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Foreword

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

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

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 - 1 presented to TSG for information;
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- 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	0]	3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA), User Equipment (UE) procedures in idle mode".
[2]	1]	3GPP TS 23.003: "Technical Specification Group Core Network and Terminals; Numbering, addressing and identification".
[22	2]	3GPP TS 36.423: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP)".
[23	3]	3GPP TS 48.008: "Mobile Switching Centre-Base Station System (MSC-BSS) interface; Layer 3 specification".
[24	4]	3GPP TS 24.301: "Non-Access Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".
[2:	5]	3GPP2 A.S0008-C: "Interoperability Specification (IOS) for High Rate Packet Data (HRPD) Radio Access Network Interfaces with Session Control in the Access Network".
[20	6]	3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".
[2	7]	3GPP2 C.S0024-B: "cdma2000 High Rate Packet Data Air Interface Specification".
[28	8]	3GPP TS 22.220: "Service requirements for Home Node Bs and Home eNode Bs".
[29	9]	3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".
[30	0]	3GPP TS 48.016: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN) interface; Network service".
[3]	1]	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	2]	3GPP TS 29.281: "General Packet Radio Service (GPRS); Tunnelling Protocol User Plane (GTPv1-U)".
[33	3]	3GPP TS 24.008: "Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".
[34	4]	3GPP TS 36.455: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol A (LPPa)".
[3:	5]	3GPP TS 29.060: "GPRS Tunnelling Protocol (GTP) across the Gn and Gp interface".
[30	6]	3GPP TS 29.274: "Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".
[3	7]	3GPP TS 23.139: "3GPP system – fixed broadband access network interworking".
[38	8]	3GPP TS 23.007: "Technical Specification Group Core Network Terminals; Restoration procedures".
[39	9]	3GPP TS 36.104: "Base Station (BS) radio transmission and reception".
[40	0]	3GPP TR 25.921 (version.7.0.0): "Guidelines and principles for protocol description and error handling".
[4]	1]	3GPP TS 36.306: "User Equipment (UE) radio access capabilities".

3 Definitions 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].

Dual Connectivity: as defined in TS 36.300 [14].

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 1: 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 2: 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.

Secondary Cell Group: as defined in TS 36.300 [14].

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 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 BBF Broadband Forum CCO Cell Change Order

CDMA Code Division Multiple Access
CID Cell-ID (positioning method)
CIoT Cellular Internet of Things

CS Circuit Switched

CSG Closed Subscriber Group

CN Core Network

DCN Dedicated Core Network

DL Downlink

eAN evolved Access Network
ECGI E-UTRAN Cell Global Identifier
E-CID Enhanced Cell-ID (positioning method)

eHRPD evolved High Rate Packet Data

eNB E-UTRAN NodeB
EP Elementary Procedure
EPC Evolved Packet Core
EPS Evolved Packet System

E-RAB E-UTRAN Radio Access Bearer E-SMLC Evolved Serving Mobile Location Centre

E-SMLC Evolved Serving Mob E-UTRAN Evolved UTRAN

GBR Guaranteed Bit Rate
GNSS Global Navigation Satellite System
GUMMEI Globally Unique MME Identifier

GPRS Tunnelling Protocol GTP Hyper Frame Number **HFN** High Rate Packet Data **HRPD** Information Element ΙE Internet of Things IoT L-GW Local GateWay Local Home Network LHN Local Home Network ID LHN ID

LIPA Local IP Access

LPPa LTE Positioning Protocol Annex

MBSFN Multimedia Broadcast multicast service Single Frequency Network

MDT Minimization of Drive Tests MME Mobility Management Entity

NAS Non Access Stratum

NB-IoT Narrowband IoT

NNSF NAS Node Selection Function OTDOA Observed Time Difference of Arrival

PS Packet Switched
ProSe Proximity Services
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

SCG Secondary Cell Group S-GW Serving GateWay SN Sequence Number

SIPTO Selected IP Traffic Offload

SIPTO@LN Selected IP Traffic Offload at the Local Network

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

UTDOA Uplink Time Difference of Arrival

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 and modification 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 and reroute 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.
- UE Context Resumption function: This functionality allows keeping the UE Context in the eNB for a UE in RRC_IDLE that has been enabled to use User Plane EPS Optimization (see TS 23.401 [11]) and to resume the RRC connection without the need to re-establish the UE Context.
- 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 Tunnelling 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.
- UE Radio Capability Match function. The functionality enables the eNB to derive and provide an indication to the MME whether the UE radio capabilities are compatible with the network configuration for voice continuity.
- PWS Restart Indication function. The functionality enables the eNB to inform the MME that PWS information for some or all cells of the eNB are available for reloading from the CBC if needed.
- PWS Failure Indication function. The functionality enables the eNB to inform the MME that ongoing PWS operation for one or more cells of the eNB has failed.
- Connection Establishment Indication function. The functionality enables the MME to complete the establishment of the UE-associated logical S1-connection.

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	Initiating Message	Successful Outcome	Unsuccessful Outcome
Procedure		Response message	Response message
Handover	HANDOVER	HANDOVER COMMAND	HANDOVER
Preparation	REQUIRED		PREPARATION FAILURE
Handover	HANDOVER	HANDOVER REQUEST	HANDOVER FAILURE
Resource	REQUEST	ACKNOWLEDGE	
Allocation			
Path Switch	PATH SWITCH	PATH SWITCH	PATH SWITCH REQUEST
Request	REQUEST	REQUEST	FAILURE
'		ACKNOWLEDGE	
Handover	HANDOVER CANCEL	HANDOVER CANCEL	
Cancellation		ACKNOWLEDGE	
E-RAB Setup	E-RAB SETUP	E-RAB SETUP	
'	REQUEST	RESPONSE	
E-RAB Modify	E-RAB MODIFY	E-RAB MODIFY	
,	REQUEST	RESPONSE	
E-RAB	E-RAB	E-RAB MODIFICATION	
Modification	MODIFICATION	CONFIRM	
Indication	INDICATION		
E-RAB Release	E-RAB RELEASE	E-RAB RELEASE	
	COMMAND	RESPONSE	
Initial Context	INITIAL CONTEXT	INITIAL CONTEXT	INITIAL CONTEXT SETUP
Setup	SETUP REQUEST	SETUP RESPONSE	FAILURE
Reset	RESET	RESET	
		ACKNOWLEDGE	
S1 Setup	S1 SETUP REQUEST	S1 SETUP RESPONSE	S1 SETUP FAILURE
UE Context	UE CONTEXT	UE CONTEXT RELEASE	
Release	RELEASE COMMAND	COMPLETE	
UE Context	UE CONTEXT	UE CONTEXT	UE CONTEXT
Modification	MODIFICATION	MODIFICATION	MODIFICATION FAILURE
	REQUEST	RESPONSE	
eNB	ENB	ENB CONFIGURATION	ENB CONFIGURATION
Configuration	CONFIGURATION	UPDATE	UPDATE FAILURE
Update	UPDATE	ACKNOWLEDGE	
MME	MME	MME CONFIGURAION	MME CONFIGURATION
Configuration	CONFIGURATION	UPDATE	UPDATE FAILURE
Update	UPDATE	ACKNOWLEDGE	
Write-Replace	WRITE-REPLACE	WRITE-REPLACE	
Warning	WARNING REQUEST	WARNING RESPONSE	
Kill	KILL REQUEST	KILL RESPONSE	
UE Radio	UE RADIO	UE RADIO CAPABILITY	
Capability	CAPABILITY MATCH	MATCH RESPONSE	
Match	REQUEST		
UE Context	UE CONTEXT	UE CONTEXT	
Modification	MODIFICATION	MODIFICATION	
Indication	INDICATION	CONFIRM	
UE Context	UE CONTEXT	UE CONTEXT	
Suspend	SUSPEND REQUEST	SUSPEND RESPONSE	
UE Context	UE CONTEXT	UE CONTEXT RESUME	UE CONTEXT RESUME
Resume	RESUME REQUEST	RESPONSE	FAILURE

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 Tunnelling	DOWNLINK S1 CDMA2000	
	TUNNELLING	
Uplink S1 CDMA2000 Tunnelling	UPLINK S1 CDMA2000	
,	TUNNELLING	
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	LOCATION REPORTING FAILURE	
Indication	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	DOWNLINK UE ASSOCIATED LPPA	
Transport	TRANSPORT	
Uplink UE Associated LPPa	UPLINK UE ASSOCIATED LPPA	
Transport	TRANSPORT	
Downlink Non UE Associated LPPa	DOWNLINK NON UE ASSOCIATED	
Transport	LPPA TRANSPORT	
Uplink Non UE Associated LPPa	UPLINK NON UE ASSOCIATED	
Transport PWS Restart Indication	LPPA TRANSPORT PWS RESTART INDICATION	
Reroute NAS Request PWS Failure Indication	REROUTE NAS REQUEST PWS FAILURE INDICATION	
	CONNECTION ESTABLISHMENT	
Connection Establishment Indication	INDICATION ESTABLISHMENT	
muication	INDICATION	

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

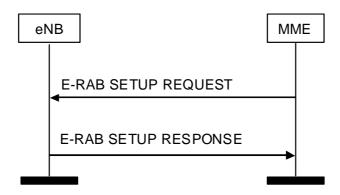


Figure 8.2.1.2-1: E-RAB Setup procedure. Successful operation.

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.

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

If the *Bearer Type* IE is included in the E-RAB SETUP REQUEST message and is set to 'non IP', then the eNB shall not perform header compression 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'.

If the eNB receives an E-RAB SETUP REQUEST message containing both the *Correlation ID* and the *SIPTO Correlation ID* IEs for the same E-RAB, the eNB shall consider the establishment of the corresponding E-RAB as failed.

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

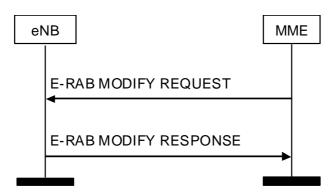


Figure 8.2.2.2-1: E-RAB Modify procedure. Successful operation.

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 for which the *Transport Information* IE is not included 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.

If the *Transport Information* IE is included in the E-RAB MODIFY REQUEST message, the eNB shall use the included information as the new S-GW address and uplink packet destination for the relevant E-RAB as defined in TS 23.401 [11], and it shall ignore the *E-RAB Level QoS Parameters* and *NAS-PDU* IEs for the same E-RAB.

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

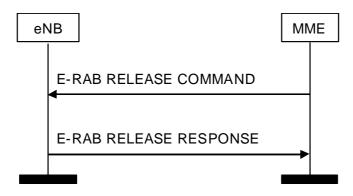


Figure 8.2.3.2.1-1: E-RAB Release procedure. Successful operation.

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.

The eNB shall, if supported, report in the E-RAB RELEASE RESPONSE message location information of the UE in the *User Location Information* IE.

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.

If the *User Location Information* IE is included in the E-RAB RELEASE RESPONSE message, the MME shall handle this information as specified in TS 23.401 [11].

8.2.3.2.2 E-RAB Release Indication – eNB initiated

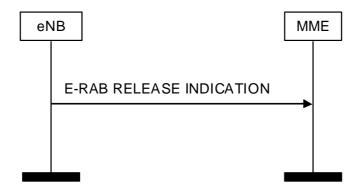


Figure 8.2.3.2.2-1: E-RAB Release INDICATION procedure. Successful operation.

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.

The eNB shall, if supported, report in the E-RAB RELEASE INDICATION message location information of the UE in the *User Location Information* 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.

If the *User Location Information* IE is included in the E-RAB RELEASE INDICATION message, the MME shall handle this information as specified in TS 23.401 [11].

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'.

8.2.4 E-RAB Modification Indication

8.2.4.1 General

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

8.2.4.2 Successful Operation

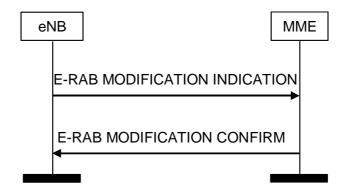


Figure 8.2.4.2-1: E-RAB Modification Indication procedure. Successful operation.

The eNB initiates the procedure by sending an E-RAB MODIFICATION INDICATION message to the MME.

The *Transport Layer Address* IE and *DL GTP TEID* IE included in the *E-RAB To Be Modified Item IEs* IE in the E-RAB MODIFICATION INDICATON message shall be considered by the MME as the new DL address of the E-RABs. The *Transport Layer Address* IE and *DL GTP TEID* IE included in the *E-RAB Not To Be Modified Item IEs* IE in the E-RAB MODIFICATION INDICATION message shall be considered by the MME as the E-RABs with unchanged DL address

The E-RAB MODIFICATION CONFIRM message shall contain the result for all the E-RABs that were requested to be modified according to the *E-RAB To Be Modified Item IEs* IE of the E-RAB MODIFICATION INDICATION message as follows:

- 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.
- A list of E-RABs which are to be released, if any, shall be included in the E-RAB To Be Released List IE.

If the E-RAB Failed to Modify List IE is received in the E-RAB MODIFICATION CONFIRM message, the eNB shall either

- release all corresponding E-UTRA and E-UTRAN resources for the concerned E-RAB or
- keep the previous transport information before sending the E-RAB MODIFICATION INDICATION message unchanged for the concerned E-RAB.

If the *E-RAB To Be Released List* IE is received in the E-RAB MODIFICATION CONFIRM message, the eNB shall release all corresponding E-UTRA and E-UTRAN resources for the concerned E-RAB.

If the *CSG Membership Info* IE is included in the E-RAB MODIFICATION INDICATION message, the MME shall use the information for CSG membership verification as specified in TS 36.300 [14] and provide the result of the membership verification in the *CSG Membership Status* IE contained in the E-RAB MODIFICATION CONFIRM message.

If *PLMN Identity* IE is received in the *CSG Membership Info* IE in the E-RAB MODIFICATION INDICATION message, the MME shall use it for CSG membership verification as specified in TS 36.300 [14].

When the MME reports unsuccessful modification of an E-RAB, the cause value should be precise enough to enable the eNB to know the reason for an unsuccessful modification.

If the *Tunnel Information for BBF* IE is received in the E-RAB MODIFICATION INDICATION message, the MME shall, if supported, use it in the core network as specified in TS 23.139 [37].

8.2.4.3 Unsuccessful Operation

The unsuccessful operation is specified in the successful operation section.

8.2.4.4 Abnormal Conditions

Interaction with UE Context Release Request procedure:

If the E-RAB MODIFICATION INDICATION message does not contain all the E-RABs previously included in the UE Context, the MME shall trigger the UE Context Release procedure.

If the E-RAB MODIFICATION INDICATION message contains several *E-RAB ID* IEs set to the same value, the MME shall trigger the UE Context Release procedure.

If the *CSG Membership Info* IE in the E-RAB MODIFICATION INDICATION message does not contain the *Cell Access Mode* IE set to "hybrid", the MME shall trigger the UE Context Release procedure.

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

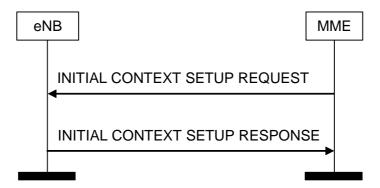


Figure 8.3.1.2-1: Initial Context Setup procedure. Successful operation.

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 SIPTO Correlation ID IE in case of SIPTO@LN operation,
- the Bearer Type IE.

The INITIAL CONTEXT SETUP REQUEST message may contain

- the *Trace Activation* IE.
- the Handover Restriction List IE, which may contain roaming 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* 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 Management Based MDT PLMN List IE.
- the Additional CS Fallback Indicator IE.
- the Masked IMEISV IE.
- the Expected UE Behaviour IE.
- the *ProSe Authorized* IE.
- the *UE User Plane CIoT Support Indicator* 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.

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

If the *Bearer Type* IE is included in the INITIAL CONTEXT SETUP REQUEST message and is set to 'non IP', then the eNB shall not perform header compression for the concerned E-RAB.

If the *Masked IMEISV* IE is contained in the INITIAL CONTEXT SETUP REQUEST the target eNB shall, if supported, use it to determine the characteristics of the UE for subsequent handling.

If the *Expected UE Behaviour* IE is included in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall, if supported, store this information and may use it to determine the RRC connection time.

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.
- store the received Management Based MDT PLMN List information, if supported, in the UE context.
- store the received ProSe Authorization 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, except if the *CS Fallback Indicator* IE is set to 'CS Fallback High Priority' and the *Additional CS Fallback Indicator* IE is not present in which case the eNB may use the information in the *Handover Restriction List* IE;
- select a proper SCG during dual connectivity operation.

If the *Handover Restriction List* IE is not contained in the INITIAL CONTEXT SETUP REQUEST message, the eNB shall consider that no roaming and no access restriction apply to the UE. The eNB shall also consider that no roaming and no access restriction apply to the UE when:

- one of the setup E-RABs has a particular ARP value (TS 23.401 [11]);
- the CS Fallback Indicator IE is set to 'CS Fallback High Priority' and the Additional CS Fallback Indicator IE is not present and, in case the Handover Restriction List IE is applied, no suitable target is found, in which case it shall process according to TS 23.272 [17];
- the *CS Fallback Indicator* IE is set to 'CS Fallback High Priority' and the *Additional CS Fallback Indicator* IE is set to 'no restriction', 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', 'Logged MDT only' or 'Logged MBSFN MDT', 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 *Trace Activation* IE includes the *MDT Location Information* IE, within the *MDT Configuration* IE, store this information and take it into account in the requested MDT session.
- if the *Trace Activation* IE includes the *Signalling based MDT PLMN List* IE, within the *MDT Configuration* IE, the eNB may use it to propagate the MDT Configuration as described in TS 37.320 [31].
- if the *Trace Activation* IE includes the *MBSFN-ResultToLog* IE, within the *MDT Configuration* IE, take it into account for MDT Configuration as described in TS 37.320 [31].

- if the *Trace Activation* IE includes the *MBSFN-Areald* IE in the *MBSFN-ResultToLog* IE, within the *MDT Configuration* IE, take it into account for MDT Configuration as described in TS 37.320 [31].

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* 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, together with information in the *Management Based MDT PLMN List* IE, if available in the UE context, to allow subsequent selection of the UE for management based MDT defined in TS 32.422 [10].

If the *UE User Plane CloT Support Indicator* IE is included in the INITIAL CONTEXT SETUP REQUEST message and is set to "supported", the eNB shall, if supported, consider that User Plane CloT EPS Optimisation as specified in TS 23.401[11] is supported for the UE.

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

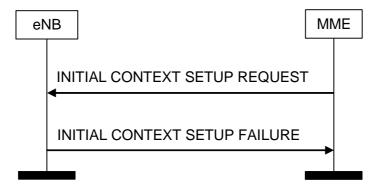


Figure 8.3.1.3-1: Initial Context Setup procedure. Unsuccessful operation.

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.

If the eNB receives an INITIAL CONTEXT SETUP REQUEST message containing both the *Correlation ID* and the *SIPTO Correlation ID* IEs for the same E-RAB, the eNB shall consider the establishment of the corresponding E-RAB as failed.

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., ${}^{\prime}TX2_{RELOCOverall}$ 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

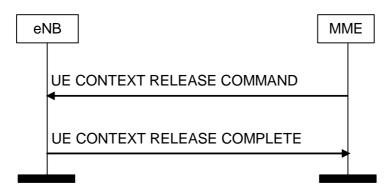


Figure 8.3.3.2-1: UE Context Release procedure. Successful operation.

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 and/or SIPTO@LN operation, the eNB shall also release any related tunnel resources. In case of successful handover, the eNB using L-GW function for SIPTO@LN operation shall also request using intra-node signalling the collocated L-GW to release the SIPTO@LN PDN connection as defined in TS 23.401 [11].

The eNB shall, if supported, report in the UE CONTEXT RELEASE COMPLETE message location information of the UE in the *User Location Information* IE.

If the *User Location Information* IE is included in the UE CONTEXT RELEASE COMPLETE message, the MME shall handle this information as specified in TS 23.401 [11].

If the *Information on Recommended Cells and eNBs for Paging* IE is included in the UE CONTEXT RELEASE COMPLETE message, the MME shall, if supported, store it and may use it for subsequent paging.

If the *Cell Identifier and Coverage Enhancement Level* IE is included in the UE CONTEXT RELEASE COMPLETE message, the MME shall, if supported, store it and use it for subsequent paging.

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

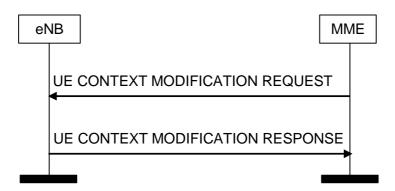


Figure 8.3.4.2-1: UE Context Modification procedure. Successful operation.

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.
- the Additional CS Fallback Indicator IE.
- the ProSe Authorized IE.
- the SRVCC Operation Possible IE.
- the SRVCC Operation Not Possible 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 is in dual connectivity operation and the cell configured as SCG is a hybrid cell, the eNB shall inform the eNB serving the SCG of the updated CSG membership status.

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' and the *Additional CS Fallback Indicator* IE is not present and, in case the Handover Restriction List information that may exist in the UE context is applied, no suitable target is found, or if the *CS Fallback Indicator* IE is set to 'CS Fallback High Priority' and the *Additional CS Fallback Indicator* IE is set to 'no restriction', the eNB shall consider that no roaming and no access restriction apply 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].

If the *ProSe Authorized* IE is contained in the UE CONTEXT MODIFICATION REQUEST message, the eNB shall, if supported, update its ProSe authorization information for the UE accordingly. If the *ProSe Authorized* IE includes one or more IEs set to 'not authorized', the eNB shall, if supported, initiate actions to ensure that the UE is no longer accessing the relevant ProSe service(s).

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

If the *SRVCC Operation Not Possible* IE is included in UE CONTEXT MODIFICATION REQUEST message, the eNB shall, if supported, remove the SRVCC Operation Possible information from the UE context.

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

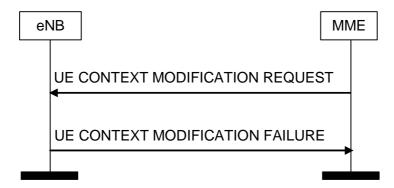


Figure 8.3.4.3-1: UE Context Modification procedure. Unsuccessful operation.

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.

8.3.5 UE Radio Capability Match

8.3.5.1 General

The purpose of the UE Radio Capability Match procedure is for the MME to request the eNB to derive and provide an indication to the MME whether the UE radio capabilities are compatible with the network configuration for voice continuity.

The procedure uses UE-associated signalling.

8.3.5.2 Successful Operation

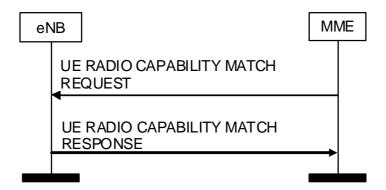


Figure 8.3.5.2-1: UE Radio Capability Match. Successful operation

The MME initiates the procedure by sending a UE RADIO CAPABILITY MATCH REQUEST message. 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 the *MME UE S1AP ID* IE in the UE RADIO CAPABILITY MATCH REQUEST message; by receiving the *MME UE S1AP ID* IE in the UE RADIO CAPABILITY MATCH REQUEST message, the eNB establishes the UE-associated logical S1-connection.

Upon receipt of the UE RADIO CAPABILITY MATCH REQUEST message, the eNB shall act as defined in the TS 23.401 [11] and respond with a UE RADIO CAPABILITY MATCH RESPONSE message.

If the *UE Radio Capability* IE is contained in the UE RADIO CAPABILITY MATCH REQUEST message, the eNB shall use it to determine the value of the *Voice Support Match Indicator* IE to be included in the UE RADIO CAPABILITY MATCH RESPONSE message.

8.3.5.3 Unsuccessful Operation

Not applicable.

8.3.5.4 Abnormal Conditions

Not applicable.

8.3.6 UE Context Modification Indication

8.3.6.1 General

The purpose of the UE Context Modification Indication procedure is for the eNB to request the modifications on the established UE Context.

The procedure uses UE-associated signalling.

In the current version of the specification, this procedure is only used for membership verification, as described in TS 36.300 [14].

8.3.6.2 Successful Operation

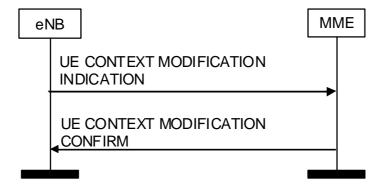


Figure 8.3.6.2-1: UE Context Modification Indication. Successful operation

If the *CSG Membership Info* IE is included in the UE CONTEXT MODIFICATION INDICATION message, the MME shall use the information for CSG membership verification as specified in TS 36.300 [14] and provide the result of the membership verification in the *CSG Membership Status* IE contained in the UE CONTEXT MODIFICATION CONFIRM message.

If no CSG Membership Info IE is received in the UE CONTEXT MODIFICATION INDICATION message and the UE was previously configured with resources from a hybrid cell, the MME shall consider that the UE has moved into an open access cell.

If *PLMN Identity* IE is received in the *CSG Membership Info* IE in the UE CONTEXT MODIFICATION INDICATION message, the MME shall use it for CSG membership verification as specified in TS 36.300 [14].

8.3.6.3 Unsuccessful Operation

Not applicable.

8.3.6.4 Abnormal Conditions

If the *CSG Membership Info* IE in the UE CONTEXT MODIFICATION message does not contain the *Cell Access Mode* IE set to "hybrid" the MME shall trigger the UE Context Release procedure.

8.3.7 UE Context Suspend

8.3.7.1 General

The purpose of the UE Context Suspend procedure is to suspend the UE context, the UE-associated logical S1-connection and the related bearer contexts in the E-UTRAN and the EPC.

8.3.7.2 Successful Operation

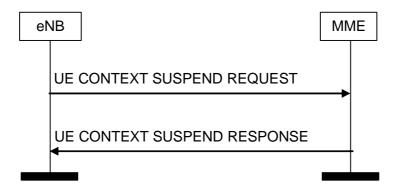


Figure 8.3.7.2-1: UE Context Suspend procedure. Successful operation.

The eNB initiates the procedure by sending the UE CONTEXT SUSPEND REQUEST message to the MME.

Upon receipt of the UE CONTEXT SUSPEND REQUEST the MME shall act as defined in TS 23.401 [11].

Upon receipt of the UE CONTEXT SUSPEND RESPONSE message the eNB shall suspend the UE context, the UE-associated logical S1-connection and the related bearer contexts and send the UE to RRC_IDLE.

If the *Information on Recommended Cells and eNBs for Paging* IE is included in the UE CONTEXT SUSPEND REQUEST message, the MME shall, if supported, store it and may use it for subsequent paging.

If the *Cell Identifier and Coverage Enhancement Level* IE is included in the UE CONTEXT SUSPEND REQUEST message, the MME shall, if supported, store it and use it for subsequent paging.

8.3.8 UE Context Resume

8.3.8.1 General

The purpose of the UE Context Resume procedure is to indicate to the MME that the UE has resumed the suspended RRC connection and to request the MME to resume the UE context, UE-associated logical S1-connection and the related bearer contexts in the EPC.

8.3.8.2 Successful Operation

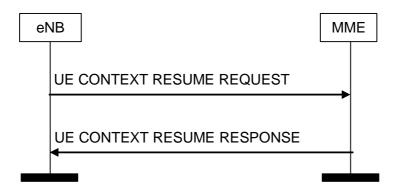


Figure 8.3.8.2-1: UE Context Resume procedure. Successful operation.

The eNB initiates the procedure by sending the UE CONTEXT RESUME REQUEST message to the MME. If the eNB is not able to admit all suspended E-RABs the eNB shall indicate this in the *E-RABs Failed To Resume List* IE.

Upon receipt of the UE CONTEXT RESUME REQUEST message the MME shall act as defined in TS 23.401 [11] and respond with the UE CONTEXT RESUME RESPONSE. If the MME is not able to admit all suspended E-RABs the MME shall indicate this in the *E-RABs Failed To Resume List* IE.

The eNB shall release resources for each E-RAB failed to resume and shall assume that the EPC has released respective resources as well.

8.3.8.3 Unsuccessful Operation

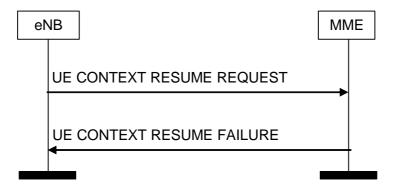


Figure 8.3.8.3-1: UE Context Resume procedure. Unsuccessful operation.

If the MME is not able to resume a single E-RAB it releases the UE-associated logical S1-connection by sending the UE CONTEXT RESUME FAILURE message to the eNB. Upon reception of the UE CONTEXT RESUME FAILURE message the eNB shall release the RRC connection as specified in TS 36.331 [16] and release all related signalling and user data transport resources.

8.3.9 Connection Establishment Indication

8.3.9.1 General

The purpose of the Connection Establishment Indication procedure is to enable the MME to complete the establishment of the UE-associated logical S1-connection. The procedure uses UE-associated signalling.

8.3.9.2 Successful Operation



Figure 8.3.9.2-1: Connection Establishment Indication procedure. Successful operation.

The MME initiates the procedure by sending a CONNECTION ESTABLISHMENT INDICATION message to the and

The MME shall allocate a unique MME UE S1AP ID to be used for the UE and include that in the CONNECTION ESTABLISHMENT INDICATION message.

If the *UE Radio Capability* IE is included in the CONNECTION ESTABLISHMENT INDICATION message, the eNB shall store this information in the UE context, use it as defined in TS 36.300 [14].

8.3.9.3 Unsuccessful Operation

Not applicable.

8.3.9.4 Abnormal Conditions

Not applicable.

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

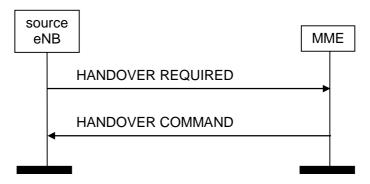


Figure 8.4.1.2-1: Handover preparation: successful operation

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 $TS1_{RELOCOverall}$ 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 a particular ARP value (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 a particular ARP value (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 of inter-system handover from E-UTRAN to UTRAN, the source eNB shall, if supported, include the *HO Cause Value* IE in the *UE History Information* IE of the HANDOVER REQUIRED message.

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 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 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 signalling connection, the source eNB shall either:

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

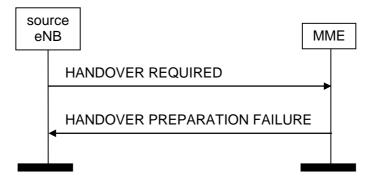


Figure 8.4.1.3-1: Handover preparation: unsuccessful operation

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 a particular ARP value (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 a particular ARP value (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

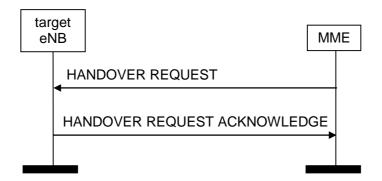


Figure 8.4.2.2-1: Handover resource allocation: successful operation

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 roaming 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 a particular ARP value (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; - select a proper SCG during dual connectivity operation.

If the *Handover Restriction List* IE is not contained in the HANDOVER REQUEST message, the target eNB shall consider that no roaming and no access restriction apply 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', 'Logged MDT only' or 'Logged MBSFN MDT', 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 *Trace Activation* IE includes the *MDT Location Information* IE, within the *MDT Configuration* IE, store this information and take it into account in the requested MDT session.
- if the *Trace Activation* IE includes the *Signalling based MDT PLMN List* IE, within the *MDT Configuration* IE, the eNB may use it to propagate the MDT Configuration as described in TS 37.320 [31].
- if the *Trace Activation* IE includes the *MBSFN-ResultToLog* IE, within the *MDT Configuration* IE, take it into account for MDT Configuration as described in TS 37.320 [31].
- if the *Trace Activation* IE includes the *MBSFN-Areald* IE in the *MBSFN-ResultToLog* IE, within the *MDT Configuration* IE, take it into account for MDT Configuration as described in TS 37.320 [31].

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 cell is CSG cell or hybrid cell, the target eNB shall include the CSG ID IE in the HANDOVER REQUEST ACKNOWLEDGE message.

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 a particular ARP value (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 and shall, if supported, collect the information defined as optional 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.

Upon reception of the *UE History Information from the UE* IE, which is included within the *Source eNB to Target eNB Transparent Container* IE in the HANDOVER REQUEST message, the target eNB shall, if supported, store the collected information, to be used for future handover preparations.

If the *Mobility Information* IE is included within the *Source eNB to Target eNB Transparent Container* IE in the HANDOVER REQUEST message, the target eNB shall, if supported, store this information and use it as defined in TS 36.300 [14].

If the *Expected UE Behaviour* IE is included in the HANDOVER REQUEST message, the eNB shall, if supported, store this information and may use it to determine the RRC connection time.

If the *Bearer Type* IE is included in the HANDOVER REQUEST message and is set to 'non IP', then the eNB shall not perform header compression for the concerned E-RAB.

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 only or the *Management Based MDT Allowed* IE and the *Management Based MDT PLMN List* 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].

If the *Masked IMEISV* IE is contained in the HANDOVER REQUEST message the target eNB shall, if supported, use it to determine the characteristics of the UE for subsequent handling.

If the HANDOVER REQUEST contains a *Target Cell ID* IE, as part of the *Source eNB to Target eNB Transparent Container* IE, for a cell which is no longer active, the eNB may respond with an HANDOVER REQUEST ACKNOWLEDGE in case the PCI of the deactivated cell is in use by another active cell.

If the *ProSe Authorized* IE is contained in the HANDOVER REQUEST message and it contains one or more IEs set to 'authorized', the eNB shall, if supported, consider that the UE is authorized for the relevant ProSe service(s).

If the *UE User Plane CIoT Support Indicator* IE is included in the HANDOVER REQUEST message and is set to "supported", the eNB shall, if supported, consider that User Plane CIoT EPS Optimisation as specified in TS 23.401[11] is supported for the UE.

If the *CE-mode-B Support Indicator* IE is included in the HANDOVER REQUEST ACKNOWLEDGE message and set to "supported", the MME shall, if supported, use the extended NAS timer settings for the UE as specified in TS 24.301[24].

8.4.2.3 Unsuccessful Operation

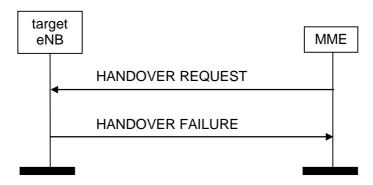


Figure 8.4.2.3-1: Handover resource allocation: unsuccessful operation

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

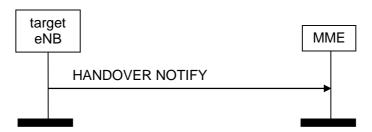


Figure 8.4.3.2-1: Handover notification

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.

If the *Tunnel Information for BBF* IE is received in the HANDOVER NOTIFY message, the MME shall, if supported, use it in the core network as specified in TS 23.139 [37].

If the *LHN ID* IE is included in the HANDOVER NOTIFY message, the MME shall, if supported, use it as specified in TS 23.401 [11].

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

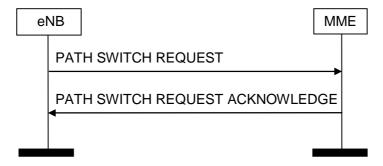


Figure 8.4.4.2-1: Path switch request: successful operation

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.

When the eNB receives the PATH SWITCH REQUEST ACKNOWLEDGE message including the *CSG Membership Status* IE, and if the cell that serves the UE is a hybrid cell, the eNB shall use it as defined in TS 36.300 [14].

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.

If the *Tunnel Information for BBF* IE is received in the PATH SWITCH REQUEST message, the MME shall, if supported, use it in the core network as specified in TS 23.139 [37].

If the *LHN ID* IE is included in the PATH SWITCH REQUEST message, the MME shall, if supported, use it as specified in TS 23.401 [11].

If the *ProSe Authorized* IE is contained in the PATH SWITCH REQUEST ACKNOWLEDGE message, the eNB shall, if supported, update its ProSe authorization information for the UE accordingly. If the *ProSe Authorized* IE includes one or more IEs set to 'not authorized', the eNB shall, if supported, initiate actions to ensure that the UE is no longer accessing the relevant ProSe service(s).

If the *UE User Plane CloT Support Indicator* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message and is set to "supported", the eNB shall, if supported, consider that User Plane CloT EPS Optimisation as specified in TS 23.401[11] is supported for the UE.

8.4.4.3 Unsuccessful Operation

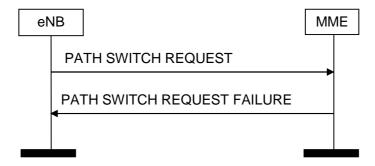


Figure 8.4.4.3-1: Path switch request: unsuccessful operation

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.

If the MME receives a PATH SWITCH REQUEST message without the *CSG Membership Status* IE, and the cell accessed by the UE is a hybrid cell with a different CSG from the source cell or the source cell does not have a CSG ID, the MME shall send the PATH SWITCH REQUEST FAILURE message to the eNB.

If the *CSG Membership Status* IE is not included in the PATH SWITCH REQUEST ACKNOWLEDGE message and the cell accessed by the UE is a hybrid cell with a different CSG from the source cell or the source cell does not have a CSG ID, the eNB shall consider the procedure as unsuccessfully terminated and initiate local error handling.

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

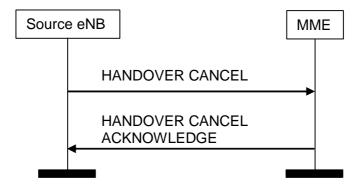


Figure 8.4.5.2-1: Handover Cancel procedure. Successful operation.

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.
- In case of 15 bit long PDCP-SN, for each E-RAB for which PDCP-SN and HFN status preservation applies, the source eNB shall additionally include the *UL COUNT Value Extended* IE and the *DL COUNT Value Extended* IE within the *E-RABs Subject to Status Transfer Item* IE.
- In case of 18 bit long PDCP-SN, for each E-RAB for which PDCP-SN and HFN status preservation applies, the source eNB shall additionally include the *UL COUNT Value for PDCP SN Length 18* IE and the *DL COUNT Value for PDCP SN Length 18* IE within the *E-RABs Subject to Status Transfer Item* IE.

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, or in the *Receive Status Of UL PDCP SDUs Extended* IE in case of 15 bit long PDCP-SN, or in the *Receive Status Of UL PDCP SDUs for PDCP SN Length 18* IE in case of 18 bit long PDCP-SN, 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. The target eNB using Full Configuration for this handover as per TS 36.300 [14] shall ignore the information received in this message.

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. If the *UL COUNT Value Extended* IE or *UL COUNT Value for PDCP SN Length 18* IE is included in the *E-RABs Subject to Status Transfer Item* IE, the target eNB shall, if supported, use the value contained in the *PDCP-SN Extended* IE in the *UL COUNT Value Extended* IE or *PDCP-SN Length 18* IE of the *UL COUNT Value for PDCP SN Length 18* IE instead of the value contained in the *PDCP-SN* IE of the *UL COUNT value* 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 *DL COUNT Value Extended* IE or *DL COUNT Value for PDCP SN Length 18* IE is included in the *E-RABs Subject to Status Transfer Item* IE, the target eNB shall, if supported, use the *DL COUNT Value Extended* IE or *DL COUNT Value for PDCP SN Length 18* IE instead of the *DL COUNT value* IE.

