87
id-SourceMME-UE-S1AP-ID                         ProtocolIE-ID ::= 88
id-Bearers-SubjectToStatusTransfer-Item         ProtocolIE-ID ::= 89
id-eNB-StatusTransfer-TransparentContainer      ProtocolIE-ID ::= 90
id-UE-associatedLogicalS1-ConnectionItem        ProtocolIE-ID ::= 91
id-ResetType                                    ProtocolIE-ID ::= 92
id-UE-associatedLogicalS1-ConnectionListResAck  ProtocolIE-ID ::= 93
id-E-RABToBeSwitchedULItem                      ProtocolIE-ID ::= 94
id-E-RABToBeSwitchedULList                      ProtocolIE-ID ::= 95
id-S-TMSI                                       ProtocolIE-ID ::= 96
id-cdma2000OneXRAND                             ProtocolIE-ID ::= 97
id-RequestType                                  ProtocolIE-ID ::= 98
id-UE-S1AP-IDs                                  ProtocolIE-ID ::= 99
id-EUTRAN-CGI                                   ProtocolIE-ID ::= 100
id-OverloadResponse                             ProtocolIE-ID ::= 101
id-cdma2000OneXSRVCCInfo                        ProtocolIE-ID ::= 102
id-E-RABFailedToBeReleasedList                  ProtocolIE-ID ::= 103
id-Source-ToTarget-TransparentContainer         ProtocolIE-ID ::= 104
id-ServedGUMMEIs                                ProtocolIE-ID ::= 105
id-SubscriberProfileIDforRFP                    ProtocolIE-ID ::= 106
id-UESecurityCapabilities                       ProtocolIE-ID ::= 107
id-CSFallbackIndicator                          ProtocolIE-ID ::= 108
id-CNDomain                                     ProtocolIE-ID ::= 109
id-E-RABReleasedList                            ProtocolIE-ID ::= 110
```

```
id-MessageIdentifier                            ProtocolIE-ID ::= 111
id-SerialNumber                                 ProtocolIE-ID ::= 112
id-WarningAreaList                              ProtocolIE-ID ::= 113
id-RepetitionPeriod                             ProtocolIE-ID ::= 114
id-NumberofBroadcastRequest                     ProtocolIE-ID ::= 115
id-WarningType                                  ProtocolIE-ID ::= 116
id-WarningSecurityInfo                          ProtocolIE-ID ::= 117
id-DataCodingScheme                             ProtocolIE-ID ::= 118
id-WarningMessageContents                       ProtocolIE-ID ::= 119
id-BroadcastCompletedAreaList                   ProtocolIE-ID ::= 120
id-Inter-SystemInformationTransferTypeEDT       ProtocolIE-ID ::= 121
id-Inter-SystemInformationTransferTypeMDT       ProtocolIE-ID ::= 122
id-Target-ToSource-TransparentContainer         ProtocolIE-ID ::= 123
id-SRVCCOperationPossible                       ProtocolIE-ID ::= 124
id-SRVCCHOIndication                            ProtocolIE-ID ::= 125
id-NAS-DownlinkCount                            ProtocolIE-ID ::= 126
id-CSG-Id                                       ProtocolIE-ID ::= 127
id-CSG-IdList                                   ProtocolIE-ID ::= 128
id-SONConfigurationTransferECT                  ProtocolIE-ID ::= 129
id-SONConfigurationTransferMCT                  ProtocolIE-ID ::= 130
id-TraceCollectionEntityIPAddress               ProtocolIE-ID ::= 131
id-MSClassmark2                                 ProtocolIE-ID ::= 132
id-MSClassmark3                                 ProtocolIE-ID ::= 133
id-RRC-Establishment-Cause                      ProtocolIE-ID ::= 134
id-NASSecurityParametersfromE-UTRAN             ProtocolIE-ID ::= 135
id-NASSecurityParameterstoE-UTRAN               ProtocolIE-ID ::= 136
id-DefaultPagingDRX                             ProtocolIE-ID ::= 137
id-Source-ToTarget-TransparentContainer-Secondary   ProtocolIE-ID ::= 138
id-Target-ToSource-TransparentContainer-Secondary   ProtocolIE-ID ::= 139
id-EUTRANRoundTripDelayEstimationInfo           ProtocolIE-ID ::= 140
id-BroadcastCancelledAreaList                   ProtocolIE-ID ::= 141
id-ConcurrentWarningMessageIndicator            ProtocolIE-ID ::= 142
id-Data-Forwarding-Not-Possible                 ProtocolIE-ID ::= 143
id-ExtendedRepetitionPeriod                     ProtocolIE-ID ::= 144
id-CellAccessMode                               ProtocolIE-ID ::= 145
id-CSGMembershipStatus                          ProtocolIE-ID ::= 146
id-LPPa-PDU                                     ProtocolIE-ID ::= 147
id-Routing-ID                                   ProtocolIE-ID ::= 148
id-Time-Synchronization-Info                    ProtocolIE-ID ::= 149
id-PS-ServiceNotAvailable                       ProtocolIE-ID ::= 150
id-PagingPriority                               ProtocolIE-ID ::= 151
id-x2TNLConfigurationInfo                       ProtocolIE-ID ::= 152
id-eNBX2ExtendedTransportLayerAddresses         ProtocolIE-ID ::= 153
id-GUMMEIList                                   ProtocolIE-ID ::= 154
id-GW-TransportLayerAddress                     ProtocolIE-ID ::= 155
id-Correlation-ID                               ProtocolIE-ID ::= 156
id-SourceMME-GUMMEI                             ProtocolIE-ID ::= 157
id-MME-UE-S1AP-ID-2                             ProtocolIE-ID ::= 158
id-RegisteredLAI                                ProtocolIE-ID ::= 159
id-RelayNode-Indicator                          ProtocolIE-ID ::= 160
id-TrafficLoadReductionIndication               ProtocolIE-ID ::= 161
id-MDTConfiguration                             ProtocolIE-ID ::= 162
id-MMERelaySupportIndicator                     ProtocolIE-ID ::= 163
```

```
id-GWContextReleaseIndication                  ProtocolIE-ID ::= 164
id-ManagementBasedMDTAllowed                   ProtocolIE-ID ::= 165
id-PrivacyIndicator                            ProtocolIE-ID ::= 166

END
```

9.3.7 Container Definitions

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

S1AP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-Containers (5) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

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

IMPORTS
    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolExtensionID,
    ProtocolIE-ID
FROM S1AP-CommonDataTypes

    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs
FROM S1AP-Constants;

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

S1AP-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
--
-- **************************************************************

S1AP-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
--
-- **************************************************************

S1AP-PROTOCOL-EXTENSION ::= CLASS {
    &id             ProtocolExtensionID             UNIQUE,
    &criticality            Criticality,
    &Extension,
    &presence       Presence
}
WITH SYNTAX {
    ID              &id
    CRITICALITY         &criticality
    EXTENSION           &Extension
    PRESENCE        &presence
}

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

```
-- Class Definition for Private IEs
--
-- ************************************************************

S1AP-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 {S1AP-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-SingleContainer {S1AP-PROTOCOL-IES : IEsSetParam} ::=
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field {S1AP-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
    id              S1AP-PROTOCOL-IES.&id               ({IEsSetParam}),
    criticality         S1AP-PROTOCOL-IES.&criticality          ({IEsSetParam}{@id}),
    value               S1AP-PROTOCOL-IES.&Value            ({IEsSetParam}{@id})
}

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

ProtocolIE-ContainerPair {S1AP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-FieldPair {{IEsSetParam}}