If the *Receive Status Of UL PDCP SDUs* IE or the *Receive Status Of UL PDCP SDUs Extended* IE or the *Receive Status Of UL PDCP SDUs for PDCP SN Length 18* 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

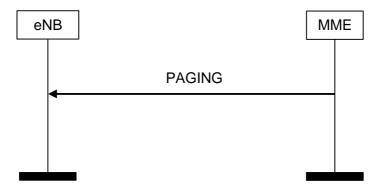


Figure 8.5.2-1: Paging procedure

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].

If the *UE Radio Capability for Paging* IE is included in the PAGING message, the eNB may use it to apply specific paging schemes.

If the *Assistance Data for Recommended Cells* IE is included in the *Assistance Data for Paging* IE it may be used, together with the *Paging Attempt Information* IE if also present according to TS 36.300 [14].

If the Assistance Data for CE capable UEs IE is included in the Assistance Data for Paging IE, it may be used for paging the indicated CE capable UE, together with the Paging Attempt Information IE according to TS 36.300 [14].

If the *Next Paging Area Scope* IE is included in the *Paging Attempt Information* IE it may be used for paging the UE according to TS 36.300 [14].

If the *Paging eDRX Information* IE is included in the PAGING message, the eNB shall, if supported, use it according to TS 36.304 [20]. If the *Paging Time Window* IE is included in the *Paging eDRX Information* IE, the eNB shall take this information into account to determine the UE"s paging occasion according to TS 36.304 [20]. The eNB should take into account the reception time of the PAGING message on the S1-MME interface to determine when to page the UE.

If the *Extended UE Identity Index Value* IE is included in the PAGING message, the eNB shall, if supported, use it to identify the paging resources to be used according to TS 36.304 [20].

If the *NB-IoT Paging eDRX Information* IE is included in the PAGING message, the eNB shall, if supported, use it according to TS 36.304 [20]. If the *NB-IoT Paging Time Window* IE is included in the *NB-IoT Paging eDRX Information* IE, the eNB shall take this information into account to determine the UE"s paging occasion according to TS 36.304 [20]. The eNB should take into account the reception time of the PAGING message on the S1-MME interface to determine when to page the UE.

If the *NB-IoT UE Identity Index Value* IE is included in the PAGING message, the eNB shall, if supported, use it to identify the paging resources to be used according to TS 36.304 [20].

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, UPLINK NAS TRANSPORT or REROUTE NAS REQUEST 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 eNB does not support NNSF and the eNB has received from the radio interface the GUMMEI Type 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.

If the SIPTO L-GW Transport Layer Address IE is received in the INITIAL UE MESSAGE message, the MME shall, if supported, use it for SIPTO@LN operation as sepecified in TS 23.401 [11].

If the *LHN ID* IE is included in the INITIAL UE MESSAGE message, the MME shall, if supported, use it as specified in TS 23.401 [11].

If the *Tunnel Information for BBF* IE is received in the INITIAL UE MESSAGE message, the MME shall, if supported, use it in the core network as specified in TS 23.139 [37].

If the *MME Group ID* IE is included in the INITIAL UE MESSAGE message this indicates that the message is a rerouted message and the MME shall, if supported, use the IE as described in TS 23.401 [11].

If the *UE Usage Type* IE is included in the INITIAL UE MESSAGE message, then the selected MME in the DCN shall if supported, use it as defined in TS 23.401 [48].

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

If the *CE-mode-B Support Indicator* IE is included in the INITIAL UE MESSAGE message and set to "supported", the MME shall, if supported, use the extended NAS timer settings for the UE as specified in TS 24.301[24].

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 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;
- select a proper SCG during dual connectivity operation.

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 roaming and no access restriction apply 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].

If the SRVCC Operation Possible IE is included in DOWNLINK NAS TRANSPORT message, the eNB shall store it in the UE context and, if supported, use it as defined in TS 23.216 [9].

If the *UE Radio Capability* IE is included in the DOWNLINK NAS TRANSPORT message, the eNB shall store this information in the UE context, 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 *GW Transport Layer Address* IE is received in the UPLINK NAS TRANSPORT message, the MME shall, if supported, use it for LIPA operation as specified in TS 23.401 [11].

If the SIPTO L-GW Transport Layer Address IE is received in the UPLINK NAS TRANSPORT message, the MME shall, if supported, use it for SIPTO@LN operation as specified in TS 23.401 [11].

If the *LHN ID* IE is included in the UPLINK NAS TRANSPORT message, the MME shall, if supported, use it as specified in TS 23.401 [11].

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'.

8.6.2.5 Reroute NAS Request



Figure 8.6.2.5-1: Reroute NAS Request Procedure

The purpose of the Reroute NAS Request procedure is to enable the MME to request for a rerouting of the INITIAL UE MESSAGE message to the MME in the indicated DCN.

The MME initiates the procedure by sending a REROUTE NAS REQUEST message to the eNB. The eNB shall, if supported, reroute the INITIAL UE MESSAGE message to the MME in the DCN indicated by the *MME Group ID* IE as described in TS 23.401 [11].

If the *Additional GUTI* IE is included in the REROUTE NAS REQUEST message, then the eNB shall if supported, use it when selecting the MME in the DCN as defined in TS 23.401 [11].

If the *UE Usage Type* IE is included in the REROUTE NAS REQUEST message, then the eNB shall if supported, include it towards the selected MME in the DCN as defined in TS 23.401 [48].

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

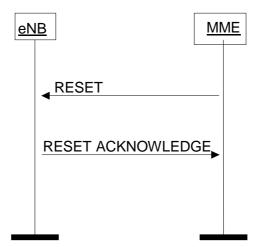


Figure 8.7.1.2.1-1: Reset procedure initiated from the MME. Successful operation.

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

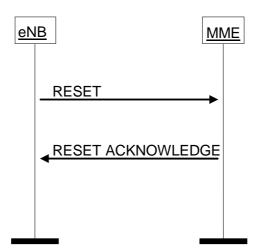


Figure 8.7.1.2.2-1: Reset procedure initiated from the E-UTRAN. Successful operation.

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 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 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 ID' 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 and clears MME overload state information at the eNB. If the eNB and MME do not agree on retaining the UE Contexts 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. 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

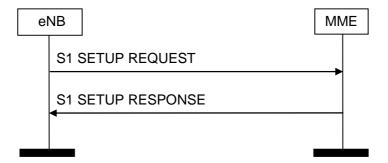


Figure 8.7.3.2-1: S1 Setup procedure: Successful Operation.

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.

If the *UE Retention Information* IE set to 'ues-retained' was included in the S1 SETUP REQUEST message, then the MME may accept the proposal to retain the existing UE related contexts and signalling connections by including the *UE Retention Information* IE set to 'ues-retained' in the S1 SETUP RESPONSE message.

If the *NB-IoT Default Paging DRX* IE is included in the S1 SETUP REQUEST message, the MME will take it into account as specified in TS36.300 [14].

8.7.3.3 Unsuccessful Operation

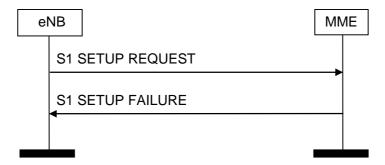


Figure 8.7.3.3-1: S1 Setup procedure: Unsuccessful Operation.

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

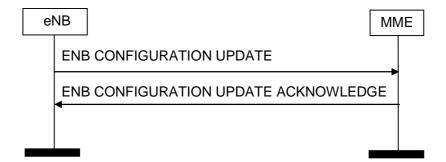


Figure 8.7.4.2-1: ENB Configuration Update procedure: Successful Operation.

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.

If the *NB-IoT Default Paging DRX* IE is included in the ENB CONFIGURATION UPDATE message, the MME shall overwrite any previously stored NB-IoT 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

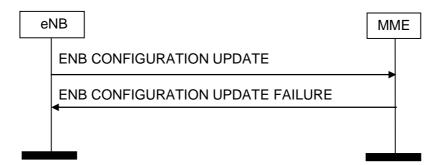


Figure 8.7.4.3-1: ENB Configuration Update procedure: Unsuccessful Operation.

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 message includes the *Time To Wait* IE, the eNB shall wait at least for the indicated time before reinitiating the ENB Configuration Update procedure towards the 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

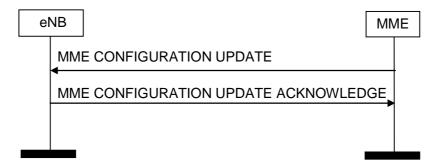


Figure 8.7.5.2-1: MME Configuration Update procedure: Successful Operation.

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

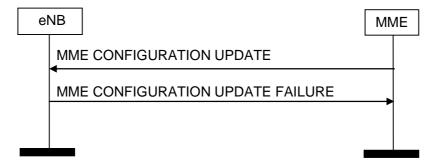


Figure 8.7.5.3-1: MME Configuration Update: Unsuccessful Operation.

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", "mo-VoiceCall" 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", "mo-VoiceCall" 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. If the *GUMMEI List* IE is present, the eNB replaces applicable ongoing actions according to TS 36.300 [14], clauses 4.6.2, 4.7.4 and 19.2.2.12.

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 for the applicable traffic 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, and proceed according to TS 36.300 [14], clauses 4.6.2, 4.7.4 and 19.2.2.12. 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 Tunnelling Procedures

8.8.1 General

The purpose of S1 CDMA2000 Tunnelling 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 tunnelling procedure. These procedures use an established UE-associated logical S1-connection.

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

8.8.2 Successful Operations

8.8.2.1 Downlink S1 CDMA2000 Tunnelling

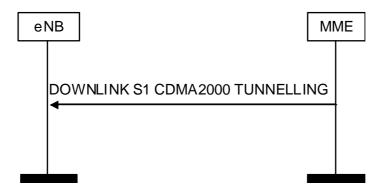


Figure 8.8.2.1-1: Downlink S1 CDMA2000 Tunnelling Procedure

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 TUNNELLING 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 TUNNELLING message.

If the DOWNLINK S1 CDMA2000 TUNNELLING 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 Tunnelling

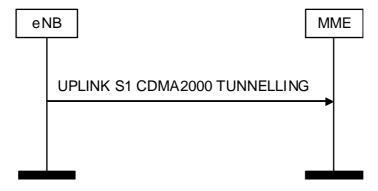


Figure 8.8.2.2-1: Uplink S1 CDMA2000 Tunnelling Procedure

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 TUNNELLING 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 TUNNELLING 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 TUNNELLING 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 TUNNELLING 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 TUNNELLING message with *CDMA2000 HO Required Indication* IE set to 'true' is sent before the DOWNLINK S1 CDMA2000 TUNNELLING message with *CDMA2000 HO Status* IE is received, the source eNB receives an MME initiated E-RAB Management procedure on the same UE associated signalling 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 TUNNELLING 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 TUNNELLING 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 INFO INDICATION message may also include paging specific UE capability information within the *UE Radio Capability for Paging* IE. 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', 'Logged MDT only' or 'Logged MBSFN MDT', 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.

If the *Trace Activation* IE includes the *MDT Location Information* IE, within the *MDT Configuration* IE, the eNB shall, if supported, store this information and take it into account in the requested MDT session.

If the *Trace Activation* IE is included in the TRACE START message which includes the *MDT Activation* IE set to 'Immediate MDT Only', 'Logged MDT only' or 'Logged MBSFN MDT' and if the *Signalling based MDT PLMN List* IE is included in the *MDT Configuration* IE, the eNB may use it to propagate the MDT Configuration as described in TS 37.320 [31].

If the *Trace Activation* IE includes the *MBSFN-ResultToLog* IE, within the *MDT Configuration* IE, the eNB shall, if supported, take it into account for MDT Configuration as described in TS 37.320 [31].

If the *Trace Activation* IE includes the *MBSFN-Areald* IE in the *MBSFN-ResultToLog* IE, within the *MDT Configuration* IE, the eNB shall, if supported, take it into account for MDT Configuration as described in TS 37.320 [31].

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

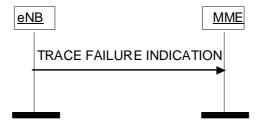


Figure 8.10.2.2-1: Trace Failure Indication procedure.

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 anonymisation 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, 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 *Message Identifier* IE and *Serial Number* IE which correspond to one of the warning messages already being broadcast in that area, 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

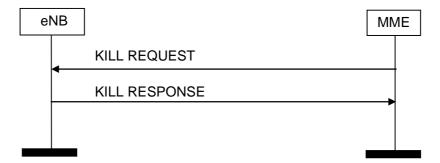


Figure 8.12.2.2-1: Kill procedure. Successful operation.

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

If the eNB receives a KILL REQUEST message and broadcast of the warning message identified by the *Message Identifier* and *Serial Number* IE is ongoing in an area indicated within the *Warning Area List* IE, the eNB shall stop broadcasting the warning message within that area 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 shall, if there is an area to report where an ongoing broadcast was stopped successfully, include the *Broadcast Cancelled Area List* IE.

If an area included in the *Warning Area List* IE in the KILL REQUEST message 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*.

If the *Kill-all Warning Messages Indicator* IE is present in the KILL REQUEST message, then the eNB shall stop broadcasting and discard all warning messages for the area as indicated in the *Warning Area List* IE or in all the cells of the eNB if the *Warning Area List* IE is not included. 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 shall, if there is area to report where an ongoing broadcast was stopped successfully, include the *Broadcast Cancelled Area List* IE with the *Number of Broadcasts* IE set to 0.

8.12.3 PWS Restart Indication

8.12.3.1 General

The purpose of PWS Restart Indication procedure is to inform the MME that PWS information for some or all cells of the eNB are available for reloading from the CBC if needed. The procedure uses non UE-associated signalling.

8.12.3.2 Successful Operation



Figure 8.12.3.2-1: PWS Restart Indication procedure. Successful operation.

The eNB initiates the procedure by sending a PWS RESTART INDICATION message to the MME. On receipt of a PWS RESTART INDICATION message, the MME shall act as defined in TS 23.007 [38].

If the Emergency Area ID is available, the eNB shall also include it in the Emergency Area ID List for Restart IE.

8.12.4 PWS Failure Indication

8.12.4.1 General

The purpose of PWS Failure Indication procedure is to inform the MME that ongoing PWS operation for one or more cells of the eNB has failed. The procedure uses non UE-associated signalling.

8.12.4.2 Successful Operation



Figure 8.12.4.2-1: PWS Failure Indication procedure. Successful operation.

The eNB initiates the procedure by sending a PWS FAILURE INDICATION message to the MME. On receipt of a PWS FAILURE INDICATION message, the MME shall act as defined in TS 23.041 [29].

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 MME 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

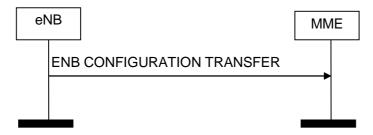


Figure 8.15.2.1-1: eNB Configuration Transfer procedure. Successful operation.

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, in the SON Configuration Transfer IE, 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 X2 TNL Configuration Info IE contains the eNB Indirect X2 Transport Layer Addresses IE, the eNB may use it for the X2 TNL establishment, and may transfer back the received eNB Indirect X2 Transport Layer Addresses 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, in the SON Configuration Transfer IE, the X2 TNL Configuration Info IE containing 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, in the *SON Configuration Transfer* IE, 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. If the *X2 TNL Configuration Info* IE contains the *eNB Indirect X2 Transport Layer Addresses* IE, the eNB may use it for 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 Synchronisation Info* IE as an answer to a former request, it may use it for over-the-air synchronisation by means of network listening and for triggering muting activation request.

If the eNB receives the SON Information IE containing the SON Information Report IE it may use it as specified in TS 36.300 [14].

If the eNB receives the *SON Information* IE containing the *SON Information Request* IE set to 'Activate Muting', the eNB should consider activating for over-the-air synchronisation by means of network listening, taking into account information on the selected source of synchronisation cell and the cells as indicated by the *Aggressor E-CGI List* IE. In case the *Aggressor E-CGI List* IE is not present, the eNB may consider the request applicable to all cells.

If the eNB receives the *SON Information* IE containing the *SON Information Reply* IE including the *Muting Pattern Information* IE as an answer to a former request, it may use it for over-the-air synchronisation by means of network listening. The *Muting Pattern Information* IE may apply to all cells that were requested to mute.

If the eNB receives the *SON Information* IE containing the *SON Information Request* IE set to 'Deactivate Muting', the eNB may consider deactivating muting for over-the-air synchronisation that was activated by a former muting request from the corresponding eNB.

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 and UTDOA 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

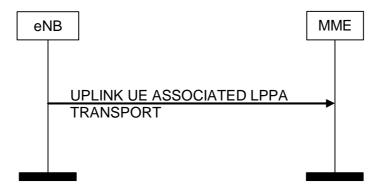


Figure 8.17.2.2-1: UPLINK UE ASSOCIATED LPPA TRANSPORT Procedure

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

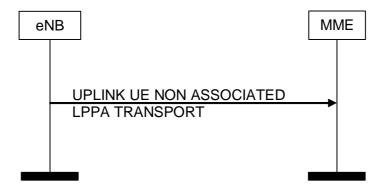


Figure 8.17.2.4-1: UPLINK NON UE ASSOCIATED LPPA TRANSPORT Procedure

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.
0	IEs marked as Optional (O) may or may not be included in the
	message.
С	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 \rightarrow 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	0		9.2.1.20		YES	reject
E-RAB to be Setup List		1			YES	reject
>E-RAB To Be Setup Item IEs		1 <maxnoof E-RABs></maxnoof 			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	М		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	EPC TEID.	-	
>>NAS-PDU	M		9.2.3.5		-	
>>Correlation ID	0		9.2.1.80		YES	ignore
>>SIPTO Correlation ID	0		Correlation ID 9.2.1.80		YES	ignore
>>Bearer Type	0		9.2.1.116		YES	reject

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.

IE/Group Name	Presence	Range	IE type and	Semantics	Criticality	Assigned
Managara Tura	NA.		reference	description	VEC	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		01			YES	ignore
>E-RAB Setup Item IEs		1 <maxnoof e-<br="">RABs></maxnoof>			EACH	ignore
>>E-RAB ID	M				-	
>>Transport Layer Address	М		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2	eNB TEID.	-	
E-RAB Failed to Setup List	0		E-RAB List 9.2.1.36	A value for E-RAB ID shall only be present once in E-RAB Setup List IE and in E- RAB Failed to Setup List IE.	YES	ignore
Criticality Diagnostics	0		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 or to change the S-GW as defined in TS 23.401 [11].

Direction: MME \rightarrow eNB

IE/Group Name	Presence	Range	IE type and	Semantics	Criticality	Assigned
Managara Tama	N 4		reference	description	VE0.	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	0		9.2.1.20		YES	reject
E-RAB to be Modified		1			YES	reject
List						,
>E-RAB To Be Modified		1 <maxnoofe-< td=""><td></td><td></td><td>EACH</td><td>reject</td></maxnoofe-<>			EACH	reject
Item IEs		RABs>				,
>>E-RAB ID	М		9.2.1.2		-	
>>E-RAB Level QoS	M		9.2.1.15	Includes	-	
Parameters				necessary		
				QoS		
				parameters.		
>>NAS-PDU	M		9.2.3.5		-	
>>Transport	0				YES	reject
Information						
>>>Transport Layer	M		9.2.2.1		-	
Address						
>>>UL GTP TEID	М		GTP-TEID		-	
			9.2.2.2			

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.

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		01			YES	ignore
>E-RAB Modify Item IEs		1 <maxnoofe- RABs></maxnoofe- 			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
E-RAB Failed to Modify List	0		E-RAB List 9.2.1.36	A value for E-RAB ID shall only be present once in E-RAB Modify List IE and E- RAB Failed to Modify List IE.	YES	ignore
Criticality Diagnostics	0		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 \rightarrow 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	0		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	0		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.

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		01			YES	ignore
>E-RAB Release Item IEs		1 <maxnoofe- RABs></maxnoofe- 			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
E-RAB Failed to Release List	0		E-RAB List 9.2.1.36	A value for E-RAB ID shall only be present once in E-RAB Release List IE and E- RAB Failed to Release List IE.	YES	ignore
Criticality Diagnostics	0		9.2.1.21		YES	ignore
User Location Information	0		9.2.1.93		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.

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
User Location Information	0		9.2.1.93		YES	ignore

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

9.1.3.8 E-RAB MODIFICATION INDICATION

This message is sent by the eNB and is used to request the MME to apply the indicated modification for one or several E-RABs.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		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
E-RAB to be Modified		1			YES	reject
List						-
>E-RAB to Be Modified		1 <maxnoofe-< td=""><td></td><td></td><td>EACH</td><td>reject</td></maxnoofe-<>			EACH	reject
Item IEs		RABs>				,,,,,,
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer	M		9.2.2.1		-	
Address						
>>DL GTP TEID	M		GTP-TEID		-	
			9.2.2.2			
E-RAB not to be Modified		01			YES	reject
List						
>E-RAB not to Be		1 <maxnoofe-< td=""><td></td><td></td><td>EACH</td><td>reject</td></maxnoofe-<>			EACH	reject
Modified Item IEs		RABs>				
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer	M		9.2.2.1		-	
Address						
>>DL GTP TEID	M		GTP-TEID		-	
			9.2.2.2			
CSG Membership Info		01			YES	reject
>CSG Membership	M		9.2.1.73		-	
Status						
>CSG Id	M		9.2.1.62		-	
>Cell Access Mode	0		9.2.1.74		-	
>PLMN Identity	0		9.2.3.8		-	
Tunnel Information for BBF	0		Tunnel Information 9.2.2.3	Indicating HeNB"s Local IP Address assigned by the broadband access provider, UDP port	YES	ignore

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

9.1.3.9 E-RAB MODIFICATION CONFIRM

This message is sent by the MME and is used to report the outcome of the request from the E-RAB MODIFICATION INDICATION message.

Direction: MME \rightarrow eNB

IE/Group Name	Presence	Range	IE type and	Semantics	Criticality	Assigned
			reference	description		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		01			YES	ignore
>E-RAB Modify Item		1 <maxnoofe-< td=""><td></td><td></td><td>EACH</td><td>ignore</td></maxnoofe-<>			EACH	ignore
IEs		RABs>				
>>E-RAB ID	M		9.2.1.2		-	
E-RAB Failed to Modify	0		E-RAB List	A value for E-RAB ID	YES	ignore
List			9.2.1.36	shall only be present		
				once in the E-RAB		
				MODIFICATION		
				CONFIRM message.		
E-RAB To Be Released	0		E-RAB List	A value for E-RAB ID	YES	ignore
List			9.2.1.36	shall only be present		
				once in the E-RAB		
				MODIFICATION		
				CONFIRM message.		
Criticality Diagnostics	0		9.2.1.21	, and the second	YES	ignore
CSG Membership Status	0		9.2.1.73		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 \rightarrow 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 <maxnoofe- RABs></maxnoofe- 			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	0		9.2.3.5		-	
>>Correlation ID	0		9.2.1.80		YES	ignore

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
>>SIPTO Correlation ID	0		Correlation ID 9.2.1.80		YES	ignore
>>Bearer Type	0		9.2.1.116		YES	reject
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	0		9.2.1.4		YES	ignore
Handover Restriction List	0		9.2.1.22		YES	ignore
UE Radio Capability	0		9.2.1.27		YES	ignore
Subscriber Profile ID for RAT/Frequency priority	0		9.2.1.39		YES	ignore
CS Fallback Indicator	0		9.2.3.21		YES	reject
SRVCC Operation Possible	0		9.2.1.58		YES	ignore
CSG Membership Status	0		9.2.1.73		YES	ignore
Registered LAI	0		9.2.3.1		YES	ignore
GUMMEI	0		9.2.3.9	This IE indicates the MME serving the UE.	YES	ignore
MME UE S1AP ID 2	0		9.2.3.3	This IE indicates the MME UE S1AP ID assigned by the MME.	YES	ignore
Management Based MDT Allowed	0		9.2.1.83		YES	ignore
Management Based MDT PLMN List	0		MDT PLMN List 9.2.1.89		YES	ignore
Additional CS Fallback Indicator	C- ifCSFBhighp riority		9.2.3.37		YES	ignore
Masked IMEISV	0		9.2.3.38		YES	ignore
Expected UE Behaviour	0		9.2.1.96		YES	ignore
ProSe Authorized	0		9.2.1.99		YES	ignore
UE User Plane CloT Support Indicator	0		9.2.1.113		YES	ignore

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

Condition	Explanation
ifCSFBhighpriority	This IE shall be present if the CS Fallback Indicator IE is set to 'CS
	Fallback High Priority'.

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.

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 <maxnoofe- RABs></maxnoofe- 			EACH	ignore
>>E-RAB ID	М		9.2.1.2		-	
>>Transport Layer Address	М		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2		-	
E-RAB Failed to Setup List	0		E-RAB List 9.2.1.36	A value for E- RAB ID shall only be present once in E-RAB Setup List IE and E-RAB Failed to Setup List IE.	YES	ignore
Criticality Diagnostics	0		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: $eNB \rightarrow MME$

IE/Group Name	Presence	Range	IE type and	Semantics	Criticality	Assigned
			reference	description		Criticality
Message Type	M		9.2.1.1		YES	reject
MME UE S1AP ID	М		9.2.3.3		YES	ignore
eNB UE S1AP ID	М		9.2.3.4		YES	ignore
Cause	M		9.2.1.3		YES	ignore
Criticality Diagnostics	0		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.

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	0		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 \rightarrow eNB

IE/Group Name	Presence	Range	IE type and	Semantics	Criticality	Assigned
			reference	description		Criticality
Message Type	M		9.2.1.1		YES	reject
CHOICE UE S1AP IDs	M				YES	reject
>UE S1AP ID pair						
>>UE S1AP ID pair	M		9.2.3.18			
>MME UE S1AP ID						
>>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: $eNB \rightarrow MME$

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	0		9.2.1.21		YES	ignore
User Location Information	0		9.2.1.93		YES	ignore
Information on Recommended Cells and eNBs for Paging	0		9.2.1.105		YES	ignore
Cell Identifier and Coverage Enhancement Level	0		9.2.1.109		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 \rightarrow eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1		YES	reject
MME UE S1AP ID	М		9.2.3.3		YES	reject
eNB UE S1AP ID	М		9.2.3.4		YES	reject
Security Key	0		9.2.1.41	A fresh KeNB is provided after performing a keychange on the fly procedure in the MME, see TS 33.401 [15].	YES	reject
Subscriber Profile ID for RAT/Frequency priority	0		9.2.1.39		YES	ignore
UE Aggregate Maximum Bit Rate	0		9.2.1.20		YES	ignore
CS Fallback Indicator	0		9.2.3.21		YES	reject
UE Security Capabilities	0		9.2.1.40		YES	reject
CSG Membership Status	0		9.2.1.73		YES	ignore
Registered LAI	0		9.2.3.1		YES	ignore
Additional CS Fallback Indicator	C- ifCSFBhig hpriority		9.2.3.37		YES	ignore
ProSe Authorized	0		9.2.1.99		YES	ignore
SRVCC Operation Possible	0		9.2.1.58		YES	ignore
SRVCC Operation Not Possible	0		9.2.1.119		YES	ignore

Condition	Explanation
ifCSFBhighpriority	This IE shall be present if the CS Fallback Indicator IE is set to 'CS
	Fallback High Priority'.

9.1.4.9 UE CONTEXT MODIFICATION RESPONSE

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

Direction: $eNB \rightarrow MME$

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	0		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.

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	0		9.2.1.21		YES	ignore

9.1.4.11 UE RADIO CAPABILITY MATCH REQUEST

This message is sent by the MME to request the compatibility between the UE radio capabilities and network configuration.

Direction: $MME \rightarrow eNB$

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 Radio Capability	0		9.2.1.27		YES	ignore

9.1.4.12 UE RADIO CAPABILITY MATCH RESPONSE

This message is sent by the eNB to report the compatibility between the UE radio capabilities and network configuration.

Direction: $eNB \rightarrow MME$

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
Voice Support Match Indicator	M		9.2.1.85		YES	reject
Criticality Diagnostics	0		9.2.1.21		YES	ignore

9.1.4.13 UE CONTEXT MODIFICATION INDICATION

This message is sent by the eNB to request the MME to modify the UE Context information.

Direction: $eNB \rightarrow MME$

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	М		9.2.3.3		YES	reject
eNB UE S1AP ID	M		9.2.3.4		YES	reject
CSG Membership Info		01			YES	reject
>CSG Membership Status	M		9.2.1.73		-	
>CSG Id	М		9.2.1.62		-	
>Cell Access Mode	0		9.2.1.74		-	
>PLMN Identity	0		9.2.3.8		-	

9.1.4.14 UE CONTEXT MODIFICATION CONFIRM

This message is sent by the MME to confirm the modification of the UE Context information.

Direction: $MME \rightarrow eNB$

IE/Group Name	Presence	Range	IE type and	Semantics	Criticality	Assigned
			reference	description		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
CSG Membership Status	0		9.2.1.73		YES	ignore
Criticality Diagnostics	0		9.2.1.21		YES	ignore

9.1.4.15 UE CONTEXT SUSPEND REQUEST

This message is sent by the eNB to request the MME to suspend the UE context and the related bearer contexts.

Direction: $eNB \rightarrow MME$

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
Information on Recommended Cells and eNBs for Paging	0		9.2.1.105		YES	ignore
Cell Identifier and Coverage Enhancement Level	0		9.2.1.109		YES	ignore

9.1.4.16 UE CONTEXT SUSPEND RESPONSE

This message is sent by the MME to indicate to the eNB the UE context and the related bearer contexts have been suspended.

Direction: MME \rightarrow 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	0		9.2.1.21		YES	ignore

9.1.4.17 UE CONTEXT RESUME REQUEST

This message is sent by the eNB to request the MME to indicate that the suspended RRC connection has been resumed.

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
E-RAB Failed To Resume List		01			YES	reject
>E-RAB Failed To Resume Item IEs		1 <maxnoofe- RABs></maxnoofe- 			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Cause	М		9.2.1.3		-	

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

9.1.4.18 UE CONTEXT RESUME RESPONSE

This message is sent by the MME to indicate to the eNB that the UE context and the related bearer contexts have been resumed in the EPC.

Direction: MME \rightarrow eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1	u.ccpc	YES	reject
MME UE S1AP ID	М		9.2.3.3		YES	ignore
eNB UE S1AP ID	M		9.2.3.4		YES	ignore
E-RAB Failed To Resume List		01			YES	reject
>E-RAB Failed To Resume Item IEs		1 <maxnoofe- RABs></maxnoofe- 			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Cause	M		9.2.1.3		-	
Criticality Diagnostics	0		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.

9.1.4.19 UE CONTEXT RESUME FAILURE

This message is sent by the MME to indicate to the eNB that resumption of the UE context and the related bearer contexts has failed in the EPC.

Direction: MME \rightarrow 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	0		9.2.1.21		YES	ignore

9.1.4.20 Connection Establishment Indication

This message is sent by the MME to complete the establishment of the UE-associated logical S1-connection.

Direction: $MME \rightarrow eNB$

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 Radio Capability	0		9.2.1.27		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.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1	uooonpuon	YES	reject
MME UE S1AP ID	М		9.2.3.3		YES	reject
eNB UE S1AP ID	М		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	0		9.2.3.15		YES	ignore
SRVCC HO Indication	0		9.2.1.59		YES	reject
Source to Target Transparent Container	М		9.2.1.56		YES	reject
Source to Target Transparent Container Secondary	0		Source to Target Transparent Container 9.2.1.56		YES	reject
MS Classmark 2	C- ifSRVCCto GERAN		9.2.1.64		YES	reject
MS Classmark 3	C- ifSRVCCto GERAN		9.2.1.65		YES	ignore
CSG Id	0		9.2.1.62	_	YES	reject
Cell Access Mode	0		9.2.1.74		YES	reject
PS Service Not Available	0		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 \rightarrow 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- iftoUTRAN GERAN		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		01			YES	ignore
>E-RABs Subject to Forwarding Item IEs		1 <maxnoofe- RABs></maxnoofe- 			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>DL Transport Layer Address	0		9.2.2.1		-	
>>DL GTP-TEID	0		9.2.2.2	To deliver forwarded DL PDCP SDUs.	-	
>>UL Transport Layer Address	0		9.2.2.1		-	
>>UL GTP-TEID	0		9.2.2.2	To deliver forwarded UL PDCP SDUs.	-	
E-RABs to Release List	0		E-RAB List 9.2.1.36		YES	ignore
Target to Source Transparent Container	М		9.2.1.57		YES	reject
Target to Source Transparent Container Secondary	0		Target to Source Transparent Container 9.2.1.57		YES	reject
Criticality Diagnostics	0		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 \rightarrow eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		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	0		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 \rightarrow 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	М		9.2.3.3		YES	reject
Handover Type	M		9.2.1.13		YES	reject
Cause	М		9.2.1.3		YES	ignore
UE Aggregate Maximum Bit Rate	М		9.2.1.20		YES	reject
E-RABs To Be Setup List		1			YES	reject
>E-RABs To Be Setup Item IEs		1 <maxnoofe- RABs></maxnoofe- 			EACH	reject
>>E-RAB ID	М		9.2.1.2		-	
>>Transport Layer Address	М		9.2.2.1		-	
>>GTP-TEID	М		9.2.2.2	To deliver UL PDUs.	-	
>>E-RAB Level QoS Parameters	М		9.2.1.15	Includes necessary QoS parameters.	-	
>>Data Forwarding Not Possible	0		9.2.1.76		YES	ignore
>>Bearer Type	0		9.2.1.116		YES	reject
Source to Target Transparent Container	М		9.2.1.56		YES	reject
UE Security Capabilities	М		9.2.1.40		YES	reject
Handover Restriction List	0		9.2.1.22		YES	ignore
Trace Activation	0		9.2.1.4		YES	ignore
Request Type	0		9.2.1.34		YES	ignore
SRVCC Operation Possible	0		9.2.1.58		YES	ignore
Security Context	М		9.2.1.26		YES	reject
NAS Security Parameters to E-UTRAN	C- iffromUTR ANGERA N		9.2.3.31	The eNB shall use this IE as specified in TS 33.401 [15].	YES	reject
CSG Id	0		9.2.1.62		YES	reject
CSG Membership Status	0		9.2.1.73		YES	ignore
GUMMEI	0		9.2.3.9	This IE indicates the MME serving the UE.	YES	ignore
MME UE S1AP ID 2	0		9.2.3.3	This IE indicates the MME UE S1AP ID assigned by the MME.	YES	ignore
Management Based MDT Allowed	0		9.2.1.83		YES	ignore
Management Based MDT PLMN List	0		MDT PLMN List 9.2.1.89		YES	ignore
Masked IMEISV	0		9.2.3.38		YES	ignore
Expected UE Behaviour	0		9.2.1.96		YES	ignore
ProSe Authorized	0		9.2.1.99		YES	ignore
UE User Plane CloT Support Indicator	0		9.2.1.113		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.

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	М		9.2.3.4	Allocated at the target eNB.	YES	ignore
E-RABs Admitted List		1		-	YES	ignore
>E-RABs Admitted Item IEs		1 <maxnoofe- RABs></maxnoofe- 			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	М		9.2.2.1		-	
>>GTP-TEID	М		9.2.2.2	To deliver DL PDUs.	-	
>>DL Transport Layer Address	0		9.2.2.1		-	
>>DL GTP-TEID	0		9.2.2.2	To deliver forwarded DL PDCP SDUs.	-	
>>UL Transport Layer Address	0		9.2.2.1		-	
>>UL GTP-TEID	0		9.2.2.2	To deliver forwarded UL PDCP SDUs.	-	
E-RABs Failed to Setup List	0		E-RAB List 9.2.1.36	A value for E- RAB ID shall only be present once in E-RABs Admitted List IE and E-RABs Failed to Setup List IE.	YES	ignore
Target to Source Transparent Container	М		9.2.1.57		YES	reject
CSG Id	0		9.2.1.62		YES	ignore
Criticality Diagnostics	0		9.2.1.21		YES	ignore
Cell Access Mode	0		9.2.1.74		YES	ignore
CE-mode-B Support Indicator	0		9.2.1.118		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 \rightarrow 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	0		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.

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
Tunnel Information for BBF	0		Tunnel Information 9.2.2.3	Indicating HeNB"s Local IP Address assigned by the broadband access provider, UDP port Number.	YES	ignore
LHN ID	0	•	9.2.1.92		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.

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		1			YES	reject
Downlink List						
>E-RABs Switched in Downlink Item IEs		1 <maxnoofe- RABs></maxnoofe- 			EACH	reject
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer address	M		9.2.2.1		-	
>>GTP-TEID	М		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	0		9.2.1.62		YES	ignore
Cell Access Mode	0		9.2.1.74		YES	ignore
Source MME GUMMEI	0		9.2.3.9		YES	ignore
CSG Membership Status	0		9.2.1.73		YES	ignore
Tunnel Information for BBF	0		Tunnel Information 9.2.2.3	Indicating HeNB"s Local IP Address assigned by the broadband access provider, UDP port Number.	YES	ignore
LHN ID	0		9.2.1.92		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 \rightarrow eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1	uooonpiion	YES	reject
MME UE S1AP ID	М		9.2.3.3		YES	ignore
eNB UE S1AP ID	М		9.2.3.4		YES	ignore
UE Aggregate Maximum Bit Rate	0		9.2.1.20		YES	ignore
E-RAB To Be Switched in Uplink List		01			YES	ignore
>E-RABs Switched in		1 <maxnoofe-< td=""><td></td><td></td><td>EACH</td><td>ignore</td></maxnoofe-<>			EACH	ignore
Uplink Item IEs		RABs>				-
>>E-RAB ID	M		9.2.1.2		-	
>>Transport Layer Address	М		9.2.2.1		-	
>>GTP-TEID	M		9.2.2.2		-	
E-RAB To Be Released List	0		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 and 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	0		9.2.1.21		YES	ignore
MME UE S1AP ID 2	0		9.2.3.3	This IE indicates the MME UE S1AP ID assigned by the MME.	YES	ignore
CSG Membership Status	0		9.2.1.73		YES	ignore
ProSe Authorized	0		9.2.1.99		YES	ignore
UE User Plane CloT Support Indicator	0		9.2.1.113		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 \rightarrow 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	0		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 \rightarrow 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 \rightarrow 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	0		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 \rightarrow 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	М		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 \rightarrow 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	M		9.2.1.31		YES	reject
Transparent Container						

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 \rightarrow 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	0		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 <maxnooftals></maxnooftals>			EACH	ignore
>>TAI	M		9.2.3.16		-	
CSG Id List		01			GLOBAL	ignore
>CSG Id		1 <maxnoofcsgid ></maxnoofcsgid 	9.2.1.62		-	
Paging Priority	0		9.2.1.78		YES	ignore
UE Radio Capability for Paging	0		9.2.1.98		YES	ignore
Assistance Data for Paging	0		9.2.1.103		YES	ignore
Paging eDRX Information	0		9.2.1.111		YES	ignore
Extended UE Identity Index Value	0		9.2.3.46		YES	ignore
NB-IoT Paging eDRX Information	0		9.2.1.115		YES	ignore
NB-IoT UE Identity Index value	0		9.2.3.47		YES	ignore

Range bound	Explanation
maxnoofTAIs	Maximum no. of TAIs. Value is 256.
maxnoofCSGlds	Maximum no. of CSG lds within the CSG ld 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.

IE/Group Name	Presence Range		IE type and reference	Semantics description	Criticality	Assigned Criticality	
Message Type	М		9.2.1.1		YES	ignore	
eNB UE S1AP ID	М		9.2.3.4		YES	reject	
NAS-PDU	М		9.2.3.5		YES	reject	
TAI	М		9.2.3.16	Indicating the Tracking Area from which the UE has sent the NAS message.	YES	reject	
E-UTRAN CGI	М		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	0		9.2.3.6		YES	reject	
CSG Id	0		9.2.1.62		YES	reject	
GUMMEI	0		9.2.3.9		YES	reject	
Cell Access Mode	0		9.2.1.74		YES	reject	
GW Transport Layer Address	0		Transport Layer Address 9.2.2.1	Indicating GW Transport Layer Address if the GW is collocated with eNB.	YES	ignore	
Relay Node Indicator	0		9.2.1.79	Indicating a relay node.	YES	reject	
GUMMEI Type	0		ENUMERATE D (native, mapped,)		YES	ignore	
Tunnel Information for BBF	0		Tunnel Information 9.2.2.3	Indicating HeNB"s Local IP Address assigned by the broadband access provider, UDP port Number.	YES	ignore	
SIPTO L-GW Transport Layer Address	0		Transport Layer Address 9.2.2.1	Indicating SIPTO L-GW Transport Layer Address if the SIPTO L- GW is collocated with eNB.	YES	ignore	
LHN ID	0		9.2.1.92		YES	ignore	
MME Group ID	0		9.2.3.44		YES	ignore	
UE Usage Type	0		INTEGER (0255)		YES	ignore	
CE-mode-B Support Indicator	0		9.2.1.118		YES	ignore	

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 \rightarrow 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	0		9.2.1.22		YES	ignore
Subscriber Profile ID for RAT/Frequency priority	0		9.2.1.39		YES	ignore
SRVCC Operation Possible	0		9.2.1.58		YES	ignore
UE Radio Capability	0		9.2.1.27		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: $eNB \rightarrow MME$

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1		YES	ignore
MME UE S1AP ID	М		9.2.3.3		YES	reject
eNB UE S1AP ID	М		9.2.3.4		YES	reject
NAS-PDU	М		9.2.3.5		YES	reject
E-UTRAN CGI	М		9.2.1.38		YES	ignore
TAI	М		9.2.3.16		YES	ignore
GW Transport Layer Address	0		Transport Layer Address 9.2.2.1	Indicating GW Transport Layer Address if the GW is collocated with eNB.	YES	ignore
SIPTO L-GW Transport Layer Address	0		Transport Layer Address 9.2.2.1	Indicating SIPTO L-GW Transport Layer Address if the SIPTO L-GW is collocated with eNB.	YES	ignore
LHN ID	0		9.2.1.92		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.

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

9.1.7.5 REROUTE NAS REQUEST

This message is sent by the MME in order to request for a rerouting of the INITIAL UE MESSAGE to a DCN.

Direction: MME \rightarrow eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1		YES	reject
eNB UE S1AP ID	М		9.2.3.4		YES	reject
MME UE S1AP ID	0		9.2.3.3		YES	ignore
S1 Message	M		OCTET STRING	Contains the INITIAL UE MESSAGE	YES	reject
MME Group ID	М		9.2.3.44		YES	reject
Additional GUTI	0		9.2.3.45		YES	ignore
UE Usage Type	0		INTEGER (0255)		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 \rightarrow eNB and eNB \rightarrow 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		ENUMERAT ED (Reset all,)		-	
>Part of S1 interface						
>>UE-associated logical S1-connection list		1			-	
>>>UE-associated logical S1-connection Item		1 <maxnoofindividu alS1ConnectionsT oReset></maxnoofindividu 			EACH	reject
>>>MME UE S1AP ID	0		9.2.3.3		-	
>>>eNB UE S1AP ID	0		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: $eNB \rightarrow MME$ and $MME \rightarrow eNB$.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1		YES	reject
UE-associated logical S1-connection list		01			YES	ignore
>UE-associated logical S1-connection Item		1 <maxnoofindividu als1connectionst="" oreset=""></maxnoofindividu>			EACH	ignore
>>MME UE S1AP ID	0		9.2.3.3		-	
>>eNB UE S1AP ID	0		9.2.3.4		-	
Criticality Diagnostics	0		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 \rightarrow eNB and eNB \rightarrow 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	0		9.2.3.3		YES	ignore
eNB UE S1AP ID	0		9.2.3.4		YES	ignore
Cause	0		9.2.1.3		YES	ignore
Criticality Diagnostics	0		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.

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	0		PrintableStri ng(SIZE(11 50,))		YES	ignore
Supported TAs		1 <maxnooftacs< td=""><td></td><td>Supported TAs in the eNB.</td><td>GLOBAL</td><td>reject</td></maxnooftacs<>		Supported TAs in the eNB.	GLOBAL	reject
>TAC	М		9.2.3.7	Broadcast TAC.	-	
>Broadcast PLMNs		1 <maxnoofbplm Ns></maxnoofbplm 		Broadcast PLMNs.	-	
>>PLMN Identity	M		9.2.3.8			
>RAT-Type	0		9.2.1.117	RAT-Type associated with the TAC of the indicated PLMN(s).	YES	reject
Default Paging DRX	M		9.2.1.16		YES	ignore
CSG Id List		01			GLOBAL	reject
>CSG Id		1 <maxnoofcsglds ></maxnoofcsglds 	9.2.1.62			
UE Retention Information	0		9.2.1.112		YES	ignore
NB-IoT Default Paging DRX	0		9.2.1.114		YES	ignore

Range bound	Explanation
maxnoofTACs	Maximum no. of TACs. Value is 256.
maxnoofBPLMNs	Maximum no. of Broadcast PLMNs. Value is 6.
maxnoofCSGlds	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 \rightarrow 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	0		PrintableString (SIZE(1150,))		YES	ignore
Served GUMMEIs		1 <maxnoofrats></maxnoofrats>		The LTE related pool configuration is included on the first place in the list.	GLOBAL	reject
>Served PLMNs	•	1 <maxnoofplm nspermme=""></maxnoofplm>	•	•	-	•
>>PLMN Identity	М		9.2.3.8		-	
>Served GroupIDs		1 <maxnoofgroupid s></maxnoofgroupid 			-	
>>MME Group ID	M		OCTET STRING (SIZE(2))		-	
>Served MMECs		1 <maxnoofmmecs></maxnoofmmecs>			-	
>>MME Code	М		9.2.3.12		-	
Relative MME Capacity	M		9.2.3.17		YES	ignore
MME Relay Support Indicator	0		9.2.1.82		YES	ignore
Criticality Diagnostics	0		9.2.1.21	_	YES	ignore
UE Retention Information	0		9.2.1.112		YES	ignore

Range bound	Explanation				
maxnoofPLMNsPerMME	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 \rightarrow eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1		YES	reject
Cause	М		9.2.1.3		YES	ignore
Time to wait	0		9.2.1.61		YES	ignore
Criticality Diagnostics	0		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.

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	0		PrintableStrin g(SIZE(1150 ,))		YES	ignore
Supported TAs		0 <maxnooftacs></maxnooftacs>		Supported TAs in the eNB.	GLOBAL	reject
>TAC	M		9.2.3.7	Broadcast TAC.	-	
>Broadcast PLMNs		1 <maxnoofbplmns></maxnoofbplmns>		Broadcast PLMNs.	-	
>>PLMN Identity	М		9.2.3.8		-	
>RAT-Type	0		9.2.1.117	RAT Type associated with the TAC of the indicated PLMN(s).	YES	reject
CSG Id List		01			GLOBAL	reject
>CSG Id		1 <maxnoofcsgid></maxnoofcsgid>	9.2.1.62		-	
Default Paging DRX	0	•	9.2.1.16		YES	ignore
NB-IoT Default Paging DRX	0		9.2.1.114		YES	ignore

Range bound	Explanation				
maxnoofTACs	Maximum no. of TACs. Value is 256.				
maxnoofBPLMNs	Maximum no. of Broadcast PLMNs. Value is 6.				
maxnoofCSGlds	Maximum no. of CSG lds within the CSG ld 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 \rightarrow eNB

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1		YES	reject
Criticality Diagnostics	0		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 \rightarrow 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	0		9.2.1.61		YES	ignore
Criticality Diagnostics	0		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 \rightarrow 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	0		PrintableStrin g(SIZE(1150 ,))		YES	ignore
Served GUMMEIs		0 <maxnoofrats></maxnoofrats>		The LTE related pool configuration is included on the first place in the list.	GLOBAL	reject
>Served PLMNs		1 <maxnoofplmnsp erMME></maxnoofplmnsp 			-	
>>PLMN Identity	М		9.2.3.8		-	
>Served GroupIDs		1 <maxnoofgroupid s></maxnoofgroupid 			-	
>>MME GroupID	М		OCTET STRING (SIZE(2))		-	
>Served MMECs		1 <maxnoofmmecs></maxnoofmmecs>			-	
>>MME Code	M		9.2.3.12		-	
Relative MME Capacity	0		9.2.3.17		YES	reject

Range bound	Explanation
maxnoofPLMNsPerMME	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: $eNB \rightarrow MME$

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1		YES	reject
Criticality Diagnostics	0		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: $eNB \rightarrow MME$

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	М		9.2.1.1		YES	reject
Cause	М		9.2.1.3		YES	ignore
Time to wait	0		9.2.1.61		YES	ignore
Criticality Diagnostics	0		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 \rightarrow 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		01			YES	ignore
>GUMMEI List Item		1 <maxnoofmmecs></maxnoofmmecs>			EACH	ignore
>>GUMMEI	M		9.2.3.9		-	
Traffic Load Reduction	0		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 \rightarrow 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		01			YES	ignore
>GUMMEI List Item		1 <maxnoofmmecs></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 Tunnelling Messages

9.1.9.1 DOWNLINK S1 CDMA2000 TUNNELLING

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

Direction: MME \rightarrow 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		01			YES	ignore
>E-RABs Subject to Forwarding Item IEs		1 <maxnoof e-<br="">RABs></maxnoof>			EACH	ignore
>>E-RAB ID	M		9.2.1.2		-	
>>DL Transport Layer Address	0		9.2.2.1		-	
>>DL GTP-TEID	0		9.2.2.2	This IE indicates the tunnel endpoint for forwarding of DL data.	-	
>>UL Transport Layer Address	0		9.2.2.1		-	
>>UL GTP-TEID	0		9.2.2.2		-	
CDMA2000 HO Status	0		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 TUNNELLING

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

Direction: eNB \rightarrow 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	0		9.2.1.29		YES	ignore
Indication						
CDMA2000 1xRTT	0		9.2.1.35		YES	reject
SRVCC Info						
CDMA2000 1xRTT RAND	0		9.2.1.33		YES	reject
CDMA2000-PDU	M		9.2.1.23		YES	reject
E-UTRAN Round Trip	0	•	9.2.1.69		YES	ignore
Delay Estimation Info						-

9.1.10 UE CAPABILITY INFO INDICATION

This message is sent by the eNB to provide UE Radio Capability information to the 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
UE Radio Capability for	0		9.2.1.98		YES	ignore
Paging						-

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 \rightarrow 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 \rightarrow 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	М		OCTET STRING (SIZE(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 \rightarrow 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 (SIZE(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 \rightarrow 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: $eNB \rightarrow MME$

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: $eNB \rightarrow MME$

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	М		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 \rightarrow 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	0		9.2.1.46		YES	ignore
Repetition Period	M		9.2.1.48		YES	reject
Extended Repetition Period	0		9.2.1.75		YES	reject
Number of Broadcasts Requested	M		9.2.1.49		YES	reject
Warning Type	0		9.2.1.50		YES	ignore
Warning Security Information	0		9.2.1.51	See TS 23.041 [29].	YES	ignore
Data Coding Scheme	0		9.2.1.52		YES	ignore
Warning Message Contents	0		9.2.1.53		YES	ignore
Concurrent Warning Message Indicator	0		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: $eNB \rightarrow MME$

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	0		9.2.1.54		YES	ignore
Criticality Diagnostics	0		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 \rightarrow 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	0		9.2.1.46		YES	ignore
Kill-all Warning Messages Indicator	0		9.2.1.91		YES	reject

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.

IE/Group Name	Presence	Range	IE type and	Semantics	Criticality	Assigned
			reference	description		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	0		9.2.1.70		YES	ignore
Criticality Diagnostics			9.2.1.21		YES	ignoro
Chilicality Diagnostics	U		9.2.1.21		160	ignore

9.1.13.5 PWS RESTART INDICATION

This message is sent by the eNB to inform the MME that PWS information for some or all cells of the eNB are available for reloading from the CBC if needed.

Direction: $eNB \rightarrow MME$

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
E-CGI List for Restart		1 <maxnoofcellsf orRestart></maxnoofcellsf 			EACH	reject
>E-CGI	M		9.2.1.38		-	-
Global eNB ID	M		9.2.1.37		YES	reject
TAI List for Restart		1 <maxnoofrestartt Als></maxnoofrestartt 			EACH	reject
>TAI	M		9.2.3.16		-	-
Emergency Area ID List for Restart		0 <maxnoofrestarte mergencyareaids=""></maxnoofrestarte>			EACH	reject
>Emergency Area ID	М		9.2.1.47		-	-

Range bound	Explanation
maxnoofCellsforRestart	Maximum no. of Cell ID subject for reloading warning messages
	broadcast. Value is 256.
maxnoofRestartTAIs	Maximum no. of TAI subject for reloading warning message
	broadcast. Value is 2048.
maxnoofRestartEmergencyAreaID	Maximum no. of Emergency Area ID subject for reloading warning
	message broadcast. Value is 256.

9.1.13.6 PWS FAILURE INDICATION

This message is sent by the eNB to inform the MME that ongoing PWS operation for one or more cells of the eNB has failed.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.1		YES	ignore
PWS failed E-CGI List		1 <maxnoofcellsi neNB></maxnoofcellsi 			EACH	reject
>E-CGI	M		9.2.1.38		-	-
Global eNB ID	M		9.2.1.37		YES	reject

Range bound	Explanation
maxnoofCellsineNB	Maximum no. of cells that can be served by an eNB. Value is 256.

9.1.14 eNB DIRECT INFORMATION TRANSFER

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

Direction: eNB \rightarrow 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	М		9.2.1.55		YES	reject

9.1.15 MME DIRECT INFORMATION TRANSFER

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

Direction: MME \rightarrow 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	reject

9.1.16 eNB CONFIGURATION TRANSFER

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

Direction: eNB \rightarrow 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	0		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 \rightarrow 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	0		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 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 (SIZE(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	М		Transport Layer Address 9.2.2.1	Defined in TS 32.422 [10]	YES	ignore
Privacy Indicator	0		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 \rightarrow 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.

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	Semantics	Criticality	Assigned
			reference	description		Criticality
Message Type	M		9.2.1.1		YES	ignore
Routing ID	М		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: $eNB \rightarrow MME$

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.

The messages have been defined in accordance to the guidelines specified in TR 25.921 [40].

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				
>Procedure	M		INTEGER (0255)	
Code				
>Type of	M		CHOICE (Initiating Message, Successful Outcome,	
Message			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	М		INTEGER (015,)	

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	М			
Group				
>Radio Network Layer				
>>Radio	М		ENUMERATED	
Network			(Unspecified,	
Layer Cause			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	M		ENUMERATED	
Layer Cause	IVI		(Transport Resource Unavailable,	
Layor Gauco			Unspecified,	
1/40)	
>NAS >>NAS	M		ENUMERATED (Normal Release,	
Cause	141		Authentication failure,	
			Detach,	
			Unspecified,	
			, CSG Subscription Expiry)	
>Protocol				
>>Protocol	М		ENUMERATED	
Cause			(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),	
>Misc			Unspecified,)	
>////sc >>Miscellan	M		ENUMERATED	
eous Cause			(Control Processing Overload, Not enough User	
			Plane Processing Resources,	
	<u> </u>		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	Release is initiated due to E-UTRAN generated reason.
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	The handover failed due to a failure in target EPC/eNB or
EPC/eNB Or Target System	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	Load on target cell is too high.
target cell	
Unknown or already allocated MME	The action failed because the MME UE S1AP ID is either
UE S1AP ID	unknown, or (for a first message received at the eNB) is
	known and already allocated to an existing context.
Unknown or already allocated eNB	The action failed because the eNB UE S1AP ID is either
UE S1AP ID	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	The action failed because both UE S1AP IDs are unknown, or
S1AP ID	are known but do not define a single UE context.
Handover Desirable for Radio	The reason for requesting handover is radio related.
Reasons	
Time Critical Handover	Handover is requested for time critical reason i.e., this cause
Time Chiicai Handovei	value is reserved to represent all critical cases where the
	connection is likely to be dropped if handover is not
	performed.
	penomieu.
Resource Optimisation Handover	The reason for requesting handover is to improve the load
The same of the sa	distribution with the neighbour cells.
	S.S. S.
Reduce Load in Serving Cell	Load on serving cell needs to be reduced. When applied to
	handover preparation, it indicates the handover is triggered
	due to load balancing.
	-

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 losing 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	No enough resources are available related to user plane
Resources Available	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 content of the *RRC Establishment Cause* IE 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,,delayTolerantAccess, mo-VoiceCall, mo-ExceptionData)	

9.2.1.4 Trace Activation

Defines parameters related to a trace activation.

IE/Group	Presence	Range	IE type and	Semantics description	Criticality	Assigned
Name	N 4		reference	The FUITDANI Trees ID IF is		Criticality
E-UTRAN	M		OCTET STRING	The E-UTRAN Trace ID IE is		
Trace ID			(SIZE(8))	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		
Interfaces To	M		BIT STRING	[10] (last 2 octets).		
	IVI			Each position in the bitmap		
Trace			(SIZE(8))	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(Defined in TS 32.422 [10].		
Trace deptir	IVI		minimum, medium,	Defined in 13 32.422 [10].		
			maximum,			
			MinimumWithoutVend			
			orSpecificExtension,			
			MediumWithoutVendo			
			rSpecificExtension,			
			MaximumWithoutVen			
			dorSpecificExtension,			
)			
Trace	М		Transport Layer	Defined in TS 32.422 [10].		
Collection			Address 9.2.2.1			
Entity IP						
Address						
MDT	0		9.2.1.81		YES	ignore
Configuration						_

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	M			_	-	-
>Target eNB-ID					-	-
>>Global eNB ID	M		9.2.1.37		-	-
>>Selected TAI	М		TAI 9.2.3.16		-	-
>Target RNC-ID					-	-
>>LAI	М		9.2.3.1		-	-
>>RAC	0		9.2.3.2		-	-
>>RNC-ID	М		INTEGER (04095)	If the Extended RNC- ID IE is included in the Target ID IE, the RNC-ID IE shall be ignored.	-	-
>>Extended RNC- ID	0		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 (SIZE(2))	0000 and FFFE not allowed.	-	-
>>CI	M		OCTET STRING (SIZE(2))		-	-
>>RAC	0		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		01			-	
>E-RABs Information Item		1 <maxnoof E-RABs></maxnoof 			EACH	ignore
>>E-RAB ID	М		9.2.1.2		-	
>>DL Forwarding	0		9.2.3.14		-	
Target Cell ID	М		E-UTRAN CGI 9.2.1.38		-	
Subscriber Profile ID for RAT/Frequency priority	0		9.2.1.39		-	
UE History Information	М		9.2.1.42		-	
Mobility Information	0		BIT STRING (SIZE (32))	Information related to the handover; the external handover source provides it in order to enable later analysis of the conditions that led to a wrong HO.	YES	ignore
UE History Information from the UE	0		OCTET STRING	VisitedCellInfoList contained in the UEInformationResp onse message (TS 36.331 [16])	YES	ignore

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	Semantics	Criticality	Assigned
			reference	description		Criticality
RRC Container	M		OCTET	Includes the RRC	-	
			STRING	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	The Extended RNC-ID IE shall
			(409665535)	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 (0255)	QoS Class Identifier defined in TS 23.401 [11]. Coding specified in TS 23.203 [13].
>Allocation and Retention Priority	М		9.2.1.60	
>GBR QoS Information	0		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	М		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	М		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 (010,000,000,000)	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				Applicable for non-GBR E-RABs.
>UE Aggregate Maximum Bit Rate Downlink	M		Bit Rate 9.2.1.19	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	М		Bit Rate 9.2.1.19	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	0		INTEGER (0255)	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	0		ENUMERATED(initi ating message, successful outcome, unsuccessful outcome)	The Triggering Message is used only if the Criticality Diagnostics is part of Error Indication procedure.
Procedure Criticality	0		ENUMERATED(reje ct, ignore, notify)	This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure).
Information Element Criticality Diagnostics		0 <maxnoof Errors></maxnoof 		
>IE Criticality	M		ENUMERATED(reje ct, ignore, notify)	The IE Criticality is used for reporting the criticality of the triggering IE. The value "ignore" shall not be used.
>IE ID	М		INTEGER (065535)	The IE ID of the not understood or missing IE.
>Type of Error	М		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 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, or for SCG selection during dual connectivity operation. If the eNB receives the *Handover Restriction List* IE, it shall overwrite previously received restriction information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Serving PLMN	М		9.2.3.8	
Equivalent PLMNs		0 <maxnoofepl MNs></maxnoofepl 		Allowed PLMNs in addition to Serving PLMN. This list corresponds to the list of 'equivalent PLMNs' as defined in TS 24.301 [24]. This list is part of the roaming restriction information. Roaming restrictions apply to PLMNs other than the Serving PLMN and Equivalent PLMNs.
>PLMN Identity	М		9.2.3.8	
Forbidden TAs		0 <maxnoofepl MNsPlusOne></maxnoofepl 		Intra LTE roaming restrictions.
>PLMN Identity	M		9.2.3.8	The PLMN of forbidden TACs.
>Forbidden TACs		1 <maxnoofforb TACs></maxnoofforb 		
>>TAC	M		9.2.3.7	The TAC of the forbidden TAI.
Forbidden LAs		0 <maxnoofepl MNsPlusOne></maxnoofepl 		Inter-3GPP RAT roaming restrictions.
>PLMN Identity	M		9.2.3.8	
>Forbidden LACs		1 <maxnoofforb LACs></maxnoofforb 		
>>LAC	М		OCTET STRING (SIZE(2))	
Forbidden inter RATs	0		ENUMERATED(AL L, 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 lds. Value is 15.
maxnoofEPLMNsPlusOne	Maximum no. of equivalent PLMN lds 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	М		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	Semantics description
			reference	
CDMA2000 RAT Type	M		ENUMERATED	This IE is used to identify which
			(HRPD,	CDMA2000 RAT the tunnelled
			1xRTT,)	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	М		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-B [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 (07)	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	М		OCTET STRING	Includes either the UERadioAccessCapabilityInf ormation message as defined in 10.2.2 of TS 36.331 [16], or the UERadioAccessCapabilityInf ormation-NB message as defined in 10.6.2 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	М		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 <maxnoof e-<br="">RABs></maxnoof>			EACH	ignore
>>E-RAB ID	М		9.2.1.2		-	-
>>UL COUNT value	M		COUNT Value 9.2.1.32	PDCP-SN and HFN of first missing UL PDCP SDU in case of 12 bit long PDCP-SN.	-	-
>>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 in case of 12 bit long PDCP-SN.	-	-
>>Receive Status Of UL PDCP SDUs	0		BIT STRING (SIZE(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.		
>>UL COUNT Value Extended	0		COUNT Value Extended 9.2.1.90	PDCP-SN and HFN of first missing UL PDCP SDU in case of 15 bit long PDCP-SN.	YES	ignore
>>DL COUNT Value Extended	0		COUNT Value Extended 9.2.1.90	PDCP-SN and HFN that the target eNB should assign for the next DL SDU not having an SN yet in case of 15 bit long PDCP-SN.	YES	ignore
>>Receive Status Of UL PDCP SDUs Extended	0		BIT STRING (SIZE(116384))	The IE is used in case of 15 bit long PDCP-SN in this release. The first bit indicates the status of the SDU after the First Missing UL PDCP SDU. The N th bit indicates the status of the UL PDCP SDU in position (N + First Missing SDU Number) modulo (1 + the maximum value of the PDCP-SN). 0: PDCP SDU has not been received. 1: PDCP SDU has	YES	ignore
>>UL COUNT Value for PDCP SN Length 18	0		COUNT Value for PDCP SN Length 18	been received correctly. PDCP-SN and HFN of first missing UL PDCP SDU in case of	YES	ignore
>>DL COUNT Value for	0		9.2.1.100 COUNT Value	18 bit long PDCP-SN. PDCP-SN and HFN	YES	ignore

PDCP SN Length 18		for PDCP SN Length 18 9.2.1.100	that the target eNB should assign for the next DL SDU not having an SN yet in case of 18 bit long PDCP-SN.		
>>Receive Status Of UL PDCP SDUs for PDCP SN Length 18	0	BIT STRING (SIZE(113107 2))	The IE is used in case of 18 bit long PDCP-SN. The first bit indicates the status of the SDU after the First Missing UL PDCP SDU. The Nth bit indicates the status of the UL PDCP SDU in position (N + First Missing SDU Number) modulo (1 + the maximum value of the PDCP-SN). 0: PDCP SDU has not been received. 1: PDCP SDU has been received correctly.	YES	ignore

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 in case of 12 bit long PDCP-SN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
PDCP-SN	M		INTEGER (04095)		-	-
HFN	M		INTEGER (01048575)		-	-

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	Semantics description
			reference	
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 Type	М		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	М		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	М		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 <i>Pilot List</i> 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 <maxnoofe- RABs></maxnoofe- 			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 (SIZE(20))	Equal to the 20 leftmost bits of the <i>Cell Identity</i> IE contained in the <i>E-UTRAN CGI</i> IE (see subclause 9.2.1.38) of each cell served by the eNB.
>Home eNB ID				
>>Home eNB ID	М		BIT STRING (SIZE(28))	Equal to the <i>Cell Identity</i> IE contained in the <i>E-UTRAN CGI</i> 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 (SIZE(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 (1256)	

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	М		BIT STRING (SIZE(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, 'third bit' – 128-EEA3, 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 (SIZE(16,))	Each position in the bitmap represents an integrity protection algorithm: 'all bits equal to 0' – UE supports no other algorithm than EIAO, 'first bit' – 128-EIA1, 'second bit' – 128-EIA2, 'third bit' – 128-EIA3, 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	М		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 <maxnoofcells></maxnoofcells>		Most recent information is added to the top of this list.	-	1
>Last Visited Cell Information	M		9.2.1.43		-	-

Range bound	Explanation
maxnoOfCells	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	М		E-UTRAN CGI 9.2.1.38		-	
Cell Type	М		9.2.1.66		-	
Time UE stayed in Cell	М		INTEGER (04095)	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.	-	
Time UE stayed in Cell Enhanced Granularity	0		INTEGER (040950)	The duration of the time the UE stayed in the cell in 1/10 seconds. If the UE stays in a cell more than 4095s, this IE is set to 40950.	YES	ignore
HO Cause Value	0		9.2.1.3	The cause for the handover from the E-UTRAN cell.	YES	ignore

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	Semantics Description
			Reference	
Message Identifier	M		BIT STRING	This IE is set by the EPC, transferred to
			(SIZE(16))	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 (SIZE(16))	

9.2.1.46 Warning Area List

The Warning Area List IE indicates the areas where the warning message needs to be broadcast or cancelled.

IE/Group Name	Presence	Range	IE Type and	Semantics
			Reference	Description
CHOICE Warning Area	M			
>Cell ID List		1 <maxnoofcellid></maxnoofcellid>		
>>E-CGI	M		9.2.1.38	
>TAI List for Warning		1 <maxnooftaiforwarning></maxnooftaiforwarning>		
>>TAI	M		9.2.3.16	
>Emergency Area ID List		1		
		<maxnoofemergencyareaid></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.	
maxnoofTAlforWarning	Maximum no. of TAI subject for warning message broadcast. Va	
	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 (SIZE(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	М		INTEGER (04095)	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	М		INTEGER (065535)	

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
١	Narning Type	M		OCTET STRING (SIZE(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	М		OCTET STRING(SIZE(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 (SIZE(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(19600))	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 either resources are available to perform the broadcast or where broadcast is performed successfully.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE Broadcast Completed	M			_
Area				
>Broadcast Completed Area				
>>Cell ID Broadcast		1 <maxnoofcellid></maxnoofcellid>		
>>>E-CGI	M		9.2.1.38	
>TAI Broadcast				
>>TAI Broadcast		1 <maxnooftalforwarning></maxnooftalforwarning>		
>>>TAI	M		9.2.3.16	
>>>Completed Cell in TAI List		1 <maxnoofcellintai></maxnoofcellintai>		
>>>E-CGI	M			
>Emergency Area ID				
>>Emergency Area ID Broadcast		1 <maxnoofemergencyareaid ></maxnoofemergencyareaid 		
>>>Emergency Area ID	М		9.2.1.47	
>>>Completed Cell in Emergency Area ID List		1 <maxnoofcellineai></maxnoofcellineai>		
>>>E-CGI	М			

Range bound	Explanation
maxnoofCellID	Maximum no. of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAlforWarning	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	М			
>RIM				
>>RIM Transfer	M		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 Contents of the Source BSS to Target BSS Transparent Container Container IE as defined in TS 48.018 [18] or the Old BSS to New BSS information elements field of 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 Contents of the Target BSS to Source BSS Transparent Container IE as defined in TS 48.018 [18] or the Layer 3 Information field of 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	М		INTEGER (015)	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	М		ENUMERATED(shall not trigger pre-emption, may trigger pre- emption)	Desc.: This IE indicates the preemption 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 ld

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	М		BIT STRING (SIZE (27))	

9.2.1.63 CSG ld 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 as the value part of the
				Classmark Information Type 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 as the value part of the
				Classmark Information Type 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 (02047)	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	М		11010101100	2000.15.1011
Area				
>CID Cancelled				
>>Cell ID Cancelled		1 <maxnoofcellid></maxnoofcellid>		
>>>E-CGI	M		9.2.1.38	
>>>Number of Broadcasts	M		9.2.1.71	
>TAI Cancelled				
>>TAI Cancelled		1 <maxnooftalforwarning></maxnooftalforwarning>		
>>>TAI	M		9.2.3.16	
>>>Cancelled Cell in TAI		1 <maxnoofcellintai></maxnoofcellintai>		
List				
>>>E-CGI	M			
>>>Number of	M		9.2.1.71	
Broadcasts				
>Emergency Area Cancelled				
>>Emergency Area ID		1		
Cancelled		<maxnoofemergencyareaid></maxnoofemergencyareaid>		
>>>Emergency Area ID	M		9.2.1.47	
>>>Cancelled Cell in		1 <maxnoofcellineai></maxnoofcellineai>		
Emergency Area ID List				
>>>E-CGI	M			
>>>Number of	M		9.2.1.71	
Broadcasts				

Range bound	Explanation
maxnoofCellID	Maximum no. of Cell ID subject for warning message broadcast. Value is 65535.
maxnoofTAlforWarning	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	М		INTEGER(065535)	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	M		ENUMERATED(true)	This IE is used to identify a
Message Indicator				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.

Presence	Range	IE type and reference	Semantics description
M		ENUMERATED (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 (40962 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	M		ENUMERATED (Data	
Possible			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,	Lower value codepoint
			PrioLevel2, PrioLevel3, PrioLevel4,	indicates higher priority.
			PrioLevel5, PrioLevel6, PrioLevel7,	
			PrioLevel8,)	

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	
			(SIZE(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	Criticality	Assigned Criticality
MDT Activation	М		ENUMERATED(Imm ediate MDT only, Logged MDT only, Immediate MDT and Trace,, Logged MBSFN MDT)		-	-
CHOICE Area Scope of MDT	M				-	-
>Cell based						-
>>Cell ID List for MDT		1 <maxno ofCellID forMDT</maxno 				-
>>>E-CGI	M		9.2.1.38		-	-
>TA based						-
>>TA List for MDT		1 <maxno ofTAfor MDT></maxno 				-
>>>TAC	М		9.2.3.7	The TAI is derived using the current serving PLMN.	-	-
>PLMN Wide			NULL		-	-
>TAI based					-	-
>>TAI List for MDT		1 <maxno ofTAfor MDT></maxno 			-	-
>>>TAI	M		9.2.3.16		-	-
CHOICE MDT Mode	M				-	-
>Immediate MDT			DITOTOINO	F 1 30 1 0		-
>>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, Third Bit = M3, Fourth Bit = M4, Fifth Bit = M5, Sixth Bit = logging of M1 from event triggered measurement reports according to existing RRM configuration, Seventh Bit = M6, Eighth Bit = M7. Value '1' indicates 'activate' and value '0' indicates 'do not activate'.	-	-
>>M1 Reporting Trigger	M		ENUMERATED (periodic, A2event- triggered,, A2event-triggered periodic)	This IE shall be ignored if the <i>Measurements to Activate</i> IE has the first bit set to '0'.	-	-
>>M1 Threshold Event A2	C- ifM1A2trig ger			Included in case of event-triggered or event-triggered periodic reporting for measurement M1.	-	-
>>>CHOICE Threshold	M				-	-
>>>RSRP						-

>>>>Threshold RSRP	M	INTEGER (097)	This IE is defined in TS 36.331 [16].	-	-
>>>RSRQ >>>>Threshold	M	INTEGER (034)	This IE is defined in TS	-	-
RSRQ			36.331 [16].		
>>M1 Periodic reporting	C- ifperiodic MDT		Included in case of periodic or event-triggered periodic reporting for measurement M1.	-	-
>>>Report interval	М	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.	-	-
>>M3 Configuration	C-ifM3	9.2.1.86		YES	ignore
>>M4 Configuration	C-ifM4	9.2.1.87		YES	ignore
>>M5 Configuration	C-ifM5	9.2.1.88		YES	ignore
>>MDT Location Information	0	BITSTRING(SIZE(8))	Each position in the bitmap represents requested location information as defined in TS 37.320 [31]. First Bit = GNSS Second Bit = E-CID information. Other bits are reserved for future use and are ignored if received. Value '1' indicates 'activate' and value '0' indicates 'do not activate'. The eNB shall ignore the first bit unless the Measurements to Activate IE has the first bit or the sixth bit set to '1'.	YES	ignore
>>M6 Configuration	C-ifM6	9.2.1.101		YES	ignore
>>M7 Configuration	C-ifM7	9.2.1.102		YES	ignore
>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	М	ENUMERATED (10, 20, 40, 60, 90 and 120)	This IE is defined in TS 36.331 [16]. Unit: [minute].	-	-
>Logged MBSFN MDT				YES	ignore
>>Logging interval	М	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	М	ENUMERATED (10, 20, 40, 60, 90 and 120)	This IE is defined in TS 36.331 [16]. Unit: [minute].	-	-
>>MBSFN-ResultToLog	0	MBSFN-ResultToLog 9.2.1.94		-	-
Signalling based MDT PLMN List	0	MDT PLMN List 9.2.1.89		YES	ignore

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 M1 Reporting Trigger IE is set to 'A2event-
	triggered' or to 'A2event-triggered periodic'.
ifperiodicMDT	This IE shall be present if the M1 Reporting Trigger IE is set to
	'periodic', or to 'A2event-triggered periodic'.
ifM3	This IE shall be present if the Measurements to Activate IE has the third
	bit set to '1'.
ifM4	This IE shall be present if the Measurements to Activate IE has the
	fourth bit set to '1'.
ifM5	This IE shall be present if the Measurements to Activate IE has the fifth
	bit set to '1'.
ifM6	This IE shall be present if the Measurements to Activate IE has the
	seventh bit set to '1'.
ifM7	This IE shall be present if the Measurements to Activate IE has the
	eighth bit set to '1'.

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	M		ENUMERATED (true,)	
Indicator				

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	Semantics description
			reference	
Management Based MDT	М		ENUMERATED	
Allowed			(Allowed,)	

9.2.1.84 GW Context Release Indication

This information element is set by the eNB to provide an indication that the MME may release any resources related to the signalled S1 UE context (see TS 36.300 [14]).

IE/Group Name	Presence	Range	IE type and	Semantics description
			reference	
GW Context Release	M		ENUMERATED	This IE indicates to the MME
Indication			(true,)	that the eNB has successfully
				performed an X2 HO for the
				UE to a target eNB.

9.2.1.85 Voice Support Match Indicator

This information element is set by the eNB to provide an indication whether the UE radio capabilities are compatible with the network configuration for voice continuity.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Voice Support Match	M		ENUMERATED	
Indicator			(Supported, Not	
			Supported)	

9.2.1.86 M3 Configuration

This IE defines the parameters for M3 measurement collection.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
M3 Collection Period	M		ENUMERATED	
			(ms100, ms1000,	
			ms10000,)	

9.2.1.87 M4 Configuration

This IE defines the parameters for M4 measurement collection.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
M4 Collection Period	M		ENUMERATED (ms1024, ms2048, ms5120, ms10240, min1,)	
M4 Links to log	M		ENUMERATED(uplin k, downlink, both-uplink-and-downlink,)	

9.2.1.88 M5 Configuration

This IE defines the parameters for M5 measurement collection.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
M5 Collection Period	М		ENUMERATED (ms1024, ms2048, ms5120, ms10240, min1,)	
M5 Links to log	M		ENUMERATED(uplin k, downlink, both-uplink-and-downlink,)	

9.2.1.89 MDT PLMN List

The purpose of the MDT PLMN List IE is to provide the list of PLMN allowed for MDT.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MDT PLMN List		1 <maxnoofmd TPLMNs></maxnoofmd 		
>PLMN Identity	M		9.2.3.8	

Range bound	Explanation
maxnoofMDTPLMNs	Maximum no. of PLMNs in the MDT PLMN list. Value is 16.

9.2.1.90 COUNT Value Extended

This IE contains a PDCP sequence number and a hyper frame number in case of 15 bit long PDCP-SN.