ProtocolIE-FieldPair {S1AP-PROTOCOL-IES-PAIR : IEsSetParam} ::= SEQUENCE {
    id              S1AP-PROTOCOL-IES-PAIR.&id          ({IEsSetParam}),
    firstCriticality        S1AP-PROTOCOL-IES-PAIR.&firstCriticality    ({IEsSetParam}{@id}),
    firstValue          S1AP-PROTOCOL-IES-PAIR.&FirstValue         ({IEsSetParam}{@id}),
    secondCriticality       S1AP-PROTOCOL-IES-PAIR.&secondCriticality   ({IEsSetParam}{@id}),
    secondValue         S1AP-PROTOCOL-IES-PAIR.&SecondValue        ({IEsSetParam}{@id})
}
```

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

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, S1AP-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-SingleContainer {{IEsSetParam}}

ProtocolIE-ContainerPairList {INTEGER : lowerBound, INTEGER : upperBound, S1AP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-ContainerPair {{IEsSetParam}}

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

ProtocolExtensionContainer {S1AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
    SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
    ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField {S1AP-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
    id              S1AP-PROTOCOL-EXTENSION.&id         ({ExtensionSetParam}),
    criticality         S1AP-PROTOCOL-EXTENSION.&criticality        ({ExtensionSetParam}{@id}),
    extensionValue          S1AP-PROTOCOL-EXTENSION.&Extension      ({ExtensionSetParam}{@id})
}

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

PrivateIE-Container {S1AP-PRIVATE-IES : IEsSetParam } ::=
    SEQUENCE (SIZE (1.. maxPrivateIEs)) OF
    PrivateIE-Field {{IEsSetParam}}

PrivateIE-Field {S1AP-PRIVATE-IES : IEsSetParam} ::= SEQUENCE {
    id              S1AP-PRIVATE-IES.&id            ({IEsSetParam}),
    criticality         S1AP-PRIVATE-IES.&criticality       ({IEsSetParam}{@id}),
    value           S1AP-PRIVATE-IES.&Value     ({IEsSetParam}{@id})
}

END
```

9.4 Message Transfer Syntax

S1AP 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

$TS1_{RELOCprep}$

- Specifies the maximum time for the Handover Preparation procedure in the source eNB.

$TS1_{RELOCoverall}$

- Specifies the maximum time for the protection of the overall handover procedure in the source eNB.

$TX2_{RELOCOverall}$

- it is specified in reference TS 36.423 [22].

10 Handling of Unknown, Unforeseen and Erroneous Protocol Data

10.1 General

Protocol Error cases can be divided into three classes:

- Transfer Syntax Error.
- Abstract Syntax Error.
- Logical Error.

Protocol errors can occur in the following functions within a receiving node:

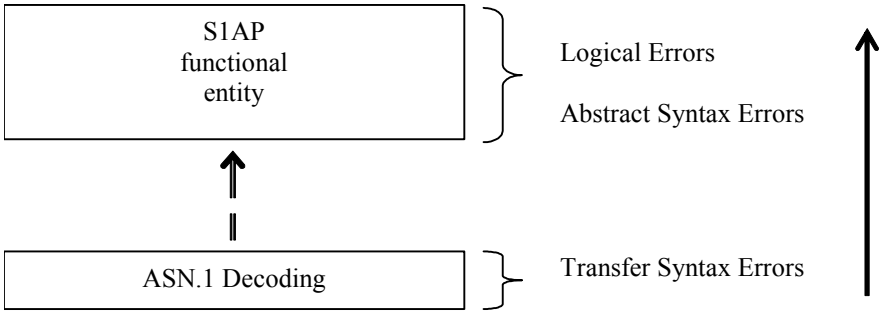

Figure 10.1: Protocol Errors in S1AP.

The information stated in subclauses 10.2, 10.3 and 10.4, to be included in the message used when reporting an error, is what at minimum shall be included. Other optional information elements within the message may also be included, if available. This is also valid for the case when the reporting is done with a response message. The latter is an exception to what is stated in subclause 4.1.

10.2 Transfer Syntax Error

A Transfer Syntax Error occurs when the receiver is not able to decode the received physical message. Transfer syntax errors are always detected in the process of ASN.1 decoding. If a Transfer Syntax Error occurs, the receiver should initiate Error Indication procedure with appropriate cause value for the Transfer Syntax protocol error.

Examples for Transfer Syntax Errors are:

- Violation of value ranges in ASN.1 definition of messages. E.g., if an IE has a defined value range of 0 to 10 (ASN.1: INTEGER (0..10)), and 12 will be received, then this will be treated as a transfer syntax error.
- Violation in list element constraints. E.g., if a list is defined as containing 1 to 10 elements, and 12 elements will be received, than this case will be handled as a transfer syntax error.
- Missing mandatory elements in ASN.1 SEQUENCE definitions (as sent by the originator of the message).
- Wrong order of elements in ASN.1 SEQUENCE definitions (as sent by the originator of the message).

10.3 Abstract Syntax Error

10.3.1 General

An Abstract Syntax Error occurs when the receiving functional S1AP entity:

1. receives IEs or IE groups that cannot be understood (unknown IE ID);

2. receives IEs for which the logical range is violated (e.g., ASN.1 definition: 0 to 15, the logical range is 0 to 10, while values 11 to 15 are undefined), and 12 will be received; this case will be handled as an abstract syntax error using criticality information sent by the originator of the message);

3. does not receive IEs or IE groups but according to the specified presence of the concerning object, the IEs or IE groups should have been present in the received message.

4. receives IEs or IE groups that are defined to be part of that message in wrong order or with too many occurrences of the same IE or IE group;

5. receives IEs or IE groups but according to the conditional presence of the concerning object and the specified condition, the IEs or IE groups should not have been present in the received message.

Cases 1 and 2 (not comprehended IE/IE group) are handled based on received Criticality information. Case 3 (missing IE/IE group) is handled based on Criticality information and Presence information for the missing IE/IE group specified in the version of the specification used by the receiver. Case 4 (IEs or IE groups in wrong order or with too many occurrences) and Case 5 (erroneously present conditional IEs or IE groups) result in rejecting the procedure.

If an Abstract Syntax Error occurs, the receiver shall read the remaining message and shall then for each detected Abstract Syntax Error that belong to cases 1-3 act according to the Criticality Information and Presence Information for the IE/IE group due to which Abstract Syntax Error occurred in accordance with subclauses 10.3.4 and 10.3.5. The handling of cases 4 and 5 is specified in subclause 10.3.6.

10.3.2 Criticality Information

In the S1AP messages there is criticality information set for individual IEs and/or IE groups. This criticality information instructs the receiver how to act when receiving an IE or an IE group that is not comprehended, i.e., the entire item (IE or IE group) which is not (fully or partially) comprehended shall be treated in accordance with its own criticality information as specified in subclause 10.3.4.

In addition, the criticality information is used in case of the missing IE/IE group abstract syntax error (see subclause 10.3.5).

The receiving node shall take different actions depending on the value of the Criticality Information. The three possible values of the Criticality Information for an IE/IE group are:

- Reject IE.
- Ignore IE and Notify Sender.
- Ignore IE.

The following rules restrict when a receiving entity may consider an IE, an IE group, or an EP not comprehended (not implemented), and when action based on criticality information is applicable:

1. IE or IE group: When one new or modified IE or IE group is implemented for one EP from a standard version, then other new or modified IEs or IE groups specified for that EP in that standard version shall be considered comprehended by a receiving entity (some may still remain unsupported).

2. EP: The comprehension of different EPs within a standard version or between different standard versions is not mandated. Any EP that is not supported may be considered not comprehended, even if another EP from that standard version is comprehended, and action based on criticality shall be applied.

10.3.3 Presence Information

For many IEs/IE groups which are optional according to the ASN.1 transfer syntax, S1AP specifies separately if the presence of these IEs/IE groups is optional or mandatory with respect to RNS application by means of the presence field of the concerning object of class S1AP-PROTOCOL-IES, S1AP-PROTOCOL-IES-PAIR, S1AP-PROTOCOL-EXTENSION or S1AP-PRIVATE-IES.

The presence field of the indicated classes supports three values:

1. Optional;

2. Conditional;

3. Mandatory.

If an IE/IE group is not included in a received message and the presence of the IE/IE group is mandatory or the presence is conditional and the condition is true according to the version of the specification used by the receiver, an abstract syntax error occurs due to a missing IE/IE group.

If an IE/IE group is included in a received message and the presence of the IE/IE group is conditional and the condition is false according to the version of the specification used by the receiver, an abstract syntax error occurs due to this erroneously present conditional IE/IE group.

10.3.4 Not comprehended IE/IE group

10.3.4.1 Procedure Code

The receiving node shall treat the different types of received criticality information of the *Procedure Code* IE according to the following:

Reject IE:

- If a message is received with a *Procedure Code* IE marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall reject the procedure using the Error Indication procedure.

Ignore IE and Notify Sender:

- If a message is received with a *Procedure Code* IE marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the procedure and initiate the Error Indication procedure.

Ignore IE:

- If a message is received with a *Procedure Code* IE marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the procedure.

When using the Error Indication procedure to reject a procedure or to report an ignored procedure it shall include the *Procedure Code* IE, the *Triggering Message* IE, and the *Procedure Criticality* IE in the *Criticality Diagnostics* IE.