IE/Group Name	Presence	Range	IE type and	Semantics	Criticality	Assigned
			reference	description		Criticality
PDCP-SN Extended	M		INTEGER		-	-
			(032767)			
HFN Modified	M		INTEGER		-	-
			(0131071)			

9.2.1.91 Kill-all Warning Messages Indicator

The Kill-all Warning Messages Indicator IE indicates to the eNB to stop all already ongoing broadcast of warning messages in the eNB or in an area.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Kill-all Warning Message Indicator	M		ENUMERATED(true)	

9.2.1.92 LHN ID

The LHN ID IE is used to indicate the LHN ID of the eNB, as defined in TS 23.003 [21].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Local Home Network ID	М		OCTET STRING (SIZE (32256))	Identifies the Local
				Home Network.

9.2.1.93 User Location Information

This IE provides location information of a UE.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
User Location Information				
>E-UTRAN CGI	М		9.2.1.38	
>TAI	М		9.2.3.16	

9.2.1.94 MBSFN-ResultToLog

This IE provides information on the MBMS area in which the MBSFN MDT result is logged.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
MBSFN-ResultToLog		1 <maxnoof< th=""><th></th><th></th></maxnoof<>		
		MBSFNArea		
		MDT >		
>MBSFN-Areald	0		INTEGER (0255)	
>CarrierFreq	M		EARFCN	
			9.2.1.95	

Range bound	Explanation
maxnoofMBSFNAreaMDT	Maximum number of MBSFN areas configured for logged MBSFN MDT. Value is 8.

9.2.1.95 EARFCN

The E-UTRA Absolute Radio Frequency Channel Number defines the carrier frequency used in a cell for a given direction (UL or DL) in FDD or for both UL and DL directions in TDD.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
EARFCN	M		INTEGER (0 maxEARFCN,)	The relation between EARFCN and carrier frequency (in MHz) are
				defined in TS 36.104 [39].

Range bound	Explanation
maxEARFCN	Maximum value of EARFCNs. Value is 262143.

9.2.1.96 Expected UE Behaviour

This IE defines the behaviour of a UE with predictable activity and/or mobility behaviour, to assist the eNB in determining the optimum RRC connection time.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Expected UE Activity Behaviour	0		9.2.1.97	
Expected HO Interval	0		ENUMERATED (sec15, sec30, sec60, sec90, sec120, sec180, long-time,)	Indicates the expected time interval between inter-eNB handovers. If "long-time" is included, the interval between inter-eNB handovers is expected to be longer than 180 seconds.

9.2.1.97 Expected UE Activity Behaviour

Indicates information about the expected "UE activity behaviour" as defined in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Expected Activity Period	0		INTEGER (130 40 50 60 80 100 120 150 180 181,)	If this IE is set to "181" the expected activity time is longer than 180 seconds. The remaining values indicate the expected activity time in [seconds].
Expected Idle Period	0		INTEGER (130 40 50 60 80 100 120 150 180 181,)	If this IE is set to "181" the expected idle time is longer than 180 seconds. The remaining values indicate the expected idle time in [seconds].
Source of UE Activity Behaviour Information	0		ENUMERATED (subscription information, statistics,)	If "subscription information" is indicated, the information contained in the <i>Expected Activity Period</i> IE and the <i>Expected Idle Period</i> IE, if present, is derived from subscription information. If "statistics" is indicated, the information contained in the <i>Expected Activity Period</i> IE and the <i>Expected Idle Period</i> IE, if present, is derived from statistical information.

9.2.1.98 UE Radio Capability for Paging

This IE contains paging specific UE Radio Capability information.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
UE Radio Capability for Paging	M		OCTET STRING	Includes either the UERadioPagingInformation message as defined in 10.2.2 of TS 36.331 [16], or the UERadioPagingInformation-NB message as defined in 10.6.2 of TS 36.331 [16].

9.2.1.99 ProSe Authorized

This IE provides information on the authorization status of the UE for ProSe services.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
ProSe Direct Discovery	0		ENUMERATED (authorized, not authorized,)	Indicates whether the UE is authorized for ProSe Direct Discovery	-	-
ProSe Direct Communication	0		ENUMERATED (authorized, not authorized,)	Indicates whether the UE is authorized for ProSe Direct Communication	-	-
ProSe UE-to-Network Relaying	0		ENUMERATED (authorized, not authorized,)	Indicates whether the UE is authorized to act as ProSe UE-to-Network Relay	YES	ignore

9.2.1.100 COUNT Value for PDCP SN Length 18

This IE contains a PDCP sequence number and a hyper frame number in case of 18 bit long PDCP-SN.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
PDCP-SN Length 18	M		INTEGER		-	-
_			(0262143)			
HFN for PDCP-SN Length	M		INTEGER		-	-
18			(016383)			

9.2.1.101 M6 Configuration

This IE defines the parameters for M6 measurement collection.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
M6 Report Interval	М		ENUMERATED (ms1024, ms2048, ms5120, ms10240,)	
M6 Delay Threshold	C-ifUL		ENUMERATED (ms30, ms40, ms50, ms60, ms70, ms80, ms90, ms100, ms150, ms300, ms500, ms750,)	
M6 Links to log	М		ENUMERATED(uplin k, downlink, both-uplink-and-downlink,)	

Condition Explanation		
ifUL	This IE shall be present if the M6 Links to log IE is set to 'uplink' or to	
	'both-uplink-and-downlink'.	

9.2.1.102 M7 Configuration

This IE defines the parameters for M7 measurement collection.

IE/Group Name	Presence	Range	IE type and	Semantics description
			reference	
M7 Collection Period	M		INTEGER (160,)	Unit: minutes
M7 Links to log	M		ENUMERATED(uplin	
			k, downlink, both-	
			uplink-and-downlink,	
)	

9.2.1.103 Assistance Data for Paging

This IE provides assistance information for paging optimisation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Assistance Data for	0		9.2.1.104	
Recommended Cells				
Assistance Data for CE capable UEs	0		9.2.1.108	
Paging Attempt Information	0		9.2.1.110	

9.2.1.104 Assistance Data for Recommended Cells

This IE provides assistance information for paging in recommended cells.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Recommended Cells for Paging	M		9.2.1.106	

9.2.1.105 Information on Recommended Cells and eNBs for Paging

This IE provides information on recommended cells and eNBs for paging.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Recommended Cells for Paging	M		9.2.1.106	
Recommended eNBs for Paging	M		9.2.1.107	

9.2.1.106 Recommended Cells for Paging

This IE contains the recommended cells for paging.

This IE is transparent to the EPC.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Recommended Cell List		1		
>Recommended Cell Item IEs		1 <maxnoofre commended Cells></maxnoofre 		Includes visited and non- visited cells, where visited cells are listed in the order the UE visited them with the most recent cell being the first in the list. Non-visited cells are included immediately after the visited cell they are associated with.
>>E-UTRAN CGI	M		9.2.1.38	
>>Time Stayed in Cell	0		INTEGER (04095)	This is included for visited cells and indicates the time a UE stayed in a cell in seconds. If the UE stays in a cell more than 4095 seconds, this IE is set to 4095.

Range bound	Explanation
maxnoofRecommendedCells	Maximum no. of recommended Cells, the maximum value is 16.

9.2.1.107 Recommended eNBs for Paging

This IE contains recommended targets for paging.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Recommended eNB List				
>Recommended eNB Item IEs		1 <maxnoofre commended eNBs></maxnoofre 		Includes visited and non-visited eNBs, where visited eNBs are listed in the order the UE visited them with the most recent eNB being the first in the list. Non-visited eNBs are included after the visited eNB they are associated with.
>>Choice MME Paging Target				The MME paging target is either an eNB identity or a TAI as specified in TS 36.300 [14].
>>>eNB				
>>>>Global eNB ID	М		9.2.1.37	
>>>TAI				
>>>TAI	M		9.2.3.16	

Range bound	Explanation
maxnoofRecommendedeNBs	Maximum no. of recommended eNBs, the maximum value is 16.

9.2.1.108 Assistance Data for CE capable UEs

This IE provides information for paging for CE capable UEs.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cell Identifier and	M		9.2.1.109	
Coverage Enhancement				
Level				

9.2.1.109 Cell Identifier and Coverage Enhancement Level

This IE provides information for paging CE capable UEs.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Global Cell ID	М		E-UTRAN CGI 9.2.1.38	
Coverage Enhancement Level	М		OCTET STRING	Includes either the UEPagingCoverageInformation message as defined in 10.2.2 of TS 36.331 [16], or the UEPagingCoverageInformation-NB message as defined in 10.6.2 of TS 36.331 [16].

9.2.1.110 Paging Attempt Information

This IE includes information related to the paging count over S1.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Paging Attempt Count	М		INTEGER (116,)	Shall be set as specified in TS 36.300 [14].
Intended Number of Paging Attempts	М		INTEGER (116,)	Intended number of paging attempts (see TS 36.300 [14]).
Next Paging Area Scope	0		ENUMERATED (same, changed,)	Indicates whether the paging area scope will change or not at next paging attempt. Usage specified in TS 36.300 [14].

9.2.1.111 Paging eDRX Information

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Paging eDRX Cycle	М		ENUMERATED (hfhalf, hf1, hf2, hf4, hf6, hf8, hf10, hf12, hf14, hf16, hf32, hf64, hf128, hf256,)	$T_{\rm eDRX}$ defined in TS 36.304 [20]. Unit: [number of hyperframes].
Paging Time Window	0		ENUMERATED (s1, s2, s3, s4, s5, s6, s7, s8, s9, s10, s11, s12, s13, s14, s15, s16,)	Unit: [1.28 second].

9.2.1.112 UE Retention Information

This information element allows the eNB and the MME to indicate whether prior UE related contexts and signalling connections are intended to be retained.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Retention Information	M		ENUMERATED (ues-	
			retained,)	

9.2.1.113 UE User Plane CloT Support Indicator

This IE indicates whether User Plane CIoT EPS Optimisation as specified in TS 23.401[11] is supported for the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE User Plane CloT	M		ENUMERATED	
Support Indicator			(supported,)	

9.2.1.114 NB-IoT Default Paging DRX

This IE indicates the NB-IoT Default Paging DRX as defined in TS 36.304 [20].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NB-IoT Default Paging DRX	M		ENUMERATED(128, 256, 512, 1024,)	Unit: [number of radioframes]

9.2.1.115 NB-IoT Paging eDRX Information

This IE indicates the NB-IoT Paging eDRX parameters as defined in TS 36.304 [20].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NB-IoT Paging eDRX	M		ENUMERATED (hf2, hf4,	T _{eDRX} defined in TS 36.304 [20].
Cycle			hf6, hf8, hf10, hf12, hf14,	Unit: [number of hyperframes].
			hf16, hf32, hf64, hf128,	
			hf256, hf512, hf1024,)	
NB-IoT Paging Time	0		ENUMERATED (s1, s2,	Unit: [2.56 seconds]
Window			s3, s4, s5, s6, s7, s8, s9,	
			s10, s11, s12, s13, s14,	
			s15, s16,)	

9.2.1.116 Bearer Type

This IE is used to support Non-IP data as specified in TS 23.401 [11].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Bearer Type	М		ENUMERATED (non IP,)	

9.2.1.117 RAT Type

This element is provided by the eNB to inform about the RAT Type.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAT Type	M		ENUMERATED (NB-IOT,	
)	

9.2.1.118 CE-mode-B Support Indicator

This IE indicates whether CE-mode-B as specified in TS 36.306[41] is supported for the UE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CE-mode-B Support	M		ENUMERATED	
Indicator			(supported,)	

9.2.1.119 SRVCC Operation Not Possible

This element indicates that SRVCC operation is not possible any more.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SRVCC Operation Not Possible	М		ENUMERATED (notPossible,)	

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	Semantics description
			reference	
Transport Layer Address	M		BIT STRING	The Radio Network Layer is not supposed
			(SIZE(1160,	to interpret the address information. It
))	should pass it to the transport layer for
				interpretation.
				For details on the Transport Layer
				Address, see 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	Semantics description
			reference	
GTP-TEID	М		OCTET	For details and range, see TS
			STRING	29.281 [32].
			(SIZE(4))	

9.2.2.3 Tunnel Information

The Tunnel Information IE indicates the transport layer address and UDP port number.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Transport Layer Address	М		9.2.2.1	HeNB"s Transport Layer Address.
UDP Port Numbers	0		OCTET STRING (SIZE(2))	UDP Port Numbers if NAT/NAPT is deployed in the BBF access network.

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	0000 and FFFE not allowed.
			STRING	
			(SIZE(2))	

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	
			(SIZE(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	М		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	М		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	М		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	М		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	М		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 (SIZE(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	М		BIT STRING (SIZE(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 (38))	- 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.

	reference	·
	OCTET STRING	
_		1010101100

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	M			
>S-TMSI				
>>S-TMSI	М		9.2.3.6	
>IMSI				
>>IMSI	M		9.2.3.11	

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	M		ENUMERATED	
Availability			(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	М		9.2.3.8	
>TAC	М		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	М		INTEGER (0255)	

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	М			
>Overload Action				
>>Overload Action	М		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	М		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	М		ENUMERAT	
			ED(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	0		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	М		OCTET STRING	Contains the BSSGP RIM PDU as defined in 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	М					
>GERAN-Cell-ID					-	
>>LAI	M		9.2.3.1		-	
>>RAC	M		9.2.3.2		-	
>>Cl	M		OCTET STRING (SIZE(2))		-	
>Target RNC-ID			, , , , , ,		-	
>>LAI	M		9.2.3.1		-	
>>RAC	0		9.2.3.2		-	
>>RNC-ID	M		INTEGER (04095)	If the Extended RNC-ID IE is included in the Target ID IE, the RNC- ID IE shall be ignored.	•	
>>Extended RNC- ID	0		9.2.1.14	The Extended RNC-ID IE shall be used if the RNC identity has a value larger than 4095.	-	
>eHRPD Sector ID					-	
>>eHRPD Sector ID	M		OCTET STRING (SIZE(16))	Contains the eHRPD Sector ID as defined in 3GPP2 C.S0024-B [27] sub-section 13.9.	-	

9.2.3.26 SON Configuration Transfer

This IE contains the configuration information, used by e.g., SON functionality, and additionally includes the eNB identifier of the destination of this configuration information and the eNB identifier of the source of this information.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
SON Configuration Transfer						
>Target eNB-ID	M					
>>Global eNB ID	M		9.2.1.37			
>>Selected TAI	М		TAI 9.2.3.16			
>Source eNB-ID	M					
>>Global eNB ID	M		9.2.1.37			
>>Selected TAI	М		TAI 9.2.3.16			
>SON Information	M		9.2.3.27			
>X2 TNL Configuration Info	C- ifSONInfor mationReq uest		9.2.3.29	Source eNB X2 TNL Configuration Info.	YES	ignore
>Synchronisation Information	C-if Activate Muting		9.2.3.42	Information on cell selected as source of synchronisation and aggressor cells.	YES	ignore

Condition	Explanation
ifSONInformationRequest	This IE shall be present if the SON Information IE contains the SON
	Information Request IE set to 'X2TNL Configuration Info'
ifActivateMuting	This IE shall be present if the SON Information IE contains the SON
_	Information Request IE set to 'Activate Muting'

9.2.3.27 SON Information

This IE identifies the nature of the configuration information transferred, i.e., a request, a reply or a report.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
CHOICE SON Information	M					
>SON Information Request						
>>SON Information Request	M		ENUMERAT ED(X2 TNL Configuration Info,, Time synchronisati on Info, Activate Muting, Deactivate Muting)		-	
>SON Information Reply			-			
>>SON Information Reply	M		9.2.3.28		-	
>SON Information Report						
>>SON Information Report	М		9.2.3.39		YES	ignore

9.2.3.28 SON Information Reply

This IE contains the configuration information to be replied to the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
SON Information Reply						
>X2 TNL Configuration Info	0		9.2.3.29			
>Time Synchronisation Info	0		9.2.3.34		YES	ignore
>Muting Pattern Information	0		9.2.3.41		YES	ignore

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	Criticality	Assigned Criticality
eNB X2 Transport Layer Addresses		1 <maxnoofenb X2TLAs></maxnoofenb 				
>Transport Layer Address	M		9.2.2.1	Transport Layer Addresses for X2 SCTP end-point.		
eNB X2 Extended Transport Layer Addresses		0 <maxnoofenb X2ExtTLAs></maxnoofenb 			YES	ignore
>IP-Sec Transport Layer Address	0		9.2.2.1	Transport Layer Addresses for IP- Sec end-point.	-	-
>eNB GTP Transport Layer Addresses		0 <maxnoofenb X2GTPTLAs></maxnoofenb 			-	-
>>GTP Transport Layer Address	M		9.2.2.1	GTP Transport Layer Addresses for GTP end- points (used for data forwarding over X2).	-	-
eNB Indirect X2 Transport Layer Addresses		0 <maxnoofenb X2TLAs></maxnoofenb 			YES	ignore
>Transport Layer Address	0		9.2.2.1	Transport Layer Addresses for Indirect X2 SCTP end-point.		

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	М		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	М		INTEGER (0255)	

9.2.3.34 Time Synchronisation Info

The *Time Synchronisation Info* IE is used for signalling stratum level, synchronisation status and muting availability for over-the-air synchronisation using network listening.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Synchronisation Info						
>Stratum Level	М		INTEGER (03,)			
>Synchronisation status	M		ENUMERATED(Synchronous, Asynchronous,)			
>Muting Availability Indication	0		ENUMERATED (Available, Unavailable,)	Indicates availability of muting activation.	YES	ignore

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	M		INTEGER	
Indication			(199)	

9.2.3.37 Additional CS Fallback Indicator

The IE indicates whether the restrictions contained in the *Handover Restriction List* IE apply or not to the CS Fallback High Priority call.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Additional CS Fallback	M		ENUMERATED(no restriction,	
Indicator			restriction,)	

9.2.3.38 Masked IMEISV

This information element contains the IMEISV value with a mask, to identify a terminal model without identifying an individual Mobile Equipment.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Masked IMEISV	М		BIT STRING (SIZE (64))	Coded as the International Mobile station Equipment Identity and Software Version Number (IMEISV) defined in TS 23.003 [21] with the last 4 digits of the SNR masked by setting the corresponding bits to 1. The first to fourth bits correspond to the first digit of the IMEISV, the fifth to eighth bits correspond to the second digit of the IMEISV, and so on.

9.2.3.39 SON Information Report

This IE contains the configuration information to be transferred to the eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE SON Information	M			
Report				
>RLF Report Information				
>>RLF Report Information	М		9.2.3.40	

9.2.3.40 RLF Report Information

This IE contains the RLF report information to be transferred to the eNB.

IE/Group Name	Presence	Range	IE type and	Semantics description
			reference	
UE RLF Report Container	M		OCTET STRING	rlf-Report-r9 contained in UEInformationResponse message as defined in TS 36.331 [16].
UE RLF Report Container for extended bands	0		OCTET STRING	rlf-Report-v9e0 contained in the UEInformationResponse message (TS 36.331 [16])

9.2.3.41 Muting Pattern Information

This information element contains muting pattern information that can be used for over-the-air synchronisation using network listening.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Muting Pattern Period	М		ENUMERATED (0, 1280, 2560, 5120, 10240,)	Period for repetition of muted subframe in milliseconds. Value "0" indicates that the muting request is not fulfilled.
Muting Pattern Offset	0		INTEGER (010239,)	Offset in number of subframes of the muting pattern starting from subframe 0 in a radio frame where SFN = 0. If this IE is not present, the receiving eNB may consider the requested muting pattern offset in the former request has been accepted.

9.2.3.42 Synchronisation Information

This information element contains information concerning the cell selected as source of synchronisation signal by the sending eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Source Stratum Level	0		INTEGER (03,)	Stratum Level of cell selected as synchronisation source. The range of this IE is limited to 02.
Listening Subframe Pattern	0		9.2.3.43	Subframe pattern where the Reference Signals can be detected for synchronisation.
Aggressor Cell List		01		List of cells for which the muting pattern need to be activated.
>Aggressor E- CGI List		1 <max noofCell sineNB ></max 		
>>E-CGI	М		9.2.1.38	

Range bound	Explanation
maxnoofCellsineNB	Maximum no. cells that can be served by an eNB. Value is 256.

9.2.3.43 Listening Subframe Pattern

This information element contains information concerning the pattern of subframes where the reference signals can be detected for the purpose of over the air synchronisation via network listening.

IE/Group Name	Presence	Range	IE type and	Semantics description
			reference	
Pattern Period	M		ENUMERATED	Period in milliseconds for repetition of the
			(1280, 2560,	subframe where reference signals are
			5120, 10240,)	available.
Pattern Offset	M		INTEGER	Offset in number of subframes of the reference
			(010239,)	signals starting from subframe 0 in a radio
				frame where SFN = 0.

9.2.3.44 MME Group ID

This information element contains information concerning the MME Group ID that identifies a group of MME"s.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
MME Group ID	M		OCTET STRING (SIZE(2))	The MME Group ID is defined in TS 23.003 [21]

9.2.3.45 Additional GUTI

This information element contains DCN related information to for identification of a CN node.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
GUMMEI	M		9.2.3.9	
M-TMSI	M		OCTET STRING	
			(SIZE (4))	

9.2.3.46 Extended UE Identity Index Value

The *Extended UE Identity Index Value* IE is used by the eNB to calculate the paging resources to be used for the UE, as defined in TS 36.304 [20].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Extended UE Identity Index Value	M		BIT STRING (SIZE(14))	Corresponds to the UE_ID used to determine the Paging Narrowband as specified in TS 36.304 [20].

9.2.3.47 NB-IoT UE Identity Index Value

The *NB-IoT UE Identity Index Value* IE is used by the eNB to calculate the paging resources to be used for the UE, as defined in TS 36.304 [20].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NB-IoT UE Identity Index	M		BIT STRING	Coded as specified in TS 36.304 [20].
Value			(SIZE(12))	

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,

Downlink Non UE Associated LPP a Transport,

DownlinkS1cdma2000tunnelling,

ENBDirectInformationTransfer,

ENBStatusTransfer,

ENBConfigurationUpdate,

ENBConfigurationUpdateAcknowledge,

ENBConfigurationUpdateFailure,

ErrorIndication,

HandoverCancel,

HandoverCancelAcknowledge,

HandoverCommand,

HandoverFailure,

HandoverNotify,

HandoverPreparationFailure,

HandoverRequest,

HandoverRequestAcknowledge,

HandoverRequired,

InitialContextSetupFailure,

InitialContextSetupRequest,

InitialContextSetupResponse,

InitialUEMessage,

KillRequest,

KillResponse,

LocationReportingControl,

Location Reporting Failure Indication,

LocationReport,

MMEConfigurationUpdate,

MMEConfigurationUpdateAcknowledge,

MMEConfigurationUpdateFailure,

MMEDirectInformationTransfer,

MMEStatusTransfer,

NASNonDeliveryIndication,

OverloadStart,

OverloadStop,

Paging,

PathSwitchRequest,

Path Switch Request Acknowledge,

Path Switch Request Failure,

Private Message,

Reset,

ResetAcknowledge,

S1SetupFailure,

S1SetupRequest,

S1SetupResponse,

E-RABModifyRequest,

E-RABModifyResponse,

E-RABModificationIndication,

E-RABModificationConfirm,

E-RABReleaseCommand,

E-RABReleaseResponse,

E-RABReleaseIndication,

E-RABSetupRequest,

E-RABSetupResponse,

TraceFailureIndication,

TraceStart,

UECapabilityInfoIndication,

UEContextModificationFailure,

UEContextModificationRequest,

UEContextModificationResponse,

UEContextReleaseCommand,

UEContextReleaseComplete,

UEContextReleaseRequest,

UERadioCapabilityMatchRequest,

UERadioCapabilityMatchResponse,

Uplink UE Associated LPP a Transport,

UplinkNASTransport,

UplinkNonUEAssociatedLPPaTransport,

UplinkS1cdma2000tunnelling,

WriteReplaceWarningRequest,

WriteReplaceWarningResponse,

ENBConfigurationTransfer,

MMEConfigurationTransfer,

PWSRestartIndication,

UEContextModificationIndication,

UEContextModificationConfirm,

RerouteNASRequest,

PWSFailureIndication,

UEContextSuspendRequest,

UEContextSuspendResponse,

UEContextResumeRequest,

UEContextResumeResponse,

UEContextResumeFailure,

Connection Establishment Indication

FROM S1AP-PDU-Contents

id-CellTrafficTrace,

id-DeactivateTrace,

id-downlink UEAs sociated LPP a Transport,

id-downlinkNASTransport,

id-downlinkNonUEAssociatedLPPaTransport,

id-DownlinkS1cdma2000tunnelling,

id-eNBStatusTransfer,

id-ErrorIndication,

id-HandoverCancel,

id-HandoverNotification,

id-HandoverPreparation,

id-HandoverResourceAllocation,

id-InitialContextSetup,

id-initialUEMessage,

id-ENBConfigurationUpdate,

id-Kill,

 $id\hbox{-}Location Reporting Control,\\$

 $id\hbox{-}Location Reporting Failure Indication,\\$

id-LocationReport,

id-eNBDirectInformationTransfer,

id-MMEConfigurationUpdate,

 $id\hbox{-}MMEDirectInformationTransfer,\\$

id-MMEStatusTransfer,

id-NASNonDeliveryIndication,

id-OverloadStart,

id-OverloadStop,

id-Paging,

- id-PathSwitchRequest,
- id-PrivateMessage,
- id-Reset,
- id-S1Setup,
- id-E-RABModify,
- id-E-RABModificationIndication,
- id-E-RABRelease,
- id-E-RABReleaseIndication,
- id-E-RABSetup,
- id-TraceFailureIndication,
- id-TraceStart,
- id-UECapabilityInfoIndication,
- id-UEContextModification,
- id-UEContextRelease,
- id-UEContextReleaseRequest,
- id-UERadioCapabilityMatch,
- id-uplink UEAs sociated LPP a Transport,
- id-uplinkNASTransport,
- id-uplink Non UEAs sociated LPP a Transport,
- id-Uplink S1cdma 2000 tunnelling,
- id-WriteReplaceWarning,
- id-eNBConfigurationTransfer,
- id-MMEConfigurationTransfer,
- id-PWSRestartIndication,

```
id-UEContextModificationIndication,
     id-RerouteNASRequest,
     id-PWSFailureIndication,
     id-UEContextSuspend,
     id-UEContextResume,
     id-ConnectionEstablishmentIndication
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 {
      initiatingMessageInitiatingMessage,
     successfulOutcome
                        SuccessfulOutcome,
                        UnsuccessfulOutcome,
     unsuccessfulOutcome
InitiatingMessage ::= SEQUENCE {
     procedureCode S1AP-ELEMENTARY-PROCEDURE.&procedureCode
                                                                   ({S1AP-ELEMENTARY-PROCEDURES}),
     criticality
                        S1AP-ELEMENTARY-PROCEDURE.&criticality
                                                                         ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
                        S1AP-ELEMENTARY-PROCEDURE.&InitiatingMessage
                                                                  ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
      value
```

```
SuccessfulOutcome ::= SEQUENCE {
     procedureCode S1AP-ELEMENTARY-PROCEDURE.&procedureCode
                                                                 ({S1AP-ELEMENTARY-PROCEDURES}),
                       S1AP-ELEMENTARY-PROCEDURE.&criticality
                                                                       ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
      criticality
                       S1AP-ELEMENTARY-PROCEDURE. & SuccessfulOutcome ({$1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
     value
UnsuccessfulOutcome ::= SEQUENCE {
     procedureCode S1AP-ELEMENTARY-PROCEDURE.&procedureCode
                                                                 ({S1AP-ELEMENTARY-PROCEDURES}),
     criticality
                       S1AP-ELEMENTARY-PROCEDURE.&criticality
                                                                       ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
                                                                       ({S1AP-ELEMENTARY-PROCEDURES}{@procedureCode})
      value
                       S1AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome
    **********************
-- Interface Elementary Procedure List
S1AP-ELEMENTARY-PROCEDURES S1AP-ELEMENTARY-PROCEDURE ::= {
     S1AP-ELEMENTARY-PROCEDURES-CLASS-1
     S1AP-ELEMENTARY-PROCEDURES-CLASS-2,
```

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S1AP-ELEMENTARY-PROCEDURES-CLA	ASS-1 S1AP-E	ELEMEN	NTARY-	PROCED	URE ::= {	
handoverPreparation		I				
hand over Resource Allocation						
pathSwitchRequest						
e-RABSetup						
e-RABModify						
e-RABRelease		I				
initialContextSetup						
handoverCancel		I				
kill						
reset						
s1Setup						
uEContextModification						
uEContextRelease		I				
eNBConfigurationUpdate						
mMEC on figuration Update						
writeReplaceWarning		,				
,						
uERadioCapabilityMatch						
e-RABModificationIndication						
uEContext Modification Indication						
uEContextSuspend					1	

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```
uEContextResume
S1AP-ELEMENTARY-PROCEDURES-CLASS-2 S1AP-ELEMENTARY-PROCEDURE ::= {
       handoverNotification
       e-RABReleaseIndication
       paging
       downlink NAST ransport \\
       initialUEMessage
       uplinkNASTransport
       errorIndication
       nASNonDeliveryIndication
       uEC ontext Release Request\\
       downlinkS1cdma2000tunnelling
       uplinkS1cdma2000tunnelling
       uECapabilityInfoIndication
       eNBStatusTransfer
       mMEStatusTransfer
       deactivateTrace
       traceStart
       traceFailureIndication
       cellTrafficTrace
       locationReportingControl
       locationReportingFailureIndication |
```

	locationReport				
	overloadStart		1		
	overloadStop		1		
	eNBDirectInformationTransfer				
	mMEDirectInformationTransfer				
	eNBConfigurationTransfer				
	mMEConfigurationTransfer				
	privateMessage		,		
	,				
	downlinkUEAssociatedLPPaTransport				
	uplinkUEAssociatedLPPaTransport				
	downlink Non UEAs sociated LPP a Transport				
	uplinkNonUEAssociatedLPPaTransport				
	pWSRestartIndication				
	rerouteNASRequest		1		
	pWSFailureIndication				
	connectionEstablishmentIndication				

Interfa	ce Elementary Procedures				
د ماه ماه ماه ماه ما	- با باد باد باد باد باد باد باد باد باد	e ale ale ale ale ale	مله		

```
handoverPreparation S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                  HandoverRequired
      SUCCESSFUL OUTCOME
                                         HandoverCommand
                                  HandoverPreparationFailure
      UNSUCCESSFUL OUTCOME
      PROCEDURE CODE
                                         id-HandoverPreparation
      CRITICALITY
                                         reject
handoverResourceAllocation S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                  HandoverRequest
      SUCCESSFUL OUTCOME
                                         HandoverRequestAcknowledge
                                 HandoverFailure
      UNSUCCESSFUL OUTCOME
      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
                                 PathSwitchRequestFailure
      UNSUCCESSFUL OUTCOME
      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
                                       id-E-RABModify
      PROCEDURE CODE
      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
                                   Initial Context Setup Request\\
       SUCCESSFUL OUTCOME
                                          InitialContextSetupResponse
       UNSUCCESSFUL OUTCOME
                                   InitialContextSetupFailure
       PROCEDURE CODE
                                          id-InitialContextSetup
       CRITICALITY
                                          reject
uEContextReleaseRequest\ S1AP-ELEMENTARY-PROCEDURE::= \{
       INITIATING MESSAGE
                                   UEC on text Release Request\\
       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
n ASN on Delivery Indication \ S1AP-ELEMENTARY-PROCEDURE ::= \{
```

```
NASNonDeliveryIndication
      INITIATING MESSAGE
      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
                                         ENB Configuration Update Acknowledge \\
                                  ENBConfigurationUpdateFailure
      UNSUCCESSFUL OUTCOME
      PROCEDURE CODE
                                         id-ENBConfigurationUpdate
      CRITICALITY
                                         reject
mMEConfigurationUpdate S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                  MME Configuration Update\\
      SUCCESSFUL OUTCOME
                                         MME Configuration Update Acknowledge \\
      UNSUCCESSFUL OUTCOME
                                  MMEConfigurationUpdateFailure
                                         id-MMEConfigurationUpdate
      PROCEDURE CODE
      CRITICALITY
                                         reject
```

```
downlink S1cdma 2000 tunnelling \ S1AP-ELEMENTARY-PROCEDURE ::= \{
       INITIATING MESSAGE
                                    DownlinkS1cdma2000tunnelling
                                           id-DownlinkS1cdma2000tunnelling
       PROCEDURE CODE
       CRITICALITY
                                           ignore
uplinkS1cdma2000tunnelling S1AP-ELEMENTARY-PROCEDURE ::= {
       INITIATING MESSAGE
                                    UplinkS1cdma2000tunnelling
                                           id-UplinkS1cdma2000tunnelling
       PROCEDURE CODE
       CRITICALITY
                                           ignore
uEContextModification S1AP-ELEMENTARY-PROCEDURE ::= {
       INITIATING MESSAGE
                                    UEC ontext Modification Request\\
                                           UEC ontext Modification Response\\
       SUCCESSFUL OUTCOME
       UNSUCCESSFUL OUTCOME
                                   UEContextModificationFailure
                                           id-UEContextModification
       PROCEDURE CODE
       CRITICALITY
                                           reject
uECapabilityInfoIndication S1AP-ELEMENTARY-PROCEDURE ::= {
       INITIATING MESSAGE
                                    UECapabilityInfoIndication
       PROCEDURE CODE
                                           id-UECapabilityInfoIndication
```

```
CRITICALITY
                                         ignore
uEContextRelease S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                  UEContextReleaseCommand
      SUCCESSFUL OUTCOME
                                         UEC ontext Release Complete\\
      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
eNBConfiguration Transfer\ S1AP-ELEMENTARY-PROCEDURE ::= \{
      INITIATING MESSAGE
                                   ENB Configuration Transfer\\
```

```
PROCEDURE CODE
                                          id-eNBConfigurationTransfer
      CRITICALITY
                                          ignore
mMEConfigurationTransfer S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                   MMEConfigurationTransfer
      PROCEDURE CODE
                                          id\text{-}MMEC on figuration Transfer\\
      CRITICALITY
                                          ignore
privateMessage S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                   PrivateMessage
       PROCEDURE CODE
                                          id-PrivateMessage
      CRITICALITY
                                          ignore
pWSRestartIndication S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                   PWSRestartIndication
      PROCEDURE CODE
                                          id-PWSRestartIndication
      CRITICALITY
                                          ignore
kill S1AP-ELEMENTARY-PROCEDURE ::= {
```

```
INITIATING MESSAGE
                                   KillRequest
                                           KillResponse
       SUCCESSFUL OUTCOME
       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
                                   Downlink Non UEAs sociated LPP a Transport\\
       PROCEDURE CODE
                                          id-downlink Non UEAs sociated LPP a Transport\\
       CRITICALITY
                                           ignore
uplinkNonUEAssociatedLPPaTransport S1AP-ELEMENTARY-PROCEDURE ::= {
```

```
INITIATING MESSAGE
                                    UplinkNonUEAssociatedLPPaTransport
                                           id\text{-}uplink Non UEAs sociated LPP a Transport\\
       PROCEDURE CODE
       CRITICALITY
                                           ignore
uERadioCapabilityMatch S1AP-ELEMENTARY-PROCEDURE ::= {
       INITIATING MESSAGE
                                    UERadio Capability Match Request\\
       SUCCESSFUL OUTCOME
                                           UERadioCapabilityMatchResponse
       PROCEDURE CODE
                                           id-UERadioCapabilityMatch
       CRITICALITY
                                           reject
e-RABModificationIndication S1AP-ELEMENTARY-PROCEDURE ::= {
                                    E-RABModificationIndication
       INITIATING MESSAGE
       SUCCESSFUL OUTCOME
                                           E-RABModificationConfirm
       PROCEDURE CODE
                                           id-E-RABModificationIndication
       CRITICALITY
                                           reject
uEContextModificationIndication S1AP-ELEMENTARY-PROCEDURE ::= {
       INITIATING MESSAGE
                                    UEContextModificationIndication
       SUCCESSFUL OUTCOME
                                           UEContextModificationConfirm
       PROCEDURE CODE
                                           id-UEContextModificationIndication
       CRITICALITY
                                           reject
```

```
rerouteNASRequest S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                   RerouteNASRequest
      PROCEDURE CODE
                                          id-RerouteNASRequest
      CRITICALITY
                                          reject
pWSFailureIndication S1AP-ELEMENTARY-PROCEDURE ::= {
       INITIATING MESSAGE
                                   PWSFailureIndication
      PROCEDURE CODE
                                          id-PWSFailureIndication
      CRITICALITY
                                          ignore
uEContextSuspend S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                   UEContextSuspendRequest
      SUCCESSFUL OUTCOME
                                          UEC on text Suspend Response \\
                                          id-UEContextSuspend
       PROCEDURE CODE
       CRITICALITY
                                          reject
uEContextResume S1AP-ELEMENTARY-PROCEDURE ::= {
      INITIATING MESSAGE
                                   UEC on text Resume Request\\
       SUCCESSFUL OUTCOME
                                          UEC on text Resume Response \\
```

END

```
UNSUCCESSFUL OUTCOME UEContextResumeFailure
PROCEDURE CODE id-UEContextResume
CRITICALITY reject

}

connectionEstablishmentIndication S1AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE ConnectionEstablishmentIndication
    PROCEDURE CODE id-ConnectionEstablishmentIndication
    CRITICALITY reject
}
```

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,

BearerType, Cause, CellAccessMode, Cdma2000HORequiredIndication, Cdma2000HOStatus, Cdma2000OneXSRVCCInfo, Cdma2000OneXRAND, Cdma2000PDU, Cdma2000RATType, Cdma2000SectorID, EUTRAN Round Trip Delay Estimation Info,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,

GUMMEIType,

HandoverRestrictionList,

HandoverType,

Masked-IMEISV,

LAI,

LPPa-PDU,

ManagementBasedMDTAllowed,

MDTPLMNList,

MMEname,

MMERelaySupportIndicator,

MME-UE-S1AP-ID,

MSClassmark2,

MSClassmark3,

NAS-PDU,

NASSecurityParametersfromE-UTRAN,

NASSecurityParameterstoE-UTRAN,

OverloadResponse,

PagingDRX,

PagingPriority,

PLMNidentity,

ProSe Authorized,

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,

Source RNC-ToT arget RNC-Transparent Container,

SubscriberProfileIDforRFP,

SRVCCOperationNotPossible,

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,

UERadioCapabilityForPaging,

UE-RetentionInformation,

UE-S1AP-IDs,

UE-associatedLogicalS1-ConnectionItem,

UESecurityCapabilities,

S-TMSI,

MessageIdentifier,

SerialNumber,

Warning Area List,

RepetitionPeriod,

Number of Broad cast Request,

Warning Type,

221

WarningSecurityInfo,

DataCodingScheme,

WarningMessageContents,

BroadcastCompletedAreaList,

RRC-Establishment-Cause,

BroadcastCancelledAreaList,

PS-ServiceNotAvailable,

GUMMEIList,

Correlation-ID,

GWContextReleaseIndication,

PrivacyIndicator,

VoiceSupportMatchIndicator,

TunnelInformation,

KillAllWarningMessages,

TransportInformation,

LHN-ID,

UserLocationInformation,

AdditionalCSFallbackIndicator,

ECGIListForRestart,

TAIListForRestart,

Emergency Area ID List For Restart,

ExpectedUEBehaviour,

Paging-eDRXInformation,

Extended-UEIdentityIndexValue,