10.3.4.1A Type of Message

When the receiving node cannot decode the *Type of Message* IE, the Error Indication procedure shall be initiated with an appropriate cause value.

10.3.4.2 IEs other than the Procedure Code and Type of Message

The receiving node shall treat the different types of received criticality information of an IE/IE group other than the *Procedure Code* IE and *Type of Message* IE according to the following:

Reject IE:

- If a message *initiating* a procedure is received containing one or more IEs/IE group marked with "*Reject IE*" which the receiving node does not comprehend; none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the rejection of one or more IEs/IE group using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- If a message *initiating* a procedure that does not have a message to report unsuccessful outcome is received containing one or more IEs/IE groups marked with "*Reject IE*" which the receiving node does not comprehend, the receiving node shall terminate the procedure and initiate the Error Indication procedure.

- If a *response* message is received containing one or more IEs marked with "*Reject IE*", that the receiving node does not comprehend, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups, and report in the response message of the procedure that one or more IEs/IE groups have been ignored. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the response message, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- if a message *initiating* a procedure that does not have a message to report the outcome of the procedure is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups, and initiate the Error Indication procedure to report that one or more IEs/IE groups have been ignored.

- If a *response* message is received containing one or more IEs/IE groups marked with "*Ignore IE and Notify Sender*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups, continue with the procedure as if the not comprehended IEs/IE groups were not received (except for the reporting) using the understood IEs/IE groups and initiate the Error Indication procedure.

Ignore IE:

- If a message *initiating* a procedure is received containing one or more IEs/IE groups marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups and continue with the procedure as if the not comprehended IEs/IE groups were not received using the understood IEs/IE groups.

- If a *response* message is received containing one or more IEs/IE groups marked with "*Ignore IE*" which the receiving node does not comprehend, the receiving node shall ignore the content of the not comprehended IEs/IE groups and continue with the procedure as if the not comprehended IEs/IE groups were not received using the understood IEs/IE groups.

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

When reporting not comprehended IEs/IE groups marked with "*Reject IE*" or "*Ignore IE and Notify Sender*" using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

10.3.5 Missing IE or IE group

The receiving node shall treat the missing IE/IE group according to the criticality information for the missing IE/IE group in the received message specified in the version of this specification used by the receiver:

Reject IE:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Reject IE*"; none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the missing IEs/IE groups using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- if a received message *initiating* a procedure that does not have a message to report unsuccessful outcome is missing one or more IEs/IE groups with specified criticality "*Reject IE*", the receiving node shall terminate the procedure and initiate the Error Indication procedure.

- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Reject IE*, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

Ignore IE and Notify Sender:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and report in the response message of the procedure that one or more IEs/IE groups were missing. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the response message, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- if a received message *initiating* a procedure that does not have a message to report the outcome of the procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and initiate the Error Indication procedure to report that one or more IEs/IE groups were missing.

- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Ignore IE and Notify Sender*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message and initiate the Error Indication procedure to report that one or more IEs/IE groups were missing.

Ignore IE:

- if a received message *initiating* a procedure is missing one or more IEs/IE groups with specified criticality "*Ignore IE*", the receiving node shall ignore that those IEs are missing and continue with the procedure based on the other IEs/IE groups present in the message.

- if a received *response* message is missing one or more IEs/IE groups with specified criticality "*Ignore IE*", the receiving node shall ignore that those IEs/IE groups are missing and continue with the procedure based on the other IEs/IE groups present in the message.

When reporting missing IEs/IE groups with specified criticality "*Reject IE*" or "*Ignore IE and Notify Sender*" using a response message defined for the procedure, the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

When reporting missing IEs/IE groups with specified criticality "*Reject IE*" or "*Ignore IE and Notify Sender*" using the Error Indication procedure, the *Procedure Code* IE, the *Triggering Message* IE, *Procedure Criticality* IE, and the *Information Element Criticality Diagnostics* IE shall be included in the *Criticality Diagnostics* IE for each reported IE/IE group.

10.3.6 IEs or IE groups received in wrong order or with too many occurrences or erroneously present

If a message with IEs or IE groups in wrong order or with too many occurrences is received or if IEs or IE groups with a conditional presence are present when the condition is not met (i.e., erroneously present), the receiving node shall behave according to the following:

- If a message *initiating* a procedure is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, none of the functional requests of the message shall be executed. The receiving node shall reject the procedure and report the cause value "Abstract Syntax Error (Falsely Constructed Message)" using the message normally used to report unsuccessful outcome of the procedure. In case the information received in the initiating message was insufficient to determine a value for all IEs that are required to be present in the message used to report the unsuccessful outcome of the procedure, the receiving node shall instead terminate the procedure and initiate the Error Indication procedure.

- If a message *initiating* a procedure that does not have a message to report unsuccessful outcome is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, the receiving node shall terminate the procedure and initiate the Error Indication procedure, and use cause value "Abstract Syntax Error (Falsely Constructed Message)".

- If a *response* message is received containing IEs or IE groups in wrong order or with too many occurrences or erroneously present, the receiving node shall consider the procedure as unsuccessfully terminated and initiate local error handling.

When determining the correct order only the IEs specified in the specification version used by the receiver shall be considered.

10.4 Logical Error

Logical error situations occur when a message is comprehended correctly, but the information contained within the message is not valid (i.e., semantic error), or describes a procedure which is not compatible with the state of the receiver. In these conditions, the following behaviour shall be performed (unless otherwise specified) as defined by the class of the elementary procedure, irrespective of the criticality information of the IEs/IE groups containing the erroneous values.

Class 1:

Where the logical error occurs in a request message of a class 1 procedure, and the procedure has a message to report this unsuccessful outcome, this message shall be sent with an appropriate cause value. Typical cause values are:

- Semantic Error.
- Message not compatible with receiver state.

Where the logical error is contained in a request message of a class 1 procedure, and the procedure does not have a message to report this unsuccessful outcome, the procedure shall be terminated and the Error Indication procedure shall be initiated with an appropriate cause value. The *Procedure Code* IE and the *Triggering Message* IE within the *Criticality Diagnostics* IE shall then be included in order to identify the message containing the logical error.

Where the logical error exists in a response message of a class 1 procedure, the procedure shall be considered as unsuccessfully terminated and local error handling shall be initiated.

Class 2:

Where the logical error occurs in a message of a class 2 procedure, the procedure shall be terminated and the Error Indication procedure shall be initiated with an appropriate cause value. The *Procedure Code* IE and the *Triggering Message* IE within the *Criticality Diagnostics* IE shall then be included in order to identify the message containing the logical error.

10.5 Exceptions

The error handling for all the cases described hereafter shall take precedence over any other error handling described in the other subclauses of clause 10.

- If any type of error (Transfer Syntax Error, Abstract Syntax Error or Logical Error) is detected in the ERROR INDICATION message, it shall not trigger the Error Indication procedure in the receiving Node but local error handling.
- In case a response message or Error Indication message needs to be returned, but the information necessary to determine the receiver of that message is missing, the procedure shall be considered as unsuccessfully terminated and local error handling shall be initiated.
- If an error that terminates a procedure occurs, the returned cause value shall reflect the error that caused the termination of the procedure even if one or more abstract syntax errors with criticality “ignore and notify” have earlier occurred within the same procedure.
- If an AP ID error is detected, the error handling as described in subclause 10.6 shall be applied.

10.6 Handling of AP ID

NOTE: The “first message”, the “first returned message” and the “last message” as used below correspond to messages for a UE-associated logical connection. The “first message” has a new AP ID from the sending node and the “first returned message” is the first response message, which has a new APID from the node sending the “first returned message”. Thereafter the two APIDs are included in all messages over the UE-associated logical connection unless otherwise allowed by the specification. The “last message” is a message sent by a node in order to complete the termination of a given UE-associated logical connection, such that no other messages for the same connection are expected in either direction.

If a node receives a first message that includes a remote AP ID which is erroneous, e.g., an AP ID which has been stored previously for another UE-associated logical connection for the same peer node, the receiving node shall initiate an Error Indication procedure with inclusion of only the previously received AP ID from the peer node and an

appropriate cause value. In this case, both nodes shall initiate a local release of any established UE-associated logical connection having the erroneous AP ID as local or remote identifier.

If a node receives a first returned message that includes a remote AP ID which has been stored previously for another UE-associated logical connection for the same peer node, or that includes an AP ID pair which is inconsistent (e.g., the local AP ID is unknown or already allocated to another UE-associated logical connection), the receiving node shall initiate an Error Indication procedure with inclusion of the received AP IDs from the peer node and an appropriate cause value. Both nodes shall initiate a local release of any established UE-associated logical connection (for the same S1 interface) having these AP IDs as local or remote identifier.

If a node receives a message (other than the first or first returned messages) that includes AP ID(s) identifying a logical connection which is unknown to the node (for the same S1 interface):

- if this message is not the last message for this UE-associated logical connection, the node shall initiate an Error Indication procedure with inclusion of the received AP ID(s) from the peer node and an appropriate cause value. Both nodes shall initiate a local release of any established UE-associated logical connection (for the same S1 interface) having the erroneous AP ID(s) as local or remote identifier.

- if this message is the last message for this UE-associated logical connection, the receiving node shall initiate a local release of any established UE-associated logical connection (for the same S1 interface) that have either the local or remote AP ID(s) as identifiers.

Annex A (informative): S1AP Transparent containers content

Transparent containers are used in order to transfer information from one RAN node to another RAN node. Depending on the particular scenario the behaviour of both involved RAN nodes may be either specified according to the same radio system or according to different radio systems. During an inter-system handover the source RAN node has to adopt to the target RAN node and its requirements. Therefore the container content is encoded according to the rules which are specified for the target radio system.

In S1AP, there is a single transparent container defined for transporting information from the source to the target RAN node and a single transparent container for transporting information from the target to the source RAN node during handover preparation: the *Source to Target Transparent Container* IE and the *Target to Source Transparent Container* IE, which may carry either E-UTRAN, UTRAN or GERAN specific information.

NOTE: The definition of generic transparent containers for handover purposes allows to transport them through the core network in a RAT-agnostic way.

In subclause 8.4.1.2, it is described how the transparent container shall be encoded with respect to the scenario in which it is used.

The table below is showing all possible scenarios and definitions according to which the content of the transparent container shall be encoded. Additionally the reference to the specification defining particular IE is given.

Table A.1. Specification of Transparent Containers referenced in S1AP.

Scenario	***Source to Target Transparent Container* IE in S1AP: HANDOVER REQUIRED message**		***Target to Source Transparent Container* IE in S1AP: HANDOVER COMMAND message**	
	Name of the IE	Definition in specification	Name of the IE	Definition in specification
Intra E-UTRAN handover	Source eNB to Target eNB Transparent Container	36.413	Target eNB to Source eNB Transparent Container	36.413
Inter-system handover to UTRAN or SRVCC operation to UTRAN	Source RNC to Target RNC Transparent Container	25.413	Target RNC to Source RNC Transparent Container	25.413
Inter-system handover to GERAN (PS domain only)	Source BSS to Target BSS Transparent Container	48.018	Target BSS to Source BSS Transparent Container	48.018
SRVCC operation to GERAN without DTM support or SRVCC operation to GERAN with DTM but without DTM HO support	Old BSS to New BSS information	48.008	Layer 3 Information	48.008
SRVCC operation to GERAN with DTM HO support	Source BSS to Target BSS Transparent Container (in the *Source to Target Transparent Container* IE), Old BSS to New BSS information (in the *Source to Target Transparent Container Secondary* IE)	48.018 48.008	Layer 3 Information (in the *Target to Source Transparent Container* IE), Target BSS to Source BSS Transparent Container (in the *Target to Source Transparent Container Secondary* IE)	48.008 48.018

Annex B (normative): IEs for SON Transfer

This annex defines IEs used by the SON Transfer RIM application (TS 48.018 [18]).

B.1 Tabular definition

B.1.1 SON Transfer Application Identity

This IE indicates the application identity within the SON Transfer application.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SON Transfer Application Identity	M		ENUMERATED (Cell Load Reporting, …, Multi-Cell Load Reporting, Event-Triggered Cell Load Reporting, HO Reporting)	The receiving RAN node shall discard any RAN-INFORMATION-REQUEST/Multiple Report PDU containing this IE with value set to “Cell Load Reporting”, "Multi-Cell Load Reporting" or “HO Reporting”.

B.1.2 SON Transfer Request Container

This container transfers request information for the SON Transfer application.

NOTE: The length of the *SON Transfer Request Container* IE shall remain compatible with the maximum message size on the Gb interface, this maximum size being determined depending on the lower layers used on the interface and on their configuration, a typical (default) limitation being 1600 octets for a Frame Relay sub-network as stated in TS 48.016 [30].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *SON Transfer Application*	M			
>*Cell Load Reporting*			NULL	
>*Multi-Cell Load Reporting*				
>>Multi-Cell Load Reporting Request	M		B.1.7	
>*Event-Triggered Cell Load Reporting*				
>>Event-Triggered Cell Load Reporting Request	M		B.1.11	
>*HO Reporting*				
>>HO Report	M		B.1.13	

B.1.3 SON Transfer Response Container

This container transfers response information for the SON Transfer application.

NOTE: The length of the *SON Transfer Response Container* IE shall remain compatible with the maximum message size on the Gb interface, this maximum size being determined depending on the lower layers used on the interface and on their configuration, a typical (default) limitation being 1600 octets for a Frame Relay sub-network as stated in TS 48.016 [30].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *SON Transfer Application*	M			
>*Cell Load Reporting*				
>>Cell Load Reporting Response	M		B.1.5	
>*Multi-Cell Load Reporting*				
>>Multi-Cell Load Reporting Response	M		B.1.9	
>*Event-Triggered Cell Load Reporting*				
>>Event-triggered Cell Load Reporting Response	M		B.1.12	
>*HO Reporting*			NULL	

B.1.4 SON Transfer Cause

This container indicates the cause why the *Application Error Container* IE for the SON Transfer application defined in TS 48.018 [18] is sent.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *SON Transfer Application*	M			
>*Cell Load Reporting*				
>>Cell Load Reporting Cause	M		B.1.10	
>*Multi-Cell Load Reporting*				
>>Cell Load Reporting Cause	M		B.1.10	
>*Event-Triggered Cell Load Reporting*				
>>Cell Load Reporting Cause	M		B.1.10	
>*HO Reporting*				
>>HO Reporting Cause	M		ENUMERATED (Application Container Syntax Error, Inconsistent Reporting Cell Identifier, Unspecified, …)	

HO Reporting Cause	Meaning
Application Container Syntax Error	The *Application Container* IE is syntactically incorrect.
Inconsistent Reporting Cell Identifier	- In case the reporting RAT is GERAN: the Reporting Cell Identifier in the *Application Container* IE does not match with the *Destination Cell Identifier* IE value (in the case of a RAN-INFORMATION-REQUEST PDU) or with the *Source Cell Identifier* IE value (in the case of a RAN-INFORMATION PDU) of the RIM header. - In case the reporting RAT is UTRAN or E-UTRAN: the cell identified by Reporting Cell Identifier in the *Application Container* IE is unknown in the RNC (UTRAN case) or in the eNodeB (E-UTRAN case) identified by the *Destination Cell Identifier* IE value in the RAN-INFORMATION-REQUEST PDU.
Unspecified	Sent when none of the above cause values applies

B.1.5 Cell Load Reporting Response

This IE contains response information for inter-RAT cell load reporting.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Reporting RAT*	M			
>*E-UTRAN*				
>>E-UTRAN Response	M		E-UTRAN Cell Load Reporting Response B.1.6	
>*UTRAN*				
>>UTRAN Response	M		OCTET STRING	Contains the *Cell Load Information Group* IE as defined in TS 25.413. The receiver shall ignore the value of the *Source Cell Identifier* IE within the *Cell Load Information Group* IE.
>*GERAN*				
>>GERAN Response	M		OCTET STRING	Contains the *Cell Load Information Group* IE as defined in TS 48.008. The receiver shall ignore the value of the *Cell Identifier* IE within the *Cell Load Information Group* IE.

B.1.6 E-UTRAN Cell Load Reporting Response

This IE contains response information for inter-RAT cell load reporting.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Composite Available Capacity Group	M		OCTET STRING	Contains the *Composite Available Capacity Group* IE as defined in TS 36.423.