```
MME-Group-ID,
```

Additional-GUTI,

PWSfailedECGIList,

CellIdentifierAndCELevelForCECapableUEs,

AssistanceDataForPaging,

InformationOnRecommendedCellsAndENBsForPaging,

UE-Usage-Type,

UEUserPlaneCIoTSupportIndicator,

NB-IoT-DefaultPagingDRX,

NB-IoT-Paging-eDRXInformation,

CE-mode-B-SupportIndicator,

NB-IoT-UEIdentityIndexValue

FROM S1AP-IEs

```
PrivateIE-Container{},
ProtocolExtensionContainer{},
ProtocolIE-Container{},
ProtocolIE-ContainerList{},
ProtocolIE-ContainerPair{},
```

ProtocolIE-SingleContainer{},

S1AP-PRIVATE-IES,

S1AP-PROTOCOL-EXTENSION,

S1AP-PROTOCOL-IES,

S1AP-PROTOCOL-IES-PAIR

FROM S1AP-Containers

id-AssistanceDataForPaging,

id-uEaggregateMaximumBitrate,

id-BearerType,

id-Cause,

id-CellAccessMode,

id-CellIdentifierAndCELevelForCECapableUEs,

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-GUMMEIType,

id-HandoverRestrictionList,

id-HandoverType,

id-Masked-IMEISV,

id-InformationOnRecommendedCellsAndENBsForPaging,

id-InitialContextSetup,

id-Inter-SystemInformationTransferTypeEDT,

id-Inter-SystemInformationTransferTypeMDT,

id-LPPa-PDU,

id-NAS-DownlinkCount,

- id-ManagementBasedMDTAllowed,
- id-ManagementBasedMDTPLMNList,
- 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,
- $id\hbox{-}Request Type,$
- id-Routing-ID,
- id-E-RABAdmittedItem,
- id-E-RABAdmittedList,
- id-E-RABDataForwardingItem,
- id-E-RAB Failed To Modify List,
- id-E-RABFailed To Release List,
- id-E-RABFailedtoSetupItemHOReqAck,
- id-E-RABFailed To Setup List Bearer SURes,
- id-E-RABFailed To Setup List Ctxt SURes,
- $id\hbox{-}E\hbox{-}RABFailedToSetupListHOReqAck,\\$

- id-E-RABFailedToBeReleasedList,
- id-E-RABFailedToResumeListResumeReq,
- id-E-RABFailedToResumeItemResumeReq,
- id-E-RABFailedToResumeListResumeRes,
- id-E-RABFailedToResumeItemResumeRes,
- 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-RABToBeModifiedListBearerModInd,
- id-E-RABToBeModifiedItemBearerModInd,
- id-E-RABNotToBeModifiedListBearerModInd,

- id-E-RABNotToBeModifiedItemBearerModInd,
- id-E-RABModifyListBearerModConf,
- id-E-RABModifyItemBearerModConf,
- id-E-RABFailedToModifyListBearerModConf,
- id-E-RABToBeReleasedListBearerModConf,
- 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-ProSeAuthorized,
- 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-SRVCCOperationNotPossible,

id-SRVCCOperationPossible,

id-SRVCCHOIndication,

id-SubscriberProfileIDforRFP,

id-SupportedTAs,

id-S-TMSI,

id-TAI,

id-TAIItem,

id-TAIList,

id-Target-ToSource-TransparentContainer,

id-Target-To Source-Transparent Container-Secondary,

id-TargetID,

id-TimeToWait,

id-TraceActivation,

id-TrafficLoadReductionIndication,

id-E-UTRAN-Trace-ID,

id-UEIdentityIndexValue,

id-UEPagingID,

id-UERadioCapability,

id-UERadioCapabilityForPaging,

id-UTRANtoLTEHOInformationRes,

id-UE-associatedLogicalS1-ConnectionListResAck,

id-UE-associatedLogicalS1-ConnectionItem,

id-UE-RetentionInformation,

id-UESecurityCapabilities,

id-UE-S1AP-IDs,

id-ResetType,

id-MessageIdentifier,

id-SerialNumber,

id-WarningAreaList,

id-RepetitionPeriod,

id-NumberofBroadcastRequest,

id-WarningType,

id-WarningSecurityInfo,

 $id\hbox{-}Data Coding Scheme,$

id-WarningMessageContents,

id-Broad cast Completed Area List,

id-BroadcastCancelledAreaList,

id-RRC-Establishment-Cause,

 $id\hbox{-} Trace Collection Entity IPA ddress,\\$

maxnoofTAIs,

maxnoofErrors,

maxnoofE-RABs,

maxnoofIndividualS1ConnectionsToReset,

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,

 $id\hbox{-}MMERelay Support Indicator,\\$

id-GWContextReleaseIndication,

id-PrivacyIndicator,

id-VoiceSupportMatchIndicator,

id-Tunnel-Information-for-BBF,

id-SIPTO-Correlation-ID,

 $id\hbox{-}SIPTO\hbox{-}L\hbox{-}GW\hbox{-}TransportLayerAddress,\\$

id-KillAllWarningMessages,

id-TransportInformation,

id-LHN-ID,

id-UserLocationInformation,

id-AdditionalCSFallbackIndicator,

id-ECGIListForRestart,

id-TAIListForRestart,

id-EmergencyAreaIDListForRestart,

id-ExpectedUEBehaviour,

id-Paging-eDRXInformation,

id-extended-UEIdentityIndexValue,

id-CSGMembershipInfo,

id-MME-Group-ID,

id-Additional-GUTI,

id-S1-Message,

id-PWSfailedECGIList,

id-PWSFailureIndication,

id-UE-Usage-Type,

id-UEUserPlaneCIoTSupportIndicator,

id-NB-IoT-DefaultPagingDRX,

id-NB-IoT-Paging-eDRXInformation,

id-CE-mode-B-SupportIndicator,

 $id\text{-}NB\text{-}IoT\text{-}UEIdentityIndexValue}$

FROM S1AP-Constants;

		
Common Container Lists		
******************	***********	*
E-RAB-IE-ContainerList	{ S1AP-PROTOCOL-IES : IE	SesSetParam } ::= ProtocolIE-ContainerList { 1, maxnoofE-RABs, {IEsSetParam} }
E-RAB-IE-ContainerPairList	{ S1AP-PROTOCOL-IES-PAIR :	: IEsSetParam } ::= ProtocolIE-ContainerPairList { 1, maxnoofE-RABs, {IEsSetParam} }
ProtocolError-IE-ContainerList	{ S1AP-PROTOCOL-IES : IEsSetParar	m } ::= ProtocolIE-ContainerList { 1, maxnoofE-RABs, {IEsSetParam} }
******************	***********	*
 HANDOVER PREPARATION	ELEMENTARY PROCEDURE	
 ********************	************	*
******************	to also also also also also also also als	*
Handover Required		
 ************	**********	*
HandoverRequired ::= SEQUENC	CE {	
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}
                                                                                                  TYPE HandoverType
       { ID id-HandoverType
                                                                            CRITICALITY reject
               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
                                                                           TYPE Source-ToTarget-TransparentContainer
                                                                                                                         PRESENCE mandatory}|
                                                     CRITICALITY reject
       { ID id-Source-ToTarget-TransparentContainer-Secondary
                                                                                   TYPE Source-ToTarget-TransparentContainer
                                                            CRITICALITY reject
                                                                                                                                 PRESENCE optional}
       { ID id-MSClassmark2
                                                                                                  TYPE MSClassmark2
                                                                            CRITICALITY reject
               PRESENCE conditional }|
       { ID id-MSClassmark3
                                                                            CRITICALITY ignore
                                                                                                  TYPE MSClassmark3
               PRESENCE conditional |
                                                                                   CRITICALITY reject
       { ID id-CSG-Id
                                                                                                          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 ::= {
                                                                      CRITICALITY reject
                                                                                         TYPE MME-UE-S1AP-ID
      { ID id-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
                                                                      TYPE NASSecurityParametersfromE-UTRAN
                                                   CRITICALITY reject
      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}
```

```
CRITICALITY ignore
       { ID id-E-RABtoReleaseListHOCmd
                                                                                                  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
                                                                                          TYPE CriticalityDiagnostics
                                                                    CRITICALITY ignore
       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,
                                                                   GTP-TEID
       dL-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 }|
```

PRESENCE optional

PRESENCE

```
{ ID id-eNB-UE-S1AP-ID
                                  CRITICALITY ignore
                                               TYPE ENB-UE-S1AP-ID
mandatory
        }|
    { ID id-Cause
                                      CRITICALITY ignore
                                                   TYPE Cause
    PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics
                              CRITICALITY ignore TYPE CriticalityDiagnostics
-- HANDOVER RESOURCE ALLOCATION ELEMENTARY PROCEDURE
-- Handover Request
HandoverRequest ::= SEQUENCE {
                     ProtocolIE-Container
                                      { {HandoverRequestIEs} },
    protocolIEs
```

```
HandoverRequestIEs S1AP-PROTOCOL-IES ::= {
       { ID id-MME-UE-S1AP-ID
                                                                                   CRITICALITY reject
                                                                                                          TYPE MME-UE-S1AP-ID
                              PRESENCE mandatory}
                                                                            CRITICALITY reject
                                                                                                   TYPE HandoverType
       { ID id-HandoverType
               PRESENCE mandatory}|
                                                                                   CRITICALITY ignore
                                                                                                          TYPE Cause
       { ID id-Cause
                              PRESENCE mandatory}|
       { ID id-uEaggregateMaximumBitrate
                                                                                           TYPE UEAggregateMaximumBitrate
                                                                    CRITICALITY reject
       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
                                                                                           TYPE UESecurityCapabilities
                                                                    CRITICALITY reject
                                                                                                                                         PRESENCE
mandatory}
       { ID id-HandoverRestrictionList
                                                                    CRITICALITY ignore
                                                                                           TYPE HandoverRestrictionList
                                                                                                                                         PRESENCE
optional}|
                                                                            CRITICALITY ignore
       { ID id-TraceActivation
                                                                                                   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 }
                                                                                CRITICALITY ignore
       { ID id-GUMMEI-ID
                                                                                                      TYPE GUMMEI
                             PRESENCE optional |
                                                                         CRITICALITY ignore
       { ID id-MME-UE-S1AP-ID-2
                                                                                               TYPE MME-UE-S1AP-ID
                     PRESENCE optional }
       { ID id-ManagementBasedMDTAllowed
                                                                 CRITICALITY ignore
                                                                                       TYPE ManagementBasedMDTAllowed
       PRESENCE optional }|
       { ID id-ManagementBasedMDTPLMNList
                                                                 CRITICALITY ignore
                                                                                       TYPE MDTPLMNList
       PRESENCE optional }
       { ID id-Masked-IMEISV
                                                                         CRITICALITY ignore
                                                                                               TYPE Masked-IMEISV
              PRESENCE optional }
       { ID id-ExpectedUEBehaviour
                                                                         CRITICALITY ignore
                                                                                               TYPE ExpectedUEBehaviour
       PRESENCE optional}|
                                                                         CRITICALITY ignore
       { ID id-ProSeAuthorized
                                                                                               TYPE ProSeAuthorized
       PRESENCE optional}|
       { ID id-UEUserPlaneCIoTSupportIndicator
                                                          CRITICALITY ignore
                                                                                TYPE UEUserPlaneCIoTSupportIndicator
                                                                                                                            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 }|
      { ID id-BearerType
                                                              CRITICALITY reject
                                                                                 EXTENSION BearerType
      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}|
                                                                          CRITICALITY ignore
       { ID id-eNB-UE-S1AP-ID
                                                                                                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}|
       { ID id-CellAccessMode
                                                                          CRITICALITY ignore
                                                                                                TYPE CellAccessMode
              PRESENCE optional }
       { ID id-CE-mode-B-SupportIndicator
                                                                                        TYPE CE-mode-B-SupportIndicator
                                                                   CRITICALITY ignore
       PRESENCE optional},
E-RABAdmittedList
                                                    ::= E-RAB-IE-ContainerList { {E-RABAdmittedItemIEs} }
E-RABAdmittedItemIEs S1AP-PROTOCOL-IES ::= {
                                                                          TYPE E-RABAdmittedItem
                                                    CRITICALITY ignore
       { ID id-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,
                                                         GTP-TEID
                                                                                              OPTIONAL,
       uL-GTP-TEID
       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 {
                          ProtocolIE-Container
                                         { { HandoverNotifyIEs} },
     protocolIEs
```

```
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}|
-- Extension for Release 11 to support BBAI --
     { ID id-Tunnel-Information-for-BBF
                                       CRITICALITY ignore
                                                        TYPE TunnelInformation
                                                                               PRESENCE optional}
     { ID id-LHN-ID
                                                   CRITICALITY ignore TYPE LHN-ID
                                                                                                      PRESENCE
optional},
-- PATH SWITCH REQUEST ELEMENTARY PROCEDURE
__ **************************
-- Path Switch Request
```

```
PathSwitchRequest ::= SEQUENCE {
       protocolIEs
                                   ProtocolIE-Container
                                                       { { PathSwitchRequestIEs} },
PathSwitchRequestIEs S1AP-PROTOCOL-IES ::= {
                                                       CRITICALITY reject
                                                                                                                       PRESENCE
       { ID id-eNB-UE-S1AP-ID
                                                                             TYPE ENB-UE-S1AP-ID
mandatory}
       { ID id-E-RABToBeSwitchedDLList
                                                       CRITICALITY reject
                                                                             TYPE E-RABToBeSwitchedDLList
                                                                                                                PRESENCE mandatory}|
                                                                                                                       PRESENCE
       { ID id-SourceMME-UE-S1AP-ID
                                                 CRITICALITY reject
                                                                      TYPE MME-UE-S1AP-ID
mandatory}
       { ID id-EUTRAN-CGI
                                                              CRITICALITY ignore
                                                                                   TYPE EUTRAN-CGI
       PRESENCE mandatory}|
       { ID id-TAI
                                                                      CRITICALITY ignore
                                                                                           TYPE TAI
       PRESENCE mandatory}|
       { ID id-UESecurityCapabilities
                                                                     TYPE UESecurityCapabilities
                                                                                                         PRESENCE mandatory}|
                                                 CRITICALITY ignore
                                                              CRITICALITY ignore
       { ID id-CSG-Id
                                                                                   TYPE CSG-Id
       PRESENCE optional}|
                                                       CRITICALITY ignore
                                                                                                                       PRESENCE optional |
       { ID id-CellAccessMode
                                                                             TYPE CellAccessMode
       { ID id-SourceMME-GUMMEI
                                                       CRITICALITY ignore
                                                                                                                              PRESENCE
                                                                             TYPE GUMMEI
optional}|
       { ID id-CSGMembershipStatus
                                                       CRITICALITY ignore
                                                                            TYPE CSGMembershipStatus
                                                                                                                PRESENCE optional }|
-- Extension for Release 11 to support BBAI --
       { ID id-Tunnel-Information-for-BBF
                                                 CRITICALITY ignore
                                                                      TYPE TunnelInformation
                                                                                                         PRESENCE optional}|
```

```
{ ID id-LHN-ID
                                                                 CRITICALITY ignore
                                                                                      TYPE LHN-ID
       PRESENCE optional},
                                                         ::= E-RAB-IE-ContainerList { {E-RABToBeSwitchedDLItemIEs} }
E-RABToBeSwitchedDLList
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
                                                                TYPE UEAggregateMaximumBitrate
                                                                                                              PRESENCE optional |
                                             CRITICALITY ignore
      { ID id-E-RABToBeSwitchedULList
                                                   CRITICALITY ignore
                                                                       TYPE E-RABToBeSwitchedULList
                                                                                                                     PRESENCE
optional}
                                             CRITICALITY ignore
      { ID id-E-RABToBeReleasedList
                                                                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}|
```

```
{ ID id-CSGMembershipStatus
                                                          CRITICALITY ignore
                                                                                TYPE CSGMembershipStatus
                                                                                                                                   PRESENCE
optional}|
       { ID id-ProSeAuthorized
                                                          CRITICALITY ignore
                                                                                TYPE ProSeAuthorized
                                                                                                                                   PRESENCE
optional}
       { ID id-UEUserPlaneCIoTSupportIndicator CRITICALITY ignore TYPE UEUserPlaneCIoTSupportIndicator PRESENCE optional},
E-RABToBeSwitchedULList ::= E-RAB-IE-ContainerList { {E-RABToBeSwitchedULItemIEs} }
E-RABToBeSwitchedULItemIEs S1AP-PROTOCOL-IES ::= {
                                                   CRITICALITY ignore
                                                                        TYPE E-RABToBeSwitchedULItem
                                                                                                                     PRESENCE mandatory \,
       { ID id-E-RABToBeSwitchedULItem
E-RABToBeSwitchedULItem ::= SEQUENCE {
       e-RAB-ID
                                                                 E-RAB-ID,
       transportLayerAddress
                                                   TransportLayerAddress,
       gTP-TEID
                                                                 GTP-TEID,
                                                          ProtocolExtensionContainer { { E-RABToBeSwitchedULItem-ExtIEs} }
       iE-Extensions
                                                                                                                            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 {
                               ProtocolIE-Container
                                                 { { HandoverCancelAcknowledgeIEs} },
      protocolIEs
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
          }|
                                            CRITICALITY ignore TYPE CriticalityDiagnostics
      { ID id-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 }|
                                          CRITICALITY reject
                                                          TYPE ENB-UE-S1AP-ID
     { ID id-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.. maxnoofE-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,
                                                   ProtocolExtensionContainer { {E-RABToBeSetupItemBearerSUReqExtIEs} } OPTIONAL,
       iE-Extensions
E-RABToBeSetupItemBearerSUReqExtIEs S1AP-PROTOCOL-EXTENSION ::= {
       { ID id-Correlation-ID
                                            CRITICALITY ignore
                                                                 EXTENSION Correlation-ID
                                                                                                       PRESENCE optional |
       { ID id-SIPTO-Correlation-ID
                                    CRITICALITY ignore EXTENSION Correlation-ID
                                                                                               PRESENCE optional}
                                                   CRITICALITY reject
                                                                         EXTENSION BearerType
                                                                                                              PRESENCE optional},
       { ID id-BearerType
```

```
-- E-RAB Setup Response
E-RABSetupResponse ::= SEQUENCE {
                                               { {E-RABSetupResponseIEs} },
      protocolIEs
                              ProtocolIE-Container
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.. maxnoofE-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,
                                            ProtocolExtensionContainer { {E-RABSetupItemBearerSUResExtIEs} } OPTIONAL,
       iE-Extensions
E-RABSetupItemBearerSUResExtIEs S1AP-PROTOCOL-EXTENSION ::= {
```

```
-- E-RAB MODIFY ELEMENTARY PROCEDURE
__ **************************
-- E-RAB Modify Request
E-RABModifyRequest ::= SEQUENCE {
                            ProtocolIE-Container
                                            { {E-RABModifyRequestIEs} },
     protocolIEs
E-RABModifyRequestIEs S1AP-PROTOCOL-IES ::= {
                                                        CRITICALITY reject
     { ID id-MME-UE-S1AP-ID
                                                                         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.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { {E-RABToBeModifiedItemBearerModReqIEs} }
E-RABToBeModifiedItemBearerModReqIEs
                                           S1AP-PROTOCOL-IES ::= {
       { ID id-E-RABToBeModifiedItemBearerModReg
                                                   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 ::= {
       { ID id-TransportInformation
                                    CRITICALITY reject
                                                          EXTENSION TransportInformation
                                                                                                      PRESENCE optional},
```

```
-- E-RAB Modify Response
E-RABModifyResponse ::= SEQUENCE {
     protocolIEs
                                               { {E-RABModifyResponseIEs} },
                              ProtocolIE-Container
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.. maxnoofE-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,
                                                                                                                                                                                          ProtocolExtensionContainer { {E-RABModifyItemBearerModResExtIEs} } OPTIONAL,
                              iE-Extensions
E-RABModifyItemBearerModResExtIEs~S1AP-PROTOCOL-EXTENSION ::= \{ (Context) ::= \{ (Context) ::= \{ (Context) ::= \{ (Context) := \{ (Context) :=
 -- 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
                                                                                                          }|
                                                                                                    PRESENCE
     { ID id-E-RABToBeReleasedList
                                       CRITICALITY ignore
                                                       TYPE E-RABList
        }|
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-RABFailedToReleaseList
                                      CRITICALITY ignore
                                                       TYPE E-RABList
     PRESENCE optional
     { ID id-CriticalityDiagnostics
                                      CRITICALITY ignore
                                                       TYPE CriticalityDiagnostics
                                                                                              PRESENCE optional
-- Extension for Release 12 to support User Location Information --
                                      CRITICALITY ignore
                                                                                        PRESENCE optional
     { ID id-UserLocationInformation
                                                       TYPE UserLocationInformation
```

```
E-RABReleaseListBearerRelComp ::= SEQUENCE (SIZE(1.. maxnoofE-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,
                                                                                                                                                                                                                        ProtocolExtensionContainer { {E-RABReleaseItemBearerRelCompExtIEs} } OPTIONAL,
                              iE-Extensions
E-RABRelease I temBearer Rel CompExtIEs~S1AP-PROTOCOL-EXTENSION ::= \{ 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
```

```
-- E-RAB RELEASE INDICATION ELEMENTARY PROCEDURE
-- E-RAB Release Indication
E-RABReleaseIndication ::= SEQUENCE {
                            ProtocolIE-Container
                                           { {E-RABReleaseIndicationIEs} },
     protocolIEs
E-RABReleaseIndicationIEs S1AP-PROTOCOL-IES ::= {
                                                  CRITICALITY reject
     { ID id-MME-UE-S1AP-ID
                                                                   TYPE MME-UE-S1AP-ID
     PRESENCE mandatory }|
     { ID id-eNB-UE-S1AP-ID
                                             CRITICALITY reject
                                                                                                     PRESENCE
                                                              TYPE ENB-UE-S1AP-ID
mandatory
           }|
     { ID id-E-RABReleasedList
                                             CRITICALITY ignore
                                                              TYPE E-RABList
     PRESENCE mandatory }|
-- Extension for Release 12 to support User Location Information --
     { ID id-UserLocationInformation
                                                        TYPE UserLocationInformation
                                       CRITICALITY ignore
                                                                                    PRESENCE optional
```

```
-- INITIAL CONTEXT SETUP ELEMENTARY PROCEDURE
-- Initial Context Setup Request
InitialContextSetupRequest ::= SEQUENCE {
                        ProtocolIE-Container
                                       { {InitialContextSetupRequestIEs} },
    protocolIEs
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-Masked-IMEISV
                                                          CRITICALITY ignore
                                                                                TYPE Masked-IMEISV
       PRESENCE optional }
       { ID id-ExpectedUEBehaviour
                                                          CRITICALITY ignore
                                                                                TYPE ExpectedUEBehaviour
                                                                                                                                    PRESENCE
optional}|
       { ID id-ProSeAuthorized
                                                          CRITICALITY ignore
                                                                                TYPE ProSeAuthorized
                                                                                                                                    PRESENCE
optional}|
       { ID id-UEUserPlaneCloTSupportIndicator CRITICALITY ignore TYPE UEUserPlaneCloTSupportIndicator PRESENCE optional},
E-RABToBeSetupListCtxtSUReq ::= SEQUENCE (SIZE(1.. maxnoofE-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 }
                                                                                                 PRESENCE optional}|
      { ID id-SIPTO-Correlation-ID
                                          CRITICALITY ignore EXTENSION Correlation-ID
     { ID id-BearerType
                                                      CRITICALITY reject
                                                                        EXTENSION BearerType
                                                                                                             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 }|
                                                                  CRITICALITY ignore
                                                                                        TYPE ENB-UE-S1AP-ID
       { ID id-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.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { {E-RABSetupItemCtxtSUResIEs} }
E-RABSetupItemCtxtSUResIEs S1AP-PROTOCOL-IES ::= {
       { ID id-E-RABSetupItemCtxtSURes
                                                   CRITICALITY ignore
                                                                         TYPE E-RABSetupItemCtxtSUResPRESENCE 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 }|
```

PRESENCE optional

PRESENCE mandatory

```
TYPE ENB-UE-S1AP-ID
    { ID id-eNB-UE-S1AP-ID
                            CRITICALITY ignore
    { ID id-Cause
                                CRITICALITY ignore
                                           TYPE Cause
    PRESENCE mandatory }|
                        CRITICALITY ignore
    { ID id-CriticalityDiagnostics
                                   TYPE CriticalityDiagnostics
-- PAGING ELEMENTARY PROCEDURE
-- Paging
Paging ::= SEQUENCE {
   protocolIEs
                    ProtocolIE-Container
                               {{PagingIEs}},
```

```
PagingIEs S1AP-PROTOCOL-IES ::= {
       { ID id-UEIdentityIndexValue
                                                     CRITICALITY ignore
                                                                            TYPE UEIdentityIndexValue
                                                                                                                                 PRESENCE
mandatory }
                                                                                           TYPE UEPagingID
       { ID id-UEPagingID
                                                                    CRITICALITY ignore
               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}
                                                                    CRITICALITY ignore
       { ID id-CSG-IdList
                                                                                           TYPE CSG-IdList
               PRESENCE optional |
       { ID id-PagingPriority
                                                            CRITICALITY ignore
                                                                                   TYPE PagingPriority
       PRESENCE optional |
       { ID id-UERadioCapabilityForPaging
                                                     CRITICALITY ignore
                                                                            TYPE UERadioCapabilityForPaging
                                                                                                                                 PRESENCE optional |
-- Extension for Release 13 to support Paging Optimisation and Coverage Enhancement paging --
                                                                                                                          PRESENCE optional}
       { ID id-AssistanceDataForPaging
                                                     CRITICALITY ignore
                                                                            TYPE AssistanceDataForPaging
                                                                                                                                 PRESENCE optional |
       { ID id-Paging-eDRXInformation
                                                     CRITICALITY ignore
                                                                            TYPE Paging-eDRXInformation
       { ID id-extended-UEIdentityIndexValue
                                              CRITICALITY ignore
                                                                    TYPE Extended-UEIdentityIndexValue
                                                                                                           PRESENCE optional}|
                                                                    TYPE NB-IoT-Paging-eDRXInformation
       { ID id-NB-IoT-Paging-eDRXInformation CRITICALITY ignore
                                                                                                          PRESENCE optional |
       { ID id-NB-IoT-UEIdentityIndexValue
                                                     CRITICALITY ignore
                                                                                                                          PRESENCE optional },
                                                                            TYPE NB-IoT-UEIdentityIndexValue
```

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 {
                      ProtocolIE-Container
                                       {{UEContextReleaseRequest-IEs}},
     protocolIEs
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 }|
                                                     TYPE GWContextReleaseIndication
     { ID id-GWContextReleaseIndication
                                   CRITICALITY reject
                                                                                         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 {
                    ProtocolIE-Container
                                   {{UEContextReleaseComplete-IEs}},
     protocolIEs
```

UEContextReleaseComplete-IEs S1AP-PROTOCOL-IES ::= {	
{ ID id-MME-UE-S1AP-ID PRESENCE mandatory}	CRITICALITY ignore TYPE MME-UE-S1AP-ID
{ ID id-eNB-UE-S1AP-ID PRESENCE mandatory}	CRITICALITY ignore TYPE ENB-UE-S1AP-ID
{ ID id-CriticalityDiagnostics PRESENCE optional}	CRITICALITY ignore TYPE CriticalityDiagnostics
Extension for Release 12 to support User Location Information	
{ ID id-UserLocationInformation PRESENCE optional}	CRITICALITY ignore TYPE UserLocationInformation
Extension for Release 13 to support Paging Optimisation	
{ ID id-InformationOnRecommendedCellsAndENBsForPaging PRESENCE optional}	CRITICALITY ignore TYPE InformationOnRecommendedCellsAndENBsForPaging
Extension for Release 13 to support coverage enhancement paging –	
{ ID id-CellIdentifierAndCELevelForCECapableUEs	LITY ignore TYPE CellIdentifierAndCELevelForCECapableUEs 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}
                                                     CRITICALITY reject
       { ID id-eNB-UE-S1AP-ID
                                                                          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}|
                                               CRITICALITY reject
                                                                   TYPE UESecurityCapabilities
                                                                                                                  PRESENCE optional }|
      { ID id-UESecurityCapabilities
      { ID id-CSGMembershipStatus
                                                     CRITICALITY ignore
                                                                         TYPE CSGMembershipStatus
                                                                                                                         PRESENCE
optional}|
      { ID id-RegisteredLAI
                                                     CRITICALITY ignore
                                                                         TYPE LAI
      PRESENCE optional}|
```

```
PRESENCE conditional }
      { ID id-AdditionalCSFallbackIndicator
                                        CRITICALITY ignore
                                                            TYPE AdditionalCSFallbackIndicator
                                                     CRITICALITY ignore
                                                                                                                         PRESENCE
       { ID id-ProSeAuthorized
                                                                          TYPE ProSeAuthorized
optional}|
                                               CRITICALITY ignore
                                                                   TYPE SRVCCOperationPossible
                                                                                                                   PRESENCE optional |
      { ID id-SRVCCOperationPossible
      { ID id-SRVCCOperationNotPossible
                                               CRITICALITY ignore
                                                                   TYPE SRVCCOperationNotPossible
                                                                                                                   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
```

```
-- UE RADIO CAPABILITY MATCH ELEMENTARY PROCEDURE
-- UE Radio Capability Match Request
UERadioCapabilityMatchRequest ::= SEQUENCE {
                          ProtocolIE-Container
                                         { { UERadioCapabilityMatchRequestIEs} },
     protocolIEs
UERadioCapabilityMatchRequestIEs 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 optional
```

```
-- UE Radio Capability Match Response
UERadioCapabilityMatchResponse ::= SEQUENCE {
                             ProtocolIE-Container
     protocolIEs
                                              { { UERadioCapabilityMatchResponseIEs} },
UERadioCapabilityMatchResponseIEs 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
      }|
                                                    TYPE VoiceSupportMatchIndicator
      { ID id-VoiceSupportMatchIndicator
                                   CRITICALITY reject
                                                                                        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 |
                                                                                       PRESENCE optional}|
      { ID id-SubscriberProfileIDforRFP CRITICALITY ignore
                                                     TYPE SubscriberProfileIDforRFP
      { ID id-SRVCCOperationPossible
                                        CRITICALITY ignore
                                                            TYPE SRVCCOperationPossible
                                                                                                     PRESENCE optional }
      { ID id-UERadioCapability
                                               CRITICALITY ignore
                                                                   TYPE UERadioCapability
                                                                                                            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}
                                                           CRITICALITY reject
      { ID id-NAS-PDU
                                                                                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 PRESENCE optional}	CRITIO	CALITY reject	TYPE GUMMEI		
	{ ID id-CellAccessMode	CRITICALITY	reject TYP	E CellAccessMode	PR	ESENCE optional}
	{ ID id-GW-TransportLayerAddress	CRITICALITY ignore	CRITICALITY ignore TYPE TransportLayerAddress		PRESENCE optional}	
	{ ID id-RelayNode-Indicator	CRITICALITY	reject TYP	E RelayNode-Indicator	PRESENCE optional}	
	{ ID id-GUMMEIType PRESENCE optional}	CRITIO	CALITY ignore	TYPE GUMMEIType		
Exte	ension for Release 11 to support BBAI					
	{ ID id-Tunnel-Information-for-BBF	CRITICALITY ignore	TYPE Tunnel	Information	PRESENCE optional	1}
	{ ID id-SIPTO-L-GW-TransportLayerAdd	ress CRITICALITY	ignore TYP	E TransportLayerAddress	PRESENCE optional}	
{ ID id-LHN-ID CRITICALITY ignore TYPE LHN-ID PRESENCE optional}						
	{ ID id-MME-Group-ID	CRITICALITY	ignore TYP	E MME-Group-ID	PR	ESENCE optional}
	{ ID id-UE-Usage-Type	CRITICALITY	ignore TYP	E UE-Usage-Type	PR	ESENCE optional}
	{ ID id-CE-mode-B-SupportIndicator	CRITICALITY ignore	TYPE CE-mo	de-B-SupportIndicator	PRESENCE optional	1},
}						
:	********	****	*			
 UPI 	INK NAS TRANSPORT					
***	***********	********	k			

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```
UplinkNASTransport ::= SEQUENCE {
      protocolIEs
                                         {{UplinkNASTransport-IEs}},
                       ProtocolIE-Container
UplinkNASTransport-IEs S1AP-PROTOCOL-IES ::= {
                                                 CRITICALITY reject
      { ID id-MME-UE-S1AP-ID
                                                                     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
                                                                                             PRESENCE optional}|
                                                        TYPE TransportLayerAddress
      { ID id-SIPTO-L-GW-TransportLayerAddress
                                           CRITICALITY ignore
                                                              TYPE TransportLayerAddress
                                                                                       PRESENCE optional |
      { ID id-LHN-ID
                                                  CRITICALITY ignore
                                                                    TYPE LHN-ID
      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
          }|
                                                                  TYPE Cause
      { ID id-Cause
                                                CRITICALITY ignore
                                                                                                              PRESENCE
mandatory
__ **************************
-- REROUTE NAS REQUEST
RerouteNASRequest ::= SEQUENCE {
      protocolIEs
                      ProtocolIE-Container
                                        {{RerouteNASRequest-IEs}},
```

```
RerouteNASRequest-IEs S1AP-PROTOCOL-IES ::= {
     { ID id-eNB-UE-S1AP-ID
                               CRITICALITY reject
                                              TYPE ENB-UE-S1AP-ID
                                                                        PRESENCE mandatory}|
     { ID id-MME-UE-S1AP-ID
                                    CRITICALITY ignore
                                                                                  PRESENCE optional }
                                                   TYPE MME-UE-S1AP-ID
                                    CRITICALITY reject
                                                   TYPE OCTET STRING
                                                                             PRESENCE mandatory}|
     { ID id-S1-Message
     { ID id-MME-Group-ID
                                              TYPE MME-Group-ID
                               CRITICALITY reject
                                                                        PRESENCE mandatory}
     { ID id-Additional-GUTI
                               CRITICALITY ignore
                                              TYPE Additional-GUTI
                                                                   PRESENCE optional |
     { ID id-UE-Usage-Type
                               CRITICALITY ignore
                                              TYPE UE-Usage-Type
                                                                        PRESENCE optional },
 ***********************
-- RESET ELEMENTARY PROCEDURE
-- Reset
```

PRESENCE

PRESENCE mandatory

```
Reset ::= SEQUENCE {
        protocolIEs
                                         ProtocolIE-Container
                                                                 { {ResetIEs} },
ResetIEs S1AP-PROTOCOL-IES ::= {
        { ID id-Cause
                                                                  CRITICALITY ignore
                                                                                           TYPE Cause
mandatory
             }|
        { ID id-ResetType
                                                                  CRITICALITY reject
                                                                                           TYPE ResetType
ResetType ::= CHOICE {
        s1-Interface
                                                          ResetAll,
        partOfS1-Interface
                                                          \label{prop:connectionListRes} UE-associated Logical S1-Connection ListRes,
ResetAll ::= ENUMERATED {
        reset-all,
```

```
UE-associatedLogicalS1-ConnectionListRes ::= SEQUENCE (SIZE(1.. maxnoofIndividualS1ConnectionsToReset)) OF ProtocolIE-SingleContainer { { UE-
associatedLogicalS1-ConnectionItemRes } }
UE-associatedLogicalS1-ConnectionItemRes S1AP-PROTOCOL-IES ::= {
      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 },
}				
	ociatedLogicalS1-ConnectionListResAck ::= edLogicalS1-ConnectionItemResAck } }	= SEQUENCE (SIZE(1 m	axnoofIndividualS1ConnectionsToReset)	OF ProtocolIE-SingleContainer { { UE-
UE-asso	ciatedLogicalS1-ConnectionItemResAck	S1AP-PROTOCOL-IES	::= {	
	{ ID id-UE-associatedLogicalS1-Connection	onItem CRITICALITY	rignore TYPE UE-associatedLogicalS	1-ConnectionItem PRESENCE mandatory }
}				
****	************	*******	*	
ERRO	OR INDICATION ELEMENTARY PROCE	EDURE		
****	************	********	*	
****	************************	*********	*	
Error	Indication			
****	**************	********	*	
ErrorInc	lication ::= 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
                                                                                                PRESENCE
     { ID id-Cause
                                          CRITICALITY ignore
                                                         TYPE Cause
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
                                                                                                        PRESENCE mandatory}|
                                                                 TYPE Global-ENB-ID
      { 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}
                                                   CRITICALITY reject
                                                                                                                     PRESENCE
      { ID id-CSG-IdList
                                                                       TYPE CSG-IdList
optional}|
      { ID id-UE-RetentionInformation
                                       CRITICALITY ignore
                                                          TYPE UE-RetentionInformation PRESENCE optional |
      { ID id-NB-IoT-DefaultPagingDRX
                                             CRITICALITY ignore
                                                                TYPE NB-IoT-DefaultPagingDRX PRESENCE optional},
-- S1 Setup Response
*******************
```

```
S1SetupResponse ::= SEQUENCE {
      protocolIEs
                                                       { {S1SetupResponseIEs} },
                                   ProtocolIE-Container
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}
       { ID id-UE-RetentionInformation
                                          CRITICALITY ignore
                                                               TYPE UE-RetentionInformation
                                                                                           PRESENCE optional },
-- S1 Setup Failure
S1SetupFailure ::= SEQUENCE {
                                   ProtocolIE-Container
                                                       { {S1SetupFailureIEs} },
       protocolIEs
```

```
S1SetupFailureIEs S1AP-PROTOCOL-IES ::= {
     { ID id-Cause
                                         CRITICALITY ignore
                                                                                             PRESENCE
                                                         TYPE Cause
        }|
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}|
      { ID id-NB-IoT-DefaultPagingDRX
                                            CRITICALITY ignore
                                                              TYPE NB-IoT-DefaultPagingDRX 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} },
ENBConfiguration Update Failure IEs~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 {
                          ProtocolIE-Container
                                          { {MMEConfigurationUpdateIEs} },
     protocolIEs
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 {
                            ProtocolIE-Container
                                            { {MMEConfigurationUpdateAcknowledgeIEs} },
     protocolIEs
MMEConfiguration Update Acknowledge IEs\ 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 TUNNELLING ELEMENTARY PROCEDURE
-- Downlink S1 CDMA2000 Tunnelling
```

```
DownlinkS1cdma2000tunnelling ::= SEQUENCE {
                              ProtocolIE-Container
                                                { {DownlinkS1cdma2000tunnellingIEs} },
      protocolIEs
DownlinkS1cdma2000tunnellingIEs 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 TUNNELLING ELEMENTARY PROCEDURE
```

```
-- Uplink S1 CDMA2000 Tunnelling
UplinkS1cdma2000tunnelling ::= SEQUENCE {
     protocolIEs
                            ProtocolIE-Container
                                             { {UplinkS1cdma2000tunnellingIEs} },
UplinkS1cdma2000tunnellingIEs 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
                                                               TYPE Cdma2000HORequiredIndication
                                             CRITICALITY ignore
                                                                                                  PRESENCE optional
     { ID id-cdma2000OneXSRVCCInfo
                                                                          TYPE Cdma2000OneXSRVCCInfo
                                                         CRITICALITY reject
     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 {
                            ProtocolIE-Container
                                            { { UECapabilityInfoIndicationIEs} },
     protocolIEs
```