B.1.7 Multi-Cell Load Reporting Request

This IE contains request information for inter-RAT multi-cell load reporting.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Requested Cell List		*1 to <maxIRATReportingCells>*		One of the cell IDs contained in this list shall be copied in the *Reporting Cell Identifier* field in the RAN-INFORMATION-REQUEST Application Container for SON Transfer (TS 48.018).
>IRAT Cell ID	M		B.1.8	

Range bound	Explanation
maxIRATReportingCells	Maximum no. cells to be included. Value is FFS.

B.1.8 IRAT Cell ID

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE *Reporting RAT*	M			
>*E-UTRAN*				
>>Cell Identifier	M		OCTET STRING	Contains the E-UTRAN CGI IE as defined in 9.2.1.38.
>*UTRAN*				
>>Cell Identifier	M		OCTET STRING	Contains the *Source Cell Identifier* IE as defined in TS 25.413.
>*GERAN*				
>>Cell Identifier	M		OCTET STRING	Contains the *Cell Identifier* IE as defined in TS 48.018.

B.1.9 Multi-Cell Load Reporting Response

This IE contains response information for inter-RAT multi-cell load reporting.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Reporting Cell List		*1 to <maxIRATReportingCells>*		
>CHOICE *Reporting RAT*	M			
>>*E-UTRAN*				
>>>E-UTRAN Response	M			
>>>>Cell Identifier	M		OCTET STRING	Contains the E-UTRAN CGI IE as defined in 9.2.1.38.
>>>>E-UTRAN Cell Load Reporting Response	M		B.1.6	
>>*UTRAN*				
>>>UTRAN Response	M		OCTET STRING	Contains the *Cell Load Information Group* IE as defined in TS 25.413.
>>*GERAN*				
>>>GERAN Response	M		OCTET STRING	Contains the *Cell Load Information Group* IE as defined in TS 48.008.

B.1.10 Cell Load Reporting Cause

This IE contains request information for inter-RAT cell load reporting.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cell Load Reporting Cause	M		ENUMERATED (Application Container Syntax Error, Inconsistent Reporting Cell Identifier, Unspecified, …)	

The meaning of the different cause values is described in the following table.

Cell Load Reporting Cause	Meaning
Application Container Syntax Error	The *Application Container* IE is syntactically incorrect.
Inconsistent Reporting Cell Identifier	- In case the reporting RAT is GERAN: the *Reporting Cell Identifier* in the *Application Container* IE does not match with the *Destination Cell Identifier* IE value (in the case of a RAN-INFORMATION-REQUEST PDU) or with the *Source Cell Identifier* IE value (in the case of a RAN-INFORMATION PDU) of the RIM header. - In case the reporting RAT is UTRAN or E-UTRAN: the cell identified by *Reporting Cell Identifier* in the *Application Container* IE is unknown in the RNC (UTRAN case) or in the eNodeB (E-UTRAN case) identified by the *Destination Cell Identifier* IE value in the RAN-INFORMATION-REQUEST PDU.
Unspecified	Sent when none of the above cause values applies

B.1.11 Event-Triggered Cell Load Reporting Request

This IE contains request information for inter-RAT cell load reporting.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Number Of Measurement Reporting Levels	M		ENUMERATED (2, 3, 4, 5, 10, ...)	The reporting node divides the cell load scale into the indicated number of reporting levels, evenly distributed on a linear scale below the reporting node's threshold for overload. The reporting node sends a report each time the cell load changes from one reporting level to another, and when the cell load enters and exits overload state.

B.1.12 Event-triggered Cell Load Reporting Response

This IE contains response information for event-triggered inter-RAT cell load reporting.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cell Load	M		Cell Load Reporting Response B.1.5	
Overload Flag	O		ENUMERATED (Overload, ...)	When this IE is present the cell load exceeds the threshold for overload.

B.1.13 HO Report

This IE contains information for too early inter-RAT HO without connection failure.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
HO Type	M		ENUMERATED (LTE to UTRAN, LTE to GERAN, …)	
HO Report Type	M		ENUMERATED (Unnecessary HO to another RAT, …)	
HO Source ID	M		IRAT Cell ID B.1.8	Contains the cell ID of the source cell for the HO. This IE shall contain an E-UTRAN CGI, and shall be set to the same value as the *Reporting Cell Identifier* IE in TS 48.018 [18]
HO Target ID	M		IRAT Cell ID B.1.8	Contains the cell ID of the target cell for the HO. This IE shall contain either a UTRAN Cell ID or a GERAN Cell ID.
Candidate Cell List		*1 to <maxNrOfCandidateCells>*		
>Candidate Cell ID	M		IRAT Cell ID B.1.8	This IE shall contain an E-UTRAN CGI.

Range bound	Explanation
maxNrOfCandidateCells	Maximum no. of candidate cells.

B.2 ASN.1 definition

```
-- **************************************************************
--
-- IE definitions for the SON Transfer application
-- The IEs in this ASN.1 module shall be defined and encoded
-- using the same rules as applicable for the S1AP-IEs module.
--
-- **************************************************************
SonTransfer-IEs

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

--
-- Generic IEs for the SON Transfer application
--

SONtransferApplicationIdentity ::= ENUMERATED {
    cell-load-reporting,
    ...,
    multi-cell-load-reporting,
    event-triggered-cell-load-reporting,
    ho-reporting
}

SONtransferRequestContainer ::= CHOICE{
    cellLoadReporting                   NULL,
    ...,
    multiCellLoadReporting              MultiCellLoadReportingRequest,
    eventTriggeredCellLoadReporting     EventTriggeredCellLoadReportingRequest,
    hOReporting                         HOReport
}

SONtransferResponseContainer ::= CHOICE{
    cellLoadReporting                   CellLoadReportingResponse,
    ...,
    multiCellLoadReporting              MultiCellLoadReportingResponse,
    eventTriggeredCellLoadReporting     EventTriggeredCellLoadReportingResponse,
    hOReporting                         NULL
}

SONtransferCause ::= CHOICE {
```

```
    cellLoadReporting                   CellLoadReportingCause,
    ...,
    multiCellLoadReporting              CellLoadReportingCause,
    eventTriggeredCellLoadReporting     CellLoadReportingCause,
    hOReporting                         HOReportingCause
}


CellLoadReportingCause ::= ENUMERATED {
    application-container-syntax-error,
    inconsistent-reporting-cell-identifier,
    unspecified,
    ...
}

HOReportingCause ::= ENUMERATED {
    application-container-syntax-error,
    inconsistent-reporting-cell-identifier,
    unspecified,
    ...
}

--
-- IEs for Cell Load Reporting application
--

CellLoadReportingResponse::= CHOICE{
    eUTRAN          EUTRANcellLoadReportingResponse,
    uTRAN           OCTET STRING,
    gERAN           OCTET STRING,
    ...
}

CompositeAvailableCapacityGroup ::= OCTET STRING

EUTRANcellLoadReportingResponse ::= SEQUENCE {
    compositeAvailableCapacityGroup                 CompositeAvailableCapacityGroup,
    ...
}

--
-- IEs for Multi-Cell Load Reporting application
--

EUTRANResponse::= SEQUENCE {
    cell-ID         OCTET STRING,
    eUTRANcellLoadReportingResponse         EUTRANcellLoadReportingResponse,
    ...
}

IRAT-Cell-ID ::= CHOICE{
    eUTRAN          OCTET STRING,
    uTRAN           OCTET STRING,
    gERAN           OCTET STRING,
    ...
}

RequestedCellList ::= SEQUENCE (SIZE(1.. maxIRATReportingCells)) OF IRAT-Cell-ID

MultiCellLoadReportingRequest::= SEQUENCE {
    requestedCellList                   RequestedCellList,
    ...
}

ReportingCellList-Item ::= SEQUENCE {
    cell-ID                             IRAT-Cell-ID,
    ...
}

ReportingCellList ::= SEQUENCE (SIZE(1.. maxIRATReportingCells)) OF ReportingCellList-Item

MultiCellLoadReportingResponse ::= SEQUENCE (SIZE(1.. maxIRATReportingCells)) OF
MultiCellLoadReportingResponse-Item

MultiCellLoadReportingResponse-Item ::= CHOICE{
    eUTRANResponse                                      EUTRANResponse,
    uTRANResponse                                       OCTET STRING,
    gERANResponse                                       OCTET STRING,
```

```
    ...
}


--
-- IEs for Event-triggered Cell Load Reporting application
--

NumberOfMeasurementReportingLevels ::= ENUMERATED {
    rl2,
    rl3,
    rl4,
    rl5,
    rl10,
    ...
}

EventTriggeredCellLoadReportingRequest ::= SEQUENCE {
    numberOfMeasurementReportingLevels      NumberOfMeasurementReportingLevels,
    ...
}

OverloadFlag ::= ENUMERATED {
    overload,
    ...
}

EventTriggeredCellLoadReportingResponse ::= SEQUENCE {
    cellLoadReportingResponse               CellLoadReportingResponse,
    overloadFlag                            OverloadFlag                        OPTIONAL,
    ...
}

--
-- IEs for HO Reporting application
--



HOReport::= SEQUENCE {
    hoType                  HoType,
    hoReportType            HoReportType,
    hosourceID              IRAT-Cell-ID,
    hoTargetID              IRAT-Cell-ID,
    candidateCellList       CandidateCellList,
    ...
}

HoType ::= ENUMERATED {
    ltetoutran,
    ltetogeran,
    ...
}

HoReportType ::= ENUMERATED {
    unnecessaryhotoanotherrat,
    ...
}

CandidateCellList ::= SEQUENCE (SIZE(1..maxnoofcandidateCells)) OF IRAT-Cell-ID

-- ************************************************************
--
-- Constants
--
-- ************************************************************

maxIRATReportingCells                       INTEGER ::= 128     -- Value is FFS
maxnoofcandidateCells                       INTEGER ::= 16

END
```

Annex C (informative): Processing of Transparent Containers at the MME

The encoding of the *Source to Target Transparent Container* and *Target to Source Transparent Container* IEs in this specification is different from the one specified in TS 25.413 [19].

Irrespective of the mobility scenario (inter-RAT or intra-LTE), the MME always processes these IEs in the following way:

- The MME shall convey to the eNodeB the information received within
  - the GTPv1-C "UTRAN transparent field" of the "UTRAN Transparent Container" IE across the Gn-interface (see subclause 7.7.38 of TS 29.060 [35]), or
  - the GTPv2 "F-container field" of the "F-Container" IE across the S3/S10- interface (see subclause 8.48 of TS 29.274 [36]).

  by including it in the octets of the OCTET STRING of either the *Source to Target Transparent Container* IE or the *Target to Source Transparent Container* of the corresponding S1AP message.
- The MME shall convey to the GTP peer the information received within the octets of the OCTET STRING of either the *Source to Target Transparent Container* IE or the *Target to Source Transparent Container* IE by including it in
  - the GTPv1-C "UTRAN transparent field" of the "UTRAN Transparent Container" IE across the Gn- interface (see subclause 7.7.38 of TS 29.060 [35]), or
  - the GTPv2 "F-container field" of the "F-Container" IE across the S3/S10- interface (see subclause 8.48 of TS 29.274 [36]).

Annex D (informative): Change history

TSG #	TSG Doc.	CR	Rev	Subject/Comment	New
38				Specification approved at TSG-RAN and placed under change control	8.0.0
39	RP-080080	0058		RAN3 agreed changes for TS 36.413	8.1.0
40	RP-080304	0059	1	RAN3 agreed changes for TS 36.413	8.2.0
41	RP-080584	0223		changes to TS36.413 agreed in RAN3#61	8.3.0
42	RP-080846	0325	1	changes to TS36.413 agreed in RAN3#62	8.4.0
43	RP-090083	0327		Adding extension container in SEQUENCE type for forward compatibility	8.5.0
43	RP-090091	0331	1	Corrections on S1AP: eNB configuration update procedure	8.5.0
43	RP-090086	0332	1	Corrections on S1AP: Paging procedure	8.5.0
43	RP-090089	0333	1	Handling detection of two S1 connections towards one UE	8.5.0
43	RP-090089	0334	1	Interaction between UE Context Release Request and UE Context Release procedure	8.5.0
43	RP-090246	0337	2	IP address retrieval for ANRF	8.5.0
43	RP-090083	0340		Modification of RRC context indexing	8.5.0
43	RP-090086	0342	1	Completion of LTE cause values	8.5.0
43	RP-090090	0345	1	Correction of served GUMMEIs	8.5.0
43	RP-090086	0346	1	Correction of Initial Context Setup	8.5.0
43	RP-090086	0349	1	Clarification of path switch failure	8.5.0
43	RP-090091	0350	2	Correction of eNB Status Transfer	8.5.0
43	RP-090083	0356		Addition of the description of Timer TX2RELOCOverall	8.5.0
43	RP-090089	0357	1	New cause value “Interaction with other procedure”	8.5.0
43	RP-090087	0359	1	S1AP Review on Location Reporting procedures	8.5.0
43	RP-090089	0366	1	Definition on parameters related to a trace activation	8.5.0
43	RP-090090	0368	2	Adding EUTRAN CELL TRAFFIC TRACE message over S1 interfaces	8.5.0
43	RP-090091	0369	2	Adding MS Classmark 2 and MS Clssmark 3 IEs over S1 interface	8.5.0
43	RP-090086	0370	1	New Invalid E-RAB Id causes	8.5.0
43	RP-090091	0371	2	S1AP Review: S1 Handover Cancel procedure	8.5.0
43	RP-090158	0372	2	S1AP Review: Write-Replace Warning procedure	8.5.0
43	RP-090246	0374	1	Definition of Cell Type	8.5.0
43	RP-090085	0375	1	Abnormal condition related to UE Security Capabilities	8.5.0
43	RP-090245	0376		Removal of UE Security Capabilities IE from HANDOVER NOTIFY message	8.5.0
43	RP-090086	0378	1	Corrections for the procedure concurrency	8.5.0
43	RP-090091	0380	2	Clarification of eNB Name and MME Name IE’s	8.5.0
43	RP-090083	0392		Clarifications on access control at handover	8.5.0
43	RP-090087	0393	1	Paging response	8.5.0
43	RP-090077	0394		Correction on usage of UE History Information	8.5.0
43	RP-090086	0395	1	Delete the UDP port in the note for GTP-TEID	8.5.0
43	RP-090245	0396		S1AP CR on CDMA2000 RAT Type	8.5.0
43	RP-090246	0397	1	Editorial Updates TS 36.413	8.5.0
43	RP-090091	0398	3	NAS Security Parameters for to/from E-UTRAN/UTRAN handovers	8.5.0
43	RP-090085	0399	1	Updates for Next Hop Chaining Count	8.5.0
43	RP-090245	0401		Transparent Container content – informative annex	8.5.0
43	RP-090093	0404	1	Transparent container handling in case of SRVCC operation to GERAN	8.5.0
43	RP-090090	0405	2	Changes to S1AP to support paging optimization	8.5.0
43	RP-090245	0406	3	S1 handover Clean up	8.5.0
43	RP-090087	0407	1	Support blocking 3GPP2 handover	8.5.0
43	RP-090091	0410	2	Inclusion of eNB default paging DRX in S1 setup and configuration update	8.5.0
43	RP-090087	0412	1	Explicit resetting of overload state information on S1 Setup	8.5.0
43	RP-090090	0413	2	Clarify Security Context IE description	8.5.0
43	RP-090091	0414	2	Criticality corrections in 36.413	8.5.0
43	RP-090245	0415		Add abnormal conditions section to UE Context Release and fix tabular error	8.5.0
43	RP-090245	0419		Consistent references to S1AP	8.5.0
43	RP-090090	0424	2	Two new cause values in the Cause IE	8.5.0
43	RP-090089	0425		Alignment of QCI range	8.5.0
43	RP-090089	0426		Remove the Handover Type IE from the HANDOVER REQUEST ACKNOWLEDGE message	8.5.0
43	RP-090090	0427	1	Correction of the trace procedural text and trace related IEs	8.5.0
March 2009	-	-	-	Minor corrections before freezing of ASN.1	8.5.1
44	RP-090637	0504	2	Editorial Updates	8.6.0
44	RP-090637	0512		Correction of RAN#43 CR implementation	8.6.0