PRESENCE

```
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
mandatory}|
     { ID id-UERadioCapability
                                   CRITICALITY ignore
                                                  TYPE UERadioCapability
                                                                                PRESENCE mandatory}|
     { ID id-UERadioCapabilityForPaging
                              CRITICALITY ignore
                                            TYPE UERadioCapabilityForPaging
                                                                           PRESENCE optional},
-- eNB STATUS TRANSFER ELEMENTARY PROCEDURE
__ **************************
-- eNB Status Transfer
```

```
ENBStatusTransfer ::= SEQUENCE {
     protocolIEs
                             ProtocolIE-Container
                                              { {ENBStatusTransferIEs} },
ENBStatusTransferIEs S1AP-PROTOCOL-IES ::= {
mandatory}
mandatory}|
StatusTransfer-TransparentContainer
TransparentContainer
-- MME STATUS TRANSFER ELEMENTARY PROCEDURE
```

{ ID id-MME-UE-S1AP-ID

CRITICALITY reject TYPE MME-UE-S1AP-ID PRESENCE

{ ID id-eNB-UE-S1AP-ID

CRITICALITY reject TYPE ENB-UE-S1AP-ID PRESENCE

{ ID id-eNB-CRITICALITY reject TYPE ENB-StatusTransfer-PRESENCE mandatory},

{ ID id-MME-UE-S1AP-ID

PRESENCE

PRESENCE

CRITICALITY reject TYPE MME-UE-S1AP-ID

{ ID id-eNB-UE-S1AP-ID

CRITICALITY reject
TYPE ENB-UE-S1AP-ID

```
-- MME Status Transfer
MMEStatusTransfer ::= SEQUENCE {
   protocolIEs
                  ProtocolIE-Container
                            { {MMEStatusTransferIEs} },
MMEStatusTransferIEs S1AP-PROTOCOL-IES ::= {
mandatory}
mandatory}|
```

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```
StatusTransfer-TransparentContainer
TransparentContainer
mandatory},
-- TRACE ELEMENTARY PROCEDURES
__ ***************************
-- Trace Start
TraceStart ::= SEQUENCE {
                      ProtocolIE-Container
                                   { {TraceStartIEs} },
    protocolIEs
TraceStartIEs S1AP-PROTOCOL-IES ::= {
```

{ ID id-eNB-CRITICALITY reject TYPE ENB-StatusTransfer-PRESENCE

```
{ ID id-MME-UE-S1AP-ID
                                                  CRITICALITY reject
                                                                                                                  PRESENCE
                                                                     TYPE MME-UE-S1AP-ID
            }|
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 {
                               ProtocolIE-Container
                                                  { {TraceFailureIndicationIEs} },
      protocolIEs
TraceFailureIndicationIEs S1AP-PROTOCOL-IES ::= {
      { ID id-MME-UE-S1AP-ID
                                                  CRITICALITY reject
                                                                                                                  PRESENCE
                                                                     TYPE MME-UE-S1AP-ID
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
                                                                      PRESENCE mandatory }
                                             TYPE MME-UE-S1AP-ID
     { 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
                       TYPE TransportLayerAddress
CRITICALITY ignore
 PRESENCE mandatory
{ID id-PrivacyIndicator
CRITICALITY ignore
                       TYPE PrivacyIndicator
 PRESENCE optional
```

```
LocationReportingControl ::= SEQUENCE {
      protocolIEs
                              ProtocolIE-Container
                                                { { LocationReportingControlIEs} },
LocationReportingControlIEs S1AP-PROTOCOL-IES ::= {
                                           CRITICALITY reject
                                                                                                        PRESENCE mandatory
      { ID id-MME-UE-S1AP-ID
                                                             TYPE MME-UE-S1AP-ID
      { ID id-eNB-UE-S1AP-ID
                                    CRITICALITY reject
                                                       TYPE ENB-UE-S1AP-ID
                                                                                            PRESENCE mandatory }|
                                          CRITICALITY ignore
      { ID id-RequestType
                                                             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
                                                                                                          PRESENCE mandatory
                                           CRITICALITY ignore
                                                              TYPE EUTRAN-CGI
      }|
```

PRESENCE mandatory },

PRESENCE

```
{ ID id-TAI
                                 CRITICALITY ignore
                                            TYPE TAI
mandatory
      }|
    { ID id-RequestType
                            CRITICALITY ignore TYPE RequestType
-- 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 {
                          ProtocolIE-Container
                                         { {OverloadStopIEs} },
     protocolIEs
OverloadStopIEs S1AP-PROTOCOL-IES ::= {
{ ID id-GUMMEIList
                                                     CRITICALITY ignore
                                                                    TYPE GUMMEIList
          PRESENCE optional
```

```
-- WRITE-REPLACE WARNING ELEMENTARY PROCEDURE
-- Write-Replace Warning Request
WriteReplaceWarningRequest ::= SEQUENCE {
                               ProtocolIE-Container
                                                 { {WriteReplaceWarningRequestIEs} },
      protocolIEs
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
            }|
                                                              TYPE ExtendedRepetitionPeriod
      { ID id-ExtendedRepetitionPeriod
                                            CRITICALITY reject
                                                                                                    PRESENCE optional
```

```
CRITICALITY reject
                                                                          TYPE NumberofBroadcastRequest
      { ID id-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
                                                            { {WriteReplaceWarningResponseIEs} },
                                 ProtocolIE-Container
WriteReplaceWarningResponseIEs S1AP-PROTOCOL-IES ::= {
      { ID id-MessageIdentifier
                                               CRITICALITY reject
                                                                   TYPE MessageIdentifier
                                                                                                                  PRESENCE mandatory
```

PRESENCE optional

PRESENCE optional

```
{ ID id-SerialNumber
                                     CRITICALITY reject
                                                   TYPE SerialNumber
    PRESENCE mandatory }|
    { ID id-BroadcastCompletedAreaList
                                 CRITICALITY ignore
                                               TYPE BroadcastCompletedAreaList
    { ID id-CriticalityDiagnostics
                                 CRITICALITY ignore
                                               TYPE CriticalityDiagnostics
-- eNB DIRECT INFORMATION TRANSFER ELEMENTARY PROCEDURE
-- eNB Direct Information Transfer
ENBDirectInformationTransfer ::= SEQUENCE {
                       ProtocolIE-Container
                                     {{ ENBDirectInformationTransferIEs}},
    protocolIEs
```

PRESENCE mandatory

```
ENBDirectInformationTransferIEs S1AP-PROTOCOL-IES ::= {
    { ID id-Inter-SystemInformationTransferTypeEDT CRITICALITY reject TYPE Inter-SystemInformationTransferType
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 ::= {
   PRESENCE mandatory },
-- eNB CONFIGURATION TRANSFER ELEMENTARY PROCEDURE
-- eNB Configuration Transfer
ENBConfigurationTransfer ::= SEQUENCE {
                           {{ ENBConfigurationTransferIEs}},
   protocolIEs
                 ProtocolIE-Container
```

MMEConfigurationTransferIEs S1AP-PROTOCOL-IES ::= {

```
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}},
```

```
{ 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 PROCEDURE
-- Kill Request
KillRequest ::= SEQUENCE {
                           ProtocolIE-Container
                                           { {KillRequestIEs} },
     protocolIEs
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}|
     { ID id-KillAllWarningMessages
                                CRITICALITY reject
                                                 TYPE KillAllWarningMessages
                                                                       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
                                                                                  PRESENCE optional
     { ID id-BroadcastCancelledAreaList
                                 CRITICALITY ignore
                                                 TYPE BroadcastCancelledAreaList
     { ID id-CriticalityDiagnostics
                                 CRITICALITY ignore
                                                 TYPE CriticalityDiagnostics
                                                                                        PRESENCE optional
```

```
-- PWS RESTART INDICATION PROCEDURE
-- PWS Restart Indication
PWSRestartIndication::= SEQUENCE {
                                           {{ PWSRestartIndicationIEs}},
     protocolIEs
                           ProtocolIE-Container
PWSRestartIndicationIEs S1AP-PROTOCOL-IES ::= {
     { ID id-ECGIListForRestart
                                           CRITICALITY reject
                                                            TYPE ECGIListForRestart
     PRESENCE mandatory}|
     { ID id-Global-ENB-ID
                                           CRITICALITY reject
                                                            TYPE Global-ENB-ID
     PRESENCE mandatory}|
     { ID id-TAIListForRestart
                                      CRITICALITY reject
                                                       TYPE TAIListForRestart
                                                                                              PRESENCE
mandatory}
     TYPE EmergencyAreaIDListForRestart
                                                                             PRESENCE optional},
```

```
-- PWS Failure Indication
PWSFailureIndication::= SEQUENCE {
    protocolIEs
                     ProtocolIE-Container
                                  {{ PWSFailureIndicationIEs}},
PWSFailureIndicationIEs S1AP-PROTOCOL-IES ::= {
    { ID id-PWSfailedECGIList
                          CRITICALITY reject
                                       TYPE PWSfailedECGIList
                                                         PRESENCE mandatory}|
    { ID id-Global-ENB-ID
                          CRITICALITY reject
                                       TYPE Global-ENB-ID
                                                         PRESENCE mandatory},
-- LPPA TRANSPORT ELEMENTARY PROCEDURES
```

```
-- DOWNLINK UE ASSOCIATED LPPA TRANSPORT
DownlinkUEAssociatedLPPaTransport ::= SEQUENCE {
                            ProtocolIE-Container
                                            {{DownlinkUEAssociatedLPPaTransport-IEs}},
     protocolIEs
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 }|
                                                        TYPE Routing-ID
                                                                                               PRESENCE mandatory
     { ID id-Routing-ID
                                       CRITICALITY reject
                                 CRITICALITY reject
     { ID id-LPPa-PDU
                                                  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 }|
                                         CRITICALITY reject
                                                           TYPE Routing-ID
                                                                                                    PRESENCE mandatory
     { ID id-Routing-ID
      { ID id-LPPa-PDU
                                         CRITICALITY reject
                                                           TYPE LPPa-PDU
                                                                                                    PRESENCE mandatory
-- DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT
DownlinkNonUEAssociatedLPPaTransport ::= SEQUENCE {
```

```
{{DownlinkNonUEAssociatedLPPaTransport-IEs}},
      protocolIEs
                                  ProtocolIE-Container
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 {
                           ProtocolIE-Container
                                               {{UplinkNonUEAssociatedLPPaTransport-IEs}},
      protocolIEs
UplinkNonUEAssociatedLPPaTransport-IEs S1AP-PROTOCOL-IES ::= {
```

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PRESENCE mandatory

PRESENCE mandatory

```
E-RABModificationIndicationIEs 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-RABToBeModifiedListBearerModInd
                                                           CRITICALITY reject
                                                                                 TYPE E-RABToBeModifiedListBearerModInd
                                                                                                                                      PRESENCE
mandatory}
       { ID id-E-RABNotToBeModifiedListBearerModInd CRITICALITY reject
                                                                          TYPE E-RABNotToBeModifiedListBearerModInd PRESENCE optional |
       { ID id-CSGMembershipInfo
                                                                          CRITICALITY reject
                                                                                                TYPE CSGMembershipInfo
              PRESENCE optional }
-- Extension for Release 11 to support BBAI --
       { ID id-Tunnel-Information-for-BBF
                                                                  CRITICALITY ignore
                                                                                        TYPE TunnelInformation
       PRESENCE optional },
       ...
E-RABToBeModifiedListBearerModInd ::= E-RAB-IE-ContainerList { {E-RABToBeModifiedItemBearerModIndIEs} }
E-RABToBeModifiedItemBearerModIndIEs S1AP-PROTOCOL-IES ::= {
       { ID id-E-RABToBeModifiedItemBearerModInd
                                                           CRITICALITY reject
                                                                                  TYPE E-RABToBeModifiedItemBearerModInd
                                                                                                                                      PRESENCE
mandatory},
E-RABToBeModifiedItemBearerModInd ::= SEQUENCE {
       e-RAB-ID
                                                           E-RAB-ID,
                                            TransportLayerAddress,
       transportLayerAddress
```

```
GTP-TEID,
       dL-GTP-TEID
       iE-Extensions
                                                    ProtocolExtensionContainer { { E-RABToBeModifiedItemBearerModInd-ExtIEs} }
       OPTIONAL,
E-RABToBeModifiedItemBearerModInd-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
E-RABNotToBeModifiedListBearerModInd ::= E-RAB-IE-ContainerList { {E-RABNotToBeModifiedItemBearerModIndIEs} }
E-RABNotToBeModifiedItemBearerModIndIEs S1AP-PROTOCOL-IES ::= {
                                                           CRITICALITY reject
       { ID id-E-RABNotToBeModifiedItemBearerModInd
                                                                                 TYPE E-RABNotToBeModifiedItemBearerModInd
                                                                                                                                     PRESENCE
mandatory},
E-RABNotToBeModifiedItemBearerModInd ::= SEQUENCE {
       e-RAB-ID
                                                           E-RAB-ID,
       transportLayerAddress
                                            TransportLayerAddress,
       dL-GTP-TEID
                                                           GTP-TEID,
       iE-Extensions
                                                    ProtocolExtensionContainer { { E-RABNotToBeModifiedItemBearerModInd-ExtIEs} }
                                                                                                                                     OPTIONAL,
```

```
E-RABNotToBeModifiedItemBearerModInd-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
CSGMembershipInfo ::= SEQUENCE {
     cSGMembershipStatus
                           CSGMembershipStatus,
     cSG-Id
                                 CSG-Id,
     cellAccessMode
                           CellAccessMode OPTIONAL,
                           PLMNidentity OPTIONAL,
     pLMNidentity
     iE-Extensions
                           ProtocolExtensionContainer { { CSGMembershipInfo-ExtIEs} }
                                                                             OPTIONAL,
     ...
CSGMembershipInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- E-RAB Modification Confirm
```

```
E-RABModificationConfirm ::= SEQUENCE {
                                     ProtocolIE-Container { {E-RABModificationConfirmIEs} },
       protocolIEs
E-RABModificationConfirmIEs 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-RABModifyListBearerModConf
                                                                                 TYPE E-RABModifyListBearerModConf PRESENCE optional |
                                                           CRITICALITY ignore
                                                                                                                                     PRESENCE
       { ID id-E-RABFailedToModifyListBearerModConf CRITICALITY ignore
                                                                          TYPE E-RABList
optional}
       { ID id-E-RABToBeReleasedListBearerModConf
                                                           CRITICALITY ignore
                                                                                 TYPE E-RABList
       PRESENCE optional |
       { ID id-CriticalityDiagnostics
                                                                  CRITICALITY ignore
                                                                                        TYPE CriticalityDiagnostics
                                                                                                                              PRESENCE optional |
       { ID id-CSGMembershipStatus
                                                                                                TYPE CSGMembershipStatus
                                                                          CRITICALITY ignore
       PRESENCE optional },
E-RABModifyListBearerModConf ::= SEQUENCE (SIZE(1.. maxnoofE-RABs)) OF ProtocolIE-SingleContainer { {E-RABModifyItemBearerModConfIEs} }
E-RABModifyItemBearerModConfIEs
                                     S1AP-PROTOCOL-IES ::= {
       { ID id-E-RABModifyItemBearerModConf
                                                    CRITICALITY ignore
                                                                          TYPE E-RABModifyItemBearerModConf
                                                                                                                      PRESENCE mandatory \},
       • • •
```

```
E-RABModifyItemBearerModConf ::= SEQUENCE {
    e-RAB-ID
                               E-RAB-ID,
    iE-Extensions
                          ProtocolExtensionContainer { {E-RABModifyItemBearerModConfExtIEs} } OPTIONAL,
E-RABModifyItemBearerModConfExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- UE CONTEXT MODIFICATION INDICATION ELEMENTARY PROCEDURE
-- UE Context Modification Indication
```

```
UEContextModificationIndication ::= SEQUENCE {
      protocolIEs
                              ProtocolIE-Container
                                               { { UEContextModificationIndicationIEs} },
UEContextModificationIndicationIEs S1AP-PROTOCOL-IES ::= {
      { ID id-MME-UE-S1AP-ID
                                           CRITICALITY reject
                                                             TYPE MME-UE-S1AP-ID
                                                                                                  PRESENCE mandatory}|
                                    CRITICALITY reject
      { ID id-eNB-UE-S1AP-ID
                                                       TYPE ENB-UE-S1AP-ID
                                                                                      PRESENCE mandatory}|
      { ID id-CSGMembershipInfo
                                     CRITICALITY reject
                                                       TYPE CSGMembershipInfo
                                                                                      PRESENCE optional },
-- UE Context Modification Confirm
UEContextModificationConfirm ::= SEQUENCE {
      protocolIEs
                              ProtocolIE-Container { {UEContextModificationConfirmIEs} },
```

```
UEContextModificationConfirmIEs S1AP-PROTOCOL-IES ::= {
                                               CRITICALITY ignore
                                                                                                            PRESENCE
      { ID id-MME-UE-S1AP-ID
                                                                 TYPE MME-UE-S1AP-ID
mandatory}
      { ID id-eNB-UE-S1AP-ID
                                          CRITICALITY ignore
                                                            TYPE ENB-UE-S1AP-ID
                                                                                                PRESENCE mandatory}|
      { ID id-CSGMembershipStatus
                                          CRITICALITY ignore
                                                            TYPE CSGMembershipStatus
                                                                                          PRESENCE optional }
      { ID id-CriticalityDiagnostics
                                    CRITICALITY ignore
                                                      TYPE CriticalityDiagnostics
                                                                                    PRESENCE optional},
__ **************************
-- UE CONTEXT SUSPEND ELEMENTARY PROCEDURE
 ***********************
-- UE Context Suspend Request
UEContextSuspendRequest ::= SEQUENCE {
                              ProtocolIE-Container
                                               { { UEContextSuspendRequestIEs} },
      protocolIEs
```

```
UEContextSuspendRequestIEs 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-InformationOnRecommendedCellsAndENBsForPaging
                                                         CRITICALITY ignore
                                                                            TYPE InformationOnRecommendedCellsAndENBsForPaging
PRESENCE optional}
      { ID id-CellIdentifierAndCELevelForCECapableUEs
                                                         CRITICALITY ignore
                                                                            TYPE CellIdentifierAndCELevelForCECapableUEs PRESENCE
optional},
__ **************************
-- UE Context Suspend Response
UEContextSuspendResponse ::= SEQUENCE {
                               ProtocolIE-Container { {UEContextSuspendResponseIEs} },
      protocolIEs
```

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```
UEContextSuspendResponseIEs 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 RESUME ELEMENTARY PROCEDURE
-- UE Context Resume Request
UEContextResumeRequest ::= SEQUENCE {
    protocolIEs
                       ProtocolIE-Container
                                    { { UEContextResumeRequestIEs} },
```

```
UEContextResumeRequestIEs S1AP-PROTOCOL-IES ::= {
                             { ID id-MME-UE-S1AP-ID
                                                                                                                            CRITICALITY reject
                                                                        PRESENCE mandatory}|
                             TYPE MME-UE-S1AP-ID
       { ID id-eNB-UE-S1AP-ID
                                                                                       CRITICALITY reject
                                                                                                             TYPE ENB-UE-S1AP-ID
              PRESENCE mandatory}|
       { ID id-E-RABFailedToResumeListResumeReq
                                                                        CRITICALITY reject
                                                                                              TYPE E-RABFailedToResumeListResumeReq
       PRESENCE optional },
E-RABFailedToResumeListResumeReq ::= E-RAB-IE-ContainerList { {E-RABFailedToResumeItemResumeReqIEs} }
E-RABFailedToResumeItemResumeReqIEs S1AP-PROTOCOL-IES ::= {
                                                  CRITICALITY reject
       { ID id-E-RABFailedToResumeItemResumeReq
                                                                        TYPE E-RABFailedToResumeItemResumeReq
                                                                                                                    PRESENCE mandatory},
E-RABFailedToResumeItemResumeReq ::= SEQUENCE {
       e-RAB-ID
                                                                 E-RAB-ID,
                                                                 Cause,
       cause
       iE-Extensions
                                                          ProtocolExtensionContainer { { E-RABFailedToResumeItemResumeReq-ExtIEs} }
       OPTIONAL,
```

E-RABFailedToResumeItemResumeReq-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {

```
-- UE Context Resume Response
UEContextResumeResponse ::= SEQUENCE {
     protocolIEs
                             ProtocolIE-Container
                                              { { UEContextResumeResponseIEs} },
UEContextResumeResponseIEs 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-RABFailedToResumeListResumeRes
                                         CRITICALITY reject
                                                           TYPE E-RABFailedToResumeListResumeRes
                                                                                                     PRESENCE optional}|
      { ID id-CriticalityDiagnostics
                                               CRITICALITY ignore
                                                                 TYPE CriticalityDiagnostics
     PRESENCE optional},
```

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```
E-RABFailedToResumeListResumeRes ::= E-RAB-IE-ContainerList { {E-RABFailedToResumeItemResumeResIEs} }
E-RABFailedToResumeItemResumeResIEs S1AP-PROTOCOL-IES ::= {
      { ID id-E-RABFailedToResumeItemResumeRes
                                         CRITICALITY reject
                                                          TYPE E-RABFailedToResumeItemResumeRes
                                                                                               PRESENCE mandatory},
E-RABFailedToResumeItemResumeRes ::= SEQUENCE {
     e-RAB-ID
                                                     E-RAB-ID,
                                                     Cause,
      cause
                                               ProtocolExtensionContainer { { E-RABFailedToResumeItemResumeRes-ExtIEs} }
      iE-Extensions
     OPTIONAL,
E-RABFailedToResumeItemResumeRes-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- UE Context Resume Failure
```

```
UEContextResumeFailure ::= SEQUENCE {
      protocolIEs
                                                { { UEContextResumeFailureIEs} },
                               ProtocolIE-Container
UEContextResumeFailureIEs S1AP-PROTOCOL-IES ::= {
                                                              CRITICALITY ignore
      { ID id-MME-UE-S1AP-ID
                                                                                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},
-- Connection Establishment Indication
ConnectionEstablishmentIndication::= SEQUENCE {
                               ProtocolIE-Container { {ConnectionEstablishmentIndicationIEs} },
      protocolIEs
```

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-Synchronisation-Info,
      id-x2TNLConfigurationInfo,
      id-eNBX2ExtendedTransportLayerAddresses,
      id-MDTConfiguration,
      id-Time-UE-StayedInCell-EnhancedGranularity,
```

- id-HO-Cause,
- id-M3Configuration,
- id-M4Configuration,
- id-M5Configuration,
- id-MDT-Location-Info,
- id-SignallingBasedMDTPLMNList,
- id-MobilityInformation,
- id-ULCOUNTValueExtended,
- id-DLCOUNTValueExtended,
- id-ReceiveStatusOfULPDCPSDUsExtended,
- id-eNBIndirectX2TransportLayerAddresses,
- id-Muting-Availability-Indication,
- id-Muting-Pattern-Information,
- id-Synchronisation-Information,
- id-uE-HistoryInformationFromTheUE,
- id-LoggedMBSFNMDT,
- id-SON-Information-Report,
- id-RecommendedCellItem,
- id-RecommendedENBItem,
- id-ProSeUEtoNetworkRelaying,
- id-ULCOUNTValuePDCP-SNlength18,
- id-DLCOUNTValuePDCP-SNlength18,
- id-ReceiveStatusOfULPDCPSDUsPDCP-SNlength18,
- id-M6Configuration,

id-M7Configuration,

id-RAT-Type,

maxnoofCSGs,

maxnoofE-RABs,

maxnoofErrors,

maxnoofBPLMNs,

maxnoofPLMNsPerMME,

maxnoofTACs,

maxnoofEPLMNs,

maxnoofEPLMNsPlusOne,

maxnoofForbLACs,

maxnoofForbTACs,

maxnoofCells,

maxnoofCellID,

maxnoofEmergencyAreaID,

maxnoofTAIforWarning,

maxnoofCellinTAI,

maxnoofCellinEAI,

maxnoofeNBX2TLAs,

maxnoofeNBX2ExtTLAs,

maxnoofeNBX2GTPTLAs,

maxnoofRATs,

maxnoofGroupIDs,

maxnoofMMECs,

maxnoofTAforMDT,

maxnoofCellIDforMDT,

maxnoofMDTPLMNs,

maxnoofCellsforRestart,

maxnoofRestartTAIs,

maxnoofRestartEmergencyAreaIDs,

maxnoofMBSFNAreaMDT,

maxEARFCN,

maxnoofCellsineNB,

maxnoofRecommendedCells,

maxnoofRecommendedENBs

FROM S1AP-Constants

Criticality,

ProcedureCode,

ProtocolIE-ID,

TriggeringMessage

FROM S1AP-CommonDataTypes

ProtocolExtensionContainer{},

S1AP-PROTOCOL-EXTENSION,

```
ProtocolIE-SingleContainer{},
       S1AP-PROTOCOL-IES
FROM S1AP-Containers;
-- A
Additional-GUTI::= SEQUENCE {
                                                   GUMMEI,
       gUMMEI
       m-TMSI
                                           M-TMSI,
       iE-Extensions
                                    ProtocolExtensionContainer { {Additional-GUTI-ExtIEs} } OPTIONAL,
       • • • •
Additional-GUTI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
AreaScopeOfMDT ::= CHOICE {
       cellBased
                                                   CellBasedMDT,
       tABased
                                                   TABasedMDT,
       pLMNWide
                                                   NULL,
       tAIBased
                                                   TAIBasedMDT
```

```
AllocationAndRetentionPriority ::= SEQUENCE {
        priorityLevel
                                                 PriorityLevel,
        pre-emptionCapability
                                         Pre-emptionCapability,
        pre-emptionVulnerability Pre-emptionVulnerability,
        iE-Extensions
                                                 ProtocolExtensionContainer { {AllocationAndRetentionPriority-ExtIEs} } OPTIONAL,
AllocationAndRetentionPriority-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
AssistanceDataForCECapableUEs ::= SEQUENCE {
        cell Identifier And CEL evel For CEC a pable UEs \\
                                                                  CellIdentifierAndCELevelForCECapableUEs,
        iE-Extensions
                                                                                   ProtocolExtensionContainer { { InformationForCECapableUEs-ExtIEs} }
OPTIONAL.
Information For CEC a pable UEs-ExtIEs~S1AP-PROTOCOL-EXTENSION ::= \{ (1.5, 1.5) \} \\
```

```
AssistanceDataForPaging ::= SEQUENCE {
       assistanceDataForRecommendedCells
                                             AssistanceDataForRecommendedCells
                                                                                           OPTIONAL,
       assistanceDataForCECapableUEs
                                             AssistanceDataForCECapableUEs
                                                                                           OPTIONAL,
       pagingAttemptInformation
                                             PagingAttemptInformation
                                                                                                  OPTIONAL,
                                                            ProtocolExtensionContainer { { AssistanceDataForPaging-ExtIEs} } OPTIONAL,
       iE-Extensions
       ...
AssistanceDataForPaging-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
AssistanceDataForRecommendedCells ::= SEQUENCE {
       recommendedCellsForPaging
                                      RecommendedCellsForPaging,
       iE-Extensions
                                             ProtocolExtensionContainer { { AssistanceDataForRecommendedCells-ExtIEs} }
                                                                                                                         OPTIONAL,
AssistanceDataForRecommendedCells-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- B
```

```
Bearers-SubjectToStatusTransferList ::= SEQUENCE (SIZE(1.. maxnoofE-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,
                                                                   COUNTvalue,
       dL-COUNTvalue
       receiveStatusofULPDCPSDUs
                                                            ReceiveStatusofULPDCPSDUs
                                                                                                         OPTIONAL,
                                                                   ProtocolExtensionContainer { {Bearers-SubjectToStatusTransfer-ItemExtIEs} } OPTIONAL,
       iE-Extensions
Bearers-SubjectToStatusTransfer-ItemExtIEs S1AP-PROTOCOL-EXTENSION ::= {
       { ID id-ULCOUNTValueExtended
                                                                           CRITICALITY ignore
                                                                                                 EXTENSION COUNTValueExtended
              PRESENCE optional } |
       { ID id-DLCOUNTValueExtended
                                                                           CRITICALITY ignore
                                                                                                 EXTENSION COUNTValueExtended
              PRESENCE optional }|
       { ID id-ReceiveStatusOfULPDCPSDUsExtended
                                                                   CRITICALITY ignore
                                                                                          EXTENSION ReceiveStatusOfULPDCPSDUsExtended
       PRESENCE optional }|
       { ID id-ULCOUNTValuePDCP-SNlength18
                                                                           CRITICALITY ignore
                                                                                                 EXTENSION COUNTvaluePDCP-SNlength18
              PRESENCE optional}
```

```
{ ID id-DLCOUNTValuePDCP-SNlength18
                                                                          CRITICALITY ignore
                                                                                                EXTENSION COUNTvaluePDCP-SNlength18
              PRESENCE optional }
       { ID id-ReceiveStatusOfULPDCPSDUsPDCP-SNlength18
                                                          CRITICALITY ignore
                                                                                EXTENSION ReceiveStatusOfULPDCPSDUsPDCP-SNlength18
       PRESENCE optional},
BearerType ::= ENUMERATED {
       non-IP,
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
Cancelled Cellin EAI ::= SEQUENCE \ (SIZE (1..maxnoof Cellin EAI)) \ OF \ Cancelled Cellin EAI-Item
CancelledCellinEAI-Item ::= SEQUENCE {
        eCGI
                                                   EUTRAN-CGI,
                                          NumberOfBroadcasts,
        numberOfBroadcasts
        iE-Extensions
                                          ProtocolExtensionContainer { {CancelledCellinEAI-Item-ExtIEs} } OPTIONAL,
Cancelled Cellin EAI\text{-}Item\text{-}ExtIEs\ S1AP\text{-}PROTOCOL\text{-}EXTENSION ::= \{
Cancelled Cellin TAI ::= SEQUENCE \ (SIZE (1..maxnoof Cellin TAI)) \ OF \ Cancelled Cellin TAI-I tem
CancelledCellinTAI-Item ::= SEQUENCE{
```

```
eCGI
                                      EUTRAN-CGI,
       numberOfBroadcasts
                              NumberOfBroadcasts,
                              ProtocolExtensionContainer { {CancelledCellinTAI-Item-ExtIEs} } OPTIONAL,
       iE-Extensions
CancelledCellinTAI-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
Cause ::= CHOICE {
       radioNetwork
                              CauseRadioNetwork,
                              CauseTransport,
       transport
                                              CauseNas,
       nas
       protocol
                              CauseProtocol,
                                      CauseMisc,
       misc
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,
CellIdentifierAndCELevelForCECapableUEs ::= SEQUENCE {
                                     global-Cell-ID
                                                                                                                                                       EUTRAN-CGI,
                                    cELevel
                                                                                                                                                                                              CELevel,
                                    iE-Extensions
                                                                                                                                                       ProtocolExtensionContainer { { CellIdentifierAndCELevelForCECapableUEs-ExtIEs} } OPTIONAL,
CellIdentifier And CELevel For CECapable UEs-ExtIEs~S1AP-PROTOCOL-EXTENSION ::= \{ (Continuous continuous con
-- Coverage Enhancement level encoded according to TS 36.331 [16] --
CELevel ::= OCTET STRING
CE-mode-B-SupportIndicator ::= ENUMERATED {
                                    supported,
```

```
CellIdentity ::= BIT STRING (SIZE (28))
CellID-Broadcast ::= SEQUENCE (SIZE(1..maxnoofCellID)) OF CellID-Broadcast-Item
CellID-Broadcast-Item ::= SEQUENCE {
       eCGI
                                      EUTRAN-CGI,
                              ProtocolExtensionContainer { {CellID-Broadcast-Item-ExtIEs} } OPTIONAL,
       iE-Extensions
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,
                             ProtocolExtensionContainer { {CellBasedMDT-ExtIEs} } OPTIONAL,
       iE-Extensions
CellBasedMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
CellIdListforMDT ::= SEQUENCE \ (SIZE (1..maxnoofCellID forMDT)) \ 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 ::= {
```

OPTIONAL,

```
CGI ::= SEQUENCE {
      pLMNidentity PLMNidentity,
      1AC
                                   LAC,
                                   CI,
      cI
      rAC
                                   RAC
      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
AdditionalCSFallbackIndicator ::= ENUMERATED {
       no-restriction,
       restriction,
CSG-Id
               ::= BIT STRING (SIZE (27))
CSG-IdList ::= SEQUENCE (SIZE (1.. maxnoofCSGs)) 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 ::= {
COUNTValueExtended ::= SEQUENCE {
      pDCP-SNExtended
                                   PDCP-SNExtended,
      hFNModified
                                   HFNModified,
```

```
iE-Extensions
                             ProtocolExtensionContainer { {COUNTValueExtended-ExtIEs} } OPTIONAL,
COUNTValueExtended-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
       ...
COUNTvaluePDCP-SNlength18 ::= SEQUENCE {
       pDCP-SNlength18
                                                    PDCP-SNlength18,
       hFNforPDCP-SNlength18
                                     HFNforPDCP-SNlength18,
       iE-Extensions
                                            ProtocolExtensionContainer { {COUNTvaluePDCP-SNlength18-ExtIEs} } OPTIONAL,
COUNT value PDCP-SN length 18-ExtIEs~S1AP-PROTOCOL-EXTENSION ::= \{ \\
CriticalityDiagnostics ::= SEQUENCE {
       procedureCode
                                                    ProcedureCode
                      OPTIONAL,
                                                    TriggeringMessage
       triggeringMessage
                      OPTIONAL,
```

OPTIONAL,

```
procedureCriticality
                                                 Criticality
                        OPTIONAL,
        iEsCriticalityDiagnostics
                                        CriticalityDiagnostics-IE-List
        iE-Extensions
                                                         ProtocolExtensionContainer {{CriticalityDiagnostics-ExtIEs}}
                                                                                                                                   OPTIONAL,
CriticalityDiagnostics-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1.. maxnoofErrors)) OF CriticalityDiagnostics-IE-Item
CriticalityDiagnostics-IE-Item ::= SEQUENCE {
        iECriticality
                                        Criticality,
        iE-ID
                                                 ProtocolIE-ID,
       typeOfError
                                        TypeOfError,
                                        ProtocolExtensionContainer {{CriticalityDiagnostics-IE-Item-ExtIEs}}OPTIONAL,
        iE-Extensions
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
EARFCN ::= INTEGER(0..maxEARFCN, ...)
```

EmergencyAreaID-Cancelled-Item ::= SEQUENCE {

```
ECGIList ::= SEQUENCE (SIZE(1..maxnoofCellID)) OF EUTRAN-CGI
PWSfailedECGIList ::= SEQUENCE (SIZE(1..maxnoofCellsineNB)) 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
                                             EmergencyAreaID,
       cancelledCellinEAI
                                     CancelledCellinEAI,
                                     ProtocolExtensionContainer { {EmergencyAreaID-Cancelled-Item-ExtIEs} }
       iE-Extensions
                                                                                                         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 ::= {
```