44	RP-090637	0510		Explicitly allow TRACE START to be the first UE-associated message received at the eNB	8.6.0
44	RP-090637	0507	1	Clarification of UE Capability Info Indication	8.6.0
44	RP-090637	0500	1	Mandatory UE History Information IE in HANDOVER REQUIRED For Inter-RAT HO from E-UTRAN to UMTS	8.6.0
44	RP-090637	0482	1	Clarify eNB may send Release msg rather than RRC Reject msg on receiving OVERLOAD Start msg	8.6.0
44	RP-090637	0480	1	Clarify reporting of duplicate E-RABs in E-RAB RESPONSE	8.6.0
44	RP-090637	0468		Correction of security parameters	8.6.0
44	RP-090637	0463	1	Emergency call Indicator during CS Fallback	8.6.0
44	RP-090638	0438	2	Correction on Path Switch Request procedure	8.6.0
44	RP-090644	0443	2	Removing ‘outcome’ element from the Triggering Message IE	8.6.0
44	RP-090644	0448	1	Missing S1AP functions	8.6.0
44	RP-090644	0451	1	Correction of abnormal conditions in UE Context Release	8.6.0
44	RP-090644	0452	1	Clarification of E-UTRAN Trace ID in Cell Traffice Trace message	8.6.0
44	RP-090644	0453		Removal of duplication description of MME UE S1AP ID and eNB UE S1AP ID	8.6.0
44	RP-090644	0455	1	Abnormal condition for Handover Cancellation	8.6.0
44	RP-090640	0458	3	NNSF for HeNB GW deployment scenario	8.6.0
44	RP-090640	0503	1	Transparent Container Coding	8.6.0
44	RP-090640	0471	2	Some Editorial Corrections on ASN.1	8.6.0
44	RP-090640	0492		Failure of the eNB Configuration Update procedure	8.6.0
44	RP-090640	0484		Rephrasing of abnormal conditions for S1 setup	8.6.0
44	RP-090640	0494		Cause value for inter-RAT Redirection	8.6.0
44	RP-090628	0464	2	NAS PDU in E-RAB Release Command	8.6.0
44	RP-090636	0491		Alignment of eNB configuration update procedure	8.6.0
44	RP-090636	0476	2	Add that a non-GBR must be received and admitted on S1-HO	8.6.0
44	RP-090636	0461	1	Clarification of Security Context to be used in HANDOVER REQUEST message	8.6.0
44	RP-090636	0459		Correction the text about the Handover Resource Allocation procedure	8.6.0
44	RP-090636	0502		Clarification for RAT list in S1 Setup Response and MME configuration Update	8.6.0
44	RP-090636	0501	1	Range bound for maximal number of PLMNs per MME and GUMMEIs	8.6.0
June 2009				Correction of an ASN.1 implementation error of CR0463r1 in RP-090637 (R3-091456)	8.6.1
45	RP-090767	0515	1	Corrections for 36.413	8.7.0
45	RP-090964	0522		SRVCC to GERAN/UTRAN	8.7.0
45	RP-090964	0531		Clean up the Terminology of home eNB in S1AP	8.7.0
45	RP-090964	0534		Specify how report dup E-RAB ID in Tabular and replace MME with EPC in 8.3.1.2	8.7.0
45	RP-090964	0536	1	Indirect path use by the MME	8.7.0
45	RP-090767	0537	1	Handling of not supported QCI values	8.7.0
45	RP-090964	0538	1	E-RABs subject to forwarding	8.7.0
45	RP-090767	0540	1	Mandatory NAS PDU in E-RAB Release Command	8.7.0
45	RP-090767	0542	1	Missing reference and specification for encoding the CDMA2000 Pilot List	8.7.0
45	RP-090767	0547	1	CR on *Repetition Period* IE	8.7.0
45	RP-090767	0551		Miscellaneous correction to 36.413v8.6.1	8.7.0
45	RP-090768	0553		ASN1 object identified correction	8.7.0
45	RP-090767	0554		Interaction between Initial Context Setup/UE Context Modification and Handover Preparation/Redirection procedures during CS Fallback	8.7.0
09/2009				Rel-9 version is created based on v.8.7.0	9.0.0
45	RP-090767	0521	3	Adding the RTD information in UPLINK CDMA2000 TUNNELING	9.0.0
45	RP-090787	0543	1	Handling of Emergency Calls in Limited Service Mode	9.0.0
45	RP-090787	0544	1	Emergency Calls Mobility Handling	9.0.0
45	RP-090776	0548	1	S1AP Kill procedure for cancellation of PWS warning messages	9.0.0
45	RP-090776	0549	1	S1AP Write-Replace Warning procedure for PWS/CMAS	9.0.0
46	RP-091191	0513	4	Support for paging optimization with CSG membership changes	9.1.0
46	RP-091191	0550	3	Inclusion of Access Mode and Subscription Status for UE prioritisation in LTE hybrid cells	9.1.0
46	RP-091194	0557		Handling of Multiple concurrent CMAS Warning Notifications	9.1.0
46	RP-091189	0563	2	CR for Transportation support for LPPa	9.1.0
46	RP-091195	0567	3	Introducing the “Data Forwarding Not Possible” indication to HANDOVER REQUEST	9.1.0
46	RP-091183	0569		ASN.1 correction for BroadcastCompleteAreaList	9.1.0
46	RP-091183	0571	1	Correction on abnormal handling of Subscriber Profile ID for RAT/Frequency priority IE	9.1.0
46	RP-091368	0580		Align IE’s in Tabular for two messages with their ASN.1 for R9	9.1.0

46	RP-091183	0589	2	Rejection Criteria for Overload	9.1.0
46	RP-091369	0592	2	Introduction of inbound LTE mobility	9.1.0
46	RP-091194	0605	1	Repetition Period for CMAS	9.1.0
46	RP-091183	0607		Correction of E-RAB Modify	9.1.0
46	RP-091183	0616	1	Clarification on handover restriction	9.1.0
46	RP-091183	0618	2	Correction of Transport Layer Address	9.1.0
46	RP-091183	0621	1	Missing reference and unclear handling of the CDMA2000 Sector ID	9.1.0
47	RP-100214	0623	1	Correction of RTD range	9.2.0
47	RP-100214	0625	1	Correction of path switch failure	9.2.0
47	RP-100213	0626		Fix for Mobile terminated calls rejection in eNodeB	9.2.0
47	RP-100229	0627		Introduction of PLMN-related abnormal conditions during HO in network sharing scenarios	9.2.0
47	RP-100222	0628		Correction of CSG Cell and Hybrid Cell Definition	9.2.0
47	RP-100214	0629	3	NCC Initialization in eNB at the Initial Connection Setup	9.2.0
47	RP-100228	0631		Inter RAT Mobility Load Balance on S1	9.2.0
47	RP-100213	0634		Crrection in DOWNLIN S1 CDMA2000 TUNNELING Procedure	9.2.0
47	RP-100222	0639	3	CSG expiry Handling	9.2.0
47	RP-100229	0641	1	CMAS and ETWS action if Number of Broadcasts Requested IE set to 0	9.2.0
47	RP-100229	0645	1	Description of Transparent Container Encoding	9.2.0
47	RP-100230	0647	2	Rapporteur's update for S1AP protocol	9.2.0
47	RP-100213	0649		Removing the restriction for Primary Notification	9.2.0
47	RP-100214	0651	1	CDMA2000 1xRTT RAND format	9.2.0
47	RP-100213	0659	1	Handling of the CDMA2000 RAT and Sector ID	9.2.0
47	RP-100214	0661	2	Handling of CSG ID check failure in LTE hybrid cells	9.2.0
47	RP-100225	0664	1	Transfer Encoding of LPPa PDUs over S1	9.2.0
47	RP-100214	0666	1	Correction of connection establishment	9.2.0
47	RP-100214	0667	1	Correction of S1 Release	9.2.0
47	RP-100228	0678		Creation of annex for SON Transfer and Cell Load Reporting RIM application.	9.2.0
47	RP-100230	0679		Support of time and frequency synchronization using network listening	9.2.0
04/2010				ToC updated	9.2.1
04/2010				Corrupted headers and ASN.1 fixed	9.2.2
48	RP-100592	0682	1	E-UTRAN Trace ID Abnormal Conditions	9.3.0
48	RP-100599	0683	2	Clarification on DTM and PS Handover	9.3.0
48	RP-100599	0687		Correction on UE Security Capability handling in UE Context Modification procedure	9.3.0
48	RP-100599	0693		Clarification on processing Extended Repetition Period IE	9.3.0
48	RP-100599	0694	1	List more apt cause in Interactions with E-RAB Management procedures section	9.3.0
48	RP-100596	0695	1	Missing ETWS action if Repetition period set to 0	9.3.0
48	RP-100599	0701	2	Correction of shall to shall if supported	9.3.0
48	RP-100599	0710		Correction of no DTM support	9.3.0
48	RP-100599	0711	2	Correction of forbidden inter-RAT	9.3.0
48	RP-100599	0716	1	Rapporteur's update for S1AP protocol	9.3.0
48	RP-100599	0717	1	S1AP Transparent containers compatible maximum message size	9.3.0
49	RP-100908	0726	1	Explicit PLMN coding in Trace IEs	9.4.0
49	RP-100908	0731	3	Cause value for UE context release during CSFB	9.4.0
49	RP-100906	0738	1	CS Fallback Indication and Handover Restriction List	9.4.0
49	RP-100908	0741	1	Correction of Repetition Period	9.4.0
49	RP-100908	0742	1	Notification of Location Reporting Failure	9.4.0
49	RP-100908	0743	1	Correction of UE AMBR	9.4.0
49	RP-100908	0745		Simultaneous Rekeying and CSFB	9.4.0
49	RP-100908	0751		Delete references to 23.041 in Tabular	9.4.0
50	RP-101271	0753		Handling of CDMA2000 HO Required Indication	9.5.0
50	RP-101270	0755		Correction of E-RAB Data Forwarding in HANDOVER COMMAND and DOWNLINK S1 CDMA2000 TUNNELING	9.5.0
50	RP-101271	0756		Clarification on Handover Restriction List	9.5.0
50	RP-101271	0761	4	Multiple PLMNs Selection in eNodeB for CS fallback	9.5.0
50	RP-101271	0780	2	Clarification on SRVCC procedure in case of PS handover failure	9.5.0
50	RP-101271	0783	1	Correction of GBR and MBR	9.5.0
50	RP-101271	0799		Clarification on the overload action only accepting emergency and MT sessions	9.5.0
12/2010				Rel-10 version created based on v 9.5.0	10.0.0
50	RP-101272	0752	2	Prioritised handling of MPS session in S1-AP PAGING message	10.0.0
50	RP-101272	0754	2	Alignment of tabular with ASN.1 for S1 Setup message	10.0.0
50	RP-101272	0764	2	Enhancement of the IP address exchange mechanism for ANR purposes	10.0.0
50	RP-101304	0768	1	Inter-RAT cell load reporting for multiple cells	10.0.0
50	RP-101304	0769	2	Event-triggered inter-RAT cell load reporting	10.0.0