ECGI-List ::= SEQUENCE (SIZE(1..maxnoofCellsineNB)) OF EUTRAN-CGI

EmergencyAreaIDListForRestart ::= SEQUENCE (SIZE(1..maxnoofRestartEmergencyAreaIDs)) OF EmergencyAreaID

```
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
                                    ProtocolExtensionContainer { GERAN-Cell-ID-ExtIEs} } OPTIONAL,
       iE-Extensions
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,
                                     ProtocolExtensionContainer { {ENB-StatusTransfer-TransparentContainer-ExtIEs} }
       iE-Extensions
                                                                                                                 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.. maxnoofE-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.. maxnoofE-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,
                                                           ProtocolExtensionContainer { {E-RABQoSParameters-ExtIEs} }
       iE-Extensions
                                                                                                                       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)
ExpectedUEBehaviour ::= SEQUENCE {
       expectedActivity
                              ExpectedUEActivityBehaviour OPTIONAL,
       expectedHOInterval
                                      ExpectedHOInterval
                                                                            OPTIONAL,
                              ProtocolExtensionContainer { { ExpectedUEBehaviour-ExtIEs} } OPTIONAL,
       iE-Extensions
ExpectedUEBehaviour-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
ExpectedUEActivityBehaviour ::= SEQUENCE {
       expectedActivityPeriod
                                                             ExpectedActivityPeriod
                                                                                                                  OPTIONAL,
       expectedIdlePeriod
                                                                    ExpectedIdlePeriod
                                                                                                                                 OPTIONAL,
       sourceofUEActivityBehaviourInformation SourceOfUEActivityBehaviourInformation OPTIONAL,
       iE-Extensions
                              ProtocolExtensionContainer { { ExpectedUEActivityBehaviour-ExtIEs} } OPTIONAL,
ExpectedUEActivityBehaviour-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
```

```
ExpectedActivityPeriod ::= INTEGER (1..30|40|50|60|80|100|120|150|180|181,...)
ExpectedIdle Period ::= INTEGER \ (1...30|40|50|60|80|100|120|150|180|181,...)
SourceOfUEActivityBehaviourInformation ::= ENUMERATED {
       subscription-information,
       statistics,
ExpectedHOInterval ::= ENUMERATED {
       sec15, sec30, sec60, sec90, sec120, sec180, long-time,
ExtendedRNC-ID
                                                         ::= INTEGER (4096..65535)
ExtendedRepetitionPeriod ::= INTEGER (4096..131071)
Extended-UEIdentityIndexValue ::= BIT STRING (SIZE (14))
```

```
-- 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,
                             ProtocolExtensionContainer { {ForbiddenLAs-Item-ExtIEs} } OPTIONAL,
       iE-Extensions
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,
                                                  ProtocolExtensionContainer { { GBR-QosInformation-ExtIEs} } OPTIONAL,
      iE-Extensions
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 ::= {
```

```
GUMMEIType ::= ENUMERATED {
       native,
       mapped,
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)
HFNModified ::= INTEGER (0..131071)
HFNforPDCP-SNlength18 ::= INTEGER (0..16383)
-- I
Masked-IMEISV ::= BIT STRING (SIZE (64))
ImmediateMDT ::= SEQUENCE {
```

```
measurementsToActivate
                                      MeasurementsToActivate,
       m1reportingTrigger
                                              M1ReportingTrigger,
       m1thresholdeventA2
                                                                                             OPTIONAL,
                                              M1ThresholdEventA2
-- Included in case of event-triggered, or event-triggered periodic reporting for measurement M1
       m1periodicReporting
                                              M1PeriodicReporting
                                                                                             OPTIONAL,
-- Included in case of periodic or event-triggered periodic reporting
       iE-Extensions
                                              ProtocolExtensionContainer { { ImmediateMDT-ExtIEs} } OPTIONAL,
ImmediateMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
       { ID id-M3Configuration
                                      CRITICALITY ignore
                                                              EXTENSION M3Configuration
                                                                                                     PRESENCE conditional }|
       { ID id-M4Configuration
                                      CRITICALITY ignore
                                                             EXTENSION M4Configuration
                                                                                                     PRESENCE conditional }|
       { ID id-M5Configuration
                                      CRITICALITY ignore
                                                              EXTENSION M5Configuration
                                                                                                     PRESENCE conditional |
       { ID id-MDT-Location-Info
                                                             EXTENSION MDT-Location-Info
                                                                                                     PRESENCE optional }|
                                      CRITICALITY ignore
       { ID id-M6Configuration
                                      CRITICALITY ignore
                                                             EXTENSION M6Configuration
                                                                                                     PRESENCE conditional }|
       { ID id-M7Configuration
                                      CRITICALITY ignore
                                                             EXTENSION M7Configuration
                                                                                                     PRESENCE conditional },
       ...
               OCTET STRING (SIZE (3..8))
IMSI
      ::=
InformationOnRecommendedCellsAndENBsForPaging ::= SEQUENCE {
       recommendedCellsForPaging
                                      RecommendedCellsForPaging,
```

```
recommendENBsForPaging
                                              RecommendedENBsForPaging,
       iE-Extensions
                                              ProtocolExtensionContainer { { InformationOnRecommendedCellsAndENBsForPaging-ExtIEs} }
                                                                                                                                          OPTIONAL,
InformationOnRecommendedCellsAndENBsForPaging-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
IntegrityProtectionAlgorithms ::= BIT STRING (SIZE (16,...))
IntendedNumberOfPagingAttempts ::= INTEGER (1..16, ...)
InterfacesToTrace ::= BIT STRING (SIZE (8))
-- J
-- K
KillAllWarningMessages ::= ENUMERATED {true}
-- L
```

```
::= OCTET STRING (SIZE (2))
LAC
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,
```

```
ProtocolExtensionContainer { { LastVisitedEUTRANCellInformation-ExtIEs} } OPTIONAL,
       iE-Extensions
LastVisitedEUTRANCellInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for Rel-11 to support enhanced granularity for time UE stayed in cell --
        { ID id-Time-UE-StayedInCell-EnhancedGranularity CRITICALITY ignore
                                                                              EXTENSION Time-UE-StayedInCell-EnhancedGranularity PRESENCE optional }
        { ID id-HO-Cause
                                                                                              CRITICALITY ignore
                                                                                                                      EXTENSION Cause
                                       PRESENCE optional },
LastVisitedUTRANCellInformation
                                       ::= OCTET STRING
LastVisitedGERANCellInformation ::= CHOICE {
                                                              NULL,
       undefined
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
LHN-ID ::= OCTET STRING(SIZE (32..256))
Links-to-log ::= ENUMERATED {uplink, downlink, both-uplink-and-downlink, ...}
```

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```
ListeningSubframePattern ::= SEQUENCE {
       pattern-period
                                              ENUMERATED {ms1280, ms2560, ms5120, ms10240, ...},
       pattern-offset
                                              INTEGER (0..10239, ...),
                                              ProtocolExtensionContainer { { ListeningSubframePattern-ExtIEs} } OPTIONAL,
       iE-Extensions
ListeningSubframePattern-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
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}
LoggedMBSFNMDT ::= SEQUENCE {
       loggingInterval
                                            LoggingInterval,
       loggingDuration
                                            LoggingDuration,
       mBSFN-ResultToLog
                                            MBSFN-ResultToLog
                                                                         OPTIONAL,
       iE-Extensions
                                            ProtocolExtensionContainer { { LoggedMBSFNMDT-ExtIEs } } OPTIONAL,
LoggedMBSFNMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- M
M3Configuration ::= SEQUENCE {
       m3period
                                    M3period,
       iE-Extensions
                             ProtocolExtensionContainer { { M3Configuration-ExtIEs} } OPTIONAL,
M3Configuration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
```

```
M3period ::= ENUMERATED {ms100, ms1000, ms10000, ... }
M4Configuration ::= SEQUENCE {
       m4period
                                      M4period,
       m4-links-to-log
                              Links-to-log,
       iE-Extensions
                              ProtocolExtensionContainer { { M4Configuration-ExtIEs} } OPTIONAL,
M4Configuration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
M4period ::= ENUMERATED {ms1024, ms2048, ms5120, ms10240, min1, ... }
M5Configuration ::= SEQUENCE {
       m5period
                                      M5period,
       m5-links-to-log
                              Links-to-log,
       iE-Extensions
                              ProtocolExtensionContainer { { M5Configuration-ExtIEs} } OPTIONAL,
```

```
M5Configuration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
M5period ::= ENUMERATED {ms1024, ms2048, ms5120, ms10240, min1, ... }
M6Configuration ::= SEQUENCE {
       m6report-Interval M6report-Interval,
                               M6delay-threshold
                                                               OPTIONAL,
       m6delay-threshold
-- This IE shall be present if the M6 Links to log IE is set to 'uplink' or to 'both-uplink-and-downlink' --
       m6-links-to-log
                               Links-to-log,
                               ProtocolExtensionContainer { { M6Configuration-ExtIEs} } OPTIONAL,
       iE-Extensions
M6Configuration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
M6report-Interval ::= ENUMERATED { ms1024, ms2048, ms5120, ms10240, ... }
M6delay-threshold ::= ENUMERATED { ms30, ms40, ms50, ms60, ms70, ms80, ms90, ms100, ms150, ms300, ms500, ms750, ... }
```

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```
M7Configuration ::= SEQUENCE {
       m7period
                                     M7period,
       m7-links-to-log
                              Links-to-log,
       iE-Extensions
                              ProtocolExtensionContainer { { M7Configuration-ExtIEs} } OPTIONAL,
M7Configuration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
M7period ::= INTEGER(1..60, ...)
MDT-Activation ::= ENUMERATED {
       immediate-MDT-only,
       immediate-MDT-and-Trace,
       logged-MDT-only,
       logged-MBSFN-MDT
MDT-Location-Info ::= BIT STRING (SIZE (8))
MDT-Configuration ::= SEQUENCE {
```

•••

```
mdt-Activation
                            MDT-Activation,
       areaScopeOfMDT
                                    AreaScopeOfMDT,
       mDTMode
                                           MDTMode,
       iE-Extensions
                            ProtocolExtensionContainer { { MDT-Configuration-ExtIEs} } OPTIONAL,
MDT-Configuration-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
       { ID id-SignallingBasedMDTPLMNList
                                                         CRITICALITY ignore
                                                                               EXTENSION MDTPLMNList
                                                                                                            PRESENCE optional
ManagementBasedMDTAllowed ::= ENUMERATED {allowed, ...}
MBSFN-ResultToLog ::= SEQUENCE (SIZE(1..maxnoofMBSFNAreaMDT)) OF MBSFN-ResultToLogInfo
MBSFN-ResultToLogInfo ::= SEQUENCE {
                            INTEGER (0..255)
                                                         OPTIONAL,
       mBSFN-AreaId
                                   EARFCN,
       carrierFreq
       iE-Extensions
                            ProtocolExtensionContainer { { MBSFN-ResultToLogInfo-ExtIEs} } OPTIONAL,
MBSFN-ResultToLogInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
```

```
MDTPLMNList ::= SEQUENCE (SIZE(1..maxnoofMDTPLMNs)) OF PLMNidentity
PrivacyIndicator ::= ENUMERATED {
      immediate-MDT,
      logged-MDT,
MDTMode ::= CHOICE {
      immediateMDT
                                          ImmediateMDT,
      loggedMDT
                                                 LoggedMDT,
      mDTMode-Extension
                                          MDTMode-Extension
MDTMode-Extension ::= ProtocolIE-SingleContainer {{ MDTMode-ExtensionIE }}
MDTMode-ExtensionIE S1AP-PROTOCOL-IES ::= {
       { ID id-LoggedMBSFNMDT
                                          CRITICALITY ignore
                                                               TYPE LoggedMBSFNMDT
                                                                                                   PRESENCE mandatory}
MeasurementsToActivate ::= BIT STRING (SIZE (8))
```

```
MeasurementThresholdA2 ::= CHOICE {
       threshold-RSRP
                                              Threshold-RSRP,
       threshold-RSRQ
                                              Threshold-RSRQ,
MessageIdentifier
                      ::= BIT STRING (SIZE (16))
MobilityInformation ::= BIT STRING (SIZE(32))
MMEname ::= PrintableString (SIZE (1..150,...))
MMEPagingTarget ::= CHOICE {
       global-ENB-ID
                              Global-ENB-ID,
       tAI
                                              TAI,
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
MutingAvailabilityIndication ::= ENUMERATED {
       available,
       unavailable,
MutingPatternInformation ::= SEQUENCE {
                                                    ENUMERATED {ms0, ms1280, ms2560, ms5120, ms10240, ...},
       muting-pattern-period
       muting-pattern-offset
                                                    INTEGER (0..10239, ...)
                                                                                  OPTIONAL,
       iE-Extensions
                                                            ProtocolExtensionContainer { {MutingPatternInformation-ExtIEs} } OPTIONAL,
MutingPatternInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
```

```
-- N
NAS-PDU ::= OCTET STRING
NASSecurityParametersfromE-UTRAN ::= OCTET STRING
NASSecurityParameterstoE-UTRAN ::= OCTET STRING
NB-IoT-DefaultPagingDRX ::= ENUMERATED {
       v128,
       v256,
       v512,
      v1024,
NB-IoT-Paging-eDRXInformation ::= SEQUENCE {
       nB-IoT-paging-eDRX-Cycle
                                           NB-IoT-Paging-eDRX-Cycle,
       nB-IoT-pagingTimeWindow
                                                  NB-IoT-PagingTimeWindow
                                                                                              OPTIONAL,
      iE-Extensions
                                                  ProtocolExtensionContainer { { NB-IoT-Paging-eDRXInformation-ExtIEs} } OPTIONAL,
```

```
NB-IoT-Paging-eDRXInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
NB-IoT-Paging-eDRX-Cycle ::= ENUMERATED{hf2, hf4, hf6, hf8, hf10, hf12, hf14, hf16, hf32, hf64, hf128, hf256, hf512, hf1024, ...}
NB-IoT-PagingTimeWindow ::= ENUMERATED{s1, s2, s3, s4, s5, s6, s7, s8, s9, s10, s11, s12, s13, s14, s15, s16, ...}
NB-IoT-UEIdentityIndexValue ::= BIT STRING (SIZE (12))
NextPagingAreaScope ::= ENUMERATED {
        same,
       changed,
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
PagingAttemptInformation ::= SEQUENCE {
       pagingAttemptCount
                                                                PagingAttemptCount,
       intended Number Of Paging Attempts \\
                                                IntendedNumberOfPagingAttempts,
       nextPagingAreaScope
                                                                NextPagingAreaScope
                                                                                                 OPTIONAL,
       iE-Extensions
                                                                ProtocolExtensionContainer { { PagingAttemptInformation-ExtIEs} } OPTIONAL,
```

```
PagingAttemptInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
PagingAttemptCount ::= INTEGER (1..16, ...)
Paging-eDRXInformation ::= SEQUENCE {
       paging-eDRX-Cycle
                                               Paging-eDRX-Cycle,
       pagingTimeWindow
                                              PagingTimeWindow
                                                                                      OPTIONAL,
       iE-Extensions
                                              ProtocolExtensionContainer { { Paging-eDRXInformation-ExtIEs} } OPTIONAL,
Paging-eDRXInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
Paging-eDRX-Cycle ::= ENUMERATED{hfhalf, hf1, hf2, hf4, hf6, hf8, hf10, hf12, hf14, hf16, hf32, hf64, hf128, hf256, ...}
PagingTimeWindow ::= ENUMERATED{s1, s2, s3, s4, s5, s6, s7, s8, s9, s10, s11, s12, s13, s14, s15, s16, ...}
PagingDRX ::= ENUMERATED {
       v32,
```

```
v64,
       v128,
       v256,
PagingPriority ::= ENUMERATED {
       priolevel1,
       priolevel2,
       priolevel3,
       priolevel4,
       priolevel5,
       priolevel6,
       priolevel7,
       priolevel8,
PDCP-SN ::= INTEGER (0..4095)
PDCP-SNExtended ::= INTEGER (0..32767)
PDCP-SNlength18 ::= INTEGER (0..262143)
```

```
M1PeriodicReporting ::= SEQUENCE {
       reportInterval
                                              ReportIntervalMDT,
                                              ReportAmountMDT,
       reportAmount
       iE-Extensions
                                              ProtocolExtensionContainer { { M1PeriodicReporting-ExtIEs} } OPTIONAL,
M1PeriodicReporting-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
PLMNidentity
                                      ::= TBCD-STRING
Port-Number
                      ::= OCTET STRING (SIZE (2))
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)
ProSeAuthorized ::= SEQUENCE {
       proSeDirectDiscovery
                                      ProSeDirectDiscovery
                                                                                                                           OPTIONAL,
       proSeDirectCommunication
                                      ProSeDirectCommunication
                                                                                                                           OPTIONAL,
       iE-Extensions
                                              ProtocolExtensionContainer { {ProSeAuthorized-ExtIEs} } OPTIONAL,
ProSeAuthorized-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
       { ID id-ProSeUEtoNetworkRelaying
                                              CRITICALITY ignore
                                                                                                                   PRESENCE optional},
                                                                     EXTENSION ProSeUEtoNetworkRelaying
ProSeDirectDiscovery ::= ENUMERATED {
       authorized,
       not-authorized,
ProSeUEtoNetworkRelaying ::= ENUMERATED {
       authorized,
       not-authorized,
```

```
ProSeDirectCommunication ::= ENUMERATED {
       authorized,
       not-authorized,
PS-ServiceNotAvailable ::= ENUMERATED {
       ps-service-not-available,
-- Q
QCI
                                              ::= INTEGER (0..255)
-- R
ReceiveStatusofULPDCPSDUs ::= BIT STRING (SIZE(4096))
ReceiveStatusOfULPDCPSDUsExtended ::= BIT STRING (SIZE(1..16384))
```

```
ReceiveStatusOfULPDCPSDUsPDCP-SNlength18 ::= BIT STRING (SIZE(1..131072))
RecommendedCellsForPaging ::= SEQUENCE {
       recommendedCellList
                                            RecommendedCellList,
                                            ProtocolExtensionContainer { { RecommendedCellsForPaging-ExtIEs} }
       iE-Extensions
                                                                                                               OPTIONAL,
RecommendedCellsForPaging-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
RecommendedCellList ::= SEQUENCE (SIZE(1.. maxnoofRecommendedCells)) OF ProtocolIE-SingleContainer { { RecommendedCellItemIEs } }
RecommendedCellItemIEs S1AP-PROTOCOL-IES ::= {
       { ID id-RecommendedCellItem
                                    CRITICALITY ignore
                                                          TYPE RecommendedCellItem
                                                                                                 PRESENCE mandatory },
RecommendedCellItem::= SEQUENCE {
       eUTRAN-CGI
                                            EUTRAN-CGI,
       timeStayedInCell
                             INTEGER (0..4095)
                                                           OPTIONAL,
       iE-Extensions
                                     ProtocolExtensionContainer { { RecommendedCellsForPagingItem-ExtIEs} } OPTIONAL,
       •••
```

```
RecommendedCellsForPagingItem-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
RecommendedENBsForPaging ::= SEQUENCE {
      recommendedENBList
                               RecommendedENBList,
                               ProtocolExtensionContainer { { RecommendedENBsForPaging-ExtIEs} }
      iE-Extensions
                                                                                        OPTIONAL,
RecommendedENBsForPaging-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
RecommendedENBList::= SEQUENCE (SIZE(1.. maxnoofRecommendedENBs)) OF ProtocolIE-SingleContainer { { RecommendedENBItemIEs } }
RecommendedENBItemIEs S1AP-PROTOCOL-IES ::= {
      PRESENCE mandatory },
RecommendedENBItem ::= SEQUENCE {
```

```
mMEPagingTarget
                                            MMEPagingTarget,
       iE-Extensions
                                    ProtocolExtensionContainer { { RecommendedENBItem-ExtIEs} }
                                                                                               OPTIONAL,
Recommended ENBItem-ExtIEs~S1AP-PROTOCOL-EXTENSION ::= \{\\
RelativeMMECapacity
                                            ::= INTEGER (0..255)
RelayNode-Indicator ::= ENUMERATED {
       true,
RAC
                                    ::= OCTET STRING (SIZE (1))
RAT-Type ::= ENUMERATED {
       nbiot,
```

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}
M1ReportingTrigger ::= ENUMERATED{
       periodic,
       a2eventtriggered,
       a2eventtriggered-periodic
RequestType
              ::= SEQUENCE {
       eventType
                                              EventType,
       reportArea
                                              ReportArea,
                                      ProtocolExtensionContainer { { RequestType-ExtIEs} }
       iE-Extensions
                                                                                            OPTIONAL,
       •••
RequestType-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
RIMTransfer ::= SEQUENCE {
       rIMInformation
                                      RIMInformation,
```

RepetitionPeriod ::= INTEGER (0..4095)

```
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,
       eHRPD-Sector-ID
                                           OCTET STRING (SIZE(16))
ReportArea ::= ENUMERATED {
       ecgi,
```

OPTIONAL,

```
RLFReportInformation ::= SEQUENCE {
                                                                            UE-RLF-Report-Container,
       uE-RLF-Report-Container
       uE-RLF-Report-Container-for-extended-bands
                                                             UE-RLF-Report-Container-for-extended-bands
                                                                                    ProtocolExtensionContainer {{ RLFReportInformation-ExtIEs}}
       iE-Extensions
OPTIONAL,
RLFReportInformation-ExtlEs S1AP-PROTOCOL-EXTENSION ::= {
RNC-ID ::= INTEGER (0..4095)
RRC-Container ::= OCTET STRING
RRC-Establishment-Cause ::= ENUMERATED {
       emergency,
       highPriorityAccess,
       mt-Access,
       mo-Signalling,
       mo-Data,
       delay-TolerantAccess,
```

```
mo-VoiceCall,
       mo-ExceptionData
ECGIListForRestart ::= SEQUENCE (SIZE(1..maxnoofCellsforRestart)) OF EUTRAN-CGI
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,
       sONInformation-Extension
                                      SONInformation-Extension
SONInformation-Extension ::= ProtocolIE-SingleContainer {{ SONInformation-ExtensionIE }}
SONInformation-ExtensionIE S1AP-PROTOCOL-IES ::= {
       { ID id-SON-Information-Report CRITICALITY ignore
                                                             TYPE SONInformationReport
                                                                                            PRESENCE mandatory}
SONInformationRequest ::= ENUMERATED {
       x2TNL-Configuration-Info,
       time-Synchronisation-Info,
       activate-Muting,
       deactivate-Muting}
```

```
SONInformationReply ::= SEQUENCE {
       x2TNLConfigurationInfo
                                              X2TNLConfigurationInfo
                                                                                     OPTIONAL,
       iE-Extensions
                                                      ProtocolExtensionContainer {{SONInformationReply-ExtIEs}} OPTIONAL,
SONInformationReply-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
-- Extension for Release 9 to transfer Time synchronisation information --
       {ID id-Time-Synchronisation-Info
                                              CRITICALITY ignore
                                                                     EXTENSION TimeSynchronisationInfo
                                                                                                                    PRESENCE optional},
       {ID id-Muting-Pattern-Information
                                              CRITICALITY ignore
                                                                     EXTENSION MutingPatternInformation
                                                                                                            PRESENCE optional}
SONInformationReport ::= CHOICE{
                                      RLFReportInformation,
       rLFReportInformation
SONConfigurationTransfer ::= SEQUENCE {
       targeteNB-ID
                                                      TargeteNB-ID,
       sourceeNB-ID
                                                      SourceeNB-ID,
       sONInformation
                                                      SONInformation,
                                      ProtocolExtensionContainer { { SONConfigurationTransfer-ExtIEs} }
                                                                                                                    OPTIONAL,
       iE-Extensions
```

```
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' -- }|
-- Extension for Release 12 to transfer information concerning the source cell of synchronisation and the aggressor cell --
        {ID id-Synchronisation-Information
                                                 CRITICALITY ignore
                                                                          EXTENSION SynchronisationInformation
                                                                                                                                    PRESENCE conditional
        -- This IE shall be present if the SON Information IE contains the SON Information Request IE set to 'Activate Muting '--},
SynchronisationInformation ::= SEQUENCE {
        sourceStratumLevel
                                                          StratumLevel
                                                                                                   OPTIONAL,
        listeningSubframePattern
                                        ListeningSubframePattern OPTIONAL,
                                                                                                           OPTIONAL,
        aggressoreCGI-List
                                                          ECGI-List
        iE-Extensions
                                                          ProtocolExtensionContainer { {SynchronisationInformation-ExtIEs} } OPTIONAL,
```

•••

```
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 ::= {
SRVCCOperationNotPossible ::= ENUMERATED {
       notPossible,
```

```
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,
```

 $SourceeNB-ToTargeteNB-TransparentContainer-ExtIEs\ S1AP-PROTOCOL-EXTENSION::= \{ in the container-extIEs\ S1AP-PROTOCOL-EXTENSION ::= \{ in the container-extIEs\ S1AP-PROTOCOL-$

```
{ID id-MobilityInformation
                                                           CRITICALITY ignore
                                                                                  EXTENSION MobilityInformation
                                                                                                                                      PRESENCE
optional}|
       {ID id-uE-HistoryInformationFromTheUE CRITICALITY ignore EXTENSION UE-HistoryInformationFromTheUE
                                                                                                                       PRESENCE optional },
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,
                                     ProtocolExtensionContainer { {ServedGUMMEIsItem-ExtIEs} }
                                                                                                 OPTIONAL,
       iE-Extensions
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,
                             ProtocolExtensionContainer { {SupportedTAs-Item-ExtIEs} } OPTIONAL,
       iE-Extensions
SupportedTAs-Item-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
       -- Extension for Release 13 to transfer RAT-Type per TAC --
       {ID id-RAT-Type
                                     CRITICALITY reject
                                                           EXTENSION RAT-Type
                                                                                         PRESENCE optional},
StratumLevel ::= INTEGER (0..3, ...)
```

•••

```
SynchronisationStatus ::= ENUMERATED { synchronous, asynchronous, ... }
TimeSynchronisationInfo ::= SEQUENCE {
                                                      StratumLevel,
       stratumLevel
                                               SynchronisationStatus,
       synchronisationStatus
       iE-Extensions
                                                      ProtocolExtensionContainer { { TimeSynchronisationInfo-ExtIEs} } OPTIONAL,
TimeSynchronisationInfo-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
       -- Extension for Release 12 to transfer Muting Availability Indication --
       {ID id-Muting-Availability-Indication
                                                      CRITICALITY ignore
                                                                              EXTENSION MutingAvailabilityIndication PRESENCE optional},
S-TMSI ::= SEQUENCE {
       mMEC MME-Code,
       m-TMSIM-TMSI,
       iE-Extensions
                               ProtocolExtensionContainer { {S-TMSI-ExtIEs} } OPTIONAL,
S-TMSI-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
```

```
-- T
TAC ::= OCTET STRING (SIZE (2))
TAIBasedMDT ::= SEQUENCE {
       tAIListforMDT
                                      TAIListforMDT,
                                      ProtocolExtensionContainer { {TAIBasedMDT-ExtIEs} } OPTIONAL,
       iE-Extensions
TAIBasedMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
TAIL ist for MDT ::= SEQUENCE \ (SIZE (1..maxnoofTA for MDT)) \ OF \ TAI
TAIL ist for Warning ::= SEQUENCE \ (SIZE (1..maxnoof TAI for Warning)) \ OF \ TAI
TAI ::= SEQUENCE {
       pLMNidentity
                                      PLMNidentity,
       tAC
                                                      TAC,
                                      ProtocolExtensionContainer { {TAI-ExtIEs} } OPTIONAL,
       iE-Extensions
```

```
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,
                               ProtocolExtensionContainer { {TABasedMDT-ExtIEs} } OPTIONAL,
       iE-Extensions
TABasedMDT-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
TAList for MDT ::= SEQUENCE \ (SIZE (1..maxnoof TA for MDT)) \ OF \ TAC
Completed Cellin TAI ::= SEQUENCE \ (SIZE (1..maxnoof Cellin TAI)) \ OF \ Completed Cellin TAI-Item
CompletedCellinTAI\text{-}Item ::= SEQUENCE\{
```

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```
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-ExtlEs} } OPTIONAL,
       •••
```

```
TargeteNB-ToSourceeNB-TransparentContainer-ExtIEs\ S1AP-PROTOCOL-EXTENSION ::= \{ (Container-ExtIEs\ S1AP-PROTOCOL-EXTENSION\ S1AP-PROTOCOL-EXTENSION\ S2AP-PROTOCOL-EXTENSION\ S2AP-PROTOCOL-EXTENSION\ S3AP-PROTOCOL-EXTENSION\ S3AP-PROTOCOL\ S3AP-PROT
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.
M1ThresholdEventA2 ::= SEQUENCE {
                         measurementThreshold MeasurementThresholdA2,
                         iE-Extensions
                                                                                                                                    ProtocolExtensionContainer { { M1ThresholdEventA2-ExtIEs} } OPTIONAL,
M1ThresholdEventA2-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)
Time-UE-StayedInCell-EnhancedGranularity ::= INTEGER (0..40950)
TransportInformation ::= SEQUENCE {
       transportLayerAddress
                                                       TransportLayerAddress,
       uL-GTP-TEID
                                                                      GTP-TEID,
TransportLayerAddress
                               ::= BIT STRING (SIZE(1..160, ...))
TraceActivation ::= SEQUENCE {
       e-UTRAN-Trace-ID
                                                              E-UTRAN-Trace-ID,
                                                              InterfacesToTrace,
       interfacesToTrace
                                                              TraceDepth,
    traceDepth
```

```
trace Collection Entity IPAddress\\
                                               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,
       medium Without Vendor Specific Extension,\\
       maximumWithoutVendorSpecificExtension,
E-UTRAN-Trace-ID ::= OCTET STRING (SIZE (8))
TrafficLoadReductionIndication ::= INTEGER (1..99)
```

```
TunnelInformation ::= SEQUENCE {
       transportLayerAddress
                              TransportLayerAddress,
       uDP-Port-Number
                                              Port-Number
                                                                              OPTIONAL,
       iE-Extensions
                                       ProtocolExtensionContainer { {Tunnel-Information-ExtIEs} } OPTIONAL,
Tunnel-Information-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
TypeOfError ::= ENUMERATED {
       not-understood,
       missing,
TAIListForRestart ::= SEQUENCE \ (SIZE (1..maxnoofRestartTAIs)) \ OF \ TAI
-- U
UEAggregateMaximumBitrate ::= SEQUENCE {
       uEaggregate Maximum Bit Rate DL\\
                                               BitRate,
```

```
uEaggregateMaximumBitRateUL
                                            BitRate,
       iE-Extensions
                                                   ProtocolExtensionContainer { {UEAggregate-MaximumBitrates-ExtIEs} } OPTIONAL,
UEAggregate-MaximumBitrates-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
UE-RetentionInformation ::= ENUMERATED {
       ues-retained,
       ...}
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 ::= {
\label{thm:connection} \mbox{UE-associatedLogicalS1-ConnectionItem} ::= \mbox{SEQUENCE} \; \{ \mbox{\cite{thm:connectionItem}} \; := \mbox{\cite{th
                                     mME-UE-S1AP-ID
                                                                                                                                                                                             MME-UE-S1AP-ID OPTIONAL,
                                     eNB-UE-S1AP-ID
                                                                                                                                                                                              ENB-UE-S1AP-ID OPTIONAL,
                                                                                                                                                        ProtocolExtensionContainer { { UE-associatedLogicalS1-ConnectionItemExtIEs} } OPTIONAL,
                                      iE-Extensions
UE-associatedLogicalS1-ConnectionItemExtIEs S1AP-PROTOCOL-EXTENSION ::= {
UEIdentityIndexValue ::=
                                                                                                                                                       BIT STRING (SIZE (10))
UE-HistoryInformation ::= SEQUENCE (SIZE(1..maxnoofCells)) OF LastVisitedCell-Item
```

 $\label{thm:continuous} UE\text{-}HistoryInformationFromThe} UE ::= OCTET\ STRING$

-- This IE is a transparent container and shall be encoded as the VisitedCellInfoList field contained in the UEInformationResponse message as defined in TS 36.331 [16]

```
UEPagingID ::= CHOICE {
        s-TMSI
                        S-TMSI,
        iMSI
                        IMSI,
UERadioCapability ::= OCTET STRING
UERadioCapabilityForPaging ::= OCTET STRING
UE-RLF-Report-Container ::= OCTET STRING
-- This IE is a transparent container and shall be encoded as the rlf-Report-r9 field contained in the UEInformationResponse message as defined in TS 36.331 [16]
\label{eq:UE-RLF-Report-Container-for-extended-bands} ::= OCTET\ STRING
-- This IE is a transparent container and shall be encoded as the rlf-Report-v9e0 contained in the UEInformationResponse message as defined in TS 36.331 [16]
UESecurityCapabilities ::= SEQUENCE {
        encryptionAlgorithms
                                                  EncryptionAlgorithms,
        integrity Protection Algorithms \\
                                         IntegrityProtectionAlgorithms,
        iE-Extensions
                                                          ProtocolExtensionContainer { { UESecurityCapabilities-ExtIEs} }
                                                                                                                             OPTIONAL,
```

```
UESecurityCapabilities-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
UE-Usage-Type ::= INTEGER (0..255)
UserLocationInformation ::= SEQUENCE {
       eutran-cgi
                                             EUTRAN-CGI,
                                                     TAI,
       tai
       iE-Extensions
                                     ProtocolExtensionContainer { { UserLocationInformation-ExtIEs} } OPTIONAL,
UserLocationInformation-ExtIEs S1AP-PROTOCOL-EXTENSION ::= {
       •••
UEUserPlaneCIoTSupportIndicator ::= ENUMERATED {
       supported,
-- V
```

```
VoiceSupportMatchIndicator ::= ENUMERATED {
       supported,
       not-supported,
-- W
WarningAreaList ::= CHOICE {
       cellIDList
                                                              ECGIList,
                                              TAIListforWarning,
       trackingAreaListforWarning
                                                      Emergency Area ID List,\\
       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\text{-}eNBX2ExtendedTransportLayerAddresses
                                                            CRITICALITY ignore
                                                                                   EXTENSION ENBX2ExtTLAs
                                                                                                                PRESENCE optional}
-- Extension for Release 12 to transfer the IP addresses of the X2 GW --
                                                     CRITICALITY ignore
       {ID id-eNBIndirectX2TransportLayerAddresses
                                                                           EXTENSION ENBIndirectX2TransportLayerAddresses
                                                                                                                                 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 ::= {
    ...
```

 $ENBX2GTPTLAs ::= SEQUENCE \ (SIZE (1...\ maxnoofeNBX2GTPTLAs)) \ OF \ TransportLayerAddress$

 $ENBIndirect X2 Transport Layer Addresses ::= SEQUENCE \ (SIZE (1..maxnoofeNBX2TLAs)) \ OF \ Transport Layer Addresses \\ In the substitution of t$

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

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-DownlinkS1cdma2000tunnelling	ProcedureCode ::= 19
id-UplinkS1cdma2000tunnelling	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-PWSFailureIndication

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 ProcedureCode ::= 38 id-MMEDirectInformationTransfer id-PrivateMessage ProcedureCode ::= 39 id-eNBC on figuration TransferProcedureCode ::= 40 id-MMEConfigurationTransfer ProcedureCode ::= 41 id-CellTrafficTrace ProcedureCode ::= 42 id-Kill ProcedureCode ::= 43 id-downlinkUEAssociatedLPPaTransport ProcedureCode ::= 44 id-uplink UEAs sociated LPP a TransportProcedureCode ::= 45 id-downlink Non UEAs sociated LPP a TransportProcedureCode ::= 46 id-uplink Non UEAs sociated LPP a TransportProcedureCode ::= 47 id-UERadioCapabilityMatch ProcedureCode ::= 48 id-PWSRestartIndication ProcedureCode ::= 49 id-E-RABModificationIndication ProcedureCode ::= 50

ProcedureCode ::= 51

id-RerouteNASRequest	ProcedureCode ::= 52
id-UEC ontext Modification Indication	ProcedureCode ::= 53
id-Connection Establish ment Indication	ProcedureCode ::= 54
id-UEContextSuspend	ProcedureCode ::= 55
id-UEContextResume	ProcedureCode ::= 56
*******************	*****
Extension constants	
*************************	***********
maxPrivateIEs	INTEGER ::= 65535
maxProtocolExtensions	INTEGER ::= 65535
maxProtocolIEs	INTEGER ::= 65535
****************	**********
Lists	
****************	********
maxnoofCSGs	INTEGER ::= 256
maxnoofE-RABs	INTEGER ::= 256
maxnoofTAIs	INTEGER ::= 256

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INTEGER ::= 4096

INTEGER ::= 2

maxnoofTACs INTEGER ::= 256

maxnoofErrors INTEGER ::= 256

maxnoofBPLMNs INTEGER ::= 6

maxnoofPLMNsPerMME INTEGER ::= 32

maxnoofEPLMNs

INTEGER ::= 15

max no of EPLMN s Plus One

INTEGER ::= 16

maxnoofForbLACs

maxnoofForbTACs

INTEGER ::= 4096

maxnoofIndividualS1ConnectionsToReset INTEGER ::= 256

maxnoofCells INTEGER ::= 16

maxnoofCellsineNB INTEGER ::= 256

maxnoofTAIforWarning INTEGER ::= 65535

maxnoofCellID INTEGER ::= 65535

maxnoofEmergencyAreaID INTEGER ::= 65535

maxnoofCellinTAI INTEGER ::= 65535

maxnoofCellinEAI INTEGER ::= 65535

maxnoofeNBX2TLAs

maxnoofeNBX2ExtTLAs INTEGER ::= 16

maxnoofeNBX2GTPTLAs INTEGER ::= 16

maxnoofRATs INTEGER ::= 8

maxnoofGroupIDs INTEGER ::= 65535

id-eNB-UE-S1AP-ID

ProtocolIE-ID ::= 8

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id-E-RABSubjecttoDataForwardingList	ProtocolIE-ID ::= 12
id-E-RABtoReleaseListHOCmd	ProtocolIE-ID ::= 13
id-E-RABDataForwardingItem	ProtocolIE-ID ::= 14
id-E-RABRelease Item Bearer Rel Comp	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-RABF ailed To Setup List Bearer SURes	ProtocolIE-ID ::= 29
id-E-RABToBeModifiedListBearerModReq	ProtocolIE-ID ::= 30
id-E-RABModify List Bearer Mod Res	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

$id\hbox{-}E\hbox{-}RABToBeModified ItemBearer ModReq \\$	ProtocolIE-ID ::= 36
$id\hbox{-}E\hbox{-}RABModify Item Bearer Mod Res\\$	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-RABF ailed To Setup List Ctxt SURes	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

id-S-TMSI

id-cdma2000OneXRAND

id-RequestType

id-UE-S1AP-IDs

id-EUTRAN-CGI

id-OverloadResponse

id-cdma2000OneXSRVCCInfo

 $id\hbox{-}E\hbox{-}RABFailedToBeReleasedList\\$

id-Source-ToTarget-TransparentContainer

id-ServedGUMMEIs

id-SubscriberProfileIDforRFP

id-UESecurityCapabilities

id-CSFallbackIndicator

id-CNDomain

 $id\hbox{-}E\hbox{-}RABReleasedList$

id-MessageIdentifier

id-SerialNumber

id-WarningAreaList

id-RepetitionPeriod

 $id\hbox{-}Number of Broad cast Request$

id-WarningType

id-WarningSecurityInfo

id-DataCodingScheme

ProtocolIE-ID ::= 95

ProtocolIE-ID ::= 96

ProtocolIE-ID ::= 97

ProtocolIE-ID ::= 98

ProtocolIE-ID ::= 99

ProtocolIE-ID ::= 100

ProtocolIE-ID ::= 101

ProtocolIE-ID ::= 102

ProtocolIE-ID ::= 103

ProtocolIE-ID ::= 104

ProtocolIE-ID ::= 105

ProtocolIE-ID ::= 106

ProtocolIE-ID ::= 107

ProtocolIE-ID ::= 108

ProtocolIE-ID ::= 109

ProtocolIE-ID ::= 110

ProtocolIE-ID ::= 111

ProtocolIE-ID ::= 112

ProtocolIE-ID ::= 113

ProtocolIE-ID ::= 114

ProtocolIE-ID ::= 115

ProtocolIE-ID ::= 116

ProtocolIE-ID ::= 117

id-WarningMessageContents ProtocolIE-ID ::= 119 id-BroadcastCompletedAreaListProtocolIE-ID ::= 120 id-Inter-SystemInformationTransferTypeEDT ProtocolIE-ID ::= 121 $id\hbox{-}Inter\hbox{-}SystemInformationTransferTypeMDT$ ProtocolIE-ID ::= 122 id-Target-ToSource-TransparentContainer ProtocolIE-ID ::= 123 id-SRVCCOperationPossible ProtocolIE-ID ::= 124 ProtocolIE-ID ::= 125 id-SRVCCHOIndication 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-SecondaryProtocolIE-ID::=138

id-Target-ToSource-TransparentContainer-SecondaryProtocolIE-ID ::= 139

id-EUTRANRoundTripDelayEstimationInfo ProtocolIE-ID ::= 140

id-BroadcastCancelledAreaList ProtocolIE-ID ::= 141

id-ConcurrentWarningMessageIndicator ProtocolIE-ID ::= 142

id-PrivacyIndicator

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-Synchronisation-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-Traffic Load Reduction Indication	ProtocolIE-ID ::= 161
id-MDTConfiguration	ProtocolIE-ID ::= 162
id-MMERelaySupportIndicator	ProtocolIE-ID ::= 163
id-GWContextReleaseIndication	ProtocolIE-ID ::= 164
id-ManagementBasedMDTAllowed	ProtocolIE-ID ::= 165

id-Time-UE-StayedInCell-EnhancedGranularity

id-HO-Cause

id-GUMMEIType

id-M3Configuration

id-M4Configuration

id-M5Configuration

id-MDT-Location-Info

id-MobilityInformation

id-Tunnel-Information-for-BBF

id-VoiceSupportMatchIndicator

id-ManagementBasedMDTPLMNList

 $id\hbox{-}Signalling Based MDTPLMNL ist$

id-ULCOUNTValueExtended

id-DLCOUNTValueExtended

id-ReceiveStatusOfULPDCPSDUsExtended

id-ECGIListForRestart

id-SIPTO-Correlation-ID

 $id\hbox{-}SIPTO\hbox{-}L\hbox{-}GW\hbox{-}TransportLayerAddress$

id-TransportInformation

id-LHN-ID

id-AdditionalCSFallbackIndicator

id-TAIListForRestart

id-UserLocationInformation

id-EmergencyAreaIDListForRestart

ProtocolIE-ID ::= 167

ProtocolIE-ID ::= 168

ProtocolIE-ID ::= 169

ProtocolIE-ID ::= 170

ProtocolIE-ID ::= 171

ProtocolIE-ID ::= 172

ProtocolIE-ID ::= 173

ProtocolIE-ID ::= 174

ProtocolIE-ID ::= 175

ProtocolIE-ID ::= 176

ProtocolIE-ID ::= 177

ProtocolIE-ID ::= 178

ProtocolIE-ID ::= 179

ProtocolIE-ID ::= 180

ProtocolIE-ID ::= 181

ProtocolIE-ID ::= 182

ProtocolIE-ID ::= 183

ProtocolIE-ID ::= 184

ProtocolIE-ID ::= 185

ProtocolIE-ID ::= 186

ProtocolIE-ID ::= 187

ProtocolIE-ID ::= 188

ProtocolIE-ID ::= 189

id-RecommendedCellItem

id-KillAllWarningMessages	ProtocolIE-ID ::= 191
id-Masked-IMEISV	ProtocolIE-ID ::= 192
id-eNBIndirect X2 Transport Layer Addresses	ProtocolIE-ID ::= 193
id-uE-HistoryInformationFromTheUE	ProtocolIE-ID ::= 194
id-ProSeAuthorized	ProtocolIE-ID ::= 195
id-ExpectedUEBehaviour	ProtocolIE-ID ::= 196
id-LoggedMBSFNMDT	ProtocolIE-ID ::= 197
id-UERadioCapabilityForPaging	ProtocolIE-ID ::= 198
id-E-RABToBe Modified List Bearer Mod Ind	ProtocolIE-ID ::= 199
id-E-RABToBeModified ItemBearer ModInd	ProtocolIE-ID ::= 200
id-E-RABN ot To Be Modified List Bearer Mod Ind	ProtocolIE-ID ::= 201
id-E-RABN of To Be Modified I tem Be are r Mod Ind	ProtocolIE-ID ::= 202
id-E-RABModifyListBearerModConf	ProtocolIE-ID ::= 203
id-E-RAB Modify Item Bearer Mod Conf	ProtocolIE-ID ::= 204
id-E-RABF ailed To Modify List Bearer Mod Conf	ProtocolIE-ID ::= 205
id-SON-Information-Report	ProtocolIE-ID ::= 206
id-Muting-Availability-Indication	ProtocolIE-ID ::= 207
id-Muting-Pattern-Information	ProtocolIE-ID ::= 208
id-Synchronisation-Information	ProtocolIE-ID ::= 209
id-E-RABToBeReleasedListBearerModConf	ProtocolIE-ID ::= 210
id-AssistanceDataForPaging	ProtocolIE-ID ::= 211
id-CellIdentifierAndCELevelForCECapableUEs	ProtocolIE-ID ::= 212
id-Information On Recommended Cells And ENBs For Paging	ProtocolIE-ID ::= 213

id-RecommendedENBItem	ProtocolIE-ID ::= 215
id-ProSeUEtoNetworkRelaying	ProtocolIE-ID ::= 216
id-ULCOUNTValuePDCP-SNlength18	ProtocolIE-ID ::= 217
id-DLCOUNTValuePDCP-SNlength18	ProtocolIE-ID ::= 218
id-ReceiveStatusOfULPDCPSDUsPDCP-SNlength18	ProtocolIE-ID ::= 219
id-M6Configuration	ProtocolIE-ID ::= 220
id-M7Configuration	ProtocolIE-ID ::= 221
id-PWSfailedECGIList	ProtocolIE-ID ::= 222
id-MME-Group-ID	ProtocolIE-ID ::= 223
id-Additional-GUTI	ProtocolIE-ID ::= 224
id-S1-Message	ProtocolIE-ID ::= 225
id-CSGMembershipInfo	ProtocolIE-ID ::= 226
id-Paging-eDRXInformation	ProtocolIE-ID ::= 227
id-UE-RetentionInformation	ProtocolIE-ID ::= 228
id-UE-Usage-Type	ProtocolIE-ID ::= 230
id-extended-UEIdentityIndexValue	ProtocolIE-ID ::= 231
id-RAT-Type	ProtocolIE-ID ::= 232
id-BearerType	ProtocolIE-ID ::= 233
id-NB-IoT-DefaultPagingDRX	ProtocolIE-ID ::= 234
$id\hbox{-}E\hbox{-}RABFailedToResumeListResumeReq\\$	ProtocolIE-ID ::= 235
$id\hbox{-}E\hbox{-}RABFailedToResumeItemResumeReq}\\$	ProtocolIE-ID ::= 236
id-E-RABFailed To Resume List Resume Res	ProtocolIE-ID ::= 237
id-E-RABFailed To Resume I tem Resume Res	ProtocolIE-ID ::= 238
id-NB-IoT-Paging-eDRXInformation	ProtocolIE-ID ::= 239

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**

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```
-- 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 {
                                      ProtocolIE-ID
      &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}),
                      S1AP-PROTOCOL-IES.&Value
                                                       ({IEsSetParam}{@id})
     value
-- 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}),
                   S1AP-PROTOCOL-IES-PAIR.&firstCriticality
                                                          ({IEsSetParam}{@id}),
      firstCriticality
      firstValue
                                S1AP-PROTOCOL-IES-PAIR.&FirstValue
                                                                             ({IEsSetParam}{@id}),
      secondCriticality S1AP-PROTOCOL-IES-PAIR.&secondCriticality ({IEsSetParam}{@id}),
                                                                             ({IEsSetParam}{@id})
      secondValue
                                S1AP-PROTOCOL-IES-PAIR.&SecondValue
******************
-- 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
                                                                                      ({ExtensionSetParam}),
                                     S1AP-PROTOCOL-EXTENSION.&id
      criticality
                              S1AP-PROTOCOL-EXTENSION.&criticality
                                                                   ({ExtensionSetParam}{@id}),
      extensionValue
                                                                   ({ExtensionSetParam}{@id})
                        S1AP-PROTOCOL-EXTENSION.&Extension
 **********************
-- 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 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].

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:

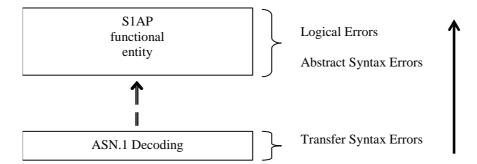


Figure 10.1-1: Protocol Errors in S1AP.

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 IE in S1AP: HANDOVER REQU 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 Contents of the Source BSS to Target BSS Transparent Container	48.018	Target BSS to Source BSS Transparent Container Contents of the 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	information elements field of	48.008	Layer 3 Information field of the Layer 3 Information	48.008
SRVCC operation to GERAN with DTM HO support	Source BSS to Target BSS Transparent Container Contents of the Source BSS to Target BSS Transparent Container (in the Source to Target Transparent Container	48.018	Layer 3 Information field of the Layer 3 Information (in the Target to Source Transparent Container IE); Target BSS to Source BSS	48.008 48.018
	IE); Old BSS to New BSS information elements field of the Old BSS to New BSS information (in the Source to Target Transparent Container Secondary IE)	48.008	Transparent Container Contents of the Target BSS to Source BSS Transparent Container (in the Target to Source Transparent Container Secondary IE)	

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	Semantics description
			reference	
SON Transfer Application Identity	M		ENUMERATED (Cell Load Reporting,, Multi-Cell Load Reporting, Event- Triggered Cell Load Reporting, HO Reporting, E- UTRAN Cell Activation, Energy Savings Indication, Failure Event Reporting)	The receiving RAN node, including the eHRPD eAN, shall discard any RAN-INFORMATION-REQUEST/Multiple Report PDU containing this IE with value set to 'Cell Load Reporting', "Multi-Cell Load Reporting", 'HO Reporting', 'E-UTRAN Cell Activation', 'Energy Savings Indication' or "Failure Event Reporting". The receiving eHRPD eAN shall discard any RAN-INFORMATION-
				REQUEST/Single Report PDU containing this IE with value set to 'Cell Load Reporting', 'HO Reporting', 'E-UTRAN Cell Activation', 'Energy Savings Indication' or "Failure Event 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	M			
Application				
>Cell Load Reporting			NULL	
>Multi-Cell Load Reporting				
>>Multi-Cell Load	M		B.1.7	
Reporting Request				
>Event-Triggered Cell				
Load Reporting				
>>Event-Triggered Cell	M		B.1.11	
Load Reporting Request				
>HO Reporting				
>>HO Report	M		B.1.13	
>E-UTRAN Cell Activation				
>>Cell Activation	M		B.1.14	
Request				
>Energy Savings Indication				
>>Cell State Indication	M		B.1.16	
>Failure Event Reporting		_		
>>Failure Event Report	M	<u>-</u>	B.1.17	

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	M			
Application				
>Cell Load Reporting				
>>Cell Load Reporting	M		B.1.5	
Response				
>Multi-Cell Load Reporting				
>>Multi-Cell Load	M		B.1.9	
Reporting Response				
>Event-Triggered Cell Load Reporting				
>>Event-triggered Cell	M		B.1.12	
Load Reporting				
Response				
>HO Reporting			NULL	
>E-UTRAN Cell Activation				
>>Cell Activation	M		B.1.15	
Response				
>Energy Savings Indication			NULL	The Reporting Cell Identifier field in the RAN-INFORMATION Application Container for SON Transfer (TS 48.018 [18]) shall be the same as received in the RAN-INFORMATION-REQUEST Application Container. The RAT Discriminator field shall be set to 'E-UTRAN'.
>Failure Event Reporting			NULL	The Reporting Cell Identifier field in the RAN-INFORMATION Application Container for SON Transfer (TS 48.018 [18]) shall be the same as received in the RAN-INFORMATION-REQUEST Application Container. The RAT Discriminator field shall be set to 'E-UTRAN'.

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	M			
Application				
>Cell Load Reporting				
>>Cell Load Reporting	M		B.1.10	
Cause				
>Multi-Cell Load Reporting				
>>Cell Load Reporting	M		B.1.10	
Cause				
>Event-Triggered Cell				
Load Reporting				
>>Cell Load Reporting	M		B.1.10	
Cause				
>HO Reporting				
>>HO Reporting Cause	M		ENUMERATED	
			(Application Container Syntax Error,	
			Inconsistent Reporting Cell Identifier,	
			Unspecified,	
)	
>E-UTRAN Cell Activation				
>>Cell Activation Cause	M		ENUMERATED	
			(Application Container Syntax Error,	
			Inconsistent Reporting Cell Identifier,	
			Unspecified,	
)	
>Energy Savings Indication				
>>Cell State Indication	M		ENUMERATED	
Cause			(Application Container Syntax Error,	
			Inconsistent Reporting Cell Identifier,	
			Unspecified,	
)	
>Failure Event Reporting			ENUMEDATED	
>>Failure Event	М		ENUMERATED	
Reporting Cause			(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 <i>Application Container</i> IE does not match with the <i>Destination Cell Identifier</i> IE value (in the case of a RAN-INFORMATION-REQUEST PDU) or with the <i>Source Cell Identifier</i> 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 <i>Application Container</i> IE is unknown in the RNC (UTRAN case) or in the eNodeB (E-UTRAN case) identified by the <i>Destination Cell Identifier</i> IE value in the RAN-INFORMATION-REQUEST PDU.
Unspecified	Sent when none of the above cause values applies.

Cell Activation Cause	Meaning
Application Container Syntax Error	The Application Container IE is syntactically incorrect.
Inconsistent Reporting Cell Identifier	- In case the reporting RAT is E-UTRAN: The Reporting Cell Identifier in the Application Container IE is unknown in the eNB identified by the Destination Cell Identifier IE value of the RIM header of a RAN-INFORMATION-REQUEST PDU or the reporting cell identifier in the Application Container IE does not match with the Source Cell Identifier IE value of the RIM header of a RAN-INFORMATION PDU.
Unspecified	Sent when none of the above cause values applies.

Cell State Indication Cause	Meaning
Application Container Syntax Error	The Application Container IE is syntactically incorrect.
Inconsistent Reporting Cell Identifier	- In case the reporting RAT is E-UTRAN: The Reporting Cell Identifier
	in the Application Container IE does not match with the Source Cell
	Identifier IE value of the RIM header of a RAN-INFORMATION-
	REQUEST PDU or the reporting cell identifier in the Application
	Container IE does not match with the Destination Cell Identifier IE
	value of the RIM header of a RAN-INFORMATION PDU.
Unspecified	Sent when none of the above cause values applies.

Failure Event Reporting Cause	Meaning
Application Container Syntax Error	The Application Container IE is syntactically incorrect.
Inconsistent Reporting Cell Identifier	- In case the reporting RAT is E-UTRAN: The Reporting Cell Identifier
	in the Application Container IE does not match with the Source Cell
	Identifier IE value of the RIM header of a RAN-INFORMATION-
	REQUEST PDU or the reporting cell identifier in the Application
	Container IE does not match with the Destination Cell Identifier IE
	value of the RIM header of a RAN-INFORMATION 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	М		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.
>eHRPD				
>>eHRPD Response	M		eHRPD Sector Load Reporting Response B.1.19	

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	Semantics description
			reference	
Requested Cell List		1 <maxnoofiratr eportingCells></maxnoofiratr 		One of the IRAT Cell IDs contained in this list shall be carried in the <i>Reporting Cell Identifier</i> field in the RAN-INFORMATION-REQUEST Application Container for SON Transfer (TS 48.018).
>IRAT Cell ID	M		B.1.8	

Range bound	Explanation
maxnoofIRATReportingCells	Maximum no. cells to be included. Value is 128.

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	М		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	М		OCTET STRING	Contains the <i>Cell Identifier</i> IE as defined in TS 48.018.
>eHRPD				
>>eHRPD Sector ID	M		B.1.18	

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 <maxnoofirat reportingcells=""></maxnoofirat>		
>CHOICE Reporting RAT	М			
>>E-UTRAN				
>>>E-UTRAN Response	М			
>>>Cell Identifier	М		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.
>>eHRPD				
>>>eHRPD Sector ID	М		B.1.18	
>>>eHRPD Sector Load Reporting Response	M		B.1.19	

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	М		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 Inconsistent Reporting Cell Identifier	The Application Container IE is syntactically incorrect. - In case the reporting RAT is GERAN or eHRPD: 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. If the reporting RAT is eHRPD, triggering is based on sector load.

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	М		Cell Load Reporting Response B.1.5	
Overload Flag	0		ENUMERATED (Overload,)	If the reporting RAT is eHRPD, when this IE is present the sector load exceeds the threshold for overload. For other reporting RATs, 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	Semantics description
			reference	
HO Type	M		ENUMERATED (LTE	
			to UTRAN, LTE to	
			GERAN,)	
HO Report Type	M		ENUMERATED	The "Early IRAT Handover"
			(Unnecessary HO to	code-point shall be used by the
			another RAT,,	RNC according to TS 25.413
			Early IRAT Handover)	[19].
HO Source ID	M		IRAT Cell ID	Contains the cell ID of the
			B.1.8	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
LIO Townst ID	1.4		IDAT CHUD	Identifier IE in TS 48.018 [18]
HO Target ID	M		IRAT Cell ID	Contains the cell ID of the target
			B.1.8	cell for the HO. This IE shall contain either a UTRAN Cell ID
				or a GERAN Cell ID.
Candidate Cell List		1		of a GERAN Cell ID.
Candidate Cen List		<pre></pre>		
		ateCells>		
>Candidate Cell ID	М	atcocnoz	IRAT Cell ID	This IE contains an E-UTRAN
Zoarididate och 15	'''		B.1.8	CGI.
Candidate PCI List		01	211.0	
>Candidate PCIs		1		
		<maxnoofcandid< td=""><td></td><td></td></maxnoofcandid<>		
		ateCells>		
>>Candidate PCI	М		B.1.23	This IE includes the Primary Cell
				Identifier and the EARFCN of
				detected cells not included in the
				Candidate Cell List IE and for
				which an E-UTRAN CGI could
				not be derived.

Range bound	Explanation		
maxnoofCandidateCells	Maximum no. of candidate cells.		

B.1.14 Cell Activation Request

This IE contains request information for inter-RAT Cell Activation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cells to Activate List		1 <maxnoofcelline NB></maxnoofcelline 	reference	One of the cell IDs contained in this list shall be carried in the Reporting Cell Identifier field in the RAN-INFORMATION-REQUEST Application Container for SON Transfer (TS 48.018 [18]).
>Cell Identifier	М		OCTET STRING	Contains the <i>E-UTRAN CGI</i> IE as defined in 9.2.1.38.
Minimum Activation Time	0		INTEGER (160)	Seconds

Range bound		Explanation			
	maxnoofCellineNB	Maximum no. cells that can be served by an eNB. Value is 256.			

B.1.15 Cell Activation Response

This IE contains response information for inter-RAT Cell Activation.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Activated Cells List		0 <maxnoofcelline NB></maxnoofcelline 		
>Cell Identifier	M		OCTET STRING	Contains the <i>E-UTRAN CGI</i> IE as defined in 9.2.1.38.

Range bound	Explanation
maxnoofCellineNB	Maximum no. cells that can be served by an eNB. Value is 256.

B.1.16 Cell State Indication

This IE contains notification information for inter-RAT Cell Activation and Deactivation

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Notification Cell List		1 <maxnoofcelline NB></maxnoofcelline 		One of the cell IDs contained in this list shall be carried in the <i>Reporting Cell Identifier</i> field in the RAN-INFORMATION-REQUEST Application Container for SON Transfer (TS 48.018 [18]).
>Cell Identifier	М		OCTET STRING	Contains the <i>E-UTRAN CGI</i> IE as defined in 9.2.1.38.
>Notify Flag	M		ENUMERATE D (Activated, Deactivated,)	

Range bound	Explanation
maxnoofCellineNB	Maximum no. cells that can be served by an eNB. Value is 256.

B.1.17 Failure Event Report

This IE contains information for inter-RAT handover with connection failure.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE Failure Event Report Type	М			
>Too Early inter-RAT HO report from E- UTRAN				The Reporting Cell Identifier field in the RAN-INFORMATION Application Container for SON Transfer (TS 48.018 [18]) shall be the same as the Last Serving Cell Identity in the UE RLF Report.
>>UE RLF Report Container	M		OCTET STRING	RLF Report contained in the UEInformationResponse message (TS 36.331 [16])
>>Mobility Information	0		BIT STRING (SIZE (32))	Information related to the handover; the external handover source provides it in the Source eNB to target eNB Transparent Container in order to enable later analysis of the conditions that led to a wrong HO.

B.1.18 eHRPD Sector ID

This IE contains the eHRPD Sector ID.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eHRPD Sector ID	М		OCTET STRING (SIZE(16))	Defined in 3GPP2 C.S0024-B [27] subsection 13.9

B.1.19 eHRPD Sector Load Reporting Response

This IE indicates the overall available resource level in the eHRPD sector in downlink and uplink.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eHRPD Composite Available Capacity Downlink	M		eHRPD Composite Available Capacity B.1.20	For the downlink
eHRPD Composite Available Capacity Uplink	M		eHRPD Composite Available Capacity B.1.20	For the uplink

B.1.20 eHRPD Composite Available Capacity

This IE indicates the overall available resource level in the eHRPD sector in either Downlink or Uplink.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eHRPD Sector Capacity Class Value	М		B.1.21	
eHRPD Capacity Value	М		B.1.22	"0" indicates no resource is available, Measured on a linear scale.

B.1.21 eHRPD Sector Capacity Class Value

This IE indicates the value that classifies the eHRPD sector capacity with regards to cells in other RATs. The IE only indicates resources that are configured for traffic purposes.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eHRPD Sector Capacity Class Value	M		INTEGER (1100,)	Value 1 indicates the minimum sector capacity, and 100 indicates the maximum sector capacity. There should be a linear relation between sector capacity and eHRPD Sector Capacity Class Value.

B.1.22 eHRPD Capacity Value

This IE indicates the amount of resources that are available for load balancing relative to the total eHRPD resources. A sector is expected to accept traffic corresponding to the indicated available capacity.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
eHRPD Capacity Value	M		INTEGER (0100)	Value 0 indicates no available capacity, and 100 indicates maximum available capacity . Capacity
				Value should be measured on a linear scale.

B.1.23 Candidate PCI

This IE contains the Primary Cell Identity and the frequency of a detected LTE cell.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PCI	М		INTEGER (0503)	Physical Cell Identifier of the detected cell
EARFCN	М		OCTET STRING	Contains the EARFCN IE as defined in 9.2.1.95.

 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.

ASN.1 definition

SonTransfer-IEs

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

B.2

```
-- Generic IEs for the SON Transfer application
SONtransferApplicationIdentity ::= ENUMERATED {
        cell-load-reporting,
        multi-cell-load-reporting,
        event-triggered-cell-load-reporting,
        ho-reporting,
        eutran-cell-activation,
        energy-savings-indication,
        failure-event-reporting
}
SONtransferRequestContainer ::= CHOICE{
        cellLoadReporting
                                                                    NULL,
        multiCellLoadReporting
                                                            MultiCellLoadReportingRequest,
        event Triggered Cell Load Reporting\\
                                                   Event Triggered Cell Load Reporting Request,\\
        hOReporting
                                                                             HOReport,
        eutranCellActivation
                                                            CellActivationRequest,
        energySavingsIndication
                                                            CellStateIndication,
        failureEventReporting
                                                            FailureEventReport
}
SONtransferResponseContainer ::= CHOICE{
                                                                    CellLoadReportingResponse,
        cellLoadReporting
        multiCellLoadReporting
                                                            MultiCellLoadReportingResponse,
        event Triggered Cell Load Reporting\ Event Triggered Cell Load Reporting Response,
        hOReporting
        eutranCellActivation
                                                            CellActivationResponse,
        energySavingsIndication
                                                            NULL,
```

```
failureEventReporting
                                                           NULL
}
SONtransferCause ::= CHOICE {
                                                                    CellLoadReportingCause,
        cellLoadReporting
        ...,
        multiCellLoadReporting\\
                                                           CellLoadReportingCause,
        event Triggered Cell Load Reporting\\
                                                   CellLoadReportingCause,
        hOReporting
                                                                             HOReportingCause,
        eutran Cell Activation \\
                                                           CellActivationCause,
        energySavingsIndication
                                                           CellStateIndicationCause,
        failureEventReporting
                                                           FailureEventReportingCause
}
CellLoadReportingCause ::= ENUMERATED {
        application-container-syntax-error,
        inconsistent-reporting-cell-identifier,
        unspecified,
}
HOReportingCause ::= ENUMERATED {
        application-container-syntax-error,
        inconsistent-reporting-cell-identifier,
        unspecified,
}
CellActivationCause ::= ENUMERATED {
        application-container-syntax-error,
        inconsistent-reporting-cell-identifier,
        unspecified,
}
```

```
CellStateIndicationCause ::= ENUMERATED {
        application-container-syntax-error,
        inconsistent-reporting-cell-identifier,
        unspecified,
}
FailureEventReportingCause ::= ENUMERATED {
        application-container-syntax-error,
        inconsistent-reporting-cell-identifier,
        unspecified,
}
-- IEs for Cell Load Reporting application
CellLoadReportingResponse::= CHOICE{
        eUTRAN
                                         EUTRAN cell Load Reporting Response,\\
        uTRAN
                                 OCTET STRING,
                                 OCTET STRING,
        gERAN
        eHRPD
                                 EHRPDSectorLoadReportingResponse\\
}
Composite Available Capacity Group ::= OCTET\ STRING
EUTRANcellLoadReportingResponse ::= SEQUENCE {
        composite Available Capacity Group \\
                                                 Composite Available Capacity Group,\\
}
```

MultiCellLoadReportingResponse-Item

```
-- IEs for Multi-Cell Load Reporting application
EUTRANResponse::= SEQUENCE {
                            cell-ID
                                                                                                                 OCTET STRING,
                            eUTRAN cell Load Reporting Response\\
                                                                                                                                                                                                     EUTRANcellLoadReportingResponse,
}
EHRPD-Sector-ID ::= OCTET STRING (SIZE (16))
IRAT-Cell-ID ::= CHOICE{
                            eUTRAN
                                                                                                                                             OCTET STRING,
                            uTRAN
                                                                                                                 OCTET STRING,
                            gERAN
                                                                                                                 OCTET STRING,
                            ...,
                            eHRPD
                                                                                                                EHRPD-Sector-ID
}
RequestedCellList ::= SEQUENCE (SIZE(1.. maxnoofIRATReportingCells)) OF IRAT-Cell-ID
MultiCellLoadReportingRequest::= SEQUENCE {
                            requested Cell List
                                                                                                                                                                                                                                  RequestedCellList,
 }
ReportingCellList-Item ::= SEQUENCE {
                                                                                                                                                                                                                                                                                           IRAT-Cell-ID,
                            cell-ID
                            ...
}
Reporting Cell List ::= SEQUENCE \ (SIZE (1...maxnoof IRAT Reporting Cells)) \ OF \ Reporting Cell List-Item
MultiCellLoadReportingResponse ::= SEQUENCE \ (SIZE (1...maxnoofIRATReportingCells)) \ OF \ (SIZE (1...maxnoofIR
```

```
MultiCellLoadReportingResponse-Item ::= CHOICE{
        eUTRANResponse
                                                                                  EUTRANResponse,
        uTRANResponse
                                                                         OCTET STRING,
                                                                         OCTET STRING,
        gERANResponse
        ...,
        eHRPD
        EHRPD \\ Multi Sector \\ Load \\ Reporting \\ Response \\ Item
}
-- IEs for Event-triggered Cell Load Reporting application
NumberOfMeasurementReportingLevels ::= ENUMERATED {
        rl2,
        rl3,
        rl4,
        rl5,
        rl10,
}
EventTriggeredCellLoadReportingRequest ::= SEQUENCE \ \{
        number Of Measurement Reporting Levels\\
                                                         Number Of Measurement Reporting Levels,\\
}
OverloadFlag ::= ENUMERATED {
        overload,
}
EventTriggeredCellLoadReportingResponse ::= SEQUENCE {
```

```
cell Load Reporting Response \\
                                                                  Cell Load Reporting Response,\\
                                                                           OverloadFlag
        overload Flag\\
                         OPTIONAL,
}
-- IEs for HO Reporting application
HOReport::= SEQUENCE {
        hoType
                                                 НоТуре,
        hoReportType\\
                                         HoReportType,
        hosourceID
                                                 IRAT-Cell-ID,
        hoTargetID
                                                 IRAT-Cell-ID,
        candidate Cell List\\
                                 CandidateCellList,
                                 CandidatePCIListOPTIONAL
        candidatePCIList
}
HoType ::= ENUMERATED {
        ltetoutran,
        ltetogeran,
}
HoReportType ::= ENUMERATED {
        unnecessaryhotoanotherrat,
        earlyirathandover
}
```

 $Candidate Cell List ::= SEQUENCE \ (SIZE (1..max no of candidate Cells)) \ OF \ IRAT-Cell-ID$

CandidatePCIList ::= SEQUENCE (SIZE(1..maxnoofcandidateCells)) OF CandidatePCI

```
CandidatePCI ::= SEQUENCE {
        pCI
                               INTEGER (0..503),
       eARFCN
                               OCTET STRING,
}
-- IEs for E-UTRAN Cell Activation application
CellActivationRequest ::= SEQUENCE {
        cells To Activate List\\
                                       CellsToActivateList,
        minimumActivationTime INTEGER (1..60)
                                                       OPTIONAL,
•••
}
CellsToActivateList ::= SEQUENCE (SIZE(1.. maxnoofCellineNB)) OF CellsToActivateList-Item
CellsToActivateList-Item ::= SEQUENCE {
        cell-ID
                                                OCTET STRING,
}
CellActivationResponse ::= SEQUENCE {
        activatedCellsList
                                       ActivatedCellsList,
        ...
}
ActivatedCellsList ::= SEQUENCE (SIZE(0.. maxnoofCellineNB)) OF ActivatedCellsList-Item
ActivatedCellsList-Item ::= SEQUENCE {
        cell-ID
                                                OCTET STRING,
```

```
}
-- IEs for Energy Savings Indication application
CellStateIndication ::= SEQUENCE {
        notificationCellList
                                                 NotificationCellList,
}
Notification CellList ::= SEQUENCE \ (SIZE (1...maxnoof Celline NB)) \ OF \ Notification CellList-Item
NotificationCellList-Item ::= SEQUENCE {
        cell-ID
                                                 OCTET STRING,
        notifyFlag
                                                 NotifyFlag,
}
NotifyFlag ::= ENUMERATED {
        activated,
        deactivated,
}
FailureEventReport::= CHOICE {
        too Early InterRATHOReport From EUTRAN\\
        TooEarlyInterRATHOReportReportFromEUTRAN,
}
TooEarlyInterRATHOReportReportFromEUTRAN ::= SEQUENCE {
        uERLFReportContainer OCTET STRING, -- as defined in TS 36.331 [16] --
                                                                         OPTIONAL,
        mobilityInformation
                                        MobilityInformation
```

```
}
MobilityInformation ::= BIT STRING (SIZE(32))
-- IEs for reporting of eHRPD load
EHRPDCapacityValue ::= INTEGER (0..100)
EHRPDSectorCapacityClassValue ::= INTEGER (1..100, ...)
EHRPDSectorLoadReportingResponse ::= SEQUENCE {
       dL-EHRPD-CompositeAvailableCapacity
                                                         EHRPDCompositeAvailableCapacity,
       uL-EHRPD-CompositeAvailableCapacity
                                                         EHRPDCompositeAvailableCapacity,
}
EHRPDCompositeAvailableCapacity ::= SEQUENCE {
       eHRPDS ector Capacity Class Value\\
                                                         EHRPDS ector Capacity Class Value,\\
       eHRPDCapacityValue
                                                                       EHRPDCapacityValue,
}
EHRPDMultiSectorLoadReportingResponseItem ::= SEQUENCE \ \{
       eHRPD-Sector-ID
                                                                       EHRPD-Sector-ID,
       eHRPDS ector Load Reporting Response\\
                                                  EHRPDSectorLoadReportingResponse,
}
```

maxnoofIRATReportingCells INTEGER ::= 128

maxnoofcandidateCells INTEGER ::= 16

maxnoofCellineNB INTEGER ::= 256

END

-- Constants

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 GTPv1-C "BSS Container" (value part octets 4-n) of the "BSS Container" IE across the Gn- interface (see subclause 7.7.72 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 the *Source to Target Transparent Container* IE, the *Target to Source Transparent Container* IE or the *Target to Source Transparent Container Secondary* IE of the corresponding S1AP message.

- The MME shall convey to the GTP peer the information received within the octets of the OCTET STRING of the Source to Target Transparent Container IE, the Target to Source Transparent Container IE or the Target to Source Transparent Container Secondary 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 GTPv1-C "BSS Container" (value part octets 4-n) of the "BSS Container" IE across the Gn- interface (see subclause 7.7.72 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			changes to TS36.413 agreed in RAN3#61	8.3.0
42	RP-080846		1	changes to TS36.413 agreed in RAN3#62	8.4.0
43	RP-090083			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			Modification of RRC context indexing	8.5.0
43	RP-090086		1	Completion of LTE cause values	8.5.0
43	RP-090090		1	Correction of served GUMMEIs	8.5.0
43	RP-090086		1	Correction of Initial Context Setup	8.5.0
43	RP-090086		1	Clarification of path switch failure	8.5.0
43	RP-090091		2	Correction of eNB Status Transfer	8.5.0
43	RP-090083			Addition of the description of Timer TX2RELOCOverall	8.5.0
43	RP-090089		1	New cause value 'Interaction with other procedure'	8.5.0
43	RP-090087		1	S1AP Review on Location Reporting procedures	8.5.0
43	RP-090089		1	Definition on parameters related to a trace activation	8.5.0
43	RP-090090		2	Adding EUTRAN CELL TRAFFIC TRACE message over S1 interfaces	8.5.0
43	RP-090091		2	Adding MS Classmark 2 and MS Clssmark 3 IEs over S1 interface	8.5.0
43	RP-090086		1	New Invalid E-RAB Id causes	8.5.0
43	RP-090091		2	S1AP Review: S1 Handover Cancel procedure	8.5.0
43	RP-090158		2	S1AP Review: Write-Replace Warning procedure	8.5.0
43	RP-090246		1	Definition of Cell Type	8.5.0
43	RP-090085		1	Abnormal condition related to UE Security Capabilities	8.5.0
43	RP-090245			Removal of UE Security Capabilities IE from HANDOVER NOTIFY message	8.5.0
43	RP-090086		1	Corrections for the procedure concurrency	8.5.0
43	RP-090091		2	Clarification of eNB Name and MME Name IE"s	8.5.0
43	RP-090083		_	Clarifications on access control at handover	8.5.0
43	RP-090087		1	Paging response	8.5.0
43	RP-090077			Correction on usage of UE History Information	8.5.0
43	RP-090086		1	Delete the UDP port in the note for GTP-TEID	8.5.0
43	RP-090245			S1AP CR on CDMA2000 RAT Type	8.5.0
43	RP-090246		1	Editorial Updates TS 36.413	8.5.0
43	RP-090091			NAS Security Parameters for to/from E-UTRAN/UTRAN handovers	8.5.0
43	RP-090085		1	Updates for Next Hop Chaining Count	8.5.0
43	RP-090245			Transparent Container content – informative annex	8.5.0
43	RP-090093		1	Transparent container handling in case of SRVCC operation to GERAN	8.5.0
43	RP-090090			Changes to S1AP to support paging optimization	8.5.0
43	RP-090245		3	S1 handover Clean up	8.5.0
43	RP-090087		1	Support blocking 3GPP2 handover	8.5.0
43	RP-090091		2	Inclusion of eNB default paging DRX in S1 setup and configuration update	8.5.0
43	RP-090087		1	Explicit resetting of overload state information on S1 Setup	8.5.0
43	RP-090090		2	Clarify Security Context IE description	8.5.0
43	RP-090091			Criticality corrections in 36.413	8.5.0
43	RP-090245		Г	Add abnormal conditions section to UE Context Release and fix tabular error	8.5.0
43	RP-090245			Consistent references to S1AP	8.5.0
43	RP-090090		2	Two new cause values in the Cause IE	8.5.0
43	RP-090089			Alignment of QCI range	8.5.0
43	RP-090089			Remove the Handover Type IE from the HANDOVER REQUEST	8.5.0
12	DD 000000	0407	1	ACKNOWLEDGE message	0 F O
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		2	Editorial Updates	8.6.0
44	RP-090637	0512		Correction of RAN#43 CR implementation	8.6.0

	1				1
44	RP-090637	0510		Explicitly allow TRACE START to be the first UE-associated message	8.6.0
4.4	DD 000637	0507	4	received at the eNB	0.6.0
44 44	RP-090637		1	Clarification of UE Capability Info Indication	8.6.0 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	0.0.0
44	RP-090637	0482	1	Clarify eNB may send Release msg rather than RRC Reject msg on receiving	8.6.0
4.4	DD 000007	0.400		OVERLOAD Start msg	0.0.0
44	RP-090637		1	Clarify reporting of duplicate E-RABs in E-RAB RESPONSE	8.6.0
44	RP-090637			Correction of security parameters	8.6.0
44	RP-090637			Emergency call Indicator during CS Fallback	8.6.0
44 44	RP-090638 RP-090644			Correction on Path Switch Request procedure	8.6.0
44	RP-090644		4	Removing "outcome" element from the Triggering Message IE	8.6.0 8.6.0
44	RP-090644		1	Missing S1AP functions Correction of abnormal conditions in UE Context Release	8.6.0
44	RP-090644		1	Clarification of E-UTRAN Trace ID in Cell Traffice Trace message	8.6.0
44	RP-090644		1	Removal of duplication description of MME UE S1AP ID and eNB UE S1AP	8.6.0
44	111-030044	0433		ID	0.0.0
44	RP-090644	0455	1	Abnormal condition for Handover Cancellation	8.6.0
44	RP-090640		_	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			Rephrasing of abnormal conditions for S1 setup	8.6.0
44	RP-090640			Cause value for inter-RAT Redirection	8.6.0
44	RP-090628		2	NAS PDU in E-RAB Release Command	8.6.0
44	RP-090636			Alignment of eNB configuration update procedure	8.6.0
44	RP-090636		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	8.6.0
	DD 000000	0.450		message	0.00
44	RP-090636			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	KF-090030	0301	1	Correction of an ASN.1 implementation error of CR0463r1 in RP-090637	8.6.1
2009				(R3-091456)	0.0.1
45	RP-090767	0515	1	Corrections for 36.413	8.7.0
45	RP-090964			SRVCC to GERAN/UTRAN	8.7.0
45	RP-090964			Clean up the Terminology of home eNB in S1AP	8.7.0
45	RP-090964			Specify how report dup E-RAB ID in Tabular and replace MME with EPC in	8.7.0
				8.3.1.2	
45	RP-090964	0536	1	Indirect path use by the MME	8.7.0
45	RP-090767		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			Miscellaneous correction to 36.413v8.6.1	8.7.0
45	RP-090768			ASN1 object identified correction	8.7.0
45	RP-090767	0554		Interaction between Initial Context Setup/UE Context Modification and	8.7.0
				Handover Preparation/Redirection procedures during CS Fallback	
09/2009		050:		Rel-9 version is created based on v.8.7.0	9.0.0
45	RP-090767		3	Adding the RTD information in UPLINK CDMA2000 TUNNELING	9.0.0
45	RP-090787		1	Handling of Emergency Calls in Limited Service Mode	9.0.0
45	RP-090787		1	Emergency Calls Mobility Handling	9.0.0
45	RP-090776		1	S1AP Kill procedure for cancellation of PWS warning messages	9.0.0
45	RP-090776		1	S1AP Write-Replace Warning procedure for PWS/CMAS	9.0.0
46	RP-091191			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		2	CR for Transportation support for LPPa	9.1.0
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