50	RP-101272	0776	3	Introduction of a new overload action IE to permit high priority access	10.0.0
50	RP-101304	0791	2	Inter-RAT MRO for Detection of too early inter-RAT handover with no RLF	10.0.0
50	RP-101281	0794	2	Adding List of GUMMEIs to Overload related messages	10.0.0
50	RP-101272	0797	1	Incorrect causes in the Error Indication msg	10.0.0
50	RP-101279	0798	4	X2 handover support	10.0.0
50	RP-101272	0800	1	Clarification on the overload action only accepting emergency and MT sessions	10.0.0
01/2011				Editorial change: highlighting removed	10.0.1
SP-49	SP-100629			Clarification on the use of References (TS 21.801 CR#0030)	10.1.0
51	RP-110231	0801		Correct the criticality for two new IEs to support X2 HO for HeNB	10.1.0
51	RP-110239	0802		Clean-up for Rel-10 enhancements of SON Transfer application	10.1.0
51	RP-110226	0803		Clarification containers for CS only SRVCC towards UTRAN without PS HO support	10.1.0
51	RP-110225	0804		Correction to the editor notes	10.1.0
51	RP-110225	0805		Correction on CSG Subcription List	10.1.0
51	RP-110222	0808		Correction of CSFB related Cause Values	10.1.0
51	RP-110236	0809	2	Relay Node indication to MME	10.1.0
51	RP-110236	0810		GUMMEI List in Overload Start and Overload Stop message	10.1.0
51	RP-110222	0812		ASN.1 Correction for the Broadcast Cancelled Area List IE	10.1.0
51	RP-110227	0813	2	LIPA Impact In RAN3	10.1.0
51	RP-110227	0814		S1 Release for LIPA Bearer	10.1.0
51	RP-110230	0815	2	Support for MDT	10.1.0
51	RP-110236	0820	1	Advertising support to RNs at the MME	10.1.0
51	RP-110225	0823	1	Introduction of SPID into DOWNLINK NAS TRANSPORT message	10.1.0
51	RP-110226	0824	2	NNSF Abbreviation and other Editorials	10.1.0
51	RP-110226	0827	2	Clarification on TEID value range for S1AP	10.1.0
51	RP-110222	0833	2	Correction of Write Replace Warning abnormal condition	10.1.0
51	RP-110226	0839		Correction of the name for Time Synchronization Info IE	10.1.0
51	RP-110226	0840	1	Typo correction in Message Type IE table	10.1.0
51	RP-110231	0848	1	Correction of Source MME GUMMEI IE criticality in PATH SWITCH REQUEST message	10.1.0
51	RP-110226	0852	1	Correction of Duplicated Warning Messages	10.1.0
51	RP-110234	0854	1	Introduction of MTC Overload Support	10.1.0
51	RP-110231	0857	3	Correction of Mobility to Open HeNBs	10.1.0
51	RP-110226	0860		S1AP Procedure Text General Clean-up	10.1.0
51	RP-110225	0863		Correction to the Semantics Description of TAC	10.1.0
51	RP-110226	0864		Introduction of a Stepwise Load Reduction Indication for the Overload procedure in Stage 3	10.1.0
52	RP-110695	0865	1	MDT correction for TAI	10.2.0
52	RP-110688	0870	1	Usage of the transparent containers for SRVCC	10.2.0
52	RP-110688	0871	1	Removal of DTM capability for UTRAN PS HO	10.2.0
52	RP-110687	0874	1	UE context release correction	10.2.0
52	RP-110700	0878		Correction to the semantic description of *Cell Load Reporting Cause* IE	10.2.0
52	RP-110682	0885	1	Correction of Target ID	10.2.0
52	RP-110689	0886	2	Review of Initial Context Setup	10.2.0
52	RP-110689	0887		Correction of SPID	10.2.0
52	RP-110689	0889	1	Overload Consistency Handling	10.2.0
52	RP-110689	0892	2	Clarification of “Redirection towards 1xRTT” cause code	10.2.0
52	RP-110695	0900	3	Support for MDT user consent	10.2.0
52	RP-110684	0903		Correction of References	10.2.0
52	RP-110686	0904	2	General clean-up before Rel-10 ASN.1 closure	10.2.0
52	RP-110698	0905	1	Clarification of MME,HeNB GW and Relay Node functions	10.2.0
52	RP-110687	0910	3	Error Handling for LIPA	10.2.0
52	RP-110695	0911	2	MDT amendments	10.2.0
52	RP-110695	0912	1	Correction of trace function and trace session	10.2.0
52	RP-110714	0913	2	Remove the UE context in the source HeNB-GW after HeNB-HeNB X2 HO	10.2.0
53	RP-111197	0914		Correction on the Order of Transparent Containers	10.3.0
53	RP-111196	0919	1	Correction of an ASN.1 typo regarding ManagementBasedMDTAllowed	10.3.0
53	RP-111197	0923	1	Data Forwarding correction	10.3.0
53	RP-111195	0924	2	Definition of value of bit in Measurements to Activate	10.3.0
53	RP-111195	0927	1	Correction of RIM function decsription	10.3.0
53	RP-111196	0928	-	Missing procedure code for “Kill”	10.3.0
53	RP-111196	0930	1	Correction of Emergency Call	10.3.0
53	RP-111198	0933	2	Container Issue	10.3.0
53	RP-111196	0935	1	Correction of SRVCC	10.3.0
53	RP-111197	0940	-	Clarification on PLMN Identity	10.3.0
54	RP-111648	0941		Definition of Maximum no. of candidate cells	10.4.0

54	RP-111651	0943		Correction of Emergency Call	10.4.0
54	RP-111651	0944		Correction of the annex on the processing of transparent containers at MME	10.4.0
54	RP-111648	0945	1	GW Context Release Indication correction	10.4.0
54	RP-111649	0954	3	Alignment on privacy requirements for MDT	10.4.0
55	RP-120233	0956	1	Corrections for SON Transfer RIM application	10.5.0
55	RP-120234	0969	2	Correct of reset	10.5.0
55	RP-120234	0978	2	Octet String for E-CGI	10.5.0
56	RP-120744	0980	-	Correction on ETWS and CMAS	10.6.0